

**THIS FOLDER WAS CHECKED BY
ARUP ON**

21.3.03

**The checking process was to ensure that 3 identical
sets of each Volume of the Operating and
Maintenance Manuals existed**

H

**5-7 CARLTON GARDENS
LONDON SW1**

**OPERATING & MAINTENANCE
INSTRUCTIONS
for the
BMS**

**VOLUME 2
2.3 – Section H**

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H MANUFACTURERS INFORMATION

- 1 SOCOMEC
- 2 TELEMECHANIQUE
- 3 TRANILAMP
- 4 MERLIN GERIN
- 5 FINDER
- 6 ENTRELAC
- 7 DANFOSS
- 8 BELIMO
- 9 SIEMENS LANDIS & STAefa
- 10 TITAN
- 11 SONTAY
- 12 SLANEY
- 13 MAMAC
- 14 TREND
- 15 SEACHANGE
- 16 DOORWAY

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	D	Operation of the Installation
	E	Maintenance of the Installation
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	23	Façade Cleaning
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25		Soft Landscaping
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MASTER INDEX

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VOLUME 2 BUILDING MANAGEMENT SYSTEM

VOLUME 3 ELECTRICAL INSTALLATION

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2. Health & Safety at Work
3. Emergency Information
4. Contractual and Legal Details

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2. Environmental Design Conditions
3. Description of the Systems

SECTION C SCHEDULES

1. BMS Points Schedule

SECTION D OPERATION OF THE INSTALLATION

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- 1.1 Weather station – System 0
- 1.2 AHU01 (East Office Ventilation) - System 1
- 1.3 AHU02 (West Office Ventilation) - System 2
- 1.4 AHU03 (Office Core Lobby & Toilet Ventilation)
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- 1.5 Basement Staffroom, Mailroom & Lift Motor Room
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13. Mamac
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15. SeaChange
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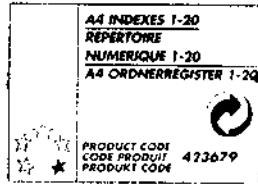
SECTION I COMMISSIONING & TESTING RECORDS

1. Panel MCCB/1
2. Panel MCCB/2
3. Panel MCC7/1
4. Panel MCP/1
5. Panel MCP/2
6. Panel MCP/3
7. Panel MCP/4
8. SCP/LG//E
9. SCP/G/N
10. SCP/1/E
11. SCP/2/E
12. SCP/3/E
13. SCP/4/E
14. SCP/5/E
15. SCP/LG/W
16. SCP/G/S
17. SCP/1/W
18. SCP/2/W
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21. SCP/5/W

CROSS REFERENCE INDEX

ITEM	GENERAL OPERATING INSTRUCTIONS	GENERAL MAINTENANCE INSTRUCTIONS	SPECIFIC SUPPLIER LITERATURE
AHU01 (East Office Ventilation) - System 1	D.1.2	E.2.8 / E.2.9	N/A
AHU02 (West Office Ventilation) - System 2	D.1.3	E.2.8 / E.2.9	N/A
AHU03 (Office Core Lobby & Toilet Ventilation) - System 3	D.1.4	E.2.8 / E.2.9	N/A
Basement Staffroom, Mailroom & Lift Motor Room Ventilation System 4	D.1.5	E.2.8 / E.2.9	N/A
Basement WCs and Refuse Room Extract Fans - System 5	D.1.6	E.2.8 / E.2.9	N/A
Car Park Ventilation & Smoke Fans - System 6	D.1.7	E.2.8 / E.2.9	N/A
BMS/Security Room Ventilation - System 7	D.1.8	E.2.8 / E.2.9	N/A
Basement Plant West Extract - System 8	D.1.9	E.2.8 / E.2.9	N/A
Basement Plant East Extract - System 9	D.1.10	E.2.8 / E.2.9	N/A
Residential Staircase Pressurisation Fans - System 10	D.1.11	E.2.8 / E.2.9	N/A
Office Staircase Pressurisation Fans - System 11	D.1.12	E.2.8 / E.2.9	N/A
Fire Fighting Staircase Pressurisation Fans - System 12	D.1.13	E.2.8 / E.2.9	N/A
Workshop Ventilation - System 13	D.1.14	E.2.8 / E.2.9	N/A
Boiler Room Combustion Air - System 14	D.1.15	E.2.8 / E.2.9	N/A
East Office Pressurisation Relief Fans - System 20	D.1.16	E.2.8 / E.2.9	N/A
West Office Pressurisation Relief Fans - System 21	D.1.17	E.2.8 / E.2.9	N/A
Lower Ground Floor (East) Controls - System 30	D.1.18	E.2.8 / E.2.9	N/A
Ground Floor (North) Controls - System 31	D.1.19	E.2.8 / E.2.9	N/A
First Floor (East) Controls - System 32	D.1.20	E.2.8 / E.2.9	N/A
Second Floor (East) Controls - System 33	D.1.21	E.2.8 / E.2.9	N/A
Third Floor (East) Controls - System 34	D.1.22	E.2.8 / E.2.9	N/A
Fourth Floor (East) Controls - System 35	D.1.23	E.2.8 / E.2.9	N/A
Fifth Floor (East) Controls - System 36	D.1.24	E.2.8 / E.2.9	N/A
Lower Ground Floor (West) Controls - System 37	D.1.25	E.2.8 / E.2.9	N/A
Ground Floor (South) Controls - System 38	D.1.26	E.2.8 / E.2.9	N/A
First Floor (West) Controls - System 39	D.1.27	E.2.8 / E.2.9	N/A

Second Floor (West) Controls - System 40	D.I.28	E.2.8 / E.2.9	N/A
Third Floor (West) Controls - System 41	D.I.29	E.2.8 / E.2.9	N/A
Fourth Floor (West) Controls - System 42	D.I.30	E.2.8 / E.2.9	N/A
Fifth Floor (West) Controls - System 43	D.I.31	E.2.8 / E.2.9	N/A
Primary Boiler Plant - System 100	D.I.32	E.2.8 / E.2.9	N/A
FCU Secondary LTHW Circuit - System 101	D.I.33	E.2.8 / E.2.9	N/A
AHU Secondary LTHW Circuit - System 102	D.I.34	E.2.8 / E.2.9	N/A
DHWS Calorifier LTHW Circuit - System 103	D.I.35	E.2.8 / E.2.9	N/A
Radiator & Landlord's LTHW Circuit - System 104	D.I.36	E.2.8 / E.2.9	N/A
Primary Chilled Water Plant - System 200	D.I.37	E.2.8 / E.2.9	N/A
FCU Secondary CHW Circuit - System 201	D.I.38	E.2.8 / E.2.9	N/A
AHU Secondary CHW Circuit - System 202	D.I.39	E.2.8 / E.2.9	N/A
Residential Controls - Systems 300 to 305	D.I.40	E.2.8 / E.2.9	N/A
Public Health Monitoring - System 400	D.I.41	E.2.8 / E.2.9	N/A
Electrical Monitoring - System 500	D.I.42	E.2.8 / E.2.9	N/A
Fire Operation - System 999	D.I.43	E.2.8 / E.2.9	N/A



5 018206 092908

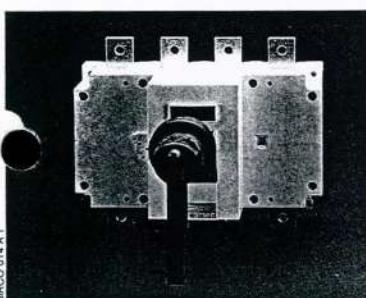
SOCOMECH ISOLATORS 40 to 3150 A

SIRCO ON-LOAD SWITCH DISCONNECTORS - EXTERNAL FRONT OPERATION

SWITCH BODY

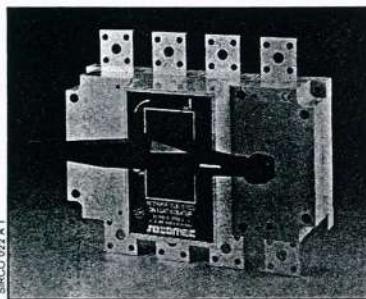
Thermal Rating (A)	(A) AC21 415V	(A) AC23 415V	kW AC23 415V	Number of Poles	Reference Number	Price (ea)
40	40	40	22	3 p	2600 3004	13.24
				4 p	2600 4004	15.45
63	63	63	33	3 p	2600 3006	18.75
				4 p	2600 4006	25.93
80	80	80	45	3 p	2600 3008	22.89
				4 p	2600 4008	29.24
100	100	100	55	3 p	2600 3010	25.65
				4 p	2600 4010	34.48
125 (R)	125	100	55	3 p	2600 3011	28.41
				4 p	2600 4011	36.96
125	125	125	63	3 p	2600 3014	43.10
				4 p	2600 4014	50.70
160	160	160	80	3 p	2600 3017	75.68
				4 p	2600 4017	84.28
200	200	200	110	3 p	2600 3021	79.47
				4 p	2600 4021	89.85
250	250	250	140	3 p	2600 3026	94.07
				4 p	2600 4026	108.80
315	315	315	160	3 p	2600 3032	112.46
				4 p	2600 4032	136.55
400	400	400	220	3 p	2600 3041	125.98
				4 p	2600 4041	150.85
500	500	400	220	3 p	2600 3051	142.69
				4 p	2600 4051	188.12
630	630	500	295	3 p	2600 3064	239.81
				4 p	2600 4064	280.89
800	800	800	475	3 p	2600 3080	284.19
				4 p	2600 4080	322.05
1000	1000	1000	600	3 p	2600 3100	670.59
				4 p	2600 4100	774.84
1250	1250	1000	600	3 p	2600 3120	703.04
				4 p	2600 4120	859.87
1600	1600	1000	600	3 p	2600 3160	929.20
				4 p	2600 4160	979.39
2000	2000	1250	750	3 p	2600 3210	1559.92
				4 p	2600 4210	1861.15
2500	2500	1250	750	3 p	2600 3260	1738.42
				4 p	2600 4260	1952.17
3150	3150	1250	750	3 p	2600 3310	2109.10
				4 p	2600 4310	2455.24

SIRCO 40 A - 4 p



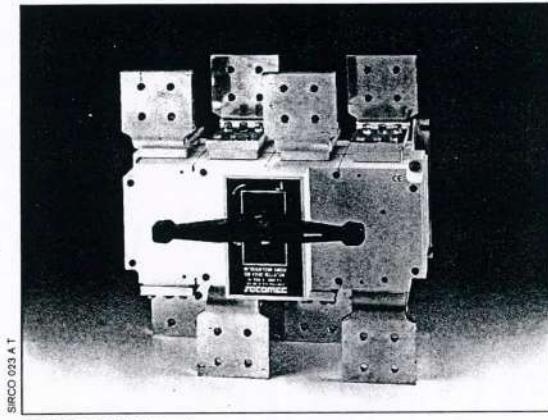
SIRCO 024 AT

SIRCO 400 A - 4 p



SIRCO 024 AT

SIRCO 800 A - 4 p



SIRCO 3150 A - 4 p

SIRCO 023 AT

SIRCO ACCESSORIES

CASTELL INTERLOCKING DEVICE

Castell lock	Rating	Reference	Price (ea)
FS Type	125 to 630 A	3629 7703	20.23
' Type	125 to 630 A	3629 7702	33.10

Type 800 - 3150A Castell fits directly to door interlocking mechanism
(See page 38 for drilling pattern)



NOTES: 1. Other variations available Please consult us



SOCOMECH ISOLATORS 40 to 3150 A

I E C
947-3

SIRCO ACCESSORIES

DOOR INTERLOCKED HANDLES

Rating	Colour	IP Rating	Reference Number	Price (ea)
40 - 125A (R)	Black	54	2699 5125	10.46
	Red-Yellow	54	2699 5123	11.03
125 - 630A	Black	54	3629 7716	12.17
	Red-Yellow	65	3629 7418	16.43
800 - 3150A	Black	54	2799 7125	46.61
	Red-Yellow	54	2799 7123	50.47

DIRECT OPERATION HANDLES

Rating	Colour	Reference Number	Price (ea)
40 - 125A (R)	Black	2699 5012	2.71
	Red	2699 5013	3.31
125 - 630A	Black	2699 5052	3.87
	Black	2799 7012	25.93

SHAFT EXTENSIONS

Rating	Shaft Length	Maximum dimensions - backplate to door		
40 - 125A (R)	200 mm	40 - 125A (R)	300 mm	2699 3003
	300 mm		400 mm	2699 3023
	450 mm		550 mm	2699 3014
125 - 630A	125 - 160A	125 - 160A	200 - 250A	315 - 630A
	120 mm	156 mm	166 mm	N / A
	120 mm	N / A	N / A	2799 3043
	200 mm	236 mm	246 mm	3999 3004
	250 mm	286 mm	296 mm	3999 3005
	320 mm	356 mm	366 mm	3999 3013
800 - 3150A	500 mm	536 mm	546 mm	3999 3010
	800 - 1600A	800 - 1600A	2000 - 3150A	
	200 mm	412 mm	560 mm	2799 3015
	450 mm	662 mm	822 mm	2799 3019
				10.48
				14.18

AUXILIARY CONTACTS

Rating	Current (Ie)	Contacts	Reference Number	Price (ea)
40 - 125A (R)	16 A	2 NO / NC	2999 0012	7.32
125 - 630A	16 A	1st NO / NC	2699 0031	9.10
	16 A	2nd NO / NC (Mounted onto ref 26990031)	2699 0032	9.10
125 - 250A	16 A	3 NO + NC	2699 0143	38.94
	16 A	4 NO + NC	2699 0144	50.62
315 - 630A	16 A	3 NO + NC	2699 0043	38.94
	16 A	4 NO + NC	2699 0044	50.62
800 - 3150A	16 A	1st NO / NC	2699 0021	9.10
	16 A	2nd NO / NC (Mounted onto ref 26990021)	2699 0022	9.10
	16 A	3 NO + NC	2699 0003	38.94
	16 A	4 NO + NC	2699 0004	50.62

TERMINAL SHROUDS

Rating	No of Poles	Shroud Side	IP rating	Reference Number	Price (ea)
40 - 63A	3 - 4 p	Top / Bottom	20	2998 3008	2.76
80 - 125A (R)	3 - 4 p	Top / Bottom	20	2994 4008	4.12
125 - 160A	3 p	Top	20	2694 3013	7.72
	4 p	Top	20	2694 4013	8.27
200 - 250A	3 p	Top	20	2694 3020	14.89
	4 p	Top	20	2694 4020	15.45
315 - 630A	3 p	Top	20	2694 3050	15.45
	4 p	Top / Bottom	20	2694 4050	16.00
125 - 160A	3 p	Bottom	20	2694 8013	7.72
	4 p	Bottom	20	2694 9013	8.27
200 - 250A	3 p	Bottom	20	2694 8020	14.89
	4 p	Bottom	20	2694 9020	15.45
315 - 630A	3 p	Bottom	20	2694 8050	15.45
800A	3 p	Top / Bottom	terminal screen	2698 3080	8.00
	4 p	Top / Bottom	terminal screen	2698 4080	9.65
1000 - 1600A	3 p	Top / Bottom	terminal screen	2698 3120	9.10
	4 p	Top / Bottom	terminal screen	2698 4120	10.48
2000 - 3150A	3 p	Factory Fitted	terminal screen	Factory Fitted	N/A
	4 p	Factory Fitted	terminal screen	Factory Fitted	N/A

NOTES: 1. Other variations / accessories available Please consult us
2. To fully shroud switches you require 2 x Terminal shrouds



SOCOMEC ISOLATORS 40 to 3150 A

ELECTRICAL & MECHANICAL CHARACTERISTICS

According to the IEC 947-3, EN60947-3, BS EN60947-3

Thermal current I_{th} (40°)	40A	63A	80A	100A	125(R)A	125A	160A
Rated insulation voltage U_i (V)	690	690	690	690	690	750	750
Impulse withstand voltage U_{imp} (kV)	6	6	6	6	6	8	8
Dielectric strength (V) 50Hz 1min	4000	4000	4000	4000	4000	5000	5000
Rated operational current I_e (A)							
AC23 415V	40	63	80	100	100	125	160
Motor 500V	32	32	63	63	100	100	100
690V (¹)	25	25	40	40	40	80	80
AC22 415V	40	63	80	100	125	125	160
Distribution 500V	40	63	80	80	80	125	125
690V (¹)	32	32	50	50	50	125	125
DC20 500V	40	63	80	100	100	125	160
DC21	20	25	25	40(²)	40(²)	125	125
DC22						125	125
DC23						80	125(²)
Operational power - AC23B (KW)							
415V	18.50	30	45	51	51	63	80
500V	18.50	18.50	40	40	40	63	63
690V		22	33	33	33	75	75
Overload capacity							
Fuse-protected short-circuit withstand(KA Rms presumed)	100	100	100	100	60	100	100
Rated peak withstand current (KA peak)	12	12	12	12	12	20	20
Rated short-time withstand current I_{cw} (KA Rms 1s)	2.50	2.50	2.50	2.50	2.50	7	7
Making & Breaking characteristics							
Breaking capacity : 415V AC23 (A)	320	400	640	640	640	1000	1000
Making capacity : 415V AC23 (A)	400	500	800	800	800	1250	1250
Rated short-circuit making capacity I_{cm} (KA peak presumed)	4.50	4.50	4.50	4.50	4.50	12	12
Mechanical Endurance	10000	10000	10000	10000	10000	10000	10000
Operating force (Nm)	2	2	2	2	2	6	6
Connection (copper)							
Minimum at I_{th} (mm^2) (cables) (According to IEC 947-3)	4	10	16	25	25	35	50
Maximum (mm^2) (cables)	16	16	35	35	35	95	95
Minimum at I_{th} (mm) (busbar)			15	15	15	25	25
Maximum (mm) (busbar)							
Weight (Kg)							
3-pole switch	0.50	0.50	0.50	0.50	0.50	1	1.50
4-pole switch	0.50	0.50	0.50	0.50	0.50	1.50	1.50

(¹): With separation shield between terminals or terminal shrouds

(²): 2 poles in series by polarity



NOTES:



SOCOMECH ISOLATORS 40 to 3150 A

I E C
947-3

ELECTRICAL & MECHANICAL CHARACTERISTICS

200A	250A	315A	400A	500A	630A	800A	1000A	1250A	1600A	2000A	2500A	3150A
750	750	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
8	8	12	12	12	12	12	12	12	12	12	12	12
5000	5000	8000	8000	8000	8000	8000	10000	10000	10000	10000	10000	10000
200	250	315	400	400	500	800	1000	1000	1000	1250	1250	1250
200	250	315	315	315	315	800	1000	1000	1000	1000	1000	1000
100	125	200	200	200	200	250	500	500	500	630	800	800
200	250	315	400	500	630	800	1000	1250	1250	2000	2500	2500
200	250	315	400	400	500	800	1000	1250	1250	1600	2000	2000
160	160	315	315	315	315	630	800	800	800	1000	1000	1000
200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150
200	200	315	400	400	500	630	1000	1250	1250	1250	1250	1250
160	200	315	400	400	500	500	1000 ⁽²⁾	1250 ⁽²⁾				
100	200 ⁽²⁾	250	250	250	500 ⁽²⁾	400	630	1000 ⁽²⁾				
100	132	160	220	220	280	450	560	560	560	710	710	710
140	160	220	220	220	220	560	710	710	710	710	710	710
90	110	185	185	185	185	220	475	475	475	600	750	750
100	100	100	100	100	70	70	100	100	120	120	80	
30	30	45	45	45	45	55	105	105	110	110	110	120
9	9	13	13	13	13	26	50	50	50	50	50	55
1600	2000	2520	3200	3200	3200	6400	8000	8000	8000	10000	10000	10000
2000	2500	3150	4000	4000	4000	8000	10000	10000	10000	12500	12500	12500
17	17	30	30	30	30	50	70	70	70	80	80	85
10000	10000	5000	5000	5000	5000	4000	4000	4000	3000	3000	2500	2500
8	8	14	14	14	14	40	40	40	40	63	63	63
70	95	150	185	240	2x150	2x185	2x240					
95	150	240	240	240	2x300	2x300	4x185	4x185	6x240			
32	32	40	40	40	2x30x5	2x40x5	2x50x5	2x60x5	2x80x5	3x100x5	4x100x5	4x100x5
					50	63	100	100	100	125	125	125
2	2	3.50	3.50	3.50	3.50	8	10.50	10.50	16	31	32	42
2	2	4	4	4.50	4.50	10	13	13	20	40	40	49

NOTES:



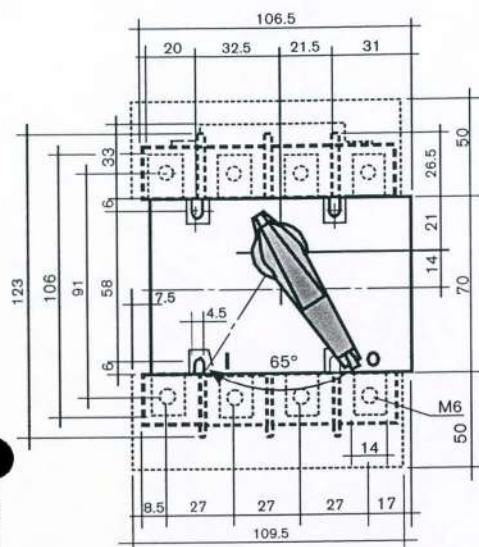


SOCOMECH ISOLATORS 40 to 3150 A

I E C
947-3

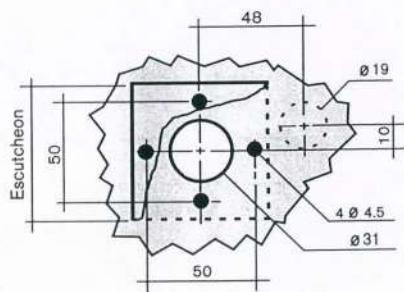
DIMENSIONS 3 AND 4 POLE

SIRCO 40-125 [R] A DIRECT FRONT OPERATION

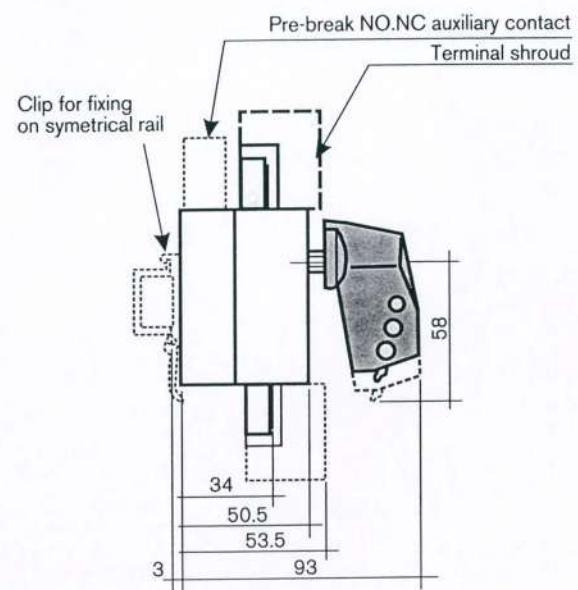


SIRCO 407 A GB T1

SIRCO 40-125 [R] A EXTERNAL FRONT OPERATION

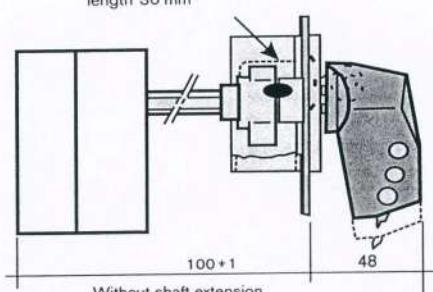


SIRCO 407 A GB T3



SIRCO 407 A GB T2

RONIS lock type 1016
with sliding bolt
length 30 mm



4SIRCO 407 A GB T4

Door drilling

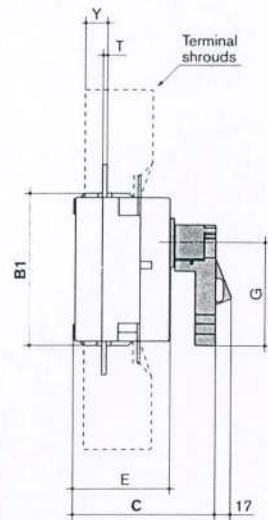
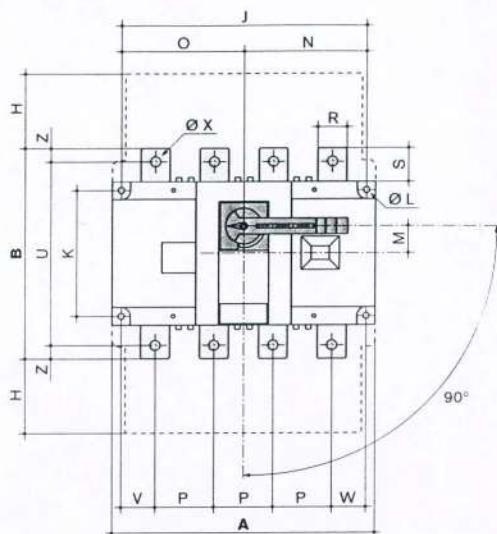
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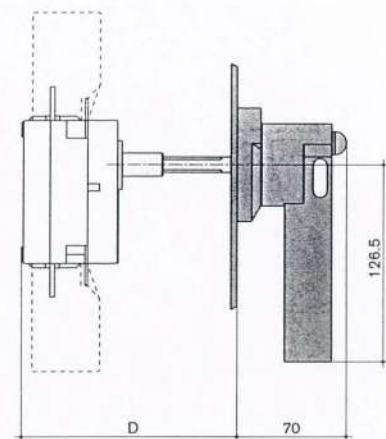
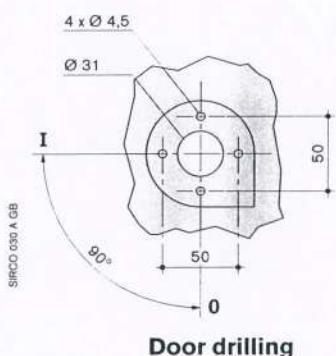
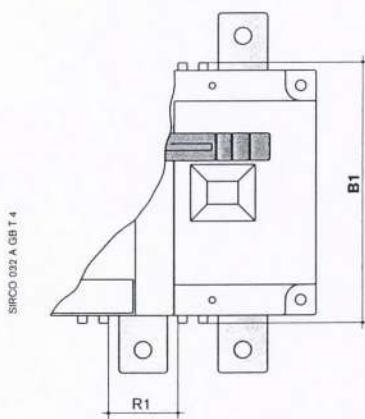
SOCOMEC ISOLATORS 40 to 3150 A

DIMENSIONS 3 AND 4 POLE

SIRCO 125-630 A DIRECT FRONT OPERATION



SIRCO 125-630 A EXTERNAL FRONT OPERATION



RATING	OVERALL DIMENSIONS									SWITCH MOUNTING						CONNECTION TERMINALS											
	A	B	B ₁	C	D	E	F	G	H	H ₁	J	K	ØL	M	N	O	P	R	R ₁	S	T	U	V	W	ØX	Y	Z
3 x 125 A	140	135	93	120	138 to 156	65	48.5	80	50	40	120	65	5.5	15	75	45	36	20	20.5	25	3.5	115	28	20	9	20.5	10
4 x 125 A	170	135	93	120	138 to 156	65	48.5	80	50	40	150	65	5.5	15	75	75	36	20	20.5	25	3.5	115	22	20	9	20.5	10
3 x 160 A	140	135	93	120	138 to 156	65	48.5	80	50	40	120	65	5.5	15	75	45	36	20	20.5	25	3.5	115	28	20	9	20.5	10
4 x 160 A	170	135	93	120	138 to 156	65	48.5	80	50	40	150	65	5.5	15	75	75	36	20	20.5	25	3.5	115	22	20	9	20.5	10
3 x 200 A	180	160	108	130	148 to 166	75	58.5	115	65	50	160	80	5.5	20	105	55	50	25	25.5	30	3.5	130	33	27	11	22.5	15
4 x 200 A	230	160	108	130	148 to 166	75	58.5	115	65	50	210	80	5.5	20	105	105	50	25	25.5	30	3.5	130	33	27	11	22.5	15
3 x 250 A	180	160	108	130	148 to 166	75	58.5	115	60	50	160	80	5.5	20	105	55	50	25	25.5	30	3.5	130	33	27	11	22.5	15
4 x 250 A	230	160	108	130	148 to 166	75	58.5	115	60	50	210	80	5.5	20	105	105	50	25	25.5	30	3.5	130	33	27	11	22.5	15
3 x 315 A	230	235	170	165	182 to 200	110	83.5	115	82.5	75	210	140	7	30	135	75	65	32	45.5	37.5	5	205	42.5	37.5	13	36	15
4 x 315 A	290	235	170	165	182 to 200	110	83.5	115	82.5	75	270	140	7	30	135	135	65	32	45.5	37.5	5	205	37.5	37.5	13	36	15
3 x 400 A	230	235	170	165	182 to 200	110	83.5	115	82.5	75	210	140	7	30	135	75	65	32	45.5	37.5	5	205	42.5	37.5	13	36	15
4 x 400 A	290	235	170	165	182 to 200	110	83.5	115	82.5	75	270	140	7	30	135	135	65	32	45.5	37.5	5	205	37.5	37.5	13	36	15
3 x 500 A	230	235	170	165	182 to 200	110	83.5	115	77.5	75	210	140	7	30	135	75	65	32	45.5	42.5	5	205	42.5	37.5	13	36	15
4 x 500 A	290	235	170	165	182 to 200	110	83.5	115	77.5	75	270	140	7	30	135	135	65	32	45.5	42.5	5	205	37.5	37.5	13	36	15
3 x 630 A	230	260	170	165	182 to 200	110	83.5	115	70	75	210	140	7	30	135	75	65	40	45.5	50	5	220	42.5	37.5	13	36	20
4 x 630 A	290	260	170	165	182 to 200	110	83.5	115	70	75	270	140	7	30	135	135	65	40	45.5	50	5	220	37.5	37.5	13	36	20

NOTES:

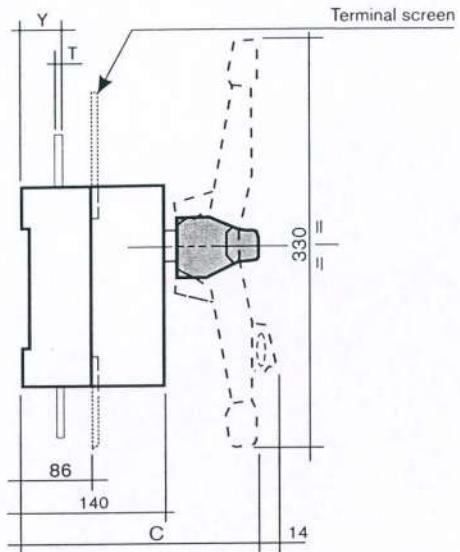
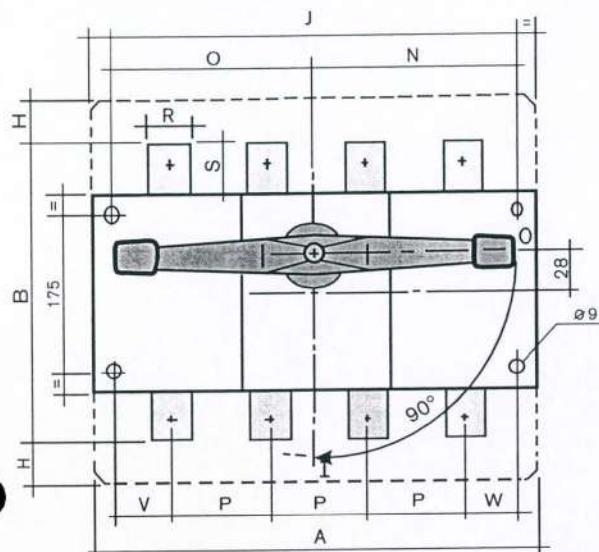


SOCOMECH ISOLATORS 40 to 3150 A

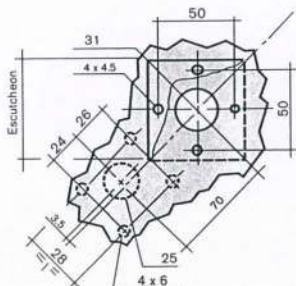
**I E C
947-3**

DIMENSIONS 3 AND 4 POLE

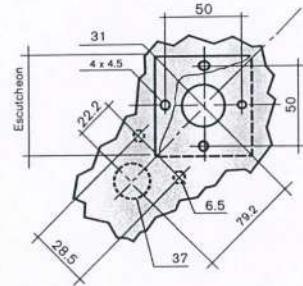
SIRCO 800-1600 A DIRECT FRONT OPERATION



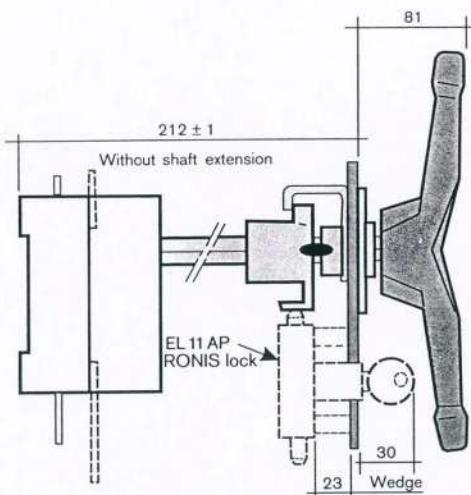
SIRCO 800-1600 A EXTERNAL FRONT OPERATION



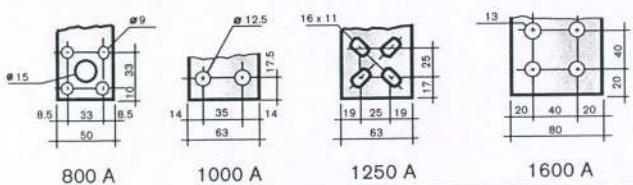
Door drilling
for RONIS lock



Door drilling for Castell K lock



Connection terminals



	OVERALL DIMENSIONS				SWITCH MOUNTING			CONNECTION TERMINALS						
RATING	A	B	C	H	J	N	O	P	R	S	T	V	W	Y
3 x 800 A	280	320	220	70	255	127.5	127.5	80	50	60	6	47.5	47.5	47
4 x 800 A	360	320	220	70	335	167.5	167.5	80	50	60	6	47.5	47.5	47
3 x 1000 A	372	270	220	95	347	173.5	173.5	120	63	35	7	46.5	60.5	47
4 x 1000 A	492	270	220	95	467	233.5	233.5	120	63	35	7	46.5	60.5	47
3 x 1250 A	372	330	220	65	347	173.5	173.5	120	63	65	7	46.5	60.5	47
4 x 1250 A	492	330	220	65	467	233.5	233.5	120	63	65	7	46.5	60.5	47
3 x 1600 A	372	360	220	50	347	173.5	173.5	120	80	80	15	46.5	60.5	51
4 x 1600 A	492	360	220	50	467	233.5	233.5	120	80	80	15	46.5	60.5	51



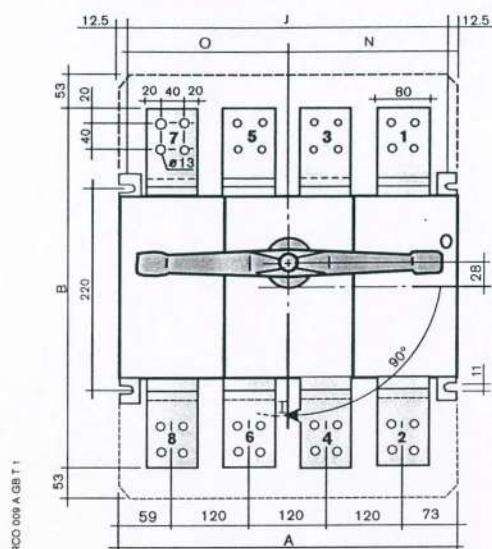
NOTES:



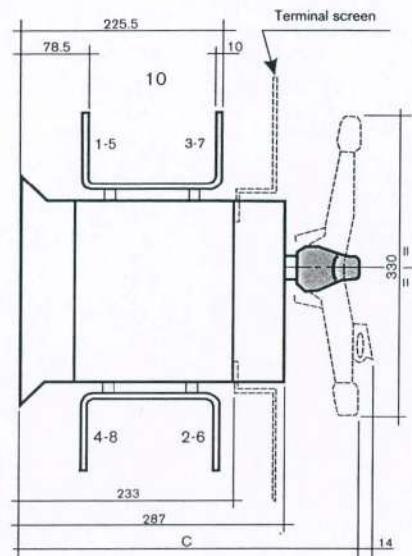
SOCOMECH ISOLATORS 40 to 3150 A

DIMENSIONS 3 AND 4 POLE

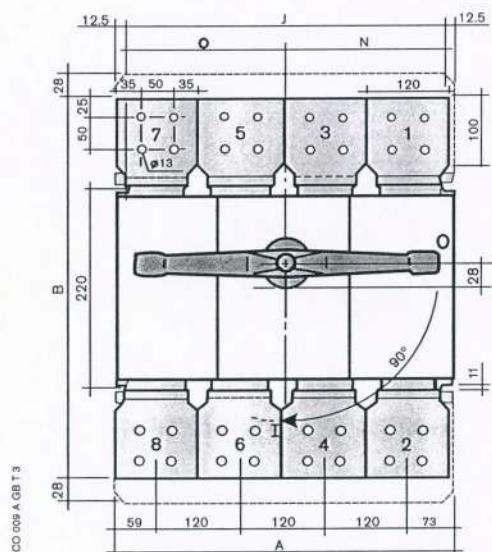
SIRCO 2000-2500 A DIRECT FRONT OPERATION



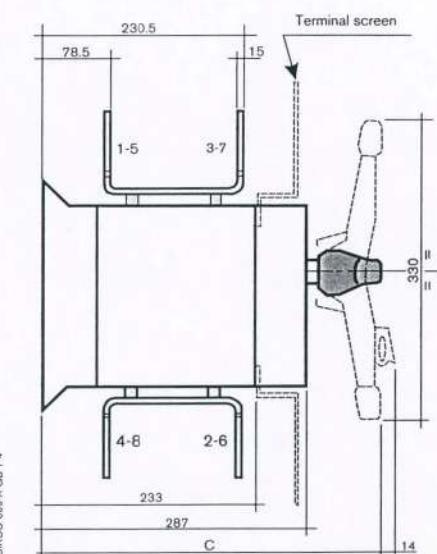
The pole numbered from 1 to 6 correspond to the 3-pole version.



SIRCO 3150 A DIRECT FRONT OPERATION



The pole numbered from 1 to 6 correspond to the 3-pole version.



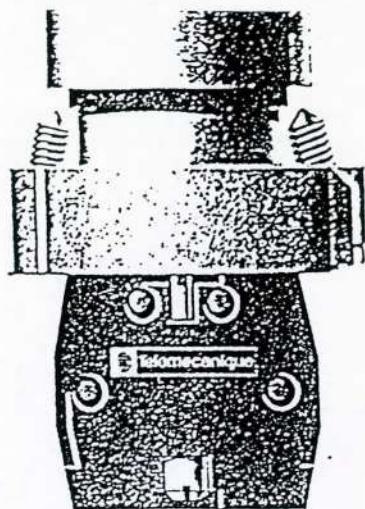
SIRCO 2000-3150 A EXTERNAL FRONT OPERATION

See SIRCO 800-1600 A 3 and 4 pole: dimensions without shaft extension: 360 +/- 1.

RATING	OVERALL DIMENSIONS			SWITCH MOUNTING		
	A	B	C	J	N	O
3 x 2000 A	372	455	363	347	173.5	173.5
4 x 2000 A	492	455	363	467	233.5	233.5
3 x 2500 A	372	455	363	347	173.5	173.5
4 x 2500 A	492	455	363	467	233.5	233.5
3 x 3150 A	372	505	363	347	173.5	173.5
4 x 3150 A	492	505	363	467	233.5	233.5

NOTES:





Control and signalling
units Ø 22
XB2-B

c a t a l o g u e

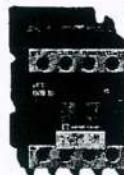
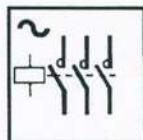
LC1 D

Three pole contactors

Selection :
pages 4/34-4/55
Characteristics :
pages 4/24-4/25
Dimensions :
page 4/58
Wiring diagrams :
page 4/56

for motor control, from 9 to 95 A (AC3)
for distribution circuit control, from 25 to 125 A (AC1)

Control circuit : a.c.



LC1 D09 10..



LC1 D32 10..



LC1 D65 11..

	Standard power ratings for three phase motors 50/60 Hz in category AC3						Maximum operational current for AC3 duty 440 V	Maximum operational current for AC1 duty $\theta < 40^\circ\text{C}$	Instantaneous auxiliary contacts	Basic reference to be completed by the code corresponding to the control circuit voltage (1)	Weight kg			
	220V/380V	230V	400V	415V	440V	500V								
kW	kW	kW	kW	kW	kW	kW	hp	hp	hp	hp	hp	hp	A	A
2,2	4	4	4	5,5	5,5		9	25	1	-	LC1 D09 10..	0,320		
3	5,5	5,5	5,5	7,5	7,5				-	1	LC1 D09 01..	0,320		
3	5,5	5,5	5,5	7,5	7,5		12	25	1	-	LC1 D12 10..	0,320		
4	7,5	7,5	7,5	10	10				-	1	LC1 D12 01..	0,320		
4	7,5	9	9	10	10		18	32	1	-	LC1 D18 10..	0,350		
5,5	10	12	12	13,5	13,5				-	1	LC1 D18 01..	0,350		
5,5	11	11	11	15	15		25	40	1	-	LC1 D25 10..	0,505		
7,5	15	15	15	20	20				-	1	LC1 D25 01..	0,505		
7,5	15	15	15	20	20				-	-	LC1 D25 00.. (2)	0,355		
7,5	15	15	15	18,5	18,5		32	50	1	-	LC1 D32 10..	0,525		
10	20	20	20	25	25				-	1	LC1 D32 01..	0,525		
11	18,5	22	22	22	30		40	60	1	1	LC1 D40 11..	1,150		
15	25	30	30	30	40									
15	22	25	30	30	33		50	80	1	1	LC1 D50 11..	1,150		
20	30	35	40	40	44									
18,5	30	37	37	37	37		65	80	1	1	LC1 D65 11..	1,150		
25	40	50	50	50	50									
22	37	45	45	55	45		80	125	1	1	LC1 D80 11..	1,500		
30	50	60	60	75	60									
25	45	45	45	55	45		95	125	1	1	LC1 D95 11..	1,500		
35	60	60	60	75	60									

Specifications	LC1 D09 to D32	LC1 D40 to D95
Standard treatment	TH	TH
Omega rail mounting	35 mm or by screw fixing	75 mm or by screw fixing
Power connections	by screw-clamp	by connectors
Protection	against direct finger contact	against direct finger contact
Screws	ready-to-tighten	ready-to-tighten

Other versions :

Contactors with unprotected power terminals, enabling power and control connections to be made using closed tags.
Consult our local agent or representative.

(2) Three pole contactor 11 kW, 380 V, width 45 mm without auxiliary contact (Standard EN 50012).

Additional contact blocks
and modules :
see pages 4/12 to 4/15

(1) Control circuit voltages

Coils for LC1 D09 to D95.

Volts	24	42	48	110	220	230	240	380	400	415	440	500	660
50 Hz	B5	D5	E5	F5	M5	P5	U5	Q5	V5	N5	R5	S5	Y5
50/60 Hz	B7	D7	E7	F7	M7	P7	U7	Q7	V7	N7	R7	-	-

For other values, see pages 4/16 and 4/17.

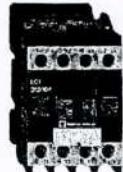
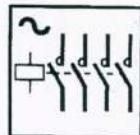
Four pole contactors

LC1 D

Selection :
pages 4/34-4/55
Characteristics :
pages 4/24-4/25
Dimensions :
page 4/58
Wiring diagrams :
page 4/56

for distribution circuit control, from 25 to 125 A (AC1)

Control circuit : a.c.



LC1 D12 004..



LC1 D65 004..

	Non-inductive loads Maximum operational current for AC1 duty (θ < 40° C)	Power poles	Basic reference to be completed by the code corresponding to the control circuit voltage (1)	Weight kg
A				
25		4 -	LC1 D12 004..	0,320
		2 2	LC1 D12 008..	0,320
40		4 -	LC1 D25 004..	0,505
		2 2	LC1 D25 008..	0,505
60		4 -	LC1 D40 004..	1,150
		2 2	LC1 D40 008..	1,150
80		4 -	LC1 D65 004..	1,150
		2 2	LC1 D65 008..	1,150
125		4 -	LC1 D80 004..	1,530
		2 2	LC1 D80 008..	1,530

Specifications	LC1 D12 to D25	LC1 D40 to D80
Standard treatment	TH	TH
Omega rail mounting	35 mm or by screw fixing	75 mm or by screw fixing
Power connections	by screw-clamp	by connectors
Protection	against direct finger contact	against direct finger contact
Screws	ready-to-tighten	ready-to-tighten

Other versions :

Contactors with unprotected power terminals, enabling power and control connections to be made using closed tags.
Consult our local agent or representative.

(1) Control circuit voltages
Coils for LC1 D12 to D80.

Volts	24	42	48	110	220	230	240	380	400	415	440	500	660
50 Hz	B5	D5	E5	F5	M5	P5	U5	Q5	V5	N5	R5	S5	Y5
50/60 Hz	B7	D7	E7	F7	M7	P7	U7	Q7	V7	N7	R7	-	-

For other values, see pages 4/16 and 4/17.

Additional contact blocks
and modules :

see pages 4/12 to 4/15

Three pole contactor selection guide

LC1, LP1 D09 to D95

For utilization category AC3

Use in category AC3	Operational current and power (ambient temperature ≤ 55°C)											
	Contactor size	LC1	LC1	LC1	LC1	LC1	LC1	LC1	LC1	LC1	LC1	LC1
		LP1	LP1	LP1	LP1	LP1	LP1	LP1	LP1	LP1	D95	
	D09	D12	D18	D25	D32	D40	D50	D65	D80	D95		
Maximum operational current AC3	≤ 440 V	A	9	12	18	25	32	40	50	65	80	95
Maximum rated power (Standard motor power ratings)	220/230 V	kW	2,2	3	4	5,5	7,5	11	15	18,5	22	25
		hp	3	4	5,5	7,5	10	15	20	25	30	35
	240 V	kW	2,2	3	4	5,5	7,5	11	15	18,5	22	25
		hp	3	4	5,5	7,5	10	15	20	25	30	35
	380/400 V	kW	4	5,5	7,5	11	15	18,5	22	30	37	45
		hp	5,5	7,5	10	15	20	25	30	40	50	60
	415 V	kW	4	5,5	9	11	15	22	25	37	45	45
		hp	5,5	7,5	12	15	20	30	35	50	60	60
	440 V	kW	4	5,5	9	11	15	22	30	37	45	45
		hp	5,5	7,5	12	15	20	30	40	50	60	60
	500 V	kW	5,5	7,5	10	15	18,5	22	30	37	55	55
		hp	7,5	10	13,5	20	25	30	40	50	75	75
	660/690 V	kW	5,5	7,5	10	15	18,5	30	33	37	45	45
		hp	7,5	10	13,5	20	25	40	44	50	60	60

Note : 1 ch ≈ 0,75 kW

Maximum operating rate (operating cycles per hour)

depending on the operational power and the on-load factor θ ≤ 55 °C
(see note 1, page 4/40).

On-load factor	Operational power	LC1	LC1	LC1	LC1	LC1	LC1	LC1	LC1	LC1	LC1	LC1
		LP1	LP1	LP1	LP1	LP1	LP1	LP1	LP1	LP1	D95	
		D09	D12	D18	D25	D32	D40	D50	D65	D80	D95	
≤ 85 %	P		1200	1200	1200	1200	1000	1000	1000	1000	750	750
≤ 85 %	0,5 P		3000	3000	2500	2500	2500	2500	2500	2500	2000	2000
≤ 25 %	P		1800	1800	1800	1800	1200	1200	1200	1200	1200	1200

Use of the Ue ≤ 440 V curve,
opposite for a voltage of 500 V

For Ue : 500 V, the number of operating cycles must be reduced by a factor of 0,85.

Example :

Asynchronous motor

P = 10 kW

Ue = 500 V

Ie = 15 A

Ic = Ie = 15 A

Required durability 2,5 million operating cycles.

The Ue ≤ 440 V curve for 15 A, indicates an LC1 (or LP1) D25 giving 3,35 million operating cycles, i.e. :

$$3,35 \times 0,85 = 2,84 \text{ million at } 500 \text{ V,}$$

The LC1(LP1) D25 is therefore suitable for this application.

Three pole contactor selection guide

LC1, LP1 D09 to D95

For utilization categories AC2 - AC4

**Use in categories AC2 - AC4
(Ue ≤ 690 V)**

Category AC2 : slip-ring motors - breaking the starting current

Category AC4 : squirrel cage motors - breaking the starting current

Maximum breaking current (A) for AC4 (Ie max.).

Ue ≤ 440 V Ie max = 6 I AC3	54	72	108	150	192	240	300	390	480	570
440 V ≤ Ue ≤ 690 V Ie max.	40	50	70	90	105	150	170	210	250	250

Maximum breaking current (A) depending on the duty and the on-load factor, 0 ≤ 55 °C (1)

Maximum operating rate (2) and on-load factor	LC1 LP1 D09	LC1 LP1 D12	LC1 LP1 D18	LC1 LP1 D25	LC1 LP1 D32	LC1 LP1 D40	LC1 LP1 D50	LC1 LP1 D65	LC1 LP1 D80	LC1 LP1 D95
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Cycles/h	A	A	A	A	A	A	A	A	A	A
from 150 and 15 % to 300 and 10 %	30	40	45	75	80	110	140	160	200	200
from 150 and 20 % to 600 and 10 %	27	36	40	67	70	96	120	148	170	170
from 150 and 30 % to 1200 and 10 %	24	30	35	56	60	80	100	132	145	145
from 150 and 55 % to 2400 and 10 %	19	24	30	45	50	62	80	110	120	120
from 150 and 85 % to 3600 and 10 %	16	21	25	40	45	53	70	90	100	100

(1) For temperatures higher than 55 °C, use a value of operating rate equal to 80 % of the actual value when selecting using the above table.

(2) Do not exceed the maximum number of mechanical operating cycles.

Plugging

The current varies from the maximum plug braking current, to the rated motor current.

The current values must be compatible with the making and breaking capacities of the contactor.

As breaking normally takes place at a current value at or near the locked rotor current, the contactor can be selected using the criteria for categories AC2 and AC4.

**Admissible AC4 power
for ≈ 200 000 operating cycles**

Operating voltage	LC+	LC+	LC+	LC+						
	LP-	LP-	LP-	LP-						
	D09	D12	D18	D25	D32	D40	D50	D65	D80	D95
kW										
220/230 V	1,1	1,5	1,5	3	3,7	4	5,5	7,5	9	11
380/400 V	2,2	3	3,7	5,5	7,5	9	11	15	18,5	22
415 V	2,2	3	3,7	5,5	7,5	9	11	15	18,5	18,5
440 V	2,2	3	3,7	5,5	7,5	11	11	15	18,5	18,5
500 V	3	4	5,5	7,5	9	11	15	18,5	22	22
660/690 V	4	5,5	7,5	10	11	15	18,5	22	25	25

Contactor selection guide

LC1, LP1 D09 to D95

For utilization category AC1

Use in category AC1	Maximum operational current (for a maximum of 600 operating cycles per hour)										
		LC1 D09	LC1 D12	LC1 D18	LC1 D25	LC1 D32	LC1 D40	LC1 D50	LC1 D65	LC1 D80	LC1 D95
With cable size	(mm ²)	4	4	6	10	10	16	25	25	50	50
Operational current AC1 duty in A, at an ambient temperature	≤ 40°C	A	25	25	32	40	50	60	80	80	125
≤ 55°C	A	20	20	26	32	44	55	70	70	100	100
According to IEC 158-1	≤ 70°C	A (at Un)	17	17	22	28	35	42	56	56	80
Rated operational power	220/230 V	kW	9	9	11	14	18	21	29	29	45
	240 V	kW	9	9	12	15	19	23	31	31	49
(three phase at an ambient temperature θ ≤ 40 °C)	380/400 V	kW	15	15	20	25	31	37	50	50	78
	415 V	kW	17	17	21	27	34	41	54	54	85
	440 V	kW	18	18	23	29	36	43	58	58	90
	500 V	kW	20	20	23	33	41	49	65	65	102
	660/690 V	kW	27	27	34	43	54	65	86	86	135
With cable size	(mm ²)	4	4	6	6	10	16	25	25	50	50
Operational current AC1 duty in A, at an ambient temperature	≤ 40°C	A	25	25	32	32	50	60	80	80	125
≤ 55°C	A	20	20	26	26	44	55	70	70	100	100
According to IEC 947-1	≤ 70°C	A (at Un)	17	17	22	22	35	42	56	56	80

Increase in operational current by paralleling of poles

Apply the following multiplying factors to the current values given above. The factors take into account the often unbalanced current distribution between poles :

- 2 poles in parallel : K = 1,6
- 3 poles in parallel : K = 2,25
- 4 poles in parallel : K = 2,8

Contactor selection guide according to the required electrical durability

Utilization category AC1

Electrical durability
in utilization category AC1
 $U_e \leq 440$ V

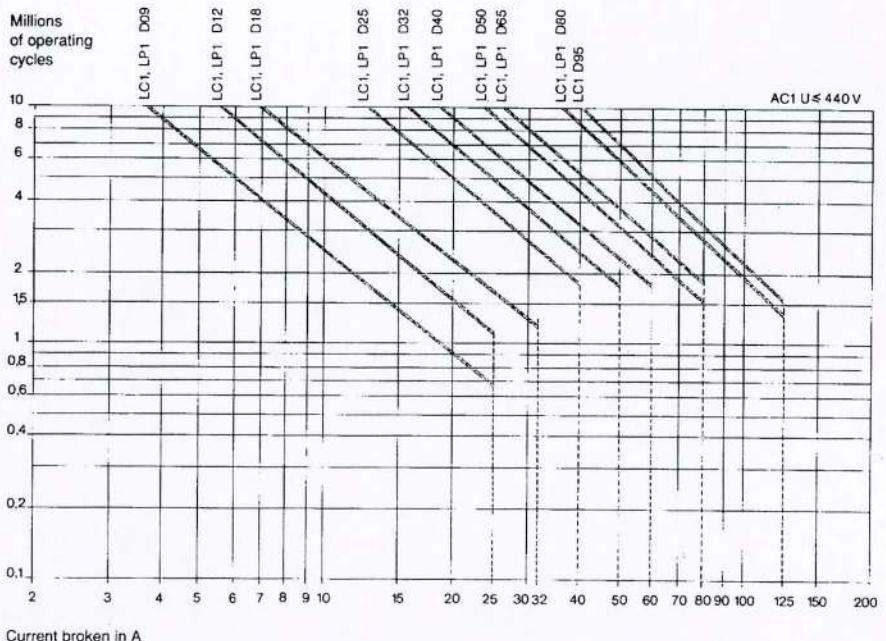
Switching a resistive circuit
($\cos \varphi \geq 0.95$)

The current broken in AC1
 I_c is equal to I_e the rated
operational current of the
load.

Example :
 $U_e = 220$ V
 $I_e = 50$ A AC1
 $\theta = 40^\circ\text{C}$

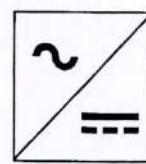
$I_c = I_e = 50$ A
required electrical durability :
2 million operating cycles

Size of contactor to be
selected : LC1, LP1 D40



Accessories for reversing contactors

Horizontally mounted
For customer assembly
Control circuit : a.c. or d.c.



Reversing contactors (mechanical interlock with incorporated electrical interlock contacts)

Reversing contactors for motor control

With 2 identical contactors (1)	Auxiliary contact blocks Reference	Weight kg	Set of power connections Reference	Weight kg	Mechanical interlock Kit reference	Weight kg
LC1/LP1 D09..	not necessary	-	LA9 D12 69	0,015	LA9 D09 02	0,060
LC1/LP1 D12..	-	-	LA9 D12 69	0,015	LA9 D09 02	0,060
LC1/LP1 D18..	-	-	LA9 D18 69	0,030	LA9 D09 02	0,060
LC1/LP1 D25..	-	-	LA9 D25 69	0,030	LA9 D09 02	0,060
LC1/LP1 D32..	-	-	LA9 D32 69	0,040	LA9 D09 02	0,060
LC1/LP1 D40..	-	-	LA9 D65 69	0,290	LA9 D40 02	0,170
LC1/LP1 D50..	-	-	LA9 D65 69	0,290	LA9 D40 02	0,170
LC1/LP1 D65..	-	-	LA9 D65 69	0,290	LA9 D40 02	0,170
LC1/LP1 D80..	-	-	LA9 D80 69	0,490	LA9 D80 02	0,170
LC1 D95..	-	-	LA9 D80 69	0,490	LA9 D80 02	0,170

Four pole changeover contactors (three phase + neutral distribution system)

LC1/LP1 D12 004	not necessary	-	LA9 D12 70	0,010	LA9 D09 02	0,060
LC1/LP1 D25 004	-	-	LA9 D25 70	0,020	LA9 D09 02	0,060
LC1/LP1 D40 004	-	-	LA9 D65 70	0,150	LA9 D40 02	0,170
LC1/LP1 D65 004	-	-	LA9 D65 70	0,150	LA9 D40 02	0,170
LC1/LP1 D80 004	-	-	LA9 D80 70	0,280	LA9 D80 02	0,170

(1) With incorporated electrical interlock, the .. composition of the contactors is as required.

Reversing contactors (mechanical interlock)

Reversing contactors for motor control

LC1/LP1 D09 01	not necessary	-	LA9 D12 69	0,015	LA9-D09978	0,030
LC1/LP1 D12 01	-	-	LA9 D12 69	0,015	LA9-D09978	0,030
LC1/LP1 D18 01	-	-	LA9 D18 69	0,030	LA9-D09978	0,030
LC1/LP1 D25 01	-	-	LA9 D25 69	0,030	LA9-D09978	0,030
LC1/LP1 D32 01	-	-	LA9 D32 69	0,040	LA9-D09978	0,030
LC1/LP1 D40 11	-	-	LA9 D65 69	0,290	LA9-D50978	0,155
LC1/LP1 D50 11	-	-	LA9 D65 69	0,290	LA9-D50978	0,155
LC1/LP1 D65 11	-	-	LA9 D65 69	0,290	LA9-D50978	0,155
LC1/LP1 D80 11	-	-	LA9 D80 69	0,490	LA9-D80978	0,180
LC1 D95 11	-	-	LA9 D80 69	0,490	LA9-D80978	0,180

Four pole changeover contactors (three phase + neutral distribution system)

LC1/LP1 D12 004	2 x LA1 DN 11	0,030	LA9 D12 70	0,010	LA9-D09978	0,030
LC1/LP1 D25 004	2 x LA1 DN 11	0,030	LA9 D25 70	0,020	LA9-D09978	0,030
LC1/LP1 D40 004	2 x LA1 DN 11	0,030	LA9 D65 70	0,150	LA9-D50978	0,155
LC1/LP1 D65 004	2 x LA1 DN 11	0,030	LA9 D65 70	0,150	LA9-D50978	0,155
LC1/LP1 D80 004	2 x LA1 DN 11	0,030	LA9 D80 70	0,280	LA9-D80978	0,180

Contactors

Selection :
 pages 4/34 - 4/55
 References :
 pages 4/2-4/4
 Dimensions :
 page 4/58
 Wiring diagrams :
 page 4/56

Control circuit supply : a.c.
 Characteristics

	LC1 D09	LC1 D12	LC1 D18	LC1 D25	LC1 D32	LC1 D40	LC1 D50	LC1 D65	LC1 D80	LC1 D95
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Environment

Rated insulation voltage according to	IEC 158-1 VDE 0110 grC/IEC 947-4	V	750 1000	750 1000	750 1000	750 1000	750 1000	750 1000	750 1000	750 1000		
Conformity to standards	IEC 158-1, NF C 63-110, VDE 0660, BS 5424, JEM 1038, IEC 947-1, 947-4											
Approvals	ASE, UL, CSA, DEMKO, NEMKO, SEMKO, FI,											
Degree of protection	Protection against direct finger contact according to VDE 0106											
Protective treatment	TH											
Dry ambient air temperature	for storage for operating permissible	°C	-60 to +80 -5 to +55 (0.8 to 1.1Un) -40 to +70, for operation at Un									
Operating altitude	m	3000										
Operating position	without derating		± 30° occasionally, compared with the normal vertical mounting pole									
Shock resistance (3) 1/2 sine wave= 11 ms	contactor open contactor closed	g	10 15	10 15	10 15	8 15	8 10	8 10	8 10	8 10		
Vibration resistance 5 to 300 Hz (3)	contactor open contactor closed	g	2 4	2 4	2 4	2 4	2 3	2 3	2 3	2 3		

Power pole characteristics

Number of poles		3	3 or 4	3	3 or 4	3	3 or 4	3	3 or 4	3	
Rated operational current	in AC3 (1) up to : in AC1 (2) up to :	A	9 25	12 25	18 32	25 40	32 50	40 60	50 80	65 80	80 125
Rated operational voltage	V	690	690	690	690	690	690	690	690	690	690
Frequency limits	of operational current	Hz	25 to 400	25 to 400	25 to 400	25 to 400	25 to 400	25 to 400	25 to 400	25 to 400	25 to 400
Maximum thermal current I_{th} ($\geq 40^{\circ}\text{C}$)	A	25	25	32	40	50	60	80	80	125	125
Making capacity	I_{rms} (IEC 158-1)	A	250	250	300	450	550	800	900	1000	1100
Breaking capacity	220-380-415-440V I_{rms} according to IEC 158-1	A	250 175 85	250 175 85	300 400 120	450 450 180	550 800 400	800 900 500	900 1000 630	1000 1000 640	1100 1100 640
Short time rating	for 1s for 5s From cold no current flowing for 30s for 15 mn at at $\theta \leq 40^{\circ}\text{C}$	A	210, 130 105 76 61 44 30	210, 130 105 76 61 44 30	240 185 145 105 84 58 40	380 290 240 155 120 92 50	430 340 260 175 138 165 60	720 420 320 215 165 208 72	810 520 400 275 208 260 84	900 660 520 340 260 320 110	990 800 640 420 320 210 135
Short circuit protection by fuses ($U \leq 440\text{V}$)	motor circuit Non-motor circuit by fuses g1, gL	A	25	25	32	40	50	60	80	80	125
Average impedance per pole at I_{th} 50 Hz	$\text{m } \Omega$	2,5	2,5	2,5	2	2	1,5	1,5	1	0,8	0,8
Power dissipation per pole	AC1 for the above operational currents AC3	W	1,56 0,20	1,56 0,36	2,5 0,8	3,2 1,25	5 2	5,4 2,4	9,6 3,7	6,4 4,2	12,5 5,1
Cabling min/max cross section											
Stranded cable without cable end	- 1 conductor - 2 conductors	mm^2	1-4 1-4	1-4 1-4	1,5-6 1,5-6	1,5-10 1,5-6	2,5-10 2,5-10	2,5-25 2,5-16	2,5-25 2,5-16	2,5-25 2,5-16	4-50 4-35
Stranded cable with cable end	- 1 conductor - 2 conductors	mm^2	1-4 1-4	1-4 1-4	1-6 1-6	1-6 1-4	1-10 1,5-6	2,5-16 2,5-6	2,5-16 2,5-6	2,5-16 4-25	4-50 4-25
Solid cable without cable end	- 1 conductor - 2 conductors	mm^2	1-4 1-4	1-4 1-4	1,5-6 1,5-6	1,5-6 1,5-6	1,5-10 2,5-10	2,5-25 2,5-25	2,5-25 2,5-25	4-50 4-50	4-50 4-50

(1) θ Ambient $\leq 55^{\circ}\text{C}$. (2) θ Ambient $\leq 40^{\circ}\text{C}$. (3) In the least favourable direction without change of state (coil supplied at Un).

Selection :
 pages 4/34 - 4/55
 References :
 pages 4/2-4/4
 Dimensions :
 page 4/58
 Wiring diagrams :
 page 4/56

Control circuit supply : a.c. Characteristics

	LC1 D09	LC1 D12	LC1 D18	LC1 D25	LC1 D32	LC1 D40	LC1 D50	LC1 D65	LC1 D80	LC1 D95
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Control circuit characteristics

Rated control voltage (50 or 60 Hz)	V	12 to 660				12 to 660							
Voltage limits ($\leq 55^{\circ}\text{C}$)													
Single frequency coils	operating	Un	0,8 to 1,1				0,85 to 1,1						
Dual frequency coils	drop-out	Un	0,3 to 0,6				0,3 to 0,6						
Average consumption	at 20°C in Un		0,85 to 1,1 in 60 Hz				0,85 to 1,1 in 60 Hz						
A.C. 50 Hz													
Inrush	single frequency coils	VA	60	60	60	90	90	200	200	200	200		
	dual frequency coils	VA	70	70	70	100	100	250	250	250	250		
Cos φ			0,75	0,75	0,75	0,6	0,6	0,6	0,6	0,6	0,6		
Sealed	single frequency coils	VA	7	7	7	7,5	7,5	20	20	20	20		
	dual frequency coils	VA	8	8	8	8,5	8,5						
Cos φ			0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3		
A.C. 60 Hz													
Inrush	single frequency coils	VA	70	70	70	100	100	220	220	220	220		
Cos φ		0,75	0,75	0,75	0,75	0,75	0,6	0,6	0,6	0,6	0,6		
Sealed	single frequency coils	VA	7,5	7,5	7,5	8,5	8,5	26	26	26	26		
	Cos φ		0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3		
Thermal dissipation in 50 and 60 Hz		W	2 to 3	2 to 3	2 to 3	2,5 to 3,5	2,5 to 3,5	6 to 10	6 to 10	6 to 10	6 to 10		
Average operating time at Un	Closing Opening	ms	12 to 22	12 to 22	12 to 22	15 to 24	15 to 24	20 to 26	20 to 26	20 to 26	20 to 35		
		ms	4 to 12	4 to 12	4 to 12	5 to 19	5 to 19	8 to 12	8 to 12	8 to 12	6 to 20		
Mechanical durability (at Un) in millions of operating cycles at 50 Hz			20	20	20	16	16	16	16	10	10		
			15	15	15	12	12	6	6	4	4		
Maximum operating rate (mechanical operations) (ambient air temperature $\leq 55^{\circ}\text{C}$)	man/h	3600	3600	3600	3600	3600	3600	3600	3600	3600	3600		

Characteristics of auxiliary contacts

Maximum thermal current ($\theta \leq 55^{\circ}\text{C}$)	A	10	10	10	10	10	10	10	10	10	
Maximum operational voltage	V	690	690	690	690	690	690	690	690	690	
Rated operational power according to IEC 337-1											
See auxiliary contact characteristics pages 5/8											
Short-circuit protection according to IEC 337-1 and VDE 0660	A	By 10 A type g1 fuses									
Cabling, minimum/maximum cross section											
Stranded without cable end	- 1 conductor	mm ²	1-4	1-4	1-4	1,4	1-4	1-4	1-4	1-4	1-4
	- 2 conductors	mm ²	1-4	1-4	1-4	1,4	1-4	1-4	1-4	1-4	1-4
Stranded with cable end	- 1 conductor	mm ²	1-4	1-4	1-4	1-4	1-4	1-4	1-4	1-4	1-4
	- 2 conductors	mm ²	1-2,5	1-2,5	1-2,5	1-2,5	1-2,5	1-2,5	1-2,5	1-2,5	1-2,5
Solid without cable end	- 1 conductor	mm ²	1-4	1-4	1-4	1-4	1-4	1-4	1-4	1-4	1-4
	- 2 conductors	mm ²	1-4	1-4	1-4	1-4	1-4	1-4	1-4	1-4	1-4

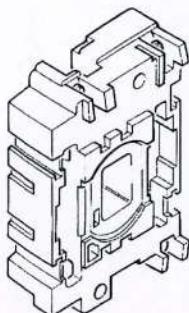
Mechanical latch blocks

Mounting on	LA6 DK1	LA6 DK2	LA6 DK3
	D09 to D32	D09 to D65	D80 and D95
Rated insulation voltage according to IEC 947-1	690	690	690
Control circuit voltage 50-60 Hz	12 to 660	12 to 660	12 to 660
Power required for unlatching	160	275	275
Maximum operating rate in operating cycles/h	1200	1000	1000
Mechanical durability (at Un) : 1 million operating cycles	Unlatching can be electrically controlled or manually operated (pulsed or maintained). The LA6 DK unlatch coil and the LC1 D operating coil must not be energized simultaneously. Auto cut-out of the coil after 15 ms. Duration of control signal > 10 ms. Blocks DK2 and DK3 also have a N/C contact to break the circuit of the contactor coil. Signal duration = contactor operating time + 20 ms.		

Coils for LC1 D contactors

LX1 D

Spare parts, a.c.



LX1 D6

For LC1 D40, D50, D65, D80, D95

Rated voltage Un V	Reference 50 Hz	Reference 60 Hz	Reference 50/60 Hz	Weight kg
12	LX1 D6 J5	-	-	0,280
24	LX1 D6 B5	LX1 D6 B6	LX1 D6 B7	0,280
32	LX1 D6 C5	-	-	0,280
42	LX1 D6 D5	-	LX1-D6 D7	0,280
48	LX1 D6 E5	LX1 D6 E6	LX1 D6 E7	0,280
110	LX1 D6 F5	LX1 D6 F6	LX1 D6 F7	0,280
120	-	LX1 D6 G6	LX1 D6 G7	0,280
127	LX1 D6 G5	-	-	0,280
208	-	LX1 D6 L6	-	0,280
220	LX1 D6 M5	LX1 D6 M6	LX1 D6 M7	0,280
230	LX1 D6 P5	-	LX1 D6 P7	0,280
240	LX1 D6 U5	LX1 D6 U6	LX1 D6 U7	0,280
256	LX1 D6 W5	-	-	0,280
277	-	LX1 D6 W6	-	0,280
380	LX1 D6 Q5	LX1 D6 Q6	LX1 D6 Q7	0,280
400	LX1 D6 V5	-	LX1 D6 V7	0,280
415	LX1 D6 N5	-	LX1 D6 N7	0,280
440	LX1 D6 R5	LX1 D6 R6	LX1 D6 R7	0,280
480	-	LX1 D6 T6	-	0,280
500	LX1 D6 S5	-	-	0,280
575	-	LX1 D6 S6	-	0,280
600	-	LX1 D6 X6	-	0,280
660	LX1 D6 Y5	-	-	0,280

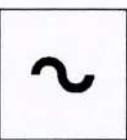
Specification

Average consumption	200 VA	220 VA	245 VA at 50 Hz
- inrush ($\cos \phi 0,75$)	20 VA	22 VA	26 VA at 50 Hz
- sealed ($\cos \phi 0,3$)			
Operating range at $\theta \leq 55^{\circ}\text{C}$	0,8 – 1,1 Un	0,8 – 1,1 Un	0,85 – 1,1 Un see page 4/13

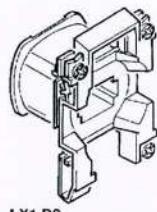
LX1 D

Coils for LC1 D contactors

Spare parts, a.c.



For LC1 D09, D12, D18 and LC1 D25 00



LX1 D2

Rated voltage Un V	Reference 50 Hz	Reference 60 Hz	Reference 50/60 Hz	Weight kg
12	LX1 D2 J5	—	—	0,070
20	LX1 D2 Z5	LX1 D2 Z6	LX1 D2 Z7	0,070
24	LX1 D2 B5	LX1 D2 B6	LX1 D2 B7	0,070
32	LX1 D2 C5	—	—	0,070
42	LX1 D2 D5	—	LX1-D2 D7	0,070
48	LX1 D2 E5	LX1 D2 E6	LX1 D2 E7	0,070
110	LX1 D2 F5	LX1 D2 F6	LX1 D2 F7	0,070
120	—	LX1 D2 G6	LX1 D2 G7	0,070
127	LX1 D2 G5	—	—	0,070
208	—	LX1 D2 L6	—	0,070
220	LX1 D2 M5	LX1 D2 M6	LX1 D2 M7	0,070
230	LX1 D2 P5	—	LX1 D2 P7	0,070
240	LX1 D2 U5	LX1 D2 U6	LX1 D2 U7	0,070
256	LX1 D2 W5	—	—	0,070
277	—	LX1 D2 W6	—	0,070
380	LX1 D2 Q5	LX1 D2 Q6	LX1 D2 Q7	0,070
400	LX1 D2 V5	—	LX1 D2 V7	0,070
415	LX1 D2 N5	—	LX1 D2 N7	0,070
440	LX1 D2 R5	LX1 D2 R6	LX1 D2 R7	0,070
480	—	LX1 D2 T6	—	0,070
500	LX1 D2 S5	—	—	0,070
575	—	LX1 D2 S6	—	0,070
600	—	LX1 D2 X6	—	0,070
660	LX1 D2 Y5	—	—	0,070

Specification

Average consumption

- inrush ($\cos \varphi 0,75$) 60 VA

70 VA

70 VA at 50 Hz

- sealed ($\cos \varphi 0,3$) 7 VA

7,5 VA

8 VA at 50 Hz

Operating range

at $\theta \leq 55^{\circ}\text{C}$ 0,8 – 1,1 Un

0,8 – 1,1 Un

0,85 – 1,1 Un

see page 4/13

For LC1 D25, D32

Rated voltage Un V	Reference 50 Hz	Reference 60 Hz	Reference 50/60 Hz	Weight kg
12	LX1 D4 J5	—	—	0,085
20	LX1 D4 Z5	LX1 D4 Z6	LX1 D4 Z7	0,085
24	LX1 D4 B5	LX1 D4 B6	LX1 D4 B7	0,085
32	LX1 D4 C5	—	—	0,085
42	LX1 D4 D5	—	LX1-D4 D7	0,085
48	LX1 D4 E5	LX1 D4 E6	LX1 D4 E7	0,085
110	LX1 D4 F5	LX1 D4 F6	LX1 D4 F7	0,085
120	—	LX1 D4 G6	LX1 D4 G7	0,085
127	LX1 D4 G5	—	—	0,085
208	—	LX1 D4 L6	—	0,085
220	LX1 D4 M5	LX1 D4 M6	LX1 D4 M7	0,085
230	LX1 D4 P5	—	LX1 D4 P7	0,085
240	LX1 D4 U5	LX1 D4 U6	LX1 D4 U7	0,085
256	LX1 D4 W5	—	—	0,085
277	—	LX1 D4 W6	—	0,085
380	LX1 D4 Q5	LX1 D4 Q6	LX1 D4 Q7	0,085
400	LX1 D4 V5	—	LX1 D4 V7	0,085
415	LX1 D4 N5	—	LX1 D4 N7	0,085
440	LX1 D4 R5	LX1 D4 R6	LX1 D4 R7	0,085
480	—	LX1 D4 T6	—	0,085
500	LX1 D4 S5	—	—	0,085
575	—	LX1 D4 S6	—	0,085
600	—	LX1 D4 X6	—	0,085
660	LX1 D4 Y5	—	—	0,085

Specification

Average consumption

- inrush ($\cos \varphi 0,75$) 90 VA

100 VA

100 VA at 50 Hz

- sealed ($\cos \varphi 0,3$) 7,5 VA

8,5 VA

8,5 VA at 50 Hz

Operating range

at $\theta \leq 55^{\circ}\text{C}$ 0,8 – 1,1 Un

0,8 – 1,1 Un

0,85 – 1,1 Un

see page 4/13

for LC • D, LP • D contactors

Characteristics :
 page 4/28
 Dimensions :
 pages 4/58 - 4/59
 Wiring diagrams :
 page 4/56

Time delay contact blocks



LA2 DT0

Mounting	Time delay contacts	Type	Range of time delay	Reference	Weight kg
Front clip-on onto LC• D09 to D95 LP• D09 to D80	1 1	On energisation	0,1 to 3s (1) 0,1 to 30s 10 to 180s 1 to 30s (2)	LA2 DT0 LA2 DT2 LA2 DT4 LA2 DS2	0,060 0,060 0,060 0,060
		On de-energisation	0,1 to 3s (1) 0,1 to 30s 10 to 180s	LA3 DR0 LA3 DR2 LA3 DR4	0,060 0,060 0,060
Lead sealing device for LA2 D/LA3 D				LA9-D901	0,005

(1) With extended scale from 0,1 to 0,6s.
 (2) With switching time of 40 ms ± 15 ms from the opening of the N/C contact, to the closing of the N/O contact.

LA6 DK1-



Mechanical latch blocks with manual or electrical unlatching



LA6 DK3-

Front clip-on mounting onto	Type	Control voltage (3)	Reference to be completed	Weight kg
LC1/LP1 D09 to D32			LA6 DK1-	0,070
LC1/LP1 D09 to D65	With contact for automatic cut-out of the contactor coil		LA6 DK2-	0,090
LC1/LP1 D80 LC1 D95	With contact for automatic cut-out of the contactor coil		LA6 DK3-	0,090

Specification

Connections	by screw-clamp
Protection	against direct finger contact
Screws	ready-to-tighten

(3) Control circuit voltages

LA6 DK mechanical latch blocks

Volts ~ 50/60 Hz	12	24	32	-	48	-	-	110/115	120/127	208	220
Volts ---	12	24	-	36	48	60	72	100	110	125	200
Code	J	*B	C	CD	*E	ND	SD	K	*F	*G	*M
Volts ~ 50/60 Hz	240	256	277	380	400	415	440	480	500	575/600	660
Code	*U	W5	W6	*Q	V	*N	*R	T	S	X	Y

* standard voltages

Additional contact blocks

LA • D

Characteristics :
pages 4/28 - 4/29
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pages 4/58 - 4/59
Wiring diagrams :
page 4/56

for LC • D, LP • D contactors



LA1 DN 11

Standard, instantaneous auxiliary contact blocks

Mounting	Number of contacts	Composition	Reference	Weight kg
By front clip-on mounting onto LC• D09 to D95 LP• D09 to D80	4	2 2 1 3 4 - - 4 3 1 2 2	LA1 DN 22 LA1 DN 13 LA1 DN 40 LA1 DN 04 LA1 DN 31 LA1 DC 22 (1)	0,050 0,050 0,050 0,050 0,050 0,050
	2	1 1 2 - - 2	LA1 DN 11 LA1 DN 20 LA1 DN 02	0,030 0,030 0,030
	1	1 - - 1	LA1 DN 10 (2) LA1 DN 01 (2)	0,020 0,020
By side clip-on mounting onto LC• D09 to D95 LP• D09 to D32	2	1 1 2 -	LA8 DN 11 (3) LA8 DN 20 (3)	0,070 0,070

(1) including 1 N/O + 1N/C make before break contacts

(2) 1 block only can be mounted on the LC1/LP1 D25 and D32
2 blocks can be mounted on the LC1/LP1 D40 to D95



LA1 DN 22

Instantaneous auxiliary contact blocks with dust and damp protected (IP54) contacts

Mounting	Screen continuity	Composition	Reference	Weight kg
By front clip-on mounting onto LC• D09 to D95 LP• D09 to D80	-	2 - 2 2 2 1 1 2 2	LA1 DX 20 LA1 DZ 40 LA1 DZ 31 LA1 DY 20 (4)	0,040 0,050 0,050 0,040

(4) Device fitted with 4 screening continuity terminals



LA1 DZ 31

(3) Front and side mounted contact block arrangements

Coils	Operating range	Possible combinations
single frequency	0,8 to 1,1 Un	Possibility of fitting front and side mounted contact blocks
dual frequency	0,8 to 1,1 Un	Possibility of fitting either : 2 side mounted contact blocks or 1 front mounted contact block
	0,85 to 1,1 Un	Possibility of mounting front and side contact blocks
d.c.	0,8 to 1,1 Un	Possibility of fitting either : 2 side mounted contact blocks or 1 front mounted contact block

LA4 D

Input and indicator modules

for LC • D, LP • D contactors

Characteristics :
pages 4/30 - 4/32
Dimensions :
pages 4/58 - 4/59
Wiring diagrams :
page 4/57



LA4 DT 2U

Electronic serial timer modules

Type	Time delay	Mounting on	Output voltage (1)	Reference	Weight kg
On energisation	0,1 to 2 seconds	LC1-LP1 D09 to D32	24 - 250 V ~ ==	LA4 DT 0U	0,040
		LC1 D40 to D95	100 - 250 V ~		
	1,5 to 30 seconds	LC1-LP1 D09 to D32	24 - 250 V ~ ==	LA4 DT 2U	0,040
		LC1 D40 to D95	100 - 250 V ~		
On de-energisation	0,1 to 2 seconds	LC1 D09 to D18	24 - 250 V ~	LA4 DR 0U	0,050
		LC1 D25 to D95	100 - 250 V ~		
	1,5 to 30 seconds	LC1 D09 to D18	24 - 250 V ~	LA4 DR 2U	0,050
		LC1 D25 to D95	100 - 250 V ~		

(1) For 24 V operation, the contactor must be fitted with a 20 V coil (see coil tables on pages 4/16 to 4/19)

Amplifier interface modules



LA4 DF B

Type	Input voltage	Mounting on	Output voltage	Reference	Weight kg
Interface with relay	24 V	LC1 D09 to D95	24 - 250 V ~	LA4 DF B	0,050
		LP1 D09 to D32	24 - 250 V ==		
	48 V	LC1 D09 to D95	24 - 250 V ~	LA4 DF E	0,050
		LP1 D09 to D32	24 - 250 V ==		
Interface with relay (forced operating)	24 V	LC1 D09 to D95	24 - 250 V ~	LA4 DL B	0,045
		LP1 D09 to D32	24 - 250 V ==		
	48 V	LC1 D09 to D95	24 - 250 V ~	LA4 DL E	0,045
		LP1 D09 to D32	24 - 250 V ==		
Solid state interface	24 V	LC1 D09 to D32	24 - 250 V ~	LA4 DW B	0,045
		LC1 D40 to D95	100 - 250 V ~		



LA4 DM U

Automatic-manual-stop control modules

Type	Mounting on	Output voltage	Reference	Weight kg
Automatic Manual Stop	LC1 D09 to D95	24 - 100 V ~	LA4 DM K	0,040
	LP1 D09 to D32	24 - 100 V ==		
	LC1 D09 to D95	100 - 250 V ~	LA4 DM U	0,040

Indicator lights

Type	Input voltage ~ and ==	Front clip-on mounting	Sold in lots of	Reference	Weight kg
Red LED	12 - 72 V	All d range products	5	LA4 DV E	0,010
	72 - 250 V		5	LA4 DV M	0,010
	250 - 440 V		5	LA4 DV R	0,010



LA4 DV M

Coil suppressor modules

LA4 D

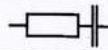
for LC • D, LP • D contactors

Characteristics :
page 4/32
Dimensions :
pages 4/58 - 4/59



LA4 DA 1U

Resistor-capacitor circuit (R.C.)



Fitted to the upper part by :	Mounting on	Operating voltage	Reference	Weight
		50/60 Hz		kg
Clip-on fixing and connection without tools to the contactor coil terminals	LC• D09 to LC• D32	24 - 48 V	LA4 DA 1E	0,012
		50 - 127 V	LA4 DA 1G	0,012
		110 - 240 V	LA4 DA 1U	0,012
Screw connection to the contactor coil terminals	LC• D09 to LC• D95	24 - 48 V	LA4 DA 2E	0,018
		50 - 127 V	LA4 DA 2G	0,018
		110 - 240 V	LA4 DA 2U	0,018

An R.C. circuit provides an effective answer to the protection needs of circuits highly sensitive to high frequency interference. Voltage limited to 3 Un maximum, oscillating frequency limited to 400 Hz maximum. Slight increase in drop-out time (1,2 to 2 times the usual time)



LA4 DA 2U

Varistor (peak-limiting)



Fitted to the upper part by :	Mounting on	Operating voltage	Reference	Weight
		50/60 Hz ou ---		kg
Clip-on fixing and connection without tools to the contactor coil terminals	LC•LP• D09 to LC•LP• D32	24 - 48 V	LA4 DE 1E	0,012
		50 - 127 V	LA4 DE 1G	0,012
		110 - 250 V	LA4 DE 1U	0,012
Screw connection to the contactor coil terminals	LC•LP• D09 to D32 LC•D40 to D95	24 - 48 V	LA4 DE 2E	0,018
		50 - 127 V	LA4 DE 2G	0,018
		110 - 250 V	LA4 DE 2U	0,018
Screw connection of wire to the connector coil terminals	LP• D40 to LP• D80	24 - 48 V	LA4 DE 3E	0,018
		50 - 127 V	LA4 DE 3G	0,018
		110 - 250 V	LA4 DE 3U	0,018

Simple component, operating in \sim and ---
- Limitation of transient voltage value to 2 Un maximum
- Maximum reduction of transient voltage peaks
- Slight increase in drop-out time (1,1 to 1,5 times the normal time)



LA4 DC 3U

Diode



Fitted to the upper part by :	Mounting on	Operating voltage	Reference	Weight
		---		kg
Clip-on fixing and connection without tools to the contactor coil terminals	LP• D09 to LP• D32	24 - 250 V	LA4 DC 1U	0,012
Screw connection of wire to the contactor coil terminals	LP• D40 to LP• D80	24 - 250 V	LA4 DC 3U	0,018

Efficient protection :
- No overvoltage or oscillating frequency
- Increased drop-out time (6 to 10 times normal)
- Polarised component.

Note : For satisfactory protection, it is necessary to fit a suppression module across the coil of each contactor.

Auxiliary contact blocks

LA1 D - LA8 D instantaneous contact blocks

LA2 D - LA3 D time delay contact blocks

LA6 D mechanical latch blocks

References :
pages 4/12-4/13

Dimensions :
page 4/58 4/59

Wiring diagrams :
page 4/56

Environment

Conformity to standards		IEC 337-1, NF C63-140 VDE 0660, BS 4794
Approvals		ASE, UL, CSA, DEMKO, NEMKO, SEMKO, FI, BV
Protective treatment		TH
Degree of protection		Protection against direct finger contact to VDE 0106
Dry ambient air temperature	For storage For operation, according to IEC 255 (0,8 to 1,1 Un) Permissible for operation at Un	from - 60 °C to + 80 °C from - 5 °C to + 55 °C from - 40 °C to + 70 °C
Operating altitude		3000 m

Instantaneous and time delay contact block characteristics

Number of contacts	On LA1 D On LA2 D, LA3 D, LA8 D	1,2 or 4 2
Operational voltage	up to	690 V
Rated insulation voltage LA1 D, LA2 D, LA3 D, LA8 D	According to IEC 337-1 660 V	BS 4794 660 V IEC 947-1 690 V VDE 0110 750 V CSA C22-2 n° 14 600 V
Rated thermal current	For ambient air temperatures of ≤ 40 °C	10 A
Frequency of operating current		from 25 – 400 Hz
Minimum switching capacity		U minimum : 17 V , I minimum : 5 mA
Short-circuit protection	According to IEC 337-1 and VDE 0660. Fuse, g1	10 A
Making capacity	According to IEC 337-1, I rms:	A.C. : 140 A ; D.C. : 250 A
Short time current	Permissible for 1s 500 ms 100 ms	100 A 120 A 140 A
Insulation resistance		> 10 MΩ
Non-overlap time	Guaranteed between N/C and N/O contacts	1,5 ms (on closing and on opening)
Overlap time	Guaranteed between N/C and N/O contacts on LA1-DC22	1,5 ms
Time delay (LA2 D and LA3 D contact blocks)	Ambient air temperature for operation Repeat accuracy Drift up to 0,5 million operating cycles Drift depending on the ambient air temperature The time delay is only ensured within the setting shown on the front of the device.	- 40 °C – +70 °C ± 2 % + 15 % 0,25 % per °C
Mechanical durability	LA1 - LA8 D LA2 - LA3 D	30 million operating cycles 5 million operating cycles

Mechanical latch block characteristics

		LA6 DK1	LA6 DK2	LA6 DK3
Mounting on		D09 to D32	D09 to D65	D80
Rated insulation voltage	V according to IEC 947-1	690	690	690
Control circuit voltage	V	12 to 220	12 to 220	12 to 220
Power required for unlatching	W	190	330	330
Maximum rating voltage	In operating cycles/h	1200	1000	1000
Mechanical durability (at Un) : 1 million operating cycles	Unlatching can be electrically controlled or manually operated (pulsed or maintained). The LA6 DK unlatch coil and the LP1 D operating coil must not be energized simultaneously. Auto cut-out of the coil after 15 ms. Duration of the control signal > 10 ms.			
	Blocks DK2 and DK3 also have a N/C contact to break the circuit of the contactor coil. Signal duration = contactor operating time + 20 ms.			

Control and signalling units Ø 22 mm (fixing)

Characteristics

References :
pages 4 to 17
Dimensions :
pages 26 and 27

Environment

Conforming to standards	IEC 337-1, IEC 337-2, NF C 63-140, ASE 0119, ASE 1003, BS 4794, VDE 0660-200, UL 508, CSA C22-2 n° 14, CSA C22-2 n° 66.
Approvals	XB2-B Standard version : CSA : pushbuttons and selector switches : A600-Q600; pilot lights and illuminated pushbuttons, direct supply (120 V max); pilot lights and illuminated pushbuttons with transformer (110/6 V, 220/6 V and 240/6 V). UL : pushbuttons and selector switches : A600-Q600; pilot lights and illuminated pushbuttons, direct supply (120 V max); pilot lights and illuminated pushbuttons with transformer (110/6 V, 220/6 V and 240/6 V). ASE, DEMKO, NEMKO, SEMKO, BUREAU VERITAS, SÄHKÖTARKASTUSKESKUS, USSR, GL, DNV, LROS
Protective treatment	Standard version: "TC".
Ambient air temperature	Operation : -25 °C to +70 °C. Storage : -40 °C to +70 °C.
Vibration resistance	Ø 60 mm mushroom head pushbuttons : 8 g. Other pushbuttons : 15 g. (40 to 500 Hz) conforming to IEC 68-2-6.
Shock resistance	Pushbuttons : 70 g. Mushroom head pushbuttons : 15 g. Selector switches : 200 g. Conforming to IEC 68-2-27
Electric shock protection	Class I, conforming to IEC 536 and NF C 20-030.
Degree of protection conforming to IEC 529 and NF C 20-010	IP 65 : flush and projecting, illuminated and non-illuminated pushbuttons (mounted). IP 66 : booted and mushroom head pushbuttons, selector switches, pilot lights (mounted). Double headed pushbuttons : Without pilot light : IP 40 or IP 65. With pilot light : IP 40 (IP 65 with boot ZB2-BW008).
Mechanical life	1 million operating cycles (latching mushroom head pushbuttons : 300,000 operating cycles).

Contact block characteristics

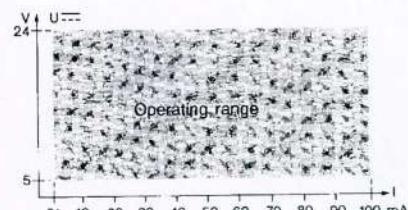
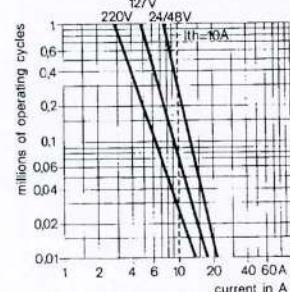
Rated thermal current	10 A conforming to IEC 337-1, NF C 63-140, UL 508, CSA C 22-2 n° 14, VDE 0660-200.
Rated insulation voltage	500 V conforming to NF C 20-040, VDE 0110, IEC 158-1, 600 V conforming to UL 508 and CSA C 22-2 n° 14.
Insulation category	Group C conforming to NF C 20-040 and VDE 0110.
Contact operation	Slow break N/C or N/O.
Resistance across terminals	≤ 25 mΩ conforming to NF C 93-050 method A or IEC 255-7 category 3.
Operating force	Flush and projecting pushbuttons - with 1 N/O contact : 1 daN - with 1 N/C contact : 0.8 daN. Additional contacts - N/O : + 0.5 daN - N/C : + 0.3 daN.
Terminal referencing	Conforming to CENELEC EN 50013.
Short-circuit protection	10 A cartridge fuses type g1 or N conforming to IEC 337-1 B, VDE 0660-200.

Rated power Conforming to IEC 337-1. Utilisation categories AC-11 and DC-11. Operating rate : 3600 operating cycles/hot Load factor : 0.5.

Standard contact blocks
a.c. supply ~ 50-60 Hz
~~~ Inductive

**d.c. supply** =  
Power broken in W  
For 1 million operating cycles

### Contact blocks for low power switching



## Cabling

Screw and captive cable clamp terminals. Capacity : minimum  $1 \times 0.5 \text{ mm}^2$ . Maximum, with or without cable e.i.  $2 \times 1.5 \text{ mm}^2$  or  $1 \times 2.5 \text{ mm}^2$  or by Faston connectors conforming to NF C 20-120 (on request).

## Control units Ø 22 mm (fixing)

circular head, with chromium plated metal bezel

### Adaptable sub-assemblies

Characteristics :  
page 3  
Dimensions :  
pages 26 and 27

#### Operating heads for pushbuttons, spring return

| Description                                                                                                  | Colour | Reference | Weight kg |
|--------------------------------------------------------------------------------------------------------------|--------|-----------|-----------|
| <b>Flush pushbutton</b>                                                                                      | White  | ZB2-BA1   | 0.030     |
|                                                                                                              | Black  | ZB2-BA2   | 0.030     |
|                                                                                                              | Green  | ZB2-BA3   | 0.030     |
|                                                                                                              | Red    | ZB2-BA4   | 0.030     |
|                                                                                                              | Yellow | ZB2-BA5   | 0.030     |
|                                                                                                              | Blue   | ZB2-BA6   | 0.030     |
| <b>Flush transparent pushbutton</b><br>for use with integral circular legend plate ZB2-BY1*** (see page 15)  | Green  | ZB2-BA38  | 0.030     |
|                                                                                                              | Red    | ZB2-BA48  | 0.030     |
|                                                                                                              | Yellow | ZB2-BA58  | 0.030     |
|                                                                                                              | Blue   | ZB2-BA68  | 0.030     |
|                                                                                                              | Clear  | ZB2-BA78  | 0.030     |
|                                                                                                              |        |           |           |
| <b>Recessed pushbutton with guard</b>                                                                        | White  | ZB2-BA16  | 0.040     |
|                                                                                                              | Black  | ZB2-BA26  | 0.040     |
|                                                                                                              | Green  | ZB2-BA36  | 0.040     |
|                                                                                                              | Red    | ZB2-BA46  | 0.040     |
|                                                                                                              | Yellow | ZB2-BA56  | 0.040     |
|                                                                                                              | Blue   | ZB2-BA66  | 0.040     |
| <b>Projecting pushbutton</b>                                                                                 | White  | ZB2-BL1   | 0.030     |
|                                                                                                              | Black  | ZB2-BL2   | 0.030     |
|                                                                                                              | Green  | ZB2-BL3   | 0.030     |
|                                                                                                              | Red    | ZB2-BL4   | 0.030     |
|                                                                                                              | Yellow | ZB2-BL5   | 0.030     |
|                                                                                                              | Blue   | ZB2-BL6   | 0.030     |
| <b>Booted pushbutton</b>                                                                                     | Black  | ZB2-BP2   | 0.025     |
|                                                                                                              | Green  | ZB2-BP3   | 0.025     |
|                                                                                                              | Red    | ZB2-BP4   | 0.025     |
|                                                                                                              | Yellow | ZB2-BP5   | 0.025     |
|                                                                                                              | Blue   | ZB2-BP6   | 0.025     |
|                                                                                                              |        |           |           |
| <b>Transparent booted pushbutton</b><br>for use with integral circular legend plate ZB2-BY1*** (see page 15) | Green  | ZB2-BP38  | 0.030     |
|                                                                                                              | Red    | ZB2-BP48  | 0.030     |
|                                                                                                              | Yellow | ZB2-BP58  | 0.030     |
|                                                                                                              | Blue   | ZB2-BP68  | 0.030     |
|                                                                                                              | Clear  | ZB2-BP78  | 0.030     |
|                                                                                                              |        |           |           |

#### Operating heads with black metal bezel

To order, add suffix "7" to the above references (except booted pushbuttons ZB2-BP2 to ZB2-BP6).  
Example : ZB2-BA2 becomes ZB2-BA27.

## Control units Ø 22 mm (fixing)

circular head, with chromium plated metal bezel

### Adaptable sub-assemblies

Characteristics :  
page 3  
Dimensions :  
pages 26 and 27

#### Operating heads for pushbuttons, spring return

| Description                                                                         | Marking | Colour | Reference | Weight kg |
|-------------------------------------------------------------------------------------|---------|--------|-----------|-----------|
|    | I       | Green  | ZB2-BA331 | 0.030     |
|                                                                                     | II      | Green  | ZB2-BA336 | 0.030     |
|                                                                                     | ↑ or →  | White  | ZB2-BA334 | 0.030     |
|                                                                                     | ↓ or ←  | Black  | ZB2-BA335 | 0.030     |
|                                                                                     | O       | Red    | ZB2-BA432 | 0.030     |
|                                                                                     | Start   | Green  | ZB2-BA333 | 0.030     |
|                                                                                     | Stop    | Red    | ZB2-BA434 | 0.030     |
|    | O       | Red    | ZB2-BL432 | 0.030     |
|                                                                                     | Stop    | Red    | ZB2-BL434 | 0.030     |
|  | Ø 30 mm | Black  | ZB2-BC24  | 0.045     |
|                                                                                     |         | Green  | ZB2-BC34  | 0.045     |
|                                                                                     |         | Red    | ZB2-BC44  | 0.045     |
|                                                                                     |         | Yellow | ZB2-BC54  | 0.045     |
|                                                                                     |         | Blue   | ZB2-BC64  | 0.045     |
|  | Ø 40 mm | Black  | ZB2-BC2   | 0.045     |
|                                                                                     |         | Green  | ZB2-BC3   | 0.045     |
|                                                                                     |         | Red    | ZB2-BC4   | 0.045     |
|                                                                                     |         | Yellow | ZB2-BC5   | 0.045     |
|                                                                                     |         | Blue   | ZB2-BC6   | 0.045     |
|  | Ø 60 mm | Black  | ZB2-BR2   | 0.055     |
|                                                                                     |         | Green  | ZB2-BR3   | 0.055     |
|                                                                                     |         | Red    | ZB2-BR4   | 0.055     |
|                                                                                     |         | Yellow | ZB2-BR5   | 0.055     |
|                                                                                     |         | Blue   | ZB2-BR6   | 0.055     |

#### Wobblestick For "Fast stop" functions

|                                                        |       |         |       |
|--------------------------------------------------------|-------|---------|-------|
| Plastic coated metal rod<br>Operates in all directions | Black | ZB2-BB2 | 0.070 |
|                                                        | Red   | ZB2-BB4 | 0.070 |

#### Operating heads with black metal bezel

To order, add suffix "7" to the above references. Example : ZB2-BA331 becomes ZB2-BA3317.

##### Other versions

Pushbuttons with metal button.  
Flush pushbutton with heavy duty sealing.  
Padlockable guard - 1, 2 or 3 padlocks.  
Please consult your Regional Sales Office.



ZB2-BB\*

## Control units Ø 22 mm (fixing)

circular head, with chromium plated metal bezel

### Adaptable sub-assemblies

Characteristics :

page 3

Dimensions :

pages 26 and 27

### Operating heads for latching pushbuttons

| Description                                                                               | Colour                        | Reference    | Weight kg                                                            |                                                    |
|-------------------------------------------------------------------------------------------|-------------------------------|--------------|----------------------------------------------------------------------|----------------------------------------------------|
| <b>Transparent projecting pushbutton</b><br>Push-push to release                          | Green                         | ZB2-BH3      | 0.030                                                                |                                                    |
|                                                                                           | Red                           | ZB2-BH4      | 0.030                                                                |                                                    |
|                                                                                           | Yellow                        | ZB2-BH5      | 0.030                                                                |                                                    |
|                                                                                           | Blue                          | ZB2-BH6      | 0.030                                                                |                                                    |
|                                                                                           | Clear                         | ZB2-BH7      | 0.030                                                                |                                                    |
| <b>Transparent booted pushbutton</b><br>Push-push to release                              | Green                         | ZB2-BH38     | 0.050                                                                |                                                    |
|                                                                                           | Red                           | ZB2-BH48     | 0.050                                                                |                                                    |
|                                                                                           | Yellow                        | ZB2-BH58     | 0.050                                                                |                                                    |
|                                                                                           | Blue                          | ZB2-BH68     | 0.050                                                                |                                                    |
|                                                                                           | Clear                         | ZB2-BH78     | 0.050                                                                |                                                    |
| <b>Mushroom head pushbutton</b><br>Push-pull                                              | Ø 40 mm<br>Ø 60 mm            | Black<br>Red | ZB2-BT2<br>ZB2-BX2                                                   | 0.075<br>0.080                                     |
|                                                                                           | Ø 30 mm                       | Black        | ZB2-BX4                                                              | 0.080                                              |
| <b>Mushroom head pushbutton</b><br>Turn to release                                        | Ø 40 mm<br>Ø 60 mm            | Black<br>Red | ZB2-BS42<br>ZB2-BS44<br>ZB2-BS62<br>ZB2-BS64                         | 0.045<br>0.045<br>0.065<br>0.065                   |
| <b>Mushroom head pushbutton with trigger action (1)</b><br>Turn to release                | Ø 30 mm<br>Ø 40 mm            | Red          | ZB2-BS834<br>ZB2-BS844                                               | 0.060<br>0.060                                     |
| <b>Mushroom head pushbutton</b><br>Key release - Ronis key n° 455                         | Ø 30 mm<br>Ø 40 mm<br>Ø 60 mm | Black<br>Red | ZB2-BS72<br>ZB2-BS74<br>ZB2-BS12<br>ZB2-BS14<br>ZB2-BS22<br>ZB2-BS24 | 0.090<br>0.090<br>0.090<br>0.090<br>0.120<br>0.120 |
| <b>Mushroom head pushbutton with trigger action (1)</b><br>Key release - Ronis key n° 455 | Ø 30 mm<br>Ø 40 mm<br>Ø 60 mm | Red          | ZB2-BS934<br>ZB2-BS944<br>ZB2-BS964                                  | 0.080<br>0.080<br>0.110                            |

(1) The trigger action mushroom head is a tamper proof unit whereby a change of contact state is not possible by 'floating' the operator, which can leave it in the unlatched position. They are particularly suitable in applications where several 'Emergency Stop' pushbuttons are used and it is necessary to quickly ascertain which one has been operated. This can be done visually by checking which operator is latched or via a pilot light etc. - use ideally with a ZB2-BZ105 body/contact assembly, shown on page 9.

### Operating heads with black metal bezel

To order, add suffix "7" to the above references. Example : ZB2-BH3 becomes ZB2-BH37.

Other versions

Key release mushroom head pushbuttons with other key numbers.  
Please consult your Regional Sales Office.

## Control units Ø 22 mm (fixing)

circular head, with chromium plated metal bezel

### Adaptable sub-assemblies

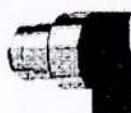
Characteristics :  
page 3  
Dimensions :  
pages 26 and 27

#### Operating heads for selector switches

| Description | Type                               | Operator        | Reference | Weight kg |
|-------------|------------------------------------|-----------------|-----------|-----------|
| 2 position  | stay put                           | Standard handle | ZB2-BD2   | 0.045     |
|             |                                    | Long handle     | ZB2-BJ2   | 0.045     |
|             | 1 spring return from right to left | Standard handle | ZB2-BD4   | 0.045     |
|             |                                    | Long handle     | ZB2-BJ4   | 0.045     |
| 3 position  | stay put                           | Standard handle | ZB2-BD3   | 0.045     |
|             |                                    | Long handle     | ZB2-BJ3   | 0.045     |
|             | 2 spring return to centre          | Standard handle | ZB2-BD5   | 0.045     |
|             |                                    | Long handle     | ZB2-BJ5   | 0.045     |
| ZB2-BJ*     | 1 spring return right to centre    | Standard handle | ZB2-BD8   | 0.045     |
|             |                                    | Long handle     | ZB2-BJ8   | 0.045     |
|             | 1 spring return left to centre     | Standard handle | ZB2-BD7   | 0.045     |
|             |                                    | Long handle     | ZB2-BJ7   | 0.045     |



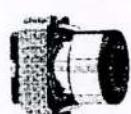
ZB2-BD\*



ZB2-BJ\*

#### Operating head + mounting base for potentiometer

| Description                                                                  | For potentiometer shaft Ø | Reference | Weight kg |
|------------------------------------------------------------------------------|---------------------------|-----------|-----------|
| For potentiometer with shaft length 43 to 47 mm (potentiometer not supplied) | 6 mm                      | ZB2-BD912 | 0.080     |
|                                                                              | 6.35 mm                   | ZB2-BD922 | 0.080     |



ZB2-BD912



#### Operating heads for key switches (Ronis key n° 455)

| Description | Type                           | Key removal        | Reference | Weight kg |
|-------------|--------------------------------|--------------------|-----------|-----------|
| 2 position  | stay put                       | LH position        | ZB2-BG2   | 0.070     |
|             |                                | LH and RH position | ZB2-BG4   | 0.070     |
|             | 1 spring return right to left  | LH position        | ZB2-BG6   | 0.070     |
|             |                                | centre position    | ZB2-BG3   | 0.070     |
| 3 position  | stay put                       | LH and RH position | ZB2-BG5   | 0.070     |
|             |                                | LH position        | ZB2-BG9   | 0.070     |
|             |                                | RH position        | ZB2-BG09  | 0.070     |
|             |                                | all 3 positions    | ZB2-BG0   | 0.070     |
|             | 2 spring return to centre      | centre position    | ZB2-BG7   | 0.070     |
|             |                                | RH position        | ZB2-BG1   | 0.070     |
|             | 1 spring return left to centre | centre position    | ZB2-BG8   | 0.070     |



ZB2-BG\*

#### Operating heads with black metal bezel

To order, add suffix "7" to the above references. Example: ZB2-BD2 becomes ZB2-BD27.

#### Other versions

Operating heads for key switches with other key numbers or other mechanical functions.  
Please consult your Regional Sales Office.



## Interchangeable housings/lenses for Tranilamp Indicator Lamp Body Units.

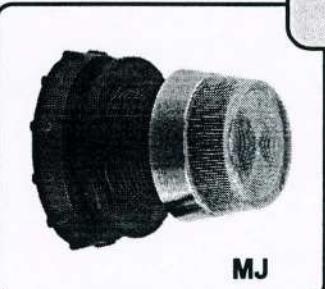
Match the Series, panel hole diameter and lens type you require; then use the tables overleaf to compare with the required Indicator Lamp Body, and lamp type to check for compatibility and correct housing length.

### JY Series

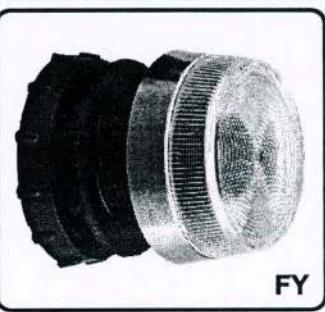
#### Standard Features:

**Housings:-** Black moulded glass reinforced nylon.  
**Lens:-** Polycarbonate welded to brass chrome plated bezels.  
**Protection:-** IP64.

|                           | 19                                                                            | 22.5                                            | 30.5                                            |
|---------------------------|-------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------------------------|
| Lens Dia mm               | 22.3                                                                          | 30                                              | 22.3                                            |
| Hole Dia mm               | 22.3                                                                          | 30                                              | 30                                              |
| <b>Lens</b>               | BJ                                                                            | BY                                              | BJ                                              |
| <b>Panel Hole Adaptor</b> |                                                                               | ADMF                                            | ADFD                                            |
| <b>Housing</b>            | MP<br>① Panel locking nut<br>② Indicator locking ring                         | FP<br>① Panel Front<br>② Indicator locking ring | FP<br>① Panel Front<br>② Indicator locking ring |
| <b>Complete Assembly</b>  | MJ                                                                            | MY                                              | FJ                                              |
| <b>Options</b>            | Not available                                                                 | Sealing washer behind lens                      | Not available                                   |
| <b>Protection to IP65</b> | Red, Amber, Green, White, Clear, Blue. (Specify "Colour" after Full Code)     | Sealing washer behind lens                      | Sealing washer behind lens                      |
| <b>Lens Colours</b>       | Black epoxy coating (Specify "Black Bezel")                                   |                                                 |                                                 |
| <b>Bezel Colour</b>       |                                                                               |                                                 |                                                 |
| <b>Legend Plates</b>      | Available for all assemblies, blank or engraved as required. (Data Sheet 214) |                                                 |                                                 |
| <b>DIN Keyway</b>         | Available for all assemblies. (Specify "DIN Keyed")                           |                                                 |                                                 |



MJ



FY

Product Code Example:- "FY Blue" = FP Housing + BY Blue Lens (See relevant Indicator Lamp Data Sheet for Full Lamp Assembly Codes)

### H Series

#### Standard Features:

**Housings & Bezels:-** Chrome plated brass.  
**Lens:-** Polystyrene (2 Watt lamp maximum).  
**Protection:-** IP64.

|                                                                                   | 19                                                                                                         | 22.5                                     | 26.5            | 30.5                                               |
|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|------------------------------------------|-----------------|----------------------------------------------------|
| Lens Dia mm                                                                       | 17.5                                                                                                       | 17                                       | 21.5            | 23.5                                               |
| Hole Dia mm                                                                       | 17.5                                                                                                       | 17                                       | 21.5            | 23.5                                               |
| <b>Lens</b>                                                                       | MA                                                                                                         | MC                                       | FA              | FB                                                 |
| Note: FB=LB                                                                       |                                                                                                            |                                          |                 |                                                    |
| <b>Bezel</b>                                                                      |                                                                                                            | BFA                                      | BFB             | BLA                                                |
| ① Rubber washer                                                                   |                                                                                                            |                                          |                 | BLB                                                |
| Note: BFB=BLB                                                                     |                                                                                                            |                                          |                 |                                                    |
| <b>Housing</b>                                                                    | MH<br>① Panel locking nut<br>② Indicator locking ring<br>③ Fibre washer<br>④ Panel locking ring            | FH                                       | LH<br>④         | DH<br>③                                            |
| MHL<br>MHXL                                                                       | 20<br>23<br>29                                                                                             | 20<br>16<br>22                           | 20<br>18<br>22  | 20<br>18<br>22                                     |
| <b>Complete Assembly</b>                                                          | MHA<br>MHLA<br>MHLC<br>MHXLC                                                                               | FHA<br>FHLC                              | FHB<br>FHLB     | LHA                                                |
| Check overleaf for correct length of housing to use with lamp and indicator body. |                                                                                                            |                                          |                 | LHB                                                |
|                                                                                   |                                                                                                            |                                          |                 | DHA                                                |
| <b>Options</b>                                                                    | Sealing washer between panel locking nut                                                                   | Sealing washer & use polycarbonate lens. | Sealing washer. | Sealing washer. O-ring & internal white reflector. |
|                                                                                   |                                                                                                            |                                          |                 | Sealing washer. O-ring & internal white reflector. |
| <b>Lens Colour</b>                                                                | Red, Amber, Green, White, Clear, Blue. (Specify "Colour" after Full Code). For no lens specify "less lens" |                                          |                 | Sealing washer.                                    |
| <b>Lens Material</b>                                                              | Polycarbonate available; essential for lamps greater than 2 Watts. (Specify "Polycarbonate Lens")          |                                          |                 |                                                    |
| <b>Bezels</b>                                                                     | Black epoxy coating. Note:- MH, MHL and MHXL, the complete housing body is black. (Specify "Black Bezel")  |                                          |                 |                                                    |
| <b>Legend Plates</b>                                                              | Available for all housings either blank or engraved, as required. (Data Sheet 214)                         |                                          |                 |                                                    |
| <b>DIN Keyway</b>                                                                 | Available on all housings. (Specify "DIN Keyed")                                                           |                                          |                 |                                                    |

Product Code Example:- "MHLC Red" = MHL Housing + MC Red Lens (See relevant Indicator Lamp Data Sheet for Full Lamp Assembly Codes)

## **Indicator Body/Housing/Lamp Compatibility (and Fitting Dimensions)**

Compare the Housing and Indicator Body chosen. Then use the Symbol Key to check lamp(s) compatible with this

## **Indicator Lamps**

|       |     |    |   |   |   |   |   |
|-------|-----|----|---|---|---|---|---|
| TMU   | 202 | 59 | O | O | O | O | O |
| TEMU  | 202 | 60 | O | O | O | O | O |
| FTMU  | 202 | 72 | O | O | O | O | O |
| NBMU  | 206 | 42 | △ | △ | △ | △ | △ |
| FNBMU | 206 | 61 | △ | △ | △ | △ | △ |
| NGMU  | 206 | 42 | △ | △ | △ | △ | △ |
| FNGMU | 206 | 61 | △ | △ | △ | △ | △ |
| NWMU  | 206 | 42 | △ | △ | △ | △ | △ |
| FNWMU | 206 | 61 | △ | △ | △ | △ | △ |
| RMU   | 207 | 42 | O | O | O | O | O |
| IRMU  | 207 | 75 | O | O | O | O | O |
| LMU/4 | 205 | 42 | O | O | O | O | O |
| LMU/2 | 212 | 25 | ● | ● | ● | ● | ● |
| FLMU  | 205 | 61 | O | O | O | O | O |
| PFTMU | 210 | 67 | O | O | O | O | O |

### **Test Indicators**

|             |     |    |                       |                       |                       |                       |                       |
|-------------|-----|----|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| <b>MTMU</b> | 203 | 67 | <input type="radio"/> |
| <b>DTMU</b> | 204 | 50 | <input type="radio"/> |

## **Flashing Indicators**

|                |     |    |                       |                       |                       |                       |                       |
|----------------|-----|----|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| <b>FACTMU</b>  | 208 | 65 | <input type="radio"/> |
| <b>FSACTMU</b> | 208 | 67 | <input type="radio"/> |
| <b>FACLMU</b>  | 208 | 42 | <input type="radio"/> |
| <b>FDCLMU</b>  | 208 | 42 | <input type="radio"/> |
| <b>FSACLMU</b> | 208 | 50 | <input type="radio"/> |
| <b>FSDCLMU</b> | 208 | 50 | <input type="radio"/> |

### ***Other dimensions and weights***

| b - Housing Depth mm  | 11       | 13   | 11   | 13   | 13   | 16 | 12   | 12   | 15   | 11   | 15   | 11   | 22   | 15   | 13   | 15   | 13   |    |
|-----------------------|----------|------|------|------|------|----|------|------|------|------|------|------|------|------|------|------|------|----|
| d - Bezel Diameter mm | 33.5     | 31.5 | 26   | 31.5 | 24   | 35 | 30.5 | 32   | 28.5 | 28.5 | 28.5 | 28.5 | 22.5 | 22.5 | 22.5 | 22.5 | 22.5 |    |
| e - Lens Diameter mm  | 30       | 30   | 22.3 | 30   | 22.3 | 26 | 23.5 | 23.5 | 23.5 | 23.5 | 21.5 | 21.5 | 17   | 17   | 17   | 17.5 | 17.5 |    |
|                       | Weight g | 32   | 21   | 15   | 21   | 11 | 46   | 39   | 45   | 47   | 42   | 49   | 44   | 23   | 19   | 19   | 19   | 19 |

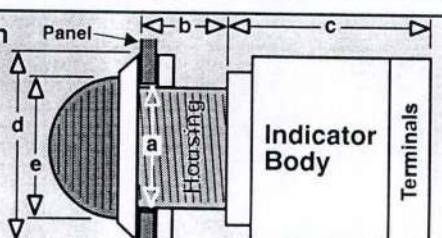
#### **Symbol Key for Lamp compatibility**

(See Product Data Sheet  
No 201 for Lamp details)

| <i>Symbol</i>                      |   |   |   |   |   |   |   |   |
|------------------------------------|---|---|---|---|---|---|---|---|
| <b>Filament</b>                    | ✓ | ✓ | ✓ | ✗ | ✓ | ✗ | ✗ | ✗ |
| <b>LED4, LEDM4 &amp; LED7</b>      | ✓ | ✓ | ✓ | ✗ | ✗ | ✗ | ✗ | ✗ |
| <b>Neon &amp; Fluorescent</b>      | ✓ | ✗ | ✗ | ✓ | ✗ | ✓ | ✗ | ✗ |
| <b>MES cap</b> (miniature screw)   | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✗ |
| <b>MBC cap</b> (miniature bayonet) | ✓ | ✗ | ✓ | ✗ | ✗ | ✓ | ✓ | ✗ |

### Dimension Key

**b + c =**  
front of  
panel to  
back of  
indicator



# Lamps for Indicators

Filament, LED Clusters,  
Neon, Fluorescent.

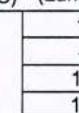
# Lamps

201

**A comprehensive range of lamps designed for use with Tranilamp illuminated products.**  
Selection depends on required voltage, power limitations, lamp life, brightness, cost, cap size and indicator colour.

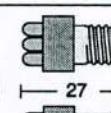
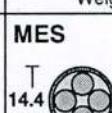
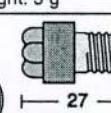
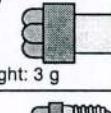
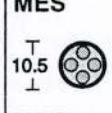
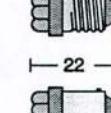
## Filament

The standard for indicator switch products unless otherwise specified. Use with any lens colour.  
\*Transformer indicators with 6V lamps are run at reduced voltage, giving up to 400% extra life.

| Volts<br>AC or DC                  | Watts | mA        | Product Code ☆ |             |             | Typical Life (hours) +<br>- AC volts<br>(DC-reduce to 60% of AC) | Typical Brightness<br>(Lumens) | Dimensions mm                                                                                                                                                                                                                                  |
|------------------------------------|-------|-----------|----------------|-------------|-------------|------------------------------------------------------------------|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                    |       |           | MES            | MBC         | LES         |                                                                  |                                |                                                                                                                                                                                                                                                |
| Standard for transformer indicator | 6     | 0.36      | 60             | -           | -           | 6V0.36 LES                                                       | 10,000                         | <br>Lamp lives given here are typical only. Actual lives depend on environmental conditions such as shock, vibration, temperature and voltage fluctuations. |
|                                    | 6     | 0.9 Flash | 50             | 6V0.9 Flash | -           | -                                                                | -                              |                                                                                                                                                                                                                                                |
|                                    | 6 ●   | 1.8       | 300            | 6V1.8       | 6V1.8 MBC   | -                                                                | 4,000 *                        |                                                                                                                                                                                                                                                |
|                                    | 6.5   | 2.0       | 300            | -           | 6.5V2.0 MBC | -                                                                | 4,000                          |                                                                                                                                                                                                                                                |
|                                    | 12    | 1.2       | 100            | 12V1.2      | 12V1.2 MBC  | -                                                                | 5,000                          |                                                                                                                                                                                                                                                |
|                                    | 24    | 1.2       | 50             | 24V1.2      | 24V1.2 MBC  | -                                                                | 5,000                          |                                                                                                                                                                                                                                                |
|                                    | 24    | 2.8       | 120            | 24V2.8      | 24V2.8 MBC  | -                                                                | 3,000                          |                                                                                                                                                                                                                                                |
|                                    | 28    | 1.1       | 40             | -           | -           | 28V1.1 LES                                                       | 4,000                          |                                                                                                                                                                                                                                                |
|                                    | 28    | 1.0       | 40             | 28V1.0      | 28V1.0 MBC  | -                                                                | 3,000                          |                                                                                                                                                                                                                                                |
|                                    | 50    | 2.5       | 50             | 50V2.5      | 50V2.5 MBC  | -                                                                | 5,000                          |                                                                                                                                                                                                                                                |
|                                    | 60    | 1.2       | 20             | 60V1.2      | 60V1.2 MBC  | -                                                                | 3,000                          |                                                                                                                                                                                                                                                |
|                                    | 60    | 3.0       | 50             | 60V3.0      | 60V3.0 MBC  | -                                                                | 3,000                          |                                                                                                                                                                                                                                                |
|                                    | 130   | 2.6       | 20             | 130V2.6     | 130V2.6 MBC | -                                                                | 3,000                          |                                                                                                                                                                                                                                                |

## LED Clusters

Long life, bright lamps at lower currents. The 4 colours are usually used with the same colour lenses, but amber and green can be used with clear and white lenses respectively for variation.

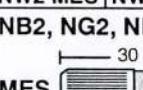
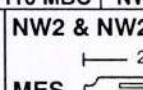
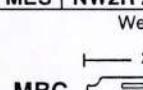
| Type                                                                             | Supply |       | Current<br>mA | Product Code Make-up ☆ |          |        |         | Typical<br>Life<br>(hours) | Typical<br>Brightness                                                                                                                                         | Dimensions mm                                                                                                                                                                                                             |
|----------------------------------------------------------------------------------|--------|-------|---------------|------------------------|----------|--------|---------|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                  | AC/DC  | Volts |               | Type                   | Colour   | Supply | Current |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |
| LED7<br><br>Wide light spread for indicator lamps                                | AC     | 4.5   | 60            | LED7                   | A =Amber | 4.5AC  |         | All<br>100,000             | Total brightness of the 7 LED's is similar to a typical indicator filament lamp. LED layout is designed to give optimum and even light spread through a lens. | <br><b>MES</b><br><br><b>MBC</b><br>Weight: 3 g |
|                                                                                  |        | 24    | 40            |                        | G =Green | 24AC   | 20mA    |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |
|                                                                                  |        | 24    | 20            |                        |          | 110AC  |         |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |
|                                                                                  |        | 110   | 14            |                        | R =Red   | 4.5DC  |         |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |
|                                                                                  |        | 4.5   | 80            |                        |          | 24DC   |         |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |
|                                                                                  | DC     | 24    | 40            |                        |          | 24DC   | 20mA    |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |
|                                                                                  |        | 24    | 20            |                        | A =Amber | 4.5AC  |         | All<br>100,000             | A lower cost lamp with total brightness of the 4 LED's similar to a typical indicator filament lamp.                                                          | <br><b>MES</b><br><br><b>MBC</b><br>Weight: 3 g |
|                                                                                  |        | 4.5 b | 40            |                        | B =Blue  | 24AC   | 20mA    |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |
|                                                                                  |        | 24 b  | 40            |                        | G =Green | 110AC  |         |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |
|                                                                                  |        | 24 b  | 20            |                        | R =Red   | 4.5DC  |         |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |
| LED4<br><br>for indicator lamps<br><br>b - Blue available only at these voltages | AC     | 4.5 b | 40            | LED4                   | A =Amber | 4.5AC  |         | All<br>100,000             | Total brightness of the 4 LED's is similar to a typical indicator filament lamp. Specifically designed low diameter for narrow fitting of actuators.          | <br><b>MES</b><br><br><b>MBC</b><br>Weight: 3 g |
|                                                                                  |        | 24 b  | 40            |                        | B =Blue  | 24AC   | 20mA    |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |
|                                                                                  |        | 24 b  | 20            |                        | G =Green | 110AC  |         |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |
|                                                                                  |        | 110 b | 15            |                        | R =Red   | 4.5DC  |         |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |
|                                                                                  | DC     | 4.5   | 40            |                        | A =Amber | 24AC   | 20mA    |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |
|                                                                                  |        | 24    | 40            |                        | B =Blue  | 110AC  |         |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |
|                                                                                  |        | 24    | 20            |                        | G =Green | 24DC   | 20mA    |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |
|                                                                                  |        | 24    | 20            |                        | R =Red   | 24DC   | 20mA    |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |
| LEDM4<br><br>for illuminated actuating assemblies                                | AC     | 4.5   | 50            | LEDM4                  | A =Amber | 4.5AC  |         | All<br>100,000             | Total brightness of the 4 LED's is similar to a typical indicator filament lamp. Specifically designed low diameter for narrow fitting of actuators.          | <br><b>MES</b><br><br><b>MBC</b><br>Weight: 2 g |
|                                                                                  |        | 24    | 50            |                        | G =Green | 24AC   | 25mA    |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |
|                                                                                  |        | 24    | 25            |                        | R =Red   | 110AC  |         |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |
|                                                                                  |        | 110   | 15            |                        | A =Amber | 24DC   | 25mA    |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |
|                                                                                  |        | 24    | 50            |                        | G =Green | 24DC   | 25mA    |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |
|                                                                                  | DC     | 24    | 25            |                        | R =Red   | 24DC   | 25mA    |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |
|                                                                                  |        | 24    | 25            |                        | A =Amber | 24AC   | 25mA    |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |
| Other AC and DC voltages for any of the above can be considered on application.  |        |       |               |                        |          |        |         |                            |                                                                                                                                                               |                                                                                                                                                                                                                           |

Example 1: LED7A 4.5AC MES = Amber 7 LED cluster with Miniature Edison Screw cap supplied from 4.5VAC.

Example 2: LED4R 24DC 20mA MBC = Red 4 LED cluster (20mA option) with Miniature Bayonet Cap supplied from 24VDC.

## Neon, Fluorescent

A very low current alternative, if low brightness is acceptable. Neon's can be used with opal, clear, red and amber lenses; fluorescent's only their own colour lenses.

| Current Rating         |        | Product Code ☆                                                                                                                      |     |                                                                                                   |     |                                                                                                   | Typical<br>Life<br>hours | Typical<br>Brightness<br>lumens                                                                     |  |
|------------------------|--------|-------------------------------------------------------------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------------------------------|--------------------------|-----------------------------------------------------------------------------------------------------|--|
| All 1.8mA              |        | For direct connection to Supply Voltage (internal resistor fitted). Use with Direct Voltage Indicator Body Type LMU. Data Sheet 205 |     |                                                                                                   |     |                                                                                                   |                          |                                                                                                     |  |
| Colour                 | Type   | Supply 110V (AC only)                                                                                                               |     | Supply 240V (AC or DC)                                                                            |     |                                                                                                   |                          |                                                                                                     |  |
| Orange                 | Neon   | NB2                                                                                                                                 | MES | NB2                                                                                               | MBC | NB2R                                                                                              | 110                      | MES                                                                                                 |  |
| Green                  | Fluor' | NG2                                                                                                                                 | MES | NG2                                                                                               | MBC | NG2R                                                                                              | 110                      | MES                                                                                                 |  |
| Blue                   | Fluor' | NW2                                                                                                                                 | MES | NW2                                                                                               | MBC | NW2R                                                                                              | 110                      | MES                                                                                                 |  |
| <b>Dimensions</b>      |        | NB2, NG2, NB2R & NG2R                                                                                                               |     | Weight: 3 g                                                                                       |     | NW2 & NW2R                                                                                        |                          | Weight: 2 g                                                                                         |  |
| All Diameters 10mm max |        | <br><b>MES</b>                                   |     | <br><b>MBC</b> |     | <br><b>MES</b> |                          | <br><b>MBC</b> |  |

### Lamp Cap Types:

MES = Miniature Edison Screw (E10). Supplied as standard unless otherwise specified.  
MBC = Miniature Bayonet Cap (BA9s). Available for most lamp types. Specify if required.  
LES = Lilliput Edison Screw (E5). Available only for 6V and 28V Filament.

★ Use product codes given here to order lamps independently from Indicator assemblies

# Lamps

## Optoled7 Ultra-bright LED Cluster

**Tranilamp** Q06015

Product Data Sheet 201/2 Issue 1

## Optoled7

Design Registration No 2051734

This Cluster lamp has been designed as a replacement for control panel pigmy lamps and on control panels where very high brightness, low power consumption and long life are desirable.

### Standard features:

#### ● Long Life

More than 100,000 hours, even in environments of high shock, high vibration and large temperature variations. This leads to considerably reduced maintenance costs.

#### ● Very bright

By using 7 ultra-bright LED's the total brightness is typically 2,000 mcd (25 lumens). The arrangement of LED's ensures the optimum diffusion of light through a lens, minimising light concentrations.

#### ● Supply Voltages

Available in standard supply volts of 24V, 110V, 230V ac at 50/60 Hz and 24V, 110V dc. Other voltages can be considered, if requested. Overvoltage tolerance of +20% is standard.

#### ● Low Current

Less than 25 mA per lamp (total for 7 LED's)

#### ● Flame Resistant

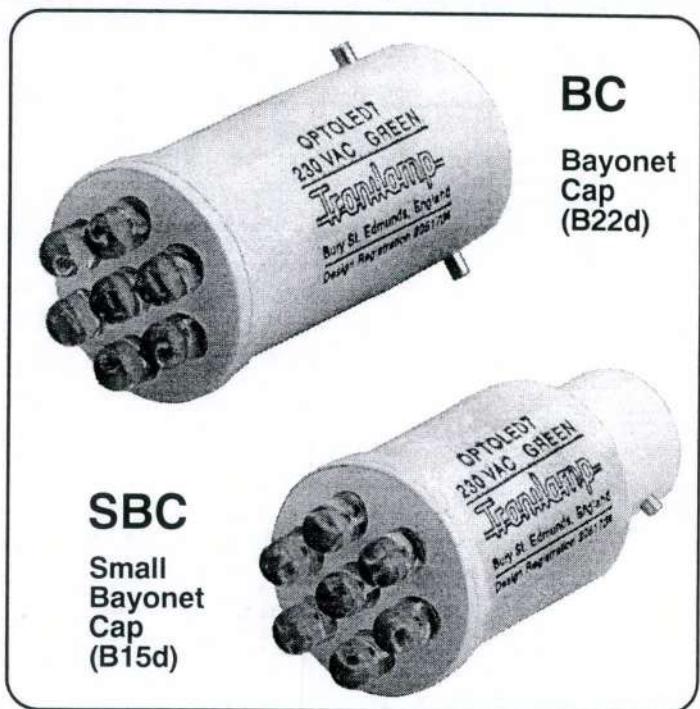
The plastic body is to flame retardant standard UL94V0.

#### ● Low Operating Temperature

Body temperature operates much lower than filament.

#### ● Colour Options

LED colours available are amber, green, red. Amber can be used with a clear lens and green with a blue lens for extra colour variation.



| Specification     |       |        | Product Codes           |                    |                                |                     |
|-------------------|-------|--------|-------------------------|--------------------|--------------------------------|---------------------|
| Power Source      | Volts | Colour | BC - Bayonet Cap (B22d) |                    | SBC - Small Bayonet Cap (B15d) |                     |
|                   |       |        | AC Supply               | DC Supply          | AC Supply                      | DC Supply           |
| AC 50/60 Hz or DC | 24    | Amber  | OPTOLED7A/24/BC         | OPTOLED7A/24DC/BC  | OPTOLED7A/24/SBC               | OPTOLED7A/24DC/SBC  |
|                   |       | Green  | OPTOLED7G/24/BC         | OPTOLED7G/24DC/BC  | OPTOLED7G/24/SBC               | OPTOLED7G/24DC/SBC  |
|                   |       | Red    | OPTOLED7R/24/BC         | OPTOLED7R/24DC/BC  | OPTOLED7R/24/SBC               | OPTOLED7R/24DC/SBC  |
|                   | 110   | Amber  | OPTOLED7A/110/BC        | OPTOLED7A/110DC/BC | OPTOLED7A/110/SBC              | OPTOLED7A/110DC/SBC |
|                   |       | Green  | OPTOLED7G/110/BC        | OPTOLED7G/110DC/BC | OPTOLED7G/110/SBC              | OPTOLED7G/110DC/SBC |
|                   |       | Red    | OPTOLED7R/110/BC        | OPTOLED7R/110DC/BC | OPTOLED7R/110/SBC              | OPTOLED7R/110DC/SBC |
| AC Only 50/60 Hz  | 230   | Amber  | OPTOLED7A/230/BC        | -                  | OPTOLED7A/230/SBC              | -                   |
|                   |       | Green  | OPTOLED7G/230/BC        | -                  | OPTOLED7G/230/SBC              | -                   |
|                   |       | Red    | OPTOLED7R/230/BC        | -                  | OPTOLED7R/230/SBC              | -                   |

|               |                       |  |                          |  |
|---------------|-----------------------|--|--------------------------|--|
| Dimensions mm | BC                    |  | SBC                      |  |
|               | Bayonet Cap (B22d)    |  | Small Bayonet Cap (B15d) |  |
| Weights       | BC - 11g<br>SBC - 16g |  |                          |  |

Transformer lamps are generally used for running indicator lamps on Control Panel at low voltages.

## Using Tranilamp TMU's

- **increases life expectancy of lamps**

Running the lamp at below rated voltage increases the typical running life of a filament lamp from 4000 hours to beyond 16,000 hours. Tranilamp LED clusters have a life typically in excess of 100,000 hours.

- **increases safety**

Lamp voltages are run at very low safe levels

- **increases flexibility**

Can use with Tranilamp's extensive range of:

- Standard filament lamps

- LED cluster lamps

- Panel housings and lenses

## Standard Specification

### Types

TMU - Standard Transformer Indicator Lamp Body.  
 TEMU - As TMU plus transformer secondary with earth terminal.  
 FTMU - As TMU plus built-on free connecting fuseholder.  
 5 x 20 mm fuse up to 10 A (not supplied).

### Input Voltages

24, 50, 110, 240V std. 440, 550V and other voltages optional.

### Operating Frequency

50/60 Hz as standard

### Surrounding Air Temperature

Maximum 50 deg C when operating.

### Lamps

6V, 1.8W tubular filament lamp supplied as standard.

### Lamp Caps

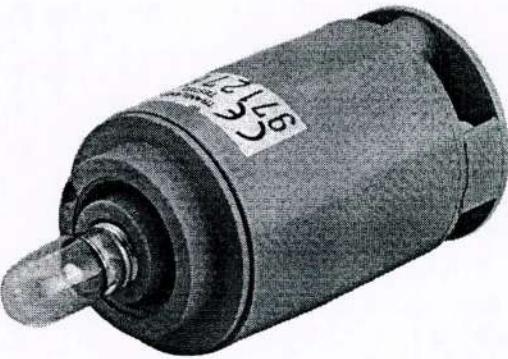
E10 Miniature Edison Screw - MES

### Mounting

Mount to panel using JY or H Series housings and lenses (see Data Sheet 200). TMU's screw onto the housings.

### Terminations

M3.5 cable clamps with fixed terminal covers to IP20.



TMU Indicator Body and Lamp  
(Standard without lens/housing)

### Construction

Transformers are encapsulated in mouldings.  
(ABS/Polycarbonate grey, flame retardant to UL94Vo non-drip)

### Tests

Transformer Lamps conform to BS EN 60947-5-1

All units are CE labelled in conformance with the L.V. Directive.

### Weight (Body Only)

TMU - 114 g, TEMU - 115 g, FTMU - 119 g (not including fuse)

## Optional Extras

### Operating Frequency

- 400 Hz.

### Input Voltages

- 440, 550V and others available on request.

### Lamps

- 12, 24, 28V tubular filament lamp.

- LED4, 4 X LED cluster lamp in Amber, Green, Red or Blue.

- LED7, 7 X LED cluster lamp in Amber, Green or Red.

### Lamp Caps

- BA9s Miniature Bayonet Cap - MBC

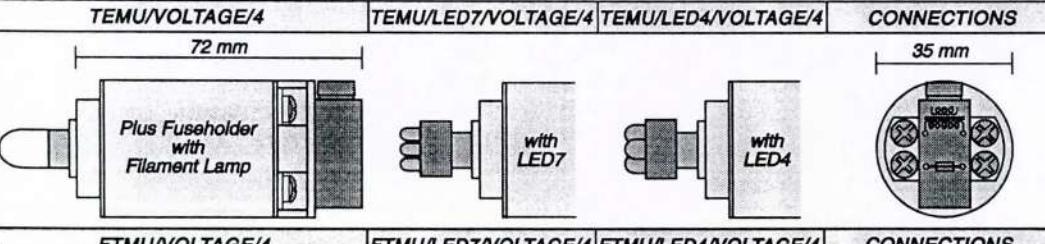
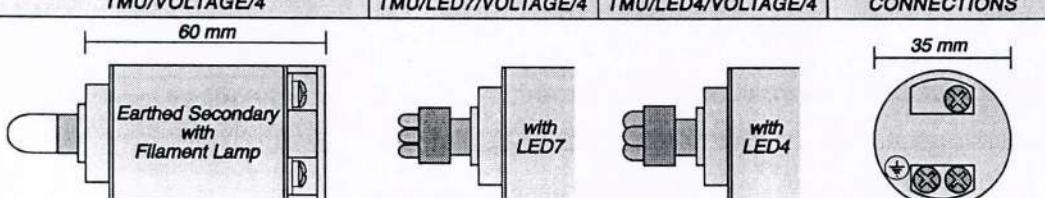
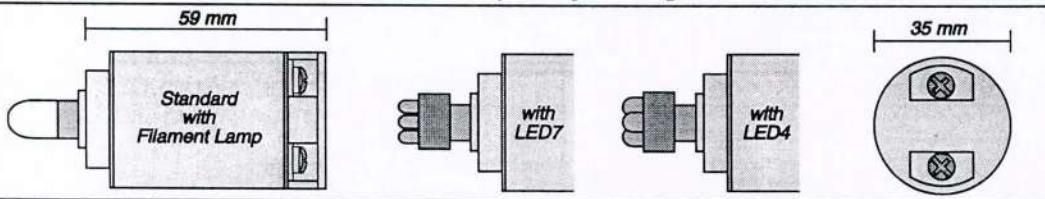
**Environmental Protection to IP65** - Funnel or Turret Shrouds for

terminals (see Data Sheet 214). Additional seals may be necessary

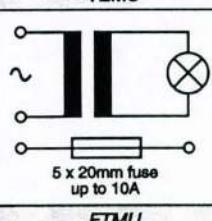
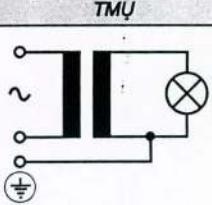
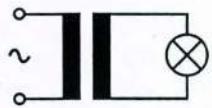
for housings and lenses (see Data Sheet 200).

202

## Transformer Lamp Body Arrangements



## Circuit Diagrams



## How to derive the correct Product Code

| Lens Housing<br>(see Product Data Sheet 200) |                                                                                        | Indicator Body Lamp Product Code |             |            |                      | Lens Colour<br>(if applicable) |
|----------------------------------------------|----------------------------------------------------------------------------------------|----------------------------------|-------------|------------|----------------------|--------------------------------|
|                                              |                                                                                        | Body / Lamp Type                 | Input Volts | Lamp Volts | Cap Type             | 4                              |
| <b>B</b>                                     | Standard Transformer Lamp Body                                                         | TMU                              |             |            |                      |                                |
|                                              | Standard Transformer Lamp Body with Earthed Secondary                                  | TEMU                             |             |            |                      |                                |
|                                              | Standard Transformer Lamp Body with Fuseholder                                         | FTMU                             |             |            |                      |                                |
| <b>L</b><br><b>A</b><br><b>M</b><br><b>P</b> | Standard Filament Lamp 6 V 1.8W<br>(See LAMP VOLTAGES for options)                     | BLANK                            |             |            |                      |                                |
|                                              | LED 7 Cluster 4.5 V AC<br>[RED, AMBER, GREEN only]                                     | RED                              | LED7R       |            |                      |                                |
|                                              |                                                                                        | AMBER                            | LED7A       |            |                      |                                |
|                                              |                                                                                        | GREEN                            | LED7G       |            |                      |                                |
|                                              | LED4 Cluster 4.5 V AC<br>[RED, AMBER, GREEN and BLUE only]                             | RED                              | LED4R       |            |                      |                                |
|                                              |                                                                                        | AMBER                            | LED4A       |            |                      |                                |
|                                              |                                                                                        | GREEN                            | LED4G       |            |                      |                                |
|                                              |                                                                                        | BLUE                             | LED4B       |            |                      |                                |
|                                              |                                                                                        |                                  |             |            |                      |                                |
| <b>INPUT<br/>VOLTAGES</b>                    | Standard Voltages available                                                            | 24 V                             | 24          |            |                      |                                |
|                                              |                                                                                        | 50 V                             | 50          |            |                      |                                |
|                                              |                                                                                        | 110 V                            | 110         |            |                      |                                |
|                                              |                                                                                        | 240 V                            | 240         |            |                      |                                |
|                                              | Optional Voltages<br>(Others on application)                                           | 440 V                            | 440         |            |                      |                                |
|                                              |                                                                                        | 550 V                            | 550         |            |                      |                                |
| <b>LAMP<br/>VOLTAGES</b>                     | Standard                                                                               | 6 V                              | BLANK       |            |                      |                                |
|                                              | Non-Standard<br>(See Lamp Data Sheet 201 for further non-standard voltages available). | 12 V                             | 12          |            |                      |                                |
|                                              |                                                                                        | 24 V                             | 24          |            |                      |                                |
|                                              |                                                                                        | 28 V                             | 28          |            |                      |                                |
| <b>LAMP CAPS</b>                             | Standard Mini-Screw - MES                                                              | BLANK                            |             |            |                      |                                |
|                                              | Optional Mini-Bayonet - MBC                                                            | MBC                              |             |            |                      |                                |
| <b>TERMINATIONS</b>                          | Standard 3.5mm captive cable clamp with cover<br>(No Alternatives)                     |                                  |             | 4          |                      |                                |
| <b>OTHER<br/>OPTIONS</b>                     | 400 Hz Operation                                                                       |                                  |             |            | Specify after Code   |                                |
|                                              | IP65 Protection - Funnel or Turret Shrouds protect Body Terminals                      |                                  |             |            | Specify after Code   |                                |
|                                              |                                                                                        |                                  |             |            | (see Data Sheet 211) |                                |

**Example 1**  
Product Code:- TMU/LED7R/240/MBC/4

is a Standard TMU lamp body, 4.5v MBC red LED 7 lamp cluster and standard screw terminals.  
Input: 240V, 50/60 Hz.

**Example 2**  
Product Code:- FHA/TEMU/110/24/4 Blue

is Transformer Indicator lamp with earthed secondary, 24V MES capped filament bulb and standard screw terminals mounted on an FH housing with a blue FA lens.  
Input: 110V at 50/60 Hz.

**Interchangeable housings for Push to Test & Switch Body Units (overleaf)**  
**Lens colours; red, amber, green, white, clear & blue**

**Non illuminated colours;**  
**red, amber, green, white,**  
**blue, black & grey**

| HOUSING PRODUCT CODE |                    | ADAPTOR<br>PRODUCT<br>CODE | PANEL HOLE<br>DIAMETER<br>mm | BEZEL<br>DIAMETER<br>mm | LENS OR<br>MAX BUTTON<br>DIAMETER<br>mm | FOR BACK<br>PANEL DEPTH<br>ADD TO BODY<br>DIMENSION |
|----------------------|--------------------|----------------------------|------------------------------|-------------------------|-----------------------------------------|-----------------------------------------------------|
| ILLUMINATED          | NON<br>ILLUMINATED |                            |                              |                         |                                         |                                                     |

|      |       |      |       |   |      |      |      |    |
|------|-------|------|-------|---|------|------|------|----|
|      |       | MJP  | MJPK  | - | 19   | 24   | 22.3 | 13 |
| FJP  | FJPK  | ADMF |       |   | 22.5 | 26   | 22.3 | 11 |
|      |       | MYP  | MYPK  | - | 19   | 31.5 | 30   | 13 |
| FYP  | FYPK  |      |       |   | 22.5 | 31.5 | 30   | 13 |
| DYP  | DYPK  | ADFD |       |   | 30.5 | 33.5 | 30   | 11 |
|      |       | MJPP | MJPPK | - | 19   | 24   | 22.3 | 13 |
| FJPP | FJPPK | ADMF |       |   | 22.5 | 26   | 22.3 | 11 |
|      |       | MYPP | MYPPK | - | 19   | 31.5 | 30   | 13 |
| FYPP | FYPPK |      |       |   | 22.5 | 31.5 | 30   | 13 |
| DYPP | DYPPK | ADFD |       |   | 30.5 | 33.5 | 30   | 11 |
|      |       | MJPM | MJPMK | - | 19   | 24   | 27.5 | 13 |
| FJPM | FJPMK | ADMF |       |   | 22.5 | 26   | 27.5 | 11 |
|      |       | MYPM | MYPMK | - | 19   | 31.5 | 34.5 | 13 |
| FYPM | FYPMK |      |       |   | 22.5 | 31.5 | 34.5 | 13 |
| DYPM | DYPMK | ADFD |       |   | 30.5 | 33.5 | 34.5 | 11 |
|      |       | MHP  | MHPK  | - | 19   | 22.5 | 14.5 | 15 |
|      |       | FHBP | FHBPK | - | 22.5 | 28.5 | 23.5 | 11 |
|      |       | LHBP | LHBPK | - | 26.5 | 30.5 | 23.5 | 12 |

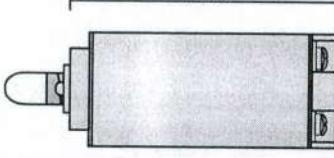
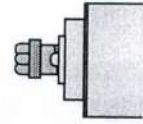
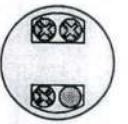
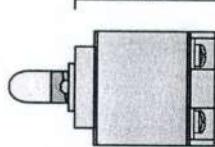
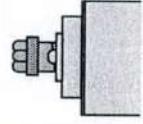
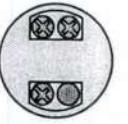
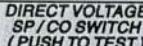
The above housings meet IP54 as standard.

Translucent lens / bezel shrouds are available for JP, YP & FHBP to meet IP65.

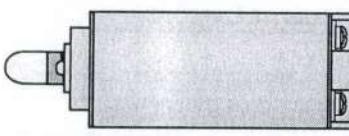
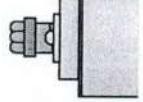
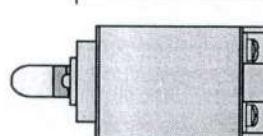
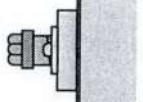
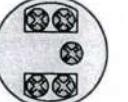
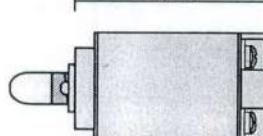
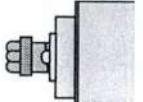
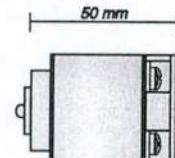
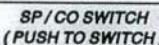
All bezels brass chrome plated, black epoxy coating optional.

## PUSH TO TEST

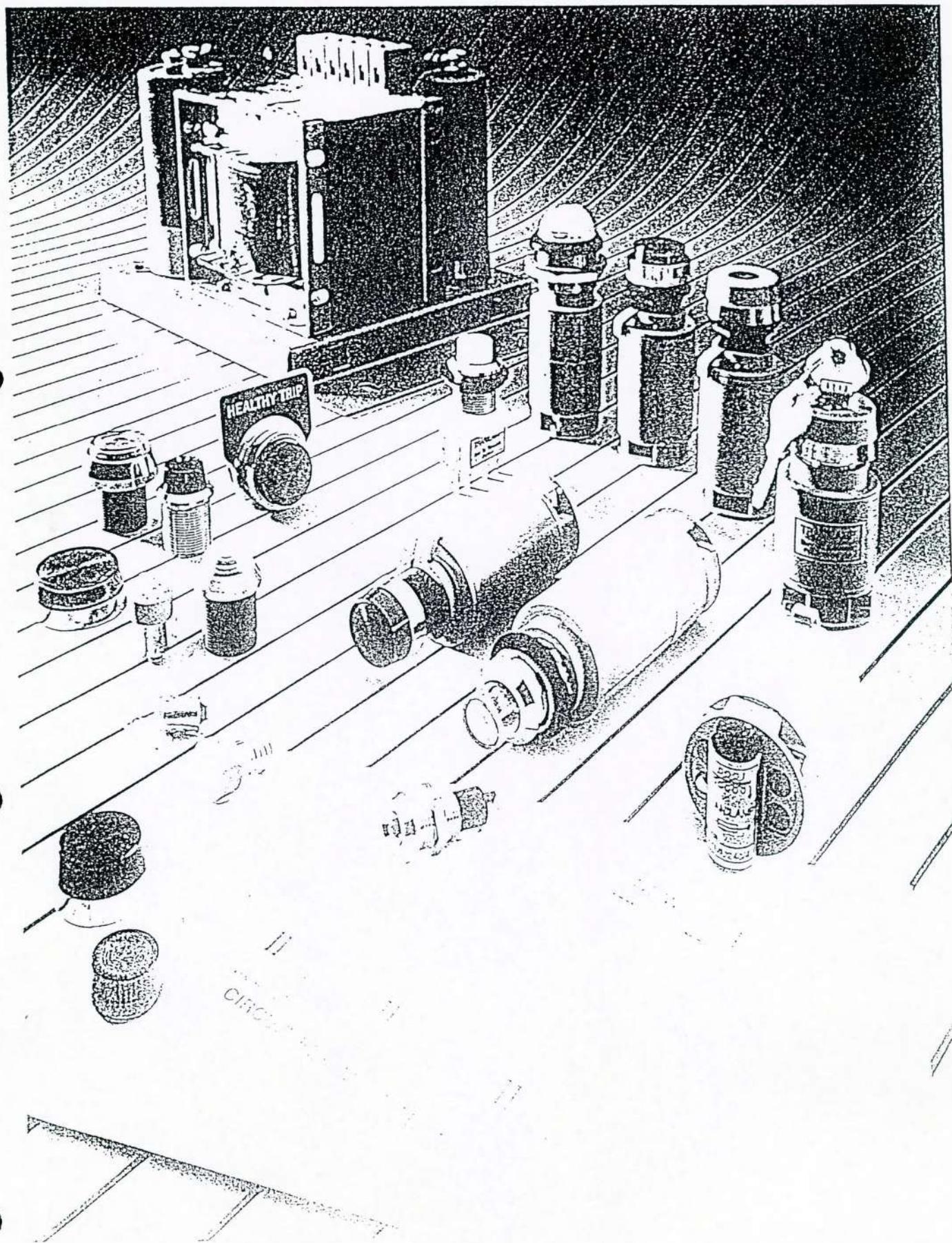
See Data Sheet 203 for Multitest, Data Sheet 212 for Push Buttons  
and overleaf for Actuating Housings

|                                                                                   |                                            |                                                                                   |                                                                                    |                  |                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------|--------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | 84 mm                                      |  |  | BASE CONNECTIONS | <b>STANDARD INPUT VOLTAGES:</b><br>24, 50, 110, 240, 440 V<br>50 / 60 Hz<br><br><b>FIL. LAMP 6 V 1.8 W</b><br><br><b>LED M4 ONLY, 4.5 VAC</b><br><b>RED, GREEN &amp; AMBER</b><br><br><b>OTHER VOLTAGES ON APPLICATION</b>                                                                       |
|  | 48 mm                                      |  |  | BASE CONNECTIONS | <b>STANDARD LAMP VOLTAGES:</b><br>6, 12, 24, 28,<br>50, 60, 130 V<br><br><b>LEDM4 CLUSTER ONLY</b><br><b>4.5, 12, 24, 110 VAC</b><br><b>4.5, 12, 24 VDC</b><br><b>RED, GREEN OR AMBER</b><br><br><b>NEON, GREEN OR BLUE</b><br><b>110, 240 V</b><br><b>SEE DATASHEET 201</b><br><b>LAMP LIST</b> |
|  | DIRECT VOLTAGE SP/CO SWITCH (PUSH TO TEST) | PLMU/VOLTAGE/4                                                                    | PLMU/LEDM4/VOLTAGE/4                                                               | BASE CONNECTIONS |                                                                                                                                                                                                                                                                                                  |

## SWITCH BODIES - ILLUMINATED

|                                                                                     |                                                 |                                                                                     |                                                                                      |                  |                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------|-------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | 91 mm                                           |  |  | BASE CONNECTIONS | <b>STANDARD INPUT VOLTAGES:</b><br>24, 50, 110, 240, 440 V<br>50 / 60 Hz<br><br><b>FIL. LAMP 6 V 1.8 W</b><br><br><b>LED M4 ONLY, 4.5 VAC</b><br><b>RED, GREEN &amp; AMBER</b><br><br><b>SEPERATE SP/CO SWITCH RATED 4AMP</b>                                             |
|  | 60 mm                                           |  |  | BASE CONNECTIONS | <b>STANDARD LAMP VOLTAGES:</b><br>6, 12, 24, 28,<br>50, 60, 130V<br><br><b>LEDM4 CLUSTER ONLY</b><br><b>4.5, 12, 24, 110 VAC</b><br><b>RED, GREEN &amp; AMBER</b><br><br><b>NEON, GREEN or BLUE</b><br><b>110, 240 V</b><br><b>SEE DATA SHEET 201</b><br><b>LAMP LIST</b> |
|  | DIRECT VOLTAGE SP/CO SWITCH (PUSH TO SWITCH)    | PSLMU/VOLTAGE/4                                                                     | PSLMU/LEDM4/VOLTAGE/4                                                                | BASE CONNECTIONS | <b>SWITCH RATED 4 AMP</b>                                                                                                                                                                                                                                                 |
|  | 60 mm                                           |  |  | BASE CONNECTIONS | <b>110 VDC</b><br><b>FILAMENT LAMP</b><br><b>60 V 1.2 W</b><br><br><b>50, 110 VDC</b><br><b>LED M4 CLUSTER ONLY</b><br><b>24 VDC 20 mA</b><br><b>RED, GREEN, AMBER</b><br><br><b>SEPARATE SP/CO SWITCH RATING</b><br><b>440 VAC 4 AMP</b>                                 |
|  | INTERNAL RESISTOR SP/CO SWITCH (PUSH TO SWITCH) | PSRMU/VOLTAGE/4                                                                     | PSRMU/LEDM4/VOLTAGE/4                                                                | BASE CONNECTIONS | <b>SINGLE POLE CHANGEOVER</b><br><b>N/C - COMM - N/O</b><br><b>SWITCH RATING</b><br><b>440 VAC 4 AMP</b>                                                                                                                                                                  |
|  | 50 mm                                           |  |  | BASE CONNECTIONS | <b>SEE DATA SHEET 212</b><br><b>FOR OTHER COMPLETE SWITCHES</b>                                                                                                                                                                                                           |
|  | SP/CO SWITCH (PUSH TO SWITCH)                   | PSMU/7512/4                                                                         | NON ILLUMINATED                                                                      | BASE CONNECTIONS |                                                                                                                                                                                                                                                                           |

## NON ILLUMINATED



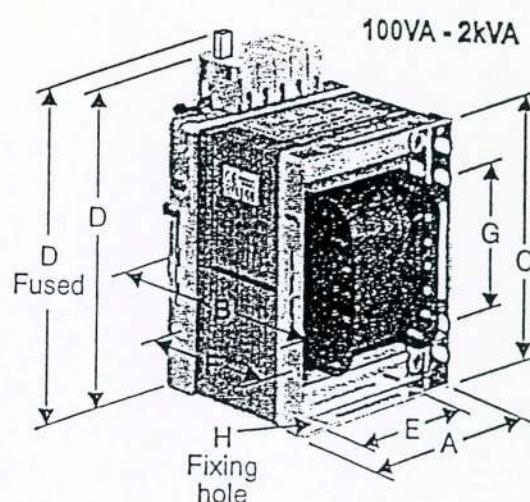
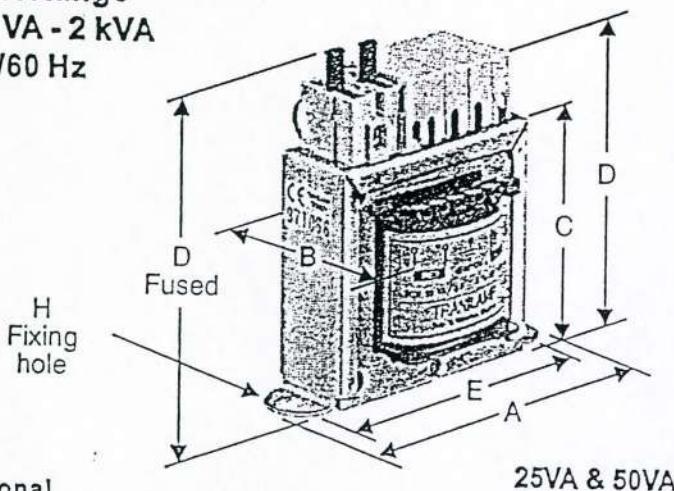
**TCX**  
**TC**

# Transformer Ranges (25VA - 5kVA)

**Tranilamp** CCE015

Product Data Sheet 400/2 Issue 1

**TCX Range**  
25 VA - 2 kVA  
50/60 Hz



Optional  
Secondary Anti-surge  
fuse Ratings

| VA Rating | Amps        |              |
|-----------|-------------|--------------|
|           | 240V 1 Fuse | 415V 2 Fuses |
| 25        | 0.40        | 0.40         |
| 50        | 0.40        | 0.40         |
| 100       | 0.80        | 0.50         |
| 150       | 1.25        | 0.63         |
| 200       | 1.25        | 1.00         |
| 250       | 2.50        | 1.00         |
| 300       | 2.50        | 1.25         |
| 500       | 4.00        | 2.50         |
| 750       | 5.00        | 3.15         |
| 1k        | 6.30        | 4.00         |
| 1.5k      | 10.0        | 6.30         |
| 2k        | 10.0        | 8.00         |

## Dimensions

| VA Rating | Maximum Dimensions mm |     |     |     |            | Fixing Dimensions mm |     |     | Wt. kg | IP23 Enc. Type* | VR <sub>Reg</sub> % | Inrush VA |      |       |
|-----------|-----------------------|-----|-----|-----|------------|----------------------|-----|-----|--------|-----------------|---------------------|-----------|------|-------|
|           | A                     | B   | C   | D   | D<br>Fused | E                    | F   | G   | H      |                 |                     |           |      |       |
| 25        | 99                    | 50  | 57  | 78  | 87         | 84                   | -   | -   | 5X8    | 0.7             | ENV0                | 12        | 35   | 45    |
| 50        | 107                   | 56  | 66  | 86  | 95         | 93                   | -   | -   | 5X8    | 1.0             | ENV0                | 10        | 70   | 90    |
| 100       | 83                    | 78  | 100 | 119 | 129        | 63                   | 53  | 63  | 4X7    | 2.3             | ENV1                | 8         | 160  | 220   |
| 150       | 83                    | 90  | 100 | 119 | 129        | 63                   | 66  | 63  | 4X7    | 3.0             | ENV1                | 9         | 250  | 350   |
| 200       | 99                    | 92  | 118 | 139 | 149        | 64                   | 57  | 63  | 5X9    | 3.5             | ENV1                | 8         | 400  | 600   |
| 250       | 99                    | 92  | 118 | 139 | 149        | 63                   | 57  | 63  | 5X9    | 3.6             | ENV1                | 8         | 450  | 675   |
| 300       | 99                    | 105 | 118 | 139 | 149        | 63                   | 66  | 63  | 5X9    | 4.5             | ENV1                | 7         | 500  | 800   |
| 500       | 115                   | 128 | 137 | 154 | 164        | 89                   | 86  | 89  | 6X11   | 7.3             | ENV3                | 5         | 800  | 1.25k |
| 750       | 115                   | 138 | 137 | 164 | 167        | 89                   | 95  | 89  | 6X11   | 9.0             | ENV3                | 5         | 1.5k | 2k    |
| 1k        | 140                   | 135 | 167 | 194 | 197        | 89                   | 88  | 89  | 7X13   | 11.3            | ENV3                | 4         | 2k   | 3.5k  |
| 1.5k      | 140                   | 160 | 167 | 187 | 197        | 89                   | 119 | 89  | 7X13   | 16.1            | ENV4                | 3         | 3k   | 5k    |
| 2k        | 180                   | 160 | 215 | 242 | 252        | 114                  | 110 | 114 | 10X18  | 21.0            | ENV5                | 3         | 3.5k | 6k    |

\*IP54 or IP65 enclosure sizes given on application

**TC Range**  
50 VA - 5 kVA  
50/60 Hz

## Dimensions

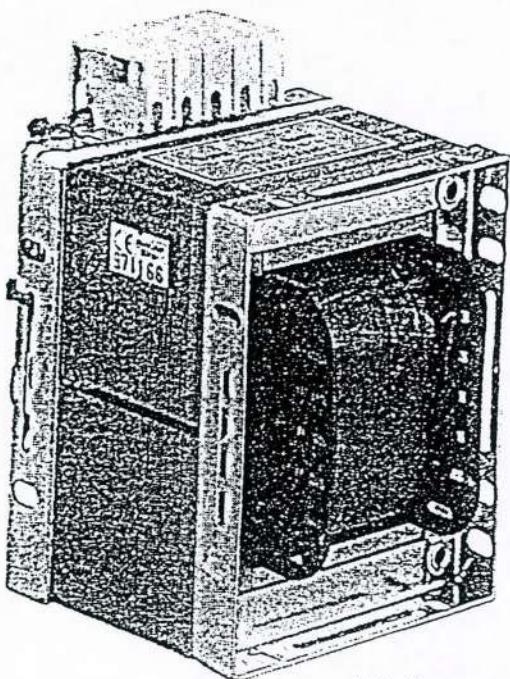
| VA Rating | Max. Dimensions mm |     |     |     |     | Fixing Dimensions mm |      |       | Wt. kg | IP23 Enc. Type* | VR <sub>Reg</sub> % | Inrush VA |       |
|-----------|--------------------|-----|-----|-----|-----|----------------------|------|-------|--------|-----------------|---------------------|-----------|-------|
|           | A                  | B   | C   | D   | E   | F                    | G    | H     |        |                 |                     |           |       |
| 50        | 67                 | 65  | 80  | 100 | 54  | 40                   | 54   | 4X8   | 1.1    | ENV0            | 10                  | 70        | .90   |
| 100       | 83                 | 76  | 100 | 120 | 63  | 53                   | 62.5 | 5X8   | 2.3    | ENV1            | 8                   | 160       | 220   |
| 150       | 83                 | 88  | 100 | 120 | 63  | 65                   | 63   | 5X8   | 3.0    | ENV1            | 9                   | 250       | 350   |
| 200       | 99                 | 92  | 118 | 139 | 63  | 56                   | 63   | 5X9   | 3.5    | ENV1            | 8                   | 400       | 600   |
| 250       | 99                 | 92  | 118 | 139 | 63  | 56                   | 63   | 5X9   | 3.6    | ENV1            | 8                   | 450       | 675   |
| 300       | 99                 | 105 | 118 | 139 | 63  | 69                   | 63   | 5X9   | 4.5    | ENV1            | 7                   | 500       | 800   |
| 500       | 115                | 128 | 137 | 162 | 89  | 83                   | 89   | 6X11  | 7.3    | ENV3            | 5                   | 800       | 1.25k |
| 750       | 115                | 140 | 137 | 162 | 89  | 98                   | 89   | 6X11  | 9.0    | ENV3            | 5                   | 1.5k      | 2k    |
| 1k        | 140                | 135 | 167 | 195 | 89  | 94                   | 89   | 7X13  | 11.3   | ENV3            | 4                   | 2k        | 3.5k  |
| 1.5k      | 140                | 160 | 167 | 189 | 89  | 119                  | 89   | 7X13  | 16.1   | ENV4            | 3                   | 3k        | 5k    |
| 2k        | 180                | 160 | 215 | 242 | 115 | 110                  | 115  | 10X18 | 21.0   | ENV5            | 3                   | 3.5k      | 6k    |
| 3k        | 214                | 198 | 179 | 208 | 115 | 147                  | 115  | 10X18 | 29.9   | ENV5            | 3                   | 5.5k      | 9k    |
| 5k        | 240                | 170 | 248 | 293 | 160 | 112                  | N/A  | 11    | 32     | ENV5            | 3                   | -         | -     |

\*IP54 or IP65 enclosure sizes given on application

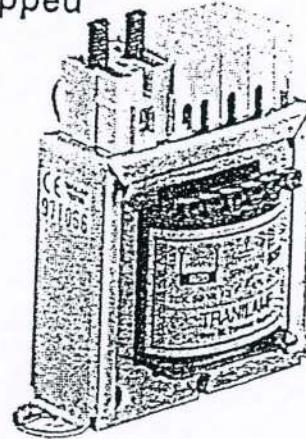
Shrouded Terminal Blocks fitted as standard up to 3 kVA

TCX and TC Standard Ranges provide a low cost high quality solution where double wound transformers are required with standard voltage primaries and secondaries. TCX's have one input and one output only; TC's are multi-tapped.

### TCX Range 25VA - 2kVA 50/60 Hz - Untapped



100 VA - 2 kVA



25 VA &amp; 50 VA

| Available VA Ratings |
|----------------------|
| 25                   |
| 50                   |
| 100                  |
| 150                  |
| 200                  |
| 250                  |
| 300                  |
| 500                  |
| 750                  |
| 1k                   |
| 1.5k*                |
| 2k*                  |

| Product Code    | Input V | Output V |
|-----------------|---------|----------|
| TCX/VA Rating/1 | 0-415   | 0-240    |
| TCX/VA Rating/2 | 0-240   | 0-110    |
| TCX/VA Rating/3 | 0-415   | 0-110    |
| TCX/VA Rating/5 | 0-415   | 0-24     |
| TCX/VA Rating/6 | 0-240   | 0-24     |

For fused primary add "F" after Product Code

\* 24v Output not available (Use STK range)

### Standard Specification

- Shrouded terminal blocks used up to 3kVA
- Design optimises size and efficiency, whilst giving a small footprint
- Earth screen fitted between primary and secondary windings
- Transformers impregnated with a polyester varnish to reduce vibration and noise from the laminations and windings
- Conform to the general requirements of BS171 (IEC76) and BS3535 Class 1 (IEC742 and BSEN 60742)
- Insulation to BS2757 Class E (IEC85)
- Maximum operating ambient temperature of 30°C without derating
- All transformers are CE labelled in accordance with the L.V. Directive

### Optional Extras

- Anti-surge fuses can be fitted on the TCX Range (one on 240V primary, two on 415V primary)
- Steel ventilated floor or wall mounting enclosures can be fitted to IP23, IP54 or IP65 protection. See Data Sheet 403
- DIN rail mounting kit available for transformers up to 100VA

### TC Range 50 VA - 5 kVA 50/60 Hz - Standard multi-taps



| Available VA Ratings |
|----------------------|
| 50                   |
| 100                  |
| 150                  |
| 200                  |
| 250                  |
| 300                  |
| 500                  |
| 750                  |
| 1k                   |
| 1.5k*                |
| 2k*                  |
| 3k*                  |
| 5k*                  |

| Product Code   | Input V       | Output V    |
|----------------|---------------|-------------|
| TC/VA Rating/1 | 0-380-415-440 | 0-220-240   |
| TC/VA Rating/2 | 0-220-240     | 55-0-55     |
| TC/VA Rating/3 | 0-380-415-440 | 55-0-55     |
| TC/VA Rating/5 | 0-380-415-440 | 0-12 + 0-12 |
| TC/VA Rating/6 | 0-220-240     | 0-12 + 0-12 |
| TC/VA Rating/7 | 0-380-415-440 | 0-110       |

\* 24v Output not available (Use STK, TUF or TCF ranges)

400

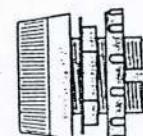
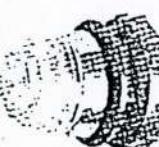
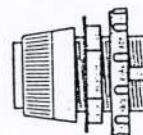
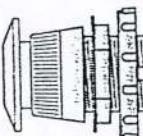
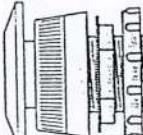
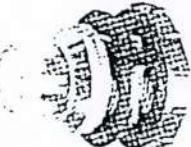
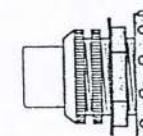
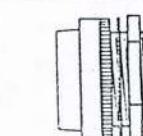
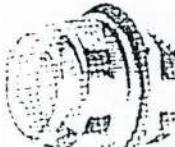
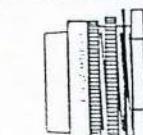
# HOUSINGS

KEEP THIS PAGE FOR CONTENTS AND CIRCUIT DETAILS

Interchangeable housings for Switch Body Units on page 10

Lens colours; red, amber, green, opal, clear & blue

Non illuminated colours; red, amber, green, white, blue, black & grey

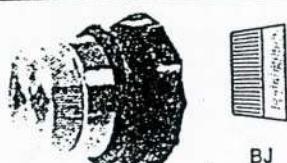
|                                                                                     |                                                                                     |                 | HOUSING CATALOGUE NO. | ADAPTOR CATALOGUE NUMBER        | PANEL HOLE DIAMETER mm | BEZEL DIAMETER mm  | LENS OR MAX BUTTON DIAMETER mm | PANEL DEPTH mm       | FOR BACK DIMENSION ADD TO BODY DIMENSION |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------|-----------------------|---------------------------------|------------------------|--------------------|--------------------------------|----------------------|------------------------------------------|
|                                                                                     | ILLUMINATED                                                                         | NON ILLUMINATED |                       |                                 |                        |                    |                                |                      |                                          |
|    |    | FLUSH           | MJP<br>FJP            | MJPK<br>FJPK<br>ADMF            | -<br>22.5              | 19<br>26           | 24<br>22.3                     | 22.3<br>22.3         | 13<br>11                                 |
|    |    | FLUSH           | MYP<br>FYP<br>DYP     | MYPK<br>FYPK<br>DYPK<br>ADFD    | -<br>22.5<br>30.5      | 19<br>31.5<br>33.5 | 31.5<br>30<br>30               | 30<br>30<br>30       | 13<br>13<br>11                           |
|    |    | PROJECTING      | MJPP<br>FJPP          | MJPPK<br>FJPPK<br>ADMF          | -<br>22.5              | 19<br>26           | 24<br>22.3                     | 22.3<br>22.3         | 13<br>11                                 |
|    |    | PROJECTING      | MYPP<br>FYPP<br>DYPP  | MYPPK<br>FYPPK<br>DYPPK<br>ADFD | -<br>22.5<br>30.5      | 19<br>31.5<br>33.5 | 31.5<br>30<br>30               | 30<br>30<br>30       | 13<br>13<br>11                           |
|  |  | MUSHROOM        | MJPM<br>FJPM          | MJPMK<br>FJPMK<br>ADMF          | -<br>22.5              | 19<br>26           | 24<br>22.3                     | 27.5<br>27.5         | 13<br>11                                 |
|  |  | MUSHROOM        | MYPM<br>FYPM<br>DYPM  | MYPMK<br>FYPMK<br>DYPMK<br>ADFD | -<br>22.5<br>30.5      | 19<br>31.5<br>33.5 | 31.5<br>34.5<br>34.5           | 34.5<br>34.5<br>34.5 | 13<br>13<br>11                           |
|  |  | PROJECTING      | MHP                   | MHPK                            | -                      | 19                 | 22.5                           | 14.5                 | 15                                       |
|  |  | PROJECTING      | FHBP                  | FHBPK                           | -                      | 22.5               | 28.5                           | 23.5                 | 11                                       |
|  |  | PROJECTING      | LHBP                  | LHBPK                           | -                      | 26.5               | 30.5                           | 23.5                 | 12                                       |

The above housings meet IP54 as standard.

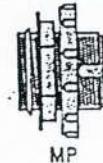
Translucent lens / bezel shrouds are available for JP, YP & FHBP to meet IP65.

All bezels brass chrome plated, black epoxy coating optional.

Interchangeable housings for Lamp Body Units pages 5 to 8  
 Housings meet IP64 as standard, IP65 with sealing washers  
 All bezels brass chrome plated, black epoxy coating optional  
 Lens colours; red, amber, green, opal, clear & blue



BJ



MP



ADMF

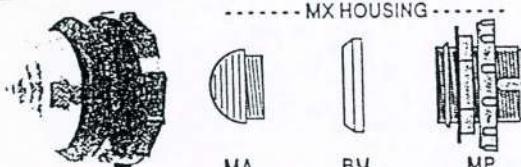
| LENS CATALOGUE NUMBER | HOUSING LESS LENS CATALOGUE NUMBER | ADAPTOR CATALOGUE NUMBER | COMPLETE HOUSING CATALOGUE NUMBER | PANEL HOLE DIAMETER mm | BEZEL DIAMETER mm | LENS DIAMETER mm | FOR BACK PANEL DEPTH ADD TO BODY DIMENSION |
|-----------------------|------------------------------------|--------------------------|-----------------------------------|------------------------|-------------------|------------------|--------------------------------------------|
|-----------------------|------------------------------------|--------------------------|-----------------------------------|------------------------|-------------------|------------------|--------------------------------------------|

|    |    |      |      |      |      |    |
|----|----|------|------|------|------|----|
| BJ | MP | MJ   | 19   | 24   | 22.3 | 13 |
| BY | MP | MY   | 19   | 31.5 | 30   | 13 |
| BJ | MP | FJ   | 22.5 | 26   | 22.3 | 11 |
| BY | FP | FY   | 22.5 | 31.5 | 30   | 13 |
| BY | FP | ADFD | 30.5 | 33.5 | 30   | 11 |

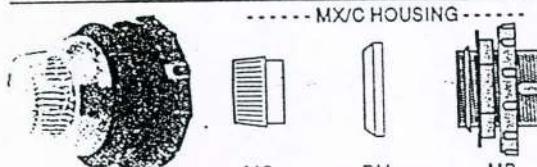
BJ &amp; BY POLYCARBONATE LENS ON BRASS BEZEL

ALL ABOVE FOR USE WITH CLICK ON OR SCREW ON LAMP BODY UNITS

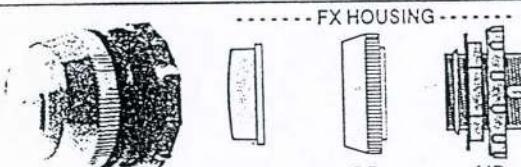
## ----- MX HOUSING -----



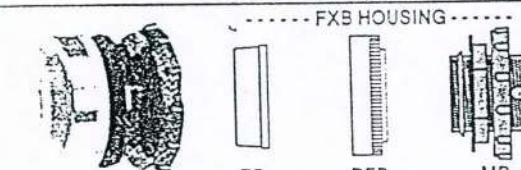
## ----- MX/C HOUSING -----



## ----- FX HOUSING -----



## ----- FXB HOUSING -----



|    |    |    |    |    |      |      |    |
|----|----|----|----|----|------|------|----|
| MA | MP | BM | MX | 19 | 22.5 | 17.5 | 13 |
|----|----|----|----|----|------|------|----|

FOR USE WITH CLICK ON OR SCREW ON LAMP BODY UNITS

|    |    |    |      |    |      |    |    |
|----|----|----|------|----|------|----|----|
| MC | MP | BM | MX/C | 19 | 22.5 | 17 | 13 |
|----|----|----|------|----|------|----|----|

FOR USE WITH CLICK ON OR SCREW ON LAMP BODY UNITS

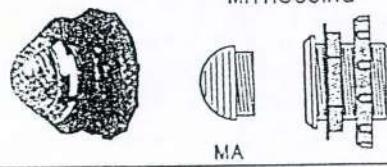
|    |    |    |    |      |      |      |    |
|----|----|----|----|------|------|------|----|
| FA | MP | BF | FX | 22.5 | 28.5 | 21.5 | 11 |
|----|----|----|----|------|------|------|----|

FOR USE WITH CLICK ON OR SCREW ON LAMP BODY UNITS

|    |    |     |     |      |      |      |    |
|----|----|-----|-----|------|------|------|----|
| FB | MP | BFB | FXB | 22.5 | 28.5 | 23.5 | 11 |
|----|----|-----|-----|------|------|------|----|

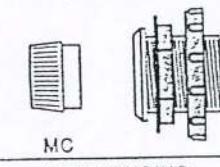
FOR USE WITH CLICK ON OR SCREW ON LAMP BODY UNITS

## MH HOUSING



MA

## MH/C HOUSING

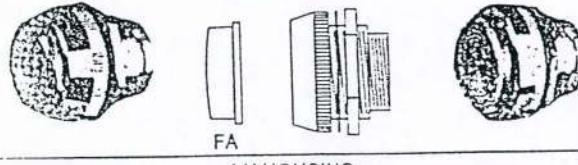


MC

|       |    |      |      |    |
|-------|----|------|------|----|
| MH    | 19 | 22.5 | 17.5 | 13 |
| MHL   | 19 | 22.5 | 17.5 | 15 |
| MH/C  | 19 | 22.5 | 17   | 13 |
| MHL/C | 19 | 22.5 | 17   | 15 |

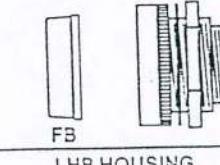
MHL &amp; MHL/C FOR NEONS, LED CLUSTERS &amp; ALL MBC

## FH HOUSING



FA

## FHB HOUSING

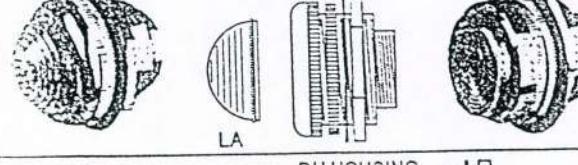


FB

|      |      |      |      |    |
|------|------|------|------|----|
| FH   | 22.5 | 28.5 | 21.5 | 11 |
| FHL  | 22.5 | 28.5 | 21.5 | 15 |
| FHB  | 22.5 | 28.5 | 23.5 | 11 |
| FHBL | 22.5 | 28.5 | 23.5 | 15 |

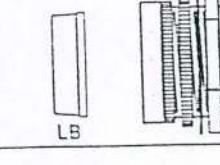
FHL &amp; FHL/C FOR ALL MBC

## LH HOUSING



LA

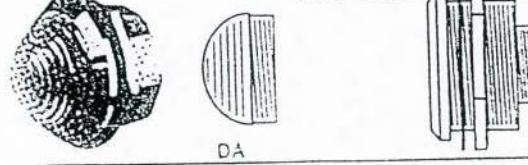
## LHB HOUSING



LB

|     |      |      |      |    |
|-----|------|------|------|----|
| LH  | 26.5 | 32   | 23.5 | 12 |
| LHB | 26.5 | 30.5 | 23.5 | 12 |

## DH HOUSING



DA

|    |      |    |    |    |
|----|------|----|----|----|
| DH | 30.5 | 35 | 26 | 16 |
|----|------|----|----|----|

BJ &amp; BY lens are polycarbonate, all other lens are polystyrene ( 2 watt lamps maximum ).

For CEGB approved housings ( ie DIN keyed with black bezel ) see page 12.

For flat lens housings see page 11.

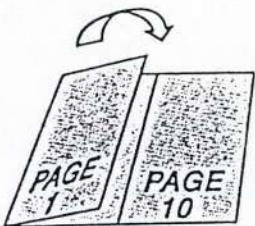
# ORDERING PROCEDURE

# CONTENTS

## INDICATORS



## PUSH TO TEST & SWITCHES



PART No. FOR COMPLETE UNITS:



LAMP  
HOUSING  
PAGE 2



BODY UNIT  
PAGES  
5 to 8

e.g. MJ RED + TU/240/4  
Assembled unit = MJ/TU/240/4 RED

PART No. FOR COMPLETE UNITS:



ACTUATOR  
HOUSING  
PAGE 1



SWITCH  
BODY UNIT  
PAGE 10

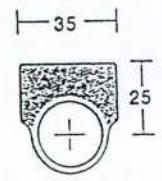
e.g. FYPM GREEN + PTMU/110/4  
Assembled unit = FYPM/PTMU/110/4 GREEN

| PAGE  | DETAIL                                             |
|-------|----------------------------------------------------|
| 1     | ACTUATING HOUSING'S & LENS                         |
| 2     | LAMP HOUSING'S & LENS                              |
| 3     | LAMPS, LED'S, LEGENDS, ETC                         |
| 4     | NEW QUICK ASSEMBLY UNITS                           |
|       | CONDITIONS OF SALE                                 |
| 5     | FUSEHOLDER INDICATORS &                            |
|       | AUDIBLE ALARMS                                     |
| 6 & 7 | LAMP BODY UNITS                                    |
| 8     | MULTITEST &                                        |
|       | POWER FAILURE INDICATORS                           |
| 9     | PUSH BUTTONS & KEY SWITCHES                        |
| 10    | PUSH TO TEST & ILLUMINATED<br>PUSH BUTTONS         |
| 11    | SEMAPHORE, 3 COLOUR &<br>ROTATING LED'S            |
| 12    | CÉGB INDICATORS & OCTAL BASE<br>FLASHING RELAYS    |
| 13    | NEONS, LOW VOLTAGE &<br>SINGLE LED'S 6 mm to 19 mm |
| 14    | TRANSFORMER CONTENTS                               |

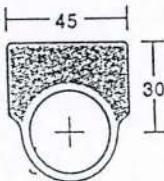
NATO Nos. for Tranilamp products are manufacture code K4779 - Please enquire for specific catalogue Nos.

## LEGEND PLATES

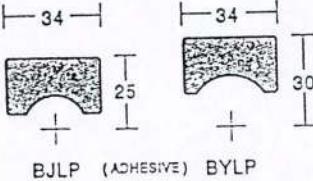
BLACK ANODISED ALUMINIUM. ENGRAVED TO ORDER  
TRAFFOLYTE: WHITE / BLACK / WHITE or BLACK / WHITE / BLACK OPTIONAL



MHLP - 19 mm  
FHLP - 22.5 mm



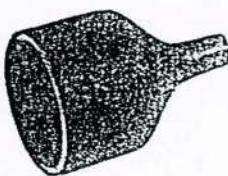
LHLP - 26.5 mm  
DHLP - 30.5 mm



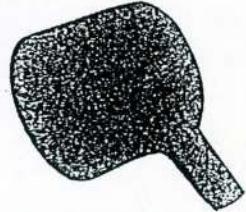
SUITABLE FOR BJ & BY LENS  
INDICATORS & SWITCHES

BJLP (ADHESIVE) BYLP

## TERMINAL SHROUDS IP65



FUNNEL SHROUD



TURRET SHROUD

## LAMP LIST

VOLTS    WATTS    CAP.

|     |           |     |      |     |
|-----|-----------|-----|------|-----|
| 6   | 0.36      | LES | NB2  | MES |
| 6   | 0.9 Flash | MES | NB2  | MBC |
| 6   | 1.8       | MES | NG2  | MES |
| 6   | 1.8       | MBC | NG2  | MBC |
| 6.5 | 2.0       | MBC | NW2  | MES |
| 12  | 1.2       | MES | NW2  | MBC |
| 12  | 1.2       | MBC | NB2R | MES |
| 24  | 1.2       | MES | NB2R | MBC |
| 24  | 1.2       | MBC | NG2R | MES |
| 24  | 2.6       | MES | NG2R | MBC |
| 24  | 2.8       | MBC | NW2R | MES |
| 25  | 1.1       | LES | NW2R | MBC |
| 25  | 1.0       | MES |      |     |
| 25  | 1.0       | MBC |      |     |
| 50  | 2.5       | MES |      |     |
| 50  | 2.5       | MBC |      |     |
| 60  | 1.2       | MES |      |     |
| 60  | 1.2       | MBC |      |     |
| 60  | 3.0       | MES |      |     |
| 60  | 3.0       | MBC |      |     |
| 130 | 2.6       | MES |      |     |
| 130 | 2.6       | MBC |      |     |

## NEON, GREEN & BLUE FLUORESCENT

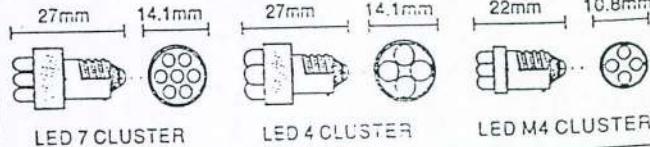
As used in standard  
neon lamp bodies.  
See page 6

Direct connection to supply  
voltage, Internal resistor in  
cap. State supply voltage 110  
or 240 V. Can be used with  
LMU or LU units. See page 6

## FILAMENT & NEON LAMP LIFE

All lamps used in our Indicators are underrun  
wherever possible. Specific lamp life can be  
quoted on request. Filament & Neon lamp life  
for DC is only 60% of the rated AC hours.  
The actual life on site may differ due to  
environmental conditions such as shock,  
vibration and the rate of switching on and off.

## LED 7 & 4 CLUSTERS PATENT No. 2098714



## LED CLUSTER VOLTAGES NOW UP TO 110 VAC

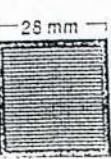
| STANDARD<br>VOLTAGES | LED 7<br>STD<br>OPTION | LED 4<br>STD<br>OPTION | LED M4<br>STD<br>OPTION |
|----------------------|------------------------|------------------------|-------------------------|
| 4.5 VAC              | 60 mA                  | -                      | 40 mA                   |
| 24 VAC               | 40 mA                  | 20 mA                  | 40 mA                   |
| 110 VAC              | 14 mA                  | -                      | 15 mA                   |
| 4.5 VDC              | 80 mA                  | -                      | 40 mA                   |
| 24 VDC               | 40 mA                  | 20 mA                  | 40 mA                   |

MES or MBC. Other cap sizes on application.  
Other voltages on application.  
Colours: Red, Yellow or Green. 2 colour & Blue on application.  
Illuminated Push Buttons & Switches can only accept LED M4.  
Grey cup signifies 4.5 VAC, White 4.5 VDC, other voltages printed.

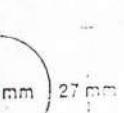
## LHSQ HOUSING



28 mm



2 mm  
23.5 mm



## LHSQ

## LENS 24 X 24 mm

Complete black nylon housing with  
flush lens for use with MES lamp unit.  
Lens: red, amber, green, opal, clear.

Quick assembly housings &amp; lamp body units see page 4

Quick assembly units have MBC lamp holders only

Screw on units MES standard MBC optional extra

# INDICATOR LAMPS WITH FUSEHOLDERS



The indicators below incorporate a fuseholder fitted to the base. Separate terminals for lamp and fuse, the fuseholder will accept standard 5 mm X 20 mm fuses up to 10 A. The combination units can thus be used to provide a fuse for a wide range of products near the panel face.

Neon units may be used as a combined fuseholder and fuse failure indicator.

The labels on the fuseholders have provision for the fuse number or rating to be written. Fuses are not supplied.

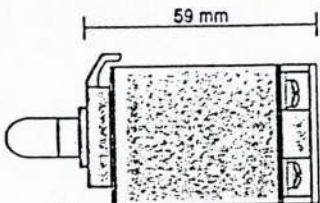
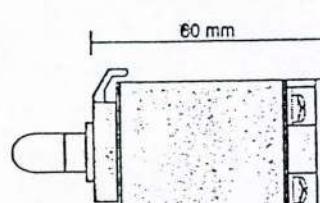
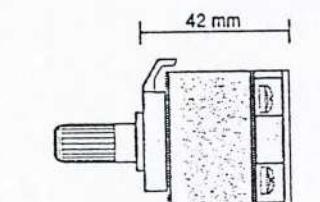
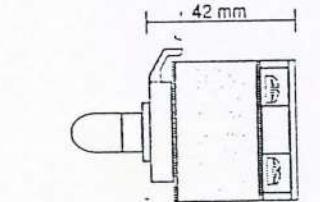
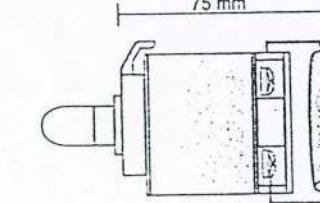
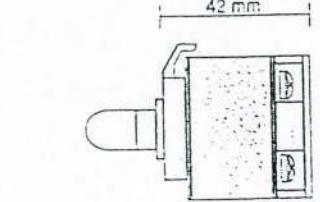
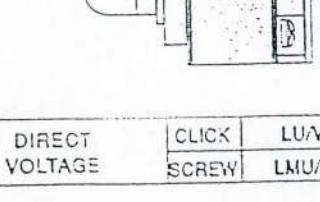
|                                   |       |                   |                     |                     |                     |                                                                                      |
|-----------------------------------|-------|-------------------|---------------------|---------------------|---------------------|--------------------------------------------------------------------------------------|
| TRANSFORMER<br>WITH FUSEHOLDER    | CLICK | FTU/VOLTAGE/4     | FTU/LED7/VOLTAGE/4  | FTU/LED4/VOLTAGE/4  | BASE<br>CONNECTIONS | STANDARD INPUT<br>VOLTAGES:<br>24, 50, 110, 240, 440V<br>50/60 Hz                    |
|                                   | SCREW | FTMU/VOLTAGE/4    | FTMU/LED7/VOLTAGE/4 | FTMU/LED4/VOLTAGE/4 |                     | FIL LAMP 6 V 1.8 W<br>LED 4 or 7, 4.5 VAC<br>RED, GREEN & AMBER                      |
| NEON<br>WITH FUSEHOLDER           | CLICK | FNBU/VOLTAGE/4/2  | FNGU/VOLTAGE/4/2    | FWU/VOLTAGE/4/2     | BASE<br>CONNECTIONS | OTHER VOLTAGES<br>ON APPLICATION                                                     |
|                                   | SCREW | FNBMU/VOLTAGE/4/2 | FNGMU/VOLTAGE/4/2   | FNWMU/VOLTAGE/4/2   |                     | STANDARD INPUT<br>VOLTAGES:<br>110, 240, 440 VAC                                     |
| DIRECT VOLTAGE<br>WITH FUSEHOLDER | CLICK | FLU/VOLTAGE/4     | FLU/LED7/VOLTAGE/4  | FLU/LED4/VOLTAGE/4  | BASE<br>CONNECTIONS | REPLACEMENT LAMPS<br>NB2, NG2, NW2                                                   |
|                                   | SCREW | FLMU/VOLTAGE/4    | FLMU/LED7/VOLTAGE/4 | FLMU/LED4/VOLTAGE/4 |                     | 2 RESISTOR, i.e:<br>BLOCKING RESISTOR<br>TO ELIMINATE<br>HALF LIGHT PICKUP           |
| DIRECT VOLTAGE<br>WITH FUSEHOLDER | CLICK | FLU/VOLTAGE/4     | FLU/LED7/VOLTAGE/4  | FLU/LED4/VOLTAGE/4  | BASE<br>CONNECTIONS | STANDARD LAMP<br>VOLTAGES:<br>6, 12, 24, 28,<br>50, 60, 130 V                        |
|                                   | SCREW | FLMU/VOLTAGE/4    | FLMU/LED7/VOLTAGE/4 | FLMU/LED4/VOLTAGE/4 |                     | LED 4 or 7 CLUSTERS<br>4.5, 12, 24, 110 VAC<br>4.5, 12, 24 VDC<br>RED, GREEN & AMBER |
| DIRECT VOLTAGE<br>WITH FUSEHOLDER | CLICK | FLU/VOLTAGE/4     | FLU/LED7/VOLTAGE/4  | FLU/LED4/VOLTAGE/4  | BASE<br>CONNECTIONS | NEON, GREEN or BLUE<br>110, 240 V SEE<br>PAGE 3 LAMP LIST                            |

## AUDIBLE ALARMS

For use with click on or screw on lamp body units

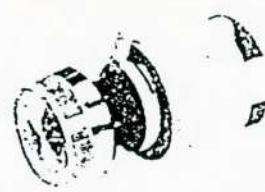
| HOUSING<br>WITH ALARM             | PANEL HOLE<br>DIAMETER | STANDARD COLOUR GREY<br>BLACK OPTIONAL |                                                                                                                                                      |
|-----------------------------------|------------------------|----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                   |                        | AKMJ                                   | 19 mm                                                                                                                                                |
| AKMY                              | 19 mm                  |                                        | 6 V AC/DC UNIT FOR USE WITH<br>TRANSFORMER LAMP HOLDER<br>TO 440 VAC or INTERNAL<br>RESISTOR HOLDER TO 110 VDC<br>e.g. AKMJ/TU240/4<br>AKFY/IRMU24/4 |
| MES or MBC                        | 22.5 mm                |                                        | TYPICAL SOUND OUTPUT:<br>85 dB @ 10 cm                                                                                                               |
|                                   | 22.5 mm                |                                        | OTHER TYPES WITH HIGHER<br>OUTPUT ON APPLICATION.                                                                                                    |
| Voltages up to 110 VDC or 440 VAC | 20.5 mm                |                                        |                                                                                                                                                      |

Terminations M3.5 cable clamps with shroud  
Housings see page 2. Lamps & LED's see page 3

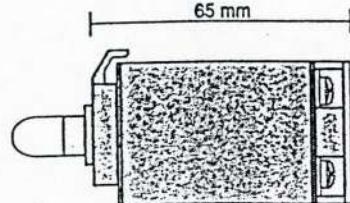
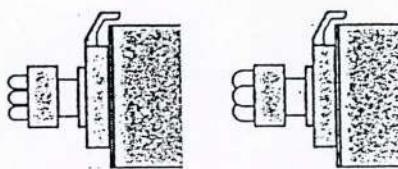
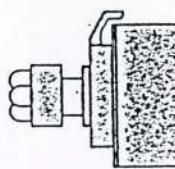
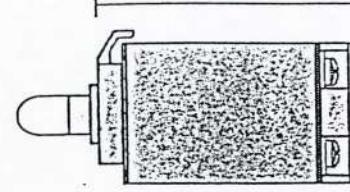
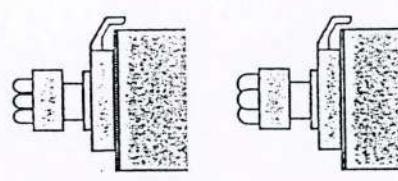
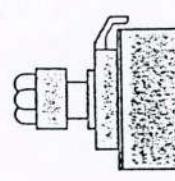
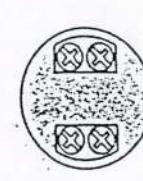
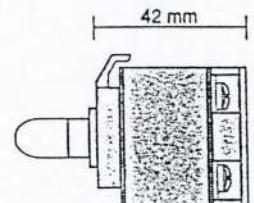
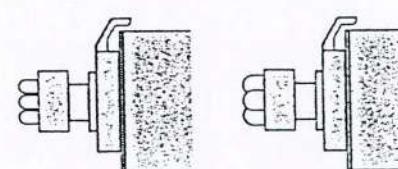
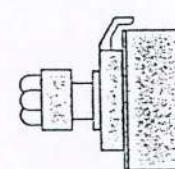
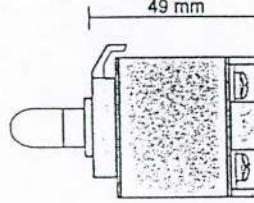
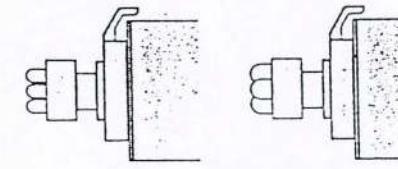
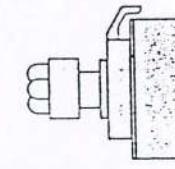
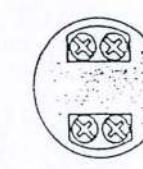
|                                                                                     |  |  |  |  |  |                                                                                                                                                                                                                                                                                 |
|-------------------------------------------------------------------------------------|--|--|--|--|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    |  |  |  |  |  | <b>STANDARD INPUT VOLTAGES:</b><br>24, 50, 110, 240, 440 V<br>50 / 60 Hz<br><br><b>FIL. LAMP 6 V 1.8 W</b><br><b>LED 4 or 7, 4.5 VAC</b><br><b>RED, GREEN &amp; AMBER</b><br><br><b>OTHER VOLTAGES ON APPLICATION</b>                                                           |
| <b>TRANSFORMER</b><br><small>CLICK SCREW</small>                                    |  |  |  |  |  | <b>TU/VOLTAGE/4</b><br><b>TMU/VOLTAGE/4</b>                                                                                                                                                                                                                                     |
| <b>TU/LED7/VOLTAGE/4</b><br><b>TMU/LED7/VOLTAGE/4</b>                               |  |  |  |  |  | <b>TU/LED4/VOLTAGE/4</b><br><b>TMU/LED4/VOLTAGE/4</b>                                                                                                                                                                                                                           |
| <b>BASE CONNECTIONS</b>                                                             |  |  |  |  |  |                                                                                                                                                                                                                                                                                 |
|    |  |  |  |  |  | <b>STANDARD INPUT VOLTAGES:</b><br>24, 50, 110, 240, 440 V<br>50 / 60 Hz<br><br><b>OTHER DETAILS AS ABOVE</b><br><br><b>EARTHED SECONDARY</b>                                                                                                                                   |
| <b>TRANSFORMER EARTHED SEC.</b><br><small>CLICK SCREW</small>                       |  |  |  |  |  | <b>TEU/VOLTAGE/4</b><br><b>TEMU/VOLTAGE/4</b>                                                                                                                                                                                                                                   |
| <b>TEU/LED7/VOLTAGE/4</b><br><b>TEMU/LED7/VOLTAGE/4</b>                             |  |  |  |  |  | <b>TEU/LED4/VOLTAGE/4</b><br><b>TEMU/LED4/VOLTAGE/4</b>                                                                                                                                                                                                                         |
| <b>BASE CONNECTIONS</b>                                                             |  |  |  |  |  |                                                                                                                                                                                                                                                                                 |
|   |  |  |  |  |  | <b>GREEN FLUORESCENT</b><br><b>BLUE FLUORESCENT</b><br><br><b>STANDARD INPUT VOLTAGES:</b><br>110, 240, 440 VAC<br><br><b>REPLACEMENT LAMPS</b><br>NB2, NG2, NW2<br><br><b>T2 RESISTOR, i.e:</b><br><b>BLOCKING RESISTOR</b><br><b>TO ELIMINATE</b><br><b>HALF LIGHT PICKUP</b> |
| <b>NEON &amp; FLUORESCENT</b><br><small>CLICK SCREW</small>                         |  |  |  |  |  | <b>NBU/VOLTAGE/4/2</b><br><b>NBMU/VOLTAGE/4/2</b>                                                                                                                                                                                                                               |
| <b>NGU/VOLTAGE/4/2</b><br><b>NGMU/VOLTAGE/4/2</b>                                   |  |  |  |  |  | <b>NWU/VOLTAGE/4/2</b><br><b>NWMU/VOLTAGE/4/2</b>                                                                                                                                                                                                                               |
| <b>BASE CONNECTIONS</b>                                                             |  |  |  |  |  |                                                                                                                                                                                                                                                                                 |
|  |  |  |  |  |  | <b>INPUT 110 VDC FILAMENT LAMP 60 V 1.2 W</b><br><br><b>INPUT 50 or 110 VDC LED 4 or 7 CLUSTERS 24 VDC 20 mA</b><br><b>RED, GREEN &amp; AMBER</b><br><br><b>OTHER VOLTAGES ON APPLICATION</b>                                                                                   |
| <b>DC INTERNAL RESISTOR</b><br><small>CLICK SCREW</small>                           |  |  |  |  |  | <b>IRU/VOLTAGE/4</b><br><b>IRMU/VOLTAGE/4</b>                                                                                                                                                                                                                                   |
| <b>IRU/LED7/VOLTAGE/4</b><br><b>IRMU/LED7/VOLTAGE/4</b>                             |  |  |  |  |  | <b>IRU/LED4/VOLTAGE/4</b><br><b>IRMU/LED4/VOLTAGE/4</b>                                                                                                                                                                                                                         |
| <b>BASE CONNECTIONS</b>                                                             |  |  |  |  |  |                                                                                                                                                                                                                                                                                 |
|  |  |  |  |  |  | <b>STANDARD INPUT VOLTAGES:</b><br>24, 50, 110/130 V<br><br><b>LAMP 6 V 1.8 W or 24 V 1.2 W</b><br><b>DEPENDENT ON INPUT VOLTAGE</b><br><b>LED 4 or 7, 4.5 VDC</b>                                                                                                              |
| <b>DC EXTERNAL RESISTOR</b><br><small>CLICK SCREW</small>                           |  |  |  |  |  | <b>RU/VOLTAGE/4</b><br><b>RMU/VOLTAGE/4</b>                                                                                                                                                                                                                                     |
| <b>RU/LED7/VOLTAGE/4</b><br><b>RMU/LED7/VOLTAGE/4</b>                               |  |  |  |  |  | <b>RU/LED4/VOLTAGE/4</b><br><b>RMU/LED4/VOLTAGE/4</b>                                                                                                                                                                                                                           |
| <b>NO COVER</b>                                                                     |  |  |  |  |  | <b>RESISTORS BELOW 2 W WILL BE INTERNAL</b>                                                                                                                                                                                                                                     |
|  |  |  |  |  |  | <b>STANDARD LAMP VOLTAGES:</b><br>6, 12, 24, 28, 50, 60, 130 V<br><br><b>LED 4 or 7 CLUSTERS 4.5, 12, 24, 110 VAC</b><br><b>4.5, 12, 24 VDC</b><br><b>RED, GREEN &amp; AMBER</b>                                                                                                |
| <b>DIRECT VOLTAGE</b><br><small>CLICK SCREW</small>                                 |  |  |  |  |  | <b>LU/VOLTAGE/4</b><br><b>LMU/VOLTAGE/4</b>                                                                                                                                                                                                                                     |
| <b>LU/LED7/VOLTAGE/4</b><br><b>LMU/LED7/VOLTAGE/4</b>                               |  |  |  |  |  | <b>LU/LED4/VOLTAGE/4</b><br><b>LMU/LED4/VOLTAGE/4</b>                                                                                                                                                                                                                           |
| <b>BASE CONNECTIONS</b>                                                             |  |  |  |  |  |                                                                                                                                                                                                                                                                                 |
|  |  |  |  |  |  | <b>NEON, GREEN or BLUE</b><br><b>110, 240 V SEE PAGE 3 LAMP LIST</b>                                                                                                                                                                                                            |



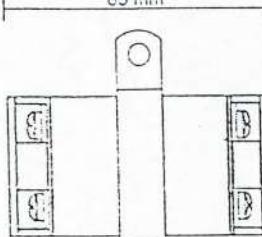
All lamp body units 35mm diameter.  
Flash rate 1 Hz, other frequencies on application  
Housings see page 2. Lamps & LED's see page 3



## FLASHING INDICATORS

|                                                                                     |                                                                                      |                                                                                      |                                                                                       |                                                                                                                                        |                                                   |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
|    |    |    |    | STANDARD INPUT VOLTAGES:<br>24, 50, 110, 240, 440 V<br>50 / 60 Hz                                                                      |                                                   |
| TRANSFORMER<br>FLASHING                                                             | CLICK<br>SCREW                                                                       | FACTU/VOLTAGE/4<br>FACTMU/VOLTAGE/4                                                  | FACTU/LED7/VOLTAGE/4<br>FACTMU/LED7/VOLTAGE/4                                         | FACTU/LED4/VOLTAGE/4<br>FACTMU/LED4/VOLTAGE/4                                                                                          | BASE CONNECTIONS<br>OTHER VOLTAGES ON APPLICATION |
|    |    |    |    | STANDARD INPUT VOLTAGES:<br>DETAILS AS ABOVE<br>FOR STEADY LIGHT<br>SHORT OUT MARKED TERMINATIONS                                      |                                                   |
| TRANSFORMER<br>FLASH/STEADY                                                         | CLICK<br>SCREW                                                                       | FSACTU/VOLTAGE/4<br>FSACTMU/VOLTAGE/4                                                | FSACTU/LED7/VOLTAGE/4<br>FSACTMU/LED7/VOLTAGE/4                                       | FSACTU/LED4/VOLTAGE/4<br>FSACTMU/LED4/VOLTAGE/4                                                                                        | BASE CONNECTIONS                                  |
|   |  |  |  | STANDARD INPUT VOLTAGE 24V<br>LAMP 24V 1.2 W<br>LED 4 or 7 CLUSTER 24 VDC<br>RED, GREEN & AMBER FOR EITHER AC or DC FLASHING INDICATOR |                                                   |
| LOW VOLTAGE<br>FLASHING<br>24 V AC or DC                                            | CLICK<br>SCREW                                                                       | FACLU/24/4 (AC)<br>FDCLU/24/4 (DC)                                                   | FACLU/LED7/24/4<br>FDCLU/LED7/24/4                                                    | FACLU/LED4/24/4<br>FDCLU/LED4/24/4                                                                                                     | BASE CONNECTIONS<br>OTHER VOLTAGES ON APPLICATION |
|  |  |  |  | STANDARD INPUT VOLTAGES:<br>DETAILS AS ABOVE<br>FOR STEADY LIGHT<br>SHORT OUT MARKED TERMINATIONS                                      |                                                   |
| LOW VOLTAGE<br>FLASH/STEADY<br>24 V AC or DC                                        | CLICK<br>SCREW                                                                       | FSACLU/24/4 (AC)<br>FSDCLU/24/4 (DC)                                                 | FSACLU/LED7/24/4<br>FSDCLU/LED7/24/4                                                  | FSACLU/LED4/24/4<br>FSDCLU/LED4/24/4                                                                                                   | BASE CONNECTIONS                                  |

## ENCAPSULATED 1.5 VA TRANSFORMER

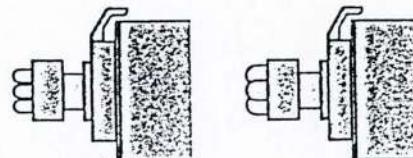
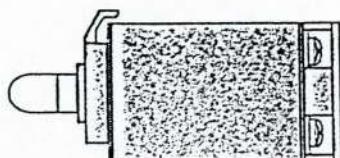
|                                                                                     |                                                                                                                                                                                              |                                                                    |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
|  | SUITABLE FOR USE WITH LOW VOLTAGE LAMPS UP TO 1.5 VA WHERE REMOTE TRANSFORMERS REQUIRED<br>OR<br>WHERE DEPTH OF STANDARD TRANSFORMER LAMP IS TOO GREAT.<br>FITTED WITH FIXED TERMINAL COVERS | STANDARD INPUT VOLTAGES:<br>24, 50, 110, 240, 440 V<br>50 / 60 Hz  |
| TRANSFORMER<br>ENCAPSULATED 1.5 VA                                                  | T/VOLTAGE/4                                                                                                                                                                                  | OUTPUT 5 VAC<br>OTHER VOLTAGES ON APPLICATION<br>'P' CLIP SUPPLIED |

Quick assembly units have MBC lamp holders only  
Screw on units MES standard MBC optional extra

## MULTI - LAMP TEST INDICATORS

### RELAY

67 mm



STANDARD INPUT VOLTAGES:  
24, 110, 240 V  
50/60 Hz

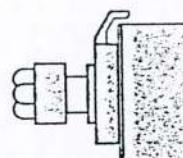
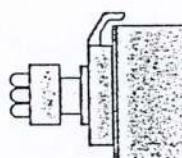
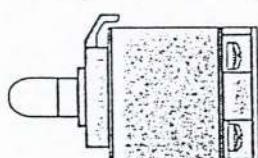
FIL LAMP 6 V 1.8 W

LED 4 or 7, 4.5 VAC  
RED, GREEN & AMBER

OTHER VOLTAGES  
ON APPLICATION

### DIODE

48 mm



STANDARD LAMP VOLTAGES:  
6, 12, 24, 28, 50, 60 V

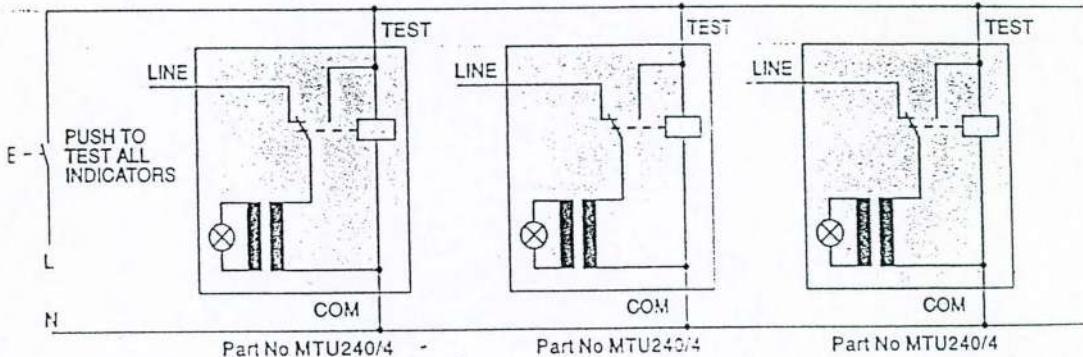
LED 4 or 7 CLUSTERS  
RED, GREEN & AMBER  
STANDARD VOLTAGES  
4.5, 12, 24 V

THE REPLACEMENT LED CLUSTERS FOR THIS UNIT ARE ALWAYS DC

### LOW VOLTAGE DIODE TEST

|       |                   |                        |                        |
|-------|-------------------|------------------------|------------------------|
| CLICK | DTU/VOLTAGE DC/4  | DTU/LED7/VOLTAGE DC/4  | DTU/LED4/VOLTAGE DC/4  |
| SCREW | DTU/VOLTAGE AC/4  | DTU/LED7/VOLTAGE AC/4  | DTU/LED4/VOLTAGE AC/4  |
| CLICK | DTMU/VOLTAGE DC/4 | DTMU/LED7/VOLTAGE DC/4 | DTMU/LED4/VOLTAGE DC/4 |
| SCREW | DTMU/VOLTAGE AC/4 | DTMU/LED7/VOLTAGE AC/4 | DTMU/LED4/VOLTAGE AC/4 |

### CIRCUIT FOR MULTITEST



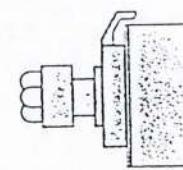
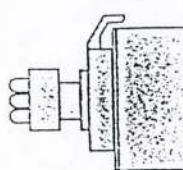
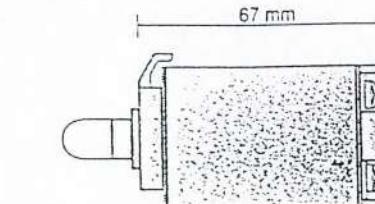
#### DESCRIPTION OF RELAY MULTITEST:-

TRANSFORMER INDICATOR INCORPORATING A SINGLE POLE CHANGEOVER RELAY ENABLING MANY UNITS TO BE TESTED FROM ONE PUSH BUTTON AND WITHOUT INTERRUPTING NORMAL OPERATION. THE UNITS ARE ALL FULLY ENCAPSULATED. EACH UNIT ISOLATES ITSELF FROM CONTROL CIRCUITRY WHEN TEST BUTTON IS PRESSED, ELIMINATING ANY FEED BACK. IF USED FROM THREE PHASE THE TEST SUPPLY MUST BE ON THE SAME PHASE AS THE CONTROL CIRCUIT.

NOMINAL RATINGS OF INDICATORS UNDER TEST FUNCTION: 240 V - 30 mA, 110 V - 40 mA, 24 V - 160 mA.

DIODE TEST LOW VOLTAGE ALSO ENABLES LAMPS TO BE TESTED WITH ONE BUTTON SWITCH.

## POWER FAILURE INDICATOR or ALARM



STANDARD INPUT VOLTAGES:  
24, 110, 240 V  
50/60 Hz

FIL LAMP 6 V 1.8 W

LED 4 or 7, 4.5 VAC  
RED, GREEN & AMBER

AUDIBLE ALARM  
SEE PAGE 5

### TRANSFORMER POWER FAILURE

|       |                 |                      |                      |
|-------|-----------------|----------------------|----------------------|
| CLICK | PFTU/VOLTAGE/4  | PFTU/LED7/VOLTAGE/4  | PFTU/LED4/VOLTAGE/4  |
| SCREW | PFTMU/VOLTAGE/4 | PFTMU/LED7/VOLTAGE/4 | PFTMU/LED4/VOLTAGE/4 |

BASE CONNECTIONS

THIS INDICATOR, WHICH INCORPORATES A RELAY, PROVIDES A WARNING WHEN THE NORMAL CONTROL CIRCUIT POWER SUPPLY FAILS. THE UNIT REQUIRES A PERMANENT LIVE SIGNAL, IF THE CIRCUIT SUPPLY FAILS THE INDICATOR THEN ILLUMINATES OR SOUNDS THE ALARM. THE CONTROL CIRCUIT AT ALL TIMES REMAINS ISOLATED FROM THE PERMANENT LIVE SUPPLY.

# NEONS, LEDS & LOW VOLTAGE LAMPS

Neons high brightness. Green lens require green fluorescent lamp as specified by Catalogue No. prefix NG

Terminations; /3 = 220 mm length leads, /5 = 0.25 male tabs, /7 = solder tags

Lead colours; 28 V brown, 110 V blue, 240 V blue/brown. Lens colours; red, amber, green, opal & clear

|  |  |         |                                                                                                                                        |                                                                                                                                |
|--|--|---------|----------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
|  |  | 6.4 mm  | NSMS6/VOLTAGE/3<br>NGSMS6/VOLTAGE/3<br><br>LSMS6/28/3                                                                                  | HIGH BRIGHTNESS NEON<br>GREEN FLOURESCENT<br><br>28 V FILAMENT LAMP                                                            |
|  |  | 10 mm   | NSMS10/VOLTAGE/3<br>NGSMS10/VOLTAGE/3<br><br>LSMS10/28/3                                                                               | HIGH BRIGHTNESS NEON<br>GREEN FLOURESCENT<br><br>28 V FILAMENT LAMP                                                            |
|  |  | 12.5 mm | NSHS/VOLTAGE/3<br>NGSHS/VOLTAGE/3                                                                                                      | HIGH BRIGHTNESS NEON<br>GREEN FLOURESCENT                                                                                      |
|  |  | 12.5 mm | NSHC/VOLTAGE/5<br>NGSHC/VOLTAGE/5<br>NSHC/VOLTAGE/3<br>NGSHC/VOLTAGE/3                                                                 | HIGH BRIGHTNESS NEON<br>GREEN FLOURESCENT<br>HIGH BRIGHTNESS NEON<br>GREEN FLOURESCENT                                         |
|  |  | 12.5 mm | LSHC/28/5                                                                                                                              | 28 V FILAMENT LAMP                                                                                                             |
|  |  | 19 mm   | MH/NBMU/VOLTAGE/7/2<br>MH/NGMU/VOLTAGE/7/2<br>MH/NWMU/VOLTAGE/7/2<br>MH/NBMU/VOLTAGE/3/2<br>MH/NGMU/VOLTAGE/3/2<br>MH/NWMU/VOLTAGE/3/2 | HIGH BRIGHTNESS NEON<br>GREEN FLOURESCENT<br>BLUE FLOURESCENT<br>HIGH BRIGHTNESS NEON<br>GREEN FLOURESCENT<br>BLUE FLOURESCENT |

## LOW VOLTAGE LAMPS

Lens colours; red, amber, green, opal, clear & blue. Low voltage unit with screw terminations page 6

|  |  |         |                                                                                                                           |                                                                                                                           |
|--|--|---------|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
|  |  | 12.5 mm | LSHLES/2<br><br>LES LAMPS                                                                                                 | CHROME PLATED BEZEL<br>MOULDED BODY<br><br>LAMP CHANGE FROM FRONT<br>SEE PAGE 3 LAMP LIST                                 |
|  |  | 19 mm   | MH/LMU/MES/2<br>MHM/LMU/MES/2<br>MHCM/LMU/MES/2<br><br>LMU/MES/2 WILL FIT ALL<br>HOUSINGS SHOWN ON PAGE 2<br>MBC OPTIONAL | BRASS CHROME PLATED<br>MOULDED BODY<br>MOULDED BODY CHROME<br>BEZEL<br><br>LAMP CHANGE FROM FRONT<br>SEE PAGE 3 LAMP LIST |

## SINGLE LED INDICATORS

Housings brass chrome plated, black epoxy coating optional. LED colours; red, amber & green

|  |  |         |                                                                                                                                     |                                                                                                                                                 |
|--|--|---------|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
|  |  | 12.5 mm | LM12/LED/7<br>LM12/LED/3<br>LMR12/LED/AC or DC VOLTS/7<br>LMR12/LED/AC or DC VOLTS/3<br><br>ULTRA HIGH BRIGHTNESS<br>ON APPLICATION | CONCAVE BEZEL<br>LM TYPE LED ONLY FITTED<br>LMR TYPE WITH RESISTOR<br>50 VDC MAX 110 VAC MAX<br><br>IP65 SEALING WASHER<br>AVAILABLE            |
|  |  | 10 mm   | LM10/LED/6<br>LM10/LED/3<br>LMR10/LED/AC or DC VOLTS/6<br>LMR10/LED/AC or DC VOLTS/3<br><br>ULTRA HIGH BRIGHTNESS<br>ON APPLICATION | CONCAVE BEZEL STANDARD<br>LM TYPE LED ONLY FITTED<br>LMR TYPE WITH RESISTOR<br>24 V AC or DC MAX<br><br>PREFIX 'X' FOR OPTIONAL<br>CONVEX BEZEL |
|  |  | 6.4 mm  | LM5/LED/6<br>LM5/LED/3<br>LMR5/LED/AC or DC VOLTS/6<br>LMR5/LED/AC or DC VOLTS/3<br><br>ULTRA HIGH BRIGHTNESS<br>ON APPLICATION     | CONCAVE BEZEL STANDARD<br>LM TYPE LED ONLY FITTED<br>LMR TYPE WITH RESISTOR<br>24 V AC or DC MAX<br><br>PREFIX 'X' FOR OPTIONAL<br>CONVEX BEZEL |



# C60HB miniature circuit breakers and V40H combined mcb/rcd

## BSEN 60 - 898 (Type B: 3 to 5 In) BSEN 60 - 898 (Type C: 5 to 10 In)

10,000A

### C60HB Type B applications

Protection and control of circuits against overloads and short circuits.

- in commercial and industrial electrical distribution systems
- in domestic installations

#### Technical data

- current ratings: BSEN 60 - 898  
1A to 63A at 30°C
- voltage ratings: 240/415V AC
- breaking capacity: BSEN 60 - 898lcn

| rating (A) | type     | voltage (V AC) | breaking capacity (A) |
|------------|----------|----------------|-----------------------|
| 1-63       | 1P       | 240            | 10,000                |
| 1-63       | 2P,3P,4P | 240/415        | 10,000                |

- tripping characteristics: BSEN 60-898 type B: magnetic setting between 3 and 5In

■ cable capacities:  
1-25A tunnel terminal for cables up to 25mm<sup>2</sup>  
32-63A tunnel terminal for cables up to 35mm<sup>2</sup>

- number of operating cycles (O-C) on load 20,000
- tropicalisation: treatment 2 (relative humidity 95% at 55°C)

- overall dimensions: see diagram
- width in 9mm modules

| 1P | 2P | 3P | 4P |
|----|----|----|----|
| 2  | 4  | 6  | 8  |

#### ■ weight (g)

| 1P  | 2P  | 3P  | 4P  |
|-----|-----|-----|-----|
| 110 | 220 | 340 | 450 |

#### ■ positive contact indication:

in accordance with the 16th Edition of the IEE Wiring Regulations (537-02, 537-03).

#### ■ auxiliaries

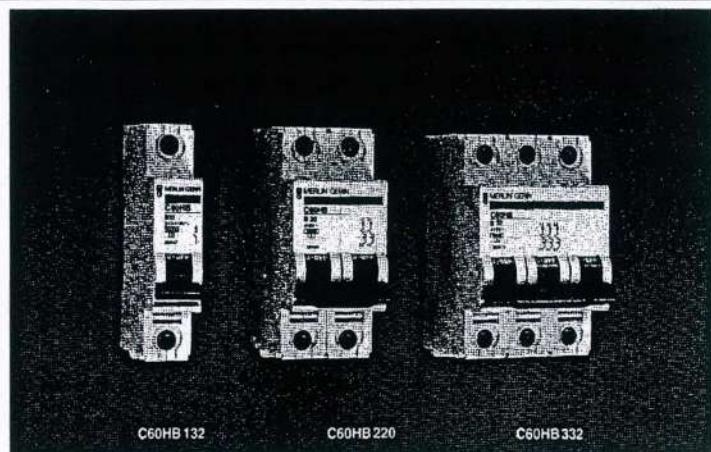
VIGI residual current devices  
shunt trip module MX  
undervoltage trip module MN  
auxiliary switch module OF  
alarm switch module SD

#### ■ accessories—see page 41

#### ■ Lloyds approval

To IEC 947 - 2

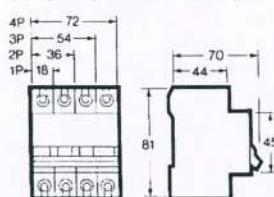
■ operating temperature: -30 to + 70°C



#### 10,000A cat. refs.

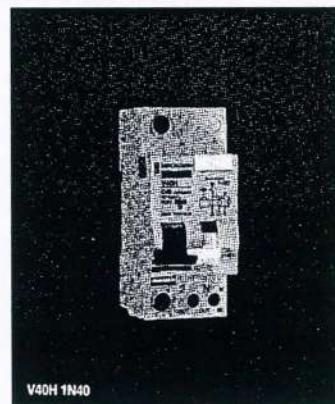
| ratings (A) | 1P        | 2P        | 3P        | 4P        |
|-------------|-----------|-----------|-----------|-----------|
| 1           | C60HB 101 | C60HB 201 | C60HB 301 | C60HB 401 |
| 2           | C60HB 102 | C60HB 202 | C60HB 302 | C60HB 402 |
| 4           | C60HB 104 | C60HB 204 | C60HB 304 | C60HB 404 |
| 6           | C60HB 106 | C60HB 206 | C60HB 306 | C60HB 406 |
| 10          | C60HB 110 | C60HB 210 | C60HB 310 | C60HB 410 |
| 16          | C60HB 116 | C60HB 216 | C60HB 316 | C60HB 416 |
| 20          | C60HB 120 | C60HB 220 | C60HB 321 | C60HB 420 |
| 25          | C60HB 125 | C60HB 225 | C60HB 325 | C60HB 425 |
| 32          | C60HB 132 | C60HB 232 | C60HB 332 | C60HB 432 |
| 40          | C60HB 140 | C60HB 240 | C60HB 340 | C60HB 440 |
| 50          | C60HB 150 | C60HB 250 | C60HB 350 | C60HB 450 |
| 63          | C60HB 163 | C60HB 263 | C60HB 363 | C60HB 463 |

#### dimensions (mm) (fixing on symmetrical DIN rail)



#### Installation

- Direct panel mounting
- Panel mounting on symmetrical DIN rail
- In all Merlin Gerin consumer units, distribution boards and standard enclosures.



#### V40H combined mcb/rcd SP&N only

| ratings (A) | cat. ref. |
|-------------|-----------|
| 10          | V40H 1N10 |
| 16          | V40H 1N16 |
| 20          | V40H 1N20 |
| 32          | V40H 1N32 |
| 40          | V40H 1N40 |

#### ■ protected against unwanted tripping

- cable capacity: 10mm<sup>2</sup>
- width in 9mm modules: 4
- weight (g): 190

Installation - see C60HB above

### V40H combined mcb/rcd

full technical specifications see page 55

#### Applications

As for C60HC mcbs, but with the additional advantage of earth leakage protection provided by an integral 30mA sensitivity residual current device.

#### Technical data

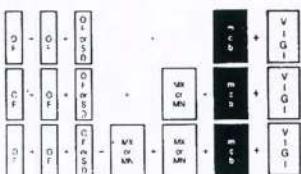
- current ratings: 10A to 40A at 30°C
- voltage rating: 240V AC
- breaking capacity: 10,000A
- tripping characteristics: BSEN 60-898 type C: magnetic setting between 5 and 10In
- sensitivity: 30mA

#### ■ positive contact indication:

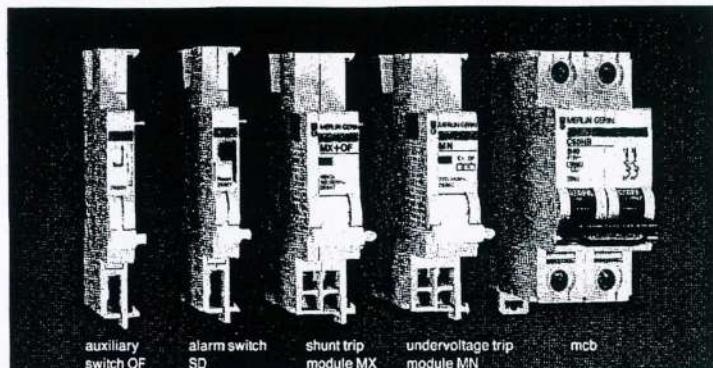
in accordance with the 16th Edition of the IEE Wiring Regulations (537-02, 537-03).

# electrical auxiliaries for C60HB, C60HC and C60HD miniature circuit breakers and V40H combined mcb/rcd

## Arrangement of auxiliaries

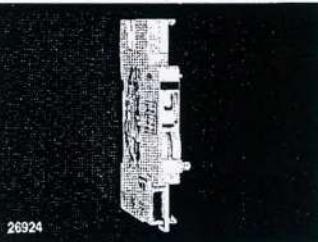


notes: SD must always be assembled before OF if fitted. Other combinations are available consult us.



### auxiliary switch (OF)

- a changeover switch which acts as an indicating or control device to monitor the 'ON' or 'OFF' positions of an mcb.
- test function.
- mounted by clipping onto the LHS of the mcb or mcb/rcd.



| No. of SP ways | 9mm modules | cat. ref. |
|----------------|-------------|-----------|
| 1              | OF          | 26924     |

contact ratings (A):  
 ■ 3A at 415V AC ■ 6A at 240V AC  
 ■ 1A at 125V DC ■ 2A at 48V DC  
 ■ 6A at 24V DC

### alarm switch (SD)

- an indicating device which monitors the tripping of an mcb.
- This device offers the following
  - A red flag trip indicator
  - Ability to reset without closing the mcb
  - test function
  - mounted by clipping onto the LHS of the mcb or mcb/rcd.



| No. of SP ways | 9mm modules | cat. ref. |
|----------------|-------------|-----------|
| 1              | SD          | 26927     |

contact ratings (A):  
 ■ 3A at 415V AC ■ 6A at 240V AC  
 ■ 1A at 125V DC ■ 2A at 48V DC  
 ■ 6A at 24V DC

### shunt trip release (MX)

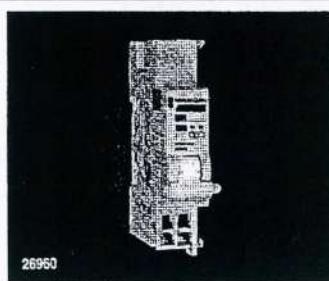
- enables the mcb to be tripped from a remote location
- allows remote indication of the 'OFF' or 'ON' position of the mcb by using the same voltage as the one feeding the shunt trip (terminals 12 and 14)
- is equipped with a cut-off switch in series with the coil
- includes one auxiliary changeover switch (OF) see page 133
- all shunt trip release devices are equipped with a red flag trip indicator.
- mounted by clipping on the LHS of the mcb or mcb/rcd.



| No. of SP ways | 9mm modules | coil voltage (V)         | cat. ref. |
|----------------|-------------|--------------------------|-----------|
| 1              | 2           | 110/130V DC or 220/415AC | 26946     |
|                |             | 48V DC or 48-130 AC      | 26947     |
|                |             | 24V AC or DC             | 26948     |

### undervoltage release (MN)

- enables miniature circuit breakers to be tripped either when the voltage drops or by operation of the 'OFF' push button of a remote device
- prevents the mcb from being switched 'ON' again if the undervoltage release supply is not present
- all under voltage releases are equipped with a red flag trip indicator.
- mounted by clipping on the LHS of the mcb or mcb/rcd.



| No. of SP ways | 9mm modules | voltage (V) | cat. ref. |
|----------------|-------------|-------------|-----------|
| 1              | 2           | 220/240 AC  | 26960     |
|                |             | 48 AC       | 26961     |
|                |             | 48 DC       | 26962     |

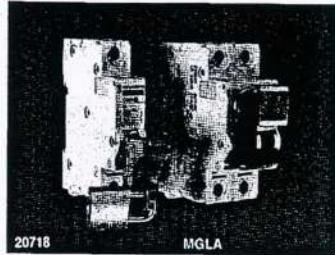
## accessories for C60HB, C60HC and C60HD miniature circuit breakers

### Door locking attachment

Enhances the degree of safety available of individual circuit breakers by permitting padlocking of the mcb in either the 'ON' or 'OFF' position.

When using ref: 20718, with C60HB/C60HC/C60HD mounted in MGA,MGB,MGD,MSA or MSB distributionboards, the door cannot be closed.

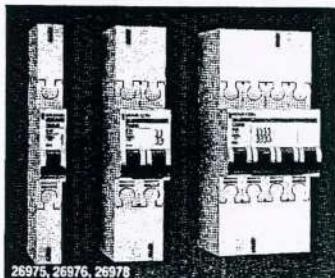
The door can be closed when using padlocking device ref: MGLA.



|                        | cat.ref. |
|------------------------|----------|
| for C60H mcbs          | 20718    |
| for RMG devices        | 20719    |
| padlocking with 2 keys | MGPL     |
| spare key for MGPL     | MGPLSK   |
| for C60H mcbs          | MGLA     |
| padlock for MGLA       | MGLAP    |
| spare key for MGLAP    | MGLAPK   |

### terminal shield

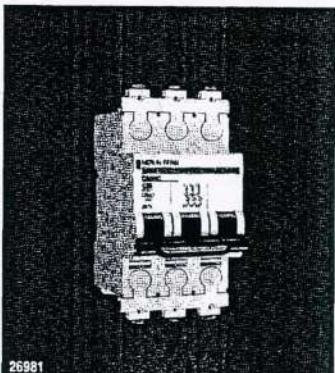
Completely cover terminals; fixed by a clip. 1P, 2P, 3P (2P + 1P) and 4P versions available, all with built in pole separation.



|                     | cat. ref. |
|---------------------|-----------|
| pair of single pole | 26975     |
| pair of double pole | 26976     |
| pair of four pole   | 26978     |

### sealable terminal screw shield

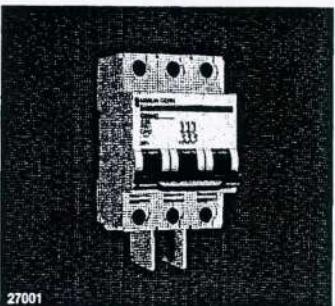
Enables total isolation of the terminal screws of 1P, 2P, 3P and 4P C60HB, C60HC and C60HD mcbs and combinations of these with Vigi (type C60) residual current devices.



|                                                                               | cat. ref. |
|-------------------------------------------------------------------------------|-----------|
| for use with C60H mcbs<br>(1 bag of 8 shields)                                | 26981     |
| for use with add-on Vigi<br>residual current devices<br>(1 bag of 20 shields) | 26982     |

### interpole barrier

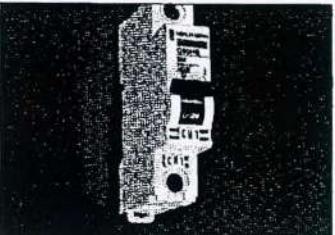
supplied in quantities of 10, they permit insulation creepage distances to be increased.



for C60HB,C60HC and C60HD mcbs 27001

### identification system

ALL C60HB, C60HC/C60HD mcbs can accept up to a total of 10 marking accessories on each of their poles by fully utilising two separate locations. The following symbols are available: Blank, 1-9, ±, -, and A-z. Please refer to Telemecanique, AB-1 terminal system. Tel: (0203) 416255.



# miniature circuit breakers for use in conjunction with motor starters and transformers

## **motor starters**

In general, miniature circuit breakers can give only short circuit protection to motor loads due to the high starting currents which may be encountered; typically 3 to 12 times full load current (FLC).

### **Assumptions**

The tables give recommended mcb ratings for motors up to 37kW based on the following assumptions:

#### **■ direct-on-line starting**

starting current =  $7 \times FLC$

run-up time =

6 seconds, motors <3kW

10 seconds, motors <22kW

running currents = average values only (individual manufacturer's figures will vary).

four-pole motors, i.e. speed approx. 1500 rev/min.

For higher inertia loads, i.e. hoists or fans, run-up times may be considerably longer than those assumed above. The rating of the mcb must take account of the greater run-up time and starting current.

The required mcb rating can be determined by reference to time/current curves (consult us).

#### **■ star/delta starting**

Since, during the changeover from star to delta, a high current surge in the order of DOL values may be met, the mcb rating selected should be the same as that recommended for DOL starting.

**Table 1 - 3 phase 415V AC D.O.L. starting**

| kW   | hp    | running I | recommended mcb |       |       |        |        |
|------|-------|-----------|-----------------|-------|-------|--------|--------|
|      |       |           | C60HB           | C60HC | C60HD | NC100C | NC100D |
| 0.12 | 0.166 | 0.65      | 2               | 2     | 1     | -      | -      |
| 0.18 | 0.25  | 0.7       | 2               | 2     | 1     | -      | -      |
| 0.25 | 0.33  | 0.87      | 4               | 2     | 1     | -      | -      |
| 0.37 | 0.5   | 1.35      | 4               | 4     | 2     | -      | -      |
| 0.55 | 0.75  | 1.55      | 4               | 4     | 2     | -      | -      |
| 0.75 | 1.0   | 1.93      | 6               | 4     | 4     | -      | -      |
| 1.1  | 1.5   | 2.5       | 6               | 6     | 4     | -      | -      |
| 1.5  | 2     | 3.5       | 10              | 10    | 6     | -      | -      |
| 2.2  | 3     | 4.8       | 16              | 10    | 10    | 10     | 10     |
| 3    | 4     | 6.4       | 20              | 20    | 10    | 16     | 10     |
| 3.75 | 5     | 7.8       | 25              | 25    | 16    | 20     | 16     |
| 4    | 5.5   | 8.1       | 25              | 25    | 16    | 20     | 16     |
| 5.5  | 7.5   | 11        | 32              | 32    | 16    | 25     | 16     |
| 7.5  | 10    | 14.4      | 50              | 50    | 20    | 25     | 20     |
| 9.33 | 12.5  | 17.3      | 63              | 50    | 20    | 32     | 20     |
| 11   | 15    | 21        | 63              | 63    | 25    | 40     | 25     |
| 13   | 17.5  | 25        | -               | -     | 32    | 50     | 32     |
| 15   | 20    | 28        | -               | -     | 40    | 50     | 40     |
| 18.5 | 25    | 35        | -               | -     | 50    | 63     | 50     |
| 22   | 30    | 40        | -               | -     | 50    | 63     | 50     |
| 30   | 40    | 54        | -               | -     | 63    | 80     | 63     |
| 37   | 50    | 65.5      | -               | -     | -     | 100    | 80     |

**Table 2 - 1 phase 240V AC D.O.L. starting**

| kW   | hp    | running I | C60HB | C60HC | C60HD | NC100C | NC100D |
|------|-------|-----------|-------|-------|-------|--------|--------|
| 0.12 | 0.166 | 0.95      | 4     | 2     | 1     | -      | -      |
| 0.18 | 0.25  | 1.5       | 4     | 4     | 2     | -      | -      |
| 0.25 | 0.33  | 1.7       | 6     | 4     | 2     | -      | -      |
| 0.37 | 0.5   | 3         | 10    | 6     | 4     | -      | -      |
| 0.55 | 0.75  | 4.5       | 16    | 10    | 6     | 10     | -      |
| 0.75 | 1     | 5.5       | 16    | 16    | 10    | 16     | 10     |
| 1.1  | 1.5   | 8.5       | 25    | 25    | 16    | 20     | 16     |
| 1.5  | 2     | 10.5      | 32    | 32    | 20    | 25     | 20     |
| 2.2  | 3     | 15.5      | 40    | 40    | 25    | 32     | 25     |
| 3    | 4     | 20        | 63    | 63    | 32    | 40     | 32     |
| 3.75 | 5     | 24        | -     | 63    | 40    | 50     | 40     |
| 5.5  | 7.5   | 34        | -     | -     | 50    | 63     | 50     |
| 6.3  | 8.5   | 36.5      | -     | -     | 63    | 63     | 63     |
| 7.5  | 10    | 45        | -     | -     | 63    | 80     | 63     |
| 11   | 15    | 66.5      | -     | -     | -     | 100    | 80     |

## **transformers**

High inrush currents are also produced when transformers are switched on, typically 10-15 times full load current.

### **Assumptions**

The tables give recommended mcb ratings for single phase transformers up to 12500 VA and three phase transformers up to 30000 VA based on the following formula:

#### **mcb rating =**

15 x normal running current of transformer  
min. instantaneous tripping coefficient of mcb

**Table 3 - 3 phase transformers 415V AC supply**

| kW    | primary In (A) | C60HB | C60HC | C60HD | NC100C | NC100D |
|-------|----------------|-------|-------|-------|--------|--------|
| 500   | 0.7            | 4     | 2     | 1     | -      | -      |
| 750   | 1.04           | 6     | 4     | 2     | -      | -      |
| 1000  | 1.39           | -     | 10    | 6     | 4      | -      |
| 2000  | 2.78           | 16    | 10    | 6     | 10     | -      |
| 5000  | 6.95           | 40    | 25    | 16    | 25     | 16     |
| 10000 | 13.89          | -     | 50    | 25    | 50     | 25     |
| 15000 | 20.84          | -     | 63    | 32    | 63     | 32     |
| 20000 | 27.78          | -     | -     | 50    | 63     | 50     |
| 25000 | 34.73          | -     | -     | 63    | 80     | 63     |
| 30000 | 41.67          | -     | -     | 63    | 100    | 63     |

**Table 4 - 1 phase transformers 240V AC supply**

| kW    | primary In (A) | C60HB | C60HC | C60HD | NC100C | NC100D |
|-------|----------------|-------|-------|-------|--------|--------|
| 50    | 0.21           | 2     | -     | -     | -      | -      |
| 100   | 0.42           | 4     | 2     | 1     | -      | -      |
| 250   | 1.04           | 6     | 4     | 2     | -      | -      |
| 500   | 2.08           | 16    | 10    | 4     | -      | -      |
| 1000  | 4.17           | 25    | 16    | 10    | 10     | 10     |
| 2500  | 10.42          | 63    | 32    | 16    | 25     | 16     |
| 5000  | 20.84          | -     | 63    | 32    | 50     | 32     |
| 10000 | 52.08          | -     | -     | 63    | 80     | 63     |
| 12500 | 52.08          | -     | -     | -     | 100    | 80     |

# BSEN 60 - 898 (Type C: 5 to 10 In)

## BSEN 60 - 898 (Type D: 10 to 14 In)

### C60HC Type C applications

Protection and control of circuits against overloads and short circuits.

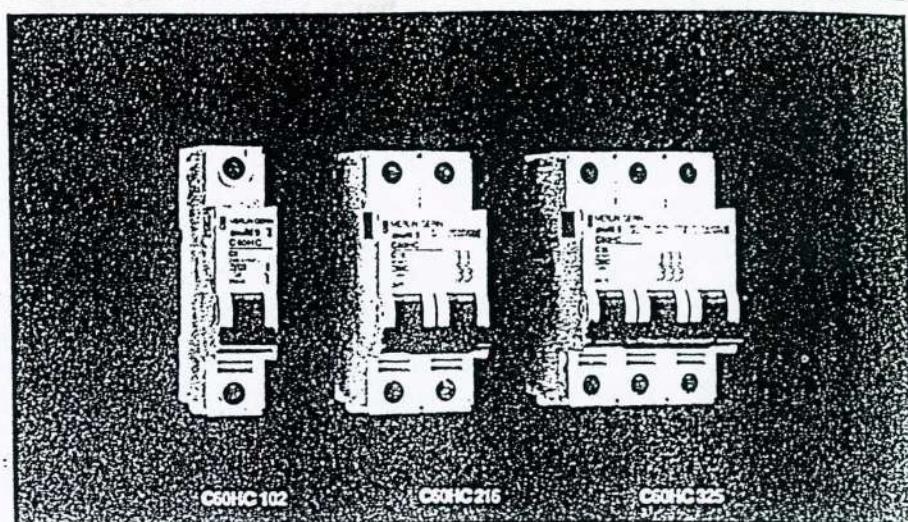
- in commercial and industrial electrical distribution systems
- in applications with moderate inrush currents, such as certain lighting systems.

#### Technical data

- current ratings: BSEN 60 - 898 1A to 63A at 30°C
- voltage ratings: 240/415V AC
- breaking capacity: BSEN 60 - 898 I<sub>cn</sub>

| rating (A) | type  | voltage (V AC) | breaking capacity (A) |
|------------|-------|----------------|-----------------------|
| 1-63       | 1P    | 240            | 10.000                |
| 1-63       | 2P,3P | 240/415        | 10.000                |

- tripping characteristics: BSEN 60-898 type C: magnetic setting between 5 and 10In.



| 10,000A     | Cat. refs. |           |           |
|-------------|------------|-----------|-----------|
| ratings (A) | 1P         | 2P        | 3P        |
| 1           | C60HC 101  | C60HC 201 | C60HC 301 |
| 2           | C60HC 102  | C60HC 202 | C60HC 302 |
| 4           | C60HC 104  | C60HC 204 | C60HC 304 |
| 6           | C60HC 106  | C60HC 206 | C60HC 306 |
| 10          | C60HC 110  | C60HC 210 | C60HC 310 |
| 16          | C60HC 116  | C60HC 216 | C60HC 316 |
| 20          | C60HC 120  | C60HC 220 | C60HC 320 |
| 25          | C60HC 125  | C60HC 225 | C60HC 325 |
| 32          | C60HC 132  | C60HC 232 | C60HC 332 |
| 40          | C60HC 140  | C60HC 240 | C60HC 340 |
| 50          | C60HC 150  | C60HC 250 | C60HC 350 |
| 63          | C60HC 163  | C60HC 263 | C60HC 363 |

### C60HD Type D applications

Protection and control of circuits against overloads and short circuits.

- in commercial and industrial electrical distribution systems
- in applications with high inrush currents such as transformers, motors, certain lighting systems etc.

#### Technical data

- current ratings: BSEN 60 - 898 1A to 63A at 30°C
- voltage ratings: 240/415V AC
- breaking capacity: BSEN 60 - 898 I<sub>cn</sub>

| rating (A) | type  | voltage (V AC) | breaking capacity (A) |
|------------|-------|----------------|-----------------------|
| 1-63       | 1P    | 240            | 10.000                |
| 1-63       | 2P,3P | 240/415        | 10.000                |

- tripping characteristics: BSEN 60-898 type D: magnetic setting between 10 to 14In.

Please refer to page 38 for other Technical Data.

| 10,000A     | Cat. refs. |           |           |
|-------------|------------|-----------|-----------|
| ratings (A) | 1P         | 2P        | 3P        |
| 1           | C60HD 101  | C60HD 201 | C60HD 301 |
| 2           | C60HD 102  | C60HD 202 | C60HD 302 |
| 4           | C60HD 104  | C60HD 204 | C60HD 304 |
| 6           | C60HD 106  | C60HD 206 | C60HD 306 |
| 10          | C60HD 110  | C60HD 210 | C60HD 310 |
| 16          | C60HD 116  | C60HD 216 | C60HD 316 |
| 20          | C60HD 120  | C60HD 220 | C60HD 320 |
| 25          | C60HD 125  | C60HD 225 | C60HD 325 |
| 32          | C60HD 132  | C60HD 232 | C60HD 332 |
| 40          | C60HD 140  | C60HD 240 | C60HD 340 |
| 50          | C60HD 150  | C60HD 250 | C60HD 350 |
| 63          | C60HD 163  | C60HD 263 | C60HD 363 |

#### Information





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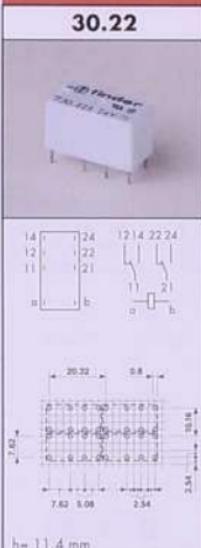
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## 30.22



$h = 11.4 \text{ mm}$

|                                                    |                                                       |
|----------------------------------------------------|-------------------------------------------------------|
| Mounting                                           | P.C.B.                                                |
| <b>Contact specification</b>                       |                                                       |
| Number of contacts                                 | 2 CO (DPDT)                                           |
| Rated current A                                    | 1.25                                                  |
| Maximum peak current A                             | 2                                                     |
| Rated load AC1 VA                                  | 125                                                   |
| Rated load AC15 VA                                 | 25                                                    |
| Rated voltage/Max switching voltage V              | 250                                                   |
| Breaking capacity in DC1: 30/110/220V A            | 2/0.3/—                                               |
| Minimum switching load mW (V/mA)                   | 10 (0.1/1)                                            |
| Single phase motor rating kW/HP                    | —                                                     |
| Standard contact material                          | Ag Pd                                                 |
| <b>Coil specification</b>                          |                                                       |
| Nominal voltage (U <sub>N</sub> ) V AC (50/60 Hz)  | —                                                     |
| V DC                                               | 5 - 6 - 9 - 12 - 24 - 48                              |
| Rated power AC/DC/sensitive DC VA (50 Hz)/W/W      | —/0.4/0.2                                             |
| V AC (50 Hz)                                       | —                                                     |
| Operating range V DC/sensitive DC                  | (0.7 + 1.5)U <sub>N</sub> / (0.7 + 1.5)U <sub>N</sub> |
| <b>Technical data</b>                              |                                                       |
| Mechanical life AC/DC cycles                       | —/10,000,000                                          |
| Electrical life at rated load AC1 cycles           | 100,000                                               |
| Dielectric strength: between coil and contacts V ~ | 1000                                                  |
| between adjacent contacts V ~                      | 1000                                                  |
| Surge test [1:2/50 µs] between coil and contacts V | 1500                                                  |
| Insulation group conforming to VDE 0110            | A 125                                                 |
| Pick-up time/Drop-out time (bounce included) ms    | 15/10                                                 |
| Ambient temperature °C                             | (-40 + +70)                                           |
| Protection category                                | IP 67                                                 |
| <b>Approvals:</b> (according to type)              | CE                                                    |



|                                                    | 44.52                                              | 44.62                                             |
|----------------------------------------------------|----------------------------------------------------|---------------------------------------------------|
| Mounting                                           | P.C.B. or<br>for use with 95 series sockets        | P.C.B. or<br>for use with 95 series sockets       |
| <b>Contact specification</b>                       |                                                    |                                                   |
| Number of contacts                                 | 2 CO (DPDT)                                        | 2 CO (DPDT)                                       |
| Rated current A                                    | 6                                                  | 10                                                |
| Maximum peak current A                             | 10                                                 | 20                                                |
| Rated load AC1 VA                                  | 1500                                               | 2500                                              |
| Rated load AC1.5 VA                                | 250                                                | 500                                               |
| Rated voltage/Max switching voltage V ~            | 250/400                                            | 250/400                                           |
| Breaking capacity in DC1: 30/110/220V A            | 6/0.3/0.13                                         | 10/0.3/0.13                                       |
| Minimum switching load mW (V/mA)                   | 300 [5/5]                                          | 300 [5/5]                                         |
| Single phase motor rating kW/HP                    | 0.185/0.3                                          | 0.37/0.6                                          |
| Standard contact material                          | Ag Ni                                              | Ag Ni                                             |
| <b>Coil specification</b>                          |                                                    |                                                   |
| Nominal voltage (U <sub>N</sub> ) V AC (50/60 Hz)  | —                                                  | —                                                 |
| Nominal voltage (U <sub>N</sub> ) V DC             | 6 - 12 - 14 - 24 - 28 - 48 - 60 - 110              | —                                                 |
| Rated power AC/DC/sensitive DC VA [50 Hz]/W/W      | —/0.65/0.5                                         | —/0.65/0.5                                        |
| Operating range V AC [50 Hz]                       | —                                                  | —                                                 |
| Operating range V DC/sensitive DC                  | (0.73+1.5)U <sub>N</sub> /(0.73+1.7)U <sub>N</sub> | (0.73+1.5)U <sub>N</sub> /(0.8+1.7)U <sub>N</sub> |
| <b>Technical data</b>                              |                                                    |                                                   |
| Mechanical life AC/DC cycles                       | —/20,000,000                                       | —/20,000,000                                      |
| Electrical life at rated load AC1 cycles           | 150,000                                            | 100,000                                           |
| Dielectric strength: between coil and contacts V ~ | 4000 [8 mm]                                        | 4000 [8 mm]                                       |
| between adjacent contacts V ~                      | 2000                                               | 2000                                              |
| Surge test (1.2/50 µs) between coil and contacts V | 6000                                               | 6000                                              |
| Insulation group conforming to VDE 0110            | C 250                                              | C 250                                             |
| Pickup time/Dropout time [bounce included] ms      | 15/20                                              | 15/20                                             |
| Ambient temperature °C                             | [−40 + +85]                                        | [−40 + +85]                                       |
| Protection category                                | IP 40                                              | IP 40                                             |
| Approvals: [according to type]                     | CE                                                 |                                                   |

**44 Series - DC VERSION DATA**

| Nominal voltage U <sub>N</sub> (V) | Operating range |        | Resistance R (Ω) | Nominal coil absorption I (mA) |
|------------------------------------|-----------------|--------|------------------|--------------------------------|
|                                    | U min.*         | U max. |                  |                                |
| 6                                  | 4.4             | 9      | 55               | 109                            |
| 9                                  | 6.6             | 13.5   | 125              | 72                             |
| 12                                 | 8.8             | 18     | 220              | 55                             |
| 14                                 | 10.2            | 21     | 300              | 47                             |
| 24                                 | 17.5            | 36     | 900              | 27                             |
| 28                                 | 20.5            | 42     | 1200             | 23                             |
| 48                                 | 35              | 72     | 3500             | 14                             |
| 60                                 | 43.8            | 90     | 5500             | 11                             |
| 110                                | 80.3            | 165    | 18000            | 6.1                            |

R values relate to + 20°C.

Tolerance of R and I values: ±10%.

**44 Series - SENSITIVE DC VERSION DATA**

| Nominal voltage U <sub>N</sub> (V) | Operating range |        | Resistance R (Ω) | Nominal coil absorption I (mA) |
|------------------------------------|-----------------|--------|------------------|--------------------------------|
|                                    | U min.*         | U max. |                  |                                |
| 6                                  | 4.4             | 10.5   | 75               | 80                             |
| 9                                  | 6.6             | 15.8   | 160              | 56                             |
| 12                                 | 8.8             | 21     | 300              | 40                             |
| 14                                 | 10.2            | 24.5   | 400              | 35                             |
| 24                                 | 17.5            | 42     | 1200             | 20                             |
| 28                                 | 20.5            | 49     | 1600             | 17.5                           |
| 48                                 | 35              | 84     | 4800             | 10                             |
| 60                                 | 43.8            | 105    | 7200             | 8.3                            |
| 110                                | 80.3            | 192    | 23500            | 4.7                            |

\*Umin = 0.8 U<sub>N</sub> for 44.62

**Ordering Information**

Example: a 44 series P.C.B. mount relay with 2 CO (DPDT) contacts, with coil rated at 12 V DC

|               |                                     |                  |                            |                           |
|---------------|-------------------------------------|------------------|----------------------------|---------------------------|
| <b>Series</b> | <b>4</b> <b>4</b> <b>5</b> <b>2</b> | <b>9</b>         | <b>0</b> <b>1</b> <b>2</b> | <b>Contact material</b>   |
| No. of poles  | 2 = 2 CO                            | 7 = Sensitive DC | 9 = DC                     | 4 = Ag SnO <sub>2</sub> * |
| Type          | 5 = P.C.B.<br>5 mm pinning - 6A     | 2 = 2 CO         | 006 - 6 V                  | 006 - 6 V                 |
|               | 6 = P.C.B.<br>5 mm pinning - 10A    | 012 - 12 V       | 012 - 12 V                 |                           |
|               |                                     | 014 - 14 V       | 014 - 14 V                 |                           |
|               |                                     | 024 - 24 V       | 024 - 24 V                 |                           |
|               |                                     | 028 - 28 V       | 028 - 28 V                 |                           |
|               |                                     | 048 - 48 V       | 048 - 48 V                 |                           |
|               |                                     | 060 - 60 V       | 060 - 60 V                 |                           |
|               |                                     | 110 - 110 V      | 110 - 110 V                |                           |

For standard relays with no options, use the first 8 digits only.

\* Not available for 44.52

## Sockets and Accessories 40 and 44 Series Relays



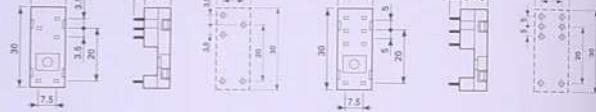
Relay type

P.C.B. socket

Retaining clip

|        | 40.31   | 40.51, 40.52, 40.61, 44.52, 44.62 |
|--------|---------|-----------------------------------|
| BLUE   | 95.13   | 95.15                             |
| BLACK* | 95.13.0 | 95.15.0                           |

|  |        |        |
|--|--------|--------|
|  | 095.51 | 095.51 |
|--|--------|--------|



95.13      95.15




Relay type

Screw terminal socket:

panel or DIN rail 46277 mount

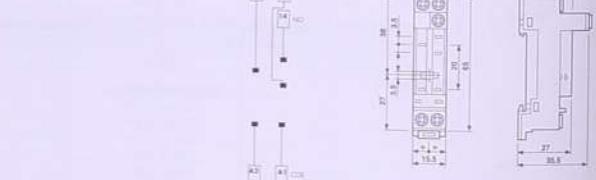
Retaining clip

Module

|        | 40.31   | 40.51, 40.52, 40.61, 44.52, 44.62 |
|--------|---------|-----------------------------------|
| BLUE   | 95.63   | —                                 |
| BLACK* | 95.63.0 | —                                 |

|  |        |   |
|--|--------|---|
|  | 095.71 | — |
|--|--------|---|

|  |       |   |
|--|-------|---|
|  | 99.01 | — |
|--|-------|---|



95.63



Relay type

Screw terminal socket:

panel or DIN rail 46277 mount

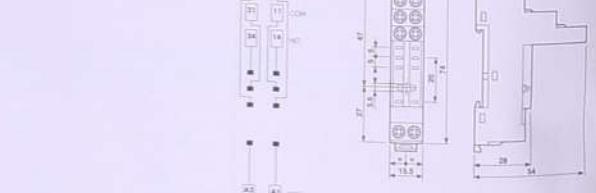
Retaining clip

Module

|        | 40.31 | 40.51, 40.52, 40.61, 44.52, 44.62 |
|--------|-------|-----------------------------------|
| BLUE   | —     | 95.75                             |
| BLACK* | —     | 95.75.0                           |

|  |        |   |
|--|--------|---|
|  | 095.71 | — |
|--|--------|---|

|  |       |   |
|--|-------|---|
|  | 99.01 | — |
|--|-------|---|



95.75



8 way jumper link

for 95.63, 95.75, 95.83.1 and 95.85.1 sockets

|  |        |
|--|--------|
|  | 095.08 |
|--|--------|

## Sockets and Accessories 40 and 44 Series Relays



99 Series modules for 95.63 and 95.75 sockets

|                                 | BLUE                | BLACK*           |
|---------------------------------|---------------------|------------------|
| Diode                           | (6 - 220) V DC      | 99.01.3.000.000  |
| Diode (inverted polarity)       | (6 - 220) V DC      | 99.01.2.000.000  |
| LED                             | (6 - 24) V DC/AC    | 99.01.0.024.59.0 |
| LED                             | (28 - 60) V DC/AC   | 99.01.0.050.59.0 |
| LED                             | (110 - 230) V DC/AC | 99.01.0.230.59.0 |
| LED + diode                     | (6 - 24) V DC       | 99.01.9.024.99.0 |
| LED + diode                     | (28 - 60) V DC      | 99.01.9.060.99.0 |
| LED + diode                     | (110 - 230) V DC    | 99.01.9.220.99.0 |
| LED + diode (inverted polarity) | (6 - 24) V DC       | 99.01.9.024.79.0 |
| LED + diode (inverted polarity) | (28 - 60) V DC      | 99.01.9.060.79.0 |
| LED + diode (inverted polarity) | (110 - 230) V DC    | 99.01.9.220.79.0 |
| LED + varistor                  | (6 - 24) V DC/AC    | 99.01.0.024.98.0 |
| LED + varistor                  | (28 - 60) V DC/AC   | 99.01.0.060.98.0 |
| LED + varistor                  | (110 - 230) V DC/AC | 99.01.0.230.98.0 |
| RC                              | (6 - 24) V DC/AC    | 99.01.0.024.09.0 |
| RC                              | (28 - 60) V DC/AC   | 99.01.0.060.09.0 |
| RC                              | (110 - 230) V DC/AC | 99.01.0.230.09.0 |
| No - remanence                  | (110 - 230) V AC    | 99.01.8.230.07.0 |
|                                 |                     | 99.01.8.230.07.0 |



Relay type

|                                                      | 40.31   | 40.51, 40.52, 40.61, 44.52, 44.62 |
|------------------------------------------------------|---------|-----------------------------------|
| Screw terminal socket:                               | BLUE    | 95.83.1                           |
| panel or DIN rail 46277 mount                        | BLACK*  | 95.83.10                          |
| Retaining and release clip                           | BLUE    | 095.91                            |
| Identification label for 95.83.1 and 95.85.1 sockets | BLACK*  | 095.91.0                          |
| Module                                               | 99.80.2 | 095.80.2                          |
|                                                      | 99.80   | 99.80                             |



CE



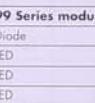
095.80.2



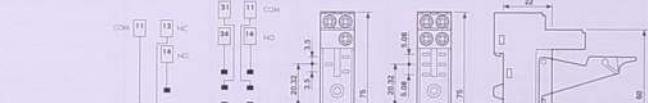
095.91



95.83.1



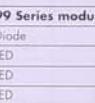
95.85.1



95.83.1      95.85.1



99.80



99.80.2

|                | BLUE                | BLACK*           |
|----------------|---------------------|------------------|
| Diode          | (6 - 220) V DC      | 99.80.3.000.000  |
| LED            | (6 - 24) V DC/AC    | 99.80.0.024.59.0 |
| LED            | (28 - 60) V DC/AC   | 99.80.0.060.59.0 |
| LED            | (110 - 230) V DC/AC | 99.80.0.230.59.0 |
| LED + diode    | (6 - 24) V DC       | 99.80.9.024.99.0 |
| LED + diode    | (28 - 60) V DC      | 99.80.9.060.99.0 |
| LED + diode    | (110 - 230) V DC    | 99.80.9.220.99.0 |
| LED + varistor | (6 - 24) V DC/AC    | 99.80.0.024.98.0 |
| LED + varistor | (28 - 60) V DC/AC   | 99.80.0.060.98.0 |
| LED + varistor | (110 - 230) V DC/AC | 99.80.0.230.98.0 |
| RC             | (6 - 24) V DC/AC    | 99.80.0.024.09.0 |
| RC             | (28 - 60) V DC/AC   | 99.80.0.060.09.0 |
| RC             | (110 - 230) V DC/AC | 99.80.0.230.09.0 |
| No - remanence | (110 - 230) V AC    | 99.80.8.230.07.0 |
|                |                     | 99.80.8.230.07.0 |

\* Available on request

# 45 Series Miniature P.C.B. Relays

## 45.61



### Mounting

### P.C.B.

### Contact specification

Number of contacts 1 NO (SPST - NO)

Rated current A 16

Maximum peak current A 30

Rated load AC1 VA 4000

Rated load AC15 VA 750

Rated voltage/Max switching voltage V~ 250/400

Breaking capacity in DC1 - 30/110/220V A 16/0.35/0.13

Minimum switching load mW (V/mA) 500 [0/5]

Single phase motor rating kW/HP 0.55/0.8

Standard contact material Ag CdO

### Coil specification

Nominal voltage (U<sub>n</sub>) V AC (50/60 Hz) —

V DC 4567411418134148400101212

Rated power AC/DC/sensitive DC VA (50 Hz)/W/W —/0.65/—

Operating range V AC (50 Hz) —

V DC/sensitive DC [(0.73 + 1.5)U<sub>n</sub>]/—

### Technical data

Mechanical life AC/DC cycles />20,000,000

Electrical life at rated load AC1 cycles 100,000 (+85°C)/50,000 (+125°C)

Dielectric strength between coil and contacts V~ 4000 [8 mm]

between adjacent contacts V~ —

Surge test (1.2/50 µs) between coil and contacts V 6000

Insulation group conforming to VDE 0110 C 250

Pickup time/Drop-out time (bounce included) ms 15/—

Ambient temperature °C [-40 + +125]

Protection category IP 67

Approvals: [according to type] CE, RoHS, REACH

## 45 Series - DC VERSION DATA

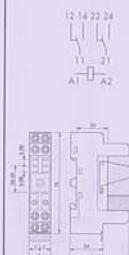
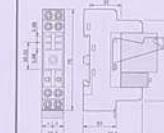
| Nominal voltage U <sub>n</sub> (V) | Operating range |            | Resistance R (Ω) | Nominal coil absorption I (mA) |
|------------------------------------|-----------------|------------|------------------|--------------------------------|
|                                    | U min. (V)      | U max. (V) |                  |                                |
| 6                                  | 4.4             | 9          | 55               | 109                            |
| 12                                 | 8.8             | 18         | 220              | 55                             |
| 24                                 | 17.5            | 36         | 900              | 27                             |
| 48                                 | 35              | 72         | 3500             | 14                             |
| 60                                 | 43.8            | 90         | 5500             | 11                             |
| 110                                | 80.3            | 165        | 18000            | 6.1                            |

R values relate to + 20°C

Tolerance of R and I values: ±10%

# 49 Series Relay Interface Modules

## 49.51



### DIN 46277

### DIN 46277

### DIN 46277

### Contact specification

Number of contacts 1 CO (SPDT) 2 CO (DPDT) 2 CO (DPDT)

Rated current A 10 6 5

Maximum peak current A 20 10 10

Rated load AC1 VA 2500 1500 1250

Rated load AC15 VA 500 250 250

Rated voltage/Max switching voltage V~ 250/400 250/400 250/400

Breaking capacity in DC1 - 30/110/220V A 10/0.3/0.12 6/0.3/0.13 5/0.3/0.12

Minimum switching load mW (V/mA) 300 [5/5] 300 [5/5] 300 [5/5]

Single phase motor rating kW/HP 0.37/0.6 0.185/0.3 0.185/0.3

Standard contact material Ag Ni Ag Ni Ag Ni

### Coil specification

Nominal voltage (U<sub>n</sub>) V AC (50/60 Hz) 12 - 24 - 230 12 - 24 - 230

V DC 12 - 24 12 - 24 —

Rated power AC/DC/sensitive DC VA (50 Hz)/W/W 1.2/—/0.5 —/—/0.5 1.2/—/—

Operating range V AC (50 Hz) [(0.8 + 1.1)U<sub>n</sub>] — [(0.8 + 1.1)U<sub>n</sub>] —

V DC/sensitive DC —/[(0.73 + 1.75)U<sub>n</sub>] —/[(0.73 + 1.75)U<sub>n</sub>] —/—

### Technical data

Mechanical life AC/DC cycles 10,000,000/20,000,000 —/20,000,000 10,000,000/—

Electrical life at rated load AC1 cycles 200,000 150,000 150,000

Dielectric strength between coil and contacts V~ 2000 2000 2000

between adjacent contacts V~ — 2000 2000

Surge test (1.2/50 µs) between coil and contacts V 4000 4000 4000

Insulation group conforming to VDE 0110 C 250 B 250 B 250

Pickup time/Drop-out time (bounce included) ms 15/20 15/20 15/20

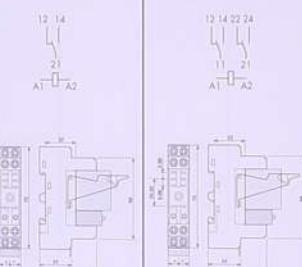
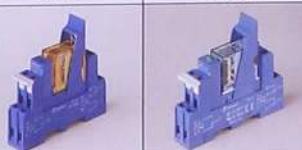
Ambient temperature °C (-40 + +70)°C (-40 + +70)°C (-40 + +70)°C

Protection category IP 40 IP 40 IP 40

Approvals: [according to type] CE

## 49 Series Relay Interface Modules

**49.61      49.62**



|                                                  |                   |                       |
|--------------------------------------------------|-------------------|-----------------------|
| Mounting                                         | DIN 46277         | DIN 46277             |
| <b>Contact specification</b>                     |                   |                       |
| Number of contacts                               | 1 CO (SPDT)       | 2 CO (DPDT)           |
| Rated current                                    | A                 | 16                    |
| Maximum peak current                             | A                 | 30                    |
| Rated load AC1                                   | VA                | 4000                  |
| Rated load AC15                                  | VA                | 750                   |
| Rated voltage/Max switching voltage              | V -               | 250/400               |
| Breaking capacity in DC1, 30/110/220V            | A                 | 16/0.3/0.12           |
| Minimum switching load                           | mW [V/mA]         | 500 [10/5]            |
| Single phase motor rating                        | kW/HP             | 0.55/0.8              |
| Standard contact material                        | Ag CdO            | Ag Ni                 |
| <b>Coil specification</b>                        |                   |                       |
| Nominal voltage [Un]                             | V AC [50/60 Hz]   | 12 - 24 - 230         |
|                                                  | V DC              | —                     |
| Rated power AC/DC/sensitive DC                   | VA [50 Hz]/W/W    | 1.2/-/0.5             |
| Operating range                                  | V AC [50 Hz]      | [0.8 + 1.1]Un         |
|                                                  | V DC/sensitive DC | —/[0.73 + 1.5]Un      |
| <b>Technical data</b>                            |                   |                       |
| Mechanical life AC/DC                            | cycles            | 10.000.000/20.000.000 |
| Electrical life at rated load AC1                | cycles            | 100.000               |
| Dielectric strength: between coil and contacts   | V -               | 2000                  |
| between adjacent contacts                        | V -               | —                     |
| Surge test (1.2/50 µs) between coil and contacts | V                 | 4000                  |
| Insulation group conforming to VDE 0110          | C 250             | C 250                 |
| Pick-up time/Drop-out time (bounce included)     | ms                | 15/20                 |
| Ambient temperature                              | °C                | [−40 + +70]           |
| Protection category                              |                   | IP 40                 |
| Approvals: (according to type)                   | CE                |                       |

## 49 Series DC Coil Data and Ordering Information

### 49 Series - AC VERSION DATA

| Rated voltage Un (V) | Operating range U min. (V) | U max. (V) | Resistance R (Ω) | Corrente I (mA) | Inductance with 1 UN 50 Hertz closed armature [H] |
|----------------------|----------------------------|------------|------------------|-----------------|---------------------------------------------------|
| 12                   | 9.6                        | 13.2       | 80               | 90              | 0.34                                              |
| 24                   | 19.2                       | 26.4       | 320              | 45              | 1.3                                               |
| 230                  | 184                        | 253        | 28000            | 4.5             | 132                                               |

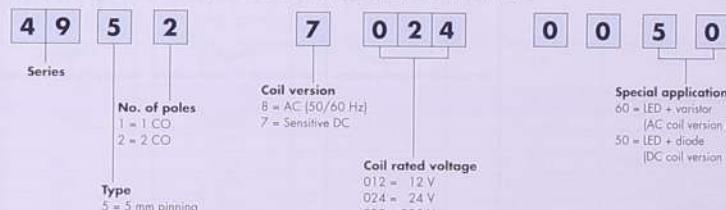
R values relate to + 20°C.  
Tolerance of R and I values: ±10%.

### 49 Series - SENSITIVE DC VERSION DATA

| Rated voltage Un (V) | Operating range U min. (V) | U max. (V) | Resistance R (Ω) | Nominal absorption I (mA) |
|----------------------|----------------------------|------------|------------------|---------------------------|
| 12                   | 8.8                        | 21         | 300              | 40                        |
| 24                   | 17.5                       | 42         | 1200             | 20                        |

### Ordering Information

Example: a 49 series DIN rail mount relay with 2 CO (DPDT) contacts, coil rated at 24 V sensitive DC.



For standard relays with no options or special applications, use the first 8 digits only.

## 55 Series Miniature General Purpose Relays

| 55.31                                     | 55.32                                     | 55.33                                     |
|-------------------------------------------|-------------------------------------------|-------------------------------------------|
|                                           |                                           |                                           |
| 1-4, 5-8<br><br>A1 A2                     | 1-4, 5-8<br><br>A1 A2                     | 1-4, 2-3, 5-8<br><br>A1 A2                |
| 20.8<br>27.8<br>37.132.37.<br>6.7.8.4.5.1 | 20.8<br>27.8<br>37.132.37.<br>6.7.8.4.5.1 | 20.8<br>27.8<br>37.132.37.<br>6.7.8.4.5.1 |
| 27.8<br>37.132.37.<br>6.7.8.4.5.1         | 27.8<br>37.132.37.<br>6.7.8.4.5.1         | 27.8<br>37.132.37.<br>6.7.8.4.5.1         |

| Mounting                     | Plug-in<br>for use with 94 Series sockets | Plug-in<br>for use with 94 Series sockets | Plug-in<br>for use with 94 Series sockets |
|------------------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
| <b>Contact specification</b> |                                           |                                           |                                           |

|                                     |                      |             |             |
|-------------------------------------|----------------------|-------------|-------------|
| Number of contacts                  | 1 CO (SPDT)          | 2 CO (DPDT) | 3 CO (3PDT) |
| Rated current                       | A 16                 | 10          | 10          |
| Maximum peak current                | A 30                 | 20          | 20          |
| Rated load AC1                      | VA 4000              | 2500        | 2500        |
| Rated load AC1.5                    | VA 750               | 500         | 500         |
| Rated voltage/Max switching voltage | V~ 250/400           | 250/400     | 250/400     |
| Breaking capacity in DC/10/110/220V | A 16/0.25/0.1        | 10/0.25/0.1 | 10/0.25/0.1 |
| Minimum switching load              | mW (V/mA) 500 (10/5) | 300 (5/5)   | 300 (5/5)   |
| Single phase motor rating           | kW/HP 0.8/1.2        | 0.37/0.6    | 0.37/0.6    |
| Standard contact material           | Ag CdO               | Ag Ni       | Ag Ni       |

|                                               |                              |                                               |
|-----------------------------------------------|------------------------------|-----------------------------------------------|
| <b>Coil specification</b>                     | V AC (50/60 Hz)              | 6 - 12 - 24 - 48 - 60 - 110 - 125 - 230 - 240 |
| Nominal voltage (U <sub>n</sub> )             | V DC                         | 6 - 12 - 24 - 48 - 60 - 110 - 125             |
| Rated power AC/DC/sensitive DC VA (50 Hz)/W/W | 1.5/1/-                      | 1.5/1/-                                       |
| Operating range V AC (50 Hz)                  | [0.8 + 1.1]U <sub>n</sub>    | [0.8 + 1.1]U <sub>n</sub>                     |
| Operating range V DC/sensitive DC             | [0.8 + 1.1]U <sub>n</sub> /— | [0.8 + 1.1]U <sub>n</sub> /—                  |

|                                                    |                              |                       |                       |                       |
|----------------------------------------------------|------------------------------|-----------------------|-----------------------|-----------------------|
| <b>Technical data</b>                              | Mechanical life AC/DC cycles | 20,000,000/50,000,000 | 20,000,000/50,000,000 | 20,000,000/50,000,000 |
| Electrical life at rated load AC1 cycles           | 100,000                      | 200,000               | 200,000               |                       |
| Dielectric strength: between coil and contacts V ~ | 2000                         | 2000                  | 2000                  |                       |
| between adjacent contacts V ~                      | —                            | 2000                  | 2000                  |                       |
| Surge test [1/2/50 µs] between coil and contacts V | 2500                         | 2500                  | 2500                  |                       |
| Insulation group conforming to VDE 0110            | B 250                        | B 250                 | B 250                 |                       |
| Pick-up time/Drop-out time [bounce included] ms    | 20/20                        | 20/20                 | 20/20                 |                       |
| Ambient temperature °C                             | [−40 + 70]                   | [−40 + 70]            | [−40 + 70]            |                       |
| Protection category                                | IP 40                        | IP 40                 | IP 40                 |                       |

|                                       |    |    |   |      |   |   |   |   |      |   |    |     |     |
|---------------------------------------|----|----|---|------|---|---|---|---|------|---|----|-----|-----|
| <b>Approvals:</b> (according to type) | CE | GS | B | GOST | D | F | P | N | RINA | S | UL | CSA | CCC |
|---------------------------------------|----|----|---|------|---|---|---|---|------|---|----|-----|-----|

## 55 Series Miniature General Purpose Relays

| 55.34                                     | 55.11                                     | 55.12                                     | 55.13                                     | 55.14                                     |
|-------------------------------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|-------------------------------------------|
|                                           |                                           |                                           |                                           |                                           |
| 1-4, 5-8<br><br>A1 A2                     | 1-4, 5-8<br><br>A1 A2                     | 5-4, 8<br>9-12<br>A1 A2                   | 1-4, 2-3, 5-8<br>9-12<br>A1 A2            | 1-4, 2-3, 5-8<br>9-12<br>A1 A2            |
| 20.8<br>27.8<br>37.132.37.<br>6.7.8.4.5.1 | 20.8<br>27.8<br>37.132.37.<br>6.7.8.4.5.1 | 20.8<br>27.8<br>37.132.37.<br>6.7.8.4.5.1 | 20.8<br>27.8<br>37.132.37.<br>6.7.8.4.5.1 | 20.8<br>27.8<br>37.132.37.<br>6.7.8.4.5.1 |
| 27.8<br>37.132.37.<br>6.7.8.4.5.1         | 27.8<br>37.132.37.<br>6.7.8.4.5.1         | 27.8<br>37.132.37.<br>6.7.8.4.5.1         | 27.8<br>37.132.37.<br>6.7.8.4.5.1         | 27.8<br>37.132.37.<br>6.7.8.4.5.1         |
| h= 35 mm                                  |

| Plug-in<br>for use with 94 Series sockets | P.C.B.      | P.C.B.      | P.C.B.      | P.C.B.      |
|-------------------------------------------|-------------|-------------|-------------|-------------|
| 4 CO (4PDT)                               | 1 CO (SPDT) | 2 CO (DPDT) | 3 CO (3PDT) | 4 CO (4PDT) |
| 5                                         | 16          | 10          | 10          | 5           |
| 10                                        | 30          | 20          | 20          | 10          |
| 1250                                      | 4000        | 2500        | 2500        | 1250        |
| 250                                       | 750         | 500         | 500         | 250         |
| 250/400                                   | 250/400     | 250/400     | 250/400     | 250/400     |
| 5/0.25/0.1                                | 16/0.25/0.1 | 10/0.25/0.1 | 10/0.25/0.1 | 5/0.25/0.1  |
| 300 (5/5)                                 | 500 (10/5)  | 300 (5/5)   | 300 (5/5)   | 300 (5/5)   |
| 0.125/0.2                                 | 0.8/1.2     | 0.37/0.6    | 0.37/0.6    | 0.125/0.2   |
| Ag Ni                                     | Ag CdO      | Ag Ni       | Ag Ni       | Ag Ni       |

|                                               |                                      |                                      |                                      |                                      |
|-----------------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|--------------------------------------|
| 6 - 12 - 24 - 48 - 60 - 110 - 125 - 230 - 240 | 6 - 12 - 24 - 48 - 60 - 110 - 125    | 1.5/1/-                              | 1.5/1/-                              | 1.5/1/-                              |
| 1.5/1/-<br>[0.8 + 1.1]U <sub>n</sub>          | 1.5/1/-<br>[0.8 + 1.1]U <sub>n</sub> | 1.5/1/-<br>[0.8 + 1.1]U <sub>n</sub> | 1.5/1/-<br>[0.8 + 1.1]U <sub>n</sub> | 1.5/1/-<br>[0.8 + 1.1]U <sub>n</sub> |
| [0.8 + 1.1]U <sub>n</sub> /—                  | [0.8 + 1.1]U <sub>n</sub> /—         | [0.8 + 1.1]U <sub>n</sub> /—         | [0.8 + 1.1]U <sub>n</sub> /—         | [0.8 + 1.1]U <sub>n</sub> /—         |
| 20,000,000/50,000,000                         | 20,000,000/50,000,000                | 20,000,000/50,000,000                | 20,000,000/50,000,000                | 20,000,000/50,000,000                |
| 150,000                                       | 100,000                              | 200,000                              | 200,000                              | 100,000                              |
| 2000                                          | 2000                                 | 2000                                 | 2000                                 | 2000                                 |
| 1550                                          | —                                    | 2000                                 | 2000                                 | 1550                                 |
| 2500                                          | 2500                                 | 2500                                 | 2500                                 | 2500                                 |
| B 250                                         | B 250                                | B 250                                | B 250                                | B 250                                |
| 20/20                                         | 20/20                                | 20/20                                | 20/20                                | 20/20                                |
| [−40 + 70]                                    | [−40 + 70]                           | [−40 + 70]                           | [−40 + 70]                           | [−40 + 70]                           |
| IP 40                                         | IP 40                                | IP 40                                | IP 40                                | IP 40                                |

**55 Series - AC VERSION DATA**

| Rated voltage<br>U <sub>r</sub> [V] | Operating range |               | Resistance<br>R [mΩ] | Nominal induction with absorption time t = U <sub>r</sub> · 30 ms<br>I [mA] | H     |
|-------------------------------------|-----------------|---------------|----------------------|-----------------------------------------------------------------------------|-------|
|                                     | U min.<br>[V]   | U max.<br>[V] |                      |                                                                             |       |
| 6                                   | 4.8             | 8.8           | 12                   | 230                                                                         | 0.872 |
| 12                                  | 9.6             | 13.2          | 50                   | 117                                                                         | 0.285 |
| 24                                  | 19.2            | 26.4          | 195                  | 58.3                                                                        | 1.16  |
| 48                                  | 38.4            | 52.8          | 770                  | 29.2                                                                        | 4.5   |
| 60                                  | 48              | 66            | 1205                 | 23.3                                                                        | 7.3   |
| 110                                 | 88              | 121           | 4000                 | 12.7                                                                        | 24.5  |
| 125                                 | 100             | 137.5         | 4700                 | 11.2                                                                        | 32    |
| 230                                 | 184             | 253           | 17000                | 6.1                                                                         | 100   |
| 240                                 | 192             | 264           | 19100                | 5.8                                                                         | 117   |

R values relate to +20°C.

Tolerance of R and I values: ±10%.

**Ordering Information**

Example: a 55 series plugin relay with 2 CO (DPDT) contacts, with coil rated at 12 V DC with a lockable test button and mechanical indicator.

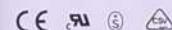
|                                                           |   |   |   |                                                 |   |   |   |                                                                                             |   |   |   |
|-----------------------------------------------------------|---|---|---|-------------------------------------------------|---|---|---|---------------------------------------------------------------------------------------------|---|---|---|
| 5                                                         | 5 | 3 | 2 | 9                                               | 0 | 1 | 2 | 0                                                                                           | 0 | 4 | 0 |
| <b>Series</b>                                             |   |   |   |                                                 |   |   |   |                                                                                             |   |   |   |
| Coil version                                              |   |   |   | Contact material                                |   |   |   | Special applications                                                                        |   |   |   |
| 3 = DC diode in parallel to the coil (positive to pin 10) |   |   |   | 2 = Ag CdO<br>5 = Ag Ni + Au (5µm) <sup>①</sup> |   |   |   | 5 = Top flange mount<br>6 = Rear flange mount                                               |   |   |   |
| 8 = AC (50/60 Hz)                                         |   |   |   |                                                 |   |   |   |                                                                                             |   |   |   |
| 9 = DC                                                    |   |   |   | Coil rated voltage                              |   |   |   | Light and mechanical indicators                                                             |   |   |   |
| No. of poles                                              |   |   |   | 006 = 6 V                                       |   |   |   | 1 = Lockable test button *<br>2 = Mechanical indicator                                      |   |   |   |
| 1 = 1 CO - 1SA                                            |   |   |   | 012 = 12 V                                      |   |   |   | 3 = LED (AC) *                                                                              |   |   |   |
| 2 = 2 CO - 1SA                                            |   |   |   | 024 = 24 V                                      |   |   |   | 4 = Lockable test button + mechanical indicator                                             |   |   |   |
| 3 = 3 CO - 1SA                                            |   |   |   | 048 = 48 V                                      |   |   |   | 5 = Lockable test button + LED (AC only) *                                                  |   |   |   |
| 4 = 4 CO - 5A                                             |   |   |   | 060 = 60 V                                      |   |   |   | 54 = Lockable test button + LED (AC only) + mechanical indicator                            |   |   |   |
| Type                                                      |   |   |   | 120 = 110 V                                     |   |   |   | 6 = LED + diode (positive to pin 14) DC only *                                              |   |   |   |
| 1 = PCB                                                   |   |   |   | 125 = 125 V                                     |   |   |   | 7 = Lockable test button + LED + diode (positive to pin 14) DC only *                       |   |   |   |
| 3 = Plugin                                                |   |   |   | 230 = 230 V                                     |   |   |   | 74 = Lockable test button + LED + diode (positive to pin 13) DC only *                      |   |   |   |
|                                                           |   |   |   | 340 = 240 V                                     |   |   |   | 8 = Lockable test button + LED + diode (positive to pin 13) DC only *                       |   |   |   |
|                                                           |   |   |   | 342 = 240 V                                     |   |   |   | 94 = Lockable test button + LED + diode (positive to pin 13) + mechanical indicator DC only |   |   |   |

\* Not available for top flange mount version.  
① Not available for 1CO(SPDT) and 3CO(SPDT) versions.  
② Not available for 1CO(SPDT) version.

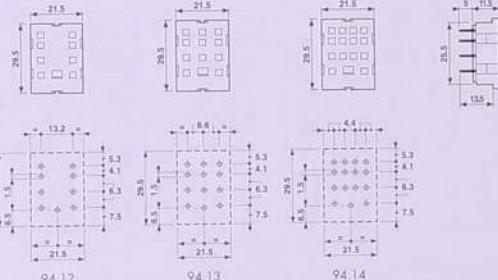
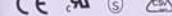
For standard relays with no options, use first 8 digits only.

**Relay type**

|                | <b>55.31, 55.32</b> | <b>55.33</b> | <b>55.34</b> |
|----------------|---------------------|--------------|--------------|
| P.C.B. socket  | BLUE 94.12          | 94.13        | 94.14        |
| Retaining clip | BLACK* 94.12.0      | 94.13.0      | 94.14.0      |
|                | 094.51              | 094.51       | 094.51       |



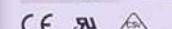
94.14



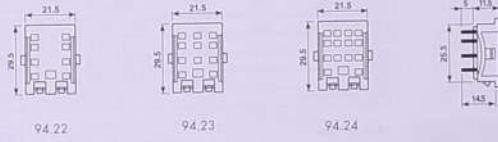
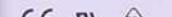
94.12 94.13 94.14

**Relay type**

|                        | <b>55.31, 55.32</b> | <b>55.33</b> | <b>55.34</b> |
|------------------------|---------------------|--------------|--------------|
| Solder socket:         | BLUE 94.22          | 94.23        | 94.24        |
| 1 mm thick panel mount | BLACK* 94.22.0      | 94.23.0      | 94.24.0      |
| Retaining clip         | 094.51              | 094.51       | 094.51       |



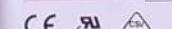
94.22



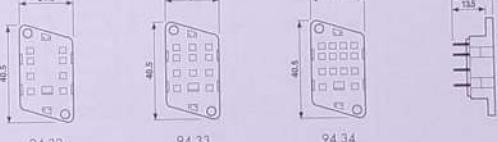
94.22 94.23 94.24

**Relay type**

|                     | <b>55.31, 55.32</b> | <b>55.33</b> | <b>55.34</b> |
|---------------------|---------------------|--------------|--------------|
| Panel mount socket: | BLUE 94.32          | 94.33        | 94.34        |
| M3 screw mount      | BLACK* 94.32.0      | 94.33.0      | 94.34.0      |
| Retaining clip      | 094.51              | 094.51       | 094.51       |



94.34



94.32 94.33 94.34

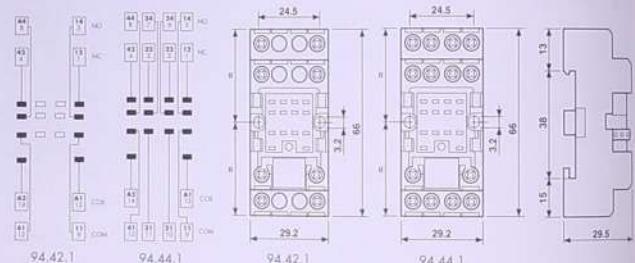
\* Available on request.

## Sockets and Accessories for 55 Series Relays



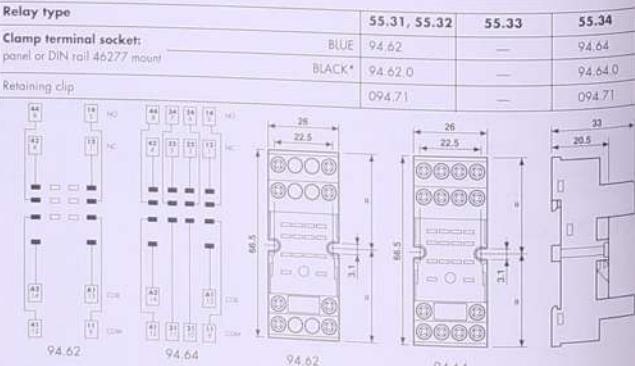
| Relay type                                              | 55.31, 55.32    | 55.33 | 55.34    |
|---------------------------------------------------------|-----------------|-------|----------|
| Screw terminal socket:<br>panel or DIN rail 46277 mount | BLUE 94.42.1    | —     | 94.44.1  |
|                                                         | BLACK* 94.42.10 | —     | 94.44.10 |
| Retaining clip                                          | 094.71          | —     | 094.71   |
| Module                                                  | 99.44           | —     | 99.44    |

CE



| 99 Series modules for 94.42.1 and 94.44.1 sockets | BLUE                | BLACK*         |
|---------------------------------------------------|---------------------|----------------|
| Diode                                             | (6...220) V DC      | 99.44.3.000.00 |
| Diode (inverted polarity)                         | (6...220) V DC      | 99.44.2.000.00 |
| LED                                               | [6...24] V DC/AC    | 99.44.0.024.59 |
| LED                                               | [28...60] V DC/AC   | 99.44.0.060.59 |
| LED                                               | [110...230] V DC/AC | 99.44.0.230.59 |
| LED + diode                                       | [6...24] V DC       | 99.44.9.024.99 |
| LED + diode                                       | [28...60] V DC      | 99.44.9.060.99 |
| LED + diode                                       | [110...230] V DC    | 99.44.9.220.99 |
| LED + varistor                                    | [6...24] V DC/AC    | 99.44.0.024.98 |
| LED + varistor                                    | [28...60] V DC/AC   | 99.44.0.060.98 |
| LED + varistor                                    | [110...230] V DC/AC | 99.44.0.230.98 |
| RC                                                | [6...24] V DC/AC    | 99.44.0.024.09 |
| RC                                                | [28...60] V DC/AC   | 99.44.0.060.09 |
| RC                                                | [110...230] V DC/AC | 99.44.0.230.09 |
| No - remanence                                    | [110...230] V AC    | 99.44.8.230.07 |

CE

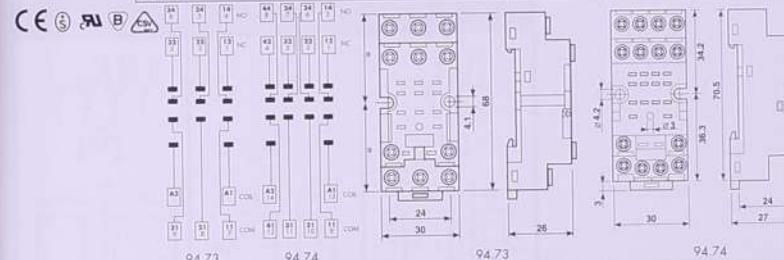


## Sockets and Accessories for 55 Series Relays



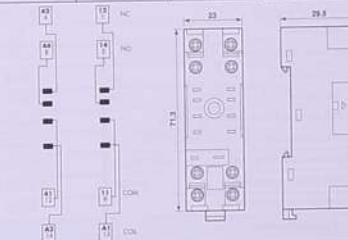
| Relay type                                              | 55.31, 55.32 | 55.33   | 55.34   |
|---------------------------------------------------------|--------------|---------|---------|
| Screw terminal socket:<br>panel or DIN rail 46277 mount | BLUE —       | 94.73   | 94.74   |
|                                                         | BLACK* —     | 94.73.0 | 94.74.0 |
| Retaining clip                                          | —            | 094.71  | 094.71  |
| Module                                                  | —            | 99.01   | 99.01   |

CE



| Relay type                                              | 55.31, 55.32   | 55.33 | 55.34 |
|---------------------------------------------------------|----------------|-------|-------|
| Screw terminal socket:<br>panel or DIN rail 46277 mount | BLUE 94.82     | —     | —     |
|                                                         | BLACK* 94.82.0 | —     | —     |
| Retaining clip                                          | 094.71         | —     | —     |
| Module                                                  | 99.01          | —     | —     |

CE



| 99 Series modules for 94.73, 94.74, 94.82 sockets | BLUE                | BLACK*         |
|---------------------------------------------------|---------------------|----------------|
| Diode                                             | (6...220) V DC      | 99.01.3.000.00 |
| Diode (inverted polarity)                         | (6...220) V DC      | 99.01.2.000.00 |
| LED                                               | [6...24] V DC/AC    | 99.01.0.024.59 |
| LED                                               | [28...60] V DC/AC   | 99.01.0.060.59 |
| LED                                               | [110...230] V DC/AC | 99.01.0.230.59 |
| LED + diode                                       | [6...24] V DC       | 99.01.9.024.99 |
| LED + diode                                       | [28...60] V DC      | 99.01.9.060.99 |
| LED + diode                                       | [110...230] V DC    | 99.01.9.220.99 |
| LED + diode (inverted polarity)                   | [6...24] V DC       | 99.01.9.024.79 |
| LED + diode (inverted polarity)                   | [28...60] V DC      | 99.01.9.060.79 |
| LED + diode (inverted polarity)                   | [110...230] V DC    | 99.01.9.220.79 |
| LED + varistor                                    | [6...24] V DC/AC    | 99.01.0.024.98 |
| LED + varistor                                    | [28...60] V DC/AC   | 99.01.0.060.98 |
| LED + varistor                                    | [110...230] V DC/AC | 99.01.0.230.98 |
| RC                                                | [6...24] V DC/AC    | 99.01.0.024.09 |
| RC                                                | [28...60] V DC/AC   | 99.01.0.060.09 |
| RC                                                | [110...230] V DC/AC | 99.01.0.230.09 |
| No - remanence                                    | [110...230] V AC    | 99.01.8.230.07 |

\* Available on request

## 56 Series Miniature Power Relays

| 56.32                                              | 56.32 - 0300                                  | 56.34                                     |
|----------------------------------------------------|-----------------------------------------------|-------------------------------------------|
|                                                    |                                               |                                           |
|                                                    |                                               |                                           |
| Mounting                                           | Plug-in<br>for use with 96 Series sockets     | Plug-in<br>for use with 96 Series sockets |
| <b>Contact specification</b>                       | Plug-in<br>for use with 96 Series sockets     | Plug-in<br>for use with 96 Series sockets |
| Number of contacts                                 | 2 CO [DPDT]                                   | 2 NO [DPST] 1.5 mm                        |
| Rated current                                      | A 12                                          | 12                                        |
| Maximum peak current                               | A 20                                          | 20                                        |
| Rated load AC1                                     | VA 3000                                       | 3000                                      |
| Rated load AC1.5                                   | VA 500                                        | 500                                       |
| Rated voltage/Max switching voltage                | V~ 250/400                                    | 250/400                                   |
| Breaking capacity in DC1: 30/110/220V              | A 12/0.25/0.1                                 | 12/0.6/0.3                                |
| Minimum switching load                             | mW (V/mA) 500 (10/5)                          | 500 (10/5)                                |
| Single phase motor rating                          | kW/HP 0.55/0.7                                | 0.55/0.7                                  |
| Standard contact material                          | Ag Ni                                         | Ag Ni                                     |
| <b>Coil specification</b>                          |                                               |                                           |
| Nominal voltage [U <sub>n</sub> ] V AC (50/60 Hz)  | 6 · 12 · 24 · 48 · 60 · 110 · 125 · 230 · 240 |                                           |
| V DC                                               | 6 · 12 · 24 · 48 · 60 · 110 · 125             | 6 · 12 · 24 · 48 · 60 · 110 · 125         |
| Rated power AC/DC/sensitive DC VA (50 Hz)/W/W      | 1.5/-                                         | 1.5/-                                     |
| Operating range V AC (50 Hz)                       | [0.8 ± 1.1]U <sub>n</sub>                     | [0.8 ± 1.1]U <sub>n</sub>                 |
| V DC/sensitive DC                                  | [0.85 ± 1.1]U <sub>n</sub> /-                 | [0.85 ± 1.1]U <sub>n</sub> /-             |
| <b>Technical data</b>                              |                                               |                                           |
| Mechanical life AC/DC cycles                       | 20.000.000/50.000.000                         | 20.000.000/-                              |
| Electrical life at rated load AC1 cycles           | 200.000                                       | 200.000                                   |
| Dielectric strength: between coil and contacts V~  | 2500                                          | 2500                                      |
| between adjacent contacts V~                       | 2500                                          | 2500                                      |
| Surge test [1.2/50 µs] between coil and contacts V | 4000                                          | 4000                                      |
| Insulation group conforming to VDE 0110            | C 250                                         | C 250                                     |
| Pick-up time/Drop-out time [bounce included] ms    | 20/20                                         | 20/-                                      |
| Ambient temperature °C                             | (-40 + +70)                                   | (-40 + +70)                               |
| Protection category                                | IP 40                                         | IP 40                                     |
| <b>Approvals:</b> (according to type)              | CE                                            | CE                                        |

## 56 Series Miniature Power Relays

| 56.42                                         | 56.42 - 0300              | 56.44                             |
|-----------------------------------------------|---------------------------|-----------------------------------|
|                                               |                           |                                   |
|                                               |                           |                                   |
| h = 35 mm                                     | h = 35 mm                 | h = 35.2 mm                       |
| <b>P.C.B.</b>                                 | <b>P.C.B.</b>             | <b>P.C.B.</b>                     |
| 2 CO [DPDT]                                   | 2 NO [DPST] 1.5 mm        | 4 CO [4PDT]                       |
| 12                                            | 12                        | 12                                |
| 20                                            | 20                        | 20                                |
| 3000                                          | 3000                      | 3000                              |
| 500                                           | 500                       | 500                               |
| 250/400                                       | 250/400                   | 250/400                           |
| 12/0.25/0.1                                   | 12/0.6/0.3                | 12/0.25/0.1                       |
| 500 (10/5)                                    | 500 (10/5)                | 500 (10/5)                        |
| 0.55/0.7                                      | 0.55/0.7                  | 0.55/0.7                          |
| Ag Ni                                         | Ag Ni                     | Ag Ni                             |
| 6 · 12 · 24 · 48 · 60 · 110 · 125 · 230 · 240 |                           |                                   |
| 6 · 12 · 24 · 48 · 60 · 110 · 125             | -                         | 6 · 12 · 24 · 48 · 60 · 110 · 125 |
| 1.5/-                                         | 1.5/-                     | 2/1.3/-                           |
| (0.8 ± 1.1)U <sub>n</sub>                     | (0.8 ± 1.1)U <sub>n</sub> | (0.8 ± 1.1)U <sub>n</sub>         |
| (0.85 ± 1.1)U <sub>n</sub> /-                 | -/-                       | (0.85 ± 1.1)U <sub>n</sub> /-     |
| 20.000.000/50.000.000                         | 20.000.000/-              | 20.000.000/50.000.000             |
| 200.000                                       | 200.000                   | 200.000                           |
| 2500                                          | 2500                      | 2500                              |
| 2500                                          | 2500                      | 2500                              |
| 4000                                          | 4000                      | 4000                              |
| C 250                                         | C 250                     | C 250                             |
| 20/20                                         | 20/-                      | 20/20                             |
| (-40 + +70)                                   | (-40 + +70)               | (-40 + +70)                       |
| IP 40                                         | IP 40                     | IP 40                             |
| <b>Approvals:</b> (according to type)         | CE                        | CE                                |

**56 Series - AC VERSION DATA (2 CO)**

| Rated voltage | Operating range |               | Resistance<br>(at 100 Hz) | Nominal absorption<br>(mA) | Inductance with<br>closed contacts<br>(nH) |
|---------------|-----------------|---------------|---------------------------|----------------------------|--------------------------------------------|
|               | U-min.<br>(V)   | U-max.<br>(V) |                           |                            |                                            |
| 24 (48)       | 4.8             | 6.6           | 12                        | 230                        | 6074                                       |
| 12            | 9.6             | 12.2          | 20                        | 177                        | 1285                                       |
| 24            | 19.2            | 26.4          | 59                        | 58.3                       | 116                                        |
| 48            | 38.4            | 50.8          | 77                        | 29.2                       | 45                                         |
| 60            | 48              | 56            | 120                       | 22.2                       | 72                                         |
| 110           | 88              | 121           | 240                       | 12.7                       | 24.3                                       |
| 125           | 100             | 127           | 4700                      | 11.5                       | 21                                         |
| 220           | 184             | 255           | 7700                      | 6.1                        | 105                                        |
| 240           | 192             | 264           | 10000                     | 5.8                        | 105                                        |

**56 Series - AC VERSION DATA (4 CO)**

| Rated voltage | Operating range |               | Resistance<br>(at 100 Hz) | Nominal absorption<br>(mA) | Inductance with<br>closed contacts<br>(nH) |
|---------------|-----------------|---------------|---------------------------|----------------------------|--------------------------------------------|
|               | U-min.<br>(V)   | U-max.<br>(V) |                           |                            |                                            |
| 6             | 4.8             | 6.6           | 6                         | 290                        | 6363                                       |
| 12            | 9.6             | 13.2          | 20                        | 150                        | 6244                                       |
| 24            | 19.2            | 26.4          | 60                        | 75                         | 6366                                       |
| 48            | 38.4            | 52.8          | 380                       | 36                         | 4                                          |
| 60            | 48              | 56            | 905                       | 28                         | 7                                          |
| 110           | 88              | 121           | 1900                      | 14.5                       | 20                                         |
| 125           | 100             | 127           | 2900                      | 14                         | 27                                         |
| 220           | 184             | 255           | 8500                      | 7.2                        | 98                                         |
| 240           | 192             | 264           | 10500                     | 6.9                        | 105                                        |

**56 Series - DC VERSION DATA (2 CO)**

| Rated voltage | Operating range |               | Resistance<br>(at 100 Hz) | Nominal absorption<br>(mA) | Inductance with<br>closed contacts<br>(nH) |
|---------------|-----------------|---------------|---------------------------|----------------------------|--------------------------------------------|
|               | U-min.<br>(V)   | U-max.<br>(V) |                           |                            |                                            |
| 6             | 5.1             | 6.6           | 44                        | 150                        |                                            |
| 12            | 10.2            | 13.2          | 125                       | 92                         |                                            |
| 24            | 20.4            | 26.4          | 500                       | 45                         |                                            |
| 48            | 41              | 52.8          | 1800                      | 25                         |                                            |
| 60            | 51              | 66            | 3000                      | 20                         |                                            |
| 110           | 93.5            | 121           | 12500                     | 10                         |                                            |
| 125           | 106.2           | 137           | 14200                     | 9                          |                                            |

F values relate to +20°C.  
Tolerance of U and I values: ±10%.

**Ordering information**

Example: 56 series plug-in relay with 2 CO (PDT) contacts, with coil rated at 12 V DC

**5 6 3 2 9 0 1 2**

Series

Coil version:  
3 = DC diode in parallel to  
the coil (positive to pin 7)  
2 = DC coil  
8 = AC (50/60 Hz)  
9 = DC

No. of poles:  
2 = 2 CO  
4 = 4 CO

Type:  
3 = Plug-in  
4 = PCB

**0 0 0 0**

Contact material:  
2 = Ag CdO  
4 = Ag SnO<sub>2</sub>

Contact circuit:  
3 = NO  
(2 CO only - AC)

Special applications:  
5 = Top flange mount  
6 = Rear flange mount  
7 = Top DIN rail mount  
(4 CO)

8 = Rear DIN rail mount  
(4 CO)

Light and mechanical indicators:  
1 = lockable test button + LED

3 = LED (AC) \*

4 = lockable test button + mechanical indicator \*

5 = lockable test button + LED (AC) \*

5A = lockable test button + LED (AC) +  
mechanical indicator \*

6 = LED + diode (positive to pin 8) DC only \*

7 = lockable test button + LED +  
diode (positive to pin 8) DC only \*

7A = lockable test button + LED + diode (positive to pin 8)

+ mechanical indicator DC only \*

8 = LED + diode (positive to pin 7) DC only \*

9 = lockable test button + LED +  
diode (positive to pin 7) DC only \*

9A = lockable test button + LED + diode (positive to pin 7)

+ mechanical indicator DC only \*

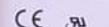
\* Not available for 4 CO (4PDT) version

\*\* Non-lockable test button available for 4 CO (4PDT) version

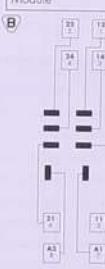
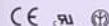
For standard relays with no options, use the first 8 digits only.


**Relay type**

|                |        |         |         |
|----------------|--------|---------|---------|
| P.C.B. socket  | BLUE   | 96.12   | 96.14   |
| Retaining clip | BLACK* | 96.12.0 | 96.14.0 |
|                |        | 094.51  | 094.51  |


**Relay type**

|                       |        |         |         |
|-----------------------|--------|---------|---------|
| Screw terminal socket | BLUE   | 96.72   | 96.74   |
| Retaining clip        | BLACK* | 96.72.0 | 96.74.0 |
| Module                |        | 094.71  | 096.71  |


**99 Series modules for 96.72, 96.74 socket**

|                                 |                     |                   |                   |
|---------------------------------|---------------------|-------------------|-------------------|
| Diode                           | [6...220] V DC      | 99.01.3.000.00.00 | 99.01.3.000.00.00 |
| Diode (inverted polarity)       | [6...220] V DC      | 99.01.2.000.00.00 | 99.01.2.000.00.00 |
| LED                             | [6...24] V DC/AC    | 99.01.0.024.59.00 | 99.01.0.024.59.00 |
| LED                             | [28...60] V DC/AC   | 99.01.0.060.59.00 | 99.01.0.060.59.00 |
| LED                             | [110...230] V DC/AC | 99.01.0.230.59.00 | 99.01.0.230.59.00 |
| LED + diode                     | [6...24] V DC       | 99.01.9.024.99.00 | 99.01.9.024.99.00 |
| LED + diode                     | [28...60] V DC      | 99.01.9.060.99.00 | 99.01.9.060.99.00 |
| LED + diode                     | [110...230] V DC    | 99.01.9.220.99.00 | 99.01.9.220.99.00 |
| LED + diode (inverted polarity) | [6...24] V DC       | 99.01.9.024.79.00 | 99.01.9.024.79.00 |
| LED + diode (inverted polarity) | [28...60] V DC      | 99.01.9.060.79.00 | 99.01.9.060.79.00 |
| LED + diode (inverted polarity) | [110...230] V DC    | 99.01.9.220.79.00 | 99.01.9.220.79.00 |
| LED + varistor                  | [6...24] V DC/AC    | 99.01.0.024.98.00 | 99.01.0.024.98.00 |
| LED + varistor                  | [28...60] V DC/AC   | 99.01.0.060.98.00 | 99.01.0.060.98.00 |
| LED + varistor                  | [110...230] V DC/AC | 99.01.0.230.98.00 | 99.01.0.230.98.00 |
| RC                              | [6...24] V DC/AC    | 99.01.0.230.98.00 | 99.01.0.230.98.00 |
| RC                              | [28...60] V DC/AC   | 99.01.0.060.09.00 | 99.01.0.060.09.00 |
| RC                              | [110...230] V DC/AC | 99.01.0.230.09.00 | 99.01.0.230.09.00 |
| No - remanence                  | [110...230] V AC    | 99.01.8.230.07.00 | 99.01.8.230.07.00 |

\* Available on request

## 60 Series General Purpose Relays

60.12

60.12 - 0200

60.13



## Mounting

Plug-in  
for use with 90 Series socketsPlug-in  
for use with 90 Series socketsPlug-in  
for use with 90 Series sockets

## Contact specification

Number of contacts

2 CO [DPDT]

2 CO [DPDT]

3 CO [3PDT]

Rated current A

10

6

10

Maximum peak current A

20

10

20

Rated load AC1 VA

2500

1500

2500

Rated load AC15 VA

500

250

500

Rated voltage/Max switching voltage V~

250/400

250/400

250/400

Breaking capacity in DC1: 30/110/220V A

10/0.4/0.15

6/0.3/0.12

10/0.4/0.15

Minimum switching load mW (V/mA)

500 (10/5)

50 (5/5)

500 (10/5)

Single phase motor rating kW/HP

0.37/0.6

0.185/0.3

0.37/0.6

Standard contact material

Ag Ni

Ag Ni bifurcated

Ag Ni

## Coil specification

Nominal voltage [U<sub>n</sub>] V AC (50/60 Hz)

6 - 12 - 24 - 48 - 60 - 110 - 125 - 230 - 240

V DC

6 - 12 - 24 - 48 - 60 - 110 - 125

V DC/sensitive DC

2.2/1.3/-

2.2/1.3/-

2.2/1.3/-

Rated power AC/DC/sensitive DC VA (50 Hz)/W/W

2.2/1.3/-

[0.8 + 1.1] U<sub>n</sub>[0.8 + 1.1] U<sub>n</sub>

Operating range V AC (50 Hz)

[0.85 + 1.1] U<sub>n</sub>/-[0.85 + 1.1] U<sub>n</sub>/-[0.85 + 1.1] U<sub>n</sub>/-

V DC/sensitive DC

[0.85 + 1.1] U<sub>n</sub>/-[0.85 + 1.1] U<sub>n</sub>/-[0.85 + 1.1] U<sub>n</sub>/-

## Technical data

Mechanical life AC/DC cycles

20 000 000/50 000 000

20 000 000/50 000 000

20 000 000/50 000 000

Electrical life at rated load AC1 cycles

200 000

200 000

200 000

Dielectric strength: between coil and contacts V~

2000

2000

2000

between adjacent contacts V~

2000

2000

2000

Surge test (1.2/50 µs) between coil and contacts V

2500

2500

2500

Insulation group conforming to VDE 0110

C 250

C 250

C 250

Pick-up time/Drop-out time (bounce included) ms

20/20

20/20

20/20

Ambient temperature °C

[-40 + +70]

[-40 + +70]

[-40 + +70]

Protection category

IP 40

IP 40

IP 40

Approvals: (according to type)

CE B GOST RINA

IEC N

UL CSA

## 60 Series General Purpose Relays

60.13 - 0200

60.32

60.33

60.42

60.43





## **60 Series General Purpose Relays**

| 60.62                                                                                                 | 60.63                                                                                                 |
|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
|                      |                      |
|                      |                      |
| - 30.2 -<br><br>10.0 | - 30.3 -<br><br>10.0 |

|          |                                                |                                                |
|----------|------------------------------------------------|------------------------------------------------|
| Mounting | Rear flange mount<br>Faston 187 (4.8 x 0.8 mm) | Rear flange mount<br>Faston 187 (4.8 x 0.8 mm) |
|----------|------------------------------------------------|------------------------------------------------|

### Contact specification

| Number of contacts                   |           | 2 CO (DPDT) | 3 CO (3PDT) |
|--------------------------------------|-----------|-------------|-------------|
| Rated current                        | A ..      | 10          | 10          |
| Maximum peak current                 | A ..      | 20          | 20          |
| Rated load AC1                       | VA        | 2500        | 2500        |
| Rated load AC1.5                     | VA        | 500         | 500         |
| Rated voltage /Max switching voltage | V ..      | 250/400     | 250/400     |
| Breaking capacity in DC1 30/110/220V | A ..      | 10/0.4/0.15 | 10/0.4/0.15 |
| Minimum switching load               | mW [V·mA] | 500 [10/5]  | 500 [10/5]  |
| Single phase motor rating            | kW/hp     | 0.37/0.6    | 0.37/0.6    |
| Standard contact material            |           | Ag Ni       | Ag Ni       |

### Coil specification

|                                              |                  |                                               |
|----------------------------------------------|------------------|-----------------------------------------------|
| Nominal voltage [Us]                         | V AC (50/60 Hz)  | 6...12...24...48...60...110...125...230...240 |
|                                              | V DC             | 6...12...24...48...60...110...125             |
| Rated power AC/DC/volatile DC [VA/50 Hz/W/W] | 2.2/1.3/-        | 2.2/1.3/-                                     |
| V AC (50 Hz)                                 | [0.8 + 1.1]Us    | [0.8 + 1.1]Us                                 |
| Operating range                              | V DC/volatile DC | [0.8 + 1.1]Us/-                               |

Technical Data



#### **60 Series AC/DC Coil Data and Ordering Information**

#### 60 Series - AC VERSION DATA

| Rated voltage<br>U <sub>r</sub> (V) | Operating range |               | Resistance<br>R, (Ω) | Nominal absorption<br>I <sub>a</sub> (mA) | Induction with<br>closed armature<br>(H) |
|-------------------------------------|-----------------|---------------|----------------------|-------------------------------------------|------------------------------------------|
|                                     | U min.<br>(V)   | U max.<br>(V) |                      |                                           |                                          |
| 6                                   | 4.8             | 6.6           | 4.6                  | 367                                       | 0.05                                     |
| 12                                  | 9.6             | 13.2          | 19                   | 183                                       | 0.2                                      |
| 24                                  | 19.2            | 26.4          | 80                   | 91.7                                      | 0.8                                      |
| 48                                  | 38.4            | 52.8          | 320                  | 45.8                                      | 3.2                                      |
| 60                                  | 48              | 66            | 500                  | 36.7                                      | 4.9                                      |
| 110                                 | 88              | 121           | 1800                 | 20                                        | 16.5                                     |
| 125                                 | 100             | 137.5         | 2000                 | 17.6                                      | 21.7                                     |
| 230                                 | 184             | 253           | 7250                 | 9.6                                       | 72                                       |
| 240                                 | 192             | 264           | 8500                 | 9.2                                       | 78                                       |

2 values relate to

The values of  $\beta$  and  $\gamma$  were set to 100.

60 Series - CURRENT SENSING AC

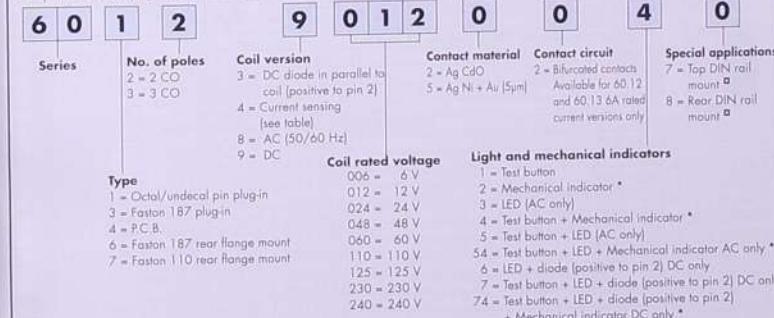
| Coil code | 1 min [Å] | 1n [Å] | 1 max [Å] | R [Ω] |
|-----------|-----------|--------|-----------|-------|
| 4501      | 4.25      | 5      | 6         | 0.01  |
| 4451      | 3.8       | 4.5    | 5.4       | 0.02  |
| 4401      | 3.4       | 4      | 4.8       | 0.02  |
| 4361      | 3         | 3.6    | 4.3       | 0.02  |
| 4321      | 2.7       | 3.2    | 3.8       | 0.03  |
| 4281      | 2.4       | 2.8    | 3.4       | 0.04  |
| 4251      | 2.1       | 2.5    | 3         | 0.05  |
| 4231      | 1.9       | 2.3    | 2.8       | 0.06  |
| 4201      | 1.7       | 2      | 2.4       | 0.08  |
| 4181      | 1.5       | 1.8    | 2.2       | 0.10  |
| 4161      | 1.4       | 1.6    | 1.9       | 0.12  |
| 4141      | 1.2       | 1.4    | 1.7       | 0.16  |
| 4121      | 1         | 1.2    | 1.4       | 0.22  |
| 4101      | 0.85      | 1      | 1.2       | 0.32  |
| 4091      | 0.8       | 0.9    | 1.1       | 0.40  |
| 4081      | 0.7       | 0.8    | 1         | 0.50  |
| 4071      | 0.6       | 0.7    | 0.9       | 0.65  |
| 4061      | 0.5       | 0.6    | 0.7       | 0.89  |
| 4051      | 0.42      | 0.5    | 0.6       | 1.28  |
| 4041      | 0.34      | 0.4    | 0.5       | 2     |
| 4031      | 0.25      | 0.3    | 0.4       | 3.57  |
| 4021      | 0.17      | 0.2    | 0.25      | 8     |
| 4011      | 0.085     | 0.1    | 0.15      | 32.1  |

60 Series - CURRENT SENSING DIODES

| Coil code | I min [A] | I n [A] | I max [A] | R [Ω] |
|-----------|-----------|---------|-----------|-------|
| 4502      | 4.25      | 5       | 6         | 0.02  |
| 4452      | 3.8       | 4.5     | 5.4       | 0.030 |
| 4402      | 3.4       | 4       | 4.8       | 0.038 |
| 4362      | 3         | 3.6     | 4.3       | 0.047 |
| 4322      | 2.7       | 3.2     | 3.8       | 0.059 |
| 4282      | 2.4       | 2.8     | 3.4       | 0.077 |
| 4252      | 2.1       | 2.5     | 3         | 0.10  |
| 4232      | 1.9       | 2.3     | 2.8       | 0.13  |
| 4202      | 1.7       | 2       | 2.4       | 0.15  |
| 4182      | 1.5       | 1.8     | 2.2       | 0.19  |
| 4162      | 1.4       | 1.6     | 1.9       | 0.24  |
| 4142      | 1.2       | 1.4     | 1.7       | 0.31  |
| 4122      | 1         | 1.2     | 1.4       | 0.42  |
| 4102      | 0.85      | 1       | 1.2       | 0.61  |
| 4092      | 0.8       | 0.9     | 1.1       | 0.75  |
| 4082      | 0.7       | 0.8     | 1         | 0.95  |
| 4072      | 0.6       | 0.7     | 0.9       | 1.24  |
| 4062      | 0.5       | 0.6     | 0.7       | 1.7   |
| 4052      | 0.42      | 0.5     | 0.6       | 2.40  |
| 4042      | 0.34      | 0.4     | 0.5       | 3.80  |
| 4032      | 0.25      | 0.3     | 0.4       | 6.7   |
| 4022      | 0.17      | 0.2     | 0.25      | 15.2  |
| 4012      | 0.085     | 0.1     | 0.15      | 61    |

#### **Ordering Information**

Example: a 60 series plug-in relay with 2 CO (DPDT) contacts, with coil rated at 12 V DC with optional test button and mechanical indicator.



• Available for AP 12 and 60 1.3 only

Available for 80-82 and 80-83 only

Please note that due to space restrictions, use the first 8 digits only.

## Sockets and Accessories for 60 Series relays

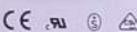
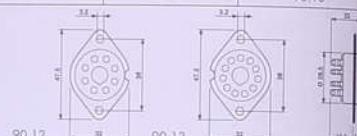


Relay type

Flange mount solder socket Flange mount with M3 screws

60.12 60.13

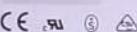
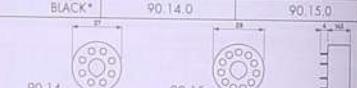
90.12 90.13



Relay type

P.C.B. socket  
BLUE  
BLACK\*

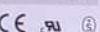
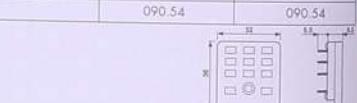
60.12 60.13

90.14 90.15  
90.14.0 90.15.0

Relay type

P.C.B. socket  
Retaining clip

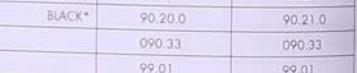
60.32 60.33

90.32 90.32  
090.54 090.54

Relay type

Clamp terminal socket:  
panel or DIN rail 46277 mount

60.12 60.13

90.20 90.21  
90.20.0 90.21.0

99 Series modules for 90.20 and 90.21 socket

Diode

BLUE BLACK\*

Diode (inverted polarity)

[6 - 220] V DC  
99.01.3.000.00

LED

[6 - 24] V DC/AC  
99.01.0.024.59

LED

[28 - 60] V DC/AC  
99.01.0.060.59

LED

(110 - 230) V DC/AC  
99.01.0.230.59

LED + diode

[6 - 24] V DC  
99.01.9.024.99

LED + diode

[28 - 60] V DC  
99.01.9.060.99

LED + diode

(110 - 230) V DC  
99.01.9.220.99

LED + diode (inverted polarity)

[6 - 24] V DC/AC  
99.01.9.024.79

LED + diode (inverted polarity)

[28 - 60] V DC  
99.01.9.060.79

LED + diode (inverted polarity)

(110 - 230) V DC  
99.01.9.220.79

LED + varistor

[6 - 24] V DC/AC  
99.01.0.024.98

LED + varistor

[28 - 60] V DC/AC  
99.01.0.060.98

RC

(110 - 230) V DC/AC  
99.01.0.230.98

RC

[6 - 24] V DC/AC  
99.01.0.024.09

RC

[28 - 60] V DC/AC  
99.01.0.060.99

No - remanence

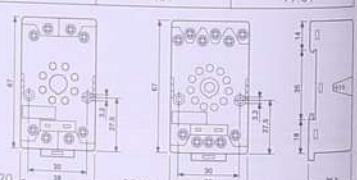
(110 - 230) V DC/AC  
99.01.0.230.09

(110 - 230) V AC

99.01.8.230.07

No - remanence

99.01.8.230.07



\*Available on request

## Sockets and Accessories for 60 Series relays



Relay type

Clamp terminal socket: panel or DIN rail 46277 mount

60.12

90.13



Relay type

Retaining clip

90.22

090.33



Relay type

Screw terminal socket: panel or DIN rail 46277 mount

60.12

90.13



Relay type

Retaining clip

90.22

090.33



Relay type

Clamp terminal socket: panel or DIN rail 46277 mount

60.12

90.13



Relay type

Retaining clip

90.22

090.33



Relay type

Module

90.12

90.13



Relay type

Multifunction timer module

90.12

90.13



Relay type

99 Series modules for 90.72 and 90.73 socket

BLUE

BLACK\*



Relay type

Diode

99.73.3.000.00

99.73.3.000.00



Relay type

LED

99.73.0.024.59

99.73.0.024.59



Relay type

LED

99.73.0.060.59

99.73.0.060.59



Relay type

LED

99.73.9.024.99

99.73.9.024.99



Relay type

LED + diode

99.73.9.024.99

99.73.9.024.99



Relay type

LED + diode

99.73.9.060.99

99.73.9.060.99



Relay type

LED + diode

99.73.9.220.99

99.73.9.220.99



Relay type

LED + varistor

99.73.0.024.98

99.73.0.024.98



Relay type

LED + varistor

99.73.0.060.98

99.73.0.060.98



Relay type

RC

99.73.0.024.09

99.73.0.024.09



Relay type

RC

99.73.0.060.09

99.73.0.060.09



Relay type

No - remanence

99.73.0.230.09

99.73.0.230.09



Relay type

(110 - 230) V AC

99.73.8.230.07

99.73.8.230.07

\*Available on request

## 62 Series Power Relays

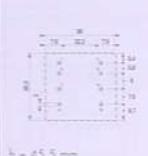
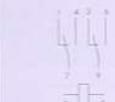
62.22



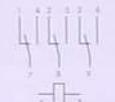
62.23



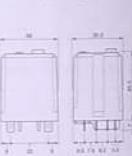
62.32



h = 45.5 mm



h = 45.5 mm



h = 45.5 mm

## Mounting

P.C.B.

P.C.B.

Plug-in  
for use with 92 Series sockets

## Contact specification

| Number of contacts                    | 2 CO [DPDT]            | 3 CO [3PDT]  | 2 CO [DPDT]  |
|---------------------------------------|------------------------|--------------|--------------|
| Rated current                         | A 16                   | 16*          | 16           |
| Maximum peak current                  | A 30                   | 30           | 30           |
| Rated load AC1                        | VA 4000                | 4000         | 4000         |
| Rated load AC1,5                      | VA 750                 | 750          | 750          |
| Rated voltage/Max switching voltage   | V~ 250/400             | 250/400      | 250/400      |
| Breaking capacity in DC1: 30/110/220V | A 16/0.6/0.4           | 16/0.6/0.4   | 16/0.6/0.4   |
| Minimum switching load                | mW (V/mA) 1000 (10/10) | 1000 (10/10) | 1000 (10/10) |
| Single phase motor rating             | kW/HP 0.8/1.2          | 0.8/1.2      | 0.8/1.2      |
| Standard contact material             | Ag CdO                 | Ag CdO       | Ag CdO       |

## Coil specification

|                                               |                                               |               |               |
|-----------------------------------------------|-----------------------------------------------|---------------|---------------|
| V AC [50/60 Hz]                               | 6 - 12 - 24 - 48 - 60 - 110 - 125 - 230 - 240 |               |               |
| V DC                                          | 6 - 12 - 24 - 48 - 60 - 110 - 125             |               |               |
| Rated power AC/DC/sensitive DC VA [50 Hz/W/W] | 2.2/1.3/-                                     | 2.2/1.3/-     | 2.2/1.3/-     |
| V AC [50 Hz]                                  | [0.8 + 1.1]Uh                                 | [0.8 + 1.1]Uh | [0.8 + 1.1]Uh |

|                                   |                  |                  |                  |
|-----------------------------------|------------------|------------------|------------------|
| Operating range V DC/sensitive DC | [0.85 + 1.1]Uh/- | [0.85 + 1.1]Uh/- | [0.85 + 1.1]Uh/- |
|-----------------------------------|------------------|------------------|------------------|

|                                                    |                       |                       |                       |
|----------------------------------------------------|-----------------------|-----------------------|-----------------------|
| Technical data                                     |                       |                       |                       |
| Mechanical life AC/DC cycles                       | 10,000,000/30,000,000 | 10,000,000/30,000,000 | 10,000,000/30,000,000 |
| Electrical life at rated load AC1 cycles           | 100,000               | 100,000               | 100,000               |
| Dielectric strength: between coil and contacts V~  | 2500                  | 2500                  | 2500                  |
| between adjacent contacts V~                       | 2500                  | 2500                  | 2500                  |
| Surge test (1/2/50 µs) between coil and contacts V | 4000                  | 4000                  | 4000                  |
| Insulation group conforming to VDE 0110            | C 400                 | C 400                 | C 400                 |
| Pick-up time/Dropout time [bounce included] ms     | 30/30                 | 30/30                 | 30/30                 |
| Ambient temperature °C                             | [−40 + 70]            | [−40 + 70]            | [−40 + 70]            |
| Protection category                                | IP 40                 | IP 40                 | IP 40                 |

## Approvals: (according to type)



## 62 Series Power Relays

## 62 Series Power Relays

62.33



62.42



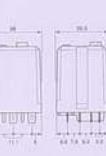
62.43



62.52



62.53



h = 45.5 mm



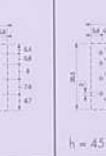
h = 45.5 mm



h = 45.5 mm



h = 45.5 mm



h = 45.5 mm

Plug-in  
for use with 92 Series sockets

P.C.B.

P.C.B.

P.C.B. with  
bifurcated terminalsP.C.B. with  
bifurcated terminals

3 CO [3PDT]

2 CO [DPDT]

3 CO [3PDT]

2 CO [DPDT]

3 CO [3PDT]

16\*

16

16\*

16

16\*

30

30

30

30

30

4000

4000

4000

4000

4000

750

750

750

750

750

250/400

250/400

250/400

250/400

250/400

16/0.6/0.4

16/0.6/0.4

16/0.6/0.4

16/0.6/0.4

16/0.6/0.4

1000 (10/10)

1000 (10/10)

1000 (10/10)

1000 (10/10)

1000 (10/10)

0.8/1.2

0.8/1.2

0.8/1.2

0.8/1.2

0.8/1.2

Ag CdO

Ag CdO

Ag CdO

Ag CdO

Ag CdO

6 - 12 - 24 - 48 - 60 - 110 - 125 - 230 - 240

6 - 12 - 24 - 48 - 60 - 110 - 125

2.2/1.3/-

2.2/1.3/-

2.2/1.3/-

2.2/1.3/-

2.2/1.3/-

(0.8 + 1.1)Uh

(0.8 + 1.1)Uh/-

10,000,000/30,000,000

10,000,000/30,000,000

10,000,000/30,000,000

10,000,000/30,000,000

10,000,000/30,000,000

100,000

100,000

100,000

100,000

100,000

2500

2500

2500

2500

2500

2500

2500

2500

2500

2500

4000

4000

4000

4000

4000

C 400

C 400

C 400

C 400

C 400

20/20

20/20

20/20

20/20

20/20

[−40 + +70]

[−40 + +70]

[−40 + +70]

[−40 + +70]

[−40 + +70]

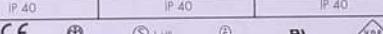
IP 40

IP 40

IP 40

IP 40

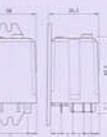
IP 40



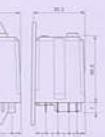
\*If different phases are connected to adjacent contacts the rated current is reduced from 16 to 10 A.

## 62 Series Power Relays

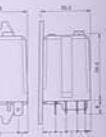
62.62



62.63



62.82



## Mounting

Rear flange mount

Faston 187 (4.8 x 0.5 mm)

Rear flange mount

Faston 187 (4.8 x 0.5 mm)

Rear flange mount

Faston 250 (6.3 x 0.8 mm)

## Contact specification

Number of contacts

2 CO [DPDT]

3 CO [3PDT]

2 CO [DPDT]

Rated current

A

16

16\*

16

Maximum peak current

A

30

30

30

Rated load AC1

VA

4000

4000

4000

Rated load AC15

VA

750

750

750

Rated voltage/Max switching voltage

V

250/400

250/400

250/400

Breaking capacity in DC1-30/110/220V A

16/0.6/0.4

16/0.6/0.4

16/0.6/0.4

Minimum switching load mW (V/mA)

1000 [10/10]

1000 [10/10]

1000 [10/10]

Single phase motor rating kW/HP

0.8/1.2

0.8/1.2

0.8/1.2

Standard contact material

Ag CdO

Ag CdO

Ag CdO

## Coil specification

V AC (50/60 Hz)

6 - 12 - 24 - 48 - 60 - 110 - 125 - 230 - 240

V DC

6 - 12 - 24 - 48 - 60 - 110 - 125

Rated power AC/DC/sensitive DC VA (50 Hz)/W/W

2.2/1.3/-

2.2/1.3/-

2.2/1.3/-

Operating range V AC (50 Hz)

[0.8 + 1.1]UH

[0.8 + 1.1]UH

[0.8 + 1.1]UH

Operating range V DC/sensitive DC

[0.85 + 1.1]UH/-

[0.85 + 1.1]UH/-

[0.85 + 1.1]UH/-

## Technical data

Mechanical life AC/DC cycles

10,000,000/30,000,000

10,000,000/30,000,000

10,000,000/30,000,000

Electrical life at rated load AC1 cycles

100,000

100,000

100,000

Dielectric strength between coil and contacts V~

2500

2500

2500

Dielectric strength between adjacent contacts V~

2500

2500

2500

Surge test (1/2/50 µs) between coil and contacts V

4000

4000

4000

Insulation group conforming to VDE 0110

C 400

C 400

C 400

Pick-up time/Drop-out time (bounce included) ms

30/30

30/30

30/30

Ambient temperature °C

[-40 + +70]

[-40 + +70]

[-40 + +70]

Protection category IP 40

IP 40

IP 40

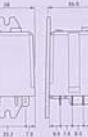
IP 40

Approvals: (according to type)

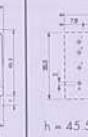


## 62 Series Power Relays

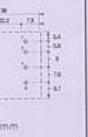
62.83



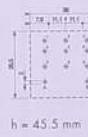
62.22 - 0300



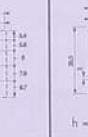
62.23 - 0300



62.52 - 0300



62.53 - 0300



\*If different phases are connected to adjacent contacts the rated current is reduced from 16 to 10 A.

## 62 Series Power Relays

|                                                    | <b>62.82 - 0300</b>                            | <b>62.83 - 0300</b>                            |
|----------------------------------------------------|------------------------------------------------|------------------------------------------------|
| <b>Mounting</b>                                    | Rear flange mount<br>Faston 250 (6.3 x 0.8 mm) | Rear flange mount<br>Faston 250 (6.3 x 0.8 mm) |
| <b>Contact specification</b>                       |                                                |                                                |
| Number of contacts                                 | 2 NO (DPST-NO) 3 mm                            | 3 NO (3PST-NO) 3 mm                            |
| Rated current A                                    | 20                                             | 16*                                            |
| Maximum peak current A                             | 40                                             | 30                                             |
| Rated load AC1 VA                                  | 5000                                           | 4000                                           |
| Rated load AC15 VA                                 | 1000                                           | 750                                            |
| Rated voltage/Max switching voltage V              | 250/400                                        | 250/400                                        |
| Breaking capacity in DC1: 30/110/220V A            | 20/1.1/0.7                                     | 16/0.6/0.4                                     |
| Minimum switching load mW [V mA]                   | 1000 [10/10]                                   | 1000 [10/10]                                   |
| Single phase motor rating kW/HP                    | 0.8/1.2                                        | 0.8/1.2                                        |
| Standard contact material                          | Ag CdO                                         | Ag CdO                                         |
| <b>Coil specification</b>                          |                                                |                                                |
| Nominal voltage [Un] V AC [50/60 Hz]               | 6 - 12 - 24 - 48 - 110 - 125 - 230 - 240       |                                                |
| V DC                                               | 6 - 12 - 24 - 48 - 60 - 110 - 125              |                                                |
| Rated power AC/DC/sensitive DC VA [50 Hz/W/W]      | 3/3/-                                          | 3/3/-                                          |
| V AC [50 Hz]                                       | [0.85 + 1.1] Un                                | [0.85 + 1.1] Un                                |
| V DC/sensitive DC                                  | [0.85 + 1.1] Un/-                              | [0.85 + 1.1] Un/-                              |
| <b>Technical data</b>                              |                                                |                                                |
| Mechanical life AC/DC cycles                       | 10,000,000/30,000,000                          | 10,000,000/30,000,000                          |
| Electrical life at rated load AC1 cycles           | 80,000                                         | 100,000                                        |
| Dielectric strength: between coil and contacts V   | 2500                                           | 2500                                           |
| between adjacent contacts V                        | 2500                                           | 2500                                           |
| Surge test (1.2/50 µs) between coil and contacts V | 4000                                           | 4000                                           |
| Insulation group conforming to VDE 0110            | C 400                                          | C 400                                          |
| Pick-up time/Drop-out time (bounce included) ms    | 30/-                                           | 30/-                                           |
| Ambient temperature °C                             | [-40 + +50]                                    | [-40 + +50]                                    |
| Protection category                                | IP 40                                          | IP 40                                          |
| <b>Approvals:</b> (according to type)              |                                                |                                                |

\* If different phases are connected to adjacent contacts the rated current is reduced from 16 to 10 A.

## 62 Series AC/DC Coil Data and Ordering Information

### 62 Series - AC VERSION DATA

| Rated voltage Un [V] | U min. |      | U max. |      | Resistance |      | Nominal absorption 1 of Un at 50 Hz [mA] |      | Inductance with closed armature [H] |       |
|----------------------|--------|------|--------|------|------------|------|------------------------------------------|------|-------------------------------------|-------|
|                      | CO     | NO   | CO     | NO   | CO         | NO   | CO                                       | NO   | CO                                  | NO    |
| 6                    | 4.8    | 5.1  | 6.6    | 6.6  | 4.6        | 3.5  | 367                                      | 550  | 0.05                                | 0.032 |
| 12                   | 9.6    | 10.2 | 13.2   | 13.2 | 19         | 14   | 183                                      | 275  | 0.2                                 | 0.13  |
| 24                   | 19.2   | 20.4 | 26.4   | 26.4 | 80         | 67   | 92                                       | 137  | 0.8                                 | 0.52  |
| 48                   | 38.4   | 40.8 | 52.8   | 52.8 | 320        | 220  | 46                                       | 70   | 3.2                                 | 2     |
| 60                   | 48     | 51   | 66     | 66   | 500        | 350  | 37                                       | 55   | 4.9                                 | 3.3   |
| 110                  | 88     | 93.5 | 121    | 121  | 1800       | 1200 | 20                                       | 30   | 16.5                                | 11    |
| 125                  | 100    | 106  | 137    | 137  | 2000       | 1400 | 17.6                                     | 26   | 22                                  | 14.6  |
| 230                  | 184    | 196  | 253    | 253  | 7250       | 5000 | 10.4                                     | 14   | 66                                  | 50    |
| 240                  | 192    | 204  | 264    | 264  | 8500       | 5300 | 9.2                                      | 13.2 | 78                                  | 55    |

### 62 Series - DC VERSION DATA

| Rated voltage Un [V] | U min. |      | U max. |      | Resistance |      | Nominal absorption 1 of Un [mA] |     |
|----------------------|--------|------|--------|------|------------|------|---------------------------------|-----|
|                      | CO     | NO   | CO     | NO   | CO         | NO   | CO                              | NO  |
| 6                    | 4.8    | 5.1  | 6.6    | 6.6  | 28         | 12   | 214                             | 500 |
| 12                   | 9.6    | 10.2 | 13.2   | 13.2 | 110        | 48   | 109                             | 250 |
| 24                   | 19.2   | 20.4 | 26.4   | 26.4 | 445        | 192  | 54                              | 125 |
| 48                   | 38.4   | 40.8 | 52.8   | 52.8 | 1770       | 770  | 27                              | 63  |
| 60                   | 48     | 51   | 66     | 66   | 2760       | 1200 | 21.7                            | 50  |
| 110                  | 88     | 93.5 | 121    | 121  | 9420       | 4000 | 11.7                            | 27  |
| 125                  | 100    | 106  | 137    | 137  | 12000      | 5200 | 10.4                            | 24  |

R values relate to + 20°C

Tolerance of R and I values: ± 10%.

### Ordering Information

Example: a 62 series FASTON 187 rear flange mount relay with 2 CO (DPDT) contacts, with coil rated at 12 V DC.

|                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                       |                                 |                                                                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|----------------------------------------------------------------------------|
| <b>Series</b>                                                                                                                                                                 | <b>Coil version</b>                                                                                                                                                                                                                                                                                   | <b>Contact material</b>         | <b>Special applications</b>                                                |
| 6 2 8 2                                                                                                                                                                       | 3 = DC diode in parallel (positive to A)<br>8 = AC [50/60 Hz]<br>9 = DC                                                                                                                                                                                                                               | 4 = Ag Sn O <sub>2</sub>        | 5 = Top mount flanges<br>7 = Top DIN rail mount<br>8 = Rear DIN rail mount |
| <b>No. of poles</b>                                                                                                                                                           | <b>Coil rated current</b>                                                                                                                                                                                                                                                                             | <b>Contact circuit</b>          |                                                                            |
| 2 = 2 CO<br>3 = 3 CO                                                                                                                                                          | 006 = 6 V<br>012 = 12 V<br>024 = 24 V<br>048 = 48 V<br>060 = 60 V<br>110 = 110 V<br>125 = 125 V<br>230 = 230 V<br>240 = 240 V                                                                                                                                                                         | 3 = 62.2x, 62.5x,<br>62.8x only |                                                                            |
| <b>Type</b>                                                                                                                                                                   | <b>Light and mechanical indicators</b>                                                                                                                                                                                                                                                                |                                 |                                                                            |
| 2 = P.C.B. - 16A<br>3 = Plug-in - 16A<br>4 = P.C.B. - 16A<br>5 = P.C.B. - 16A<br>6 = FASTON 187, with rear flange mount - 16A<br>8 = FASTON 187, with rear flange mount - 16A | 1 = Test button *<br>3 = LED (AC only) *<br>5 = Test button + LED (AC only) *<br>6 = LED + diode (positive to A) DC only *<br>7 = Test button + LED + diode (positive to A) DC only *<br>8 = LED + diode (positive to pin B) DC only *<br>9 = Test button + LED + diode (positive to pin B) DC only * |                                 |                                                                            |

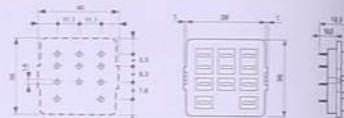
For standard relays with no options, use the first 8 digits only.



92.13

CE 94

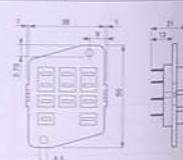
| Relay type     | 62.32  | 62.33   |
|----------------|--------|---------|
| P.C.B. socket  | BLUE   | 92.13   |
|                | BLACK* | 92.13.0 |
| Retaining clip | 092.54 | 092.54  |



92.33

CE 94

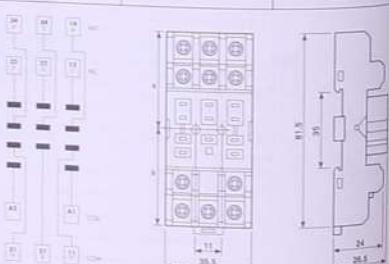
| Relay type                                           | 62.32  | 62.33   |
|------------------------------------------------------|--------|---------|
| Panel mount solder socket:<br>mounted with M3 screws | BLUE   | 92.33   |
|                                                      | BLACK* | 92.33.0 |
| Retaining clip                                       | 092.54 | 092.54  |



92.43.1

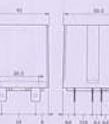
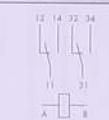
CE 94

| Relay type                                              | 62.32  | 62.33    |
|---------------------------------------------------------|--------|----------|
| Screw terminal socket:<br>panel or DIN rail 46277 mount | BLUE   | 92.43.1  |
|                                                         | BLACK* | 92.43.10 |
| Retaining clip                                          | 092.53 | 092.53   |
| Protective cover IP 20                                  | 092.55 | 092.55   |

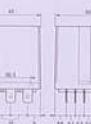


\* Available on request

65.12



65.13



65.22



## Mounting

**Ø 3 mm Screw Mount**  
Faston 250 (6.3 x 0.8 mm)

**Ø 3 mm Screw Mount**  
Faston 250 (6.3 x 0.8 mm)

**09052 Bracket**  
Faston 250 (6.3 x 0.8 mm)

## Contact specification

|                                       |                        |              |              |
|---------------------------------------|------------------------|--------------|--------------|
| Number of contacts                    | 2 CO [DPDT]            | 3 CO [3PDT]  | 2 CO [DPDT]  |
| Rated current                         | A 16                   | 16           | 16           |
| Maximum peak current                  | A 30                   | 30           | 30           |
| Rated load AC1                        | VA 4000                | 4000         | 4000         |
| Rated load AC1.5                      | VA 750                 | 750          | 750          |
| Rated voltage/Max switching voltage   | V ~ 250/400            | 250/400      | 250/400      |
| Breaking capacity in DC1: 30/110/220V | A 16/0.6/0.4           | 16/0.6/0.4   | 16/0.6/0.4   |
| Minimum switching load                | mW (V/mA) 1000 (10/10) | 1000 (10/10) | 1000 (10/10) |
| Single phase motor rating             | kW/HP 0.8/1.2          | 0.8/1.2      | 0.8/1.2      |
| Standard contact material             | Ag CdO                 | Ag CdO       | Ag CdO       |

## Coil specification

|                                   |                                                 |                                               |
|-----------------------------------|-------------------------------------------------|-----------------------------------------------|
| Nominal voltage (U <sub>n</sub> ) | V AC [50/60 Hz]                                 | 6 - 12 - 24 - 48 - 60 - 110 - 125 - 230 - 240 |
|                                   | V DC                                            | 6 - 12 - 24 - 48 - 60 - 110 - 125             |
| Rated power AC/DC/sensitive DC    | VA (50 Hz)/W/W 2.2/1.3/-                        | 2.2/1.3/-                                     |
|                                   | V AC (50 Hz)  0.8 + 1.1 U <sub>n</sub>          | 0.8 + 1.1 U <sub>n</sub>                      |
| Operating range                   | V DC/sensitive DC  0.85 + 1.1 U <sub>n</sub> /- | 0.85 + 1.1 U <sub>n</sub> /-                  |

## Technical data

|                                                    |                              |                       |                       |
|----------------------------------------------------|------------------------------|-----------------------|-----------------------|
| Mechanical life AC/DC                              | cycles 10,000,000/30,000,000 | 10,000,000/30,000,000 | 10,000,000/30,000,000 |
| Electrical life at rated load AC1                  | cycles 200,000               | 200,000               | 200,000               |
| Dielectric strength: between coil and contacts V ~ | 2000                         | 2000                  | 2000                  |
| between adjacent contacts V ~                      | 2500                         | 2500                  | 2500                  |
| Surge test (1.2/50 µs) between coil and contacts V | 2500                         | 2500                  | 2500                  |
| Insulation group conforming to VDE 0110            | C 250                        | C 250                 | C 250                 |
| Pick-up time/Drop-out time (bounce included)       | ms 30/30                     | 30/30                 | 30/30                 |
| Ambient temperature                                | °C  −40 + 50                 | −40 + 50              | −40 + 50              |
| Protection category                                | IP 40                        | IP 40                 | IP 40                 |

Approvals: (according to type)

CE

IEC

S

UL

FCC

VDE

GS

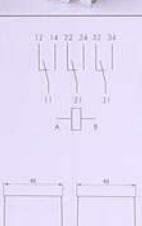
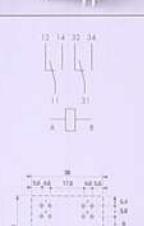
TUV

BSI

NEMKO

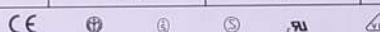
KEMA

## **65 Series Power Relays**

| 65.23                                                                                                                                                                       | 65.52                                                                                                                                                             | 65.53                                                                                                                                                                       |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                            |                                                                                  |                                                                                            |
| <p>12 - 14 - 22 - 24 - 32 - 34<br/>11 - 21 - 21</p> <p>A — B</p>  <p>65 mm 80 mm 54 mm</p> | <p>12 - 14 - 32 - 34<br/>11 - 21 - 21</p> <p>A — B</p>  <p>65 mm 80 mm 54 mm</p> | <p>12 - 14 - 23 - 24 - 32 - 34<br/>11 - 21 - 21</p> <p>A — B</p>  <p>65 mm 80 mm 54 mm</p> |



## **65 Series Power Relays**



**65 Series - AC VERSION DATA**

| Rated voltage<br>U <sub>r</sub> [V] | Operating range |               | Resistance<br>R [Ω] | Nominal absorption<br>I <sub>r</sub> at U <sub>r</sub> 50 Hz<br>[mA] | Inductance with<br>closed armature<br>[H] |
|-------------------------------------|-----------------|---------------|---------------------|----------------------------------------------------------------------|-------------------------------------------|
|                                     | U min.<br>[M]   | U max.<br>[M] |                     |                                                                      |                                           |
| 6                                   | 4.8             | 6.6           | 4.6                 | 367                                                                  | 0.05                                      |
| 12                                  | 9.6             | 13.2          | 19                  | 183                                                                  | 0.2                                       |
| 24                                  | 19.2            | 26.4          | 80                  | 91.7                                                                 | 0.8                                       |
| 48                                  | 38.4            | 52.8          | 320                 | 45.8                                                                 | 3.2                                       |
| 60                                  | 48              | 66            | 500                 | 36.7                                                                 | 5                                         |
| 110                                 | 88              | 121           | 1800                | 20                                                                   | 16.5                                      |
| 125                                 | 100             | 137.5         | 2000                | 17.6                                                                 | 22                                        |
| 230                                 | 184             | 253           | 7250                | 10.4                                                                 | 66                                        |
| 240                                 | 192             | 264           | 8500                | 9.2                                                                  | 78                                        |

R values relate to + 20°C.

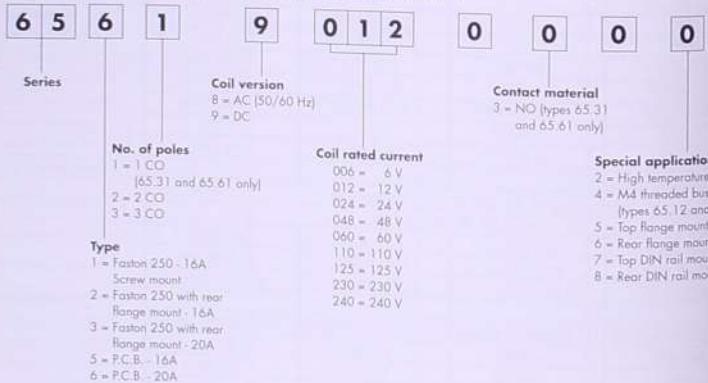
Tolerance of R and I values: ±10%.

**65 Series - DC VERSION DATA**

| Rated voltage<br>U <sub>r</sub> [V] | Operating range |               | Resistance<br>R [Ω] | Nominal absorption<br>I <sub>r</sub> [mA] | Inductance with<br>closed armature<br>[H] |
|-------------------------------------|-----------------|---------------|---------------------|-------------------------------------------|-------------------------------------------|
|                                     | U min.<br>[M]   | U max.<br>[M] |                     |                                           |                                           |
| 6                                   | 5.1             | 6.6           | 28                  | 214                                       |                                           |
| 12                                  | 10.2            | 13.2          | 110                 | 109                                       |                                           |
| 24                                  | 20.4            | 26.4          | 445                 | 53.9                                      |                                           |
| 48                                  | 40.8            | 52.8          | 1770                | 27.1                                      |                                           |
| 60                                  | 51              | 66            | 2760                | 21.7                                      |                                           |
| 110                                 | 93.5            | 121           | 9420                | 11.7                                      |                                           |
| 125                                 | 106             | 137.5         | 12000               | 10.4                                      |                                           |
| 230                                 | 253             | 7250          | 10.4                | 66                                        |                                           |
| 240                                 | 264             | 8500          | 9.2                 | 78                                        |                                           |

**Ordering Information**

Example: a 65 series 16 A P.C.B. relay with 1 CO (SPDT) contacts, coil rated at 12 V DC

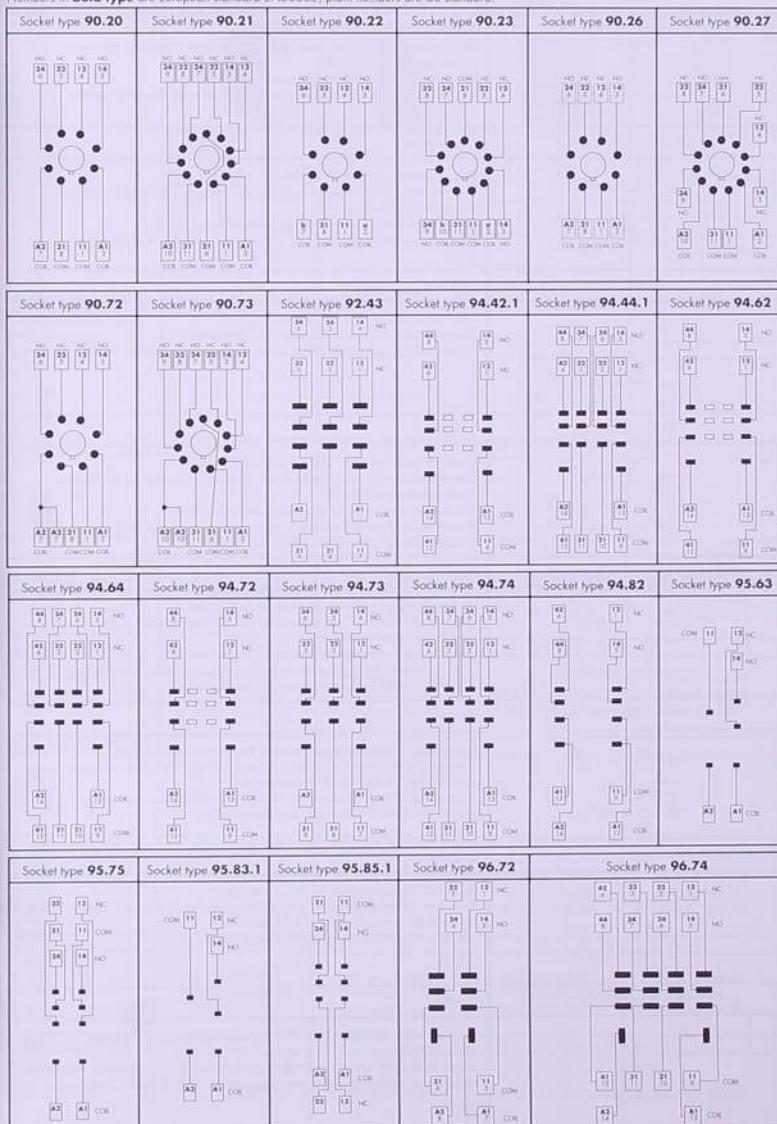


For standard relays with no options, use the first 8 digits only.

\* Available for 65.22 and 65.23 only

□ Available for 65.22, 65.23 and 65.31 only

Numbers in **bold type** are European standard ENS0005; plain numbers are US standard.



| DIODE                           | Functions                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                 | Recovery diode modules are used for DC only.<br>The negative cut-off voltage peaks of the coil are short circuited by the recovery diode [positive to terminal A1].<br>The drop-out time increases by an approximate factor of 3.<br>If an increase of the drop-out time is not wanted use a Varistor or RC module.                                                                  |
| DIODE (INVERTED POLARITY)       | Functions                                                                                                                                                                                                                                                                                                                                                                            |
|                                 | Recovery diode modules are used for DC only.<br>The negative cut-off voltage peaks of the coil are short circuited by the recovery diode [positive to terminal A2].<br>The drop-out time increases by an approximate factor of 3.<br>If an increase of the drop-out time is not wanted use a Varistor or RC module.                                                                  |
| LED                             | Functions                                                                                                                                                                                                                                                                                                                                                                            |
|                                 | LED modules are used for AC and DC.<br>The LED indicator lights up when the coil is energized.<br>When using DC it is essential that positive is connected to terminal A1.                                                                                                                                                                                                           |
| LED + DIODE                     | Functions                                                                                                                                                                                                                                                                                                                                                                            |
|                                 | Recovery diode modules + LED are used for DC only.<br>The negative cut-off voltage peaks of the coil are short circuited by the recovery diode [positive to terminal A1].<br>The drop-out time increases by an approximate factor of 3.<br>If an increase of the drop-out time is not wanted use a Varistor or RC module.<br>The LED indicator lights up when the coil is energized. |
| LED + DIODE (INVERTED POLARITY) | Functions                                                                                                                                                                                                                                                                                                                                                                            |
|                                 | Recovery diode modules + LED are used for DC only.<br>The negative cut-off voltage peaks of the coil are short circuited by the recovery diode [positive to terminal A2].<br>The drop-out time increases by an approximate factor of 3.<br>If an increase of the drop-out time is not wanted use a Varistor or RC module.<br>The LED indicator lights up when the coil is energized. |
| LED + VARISTOR                  | Functions                                                                                                                                                                                                                                                                                                                                                                            |
|                                 | LED modules + Varistor are used for both AC and DC coils.<br>The cut-off voltage peaks of the relay coil are limited by the Varistor to approximately 2.5 times the nominal voltage of the module.<br>When using DC coils it is essential that positive is connected to terminal A1.<br>The relay drop-out time increases only insignificantly.                                      |
| RC                              | Functions                                                                                                                                                                                                                                                                                                                                                                            |
|                                 | RC circuit modules are used for AC and DC coils.<br>The cut-off voltage peaks of the relay are limited by the RC module to approximately 2.5 times the nominal voltage of the module.<br>The relay drop-out time increases only insignificantly.                                                                                                                                     |
| NO - REMANENCE                  | Functions                                                                                                                                                                                                                                                                                                                                                                            |
|                                 | Bypass modules are advisable, if the relay coils do not drop-out between 110 - 240 V AC.<br>Failure to drop-out can be caused by residual currents from AC proximity switches or inductance couplings caused through long parallel lying AC control lines.                                                                                                                           |

| 99.01                                                  | 99.44                                              | 99.73                                              | 99.80                                              |                                                    |
|--------------------------------------------------------|----------------------------------------------------|----------------------------------------------------|----------------------------------------------------|----------------------------------------------------|
|                                                        |                                                    |                                                    |                                                    |                                                    |
| Sockets                                                | Relays                                             | Sockets                                            | Relays                                             |                                                    |
| 90.20                                                  | 60.12                                              | 94.42.1                                            | 55.32                                              |                                                    |
| 90.21                                                  | 60.13                                              | 94.44.1                                            | 55.34                                              |                                                    |
| 94.73                                                  | 55.33                                              |                                                    |                                                    |                                                    |
| 94.74                                                  | 55.34                                              |                                                    |                                                    |                                                    |
| 94.82                                                  | 55.32                                              |                                                    |                                                    |                                                    |
| 95.63                                                  | 40.31                                              |                                                    |                                                    |                                                    |
| 95.75                                                  | 40.51/52/61/44.52/62                               |                                                    |                                                    |                                                    |
| 96.72                                                  | 56.32                                              |                                                    |                                                    |                                                    |
| 96.74                                                  | 56.34                                              |                                                    |                                                    |                                                    |
| OPERATING RANGE                                        | CODE                                               | CODE                                               | CODE                                               |                                                    |
| DIODE                                                  |                                                    |                                                    |                                                    |                                                    |
| 6 - 220 V DC                                           | 99.01.3.000.00                                     | 99.44.3.000.00                                     | 99.73.3.000.00                                     | 99.80.3.000.00                                     |
| DIODE (INVERTED POLARITY)                              |                                                    |                                                    |                                                    |                                                    |
| 6 - 220 V DC                                           | 99.01.2.000.00                                     | 99.44.2.000.00                                     | —                                                  | —                                                  |
| LED                                                    |                                                    |                                                    |                                                    |                                                    |
| 6 - 24 V AC/DC<br>28 - 60 V AC/DC<br>110 - 230 V AC/DC | 99.01.0.024.59<br>99.01.0.060.59<br>99.01.0.230.59 | 99.44.0.024.59<br>99.44.0.060.59<br>99.44.0.230.59 | 99.73.0.024.59<br>99.73.0.060.59<br>99.73.0.230.59 | 99.80.0.024.59<br>99.80.0.060.59<br>99.80.0.230.59 |
| LED + DIODE                                            |                                                    |                                                    |                                                    |                                                    |
| 6 - 24 V DC<br>28 - 60 V DC<br>110 - 220 V DC          | 99.01.9.024.99<br>99.01.9.060.99<br>99.01.9.220.99 | 99.44.9.024.99<br>99.44.9.060.99<br>99.44.9.220.99 | 99.73.9.024.99<br>99.73.9.060.99<br>99.73.9.220.99 | 99.80.9.024.99<br>99.80.9.060.99<br>99.80.9.220.99 |
| LED + DIODE INVERTED POLARITY                          |                                                    |                                                    |                                                    |                                                    |
| 6 - 24 V DC<br>28 - 60 V DC<br>110 - 220 V DC          | 99.01.9.024.79<br>99.01.9.060.79<br>99.01.9.220.79 | 99.44.9.024.79<br>99.44.9.060.79<br>99.44.9.220.79 | —                                                  | —                                                  |
| LED + VARISTOR                                         |                                                    |                                                    |                                                    |                                                    |
| 6 - 24 V AC/DC<br>28 - 60 V AC/DC<br>110 - 230 V AC/DC | 99.01.0.024.98<br>99.01.0.060.98<br>99.01.0.230.98 | 99.44.0.024.98<br>99.44.0.060.98<br>99.44.0.230.98 | 99.73.0.024.98<br>99.73.0.060.98<br>99.73.0.230.98 | 99.80.0.024.98<br>99.80.0.060.98<br>99.80.0.230.98 |
| RC                                                     |                                                    |                                                    |                                                    |                                                    |
| 6 - 24 V AC/DC<br>28 - 60 V AC/DC<br>110 - 230 V AC/DC | 99.01.0.024.09<br>99.01.0.060.09<br>99.01.0.230.09 | 99.44.0.024.09<br>99.44.0.060.09<br>99.44.0.230.09 | 99.73.0.024.09<br>99.73.0.060.09<br>99.73.0.230.09 | 99.80.0.024.09<br>99.80.0.060.09<br>99.80.0.230.09 |
| NO - REMANENCE                                         |                                                    |                                                    |                                                    |                                                    |
| 110 - 230 V AC                                         | 99.01.8.230.07                                     | 99.44.8.230.07                                     | 99.73.8.230.07                                     | 99.80.8.230.07                                     |



**81 SERIES**  
Multifunction Timers



**85 SERIES**  
Plug-in Multifunction Timers



**94 SERIES**  
Sockets and Accessories  
for 85 Series Relays



**86 SERIES**  
Multifunction Timer Module

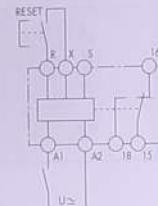


**87 SERIES**  
Modular Timers

|                                            | 81.01                            | 81.11                           |
|--------------------------------------------|----------------------------------|---------------------------------|
| <b>Mounting</b>                            |                                  |                                 |
|                                            |                                  |                                 |
| <b>Contact specification</b>               | DIN 46277                        | DIN 46277                       |
| Number of contacts                         | 1 CO [SPDT]                      | 1 CO [SPDT]                     |
| Rated current                              | A                                | 16                              |
| Maximum peak current                       | A                                | 30                              |
| Rated load AC1                             | VA                               | 4000                            |
| Rated load AC15                            | VA                               | 750                             |
| Rated voltage/Max switching voltage        | V -                              | 250/400                         |
| Breaking capacity in DC1: 30/110/220V      | A                                | 16/0.3/0.12                     |
| Minimum switching load                     | mW (V/mA)                        | 500 (10/5)                      |
| Single phase motor rating                  | kW/HP                            | 0.55/0.8                        |
| Standard contact material                  |                                  | Ag CdO                          |
| <b>Coil specification</b>                  |                                  |                                 |
| Nominal voltage [ $U_{N}$ ]                | 12 + 230 V AC/DC                 | 12 - 24 - 48 - 110 V AC/DC      |
|                                            | —                                | 230 V AC                        |
| Rated power AC/DC                          | VA (50 Hz)/W                     | —                               |
| Operating range                            |                                  | U min: 0.85 $U_{N}$             |
|                                            | U max: 250 V                     | U max: 1.1 $U_{N}$              |
| <b>Technical data</b>                      |                                  |                                 |
| Functions                                  | AI - DI - SW - SP - BE - DE - EE |                                 |
| Delay setting                              | 0.1s + 10h                       | 0.1s + 10h                      |
| Setting accuracy - full range              | ms                               | ± 5 % <sub>rel</sub>            |
| Recovery time                              |                                  | ≤ 100                           |
| Minimum control pulse                      | ms                               | 50                              |
| Dielectric strength: between open contacts |                                  | 1000                            |
| Mechanical life                            | cycles                           | 20.000.000                      |
| Electrical life at full load in AC1        | cycles                           | 100.000                         |
| Ambient temperature                        | °C                               | See diagram R-B1<br>(-10 + +50) |
| Protection category                        |                                  | IP 20                           |
| Approvals: (according to type)             |                                  |                                 |

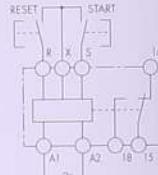
## INTERNAL START FUNCTION

Controlled through signal contact in voltage supply line.



## EXTERNAL START FUNCTION

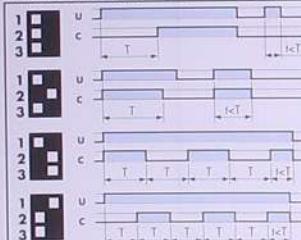
Controlled through signal contact of external start switch.



The diagrams marked with C indicate the state of the NO contact [15 - 18]. When the LED [G] is illuminated, the NO contact is closed.

S = START      U = SUPPLY VOLTAGE      C = RELAY CONTACT [NO]

### Internal START function. Controlled through signal contact in voltage supply line.



[A] ON delay.

Apply power to timer.  
Contact transfers after preset time has elapsed. Reset occurs when power is removed.

[B] ON pulse.

Apply power to timer.  
Contact transfers immediately. After preset time has elapsed, contact returns to original position.

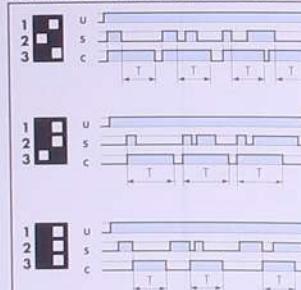
[C] Symmetrical recycler: pulse start.

Apply power to timer.  
First transfer of contact occurs as soon as power is applied. The timer now cycles between ON and OFF as long as power is applied. The ratio is 1:1 (time off = time on).

[SP] Symmetrical recycler: pause start.

Apply power to timer.  
First transfer of contact occurs after preset time has elapsed. The timer now cycles between OFF and ON as long as power is applied. The ratio is 1:1 (time off = time on).

### External START function. Controlled through signal contact of external start switch.



[E] OFF delay: timing on START release (internal start).

Power must be applied at all times to timer.  
On closure of normally open control Signal Switch, the output contact transfers and remains in that position. When the Signal Switch is reopened, the desired delay begins.  
After preset time has elapsed, the contact returns to the original position.

[D] ON pulse: timing on START pulse.

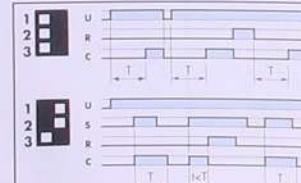
Power must be applied at all times to timer.  
On momentary or maintained closure of a normally open control Signal Switch, the output contact transfers.  
After the desired time has elapsed, the contact returns to the original position.

[E] OFF pulse: timing on START release.

Power must be applied at all times to timer.  
On opening a normally open control Signal Switch, the output contact transfers.  
After the desired time has elapsed, the contact returns to the original position.

### RESET FUNCTION (R)

In each and every function and time scale, the timer is immediately released when the reset switch is depressed.



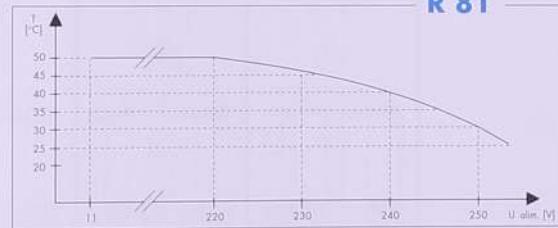
[R] On depressing the External Reset Switch the timer is immediately released.  
Releasing the Reset Switch reactivates the function.  
Example: ON delay function.

[S] Depressing the External Reset Switch terminates the interval time.  
To restart, it is necessary to depress the Start switch again.  
Example: ON pulse function.

## TIME SCALES

| 1        | 2        | 3         | 4          | 5           | 6        | 1        | 2        | 3         | 4          | 5           | 6        | 1        | 2        | 3         | 4          | 5           | 6        |
|----------|----------|-----------|------------|-------------|----------|----------|----------|-----------|------------|-------------|----------|----------|----------|-----------|------------|-------------|----------|
| 1        | 2        | 3         | 4          | 5           | 6        | 1        | 2        | 3         | 4          | 5           | 6        | 1        | 2        | 3         | 4          | 5           | 6        |
| 0,1 + 1s | 1 + 10 s | 10 - 60 s | 1 - 10 min | 10 - 60 min | 1 - 10 h | 0,1 + 1s | 1 + 10 s | 10 - 60 s | 1 - 10 min | 10 - 60 min | 1 - 10 h | 0,1 + 1s | 1 + 10 s | 10 - 60 s | 1 - 10 min | 10 - 60 min | 1 - 10 h |

## R 81



Max ambient temperature versus supply voltage (for the 81.01 timer).

If the apparatus operates at a temperature near the [R 81] limit curve, adequate ventilation must be provided.  
Minimum ambient temperature -10°C.

## Ordering Information

Example: on 81 series monovoltage 16 A relay with 1 CO [SPDT] contacts, supply rated at 24 V AC/DC.

**8 1**

Series

**1**

No. of poles  
1 = 1 CO - 16A

**0**

Supply version  
0 = AC/DC (50/60 Hz)  
B = AC (50/60 Hz)  
for 230 V only

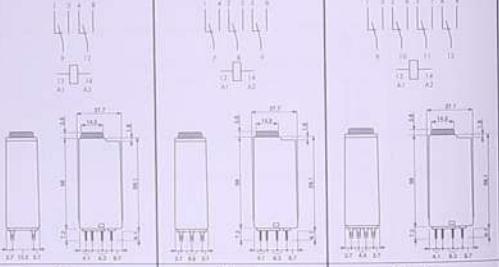
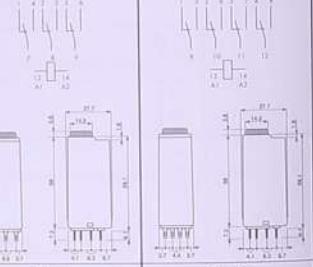
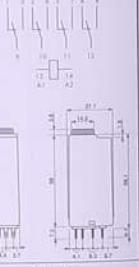
**0 2 4**

Supply voltage  
012 = 12 V AC/DC  
024 = 24 V AC/DC  
048 = 48 V AC/DC  
110 = 110 V AC/DC  
230 = 230 V AC

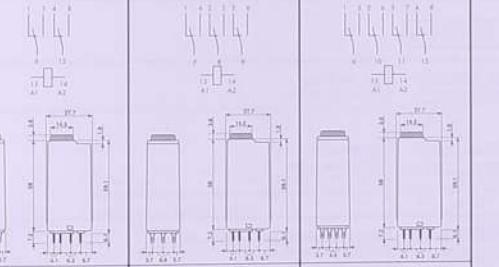
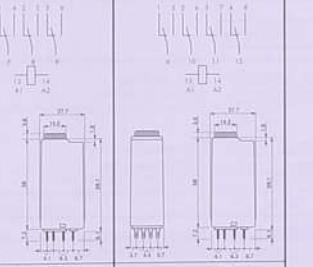
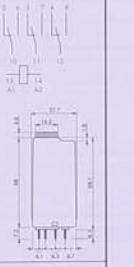
## Type

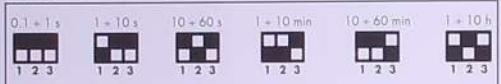
0 = Multi-voltage  
1 = Mono-voltage

## 85 Series Plug-in Multifunction Timers

|                                                                                   | 85.32                                                                               | 85.33                                                                             | 85.34                                     |
|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------|
|  |    |  |                                           |
|  |    |  |                                           |
| Mounting                                                                          | Plug-in<br>for use with 94 Series sockets                                           | Plug-in<br>for use with 94 Series sockets                                         | Plug-in<br>for use with 94 Series sockets |
| <b>Contact specification</b>                                                      |                                                                                     |                                                                                   |                                           |
| Number of contacts                                                                | 2 CO (DPDT)                                                                         | 3 CO (3PDT)                                                                       | 4 CO (4PDT)                               |
| Rated current A                                                                   | 10                                                                                  | 10                                                                                | 5                                         |
| Maximum peak current A                                                            | 20                                                                                  | 20                                                                                | 10                                        |
| Rated load AC1 VA                                                                 | 2500                                                                                | 2500                                                                              | 1250                                      |
| Rated load AC1.5 VA                                                               | 500                                                                                 | 500                                                                               | 250                                       |
| Rated voltage/Max switching voltage V~                                            | 250/400                                                                             | 250/400                                                                           | 250/400                                   |
| Breaking capacity in DC1: 30/110/220V A                                           | 10/0.25/0.1                                                                         | 10/0.25/0.1                                                                       | 5/0.25/0.1                                |
| Minimum switching load mW [V/mA]                                                  | 300 (5/5)                                                                           | 300 (5/5)                                                                         | 300 (5/5)                                 |
| Single phase motor rating kW/HP                                                   | 0.37/0.6                                                                            | 0.37/0.6                                                                          | 0.125/0.2                                 |
| Standard contact material                                                         | Ag Ni                                                                               | Ag Ni                                                                             | Ag Ni                                     |
| <b>Coil specification</b>                                                         |                                                                                     |                                                                                   |                                           |
| Nominal voltage [U <sub>n</sub> ]                                                 | 12 - 24 - 48 - 110 V AC/DC<br>230 V AC                                              | 12 - 24 - 48 - 110 V AC/DC<br>230 V AC                                            | 12 - 24 - 48 - 110 V AC/DC<br>230 V AC    |
| Rated power AC/DC VA (50 Hz)/W                                                    | 2/2                                                                                 | 2/2                                                                               | 2/2                                       |
| Operating range                                                                   | [0.85 + 1.1]U <sub>n</sub>                                                          | [0.85 + 1.1]U <sub>n</sub>                                                        | [0.85 + 1.1]U <sub>n</sub>                |
| <b>Technical data</b>                                                             |                                                                                     |                                                                                   |                                           |
| Functions                                                                         | AI - DI                                                                             | AI - DI                                                                           | AI - DI                                   |
| Delay setting                                                                     | 0.1s + 10h                                                                          | 0.1s + 10h                                                                        | 0.1s + 10h                                |
| Repeatability                                                                     | ± 2 %                                                                               | ± 2 %                                                                             | ± 2 %                                     |
| Setting accuracy - full range                                                     | ± 5 %                                                                               | ± 5 %                                                                             | ± 5 %                                     |
| Recovery time ms                                                                  | ≤ 60                                                                                | ≤ 60                                                                              | ≤ 60                                      |
| Dielectric strength: between open contacts V                                      | 1000                                                                                | 1000                                                                              | 1000                                      |
| Mechanical life cycles                                                            | 10,000,000                                                                          | 10,000,000                                                                        | 10,000,000                                |
| Electrical life at full load in AC1 cycles                                        | 150,000                                                                             | 150,000                                                                           | 150,000                                   |
| Ambient temperature °C                                                            | [−10 + +50]                                                                         | [−10 + +50]                                                                       | [−10 + +50]                               |
| Protection category                                                               | IP 40                                                                               | IP 40                                                                             | IP 40                                     |
| Approvals: (according to type)                                                    |  |                                                                                   |                                           |

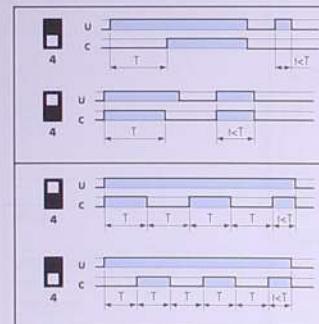
## 85 Series Plug-in Multifunction Timers

|                                                                                    | 85.52                                                                               | 85.53                                                                               | 85.54                                     |
|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------|
|  |  |  |                                           |
|  |  |  |                                           |
| Mounting                                                                           | Plug-in<br>for use with 94 Series sockets                                           | Plug-in<br>for use with 94 Series sockets                                           | Plug-in<br>for use with 94 Series sockets |
| <b>Contact specification</b>                                                       |                                                                                     |                                                                                     |                                           |
| Number of contacts                                                                 | 2 CO (DPDT)                                                                         | 3 CO (3PDT)                                                                         | 4 CO (4PDT)                               |
| Rated current A                                                                    | 10                                                                                  | 10                                                                                  | 5                                         |
| Maximum peak current A                                                             | 20                                                                                  | 20                                                                                  | 10                                        |
| Rated load AC1 VA                                                                  | 2500                                                                                | 2500                                                                                | 1250                                      |
| Rated load AC1.5 VA                                                                | 500                                                                                 | 500                                                                                 | 250                                       |
| Rated voltage/Max switching voltage V~                                             | 250/400                                                                             | 250/400                                                                             | 250/400                                   |
| Breaking capacity in DC1: 10/0.25/0.1                                              | 10/0.25/0.1                                                                         | 10/0.25/0.1                                                                         | 5/0.25/0.1                                |
| Minimum switching load mW [V/mA]                                                   | 300 (5/5)                                                                           | 300 (5/5)                                                                           | 300 (5/5)                                 |
| Single phase motor rating kW/HP                                                    | 0.37/0.6                                                                            | 0.37/0.6                                                                            | 0.125/0.2                                 |
| Standard contact material                                                          | Ag Ni                                                                               | Ag Ni                                                                               | Ag Ni                                     |
| <b>Coil specification</b>                                                          |                                                                                     |                                                                                     |                                           |
| Nominal voltage [U <sub>n</sub> ]                                                  | 12 - 24 - 48 - 110 V AC/DC<br>230 V AC                                              | 12 - 24 - 48 - 110 V AC/DC<br>230 V AC                                              | 12 - 24 - 48 - 110 V AC/DC<br>230 V AC    |
| Rated power AC/DC VA (50 Hz)/W                                                     | 2/2                                                                                 | 2/2                                                                                 | 2/2                                       |
| Operating range                                                                    | [0.85 + 1.1]U <sub>n</sub>                                                          | [0.85 + 1.1]U <sub>n</sub>                                                          | [0.85 + 1.1]U <sub>n</sub>                |
| <b>Technical data</b>                                                              |                                                                                     |                                                                                     |                                           |
| Functions                                                                          | SW - SP                                                                             | SW - SP                                                                             | SW - SP                                   |
| Delay setting                                                                      | 0.1s + 10h                                                                          | 0.1s + 10h                                                                          | 0.1s + 10h                                |
| Repeatability                                                                      | ± 2 %                                                                               | ± 2 %                                                                               | ± 2 %                                     |
| Setting accuracy - full range                                                      | ± 5 %                                                                               | ± 5 %                                                                               | ± 5 %                                     |
| Recovery time ms                                                                   | ≤ 60                                                                                | ≤ 60                                                                                | ≤ 60                                      |
| Dielectric strength: between open contacts V                                       | 1000                                                                                | 1000                                                                                | 1000                                      |
| Mechanical life cycles                                                             | 10,000,000                                                                          | 10,000,000                                                                          | 10,000,000                                |
| Electrical life at full load in AC1 cycles                                         | 150,000                                                                             | 150,000                                                                             | 150,000                                   |
| Ambient temperature °C                                                             | [−10 + +50]                                                                         | [−10 + +50]                                                                         | [−10 + +50]                               |
| Protection category                                                                | IP 40                                                                               | IP 40                                                                               | IP 40                                     |
| Approvals: (according to type)                                                     | CE                                                                                  |                                                                                     |                                           |

**TIME SCALES**

**DESCRIPTION OF THE FUNCTIONS**

The diagrams marked with C indicate the state of the NO contact. When the LED (C) is illuminated, the NO contacts are closed.

**U = SUPPLY VOLTAGE**    **C = RELAY CONTACT (NO)**


**(AI) ON delay.**

Apply power to timer.  
Contact transfers after preset time has elapsed. Reset occurs when power is removed.

**(DI) ON pulse.**

Apply power to timer.  
Contact transfers immediately.  
After preset time has elapsed, contact returns to original position.

**(SW) Symmetrical recycler: pulse start.**

Apply power to timer.  
First transfer of contact occurs as soon as power is applied.  
The timer now cycles between ON and OFF as long as power is applied.  
The ratio is 1:1 (time off = time on).

**(SP) Symmetrical recycler: pause start.**

Apply power to timer.  
First transfer of contact occurs after preset time has elapsed.  
The timer now cycles between OFF and ON as long as power is applied.  
The ratio is 1:1 (time off = time on).

**Ordering Information**

Example: an 85 series AI - DI function 10 A relay with 2 CO [DPDT] contacts and supply rated at 24 V AC/DC.

|   |   |   |   |   |
|---|---|---|---|---|
| 8 | 5 | 3 | 2 | 0 |
|---|---|---|---|---|

Series

No. of poles  
2 = 2 CO - 10A  
3 = 3 CO - 10A  
4 = 4 CO - 5A

Supply version  
0 = AC/DC [50/60 Hz]  
8 = AC [50/60 Hz]  
for 230 V only

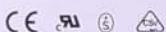
|   |   |   |
|---|---|---|
| 0 | 2 | 4 |
|---|---|---|

Supply voltage  
012 = 12 V AC/DC  
024 = 24 V AC/DC  
048 = 48 V AC/DC  
110 = 110 V AC/DC  
230 = 230 V AC

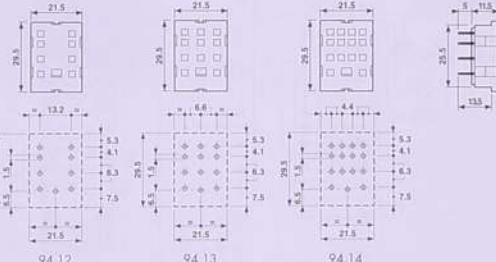
Type  
3 = Functions: AI - DI  
5 = Functions: SW/SP

**Timer type**

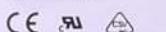
P.C.B. socket  
94.14



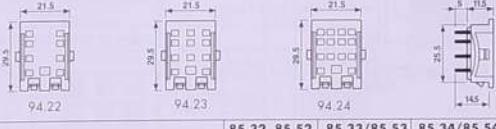
|        | 85.32, 85.52 | 85.33/85.53 | 85.34/85.54 |
|--------|--------------|-------------|-------------|
| BLUE   | 94.12        | 94.13       | 94.14       |
| BLACK* | 94.12.0      | 94.13.0     | 94.14.0     |


**Timer type**

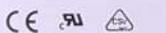
Panel mount solder socket:  
1 mm thick panel  
94.22



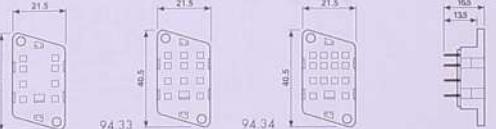
|        | 85.32, 85.52 | 85.33/85.53 | 85.34/85.54 |
|--------|--------------|-------------|-------------|
| BLUE   | 94.22        | 94.23       | 94.24       |
| BLACK* | 94.22.0      | 94.23.0     | 94.24.0     |


**Timer type**

Panel mount solder socket:  
M3 screw mount  
94.34



|        | 85.32, 85.52 | 85.33/85.53 | 85.34/85.54 |
|--------|--------------|-------------|-------------|
| BLUE   | 94.32        | 94.33       | 94.34       |
| BLACK* | 94.32.0      | 94.33.0     | 94.34.0     |


**Timer type**

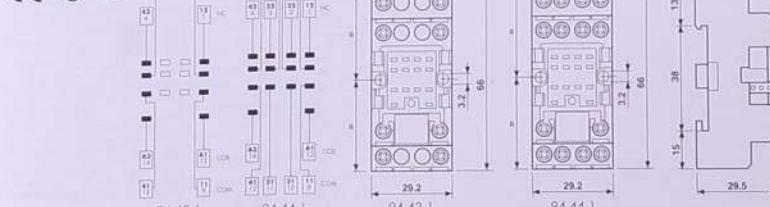
Screw terminal socket:  
panel or DIN rail 46277 mount  
94.44.1



|        | 85.32, 85.52 | 85.33/85.53 | 85.34/85.54 |
|--------|--------------|-------------|-------------|
| BLUE   | 94.42.1      | —           | 94.44.1     |
| BLACK* | 94.42.10     | —           | 94.44.10    |

**Retaining clip**


|  | 094.81 | — | 094.81 |
|--|--------|---|--------|
|  |        |   |        |



\* Available on request



**DESCRIPTION OF THE FUNCTIONS**

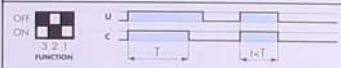
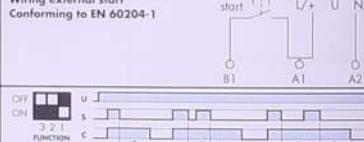
The diagrams marked with C indicate the state of the NO contact. When the LED (C) is illuminated, the NO contacts are closed.

S = START    U = SUPPLY VOLTAGE    C = RELAY CONTACT (NO)

**Wiring internal start**

**(A) ON delay.**

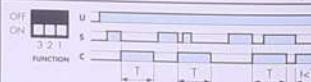
Apply power to timer.  
Contact transfers after preset time has elapsed.  
Reset occurs when power is removed.


**(B) OFF delay: timing on START release (internal start).**
**Wiring external start  
Conforming to EN 60204-1**

**(B/E) OFF delay: timing on START release (internal start).**

Power must be applied at all times to timer. On closure of normally open control Signal Switch, the output contact transfers and remains in that position. When the Signal Switch is reopened, the desired delay begins. After preset time has elapsed, the contact returns to the original position.


**(D/E) ON pulse.**

Apply power to timer.  
Contact transfers immediately.  
After preset time has elapsed, contact returns to original position.


**(E/E) OFF pulse: timing on START release.**

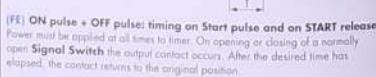
Power must be applied at all times to timer.  
On opening a normally open control Signal Switch, the output contact transfers. After the desired time has elapsed, the contact returns to the original position.


**(S/W) Symmetrical recycler: pulse start.**

Apply power to timer.  
First transfer of contact occurs as soon as power is applied.  
The timer now cycles between ON and OFF as long as power is applied.  
The ratio is 1:1 [time off = time on].


**(S/P) Symmetrical recycler: pause start.**

Apply power to timer.  
First transfer of contact occurs as soon as power is applied.  
The timer now cycles between OFF and ON as long as power is applied.  
The ratio is 1:1 [time off = time on].


**TIME SCALES**

| 15 - 125 ms            | 0.1 - 1 s              | 1 - 10 s               | 0.1 - 1 min          | 1 - 10 min           | 0.1 - 1 h              | 1 - 10 h               |
|------------------------|------------------------|------------------------|----------------------|----------------------|------------------------|------------------------|
| OFF<br>ON<br>6...5...4 | OFF<br>ON<br>6...5...4 | OFF<br>ON<br>6...5...4 | OFF<br>ON<br>0.5...4 | OFF<br>ON<br>0.5...4 | OFF<br>ON<br>6...5...4 | OFF<br>ON<br>6...5...4 |
| TIME                   | TIME                   | TIME                   | TIME                 | TIME                 | TIME                   | TIME                   |

**Ordering information**

Example: an 86 series plug-in timer module with supply rated at 240 V AC/DC:

**8 6 6 0**  
Series      Type  
6 = Plug-in

**0 2 4 0**  
Supply version  
0 = DC/AC [50/60 Hz]

240 = 12 - 240 V AC  
12 = 125 V DC

**87.01**

**87.02**

**87.11**

**DIN 46277**
**DIN 46277**
**DIN 46277**
**Contact specification**

|                                       |           |           |           |
|---------------------------------------|-----------|-----------|-----------|
| Number of contacts                    | 1         | 2         | 1         |
| Rated current                         | A         | 8         | 8         |
| Maximum peak current                  | A         | 30        | 30        |
| Rated load AC1                        | VA        | 2000      | 2000      |
| Rated load AC15                       | VA        | 750       | 750       |
| Rated voltage/Max switching voltage   | V         | 250/440   | 250/400   |
| Breaking capacity in DC1: 30/110/220V | A         | 6/0.5/0.2 | 8/0.5/0.2 |
| Minimum switching load                | mW [V/mA] | —         | —         |
| Single phase motor rating             | kW/HP     | —         | —         |
| Standard contact material             | Ag CdO    | Ag CdO    | Ag CdO    |

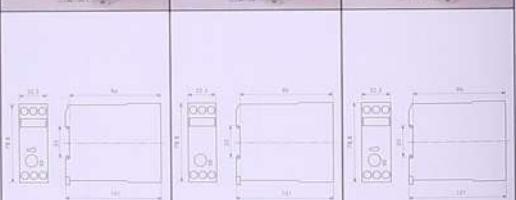
**Coil specification**

|                                   |                          |                          |                          |
|-----------------------------------|--------------------------|--------------------------|--------------------------|
| Nominal voltage (U <sub>n</sub> ) | 24 + 240 V AC [50/60 Hz] | 24 + 240 V AC [50/60 Hz] | 24 + 240 V AC [50/60 Hz] |
|                                   | 24 + 48 V DC             | 24 + 48 V DC             | 24 + 48 V DC             |
| Rated power AC/DC                 | VA [50 Hz]/W             | 1.5/1.5                  | 5/1                      |
|                                   | AC                       | [0.85 + 1.1]Un           | [0.85 + 1.1]Un           |
| Operating range                   | DC                       | [0.8 + 1.2]Un            | [0.8 + 1.2]Un            |

**Technical data**

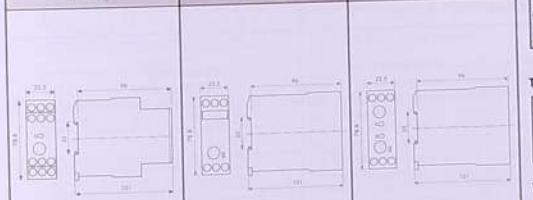
|                                     |                              |                              |             |
|-------------------------------------|------------------------------|------------------------------|-------------|
| Functions                           | AI/BE/CE/DI/DE/EE/GSW-ON/OFF | AI/BE/CE/DI/DE/EE/GSW-ON/OFF | AI          |
| Delay settings                      | 0.05s + 60h                  | 0.05s + 60h                  | 0.05s + 60h |
| Repeatability                       | 0.2 %                        | 0.2 %                        | 0.2 %       |
| Setting accuracy - full range       | 5 %                          | 5 %                          | 5 %         |
| Recovery time                       | ms                           | 50                           | 50          |
| Minimum control pulse               | ms                           | 50                           | 50          |
| Mechanical life                     | cycles                       | 30,000,000                   | 30,000,000  |
| Electrical life at full load in AC1 | cycles                       | 100,000                      | 100,000     |
| Ambient temperature                 | °C                           | (-20 + +45)                  | (-20 + +45) |
| Protection category                 |                              | IP 20                        | IP 20       |
| Approvals: (according to type)      |                              | CE                           | UL          |

## 87 Series Modular Timers



| Mounting                                   | DIN 46277                                | DIN 46277                                | DIN 46277                                |
|--------------------------------------------|------------------------------------------|------------------------------------------|------------------------------------------|
| <b>Contact specification</b>               |                                          |                                          |                                          |
| Number of contacts                         | 1                                        | 1                                        | 1                                        |
| Rated current A                            | 8                                        | 8                                        | 8                                        |
| Max peak current A                         | 30                                       | 30                                       | 30                                       |
| Rated load AC1 VA                          | 2000                                     | 2000                                     | 2000                                     |
| Rated load AC1.5 VA                        | 750                                      | 750                                      | 750                                      |
| Rated voltage/Max switching voltage V~     | 250/440                                  | 250/440                                  | 250/440                                  |
| Breaking capacity in DC1: 30/110/220V A    | 6/0.5/0.2                                | 6/0.5/0.2                                | 6/0.5/0.2                                |
| Minimum switching load mW (V/mA)           | —                                        | —                                        | —                                        |
| Single phase motor rating kW/HP            | —                                        | —                                        | —                                        |
| Standard contact material                  | Ag CdO                                   | Ag CdO                                   | Ag CdO                                   |
| <b>Coil specification</b>                  |                                          |                                          |                                          |
| Nominal voltage (U <sub>n</sub> )          | 24 = 240 V AC (50/60 Hz)<br>24 + 48 V DC | 24 = 240 V AC (50/60 Hz)<br>24 + 48 V DC | 24 = 240 V AC (50/60 Hz)<br>24 + 48 V DC |
| Rated power AC/DC VA (50 Hz)/W             | 1.5/1.5                                  | 1.5/1.5                                  | 1.5/1.5                                  |
| Operating range AC                         | (0.85 + 1.1)U <sub>n</sub>               | (0.85 + 1.1)U <sub>n</sub>               | (0.85 + 1.1)U <sub>n</sub>               |
| Operating range DC                         | (0.8 + 1.2)U <sub>n</sub>                | (0.8 + 1.2)U <sub>n</sub>                | (0.8 + 1.2)U <sub>n</sub>                |
| <b>Technical data</b>                      |                                          |                                          |                                          |
| Functions                                  | DI                                       | SW                                       | BE                                       |
| Delay settings                             | 0.05s + 60h                              | 0.5 + 10s                                | 0.05s + 60h                              |
| Repeatability                              | 0.2 %                                    | 0.2 %                                    | 0.2 %                                    |
| Setting accuracy - full range              | 5 %                                      | 5 %                                      | 5 %                                      |
| Recovery time ms                           | 50                                       | 50                                       | 50                                       |
| Minimum control pulse ms                   | 50                                       | 50                                       | 50                                       |
| Mechanical life cycles                     | 30,000,000                               | 30,000,000                               | 30,000,000                               |
| Electrical life at full load in AC1 cycles | 100,000                                  | 100,000                                  | 100,000                                  |
| Ambient temperature °C                     | (-20 + 45)                               | (-20 + 45)                               | (-20 + 45)                               |
| Protection category                        | IP 20                                    | IP 20                                    | IP 20                                    |
| Approvals: (according to type)             | CE                                       | CE                                       | CE                                       |

## Serie 87 LED Indicator and Time scales



### TIME SCALES

Types: 87.01, 87.02, 87.11, 87.21, 87.41, 87.91

|              |              |
|--------------|--------------|
| 0.05 + 1 s   | 0.15 + 3 s   |
| 0.05 + 1 min | 0.15 + 3 min |
| 0.05 + 1 h   | 0.15 + 3 h   |

|            |              |
|------------|--------------|
| 0.5 + 10 s | 0.5 + 10 min |
| 0.5 + 10 h | 3 + 60 h     |

### Type: 87.31

|            |
|------------|
| 0.5 + 10 s |
|------------|

### Type: 87.82

|              |
|--------------|
| 0.05 + 1 min |
|--------------|

### Type: 87.61

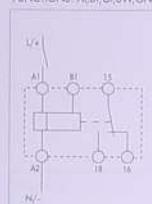
|               |
|---------------|
| 0.15 + 2.5 s  |
| 0.5 + 10 s    |
| 4 + 80 s      |
| 30 s + 10 min |

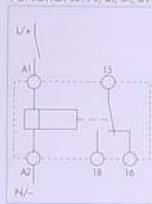
| DIN 46277                  | DIN 46277                  | DIN 46277                  |
|----------------------------|----------------------------|----------------------------|
| 1                          | 2                          | 1                          |
| 5                          | 8                          | 8                          |
| 30                         | 30                         | 30                         |
| 2000                       | 2000                       | 2000                       |
| 750                        | 750                        | 750                        |
| 380                        | 250/440                    | 250/440                    |
| 6/0.5/0.2                  | 6/0.5/0.2                  | 6/0.5/0.2                  |
| —                          | —                          | —                          |
| —                          | —                          | —                          |
| Ag CdO                     | Ag CdO                     | Ag CdO                     |
| 24 + 240 V AC (50/60 Hz)   | 24 + 240 V AC (50/60 Hz)   | 24 + 240 V AC (50/60 Hz)   |
| 24 + 48 V DC               | 24 + 48 V DC               | 24 + 48 V DC               |
| 1.5/1.5                    | 1.5/1.5                    | 1.5/1.5                    |
| (0.85 + 1.1)U <sub>n</sub> | (0.85 + 1.1)U <sub>n</sub> | (0.85 + 1.1)U <sub>n</sub> |
| (0.8 + 1.2)U <sub>n</sub>  | (0.8 + 1.2)U <sub>n</sub>  | (0.8 + 1.2)U <sub>n</sub>  |
| SD                         | SD                         | SD                         |
| 0.05s + 1m                 | 0.05s + 1m                 | 0.05s + 60h                |
| 0.2 %                      | 0.2 %                      | 0.2 %                      |
| 15 %                       | 5 %                        | 5 %                        |
| —                          | 50                         | 50                         |
| 300                        | 50                         | 50                         |
| 30,000,000                 | 30,000,000                 | 30,000,000                 |
| 100,000                    | 100,000                    | 100,000                    |
| (-20 + 45)                 | (-20 + 45)                 | (-20 + 45)                 |
| IP 20                      | IP 20                      | IP 20                      |
| CE                         | CE                         | CE                         |

**LED INDICATOR**

| LED | TIMING      | "NO" contact<br>(Δ for type 87.82) | SUPPLY VOLTAGE<br>(type 87.61 only) | CONTACTS               |                          |                                |                                  |
|-----|-------------|------------------------------------|-------------------------------------|------------------------|--------------------------|--------------------------------|----------------------------------|
|     |             |                                    |                                     | Timed contacts<br>Open | Timed contacts<br>Closed | Instantaneous contacts<br>Open | Instantaneous contacts<br>Closed |
|     | none        | open                               | none                                | 15 - 18<br>25 - 28     | 15 - 16<br>25 - 26       | 21 - 24                        | 21 - 22                          |
|     | in progress | open                               | —                                   | 15 - 18<br>25 - 28     | 15 - 16<br>25 - 26       | 21 - 22                        | 21 - 24                          |
|     | in progress | closed                             | —                                   | 15 - 16<br>25 - 26     | 15 - 18<br>25 - 28       | 21 - 22                        | 21 - 24                          |
|     | none        | closed                             | present                             | 15 - 16<br>25 - 26     | 15 - 18<br>25 - 28       | 21 - 22                        | 21 - 24                          |

**WIRING DIAGRAMS**
**TYPE 87.01**

 INTERNAL START  
FUNCTIONS: ALDI, GI, SW, ON, OFF

**TYPE 87.11/21/31/61**

 INTERNAL START  
FUNCTIONS: AI, BI, DI, SW


○ A (10 kΩ) potentiometer may be connected between terminals Z1 and Z2 for external timer regulation.

\* The functions with external start [BI] may be activated using a different voltage to that used for the supply voltage (e.g. U=230 V AC – BI=24 V AC).

\* The 1<sup>st</sup> contact (terminal numbers 15 - 16 - 18) is always timed according to the function selected.

\* The 2<sup>nd</sup> contact is timed in the same way as the 1<sup>st</sup> contact **only if** the selector switch is set in the following position. (In this case terminal numbers 25 - 26 - 28 must be used).

\* If the selector switch is set in the following position, the 2<sup>nd</sup> contact is instantaneous. (In this case terminal numbers 21 - 22 - 24 must be used).

**Ordering Information**

Example: on 87 series 8 A multifunction timer with 1 CO (SPDT) contact, with supply rated at 240 V AC/DC.

|          |          |          |          |          |          |          |          |
|----------|----------|----------|----------|----------|----------|----------|----------|
| <b>8</b> | <b>7</b> | <b>0</b> | <b>1</b> | <b>0</b> | <b>2</b> | <b>4</b> | <b>0</b> |
|----------|----------|----------|----------|----------|----------|----------|----------|

**Series**
**Número de contactos**

 1 = 1 CO - 8A (5A, Type 87.61)  
 2 = 2 NA - 8A (for 87.82 only)  
 2 = 2 CO (1 delayed + 1 instantaneous) for 87.02 only

**Supply version**

0 = DC/AC (50/60 Hz)

**Supply voltage**

$$240 = \begin{cases} 24 + 240 \text{ V AC} \\ 24 + 48 \text{ V DC} \\ 24 + 240 \text{ V AC/DC (Type 87.61 only)} \end{cases}$$
**Type**

0 = Multifunction

(AI, BE, CE, DI, DE, EE, GI, SW, ON, OFF)

1 = Monofunction (AI)

2 = Monofunction (DI)

3 = Monofunction (SW)

4 = Monofunction (BE)

5 = Monofunction (BI)

6 = Monofunction (DE)

8 = Monofunction (SD)

9 = Monofunction (LI, LE, PI, PE)

**DESCRIPTION THE FUNCTIONS**

The diagrams marked with C indicate the state of the NO contact.

**S =** START

**U =** SUPPLY VOLTAGE

**C =** RELAY CONTACT (NO)

**[AI] ON delay.**

Apply power to timer.  
Contact transfers after preset time has elapsed. Reset occurs when power is removed.

**[BI] True OFF delay (power OFF).**

Apply power to timer (Tmin = 300ms).  
Contact transfers immediately. Reset occurs when power is removed after preset time elapsed.

**[DI] ON pulse.**

Apply power to timer.  
Contact transfers after preset time has elapsed. Contact returns to original position.

**[GI] Fixed pulse (0.5s) delayed**

Apply power to timer.  
Contact transfers after preset time has elapsed. Reset occurs after a fixed time of 0.5s.

**[SW] Symmetrical recycler: pulse start.**

Apply power to timer.  
First transfer of contact occurs as soon as power is applied. The timer now cycles between ON and OFF as long as power is applied. The ratio is 1:1 (time off : time on).

**[BE] OFF delay: timing on START release (internal start).**

Power must be applied at all times to timer.  
On closure of normally open control Signal Switch, the output contact transfers and remains in that position. When the Signal Switch is reopened, the desired delay begins.

**[CE] ON and OFF delay (external start).**

On closure of the normally open control Signal Switch the desired delay begins.  
After the preset time has elapsed, the contact returns to that position.

**[DE] ON pulse: timing on START pulse.**

Power must be applied at all times to timer.  
On momentary or maintained closure of a normally open control Signal Switch, the output contact transfers.  
After the desired time has elapsed, the contact returns to the original position.

**[EE] OFF pulse: timing on START release.**

Power must be applied at all times to timer.  
On opening a normally open control Signal Switch, the output contact transfers.  
After the desired time has elapsed, the contact returns to the original position.

**Permanently ON**

Selecting the function ON when power is applied to the relay the first contact transfers immediately and remains in that position.

**Permanently OFF**

The contact returns to the original position when the OFF-function is selected.

**[SD] Star - delta**

Apply power to relay.  
Closure of the star contact (Δ) occurs immediately.  
After preset time has elapsed the star contact (Δ) returns to the original position.  
After a fixed time of ~60 ms the delta contact (S) closes and remains in that position.

**[U] Asymmetrical recycler: pulse start**

Apply power to timer.  
First transfer of contact occurs as soon as power is applied.  
The timer now cycles between ON and OFF as long as power is applied.  
The cycles are not equal (time off ≠ time on).

**[PI] Asymmetrical recycler: pause start**

Apply power to timer.  
First transfer of contact occurs as soon as power is applied.  
The timer now cycles between OFF and ON as long as power is applied.  
The cycles are not equal (time off ≠ time on).

**[LE] Asymmetrical recycler: pulse start (external start)**

On closure of the normally open control Signal Switch the first transfer of contact occurs.  
The timer now cycles between ON and OFF.  
The cycles are not equal (time off ≠ time on).

**[PE] Asymmetrical recycler: pulse start (external start)**

On closure of the normally open control Signal Switch the first transfer of contact occurs.  
The timer now cycles between OFF and ON.  
The cycles are not equal (time off ≠ time on).



**10 SERIES**  
Light Dependent Relays



**11 SERIES**  
Light Dependent Relays



**13 SERIES**  
Electronic Step Relays



**14 SERIES**  
Multifunction Staircase  
Electronic Timers



**19 SERIES**  
Modular Auto-On-Off Relay



**20 SERIES**  
Modular Step Relays



**22 SERIES**  
Modular Monostable Relays



**26 SERIES**  
Step Relays

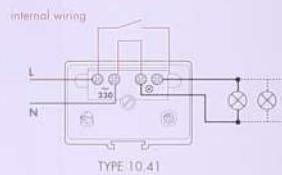
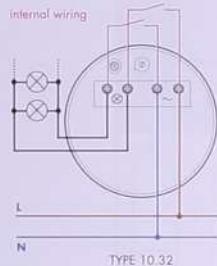


**28 SERIES**  
Step Relays



**90 SERIES**  
Sockets and Accessories  
for 28 Series Relays

|                                                   | 10.32                      | 10.41                     |
|---------------------------------------------------|----------------------------|---------------------------|
| <b>Mounting</b>                                   | Pole mount                 | Pole mount                |
| <b>Contact specification</b>                      |                            |                           |
| Number of contacts                                | 2 NO (DPST-NO)             | 1 NO (SPST-NO)            |
| Rated current A                                   | 16                         | 12                        |
| Maximum peak current A                            | 30                         | 25                        |
| Rated load AC1 VA                                 | 3700                       | 2800                      |
| Rated load AC15 VA                                | 700                        | 700                       |
| Rated voltage/Max switching voltage V -           | 230                        | 230                       |
| Nominal rate lamps: incandescence (230 V) W       | 2000                       | 1200                      |
| compensated fluorescent (230 V) W                 | 750                        | 420                       |
| Standard contact material                         | Ag Sn O <sub>2</sub>       | Ag Sn O <sub>2</sub>      |
| <b>Coil specification</b>                         |                            |                           |
| Nominal voltage [U <sub>n</sub> ] V AC (50/60 Hz) | 230                        | 230                       |
| Rated power AC VA (50 Hz)                         | 2.5                        | 2                         |
| Operating range V AC (50 Hz)                      | (0.85 + 1.1)U <sub>n</sub> | (0.8 + 1.1)U <sub>n</sub> |
| <b>Technical data</b>                             |                            |                           |
| Electrical life at full load in AC1 cycles        | 100,000                    | 100,000                   |
| Dielectric strength; between open contacts V ~    | 1000                       | 1000                      |
| Threshold setting: switching ON lx                | (1 + 80)                   | (1 + 80)                  |
| switching OFF lx                                  | (2 + 150)                  | (2 + 150)                 |
| Operating time: switching ON/OFF s                | 6/25                       | 15/25                     |
| Ambient temperature °C                            | (-30 + +70)                | (-30 + +70)               |
| Protection category                               | IP 54                      | IP 54                     |
| <b>Approvals:</b> (according to type)             | CE                         | CE                        |
|                                                   | CB 12-13                   |                           |



### Ordering Information

Example: a 10 series pole mount, light dependent relay with single phase switch 1 NO [SPSTNO] contact, with supply rated at 230 V AC.

|                                     |          |          |          |                       |          |          |          |
|-------------------------------------|----------|----------|----------|-----------------------|----------|----------|----------|
| <b>1</b>                            | <b>0</b> | <b>4</b> | <b>1</b> | <b>8</b>              | <b>2</b> | <b>3</b> | <b>0</b> |
| <b>Series</b>                       |          |          |          | <b>Supply version</b> |          |          |          |
| No. of poles                        |          |          |          | Supply rated voltage  |          |          |          |
| 1 = Single phase switch 1 NO - 12 A |          |          |          | 230 = 230 V           |          |          |          |
| 2 = Double phase switch 2 NO - 16 A |          |          |          |                       |          |          |          |
| <b>Type</b>                         |          |          |          |                       |          |          |          |
| 3 = Pole - mounting 16 A            |          |          |          |                       |          |          |          |
| 4 = Pole - mounting 12 A            |          |          |          |                       |          |          |          |

11.01

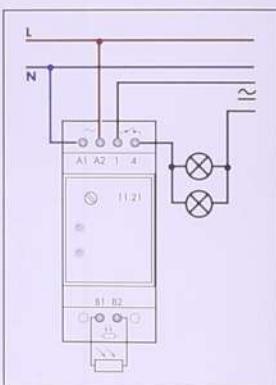
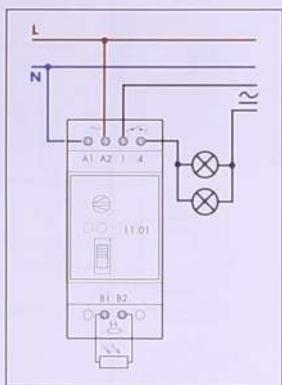
011.00

11.21

011.00



| Mounting                                       | DIN 46277              | DIN 46277                 |
|------------------------------------------------|------------------------|---------------------------|
| <b>Contact specification</b>                   |                        |                           |
| Number of contacts                             | 1 NO [SPST-NO]         | 1 NO [SPST-NO]            |
| Rated current                                  | A                      | 16                        |
| Maximum peak current                           | A                      | 30                        |
| Rated load AC1                                 | VA                     | 4000                      |
| Rated load AC15                                | VA                     | 750                       |
| Rated voltage/Max switching voltage            | V -                    | 250/400                   |
| Nominal lamp rating: incandescent(230 V) W     |                        | 2000                      |
| compensated fluorescent(230 V) W               |                        | 750                       |
| Standard contact material                      | Ag Sn O <sub>2</sub>   | Ag Sn O <sub>2</sub>      |
| <b>Coil specification</b>                      |                        |                           |
| Nominal voltage (U <sub>N</sub> )              | V AC (50/60 Hz)        | 230                       |
| Rated power AC                                 | VA (50 Hz)             | 2                         |
| Operating range                                | V AC (50 Hz)           | (0.8 ± 1.1)U <sub>N</sub> |
| <b>Technical data</b>                          |                        |                           |
| Electrical life of full load in AC1 cycles     |                        | 100,000                   |
| Dielectric strength: between open contacts V - |                        | 1000                      |
| between coil and contacts, V -                 |                        | 3750                      |
| Threshold setting L <sub>x</sub>               | low range (1 + 30)     | switching ON (1 + 100)    |
|                                                | high range (20 + 1000) | switching OFF (2 + 200)   |
| Operating time: switching ON/OFF t             |                        | 15/25                     |
| Ambient temperature °C                         | (-20 + +50)            | (-20 + +50)               |
| Protection category                            | IP 20                  | IP 20                     |
| Approvals: (according to type)                 |                        |                           |

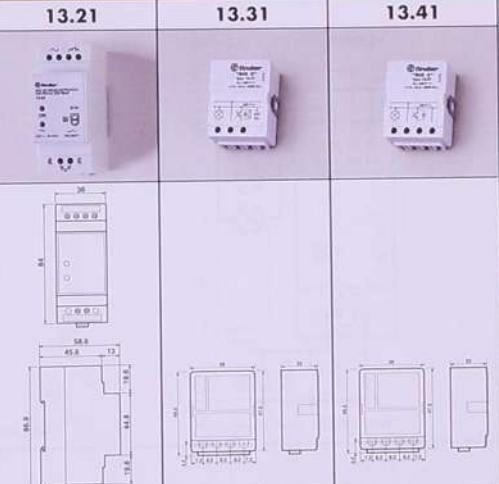
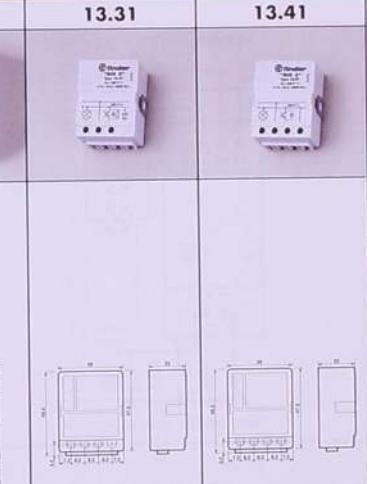


### Ordering Information

Example: on 11 series DIN rail 46277 mount zero hysteresis relay with 1 NO (SPST-NO) contact, with supply rated at 230 V AC.

|                                               |   |                      |   |   |   |   |   |
|-----------------------------------------------|---|----------------------|---|---|---|---|---|
| 1                                             | 1 | 0                    | 1 | 8 | 2 | 3 | 0 |
| <b>Series</b>                                 |   |                      |   |   |   |   |   |
| No. of poles                                  |   | Supply version       |   |   |   |   |   |
| 1 = Single phase switch 1 NO - 16 A           |   | 8 = AC (50/60 Hz)    |   |   |   |   |   |
| Type                                          |   | Supply rated version |   |   |   |   |   |
| 0 = DIN rail 46277 mount<br>"Zero Hysteresis" |   | 230 = 230 V          |   |   |   |   |   |

0 = DIN rail 46277 mount  
"Zero Hysteresis"  
2 = DIN rail 46277 mount

**13.21**

**13.31**

**13.41**


| TYPE  | Number of steps | SEQUENCES       |                 |                 |                 |
|-------|-----------------|-----------------|-----------------|-----------------|-----------------|
|       |                 | 1 <sup>st</sup> | 2 <sup>nd</sup> | 3 <sup>rd</sup> | 4 <sup>th</sup> |
| 13.21 | 2               | /               | /               |                 |                 |
| 13.31 | 2               | /               | /               |                 |                 |
| 13.41 | 2               | /               | /               |                 |                 |

### Mounting

**DIN 46277**
**Screw terminals**
**Screw terminals**

### Contact specification

|                                             |                      |                      |                      |
|---------------------------------------------|----------------------|----------------------|----------------------|
| Number of contacts                          | 1 NO (SPST-NO)       | 1 NO (SPST-NO)       | 1 NO (SPST-NO)       |
| Rated current                               | A 16                 | 10                   | 10                   |
| Maximum peak current                        | A 30                 | 20                   | 20                   |
| Rated load AC1                              | VA 4000              | 2300                 | 2300                 |
| Rated load AC1.5                            | VA 750               | 450                  | 450                  |
| Rated voltage/Max switching voltage         | V - 250/400          | 230                  | 230                  |
| Nominal lamp rates: incandescence [230 V] W | 2000                 | 1000                 | 1000                 |
| compensated fluorescent [230 V] W           | 750                  | 350                  | 350                  |
| Standard contact material                   | Ag Sn O <sub>2</sub> | Ag Sn O <sub>2</sub> | Ag Sn O <sub>2</sub> |

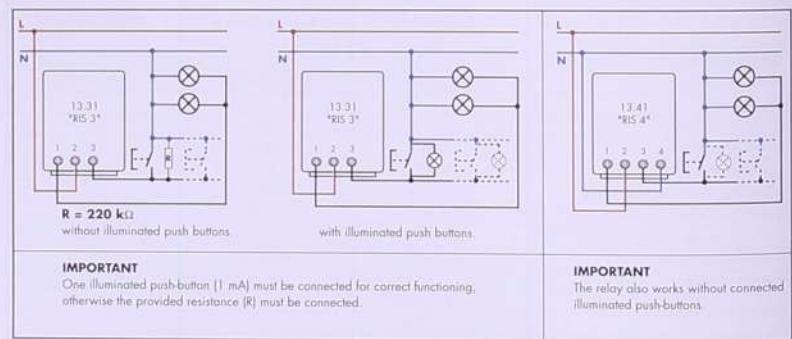
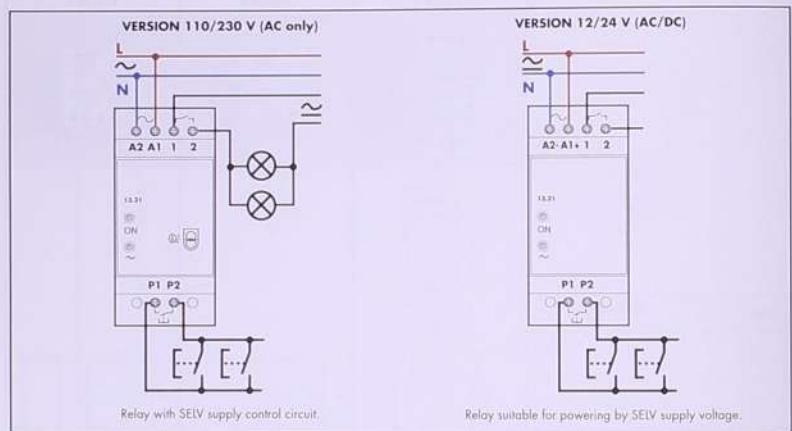
### Coil specification

|                      |                              |                |                |
|----------------------|------------------------------|----------------|----------------|
| Nominal voltage [Uh] | 12 - 24 V AC/DC              | 230 V AC       | 230 V AC       |
|                      | 110 - 230 V AC               | —              | —              |
| Rated power AC       | V A [50 Hz]/W 2.5/2.5        | 3/-            | 1.5/-          |
|                      | V AC [50 Hz]/W (0.8 ± 1.1)Uh | (0.85 ± 1.1)Uh | (0.85 ± 1.1)Uh |
| Operating range      | V DC (0.9 ± 1.1)Uh           | —              | —              |

### Technical data

|                                                |        |            |            |            |
|------------------------------------------------|--------|------------|------------|------------|
| Mechanical life                                | cycles | 20.000.000 | 5.000.000  | 5.000.000  |
| Electrical life at full load in AC1            | cycles | 100.000    | 100.000    | 100.000    |
| Dielectric strength: between open contacts V - |        | 1000       | 1000       | 1000       |
| between coil and contacts V -                  |        | 3750       | —          | —          |
| Max impulse duration                           |        | continuous | continuous | continuous |
| Max frequency : without load cycles/h          |        | 3600       | 3600       | 3600       |
| of full load cycles/h                          |        | 900        | 1800       | 1800       |
| Ambient temperature                            | °C     | [−20 + 70] | [−20 + 70] | [−20 + 70] |
| Protection category                            |        | IP 20      | IP 20      | IP 20      |
| Approvals: (according to type)                 |        | CE         | CE         | CE         |

## 13 Series Wiring Diagrams and Ordering Information

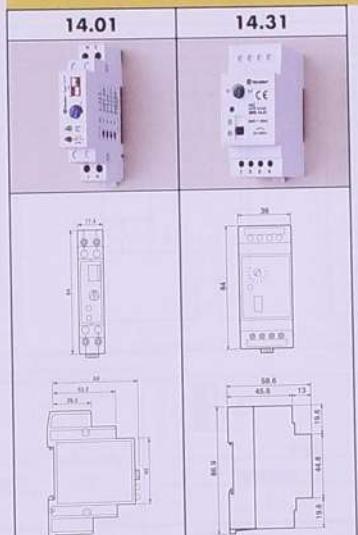


### Ordering Information

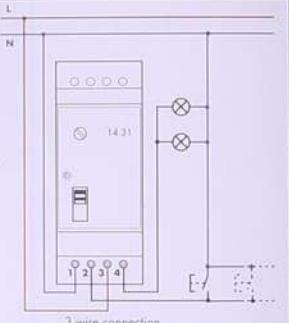
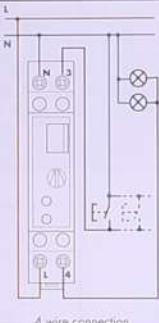
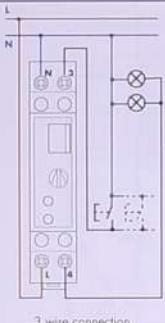
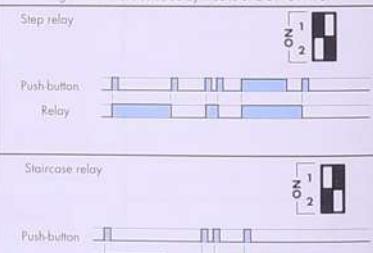
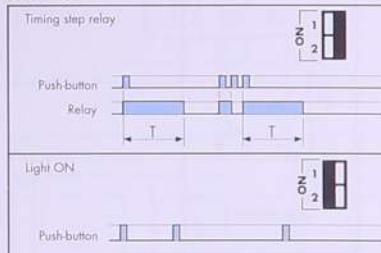
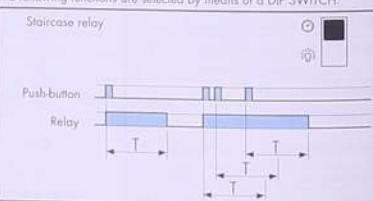
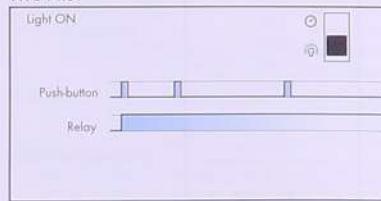
Example: a 13 series, DIN rail-mount electronic step relay with 1 single phase switch, 1 NO (SPST-NO) contact and supply rated of 230 V AC:

|                              |          |                             |          |                                               |          |                             |                            |
|------------------------------|----------|-----------------------------|----------|-----------------------------------------------|----------|-----------------------------|----------------------------|
| <b>1</b>                     | <b>3</b> | <b>2</b>                    | <b>1</b> | <b>8</b>                                      | <b>2</b> | <b>3</b>                    | <b>0</b>                   |
| <b>Series</b>                |          |                             |          |                                               |          |                             |                            |
| <b>No. of poles</b>          |          |                             |          | <b>Supply version</b>                         |          |                             |                            |
| 1 = Single phase switch 1 NO |          |                             |          | • 0 = DC/AC (50/60 Hz)<br>• 8 = AC (50/60 Hz) |          |                             |                            |
| <b>Type</b>                  | <b>2</b> | DIN rail 46277 mount - 16 A |          |                                               |          | <b>Supply rated voltage</b> |                            |
|                              | 3        | 3 = Socket - 10 A           |          |                                               |          | 012 = 12 V                  |                            |
|                              |          | 120 = 110 V                 |          |                                               |          | 024 = 24 V                  |                            |
|                              |          | 230 = 230 V                 |          |                                               |          | *                           | for 13.21 (12 - 24 V) only |

## 14 Series Multifunction Staircase Electronic Timers



| Mounting                                        | DIN 46277            | DIN 46277                  |
|-------------------------------------------------|----------------------|----------------------------|
| <b>Contact specification</b>                    |                      |                            |
| Number of contacts                              | 1 NO (SPST-NO)       | 1 NO (SPST-NO)             |
| Rated current                                   | A 16                 | 16                         |
| Maximum peak current                            | A 30                 | 30                         |
| Rated load AC1                                  | VA 3700              | 3700                       |
| Rated load AC15                                 | VA 700               | 700                        |
| Rated voltage/Max switching voltage             | V - 230              | 230                        |
| Nominal lamp rates: incandescence (230 V) W     | 2000                 | 2000                       |
| compensated fluorescent (230 V) W               | 750                  | 750                        |
| Standard contact material                       | Ag/Sn O <sub>2</sub> | Ag/Sn O <sub>2</sub>       |
| <b>Coil specification</b>                       |                      |                            |
| Nominal voltage (U <sub>h</sub> )               | V AC (50/60 Hz)      | 230                        |
| Rated power AC                                  | V A (50 Hz)          | 2                          |
| Operating range                                 | V AC (50 Hz)         | (0.8 + 1.1) U <sub>h</sub> |
| <b>Technical data</b>                           |                      |                            |
| Electrical life at full load in AC1             | cycles               | 100,000                    |
| Dielectric strength: between open contacts V -  |                      | 1000                       |
| Delay setting                                   | minutes              | 0.5 + 20                   |
| Max. no. of illuminated push-button connectable |                      | 15 (1 mA)                  |
| Max. impulse duration                           |                      | continuous                 |
| Ambient temperature                             | °C                   | (-10 + +50)                |
| Protection category                             |                      | IP 20                      |
| <b>Approvals:</b> (according to type)           |                      |                            |
|                                                 |                      |                            |


**TYPE 14.01**

**TYPE 14.31**

**Ordering Information**

Example: a 14 series single module relay with a single phase switch 1 NO (SPST-NO) 16 A contact, with supply rated at 230 V AC

**1 4 0 1**

Series

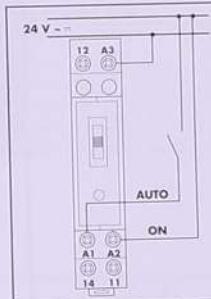
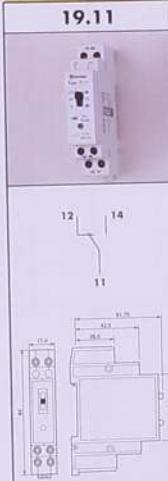
No. of poles

1 = Single phase switch 1 NO - 16 A

**8 2 3 0**

Supply version

230 - 230 V

 Type  
 0 = 1 module  
 3 = 2 modules
 
 Supply version  
 B = AC (50/60 Hz)
 
**19.11**

**Mounting**
**DIN 46277**
**Contact specification**

1 CO (SPDT)

Rated current A 10

Maximum peak current A 30

Rated load AC1 VA 2500

Rated load AC15 VA 750

Rated voltage/Max switching voltage V ~ 250/415

Breaking capacity in DC1: 30/110/220V V.A 10/0.3/0.12

Minimum switching load mW (V/mA) —

Single phase motors rating KW/HP 0.44/0.6

Standard contact material Ag Sn O<sub>2</sub>
**Coil specification**

24

Nominal voltage (U<sub>n</sub>) V AC (50/60 Hz) 24

V DC 24

Rated power AC VA (50 Hz)/W 0.8/0.65

V AC (50 Hz) (0.8 + 1.1)U<sub>n</sub>Operating range V.DC (0.8 + 1.1)U<sub>n</sub>
**Technical data**

10.000.000

Mechanical life cycles 10.000.000

Electrical life at full load in AC1 cycles 100.000

Dielectric strength: between coil and contacts V ~ 4000

between open contacts V ~ 1000

Surge test [1.2/50 µs] between coil and contacts V 6000

Insulation group conforming to VDE 0110 —

Ambient temperature °C (-10 +70)

Protection category IP 20

Approvals: (according to type) CE

**Ordering Information**

Example: a 19 series relay with 1 CO (SPDT) 10 A contact rated at 24 V AC/DC.

**1 9 1 1 0 0 2 4**

Series

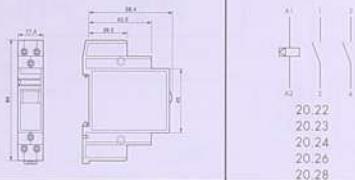
coil rated voltage  
024 - 24 VType  
1 = 1 modulecoil version  
0 = AC/DC  
(50/60 Hz)No. of poles  
1 = CO - 10 A

## 20 Series Modular Step Relays

20.2 ...



| TYPE  | Number of steps | SEQUENCES |     |     |     |
|-------|-----------------|-----------|-----|-----|-----|
|       |                 | 1         | 2   | 3   | 4   |
| 20.21 | 2               |           | 1 2 |     |     |
| 20.22 | 2               | 1 2       | 1 2 | 1 2 |     |
| 20.23 | 2               | 1 2       | 1 2 | 1 2 | 1 2 |
| 20.24 | 4               | 1 2       | 1 2 | 1 2 | 1 2 |
| 20.26 | 3               | 1 2       | 1 2 | 1 2 | 1 2 |
| 20.28 | 4               | 1 2       | 1 2 | 1 2 | 1 2 |



| Mounting                                           | DIN 46277                                                             |
|----------------------------------------------------|-----------------------------------------------------------------------|
| <b>Contact specification</b>                       |                                                                       |
| Number of contacts                                 | 1 or 2                                                                |
| Rated current                                      | A 16                                                                  |
| Maximum peak current                               | A 30                                                                  |
| Rated load AC1                                     | VA 4000                                                               |
| Rated load AC15                                    | VA 750                                                                |
| Rated voltage/Max switching voltage                | V - 250/400                                                           |
| Nominal lamp rates: incandescence                  | W 2000                                                                |
| compensated fluorescent                            | W 750                                                                 |
| Standard contact material                          | Ag Ni                                                                 |
| <b>Coil specification</b>                          |                                                                       |
| Nominal voltage (U <sub>n</sub> )                  | V AC [50/60 Hz] 8-12-24-48-110-125-230-240                            |
|                                                    | V DC 12-24-48-110                                                     |
| Rated power AC                                     | VA [50 Hz]/W 5.5/5                                                    |
| Operating range                                    | V AC [0.85+1.1]U <sub>n</sub> [50 Hz]/[0.9+1.1]U <sub>n</sub> [60 Hz] |
|                                                    | V DC [0.9+1.1]U <sub>n</sub>                                          |
| <b>Technical data</b>                              |                                                                       |
| Mechanical life                                    | cycles 300,000                                                        |
| Electrical life at full load in AC1                | cycles 100,000                                                        |
| Dielectric strength: between coil and contacts V - | 3500                                                                  |
| between adjacent contacts V -                      | 2000                                                                  |
| Surge test (1.2/50 µs) between coil and contacts V | 4000                                                                  |
| Maximum impulse duration                           | according to IEC 669.1 and 669.22                                     |
| Maximum frequency: without load                    | cycles/h 3600                                                         |
| at full load                                       | cycles/h 900                                                          |
| Ambient temperature                                | °C [-40 + +40]                                                        |
| Protection category                                | IP 20                                                                 |
| Approvals: (according to type)                     | CE                                                                    |

## 20 series AC/DC Coil Data and Ordering information

### 20 Series - AC VERSION DATA

| Nominal voltage U <sub>n</sub> [V] | Resistance R [Ω] | Absorption I at U <sub>n</sub> at 50 Hz [mA] |
|------------------------------------|------------------|----------------------------------------------|
| 8                                  | 3.5              | 700                                          |
| 12                                 | 7                | 450                                          |
| 24                                 | 27               | 210                                          |
| 48                                 | 105              | 110                                          |
| 110                                | 600              | 45                                           |
| 125                                | 700              | 42                                           |
| 230                                | 2500             | 23.5                                         |
| 240                                | 2700             | 22                                           |

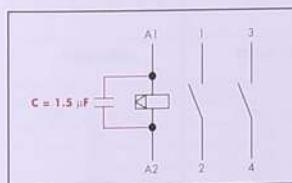
### 20 Series - DC VERSION DATA

| Nominal voltage U <sub>n</sub> [V] | Resistance R [Ω] | Absorption I at U <sub>n</sub> [mA] |
|------------------------------------|------------------|-------------------------------------|
| 12                                 | 27               | 440                                 |
| 24                                 | 105              | 230                                 |
| 48                                 | 440              | 110                                 |
| 110                                | 2330             | 47                                  |

### THE CAPACITOR

#### For use with illuminated push-buttons.

A capacitor ( $C = 1.5 \mu\text{F}$ ) is available if using a maximum of 10 illuminated push-buttons (1.5 mA max, 230 V AC) in the switching input circuit. This capacitor has to be connected in parallel to the coil of the relay (see diagram).



#### Technical data for 20 series relay capacitor.

Sealed version, 7.5 cm insulated and flexible terminals.

**CODE 02600**

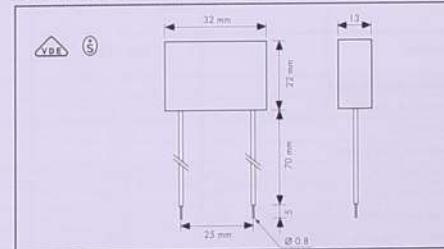
MATERIAL: Metallized polypropylene

CAPACITOR TOLERANCE:  $\leq 10\%$

RATED VOLTAGE: 250 V AC

MAX TEMPERATURE: + 85°C

DIELLECTRIC STRENGTH: 1.6 kV, 50 Hz, 60 s,  $25 \pm 5^\circ\text{C}$



### Ordering Information

Example: a 20 series DIN rail mount relay with double phase switch, 2 NO contacts, with coil rated at 12 V DC with Ag SnO<sub>2</sub> contacts.

2 0      2      2      9      0 1 2      4      0 0 0

Series

Coil version  
8 = AC [50/60 Hz]  
9 = DC

Contact material  
4 = Ag Sn O<sub>2</sub>

#### No. of poles

- 1 = Single phase switch 1 NO
- 2 = Double phase switch 2 NO
- 3 = Double phase switch 1 NO + 1 NC
- 4 = 4 sequence double phase switch
- 5 = 3 sequence double phase switch
- 6 = 4 sequence double phase switch

#### Coil rated voltage

- 008 = 8 V
- 012 = 12 V
- 024 = 24 V
- 048 = 48 V
- 110 = 110 V
- 125 = 125 V
- 230 = 230 V
- 240 = 240 V

#### Type

2 = DIN rail 46277 mount

For standard relays with no options, use the first 8 digits only.

## 22 Series Modular Monostable Relays

|                                                     | 22.21                           | 22.22                           | 22.23                           |
|-----------------------------------------------------|---------------------------------|---------------------------------|---------------------------------|
|                                                     |                                 |                                 |                                 |
| Mounting                                            | DIN 46277                       | DIN 46277                       | DIN 46277                       |
| <b>Contact specification</b>                        |                                 |                                 |                                 |
| Number of contacts                                  | 1 NO (SPST)                     | 2 NO (SPDT)                     | 1 NO + 1 NC (SPDT)              |
| Rated current A                                     | 20                              | 20                              | 20                              |
| Maximum peak current A                              | 40                              | 40                              | 40                              |
| Rated load AC1 VA                                   | 5000                            | 5000                            | 5000                            |
| Rated load AC15 VA                                  | 1000                            | 1000                            | 1000                            |
| Rated voltage/Max switching voltage V <sub>z</sub>  | 250/400                         | 250/400                         | 250/400                         |
| Nominal lamp rates: incandescence (230 V) W         | 1000                            | 1000                            | 1000                            |
| compensated fluorescent (230 V) W                   | 360                             | 360                             | 360                             |
| Standard contact material                           | Ag Ni                           | Ag Ni                           | Ag Ni                           |
| <b>Coil specification</b>                           |                                 |                                 |                                 |
| Nominal voltage (U <sub>n</sub> ) — V AC [50/60 Hz] | 8-12-24-48-110-125-230-240      | 8-12-24-48-110-125-230-240      | 8-12-24-48-110-125-230-240      |
| Y DC                                                | 12-24-48-110                    | 12-24-48-110                    | 12-24-48-110                    |
| Rated power AC VA [50 Hz]/W                         | 2.3/1.25                        | 2.3/1.25                        | 2.3/1.25                        |
| Operating range V AC [50 Hz]                        | [0.85 ± 1.1]U <sub>n</sub>      | [0.85 ± 1.1]U <sub>n</sub>      | [0.85 ± 1.1]U <sub>n</sub>      |
| V DC                                                | [0.9 ± 1.1]U <sub>n</sub>       | [0.9 ± 1.1]U <sub>n</sub>       | [0.9 ± 1.1]U <sub>n</sub>       |
| <b>Technical data</b>                               |                                 |                                 |                                 |
| Mechanical life cycles                              | 500.000                         | 500.000                         | 500.000                         |
| Electrical life at full load in AC1 cycles          | 50.000                          | 50.000                          | 50.000                          |
| Dielectric strength: between coil and contacts V ~  | 3500                            | 3500                            | 3500                            |
| between open contacts V ~                           | —                               | 2000                            | 2000                            |
| Surge test (1.2/50 µs) between coil and contacts V  | 4000                            | 4000                            | 4000                            |
| Maximum impulse duration                            | continuous [R <sub>1</sub> = 1] | continuous [R <sub>1</sub> = 1] | continuous [R <sub>1</sub> = 1] |
| Ambient temperature °C                              | [-40 ± +40]                     | [-40 ± +40]                     | [-40 ± +40]                     |
| Protection category                                 | IP 20                           | IP 20                           | IP 20                           |
| <b>Approvals:</b> (according to type)               | CE                              | CE                              | CE                              |

## 22 Series Modular Monostable Relays

|                                                     | 22.24                           |
|-----------------------------------------------------|---------------------------------|
|                                                     |                                 |
| Mounting                                            | DIN 46277                       |
| Number of contacts                                  | 2 NC                            |
| Rated current A                                     | 20                              |
| Maximum peak current A                              | 40                              |
| Rated load AC1 VA                                   | 5000                            |
| Rated load AC15 VA                                  | 1000                            |
| Rated voltage/Max switching voltage V <sub>z</sub>  | 250/400                         |
| Nominal lamp rates: incandescence (230 V) W         | 1000                            |
| compensated fluorescent (230 V) W                   | 360                             |
| Standard contact material                           | Ag Ni                           |
| <b>Coil specification</b>                           |                                 |
| Nominal voltage (U <sub>n</sub> ) — V AC [50/60 Hz] | 8-12-24-48-110-125-230-240      |
| Y DC                                                | 12-24-48-110                    |
| Rated power AC VA [50 Hz]/W                         | 2.3/1.25                        |
| Operating range V AC [50 Hz]                        | [0.85 ± 1.1]U <sub>n</sub>      |
| V DC                                                | [0.9 ± 1.1]U <sub>n</sub>       |
| <b>Technical data</b>                               |                                 |
| Mechanical life cycles                              | 500.000                         |
| Electrical life at full load in AC1 cycles          | 50.000                          |
| Dielectric strength: between coil and contacts V ~  | 3500                            |
| between open contacts V ~                           | —                               |
| Surge test (1.2/50 µs) between coil and contacts V  | 2000                            |
| Maximum impulse duration                            | continuous [R <sub>1</sub> = 1] |
| Ambient temperature °C                              | [-40 ± +40]                     |
| Protection category                                 | IP 20                           |
| <b>Approvals:</b> (according to type)               | CE                              |

### 22 Series - AC VERSION DATA

| Nominal voltage U <sub>n</sub> (V) | Resistance R (Ω) | Absorption I at U <sub>n</sub> of 50 Hz (mA) |
|------------------------------------|------------------|----------------------------------------------|
| 8                                  | 6.5              | 275                                          |
| 12                                 | 13.5             | 185                                          |
| 24                                 | 42               | 95                                           |
| 48                                 | 185              | 48                                           |
| 110                                | 980              | 21                                           |
| 125                                | 1400             | 18                                           |
| 230                                | 4250             | 10                                           |
| 240                                | 4400             | 9.5                                          |

### 22 Series - DC VERSION DATA

| Nominal voltage U <sub>n</sub> (V) | Resistance R (Ω) | Absorption I at U <sub>n</sub> (mA) |
|------------------------------------|------------------|-------------------------------------|
| 12                                 | 115              | 104.3                               |
| 24                                 | 460              | 52.2                                |
| 48                                 | 1850             | 25.9                                |
| 110                                | 9700             | 11.3                                |

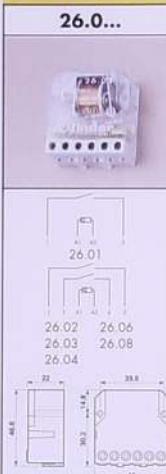
### Ordering Information

Example: a 22 series DIN rail mount relay with 1 NO (SPST-NO) contacts, coil rated at 24 V DC.

|               |   |   |   |   |   |   |   |   |   |                             |   |
|---------------|---|---|---|---|---|---|---|---|---|-----------------------------|---|
| 2             | 2 | 2 | 1 | 9 | 0 | 2 | 4 | 4 | 0 | 0                           | 0 |
| <b>Series</b> |   |   |   |   |   |   |   |   |   | Contact material            |   |
|               |   |   |   |   |   |   |   |   |   | 4 = Ag SnO <sub>2</sub>     |   |
|               |   |   |   |   |   |   |   |   |   | Coil version                |   |
|               |   |   |   |   |   |   |   |   |   | 8 = AC [50/60 Hz]<br>9 = DC |   |
|               |   |   |   |   |   |   |   |   |   | No. of poles                |   |
|               |   |   |   |   |   |   |   |   |   | Coil rated voltage          |   |
|               |   |   |   |   |   |   |   |   |   | 008 = 8 V                   |   |
|               |   |   |   |   |   |   |   |   |   | 012 = 12 V                  |   |
|               |   |   |   |   |   |   |   |   |   | 024 = 24 V                  |   |
|               |   |   |   |   |   |   |   |   |   | 048 = 48 V                  |   |
|               |   |   |   |   |   |   |   |   |   | 110 = 110 V                 |   |
|               |   |   |   |   |   |   |   |   |   | 125 = 125 V                 |   |
|               |   |   |   |   |   |   |   |   |   | 230 = 230 V                 |   |
|               |   |   |   |   |   |   |   |   |   | 240 = 240 V                 |   |

## 26 Series Step Relays

| TYPE  | Number of steps | SEQUENCES |   |   |   |
|-------|-----------------|-----------|---|---|---|
|       |                 | 1         | 2 | 3 | 4 |
| 26.01 | 2               | /         | / | / | / |
| 26.02 | 2               | /         | / | / | / |
| 26.03 | 2               | /         | / | / | / |
| 26.04 | 4               | /         | / | / | / |
| 26.06 | 3               | /         | / | / | / |
| 26.08 | 4               | /         | / | / | / |



### 26 Series - AC VERSION DATA

| Nominal voltage<br>Un [V] | Resistance<br>R [ $\Omega$ ] | Absorption 1 at Un at 50 Hz<br>[mA] |
|---------------------------|------------------------------|-------------------------------------|
| 12                        | 17                           | 370                                 |
| 24                        | 70                           | 180                                 |
| 48                        | 290                          | 90                                  |
| 110                       | 1500                         | 40                                  |
| 230                       | 6250                         | 20                                  |

### Mounting

### Screw Terminal

#### Contact specification

Number of contacts 1 or 2

Rated current A  $\pm$  10

Maximum peak current A  $\pm$  20

Rated load AC1 VA 2500

Rated load AC15 VA 500

Rated voltage/Max switching voltage V  $\pm$  250/400

Nominal lamp rates: incandescence (230 V) W 800

compensated fluorescent (230 V) W 360

Standard contact material Ag Ni

#### Coil specification

Nominal voltage [Un] V AC (50 Hz) 12 - 24 - 48 - 110 - 230

V DC —

Rated power AC VA (50 Hz)/W 4.5/-

Operating range V AC (50 Hz)  $[0.9 + 1.1] \text{ Un}$

V DC —

#### Technical data

Mechanical life cycles 300.000

Electrical life at full load in AC1 cycles 100.000

Dielectric strength: between coil and contacts V  $\pm$  3500

between open contacts V  $\pm$  2000

Surge test (1.2/50  $\mu$ s) between coil and contacts V 4000

Maximum impulse duration according to IEC 669-1 and 669-2.2

Maximum frequency: without load cycles/h 3600

at full load cycles/h 1800

Ambient temperature  $^{\circ}\text{C}$   $(-40 + +40)$

Protection category IP 20

Approvals: (according to type)

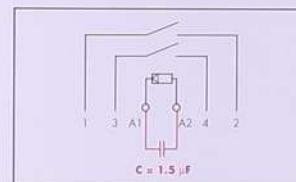


## 26 Series Wiring Diagrams and Ordering Information

### THE CAPACITOR

#### For use with illuminated push-buttons.

A capacitor ( $C = 1.5 \mu\text{F}$ ) is available if using a maximum of 10 illuminated push-buttons (1.5 mA max, 230 V AC) in the switching input circuit. This capacitor has to be connected in parallel to the coil of the relay (see diagram).



Technical data for the 26 series relay capacitor.  
Sealed version, 7.5 cm insulated and flexible terminals.

#### CODE 02600

MATERIAL: Metallized polypropylene

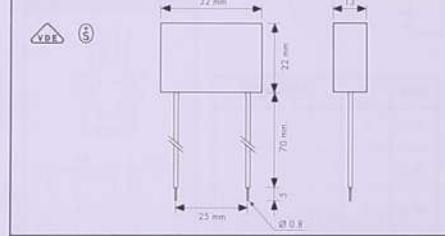
CAPACITOR TOLERANCE:  $\pm 10\%$

RATED VOLTAGE: 250 V AC

MAX TEMPERATURE:  $+ 85^{\circ}\text{C}$

Dielectric Strength: 1.6 kV, 50 Hz, 60 s,  $25 \pm 5^{\circ}\text{C}$

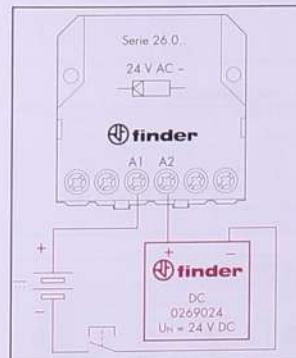
Dimensions: 32 mm width, 72 mm height, 25 mm depth, weight 0.8 kg



### ADAPTER

#### For DC supply.

The relay, if connected as below operates with direct current.



Technical data for the 26 series relay adapter.  
Sealed version, 7.5 cm insulated and flexible terminals.

#### CODE 0269012

NOMINAL VOLTAGE: 12 V DC

MAX TEMPERATURE:  $+ 40^{\circ}\text{C}$

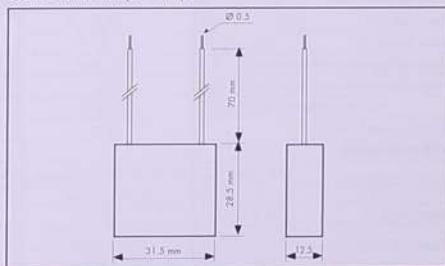
OPERATING RANGE:  $[0.9 + 1.1] \text{ Un}$

#### CODE 0269024

NOMINAL VOLTAGE: 24 V DC

MAX TEMPERATURE:  $+ 40^{\circ}\text{C}$

OPERATING RANGE:  $[0.9 + 1.1] \text{ Un}$



### Ordering information

Example: a 26 series screw terminal mount relay with double phase switch 2 NO contacts, with coil rated at 12 V AC.

**2 6 0 2**

Series

**8 0 1 2**

**8 0 1 2**

Coil version  
B = AC (50/60 Hz)

Coil rated voltage

012 = 12 V

024 = 24 V

048 = 48 V

110 = 110 V

230 = 230 V

No. of poles  
1 = Single phase switch 1 NO  
2 = Double phase switch 2 NO  
3 = Double phase switch 1 NO + 1 NC

4 = 4 sequence double phase switch

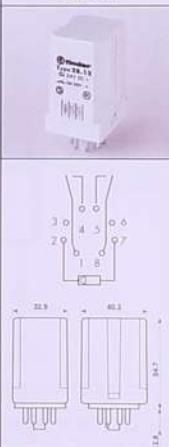
6 = 3 sequence double phase switch

8 = 4 sequence double phase switch

Type  
0 = Screw terminal - 10A

## 28 Series Step Relays

**28.1...**



| TYPE  | Number of steps | SEQUENCES |
|-------|-----------------|-----------|
| 28.12 | 2               |           |
| 28.13 | 2               |           |
| 28.14 | 4               |           |
| 28.18 | 4*              |           |

### 28 series - VERSION DATA AC

| Nominal voltage Un (V) | Resistance R (Ω) | Absorption I at Un at 50 Hz [mA] |
|------------------------|------------------|----------------------------------|
| 12                     | 12.5             | 550                              |
| 24                     | 50               | 266                              |
| 48                     | 200              | 135                              |
| 110                    | 1200             | 56.5                             |
| 125                    | 1200             | 63                               |
| 230                    | 4500             | 30                               |
| 240                    | 4500             | 33                               |

Mounting  
Plug-in for  
use with 90 series sockets

### Contact specification

Number of contacts

2

Rated current

A

10

Maximum peak current

A

20

Rated load AC1

VA

2500

Rated load AC15

VA

500

Rated voltage/Max switching voltage V

-

250/400

Nominal lamp rates: incandescence [230 V] W

800

compensated fluorescent [230 V] W

360

Standard contact material:

Ag Ni

### Coil specification

Nominal voltage [Un] V AC [50/60 Hz] 12-24-48-110-125-230-240  
V DC 9-12-24-48

Rated power AC VA [50 Hz]/W 7/6

Operating range V AC [50 Hz] [0.85 - 1.1]Un  
V DC [0.9 - 1.1]Un

### Technical data

Mechanical life cycles 200 000

Electrical life of full load in AC1 cycles 100 000

Dielectric strength: between coil and contacts V - 3500

between adjacent contacts V - 2000

Surge test (1.2/50 µs) between coil and contacts V 4000

Maximum impulse duration according to IEC 669-1 and 669-2.2

Maximum frequency, without load cycles/h 3600

at full load cycles/h 1800

Ambient temperature °C [-40 + +40]

Protection category IP 40

Approvals: (according to type)



### Ordering Information

Example: a 28 series 10 A plug-in relay with double phase switch 2 NO contacts, with coil rated at 230 V AC.

**2 8 1 2 8 2 3 0**

Series

Coil version

8 = AC [50/60]Hz  
9 = DC

No of poles

2 = Double phase switch 2 NO

3 = Double phase switch

1 NO + 1 NC

4 = 4 sequence double

phase switch

8 = 4 sequence double

phase switch

012 = 12 V

024 = 24 V

048 = 48 V

110 = 110 V

125 = 125 V

230 = 230 V

240 = 240 V

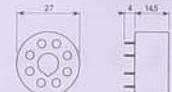
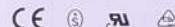
Type

1 = Plug-in - 10A

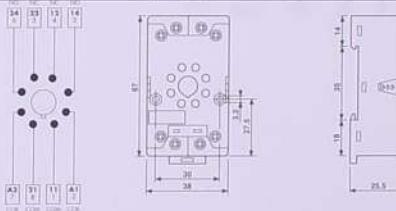
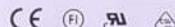
## Sockets and Accessories for 28 Series Relays



| Relay type    | 28.12, 28.13, 28.14, 28.18 |
|---------------|----------------------------|
| P.C.B. socket | BLUE 90.14                 |
|               | BLACK* 90.14.0             |



| Relay type                                              | 28.12, 28.13, 28.14, 28.18 |
|---------------------------------------------------------|----------------------------|
| Clamp terminal socket:<br>panel or DIN rail 46277 mount | BLUE 90.20                 |
|                                                         | BLACK* 90.20.0             |
| Retaining clip                                          | 90.03                      |
| Module                                                  | 99.01                      |



|                                 | BLUE                | BLACK*         |
|---------------------------------|---------------------|----------------|
| Diode                           | [6 - 220] V DC      | 99.01.3.000.00 |
| Diode (inverted polarity)       | [6 - 220] V DC      | 99.01.2.000.00 |
| LED                             | [6 - 24] V DC/AC    | 99.01.0.024.59 |
| LED                             | [28 - 60] V DC/AC   | 99.01.0.060.59 |
| LEO                             | [110 - 230] V DC/AC | 99.01.0.230.59 |
| LEO + diode                     | [6 - 24] V DC       | 99.01.9.024.99 |
| LED + diode                     | [28 - 60] V DC      | 99.01.9.060.99 |
| LED + diode                     | [110 - 230] V DC    | 99.01.9.220.99 |
| LED + diode (inverted polarity) | [6 - 24] V DC       | 99.01.9.024.79 |
| LED + diode (inverted polarity) | [28 - 60] V DC      | 99.01.9.060.79 |
| LEO + diode (inverted polarity) | [110 - 230] V DC    | 99.01.9.220.79 |
| LED + varistor                  | [6 - 24] V DC/AC    | 99.01.0.024.98 |
| LED + varistor                  | [28 - 60] V DC/AC   | 99.01.0.060.98 |
| LED + varistor                  | [110 - 230] V DC/AC | 99.01.0.230.98 |
| RC                              | [6 - 24] V DC/AC    | 99.01.0.024.09 |
| RC                              | [28 - 60] V DC/AC   | 99.01.0.060.09 |
| RC                              | [110 - 230] V DC/AC | 99.01.0.230.09 |

\*Available on request



90.22

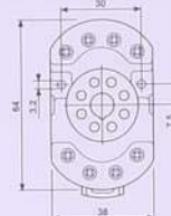
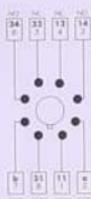
**Relay type****Clamp terminal socket:** panel or DIN rail 46277 mount

Retaining clip

**28.12, 28.13, 28.14, 28.18**

90.22

090.33



90.26

**Relay type****Screw terminal sockets:** panel or DIN rail 46277 mount

BLUE

**28.12, 28.13, 28.14, 28.18**

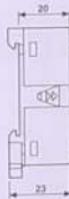
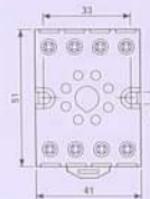
90.26

BLACK\*

90.26.0

Retaining clip

090.33





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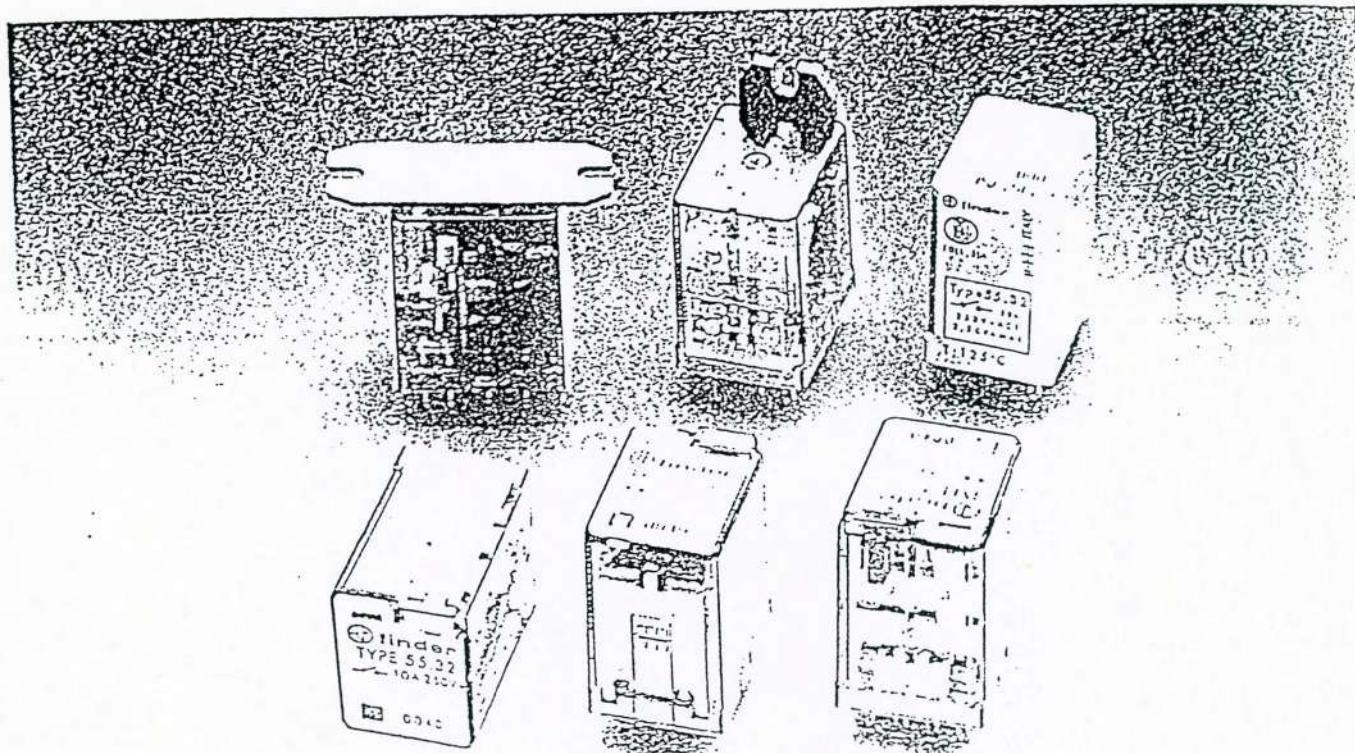
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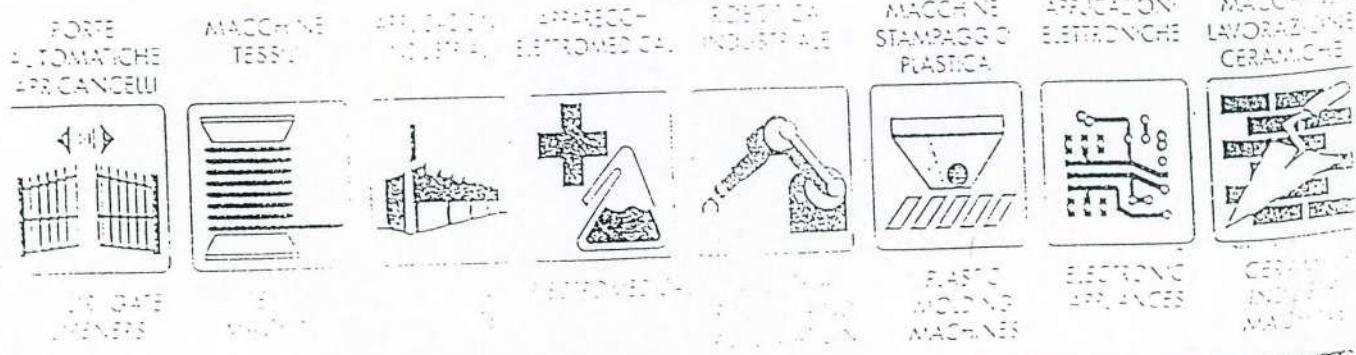
# MINI RELÈ INDUSTRIALE 5-10-16 A

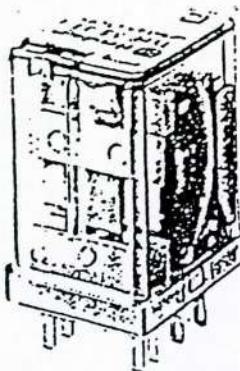
## MINIATURE INDUSTRIAL RELAY 5-10-16A



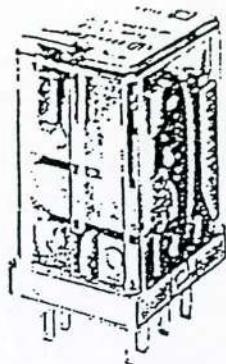
- serie di relè disponibili nei tipi a 1, 2, 3 e 4 scambi
- connessioni ad innesto o per circuito stampato
- alimentazione bobina AC e DC
- fornibile in esecuzione ermetica e/o a temperatura  
alta temperatura ( $\pm 125^\circ\text{C}$ )
- sui tipi ermetici è consigliata l'occhiello da fuga  
sul coperchio, tramite la rotura del circuito
- varianti: pulsante con indicatore meccanico;  
indicatore LED a basso assorbimento ( $< 1 \text{ mA}$ );  
diodo soppressore
- zoccoli e accessori: vedere serie 94 e 99
- omologazioni (a seconda dei tipi): EEC, CSA,  
DEMKO, FIMKO, IMQ, NEMKO, RINA, SEMKO,  
SEV, UL, UTE, VDE

- a range of small sized auxiliary relays, available  
with 1, 2, 3 and 4 changeover contacts
- socket plug - in, solder connections or PCB  
mounting
- AC and DC coil versions
- available for high temperature ( $\pm 125^\circ\text{C}$ ) and/or  
hermetically sealed
- option: manual test push button with flag  
indication, low consumption ( $< 1 \text{ mA}$ ) LED  
indication, surge suppression diode
- sockets and accessories: see 94 and 99 series
- approvals (according to types): EEC, CSA,  
DEMKO, FIMKO, IMQ, NEMKO, RINA, SEMKO,  
SEV, UL, UTE, VDE





55.31



55.32

RINA T 125°C

#### MINI RELÈ INDUSTRIALE 1 SCAMBIO 16 A

**TIPO 55.11** per circuito stampato

**TIPO 55.31** ad innesto

- connessioni in ottone stagnato:

lipo per circuito stampato (mm 1.2 x 0.5)

lipo ad innesto (mm 2.0 x 0.5)

- materiale contatti standard: Ag - CdO (non prevista varianzione contatti)

- varianti: vedere tabella codificazione

- esempio codificazione: vedere pagina 55.08.01

#### MINIATURE INDUSTRIAL RELAY 1 CO 16 A

**TYPE 55.11 P.C.B. mounting**

**TYPE 55.31 plug - in socket**

- tin plated brass connections:

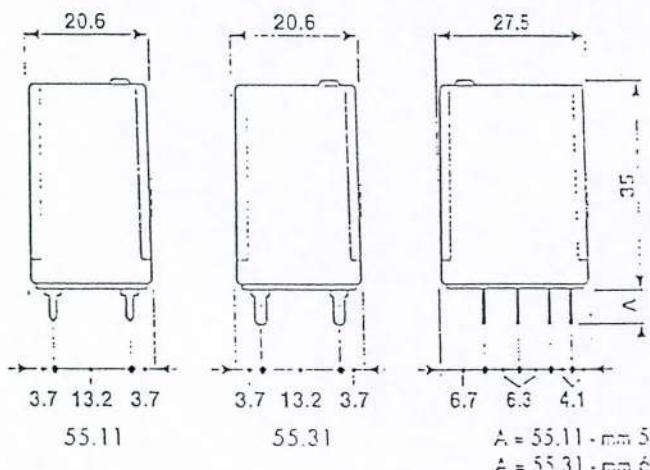
for P.C.B. (1.2 x 0.5 mm)

for plug - in (2.0 x 0.5 mm)

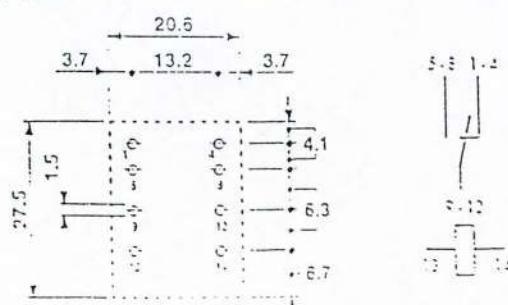
- standard contact material: Ag - CdO (contact option not available)

- option: see 55 series coding table

- ordering information: see page 55.09.01



vista lato rame  
copper side view



RINA T 125°C

#### MINI RELÈ INDUSTRIALE 2 SCAMBI 10 A

**TIPO 55.12** per circuito stampato

**TIPO 55.32** ad innesto - completo nella versione standard di pulsante per prova manuale e indicatore meccanico

- connessioni in ottone stagnato:

lipo per circuito stampato (mm 1.2 x 0.5)

lipo ad innesto (mm 2.0 x 0.5)

- materiale contatti standard: Ag - Ni

- varianti: vedere tabella codificazione

- esempio codificazione: vedere pagina 55.08.01

#### MINIATURE INDUSTRIAL RELAY 2 CO 10 A

**TYPE 55.12 P.C.B. mounting**

**TYPE 55.32 plug - in socket** - standard version is available with manual test push button and mechanical indicator

- tin plated brass connections:

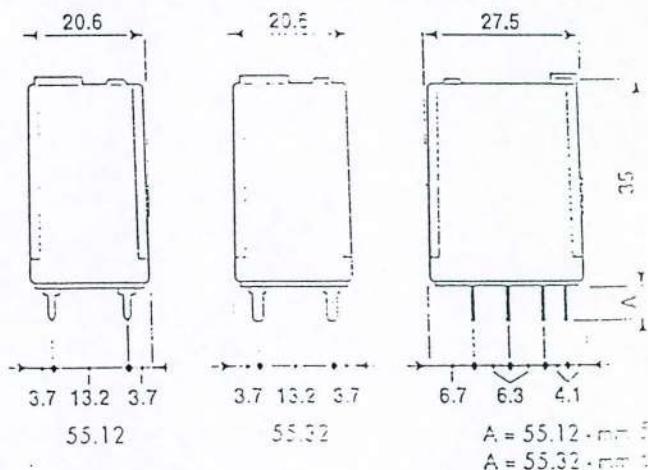
for P.C.B. (1.2 x 0.5 mm)

for plug - in (2.0 x 0.5 mm)

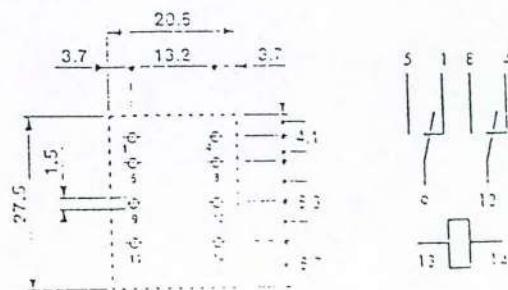
- standard contact material: Ag - Ni

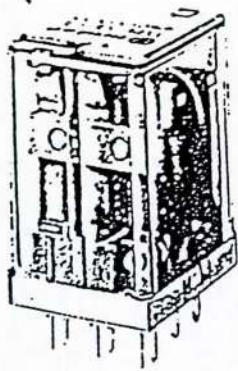
- option: see 55 series coding table

- ordering information: see page 55.09.01

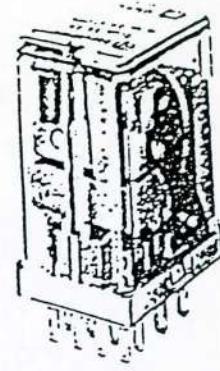


vista lato rame  
copper side view





55.13



55.34

RINA VDE  
BA BA SA

#### MINI RELÈ INDUSTRIALE 3 SCAMBI 10 A

TIPO 55.13 per circuito stampato

TIPO 55.33 ad innesto

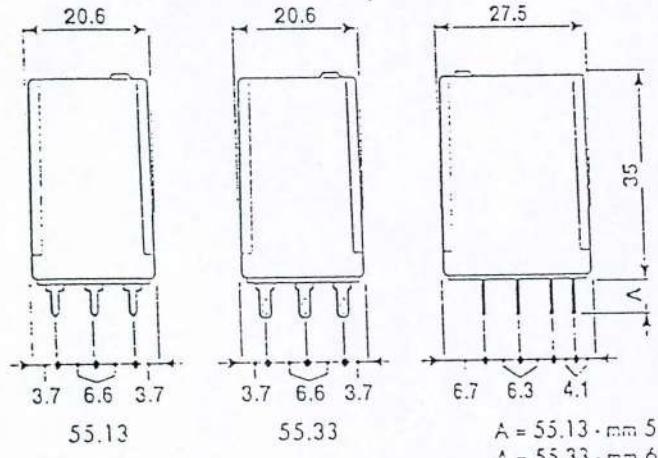
- connessioni in ottone stagnato:
- tipo per circuito stampato (mm 1.2 x 0.5)
- tipo ad innesto (mm 2.0 x 0.5)
- materiale contatti standard: Ag - Ni
- varianti: vedere tabella codificazione
- esempio codificazione: vedere pagina 55.08.01

#### MINIATURE INDUSTRIAL RELAY 3 CO 10 A

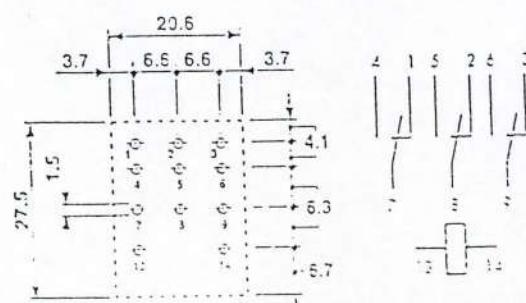
TYPE 55.13 P.C.B. mounting

TYPE 55.33 plug - in socket

- tin plated brass connections:
- for P.C.B. (1.2 x 0.5 mm)
- for plug - in (2.0 x 0.5 mm)
- standard contact material: Ag - Ni
- option: see 55 series coding table
- ordering information: see page 55.09.01



vista lato rame  
copper side view



RINA VDE  
4.5A

#### MINI RELÈ INDUSTRIALE 4 SCAMBI 5 A

TIPO 55.14 per circuito stampato

TIPO 55.34 ad innesto - completo nella versione standard di pulsante per prova manuale e indicatore meccanico

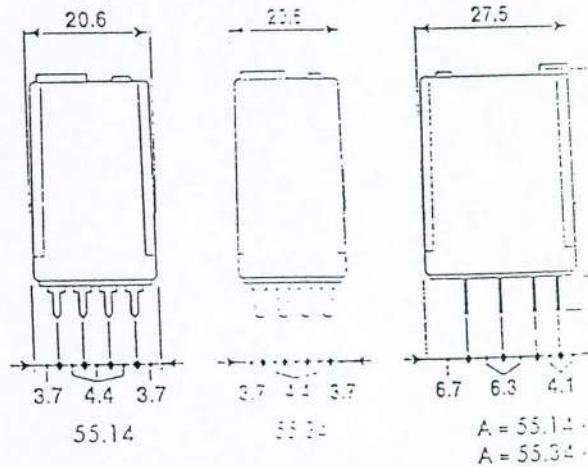
- connessioni in ottone stagnato:
- tipo per circuito stampato (mm 1.2 x 0.5)
- tipo ad innesto (mm 2.0 x 0.5)
- materiale contatti standard: Ag - Ni
- varianti: vedere tabella codificazione
- esempio codificazione: vedere pagina 55.08.01

#### MINIATURE INDUSTRIAL RELAY 4 CO 5 A

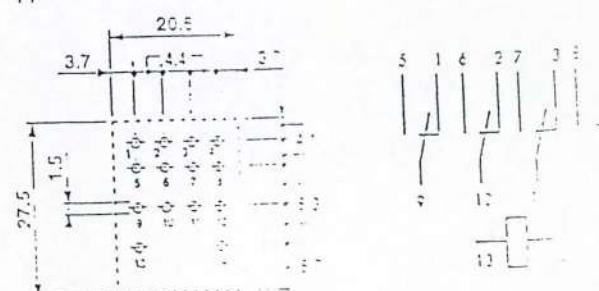
TYPE 55.14 P.C.B. mounting

TYPE 55.34 plug - in socket - standard version is available with manual test push button and mechanical indicator

- tin plated brass connections:
- for P.C.B. (1.2 x 0.5 mm)
- for plug - in (2.0 x 0.5 mm)
- standard contact material: Ag - Ni
- option: see 55 series coding table
- ordering information: see page 55.09.01



vista lato rame  
copper side view



# TECNICHE GENERALI

| RIGIDITÀ DIELETTRICA                             |                                                                                              | 1-2-3 scambi, 4 scambi               |                                      |
|--------------------------------------------------|----------------------------------------------------------------------------------------------|--------------------------------------|--------------------------------------|
| c 50 Hz<br>per 1 min<br>con 1 di fuga<br>≤ 10 mA | 1 bobina - contatti<br>contatti aperti<br>contatti adiacenti<br>massa - parti sotto tensione | 2000 V<br>1000 V<br>2000 V<br>1500 V | 2000 V<br>1000 V<br>1000 V<br>1500 V |
|                                                  |                                                                                              |                                      |                                      |

RESISTENZA DI ISOLAMENTO:  $\geq 10 \cdot 10^3 \Omega$

GRUPPO DI ISOLAMENTO: - B 250 (1 - 2 - 3 scambi)  
- A 250 (4 scambi)

MAX CADENZA CONSIGLIATA:

- a vuoto: 36000 cicli/h
- a carico nominale: 1800 cicli/h (5 - 10 A)
- a carico nominale: 600 cicli/h (16 A)

TEMPERATURA AMBIENTE: (- 40 + + 70)° C

DURATA MECCANICA:  $20 \cdot 10^5$  cicli (AC);  $50 \cdot 10^5$  cicli (DC)

GRADO DI PROTEZIONE VERSO L'INTERNO: IP 40

TEMPI DI INTERVENTO:

|                                       |                             |
|---------------------------------------|-----------------------------|
| eccitazione (da 0 a U <sub>N</sub> )  | ≤ 20 ms (rimbalzi compresi) |
| dissettazione (da U <sub>N</sub> a 0) | ≤ 20 ms (rimbalzi compresi) |

PROVA ALLA TENSIONE D'IMPULSO:

TIPO DI SERVIZIO: continuo

CLASSE DI LAVORO: C (secondo IEC 41-1)

RIGIDITÀ DIELETTRICA: 1 - 2 - 3 scambi    4 scambi

TIPO DI RELE: tutto o niente

| DIELECTRIC STRENGTH                                                  |                                                                                                                 | 1-2-3 CO                             | 4 CO                                 |
|----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|--------------------------------------|--------------------------------------|
| tested at:<br>leakage<br>current<br>≤ 10 mA<br>for 1 min<br>at 50 Hz | between coil and contacts<br>between open contacts<br>between adjacent contacts<br>between frame and live parts | 2000 V<br>1000 V<br>2000 V<br>1500 V | 2000 V<br>1000 V<br>1000 V<br>1500 V |
|                                                                      |                                                                                                                 |                                      |                                      |

INSULATION RESISTANCE:  $\geq 10 \cdot 10^3 \Omega$

INSULATION GROUP: - B 250 (1 - 2 - 3 CO)

- A 250 (4 CO)

MAX SWITCHING FREQUENCY:

- without load: 36000 cycles/h
- at rated load: 1800 cycles/h (5 - 10 A)
- at rated load: 600 cycles/h (16 A)

AMBIENT TEMPERATURE: (- 40 + + 70)° C

MECHANICAL LIFE:  $20 \cdot 10^5$  cycles (AC);  $50 \cdot 10^5$  cycles (DC)

PROTECTION CATEGORY OF ENCLOSURES: IP 40

OPERATE AND RELEASE TIME:

pick-up time (from 0 to U<sub>N</sub>) ≤ 20 ms (including contact bounce)

drop-out time (from U<sub>N</sub> to 0) ≤ 20 ms (including contact bounce)

IMPULSE VOLTAGE TEST:

TYPE OF DUTY: continuous

WORKING CLASS: C (according to IEC 255)

DIELECTRIC TEST: 1 - 2 - 3 CO

4 CO

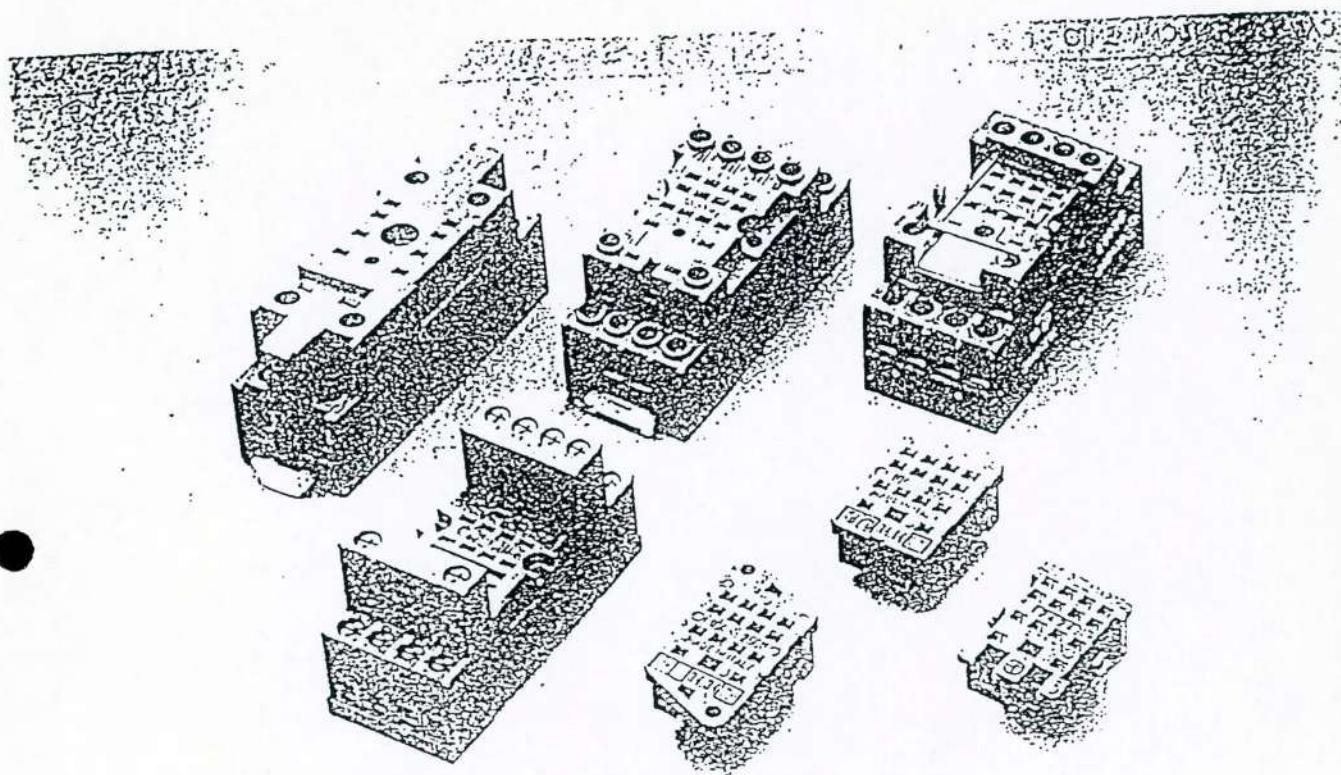
TYPE OF RELAY: all - or - nothing

## CARATTERISTICHE TECNICHE CONTATTI

|                                    | 1 scambio             | 2 scambi | 3 scambi | 4 scambi |
|------------------------------------|-----------------------|----------|----------|----------|
| FORTATA NOMINALE IN AC1            | 4000 VA               | 2500 VA  | 2500 VA  | 1250 VA  |
| CORRENTE NOMINALE                  | 16 A                  | 10 A     | 10 A     | 5 A      |
| MAX CORRENTE ISTANTANEA            | 30 A                  | 20 A     | 20 A     | 10 A     |
| TENSIONE NOMINALE                  | 250 V AC              | 250 V AC | 250 V AC | 250 V AC |
| MAX TENSIONE COMMUTABILE           | 400 V AC              | 400 V AC | 400 V AC | 400 V AC |
| POTERE DI ROTTURA IN DC1           | vedere diagramma H 55 |          |          |          |
| FORTATA MOTORI MONOFASE            | 0.5 HP                | 0.3 HP   | 0.3 HP   | 0.1 HP   |
| RESISTENZA DI CONTATTO: - iniziale | ≤ 50 mΩ               | ≤ 50 mΩ  | ≤ 50 mΩ  | ≤ 50 mΩ  |
| MATERIALE DEI CONTATTI STANDARD    | Ag - CdO              | Ag - Ni  | Ag - Ni  | Ag - Ni  |

## CONTACTS SPECIFICATION

|                               | 1 CO             | 2 CO    | 3 CO    | 4 CO    |
|-------------------------------|------------------|---------|---------|---------|
| NOMINAL RATE IN AC1           | 4000 VA          | 2500 VA | 2500 VA | 1250 VA |
| RATED CURRENT                 | 16 A             | 10 A    | 10 A    | 5 A     |
| MAX PEAK CURRENT              | 30 A             | 20 A    | 20 A    | 10 A    |
| RATED VOLTAGE                 | 250 VAC          | 250 VAC | 250 VAC | 250 VAC |
| MAX SWITCHING VOLTAGE         | 400 VAC          | 400 VAC | 400 VAC | 400 VAC |
| BREAKING CAPACITY IN DC1      | see diagram H 55 |         |         |         |
| SINGLE PHASE HP MOTORS RATING | 0.5 HP           | 0.3 HP  | 0.3 HP  | 0.1 HP  |
| CONTACT RESISTANCE: - initial | ≤ 50 mΩ          | ≤ 50 mΩ | ≤ 50 mΩ | ≤ 50 mΩ |
| STANDARD CONTACT MATERIAL     | Ag - CdO         | Ag - Ni | Ag - Ni | Ag - Ni |

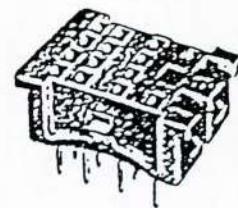


- zoccoli ed accessori adatti per relè della serie 55 e 85
- connessioni a saldare, a morsetti, a vite e per circuito stampato
- fissaggio con attacco rapido per montaggio su barra DIN 46277 o a vite
- predisposizione all'utilizzo dei moduli di segnalazione: LED, LED + diodo, diodo, LED + varistor
- circuito RC (vedi serie 99.01 e serie 99.44)
- protezione contro il contatto accidentale (IP 20)
- autoestinguenza secondo UL 94
- omologazioni (a seconda dei tipi): CSA, CS, IMQ, DEMKO, FIMKO, SEV, UL

- a range of sockets and accessories for relays series 55 and 85
- available for PCB mounting, screw terminal connections, panel mounting or DIN 46277 rail mounting
- module facilities: LED, LED + diode, diode, LED + varistor and RC series circuit are available (see 99.01 series and 99.44 series)
- finger protected to IP 20
- flammability according to UL 94
- approvals (according to types): CSA, CS - IMQ, DEMKO, FIMKO, SEV, UL



94.14



94.24

CS - IMQ

ZOCCOLO PER CIRCUITO STAMPATO  
TIPO 94.12 per relè tipi 55.31 - 55.32  
TIPO 94.13 per relè tipo 55.33  
TIPO 94.14 per relè tipo 55.34  
Completo di: TIPO 094.51 ponticello di ritenuta

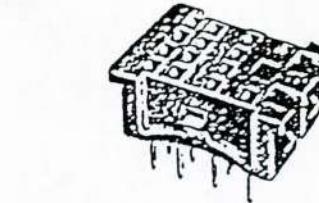
#### CARATTERISTICHE

- PORTATA: 10 A 250 V AC
- ISOLAMENTO:  $\geq 10^3$  M $\Omega$
- RIGIDITÀ DIELETTRICA:  $\geq 2$  KV
- MATERIALE ZOCCOLO: PPEm autoestinguente (V1)
- TERMINALI: Cu Sn 6 stagnati

P.C.B. SOCKET  
TYPE 94.12 for relay type 55.31 - 55.32  
TYPE 94.13 for relay type 55.33  
TYPE 94.14 for relay type 55.34  
Supplied with: TYPE 094.51 retaining clip

#### CHARACTERISTICS

- LOAD: 10 A 250 VAC
- INSULATION RESISTANCE:  $\geq 10^3$  M $\Omega$
- DIELECTRIC STRENGTH:  $\geq 2$  KV
- BODY MATERIAL: self-extinguishing PPEm (V1)
- TERMINALS MATERIAL: Cu Sn 6 tin plated



CS - IMQ

ZOCCOLO A SALDARE (fissaggio ed innesto)  
TIPO 94.22 per relè tipi 55.31 - 55.32  
TIPO 94.23 per relè tipo 55.33  
TIPO 94.24 per relè tipo 55.34  
Completo di: TIPO 094.51 ponticello di ritenuta

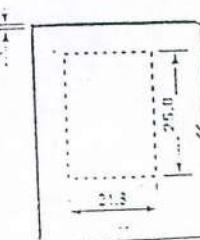
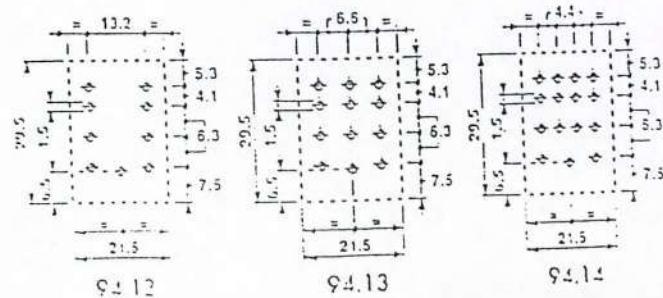
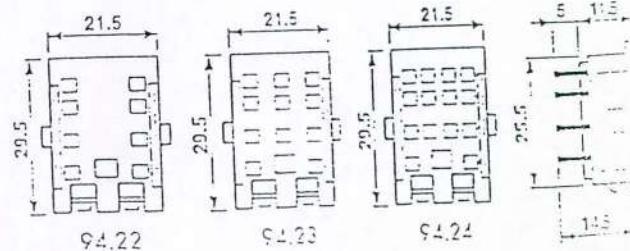
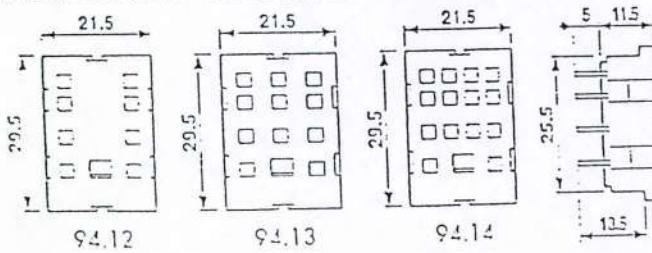
#### CARATTERISTICHE

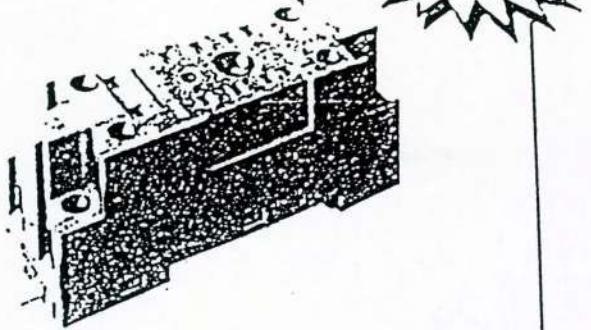
- PORTATA: 10 A 250 V AC
- ISOLAMENTO:  $\geq 10^3$  M $\Omega$
- RIGIDITÀ DIELETTRICA:  $\geq 2$  KV
- MATERIALE ZOCCOLO: Polycarbonato (PC)
- CONNESSIONI: Cu Sn 6 argentoata

PANEL MOUNTING SOLDER SOCKET (panel mounting 1 mm thickness)  
TYPE 94.22 for relay type 55.31 - 55.32  
TYPE 94.23 for relay type 55.33  
TYPE 94.24 for relay type 55.34  
Supplied with: TYPE 094.51 retaining clip

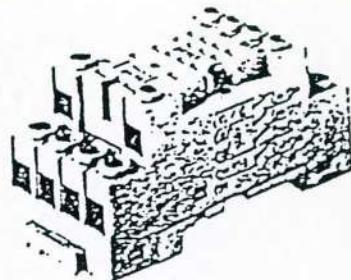
#### CHARACTERISTICS

- LOAD: 10 A 250 VAC
- INSULATION RESISTANCE:  $\geq 10^3$  M $\Omega$
- DIELECTRIC STRENGTH:  $\geq 2$  KV
- BODY MATERIAL: Polycarbonate (PC)
- CONNECTIONS: Cu Sn 6 silver plated





94.82



94.74

CE FI S R1 CS - IMQ

#### ZOCCOLO A VITE (montaggio a pannello o su barra DIN 46277)

TIPO 94.82 per relè tipi 55.31 - 55.32 - 85.32

Completo di: TIPO 094.71 ponticello di ritenuta per relè serie 55

TIPO 094.81 ponticello di ritenuta per relè serie 85

Accessori: SERIE 99.01 moduli di segnalazione e protezione bobina

#### CARATTERISTICHE

- PORTATA: 10 A 250 V AC
- ISOLAMENTO:  $\geq 10^3$  M $\Omega$
- RIGIDITÀ DIELETTRICA:  $\geq 2$  KV
- MATERIALE ZOCCOLO: PPEm autoestinguente (V1)
- CONNESSIONI: Cu Zn 33 nichelate
- GRADO DI PROTEZIONE: IP 20
- Viti imperdibili con testa a taglio combinato (loma e croce).
- Etichetta d'identificazione.

#### SCREW TERMINAL SOCKET (panel or DIN 46277 rail mounting)

TYPE 94.82 for relay type 55.31 - 55.32 - 85.32

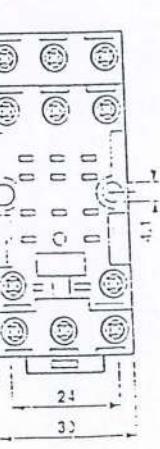
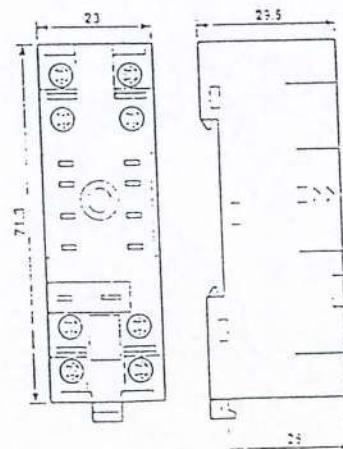
Supplied with: TYPE 094.51 retaining clip for relay series 55

TYPE 094.81 retaining clip for relay series 85

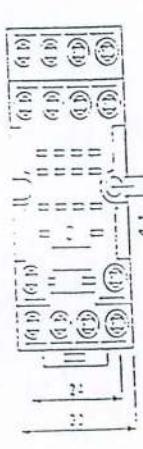
Accessories: SERIES 99.01 module facilities

#### CHARACTERISTICS

- LOAD: 10 A 250 VAC
- INSULATION RESISTANCE:  $\geq 10^3$  M $\Omega$
- DIELECTRIC STRENGTH:  $\geq 2$  KV
- BODY MATERIAL: self-extinguishing PPEm (V1)
- TERMINALS MATERIAL: Cu Zn 33 nickel plated
- PROTECTION CATEGORY: IP 20
- Non removable pozidrive slotted terminal screws.
- Identification label.



94.73



94.74

#### ZOCCOLO A VITE (montaggio a cernello o su barra DIN 46277)

TIPO 94.73 per relè tipo 55.33 - 85.33

TIPO 94.74 per relè tipo 55.34 - 85.34

Completo di: TIPO 094.71 ponticello di ritenuta per relè serie 55

TIPO 094.81 ponticello di ritenuta per relè serie 85

Accessori: SERIE 99.01 moduli di segnalazione e protezione bobina

#### CARATTERISTICHE

- PORTATA: 10 A 250 V AC
- ISOLAMENTO:  $\geq 10^3$  M $\Omega$
- RIGIDITÀ DIELETTRICA:  $\geq 2$  KV
- MATERIALE ZOCCOLO: PPEm autoestinguente (V1)
- CONNESSIONI: Cu Zn 33 nichelate
- GRADO DI PROTEZIONE: IP 20
- Viti imperdibili con testa a taglio combinato (loma e croce).

#### SCREW TERMINAL SOCKET (cowl or DIN 46277 rail mounting)

TYPE 94.73 for relay type 55.33 - 85.33

TYPE 94.74 for relay type 55.34 - 85.34

Supplied with: TYPE 094.51 retaining clip for relay series 55

TYPE 094.81 retaining clip for relay series 85

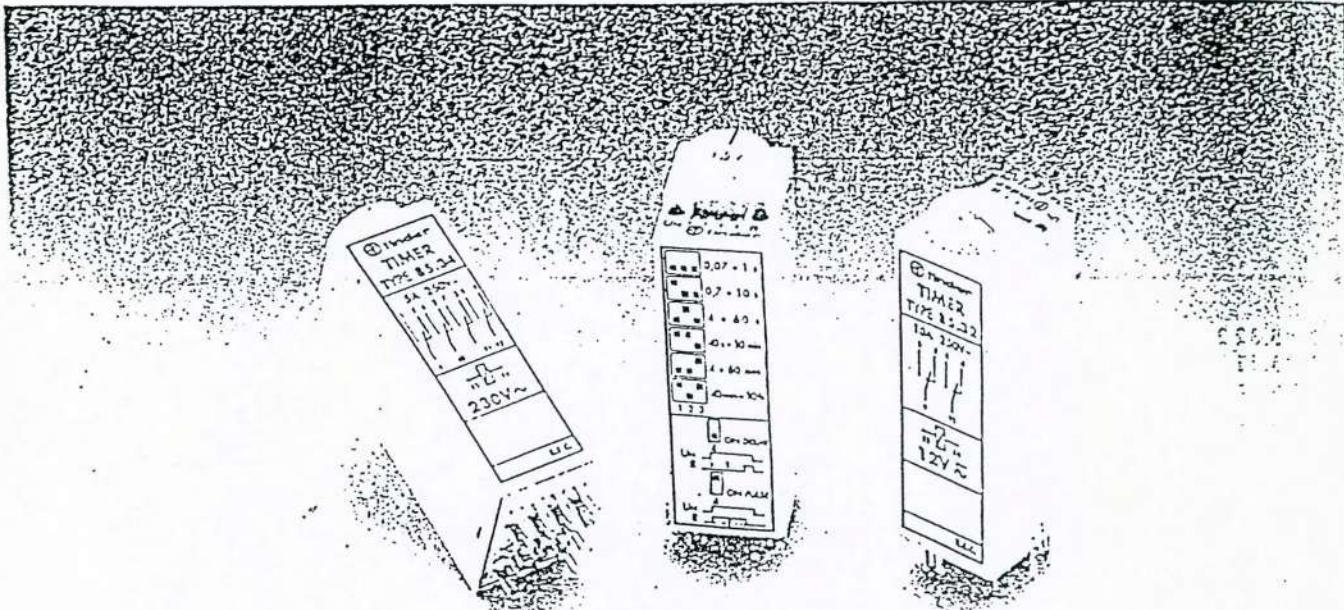
Accessories: SERIES 99.01 module facilities

#### CHARACTERISTICS

- LOAD: 10 A 250 VAC
- INSULATION RESISTANCE  $\geq 10^3$  M $\Omega$
- DIELECTRIC STRENGTH:  $\geq 2$  KV
- BODY MATERIAL: PPEm self-extinguishing (V1)
- CONNECTIONS: Cu Zn 33 nickel plated
- PROTECTION CATEGORY: IP 20
- Non removable pozidrive slotted terminal screws.

SERIE  
85

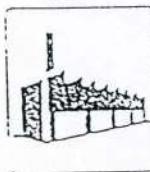
# MINI TEMPORIZZATORE MULTITUTTO 5-10A MINI MULTIFUNCTION TIMER 5-10A



- 6 differenti scale di temporizzazione da 0,05s a 10h
- due funzioni di ritardo: ritardo all'eccitazione, ritardo passante all'eccitazione
- tensioni di alimentazione: AC o DC per 12,24 e 48V, AC per 110 e 230 V
- in corrente continua è possibile non rispettare la polarità
- le funzioni e le scale tempi si selezionano tramite DIP switch situati sulla parte superiore del relè
- grado di protezione IP 40
- LED indicatori di funzionamento
- disponibilità con 2 o 3 contatti (10 A 250 V AC1) oppure 4 contatti (5 A 250 V AC1)
- zoccoli e accessori: vedere serie 94, 99.01 e 99.44
- omologazioni: UL

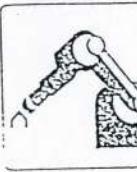
- six different time scales, from 0.05 s to 10 h
- two time functions: delay on energization, timing on impulse
- supply voltages: 12, 24, 48 VAC - DC; 110, 230 VAC
- absence of polarity for DC types
- functions and time scales to be selected by DIP switches on the top
- protection category of enclosure: IP 40
- two LED diodes display the working of the timer
- two and three NO contacts (10 A 250 VAC1) or four NO contact (5 A 250 VAC1) available
- sockets and accessories: see 94, 99.01 and 99.44 series
- approvals: UL

APPLICAZIONI  
INDUSTRIALI

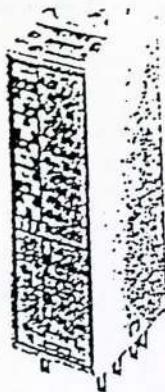


SC. ELETTR.

ROBOTICA  
INDUSTRIALE



INDUSTRIAL ROBOTS  
AND AUTOMATION



85.32

5A

#### MINI TEMPORIZZATORE MULTITUTTO

TIPO 85.32 2 scambi 10 A

TIPO 85.33 3 scambi 10 A

TIPO 85.34 4 scambi 5 A

- temporizzazioni disponibili:

0,05 + 1 s

0,5 + 10 s

1 + 60 s

30 s + 10 min

3 + 60 min

30 min + 10 h

- c innesto (mm 2.0 x 0.5)

- provvisto di LED:

rosso = relè ON

verde = illuminazione inserita

- fissaggio: vedere zoccoli serie 94

- esempio codificazione: vedere pagina 85.05.01

#### MINI MULTIFUNCTION TIMER

TIPO 85.32 2 CO 10 A

TIPO 85.33 3 CO 10 A

TIPO 85.34 4 CO 5 A

- time scales:

0,05 + 1 s

0,5 + 10 s

1 + 60 s

30 s + 10 min

3 + 60 min

30 min + 10 h

- socket mounting terminals (mm 2.0 x 0.5)

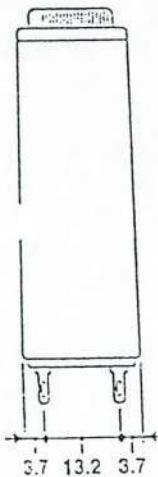
- LED indicator:

red = relay ON

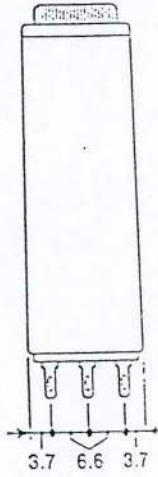
green = power ON

- mounting: see 94 series sockets

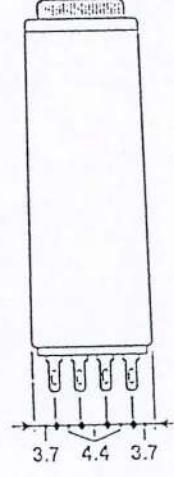
- ordering information: see page 85.05.01



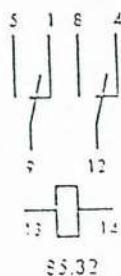
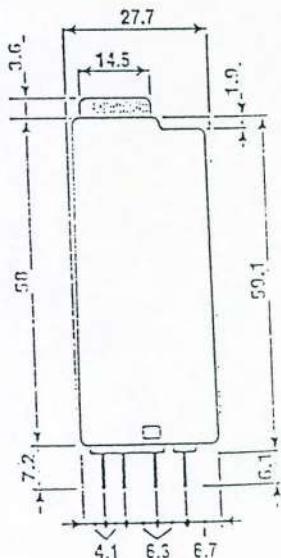
85.32



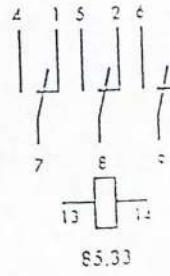
85.33



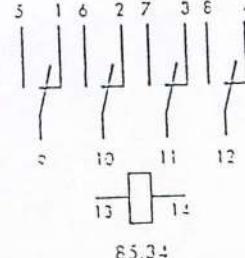
85.34



85.32



85.33



85.34

## RIGIDITÀ DIELETTRICA

|                                                               | 2 - 3 scambi                                                                                                                       | 4 scambi                   |
|---------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| a 50 Hz<br>per 1 min con<br>I di fuga<br>$\leq 10 \text{ mA}$ | bobina - contatti<br>2000 V<br>contatti aperti<br>1000 V<br>contatti adiacenti<br>2000 V<br>massa - parti sotto tensione<br>1500 V | 2000 V<br>1000 V<br>1000 V |
|                                                               |                                                                                                                                    |                            |
|                                                               |                                                                                                                                    |                            |
|                                                               |                                                                                                                                    |                            |

PORTATA NOMINALE IN AC1: - tipo 85.32/33: 10 A 250 V ~ AC1

PORTATA NOMINALE IN AC1: - tipo 85.34: 5 A 250 V ~ AC1

TENSIONI NOMINALI BOBINA:

12 V AC/DC

24 V AC/DC

48 V AC/DC

110 V AC

230 V AC

POTENZA NOMINALE:  $\leq 2 \text{ VA (AC)}$ ;  $\leq 2 \text{ W (DC)}$ 

CAMPO DI FUNZIONAMENTO: [0.85 + 1.1]UN

TEMPERATURA AMBIENTE: (-10 + +50)°C

VITA MECCANICA:  $10 \cdot 10^5$  cicliVITA ELETTRICA:  $150 \cdot 10^3$  cicli

TEMPO MINIMO DI RIPRISTINO: 100 ms

REPETIBILITÀ:  $\pm 2 \%$ 

## TECHNICAL DATA

## DIELECTRIC STRENGTH

|                                                                                                       | 2 - 3 CO                         | 4 CO                                 |
|-------------------------------------------------------------------------------------------------------|----------------------------------|--------------------------------------|
| between coil and contacts<br>tested at:<br>leakage current $\leq 10 \text{ mA}$<br>for 1 min at 50 Hz | 2000 V<br>1000 V<br>2000 V<br>-- | 2000 V<br>1000 V<br>1000 V<br>1500 V |
|                                                                                                       |                                  |                                      |
|                                                                                                       |                                  |                                      |
|                                                                                                       |                                  |                                      |

NOMINAL RATE IN AC1: - type 85.32/33: 10 A 250 V ~ AC1

NOMINAL RATE IN AC1: - type 85.34: 5 A 250 V ~ AC1

RATED POWER SUPPLY:

12 V AC/DC

24 V AC/DC

48 V AC/DC

110 V AC

230 V AC

RATED POWER CONSUMPTION:  $\leq 2 \text{ VA (AC)}$ ;  $\leq 2 \text{ W (DC)}$ 

OPERATING RANGE: [0.85 + 1.1]UN

AMBIENT TEMPERATURE: (-10 + +50)°C

MECHANICAL LIFE:  $10^7$  cyclesELECTRICAL LIFE:  $150 \cdot 10^3$  cycles

MIN RESET TIME: 100 ms

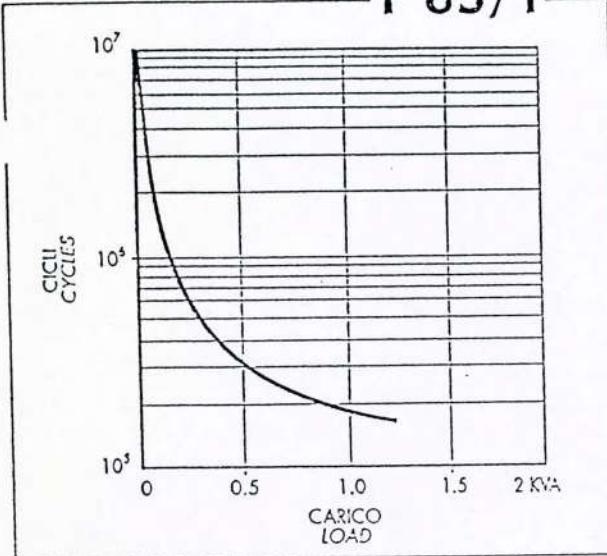
REPEATABILITY:  $\pm 2 \%$ 

## CARATTERISTICHE TECNICHE CONTATTI

|                                    | 2 scambi                  | 3 scambi                  | 4 scambi                  |
|------------------------------------|---------------------------|---------------------------|---------------------------|
| PORTATA NOMINALE IN AC1            | 2500 VA                   | 2500 VA                   | 1250 VA                   |
| CORRENTE NOMINALE                  | 10 A                      | 10 A                      | 5 A                       |
| MAX CORRENTE ISTANTANEA            | 20 A                      | 20 A                      | 10 A                      |
| TENSIONE NOMINALE                  | 250 V AC                  | 250 V AC                  | 250 V AC                  |
| MAX TENSIONE COMMUTABILE           | 400 V AC                  | 400 V AC                  | 400 V AC                  |
| POTERE DI ROTTURA IN DC1           | vedere diagramma H 85     |                           |                           |
| PORTATA MOTORI MONOFASE            | 0.3 HP                    | 0.3 HP                    | 0.1 HP                    |
| RESISTENZA DI CONTATTO: - iniziale | $\leq 50 \text{ m}\Omega$ | $\leq 50 \text{ m}\Omega$ | $\leq 50 \text{ m}\Omega$ |
| MATERIALE DEI CONTATTI STANDARD    | A <sub>g</sub> - Ni       | A <sub>g</sub> - Ni       | A <sub>g</sub> - Ni       |

|                               | 2 CO                      | 3 CO                      | 4 CO                      |
|-------------------------------|---------------------------|---------------------------|---------------------------|
| NOMINAL RATE IN AC1           | 2500 VA                   | 2500 VA                   | 1250 VA                   |
| RATED CURRENT                 | 10 A                      | 10 A                      | 5 A                       |
| MAX PEAK CURRENT              | 20 A                      | 20 A                      | 10 A                      |
| RATED VOLTAGE                 | 250 VAC                   | 250 VAC                   | 250 VAC                   |
| MAX SWITCHING VOLTAGE         | 400 VAC                   | 400 VAC                   | 400 VAC                   |
| BREAKING CAPACITY IN DC1      | see diagram H 85          |                           |                           |
| SINGLE PHASE HP MOTORS RATING | 0.3 HP                    | 0.3 HP                    | 0.1 HP                    |
| CONTACT RESISTANCE: - initial | $\leq 50 \text{ m}\Omega$ | $\leq 50 \text{ m}\Omega$ | $\leq 50 \text{ m}\Omega$ |
| STANDARD CONTACT MATERIAL     | Ag - Ni                   | Ag - Ni                   | Ag - Ni                   |

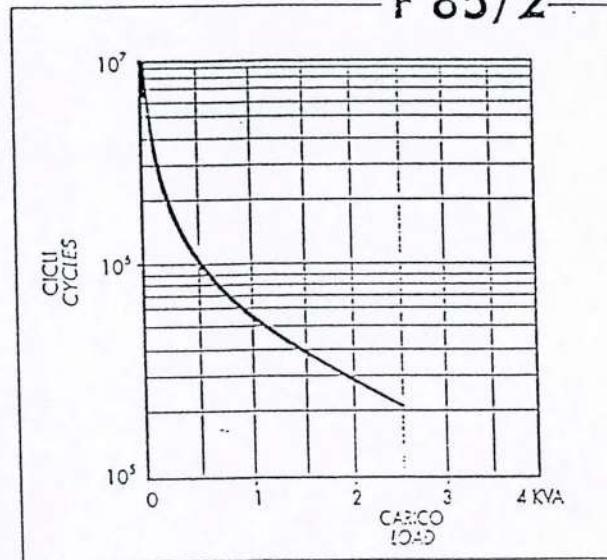
F 85/1



Durata dei contatti in funzione del carico in AC1. Tipi 4 scambi (5A).

Contacts life vs AC1 load. 4 CO types (5A).

F 85/2



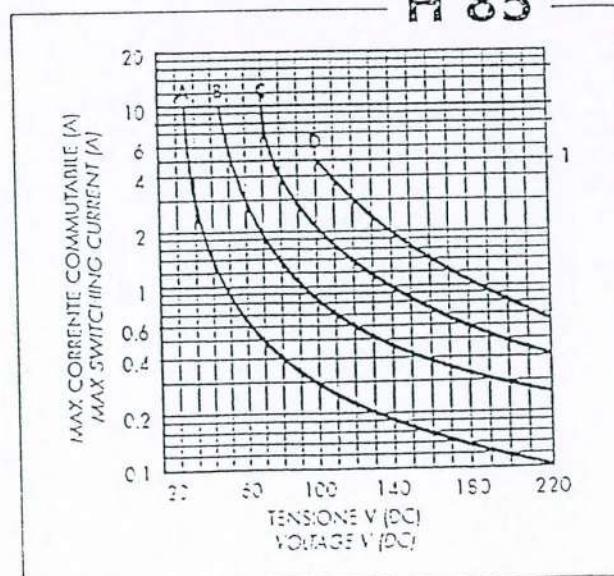
Durata dei contatti in funzione del carico AC1.Tipi 2-3 scambi (10A)

Contacts life vs AC1 load. 2 - 3 CO types (10A).

Potere di rottura del carico in DC1.

- 1 = tipo 4 scambi
- A = carico applicato  
su 1 contatto
- B = carico applicato  
su 2 contatti in serie
- C = carico applicato  
su 3 contatti in serie
- D = carico applicato  
su 4 contatti in serie

H 85



Breaking capacity for DC1 load.

- 1 = 4 CO type
- A = load applied  
to 1 contact
- B = load applied  
to 2 contacts in series
- C = load applied  
to 3 contacts in series
- D = load applied  
to 4 contacts in series

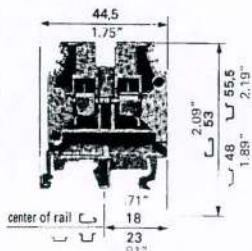


### M 4/6

Spacing 6 mm + 0,05 (.238")



For more detail, see pages 1.18-1.19.

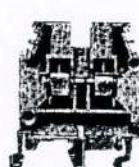


Standard 6 mm block

| Type               | Part number |
|--------------------|-------------|
| Grey body<br>M 4/6 | 115 116.07  |
| Blue               | M 4/6.N     |
| Beige              | M 4/6       |
| Yellow             | 105 116.00  |
| Green              | M 4/6       |
| Orange             | 105 002.20  |
| Red                | M 4/6       |
| Black              | 105 031.14  |

### M 4/6 color coded

Spacing 6 mm + 0,05 (.238")



Standard 6 mm block

| Type   | Part number |
|--------|-------------|
| Blue   | M 4/6.N     |
| Beige  | M 4/6       |
| Yellow | 105 116.00  |
| Green  | M 4/6       |
| Orange | 105 002.20  |
| Red    | M 4/6       |
| Black  | 105 031.14  |

### M 4/6.1

Spacing 6 mm + 0,05 (.238")



M 4/6 with partition

### M 4/6.T

Spacing 6 mm + 0,05 (.238")



M 4/6 with 1 screw-socket  
DIA. 2mm; .079" on the right

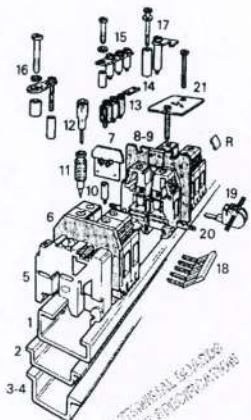
| DIN-VDE             | UL                             | CSA                | NFC-UTE             | DIN-VDE               | UL                             | CSA                | NFC-UTE             | DIN-VDE               | UL                             | CSA                | NFC-UTE             | DIN-VDE               | UL                             | CSA                | NFC-UTE             |  |
|---------------------|--------------------------------|--------------------|---------------------|-----------------------|--------------------------------|--------------------|---------------------|-----------------------|--------------------------------|--------------------|---------------------|-----------------------|--------------------------------|--------------------|---------------------|--|
| 0.4 mm <sup>2</sup> | 22-10 AWG                      | 22-10 AWG          | 0.4 mm <sup>2</sup> | 0.4 mm <sup>2</sup>   | 22-10 AWG                      | 22-10 AWG          | 0.4 mm <sup>2</sup> | 0.4 mm <sup>2</sup>   | 22-10 AWG                      |                    | 0.4 mm <sup>2</sup> | 0.4 mm <sup>2</sup>   | 22-10 AWG                      |                    | 0.4 mm <sup>2</sup> |  |
| 0.4 mm <sup>2</sup> |                                |                    | 0.4 mm <sup>2</sup> | 0.4 mm <sup>2</sup>   |                                |                    | 0.4 mm <sup>2</sup> | 0.4 mm <sup>2</sup>   |                                |                    | 0.4 mm <sup>2</sup> | 0.4 mm <sup>2</sup>   |                                |                    | 0.4 mm <sup>2</sup> |  |
| 750 Gr.C            | 600                            | 600                | 500 Cat.C           | 750 Gr.C              | 600                            | 600                | 500 Cat.C           | 750 Gr.C              | 600                            |                    | 500 Cat.C           | 750 Gr.C              | 600                            |                    | 500 Cat.C           |  |
| 900 Gr.C            |                                |                    | 500 Cat.C           | 900 Gr.C              |                                |                    | 500 Cat.C           | 900 Gr.C              |                                |                    | 500 Cat.C           | 900 Gr.C              |                                |                    | 500 Cat.C           |  |
| 35                  | 30                             | 25                 | 30                  | 35                    | 30                             | 25                 | 30                  | 35                    | 30                             |                    | 30                  | 35                    | 30                             |                    | 30                  |  |
| 4 mm <sup>2</sup>   | 10 AWG                         | 10 AWG             | 2.5 mm <sup>2</sup> | 4 mm <sup>2</sup>     | 10 AWG                         | 10 AWG             | 2.5 mm <sup>2</sup> | 4 mm <sup>2</sup>     | 10 AWG                         |                    | 2.5 mm <sup>2</sup> | 4 mm <sup>2</sup>     | 10 AWG                         |                    | 2.5 mm <sup>2</sup> |  |
| We stripping length | Recommended screwdriver torque | Recommended torque | Protectors          | Wire stripping length | Recommended screwdriver torque | Recommended torque | Protectors          | Wire stripping length | Recommended screwdriver torque | Recommended torque | Protectors          | Wire stripping length | Recommended screwdriver torque | Recommended torque | Protectors          |  |
| 9.5 mm              | 4 mm                           | 0.4-0.6 Nm         | IP 20               | 9.5 mm                | 4 mm                           | 0.4-0.6 Nm         | IP 20               | 9.5 mm                | 4 mm                           | 0.4-0.6 Nm         | IP 20               | 9.5 mm                | 4 mm                           | 0.4-0.6 Nm         | IP 20               |  |
| .37"                | 3.5-5.3 lb.in.                 | NEMA 1             | .37"                | .37"                  |                                |                    | .37"                | .37"                  |                                |                    | .37"                | .37"                  |                                |                    | .37"                |  |

| Type              | Part number   | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| PR1 Z2            | 163 050.04    |
| PR30 prepunched   | 173 220.05    |
| PR4               | 168 500.12    |
| PR5 prepunched    | 101 598.26    |
| BAM th. 9.1 mm    | 103 002.26    |
| FEM6 th. 2.5 mm   | 118 368.16    | FEM6 th. 2.5 mm   | 103 062.21    | FEM6 th. 2.5 mm   | 103 125.15    | FEM6 th. 2.5 mm   | 103 126.16    | FEM6 th. 2.5 mm   | 128 368.10    |
| SCM6              | 113 003.10    |
| SCF6 th. 3 mm     | 118 707.03    | SCF6 th. 3 mm     | 118 707.03    | SCF6 th. 3 mm     | 128 707.05    | SCF6 th. 3 mm     | 118 707.03    | SCF6 th. 3 mm     | 118 707.03    |
| SCF6 th. 3 mm     | 128 707.05    | SCF6 th. 3 mm     | 114 825.05    |
| SCFM6 th. 3 mm    | 114 825.05    |
| AL2 (1) DIA. 2 mm | 163 043.21    | AL2 (1) DIA. 2 mm | 163 043.21    | AL2 (1) DIA. 2 mm | 163 043.21    | AL2 (1) DIA. 2 mm | 163 043.21    | AL2 (1) DIA. 2 mm | 163 043.21    |
| AL3 (1) DIA. 3 mm | 163 261.00    | AL3 (1) DIA. 3 mm | 163 261.00    | AL3 (1) DIA. 3 mm | 163 261.00    | AL3 (1) DIA. 3 mm | 163 261.00    | AL3 (1) DIA. 3 mm | 163 261.00    |
| DCJ yellow        | 173 059.03    |
| FC                | (see access.) |
| BJM6 (1) 2 poles  | 168 516.25    |
| BJM6 (1) 3 poles  | 168 517.26    |
| BJM6 (1) 4 poles  | 168 518.07    |
| BJM6 (1) 5 poles  | 168 519.00    |
| BJM6 (1) 10 poles | 168 973.07    |
| EL6               | 173 627.21    |
| BJS6 (1) 20 poles | (see access.) | BJS6 (1) 20 poles | (see access.) | BJS6 (2)          | (see access.) | BJS6 (2)          | (see access.) | BJS6 (1) 20 poles | (see access.) |
| BJA6 (1)          | (see access.) | BJA6 (1)          | (see access.) | BJA6 (2)          | (see access.) | BJA6 (2)          | (see access.) | BJA6 (1)          | (see access.) |
| BDP (1)           | (see access.) | BDP (1)           | (see access.) | BDP (2)           | (see access.) | BDP (2)           | (see access.) | BDP (1)           | (see access.) |
| BJP6              | 174 413.14    |
| PC6               | (see access.) |
| AD2,5             | 114 205.20    |
| CBM               | (see access.) |
| EP6 4 blocks      | 163 427.17    |

(1) A circuit separator SC may be required with the use of these accessories.

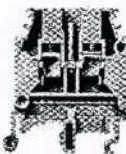
(2) Use of these accessories requires the user to cut out the partition.

## Compression clamp terminal blocks



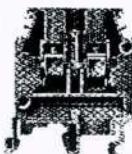
**M 4/6.2**

Spacing 6 mm + 0,05 (.238")



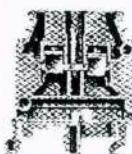
**M 4/6.3**

Spacing 6 mm + 0,05 (.238")



**M 4/6.4**

Spacing 6 mm + 0,05 (.238")



M 4/6.1 equipped with a test socket  
DIA. 2mm/.079"

M 4/6.1 equipped with a test socket  
DIA. 3mm/.12"

M 4/6.1 equipped with a test socket  
DIA. 4mm/.16"

| Type                 | Part number | Type                 | Part number | Type                 | Part number |
|----------------------|-------------|----------------------|-------------|----------------------|-------------|
| Grey body<br>M 4/6.2 | 115 217.14  | Grey body<br>M 4/6.3 | 115 268.07  | Grey body<br>M 4/6.4 | 115 192.04  |

| Wire size<br>(see generalities) | Solid wire        | DIN-VDE             | UL        | IEC/EN-C            | DIN-VDE             | UL                  | CSA       | IEC/EN-C            | DIN-VDE             | UL                  | CSA       | IEC/EN-C            |
|---------------------------------|-------------------|---------------------|-----------|---------------------|---------------------|---------------------|-----------|---------------------|---------------------|---------------------|-----------|---------------------|
|                                 | Stranded wire     | 0-4 mm <sup>2</sup> | 22-10 AWG |                     | 0-4 mm <sup>2</sup> | 0-4 mm <sup>2</sup> | 22-10 AWG |                     | 0-4 mm <sup>2</sup> | 0-4 mm <sup>2</sup> | 22-10 AWG |                     |
| Rated voltage V — ~ AC          |                   | 750 Gr.C            | 600       |                     | 500 Cat.C           | 750 Gr.C            | 600       |                     | 500 Cat.C           | 750 Gr.C            | 600       |                     |
| = DC                            |                   | 900 Gr.C            |           |                     | 500 Cat.C           | 900 Gr.C            |           |                     | 500 Cat.C           | 900 Gr.C            |           |                     |
| Rated current A                 | 35                | 30                  |           | 30                  | 35                  | 30                  |           | 30                  | 35                  | 30                  |           | 30                  |
| Rated wire size                 | 4 mm <sup>2</sup> | 10 AWG              |           | 2,5 mm <sup>2</sup> | 10 AWG              |                     |           | 2,5 mm <sup>2</sup> | 4 mm <sup>2</sup>   | 10 AWG              |           | 2,5 mm <sup>2</sup> |

| Dimensions  | Dimensions | Dimensions                  | Dimensions      | Dimensions  | Dimensions | Dimensions                  | Dimensions      |
|-------------|------------|-----------------------------|-----------------|-------------|------------|-----------------------------|-----------------|
| 9,5 mm .37" | 4 mm       | 0,4-0,6 Nm<br>3,5-5,3 lb.in | IP 20<br>NEMA 1 | 9,5 mm .37" | 4 mm       | 0,4-0,6 Nm<br>3,5-5,3 lb.in | IP 20<br>NEMA 1 |

| Approvals (Contact Entrelec) | CE | UL | CSA | IEC/EN-C | CE | UL | CSA | IEC/EN-C |
|------------------------------|----|----|-----|----------|----|----|-----|----------|
|                              |    |    |     |          |    |    |     |          |

| Accessories | Type | Part number | Type | Part number | Type | Part number |
|-------------|------|-------------|------|-------------|------|-------------|
|             |      |             |      |             |      |             |

| Accessories | Type | Part number | Type | Part number | Type | Part number |
|-------------|------|-------------|------|-------------|------|-------------|
|             |      |             |      |             |      |             |

| Accessories | Type | Part number | Type | Part number | Type | Part number |
|-------------|------|-------------|------|-------------|------|-------------|
|             |      |             |      |             |      |             |

| Accessories | Type | Part number | Type | Part number | Type | Part number |
|-------------|------|-------------|------|-------------|------|-------------|
|             |      |             |      |             |      |             |

| Accessories | Type | Part number | Type | Part number | Type | Part number |
|-------------|------|-------------|------|-------------|------|-------------|
|             |      |             |      |             |      |             |

| Accessories | Type | Part number | Type | Part number | Type | Part number |
|-------------|------|-------------|------|-------------|------|-------------|
|             |      |             |      |             |      |             |

| Accessories | Type | Part number | Type | Part number | Type | Part number |
|-------------|------|-------------|------|-------------|------|-------------|
|             |      |             |      |             |      |             |

| Accessories | Type | Part number | Type | Part number | Type | Part number |
|-------------|------|-------------|------|-------------|------|-------------|
|             |      |             |      |             |      |             |

| Accessories | Type | Part number | Type | Part number | Type | Part number |
|-------------|------|-------------|------|-------------|------|-------------|
|             |      |             |      |             |      |             |

| Accessories | Type | Part number | Type | Part number | Type | Part number |
|-------------|------|-------------|------|-------------|------|-------------|
|             |      |             |      |             |      |             |

| Accessories | Type | Part number | Type | Part number | Type | Part number |
|-------------|------|-------------|------|-------------|------|-------------|
|             |      |             |      |             |      |             |

| Accessories | Type | Part number | Type | Part number | Type | Part number |
|-------------|------|-------------|------|-------------|------|-------------|
|             |      |             |      |             |      |             |

| Accessories | Type | Part number | Type | Part number | Type | Part number |
|-------------|------|-------------|------|-------------|------|-------------|
|             |      |             |      |             |      |             |

| Accessories | Type | Part number | Type | Part number | Type | Part number |
|-------------|------|-------------|------|-------------|------|-------------|
|             |      |             |      |             |      |             |

| Accessories | Type | Part number | Type | Part number | Type | Part number |
|-------------|------|-------------|------|-------------|------|-------------|
|             |      |             |      |             |      |             |

| Accessories | Type | Part number | Type | Part number | Type | Part number |
|-------------|------|-------------|------|-------------|------|-------------|
|             |      |             |      |             |      |             |

| Accessories | Type | Part number | Type | Part number | Type | Part number |
|-------------|------|-------------|------|-------------|------|-------------|
|             |      |             |      |             |      |             |

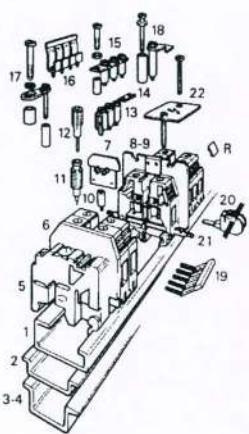
| Accessories | Type | Part number | Type | Part number | Type | Part number |
|-------------|------|-------------|------|-------------|------|-------------|
|             |      |             |      |             |      |             |

| Accessories | Type | Part number | Type | Part number | Type | Part number |
|-------------|------|-------------|------|-------------|------|-------------|
|             |      |             |      |             |      |             |

| Accessories | Type | Part number | Type | Part number | Type | Part number |
|-------------|------|-------------|------|-------------|------|-------------|
|             |      |             |      |             |      |             |

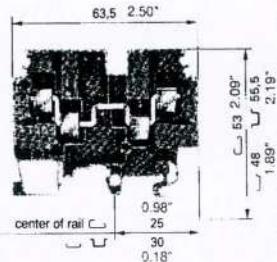


## Single pole, multic平 terminal blocks



### M 4/6.4A

Spacing 6 mm + 0,05 (.238")



Standard 6 mm block

#### Type

Grey body

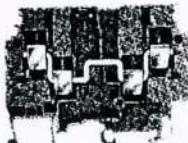
M 4/6.4A

#### Part number

115 479.23

### M 4/6.4A.1

Spacing 6 mm + 0,05 (.238")



M 4/6.4A with partition

#### Type

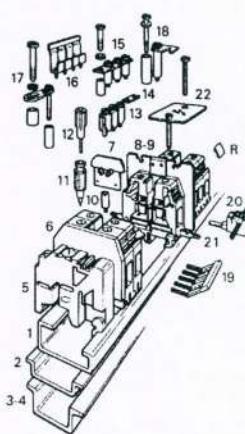
Grey body

M 4/6.4A.1

#### Part number

115 482.07

## Compression clamp terminal blocks



## Characteristics

| Wire size<br>(see generalities) | Solid wire    | DIN-VDE             | UL        | CSA        | NFC-UTE             | DIN-VDE             | UL        | CSA        | NFC-UTE             |
|---------------------------------|---------------|---------------------|-----------|------------|---------------------|---------------------|-----------|------------|---------------------|
|                                 | Stranded wire | 0-4 mm <sup>2</sup> | 22-12 AWG | 12 AWG Max | 0-4 mm <sup>2</sup> | 0-4 mm <sup>2</sup> | 22-12 AWG | 12 AWG Max | 0-4 mm <sup>2</sup> |

|               |        |          |     |     |           |          |     |     |           |
|---------------|--------|----------|-----|-----|-----------|----------|-----|-----|-----------|
| Rated voltage | V ~ AC | 660 Gr.C | 600 | 600 | 500 Cat.C | 660 Gr.C | 600 | 600 | 500 Cat.C |
|               | = DC   | 800 Gr.C |     |     | 500 Cat.C | 800 Gr.C |     |     | 500 Cat.C |

|               |   |    |    |    |    |    |    |    |    |
|---------------|---|----|----|----|----|----|----|----|----|
| Rated current | A | 35 | 20 | 25 | 30 | 35 | 20 | 25 | 30 |
|---------------|---|----|----|----|----|----|----|----|----|

|                 |                   |        |        |                     |                   |        |        |                     |
|-----------------|-------------------|--------|--------|---------------------|-------------------|--------|--------|---------------------|
| Rated wire size | 4 mm <sup>2</sup> | 12 AWG | 12 AWG | 2,5 mm <sup>2</sup> | 4 mm <sup>2</sup> | 12 AWG | 12 AWG | 2,5 mm <sup>2</sup> |
|-----------------|-------------------|--------|--------|---------------------|-------------------|--------|--------|---------------------|

## Other characteristics

### For compression clamp connection

|                       |                |      |                              |                 |                       |                |      |                              |                 |
|-----------------------|----------------|------|------------------------------|-----------------|-----------------------|----------------|------|------------------------------|-----------------|
| Wire stripping length | 9,5 mm<br>.37" | 4 mm | 0,5-0,8 Nm<br>4.4-7.1 lb.in. | IP 20<br>NEMA 1 | Wire stripping length | 9,5 mm<br>.37" | 4 mm | 0,5-0,8 Nm<br>4.4-7.1 lb.in. | IP 20<br>NEMA 1 |
|-----------------------|----------------|------|------------------------------|-----------------|-----------------------|----------------|------|------------------------------|-----------------|

### Approvals (Contact Entrellec)

## Accessories

|  | Type | Part number |  | Type | Part number |
|--|------|-------------|--|------|-------------|
|--|------|-------------|--|------|-------------|

|                                     |                                                                                                   |                                                                    |                                                                                                   |                                                                    |            |
|-------------------------------------|---------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|------------|
| 1 Rail                              | DIN 1                                                                                             | PR1 Z2                                                             | 163 050.04                                                                                        | PR1 Z2                                                             | 163 050.04 |
| 2 Rail                              | DIN 3                                                                                             | PR30 prepunched                                                    | 173 220.05                                                                                        | PR30 prepunched                                                    | 173 220.05 |
| 3 Rail                              | DIN 3                                                                                             | PR4                                                                | 168 500.12                                                                                        | PR4                                                                | 168 500.12 |
| 4 Rail                              | DIN 3                                                                                             | PR5 prepunched                                                     | 101 598.26                                                                                        | PR5 prepunched                                                     | 101 598.26 |
| 5 End stop (all rails)              |                                                                                                   | BAM th. 9,1 mm                                                     | 103 002.26                                                                                        | BAM th. 9,1 mm                                                     | 103 002.26 |
| 6 End section                       | grey yellow orange blue grey                                                                      | FEM6.4A -th. 3 mm                                                  | 116 629.22                                                                                        | FEM6.4A -th. 3 mm                                                  | 116 629.22 |
| 7 Circuit separator                 | SCM6                                                                                              | 113 003.10                                                         | SCM6                                                                                              | 113 003.10                                                         |            |
| 8 Separator end section (block)     | grey blue                                                                                         |                                                                    |                                                                                                   |                                                                    |            |
| 9 Separator end section (rail)      |                                                                                                   |                                                                    |                                                                                                   |                                                                    |            |
| 10 Test socket                      | AL2 (1) DIA. 2 mm<br>AL3 (1) DIA. 3 mm                                                            | 163 043.21<br>163 261.00                                           | AL2 DIA. 2 mm<br>AL3 DIA. 3 mm                                                                    | 163 043.21<br>163 261.00                                           |            |
| 11 Test device                      | DCJ yellow                                                                                        | 173 059.03                                                         | DCJ yellow                                                                                        | 173 059.03                                                         |            |
| 12 Test plug                        | FC                                                                                                | (see access.)                                                      | FC                                                                                                | (see access.)                                                      |            |
| 13 Assembled jumper bar             | BJM6 (1) 2 poles<br>BJM6 (1) 3 poles<br>BJM6 (1) 4 poles<br>BJM6 (1) 5 poles<br>BJM6 (1) 10 poles | 168 516.25<br>168 517.26<br>168 518.07<br>168 519.00<br>168 973.07 | BJM6 (2) 2 poles<br>BJM6 (2) 3 poles<br>BJM6 (2) 4 poles<br>BJM6 (2) 5 poles<br>BJM6 (2) 10 poles | 168 516.25<br>168 517.26<br>168 518.07<br>168 519.00<br>168 973.07 |            |
| 14 Connector plate                  | EL6                                                                                               | 173 627.21                                                         | EL6                                                                                               | 173 627.21                                                         |            |
| 15 Not pre-assembled jumper bar     | BJS6 (1) 20 poles                                                                                 | (see access.)                                                      | BJS6 (2) 20 poles                                                                                 | (see access.)                                                      |            |
| 16 Alternated jumper bar            | BJA6 (1)                                                                                          | (see access.)                                                      | BJA6 (2)                                                                                          | (see access.)                                                      |            |
| 17 Universal jumper bar             | BJDP (1)                                                                                          | (see access.)                                                      | BJDP (2)                                                                                          | (see access.)                                                      |            |
| 18 Pivoting jumper bar              | BJP6                                                                                              | 174 413.14                                                         | BJP6                                                                                              | 174 413.14                                                         |            |
| 19 Comb type jumper bar             | PC6                                                                                               | (see access.)                                                      | PC6                                                                                               | (see access.)                                                      |            |
| 20 IDC jumper                       | AD2,5                                                                                             | 114 205.20                                                         | AD2,5                                                                                             | 114 205.20                                                         |            |
| 21 Shield connector                 |                                                                                                   |                                                                    |                                                                                                   |                                                                    |            |
| R See markers and other accessories | Marking method                                                                                    | (1)                                                                | (1)                                                                                               | (1)                                                                |            |

(1) A circuit separator SC may be required with the use of these accessories.

(2) Use of these accessories requires the user to cut out the partition.

## Characteristics

| Wire size<br>(see generalities) | Solid wire | Stranded wire |
|---------------------------------|------------|---------------|
|---------------------------------|------------|---------------|

|               |        |  |
|---------------|--------|--|
| Rated voltage | V ~ AC |  |
|               | = DC   |  |

|               |   |  |
|---------------|---|--|
| Rated current | A |  |
|---------------|---|--|

|                 |                   |        |                     |
|-----------------|-------------------|--------|---------------------|
| Rated wire size | 4 mm <sup>2</sup> | 12 AWG | 2,5 mm <sup>2</sup> |
|-----------------|-------------------|--------|---------------------|

## Other characteristics

### For compression clamp connection

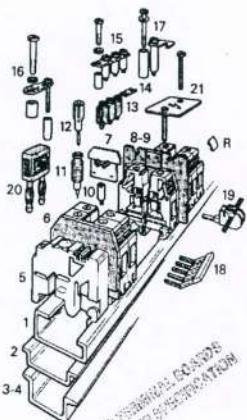
|                               |  |
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| Approvals (Contact Entrellec) |  |
|-------------------------------|--|

## Accessories

|                                     |                                                                                                   |                                                                    |                                                                                                   |                                                                    |            |
|-------------------------------------|---------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|------------|
| 1 Rail                              | DIN 1                                                                                             | PR1 Z2                                                             | 163 050.04                                                                                        |                                                                    |            |
| 2 Rail                              | DIN 3                                                                                             | PR30 prepunched                                                    | 173 220.05                                                                                        | PR30 prepunched                                                    | 173 220.05 |
| 3 Rail                              | DIN 3                                                                                             | PR4                                                                | 168 500.12                                                                                        | PR4                                                                | 168 500.12 |
| 4 Rail                              | DIN 3                                                                                             | PR5 prepunched                                                     | 101 598.26                                                                                        | PR5 prepunched                                                     | 101 598.26 |
| 5 End stop (all rails)              |                                                                                                   | BAM th. 9,1 mm                                                     | 103 002.26                                                                                        | BAM th. 9,1 mm                                                     | 103 002.26 |
| 6 End section                       | grey yellow orange blue grey                                                                      | FEM6.4A -th. 3 mm                                                  | 116 629.22                                                                                        | FEM6.4A -th. 3 mm                                                  | 116 629.22 |
| 7 Circuit separator                 | SCM6                                                                                              | 113 003.10                                                         | SCM6                                                                                              | 113 003.10                                                         |            |
| 8 Separator end section (block)     | grey blue                                                                                         |                                                                    |                                                                                                   |                                                                    |            |
| 9 Separator end section (rail)      |                                                                                                   |                                                                    |                                                                                                   |                                                                    |            |
| 10 Test socket                      | AL2 (1) DIA. 2 mm<br>AL3 (1) DIA. 3 mm                                                            | 163 043.21<br>163 261.00                                           | AL2 DIA. 2 mm<br>AL3 DIA. 3 mm                                                                    | 163 043.21<br>163 261.00                                           |            |
| 11 Test device                      | DCJ yellow                                                                                        | 173 059.03                                                         | DCJ yellow                                                                                        | 173 059.03                                                         |            |
| 12 Test plug                        | FC                                                                                                | (see access.)                                                      | FC                                                                                                | (see access.)                                                      |            |
| 13 Assembled jumper bar             | BJM6 (1) 2 poles<br>BJM6 (1) 3 poles<br>BJM6 (1) 4 poles<br>BJM6 (1) 5 poles<br>BJM6 (1) 10 poles | 168 516.25<br>168 517.26<br>168 518.07<br>168 519.00<br>168 973.07 | BJM6 (2) 2 poles<br>BJM6 (2) 3 poles<br>BJM6 (2) 4 poles<br>BJM6 (2) 5 poles<br>BJM6 (2) 10 poles | 168 516.25<br>168 517.26<br>168 518.07<br>168 519.00<br>168 973.07 |            |
| 14 Connector plate                  | EL6                                                                                               | 173 627.21                                                         | EL6                                                                                               | 173 627.21                                                         |            |
| 15 Not pre-assembled jumper bar     | BJS6 (1) 20 poles                                                                                 | (see access.)                                                      | BJS6 (2) 20 poles                                                                                 | (see access.)                                                      |            |
| 16 Alternated jumper bar            | BJA6 (1)                                                                                          | (see access.)                                                      | BJA6 (2)                                                                                          | (see access.)                                                      |            |
| 17 Universal jumper bar             | BJDP (1)                                                                                          | (see access.)                                                      | BJDP (2)                                                                                          | (see access.)                                                      |            |
| 18 Pivoting jumper bar              | BJP6                                                                                              | 174 413.14                                                         | BJP6                                                                                              | 174 413.14                                                         |            |
| 19 Comb type jumper bar             | PC6                                                                                               | (see access.)                                                      | PC6                                                                                               | (see access.)                                                      |            |
| 20 IDC jumper                       | AD2,5                                                                                             | 114 205.20                                                         | AD2,5                                                                                             | 114 205.20                                                         |            |
| 21 Shield connector                 |                                                                                                   |                                                                    |                                                                                                   |                                                                    |            |
| 22 Protection label                 | Screw for protection label                                                                        |                                                                    |                                                                                                   |                                                                    |            |
| R See markers and other accessories | Marking method                                                                                    |                                                                    |                                                                                                   |                                                                    |            |

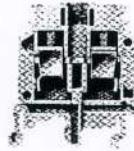
| <b>M 6/8</b>                                | <b>M 6/8 color coded</b>        | <b>M 6/8.RTS</b>                     | <b>M 4/8</b>                                                                                        |                        |               |                                             |                        |                      |                                             |                                            |                          |                                            |                                            |                                |                                              |                    |               |
|---------------------------------------------|---------------------------------|--------------------------------------|-----------------------------------------------------------------------------------------------------|------------------------|---------------|---------------------------------------------|------------------------|----------------------|---------------------------------------------|--------------------------------------------|--------------------------|--------------------------------------------|--------------------------------------------|--------------------------------|----------------------------------------------|--------------------|---------------|
| Spacing 8 mm - 0,05 (.315")<br>             | Spacing 8 mm - 0,05 (.315")<br> | Spacing 8 mm - 0,05 (.315")<br>      | Spacing 8 mm (.315")<br>                                                                            |                        |               |                                             |                        |                      |                                             |                                            |                          |                                            |                                            |                                |                                              |                    |               |
| For more detail, see pages 1.18-1.19.       |                                 |                                      | See matching fuse terminal block M 4/8.SF, P/N 115 131.06, for line, fuse, line, fuse applications. |                        |               |                                             |                        |                      |                                             |                                            |                          |                                            |                                            |                                |                                              |                    |               |
|                                             |                                 |                                      |                                                                                                     |                        |               |                                             |                        |                      |                                             |                                            |                          |                                            |                                            |                                |                                              |                    |               |
| Standard 8 mm block                         | Standard 8 mm block             | M 6/8 with blank top marking surface |                                                                                                     |                        |               |                                             |                        |                      |                                             |                                            |                          |                                            |                                            |                                |                                              |                    |               |
| Type                                        | Part number                     | Type                                 | Part number                                                                                         | Type                   | Part number   | Type                                        | Part number            |                      |                                             |                                            |                          |                                            |                                            |                                |                                              |                    |               |
| Grey body<br>M 6/8                          | 115 118.11                      | Blue M 6/8.N                         | 125 118.13                                                                                          | Grey body<br>M 6/8.RTS | 115 571.17    | Grey body<br>M 4/8                          | 115 523.07             |                      |                                             |                                            |                          |                                            |                                            |                                |                                              |                    |               |
| Yellow M 6/8                                | 105 118.20                      | Orange M 6/8                         | 105 004.22                                                                                          |                        |               |                                             |                        |                      |                                             |                                            |                          |                                            |                                            |                                |                                              |                    |               |
| Beige M 6/8                                 | 195 118.12                      |                                      |                                                                                                     |                        |               |                                             |                        |                      |                                             |                                            |                          |                                            |                                            |                                |                                              |                    |               |
| <b>DIN-VDE</b>                              | <b>UL</b>                       | <b>CSA</b>                           | <b>NFC-UTE</b>                                                                                      | <b>DIN-VDE</b>         | <b>UL</b>     | <b>CSA</b>                                  | <b>NFC-UTE</b>         | <b>DIN-VDE</b>       | <b>UL</b>                                   | <b>CSA</b>                                 | <b>NFC-UTE</b>           | <b>DIN-VDE</b>                             | <b>UL</b>                                  | <b>CSA</b>                     | <b>NFC-UTE</b>                               |                    |               |
| 0-10 mm <sup>2</sup><br>0-5 mm <sup>2</sup> | 22-8 AWG                        | 18-8 AWG                             | 0-10 mm <sup>2</sup><br>0-6 mm <sup>2</sup>                                                         | 22-8 AWG               | 18-8 AWG      | 0-10 mm <sup>2</sup><br>0-6 mm <sup>2</sup> | 22-8 AWG               | 18-8 AWG             | 0-10 mm <sup>2</sup><br>0-6 mm <sup>2</sup> | 0-4 mm <sup>2</sup><br>0-4 mm <sup>2</sup> | 22-12 AWG                |                                            | 0-4 mm <sup>2</sup><br>0-4 mm <sup>2</sup> |                                |                                              |                    |               |
| 750 Gr.C<br>900 Gr.C                        | 600                             | 600                                  | 500 Cat.C<br>500 Cat.C                                                                              | 750 Gr.C<br>900 Gr.C   | 600           | 600                                         | 500 Cat.C<br>500 Cat.C | 750 Gr.C<br>900 Gr.C | 600                                         | 600                                        | 500 Cat.C<br>500 Cat.C   | 500 Gr.C (1)<br>600 Gr.C (1)               | 600                                        | 500 Gr.C (1)<br>500 Gr.C (1)   |                                              |                    |               |
| 46                                          | 50                              | 50                                   | 51                                                                                                  | 46                     | 50            | 50                                          | 51                     | 46                   | 50                                          | 50                                         | 51                       | 26                                         | 15                                         |                                | 30                                           |                    |               |
| 5 mm <sup>2</sup><br>Wire stripping length  | 8 AWG                           | 8 AWG                                | 6 mm <sup>2</sup>                                                                                   | 6 mm <sup>2</sup>      | 8 AWG         | 8 AWG                                       | 6 mm <sup>2</sup>      | 6 mm <sup>2</sup>    | 8 AWG                                       | 8 AWG                                      | 6 mm <sup>2</sup>        | 4 mm <sup>2</sup><br>Wire stripping length | 12 AWG                                     | Recommended screwdriver torque | 2.5 mm <sup>2</sup><br>Wire stripping length |                    |               |
| 12 mm<br>4.5 mm                             | 4.5 mm                          | 0.8-1 Nm<br>7.1-8.9 lb.in            | IP 20<br>NEMA 1                                                                                     | 12 mm<br>4.5 mm        | 4.5 mm        | 0.8-1 Nm<br>7.1-8.9 lb.in.                  | IP 20<br>NEMA 1        | 12 mm<br>4.5 mm      | 0.8-1 Nm<br>7.1-8.9 lb.in.                  | IP 20<br>NEMA 1                            | 9.5 mm<br>3.5 mm<br>.37" | 3.5 mm                                     | 0.4-0.6 Nm<br>3.5-5.3 lb.in.               | IP 20 (2)<br>NEMA 1            |                                              |                    |               |
|                                             |                                 |                                      |                                                                                                     |                        |               |                                             |                        |                      |                                             |                                            |                          |                                            |                                            |                                |                                              |                    |               |
| Type                                        | Part number                     | Type                                 | Part number                                                                                         | Type                   | Part number   | Type                                        | Part number            | Type                 | Part number                                 | Type                                       | Part number              | Type                                       | Part number                                | Type                           | Part number                                  | Type               | Part number   |
| PR1 Z2                                      | 163 050.04                      | PR1 Z2                               | 163 050.04                                                                                          | PR1 Z2                 | 163 050.04    | PR1 Z2                                      | 163 050.04             | PR1 Z2               | 163 050.04                                  | PR1 Z2                                     | 163 050.04               | PR1 Z2                                     | 163 050.04                                 | PR1 Z2                         | 163 050.04                                   | PR1 Z2             | 163 050.04    |
| PR30 prepunched                             | 173 220.05                      | PR30 prepunched                      | 173 220.05                                                                                          | PR30 prepunched        | 173 220.05    | PR30 prepunched                             | 173 220.05             | PR30 prepunched      | 173 220.05                                  | PR30 prepunched                            | 173 220.05               | PR30 prepunched                            | 173 220.05                                 | PR30 prepunched                | 173 220.05                                   | PR30 prepunched    | 173 220.05    |
| PR4                                         | 168 500.12                      | PR4                                  | 168 500.12                                                                                          | PR4                    | 168 500.12    | PR4                                         | 168 500.12             | PR4                  | 168 500.12                                  | PR4                                        | 168 500.12               | PR4                                        | 168 500.12                                 | PR4                            | 168 500.12                                   | PR4                | 168 500.12    |
| PR5 prepunched                              | 101 598.26                      | PR5 prepunched                       | 101 598.26                                                                                          | PR5 prepunched         | 101 598.26    | PR5 prepunched                              | 101 598.26             | PR5 prepunched       | 101 598.26                                  | PR5 prepunched                             | 101 598.26               | PR5 prepunched                             | 101 598.26                                 | PR5 prepunched                 | 101 598.26                                   | PR5 prepunched     | 101 598.26    |
| BAM th. 9.1 mm                              | 103 002.26                      | BAM th. 9.1 mm                       | 103 002.26                                                                                          | BAM th. 9.1 mm         | 103 002.26    | BAMH th. 9.1 mm                             | 114 836.00             | BAMH th. 9.1 mm      | 114 836.00                                  | BAMH th. 9.1 mm                            | 114 836.00               | BAMH th. 9.1 mm                            | 114 836.00                                 | BAM th. 9.1 mm                 | 103 002.26                                   | BAM th. 9.1 mm     | 103 002.26    |
| FEM6 th. 2,5 mm                             | 118 368.16                      | FEM6 th. 2,5 mm                      | 103 062.21                                                                                          | FEM6 th. 2,5 mm        | 103 126.16    | FEM6 th. 2,5 mm                             | 128 368.10             | FEM6 th. 2,5 mm      | 128 368.10                                  | FEM6 th. 2,5 mm                            | 128 368.10               | FEM6 th. 2,5 mm                            | 128 368.10                                 | FEM6 th. 2,5 mm                | 118 368.16                                   | FEM6 th. 2,5 mm    | 118 624.27    |
| SCM6                                        | 113 003.10                      | SCM6                                 | 113 003.10                                                                                          | SCM6                   | 113 003.10    | SCM6                                        | 113 003.10             | SCM6                 | 113 003.10                                  | SCM6                                       | 113 003.10               | SCM6                                       | 113 003.10                                 | SCM6                           | 113 003.10                                   | SCM6               | 113 003.10    |
| SCF6 th. 3 mm                               | 118 707.03                      | SCF6 th. 3 mm                        | 118 707.03                                                                                          | SCF6 th. 3 mm          | 118 707.03    | SCF6 th. 3 mm                               | 118 707.03             | SCF6 th. 3 mm        | 118 707.03                                  | SCF6 th. 3 mm                              | 118 707.03               | SCF6 th. 3 mm                              | 118 707.03                                 | SCF6 th. 3 mm                  | 118 707.03                                   | SCF6 th. 3 mm      | 118 707.03    |
| SCFM6 th. 3 mm                              | 114 825.05                      | SCFM6 th. 3 mm                       | 114 825.05                                                                                          | SCFM6 th. 3 mm         | 114 825.05    | SCFM6 th. 3 mm                              | 114 825.05             | SCFM6 th. 3 mm       | 114 825.05                                  | SCFM6 th. 3 mm                             | 114 825.05               | SCFM6 th. 3 mm                             | 114 825.05                                 | SCFM6 th. 3 mm                 | 114 825.05                                   | SCFM6 th. 3 mm     | 114 825.05    |
| AL2 (1) DIA. 2 mm                           | 163 043.21                      | AL2 (1) DIA. 2 mm                    | 163 043.21                                                                                          | AL2 (1) DIA. 2 mm      | 163 043.21    | AL2 (1) DIA. 2 mm                           | 163 043.21             | AL2 (1) DIA. 2 mm    | 163 043.21                                  | AL2 (1) DIA. 2 mm                          | 163 043.21               | AL2 (1) DIA. 2 mm                          | 163 043.21                                 | AL2 (1) DIA. 2 mm              | 163 070.00                                   | AL2 (1) DIA. 2 mm  | 163 070.00    |
| AL3 (1) DIA. 3 mm                           | 163 261.00                      | AL3 (1) DIA. 3 mm                    | 163 261.00                                                                                          | AL3 (1) DIA. 3 mm      | 163 261.00    | AL3 (1) DIA. 3 mm                           | 163 261.00             | AL3 (1) DIA. 3 mm    | 163 261.00                                  | AL3 (1) DIA. 3 mm                          | 163 261.00               | AL3 (1) DIA. 3 mm                          | 163 261.00                                 | AL3 (1) DIA. 3 mm              | 163 261.00                                   | AL3 (1) DIA. 3 mm  | 163 261.00    |
| AL4 (1) DIA. 4 mm                           | 163 262.01                      | AL4 (1) DIA. 4 mm                    | 163 262.01                                                                                          | AL4 (1) DIA. 4 mm      | 163 262.01    | AL4 (1) DIA. 4 mm                           | 163 262.01             | AL4 (1) DIA. 4 mm    | 163 262.01                                  | AL4 (1) DIA. 4 mm                          | 163 262.01               | AL4 (1) DIA. 4 mm                          | 163 262.01                                 | AL4 (1) DIA. 4 mm              | 163 262.01                                   | AL4 (1) DIA. 4 mm  | 163 262.01    |
| DCO orange                                  | 173 060.00                      | DCO orange                           | 173 060.00                                                                                          | DCO orange             | 173 060.00    | DCO orange                                  | 173 060.00             | DCO orange           | 173 060.00                                  | DCO orange                                 | 173 060.00               | DCO orange                                 | 173 060.00                                 | DCO orange                     | 173 060.00                                   | DCO orange         | 173 060.00    |
| FC (see access.)                            |                                 | FC (see access.)                     |                                                                                                     | FC (see access.)       |               | FC (see access.)                            |                        | FC (see access.)     |                                             | FC (see access.)                           |                          | FC (see access.)                           |                                            | FC (see access.)               |                                              | FC (see access.)   |               |
| BJM8 (1) 2 poles                            | 168 520.05                      | BJM8 (1) 2 poles                     | 168 520.05                                                                                          | BJM8 (1) 2 poles       | 168 520.05    | BJM8 (1) 2 poles                            | 168 520.05             | BJM8 (1) 2 poles     | 168 520.05                                  | BJM8 (1) 2 poles                           | 168 520.05               | BJM8 (1) 2 poles                           | 168 520.05                                 | BJM8 (1) 2 poles               | 168 520.05                                   | BJM8 (1) 2 poles   | 168 520.05    |
| BJM8 (1) 3 poles                            | 168 521.22                      | BJM8 (1) 3 poles                     | 168 521.22                                                                                          | BJM8 (1) 3 poles       | 168 521.22    | BJM8 (1) 3 poles                            | 168 521.22             | BJM8 (1) 3 poles     | 168 521.22                                  | BJM8 (1) 3 poles                           | 168 521.22               | BJM8 (1) 3 poles                           | 168 521.22                                 | BJM8 (1) 3 poles               | 168 521.22                                   | BJM8 (1) 3 poles   | 168 521.22    |
| BJM8 (1) 4 poles                            | 168 522.23                      | BJM8 (1) 4 poles                     | 168 522.23                                                                                          | BJM8 (1) 4 poles       | 168 522.23    | BJM8 (1) 4 poles                            | 168 522.23             | BJM8 (1) 4 poles     | 168 522.23                                  | BJM8 (1) 4 poles                           | 168 522.23               | BJM8 (1) 4 poles                           | 168 522.23                                 | BJM8 (1) 4 poles               | 168 522.23                                   | BJM8 (1) 4 poles   | 168 522.23    |
| BJM8 (1) 5 poles                            | 168 523.24                      | BJM8 (1) 5 poles                     | 168 523.24                                                                                          | BJM8 (1) 5 poles       | 168 523.24    | BJM8 (1) 5 poles                            | 168 523.24             | BJM8 (1) 5 poles     | 168 523.24                                  | BJM8 (1) 5 poles                           | 168 523.24               | BJM8 (1) 5 poles                           | 168 523.24                                 | BJM8 (1) 5 poles               | 168 523.24                                   | BJM8 (1) 5 poles   | 168 523.24    |
| BJM8 (1) 10 poles                           | 168 974.00                      | BJM8 (1) 10 poles                    | 168 974.00                                                                                          | BJM8 (1) 10 poles      | 168 974.00    | BJM8 (1) 10 poles                           | 168 974.00             | BJM8 (1) 10 poles    | 168 974.00                                  | BJM8 (1) 10 poles                          | 168 974.00               | BJM8 (1) 10 poles                          | 168 974.00                                 | BJM8 (1) 10 poles              | 168 974.00                                   | BJM8 (1) 10 poles  | 168 974.00    |
| EL6                                         | 173 627.21                      | EL6                                  | 173 627.21                                                                                          | EL6                    | 173 627.21    | EL6                                         | 173 627.21             | EL6                  | 173 627.21                                  | EL6                                        | 173 627.21               | EL6                                        | 173 627.21                                 | EL6                            | 173 627.21                                   | EL6                | 173 627.21    |
| BJS8 (1) 20 poles                           | (see access.)                   | BJS8 (1) 20 poles                    | (see access.)                                                                                       | BJS8 (1) 20 poles      | (see access.) | BJS8 (1) 20 poles                           | (see access.)          | BJS8 (1) 20 poles    | (see access.)                               | BJS8 (1) 20 poles                          | (see access.)            | BJS8 (1) 20 poles                          | (see access.)                              | BJS8 (1) 20 poles              | (see access.)                                | BJS8 (1) 20 poles  | (see access.) |
| BJDP (1)                                    | (see access.)                   | BJDP (1)                             | (see access.)                                                                                       | BJDP (1)               | (see access.) | BJDP (1)                                    | (see access.)          | BJDP (1)             | (see access.)                               | BJDP (1)                                   | (see access.)            | BJDP (1)                                   | (see access.)                              | BJDP (1)                       | (see access.)                                | BJDP (1)           | (see access.) |
| BJP8                                        | 174 448.07                      | BJP8                                 | 174 448.07                                                                                          | BJP8                   | 174 448.07    | BJP8                                        | 174 448.07             | BJP8                 | 174 448.07                                  | BJP8                                       | 174 448.07               | BJP8                                       | 174 448.07                                 | BJP8                           | 174 448.07                                   | BJP8               | 174 448.07    |
| PC8 10 poles                                | 163 313.24                      | PC8 10 poles                         | 163 313.24                                                                                          | PC8 10 poles           | 163 313.24    | PC8 10 poles                                | 163 313.24             | PC8 10 poles         | 163 313.24                                  | PC8 10 poles                               | 163 313.24               | PC8 10 poles                               | 163 313.24                                 | PC8 10 poles                   | 163 313.24                                   | PC8 10 poles       | 163 313.24    |
| AD2,5                                       | 114 205.20                      | AD2,5                                | 114 205.20                                                                                          | AD2,5                  | 114 205.20    | AD2,5                                       | 114 205.20             | AD2,5                | 114 205.20                                  | AD2,5                                      | 114 205.20               | AD2,5                                      | 114 205.20                                 | AD2,5                          | 114 205.20                                   | AD2,5              | 114 205.20    |
| EP (see access.)                            |                                 | EP (see access.)                     |                                                                                                     | EP (see access.)       |               | EP (see access.)                            |                        | EP (see access.)     |                                             | EP (see access.)                           |                          | EP (see access.)                           |                                            | EP (see access.)               |                                              | EP (see access.)   |               |
| VSP6 (see access.)                          |                                 | VSP6 (see access.)                   |                                                                                                     | VSP6 (see access.)     |               | VSP6 (see access.)                          |                        | VSP6 (see access.)   |                                             | VSP6 (see access.)                         |                          | VSP6 (see access.)                         |                                            | VSP6 (see access.)             |                                              | VSP6 (see access.) |               |
| EP (see access.)                            | 163 433.15                      | EP (see access.)                     | 163 433.15                                                                                          | EP (see access.)       | 163 433.15    | EP (see access.)                            | 163 433.15             | EP (see access.)     | 163 433.15                                  | EP (see access.)                           | 163 433.15               | EP (see access.)                           | 163 433.15                                 | EP (see access.)               | 163 433.15                                   | EP (see access.)   | 163 433.15    |

## Compression clamp terminal blocks



M 6/8.1

Spacing 8 mm - 0,05 (.315")



M 6/8.2

Spacing 8 mm - 0,05 (.315")



M 6/8 with partition

M 6/8.1 equipped with a test socket  
DIA. 2mm/.079"

| Type                  | Part number | Type                 | Part number |
|-----------------------|-------------|----------------------|-------------|
| Grey body<br>M 6/8.1  | 115 260.03  | Grey body<br>M 6/8.2 | 115 218.25  |
| Green body<br>M 6/8.1 | 105 128.22  |                      |             |

| Wire size<br>(see generalities)    | Solid wire    | DIN VDE | UL | CSA | NFC/IEC  | DIN VDE              | UL                      | CSA               | NFC/IEC                                  |
|------------------------------------|---------------|---------|----|-----|----------|----------------------|-------------------------|-------------------|------------------------------------------|
|                                    | Stranded wire |         |    |     |          | 0-10 mm <sup>2</sup> | 22-8 AWG                |                   | 0-10 mm <sup>2</sup>                     |
|                                    |               |         |    |     |          | 0-6 mm <sup>2</sup>  |                         |                   | 0-6 mm <sup>2</sup>                      |
|                                    |               |         |    |     |          |                      |                         |                   |                                          |
| Rated voltage<br>V                 | ~ AC          |         |    |     | 750 Gr.C | 600                  |                         | 500 Cat.C         | 750 Gr.C                                 |
|                                    | = DC          |         |    |     | 900 Gr.C |                      |                         | 500 Cat.C         | 900 Gr.C                                 |
| Rated current<br>A                 |               |         |    |     |          | 46                   | 50                      | 51                | 46                                       |
| Rated wire size<br>mm <sup>2</sup> |               |         |    |     |          | 6 mm <sup>2</sup>    | 8 AWG                   | 6 mm <sup>2</sup> | 6 mm <sup>2</sup>                        |
| Other characteristics              |               |         |    |     |          | 12 mm<br>.47"        | 4-5 mm<br>7.1-8.9 lb.in | IP 20<br>NEMA 1   | 12 mm<br>.47"<br>4-5 mm<br>7.1-8.9 lb.in |
| Approvals (Contact Entelec)        |               |         |    |     |          |                      |                         |                   | IP 10                                    |

| ACCESSORIES                               | Part number | Type              | Part number   | Part number | Type            | Part number |
|-------------------------------------------|-------------|-------------------|---------------|-------------|-----------------|-------------|
| 1 Rail 32x15 DIN 1                        |             | PR1 Z2            | 163 050.04    |             | PR1 Z2          | 163 050.04  |
| 2 Rail 35x7,5x1 DIN 3                     |             | PR30 prepunched   | 173 220.05    |             | PR30 prepunched | 173 220.05  |
| 3 Rail 35x15x2,3 DIN 3                    |             | PR4               | 168 500.12    |             | PR4             | 168 500.12  |
| 4 Rail 35x15x1,5                          |             | PR5 prepunched    | 101 598.26    |             | PR5 prepunched  | 101 598.26  |
| 5 End stop (all rails)                    |             | BAM th. 9,1 mm    | 103 002.26    |             | BAM th. 9,1 mm  | 103 002.26  |
| 6 End section grey yellow blue            |             | FEM6 th. 2,5 mm   | 118 368.16    |             | FEM6 th. 2,5 mm | 118 368.16  |
| 7 Circuit separator grey                  |             | SCF6 th. 3 mm     | 118 707.03    |             | SCF6 th. 3 mm   | 118 707.03  |
| 8 Separator end section (block) grey blue |             | SCFM6 th. 3 mm    | 114 825.05    |             | SCFM6 th. 3 mm  | 114 825.05  |
| 9 Separator end section (rail)            |             | AL2 DIA. 2 mm     | 163 043.21    |             |                 |             |
| 10 Test socket                            |             | AL3 DIA. 3 mm     | 163 261.00    |             |                 |             |
| 11 Test device                            |             | AL4 DIA. 4 mm     | 163 262.01    |             |                 |             |
| 12 Test plug                              |             | DCO orange        | 173 060.00    |             |                 |             |
| 13 Assembled jumper bar                   |             | BJM8 (2) 2 poles  | 168 520.05    |             |                 |             |
|                                           |             | BJM8 (2) 3 poles  | 168 521.22    |             |                 |             |
|                                           |             | BJM8 (2) 4 poles  | 168 522.23    |             |                 |             |
|                                           |             | BJM8 (2) 5 poles  | 168 523.24    |             |                 |             |
|                                           |             | BJM8 (2) 10 poles | 168 974.00    |             |                 |             |
|                                           |             | EL6 (2)           | 173 627.21    |             |                 |             |
|                                           |             | BJS8 (2) 20 poles | (see access.) |             |                 |             |
|                                           |             | BJDP (2)          | (see access.) |             |                 |             |
|                                           |             | BJP8              | 174 448.07    |             |                 |             |
|                                           |             | PC8 10 poles      | 163 313.24    |             |                 |             |
|                                           |             | AD2,5             | 114 205.20    |             |                 |             |
|                                           |             | BP8,A4            | 173 888.20    |             |                 |             |
|                                           |             | EP                | (see access.) |             |                 |             |

R See markers and other accessories

Marking method

(2) Use of these accessories requires the user to cut out the partition.

⑪

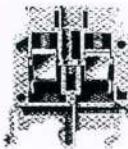
⑫

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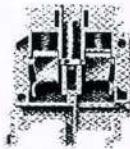
1.26

**M 6/8.3**

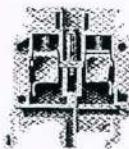
Spacing 8 mm + 0,05 (.315")

**M 6/8.4**

Spacing 8 mm - 0,05 (.315")

**M 6/8.C**

Spacing 8 mm - 0,05 (.315")

M 6/8.1 equipped with a test socket  
DIA. 3mm/.12"M 6/8.1 equipped with a test socket  
DIA. 4mm/.16"M 6/8.1 equipped with a flexible test  
socket DIA. 2,5mm/.10" for connector  
type MLE

| Type                 | Part number | Type                 | Part number | Type                 | Part number |
|----------------------|-------------|----------------------|-------------|----------------------|-------------|
| Grey body<br>M 6/8.3 | 115 253.20  | Grey body<br>M 6/8.4 | 115 219.26  | Grey body<br>M 6/8.C | 115 209.05  |

| DIN 43650            | JL       | GS                        | NEMA            | DIN 43650            | JL       | GS                        | NEMA  | DIN 43650            | JL       | GS                        | NEMA  | DIN 43650            | JL | GS | NEMA |
|----------------------|----------|---------------------------|-----------------|----------------------|----------|---------------------------|-------|----------------------|----------|---------------------------|-------|----------------------|----|----|------|
| 0-10 mm <sup>2</sup> | 22-8 AWG |                           |                 | 0-10 mm <sup>2</sup> | 22-8 AWG |                           |       | 0-10 mm <sup>2</sup> | 22-8 AWG |                           |       | 0-10 mm <sup>2</sup> |    |    |      |
| 0-6 mm <sup>2</sup>  |          |                           |                 | 0-6 mm <sup>2</sup>  |          |                           |       | 0-6 mm <sup>2</sup>  |          |                           |       | 0-6 mm <sup>2</sup>  |    |    |      |
| 750 Gr.C             | 600      |                           |                 | 500 Cat.C            | 750 Gr.C |                           |       | 500 Cat.C            | 750 Gr.C |                           |       | 600                  |    |    |      |
| 900 Gr.C             |          |                           |                 | 500 Cat.C            | 900 Gr.C |                           |       | 500 Cat.C            | 900 Gr.C |                           |       |                      |    |    |      |
| 46                   | 50       |                           |                 | 51                   | 46       |                           |       | 51                   | 46       |                           |       | 50                   |    |    |      |
| 6 mm <sup>2</sup>    | 8 AWG    |                           |                 | 6 mm <sup>2</sup>    | 8 AWG    |                           |       | 6 mm <sup>2</sup>    | 8 AWG    |                           |       | 6 mm <sup>2</sup>    |    |    |      |
| 12 mm<br>.47"        | 4-5 mm   | 0.8-1 Nm<br>7.1-8.9 lb.in | IP 20<br>NEMA 1 | 12 mm<br>.47"        | 4-5 mm   | 0.8-1 Nm<br>7.1-8.9 lb.in | IP 10 | 12 mm<br>.47"        | 4-5 mm   | 0.8-1 Nm<br>7.1-8.9 lb.in | IP 10 |                      |    |    |      |

| Type            | Part number | Type            | Part number | Type            | Part number |
|-----------------|-------------|-----------------|-------------|-----------------|-------------|
| PR1 Z2          | 163 050.04  | PR1 Z2          | 163 050.04  | PR1 Z2          | 163 050.04  |
| PR30 prepunched | 173 220.05  | PR30 prepunched | 173 220.05  | PR30 prepunched | 173 220.05  |
| PR4             | 168 500.12  | PR4             | 168 500.12  | PR4             | 168 500.12  |
| PR5 prepunched  | 101 598.26  | PR5 prepunched  | 101 598.26  | PR5 prepunched  | 101 598.26  |
| BAM th. 9,1 mm  | 103 002.26  | BAM th. 9,1 mm  | 103 002.26  | BAM th. 9,1 mm  | 103 002.26  |
| FEM6 th. 2,5 mm | 118 368.16  | FEM8 th. 3 mm   | 118 368.16  | FEM6 th. 2,5 mm | 118 368.16  |

| Type           | Part number | Type           | Part number   | Type           | Part number |
|----------------|-------------|----------------|---------------|----------------|-------------|
| SCF6 th. 3 mm  | 118 707.03  | SCF6 th. 3 mm  | 118 707.03    | SCF6 th. 3 mm  | 118 707.03  |
| SCFM6 th. 3 mm | 114 825.05  | SCFM6 th. 3 mm | 114 825.05    | SCFM6 th. 3 mm | 114 825.05  |
|                |             | FC             | (see access.) |                |             |

| Type         | Part number | Type         | Part number | Type         | Part number |
|--------------|-------------|--------------|-------------|--------------|-------------|
| PC8 10 poles | 163 313.24  | PC8 10 poles | 163 313.24  | PC8 10 poles | 163 313.24  |
| AD2,5        | 114 205.20  | AD2,5 BP8.A4 | 114 205.20  | AD2,5        | 114 205.20  |

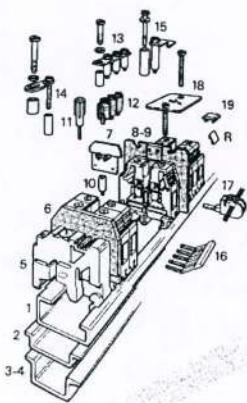
(1)

(1)

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**entrellec**

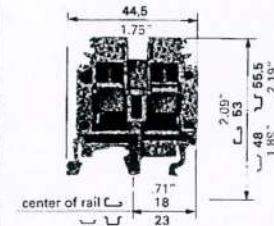
### Compression clamp terminal blocks



### M 10/10

Spacing 10 mm - 0.05 (.394")

For more detail, see pages 1.18-1.19.



Standard 16 mm² block

Type Part number  
Grey body M 10/10 115 120.17

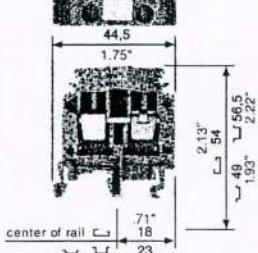
#### Color Coded

Blue M 10/10.N 125 120.11  
Yellow M 10/10 105 120.26

### M 10/10.RTS

Spacing 10 mm - 0.05 (.394")

**NEW!**

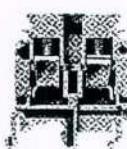


M 10/10 with blank top marking surface

Type Part number  
Grey body M 10/10.RTS 115 572.10

### M 10/10.1

Spacing 10 mm - 0.05 (.394")



M 10/10 with partition

Type Part number  
Grey body M 10/10.1 115 261.20

### Characteristics

|                                 | DIN-VDE                                       | UL                                                  | CSA                                                 | NFC-UTE                                     | DIN-VDE                                     | UL                                                  | CSA                                                 | NFC-UTE                                     | DIN-VDE                                  | UL                                                  | CSA                                      | NFC-UTE                                  |
|---------------------------------|-----------------------------------------------|-----------------------------------------------------|-----------------------------------------------------|---------------------------------------------|---------------------------------------------|-----------------------------------------------------|-----------------------------------------------------|---------------------------------------------|------------------------------------------|-----------------------------------------------------|------------------------------------------|------------------------------------------|
| Wire size<br>(see generalities) | Solid wire 0-16 mm²<br>Stranded wire 0-10 mm² | 20-6 AWG<br>18-6 AWG                                | 0-16 mm²<br>0-10 mm²                                | 0-16 mm²<br>0-10 mm²                        | 20-6 AWG<br>18-6 AWG                        | 20-6 AWG<br>18-6 AWG                                | 0-16 mm²<br>0-10 mm²                                | 0-16 mm²<br>0-10 mm²                        | 20-6 AWG<br>18-6 AWG                     | 20-6 AWG<br>18-6 AWG                                | 0-16 mm²<br>0-10 mm²                     | 0-16 mm²<br>0-10 mm²                     |
| Rated voltage V                 | - AC 750 Gr.C.<br>= DC 900 Gr.C.              | 600                                                 | 600                                                 | 500 Cat.C.<br>500 Cat.C.                    | 750 Gr.C.                                   | 600                                                 | 600                                                 | 500 Cat.C.<br>500 Cat.C.                    | 750 Gr.C.                                | 600                                                 | 500 Cat.C.<br>500 Cat.C.                 | 500 Cat.C.                               |
| Rated current A                 | 63                                            | 65                                                  | 70                                                  | 71                                          | 63                                          | 65                                                  | 70                                                  | 71                                          | 63                                       | 65                                                  | 70                                       | 71                                       |
| Rated wire size                 | 10 mm²<br>Wires stripping length<br>.47"      | 6 AWG<br>5,5-6 mm<br>1.2-1.4 Nm<br>10.6-12.3 lb.in. | 6 AWG<br>5,5-6 mm<br>1.2-1.4 Nm<br>10.6-12.3 lb.in. | 10 mm²<br>Recommended screwdriver<br>NEMA 1 | 10 mm²<br>Recommended screwdriver<br>NEMA 1 | 6 AWG<br>5,5-6 mm<br>1.2-1.4 Nm<br>10.6-12.3 lb.in. | 6 AWG<br>5,5-6 mm<br>1.2-1.4 Nm<br>10.6-12.3 lb.in. | 10 mm²<br>Recommended screwdriver<br>NEMA 1 | 10 mm²<br>Wires stripping length<br>.47" | 6 AWG<br>5,5-6 mm<br>1.2-1.4 Nm<br>10.6-12.3 lb.in. | 10 mm²<br>Wires stripping length<br>.47" | 10 mm²<br>Wires stripping length<br>.47" |

### Other characteristics

|                                 | Approvals (Contact Entrellec) | Type               | Part number       | Type               | Part number       | Type               | Part number       |
|---------------------------------|-------------------------------|--------------------|-------------------|--------------------|-------------------|--------------------|-------------------|
| <b>Accessories</b>              |                               |                    |                   |                    |                   |                    |                   |
| 1 Rail                          | DIN 1                         | PR1 Z2             | 163 050.04        | PR1 Z2             | 163 050.04        | PR1 Z2             | 163 050.04        |
| 2 Rail                          | DIN 3                         | PR30 prepunched    | 173 220.05        | PR30 prepunched    | 173 220.05        | PR30 prepunched    | 173 220.05        |
| 3 Rail                          | DIN 3                         | PR4                | 168 500.12        | PR4                | 168 500.12        | PR4                | 168 500.12        |
| 4 Rail                          | DIN 1.5                       | PR5 prepunched     | 101 598.26        | PR5 prepunched     | 101 598.26        | PR5 prepunched     | 101 598.26        |
| 5 End stop (all rails)          |                               | BAM th. 9.1 mm     | 103 002.26        | BAMH th. 9.1 mm    | 114 836.00        | BAMH th. 9.1 mm    | 114 836.00        |
| 6 End section                   | grey<br>yellow<br>blue        | FEM6 th. 2.5 mm    | 118 368.16        | FEM6 th. 2.5 mm    | 118 368.16        | FEM6 th. 2.5 mm    | 118 368.16        |
| 7 Circuit separator             | grey                          | FEM6 th. 2.5 mm    | 103 062.21        | FEM6 th. 2.5 mm    | 128 368.10        | FEM6 th. 2.5 mm    | 128 368.10        |
| 8 Separator end section (block) | grey<br>blue                  | SCM6               | 113 003.10        | SCF6 th. 3 mm      | 118 707.03        | SCF6 th. 3 mm      | 118 707.03        |
| 9 Separator end section (rail)  |                               | SCF6 th. 3 mm      | 128 707.05        | SCFM6 th. 3 mm     | 114 825.05        | SCFM6 th. 3 mm     | 114 825.05        |
| 10 Test socket                  |                               | SCFM6 th. 3 mm     | AL2 (1) DIA. 2 mm | AL2 (1) DIA. 2 mm  | AL3 (1) DIA. 3 mm | AL3 (1) DIA. 3 mm  | AL3 (1) DIA. 3 mm |
| 11 Test plug                    |                               | BJM10 (1) 2 poles  | 163 043.21        | BJM10 (1) 2 poles  | 163 261.00        | BJM10 (1) 2 poles  | 163 261.00        |
| 12 Assembled jumper bar         |                               | BJM10 (1) 3 poles  | 173 611.21        | BJM10 (1) 3 poles  | 173 612.22        | BJM10 (1) 3 poles  | 173 612.22        |
| 13 Jumper bar not preassembled  |                               | BJM10 (1) 4 poles  | 173 612.22        | BJM10 (1) 4 poles  | 173 613.23        | BJM10 (1) 4 poles  | 173 613.23        |
| 14 Universal jumper bar         |                               | BJM10 (1) 5 poles  | 173 614.24        | BJM10 (1) 5 poles  | 173 614.24        | BJM10 (1) 5 poles  | 173 614.24        |
| 15 Pivoting jumper bar          |                               | BJM10 (1) 10 poles | 173 615.25        | BJM10 (1) 10 poles | 173 615.25        | BJM10 (2) 10 poles | 173 615.25        |
| 16 Comb type jumper bar         |                               | BJS10 (1) 20 poles | (see access.)     | BJS10 (1) 20 poles | (see access.)     | BJS10 (2) 20 poles | (see access.)     |
| 17 IDC jumper                   |                               | BJDP (1)           | (see access.)     | BJDP (1)           | (see access.)     | BJDP (2)           | (see access.)     |
| 18 Protection label             |                               | BJP10              | 174 451.22        | BJP10              | 174 451.22        | BJP10              | 174 451.22        |
| 19 Ground identification        |                               | PC10 10 poles      | 163 315.26        | PC10 10 poles      | 163 315.26        | PC10 10 poles      | 163 315.26        |
|                                 |                               | AD2,5              | 114 205.20        | AD2,5              | 114 205.20        | AD2,5              | 114 205.20        |
|                                 |                               | EP                 | (see access.)     | EP                 | (see access.)     | EP                 | (see access.)     |

R See markers and other accessories

Marking method

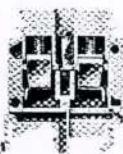
(1) (2)

(1) A circuit separator SC may be required with the use of these accessories.

(2) Use of these accessories requires the user to cut out the partition.

### M 10/10.C

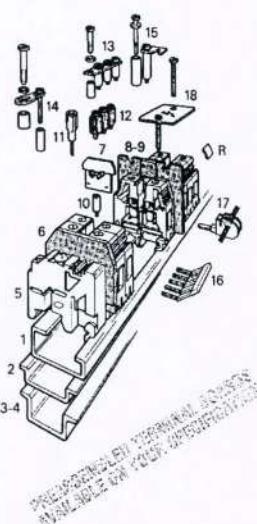
Spacing 10 mm - 0,05 (.394")



M 10/10.1 equipped with a flexible test socket DIA. 2,5 mm/.10" for connector type MLE.

| Type      | Part number          |
|-----------|----------------------|
| Grey body | M 10/10.C 115 228.27 |

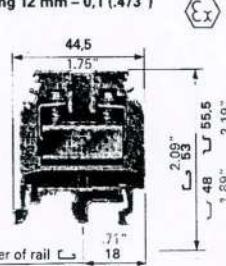
### Compression clamp terminal blocks



### M 16/12

### M 16/12.N

Spacing 12 mm - 0,1 (.473")



Standard 12 mm block with partition

| Type      | Part number        |
|-----------|--------------------|
| Grey body | M 16/12 115 129.14 |

#### Color Coded

|        |                      |
|--------|----------------------|
| Blue   | M 16/12.N 125 129.16 |
| Yellow | M 16/12 105 129.23   |

### M 16/12.C

Spacing 12 mm - 0,1 (.473")



M 16/12 equipped with a flexible test socket DIA. 2,5 mm/.10" for connector type MLE.

| Type      | Part number          |
|-----------|----------------------|
| Grey body | M 16/12.C 115 210.21 |

#### DIN-VDE UL CSA NFC-UTE

|                      |          |  |                      |
|----------------------|----------|--|----------------------|
| 0-16 mm <sup>2</sup> | 20-6 AWG |  | 0-16 mm <sup>2</sup> |
| 0-10 mm <sup>2</sup> |          |  | 0-10 mm <sup>2</sup> |

|          |     |  |           |
|----------|-----|--|-----------|
| 750 Gr.C | 600 |  | 500 Cat.C |
| 900 Gr.C |     |  | 500 Cat.C |

|    |    |  |    |
|----|----|--|----|
| 63 | 65 |  | 71 |
|----|----|--|----|

|                    |       |  |                    |
|--------------------|-------|--|--------------------|
| 10 mm <sup>2</sup> | 6 AWG |  | 10 mm <sup>2</sup> |
|--------------------|-------|--|--------------------|

|                       |                         |                             |            |
|-----------------------|-------------------------|-----------------------------|------------|
| Wire stripping length | Recommended screwdriver | Recommended torque          | Protection |
| 12 mm<br>47"          | 5.5-6 mm                | 1.2-1.4 Nm<br>0.8-2.3 lb.in | IP 10      |

#### Characteristics

| Wire size<br>(see generalities) | Solid wire             | Stranded wire          |
|---------------------------------|------------------------|------------------------|
| 2.5-16 mm <sup>2</sup>          | 2.5-16 mm <sup>2</sup> | 2.5-16 mm <sup>2</sup> |
| 2.5-16 mm <sup>2</sup>          | 14-4 AWG               | 14-4 AWG               |

#### Other characteristics

#### Approvals (Contact Entrelec)

#### Accessories

#### Type Part number

|        |            |
|--------|------------|
| PR1 Z2 | 163 050.04 |
| PR30   | 173 220.05 |
| PR4    | 168 500.12 |
| PR5    | 101 598.26 |
| BAM    | 103 002.26 |
| FEM6   | 118 368.16 |

|       |          |            |
|-------|----------|------------|
| SCF6  | th. 3 mm | 118 707.03 |
| SCFM6 | th. 3 mm | 114 825.05 |

|       |          |            |
|-------|----------|------------|
| PC10  | 10 poles | 163 315.26 |
| AD2,5 |          | 114 205.20 |

#### Marking method

#### R See markers and other accessories

#### DIN-VDE UL CSA NFC-UTE

|                        |                      |         |                      |
|------------------------|----------------------|---------|----------------------|
| 2.5-16 mm <sup>2</sup> | 6-25 mm <sup>2</sup> | 8-2 AWG | 6-25 mm <sup>2</sup> |
| 2.5-16 mm <sup>2</sup> | 6-16 mm <sup>2</sup> | 8-4 AWG | 6-16 mm <sup>2</sup> |

|                        |                      |         |                      |
|------------------------|----------------------|---------|----------------------|
| 2.5-16 mm <sup>2</sup> | 6-25 mm <sup>2</sup> | 8-4 AWG | 6-25 mm <sup>2</sup> |
| 2.5-16 mm <sup>2</sup> | 6-16 mm <sup>2</sup> | 8-4 AWG | 6-16 mm <sup>2</sup> |

|                    |       |       |                    |
|--------------------|-------|-------|--------------------|
| 16 mm <sup>2</sup> | 4 AWG | 4 AWG | 16 mm <sup>2</sup> |
| 16 mm <sup>2</sup> | 4 AWG | 4 AWG | 16 mm <sup>2</sup> |

|                       |                         |                               |            |
|-----------------------|-------------------------|-------------------------------|------------|
| Wire stripping length | Recommended screwdriver | Recommended torque            | Protection |
| 14 mm<br>.55"         | 5,5 mm                  | 1,2-1,4 Nm<br>10.6-12.3 lb.in | IP 10      |

|               |        |                               |       |
|---------------|--------|-------------------------------|-------|
| 14 mm<br>.55" | 5,5 mm | 1,2-1,4 Nm<br>10.6-12.3 lb.in | IP 10 |
|---------------|--------|-------------------------------|-------|

|                       |                         |                               |            |
|-----------------------|-------------------------|-------------------------------|------------|
| Wire stripping length | Recommended screwdriver | Recommended torque            | Protection |
| 14 mm<br>.55"         | 5,5 mm                  | 1,2-1,4 Nm<br>10.6-12.3 lb.in | IP 10      |

|               |        |                               |       |
|---------------|--------|-------------------------------|-------|
| 14 mm<br>.55" | 5,5 mm | 1,2-1,4 Nm<br>10.6-12.3 lb.in | IP 10 |
|---------------|--------|-------------------------------|-------|

|           |               |
|-----------|---------------|
| Type      | Part number   |
| PR1 Z2    | 163 050.04    |
| PR30      | 173 220.05    |
| PR4       | 168 500.12    |
| PR5       | 101 598.26    |
| BAM       | 103 002.26    |
| FEM12     | 118 618.01    |
| SCF12     | 113 102.10    |
| SCFM6     | 114 825.05    |
| AL2       | 163 043.21    |
| AL3       | 163 261.00    |
| AL4       | 163 262.01    |
| FC        | (see access.) |
| BJM12 (2) | 173 616.26    |
| BJM12 (2) | 173 617.27    |
| BJM12 (2) | 173 618.00    |
| BJM12 (2) | 173 619.01    |
| BJM12 (2) | 173 620.06    |
| BJS12 (2) | 173 620.06    |
| BJDP (2)  | (see access.) |
| EP        | (see access.) |

|           |               |
|-----------|---------------|
| Type      | Part number   |
| PR1 Z2    | 163 050.04    |
| PR30      | 173 220.05    |
| PR4       | 168 500.12    |
| PR5       | 101 598.26    |
| BAM       | 103 002.26    |
| FEM12     | 118 618.01    |
| SCF12     | 113 102.10    |
| SCFM6     | 114 825.05    |
| AL2       | 163 043.21    |
| AL3       | 163 261.00    |
| AL4       | 163 262.01    |
| FC        | (see access.) |
| BJM12 (2) | 173 616.26    |
| BJM12 (2) | 173 617.27    |
| BJM12 (2) | 173 618.00    |
| BJM12 (2) | 173 619.01    |
| BJM12 (2) | 173 620.06    |
| BJS12 (2) | 173 620.06    |
| BJDP (2)  | (see access.) |
| EP        | (see access.) |

|           |               |
|-----------|---------------|
| Type      | Part number   |
| PR1 Z2    | 163 050.04    |
| PR30      | 173 220.05    |
| PR4       | 168 500.12    |
| PR5       | 101 598.26    |
| BAM       | 103 002.26    |
| FEM12     | 118 618.01    |
| SCF12     | 113 102.10    |
| SCFM6     | 114 825.05    |
| AL2       | 163 043.21    |
| AL3       | 163 261.00    |
| AL4       | 163 262.01    |
| FC        | (see access.) |
| BJM12 (2) | 173 616.26    |
| BJM12 (2) | 173 617.27    |
| BJM12 (2) | 173 618.00    |
| BJM12 (2) | 173 619.01    |
| BJM12 (2) | 173 620.06    |
| BJS12 (2) | 173 620.06    |
| BJDP (2)  | (see access.) |
| EP        | (see access.) |

|           |               |
|-----------|---------------|
| Type      | Part number   |
| PR1 Z2    | 163 050.04    |
| PR30      | 173 220.05    |
| PR4       | 168 500.12    |
| PR5       | 101 598.26    |
| BAM       | 103 002.26    |
| FEM12     | 118 618.01    |
| SCF12     | 113 102.10    |
| SCFM6     | 114 825.05    |
| AL2       | 163 043.21    |
| AL3       | 163 261.00    |
| AL4       | 163 262.01    |
| FC        | (see access.) |
| BJM12 (2) | 173 616.26    |
| BJM12 (2) | 173 617.27    |
| BJM12 (2) | 173 618.00    |
| BJM12 (2) | 173 619.01    |
| BJM12 (2) | 173 620.06    |
| BJS12 (2) | 173 620.06    |
| BJDP (2)  | (see access.) |
| EP        | (see access.) |

|           |               |
|-----------|---------------|
| Type      | Part number   |
| PR1 Z2    | 163 050.04    |
| PR30      | 173 220.05    |
| PR4       | 168 500.12    |
| PR5       | 101 598.26    |
| BAM       | 103 002.26    |
| FEM12     | 118 618.01    |
| SCF12     | 113 102.10    |
| SCFM6     | 114 825.05    |
| AL2       | 163 043.21    |
| AL3       | 163 261.00    |
| AL4       | 163 262.01    |
| FC        | (see access.) |
| BJM12 (2) | 173 616.26    |
| BJM12 (2) | 173 617.27    |
| BJM12 (2) | 173 618.00    |
| BJM12 (2) | 173 619.01    |
| BJM12 (2) | 173 620.06    |
| BJS12 (2) | 173 620.06    |
| BJDP (2)  | (see access.) |
| EP        | (see access.) |

|           |               |
|-----------|---------------|
| Type      | Part number   |
| PR1 Z2    | 163 050.04    |
| PR30      | 173 220.05    |
| PR4       | 168 500.12    |
| PR5       | 101 598.26    |
| BAM       | 103 002.26    |
| FEM12     | 118 618.01    |
| SCF12     | 113 102.10    |
| SCFM6     | 114 825.05    |
| AL2       | 163 043.21    |
| AL3       | 163 261.00    |
| AL4       | 163 262.01    |
| FC        | (see access.) |
| BJM12 (2) | 173 616.26    |
| BJM12 (2) | 173 617.27    |
| BJM12 (2) | 173 618.00    |
| BJM12 (2) | 173 619.01    |
| BJM12 (2) | 173 620.06    |
| BJS12 (2) | 173 620.06    |
| BJDP (2)  | (see access.) |
| EP        | (see access.) |

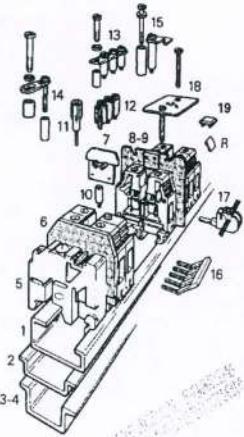
|  |  |
| --- | --- |
| Type | Part number |





<tbl\_r cells="2" ix="

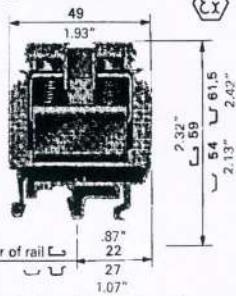
## Compression clamp terminal blocks



### M 35/16

**M 35/16.N**

Spacing 16 mm - 0,1 (.630")



Standard 16 mm block with partition

Type Part number

Grey body M 35/16 115 124.07

Color Coded

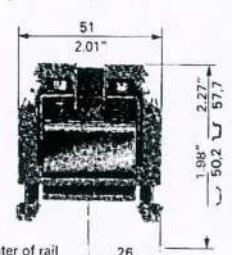
Blue M 35/16.N 125 124.01

Yellow M 35/16 105 124.16

### R 35/16

**R 35/16.N**

Spacing 16 mm - 0,1 (.630")



Low profile 16 mm block with partition

Type Part number

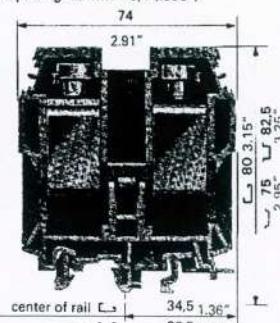
Grey body R 35/16.N 125 107.11

Blue body

DIN standard IEC 60947-5-1 recommends the use of terminal blocks not exceeding 44 mm 1.73" in height above the mounting rail (EN 50022, DIN 3, 25 x 7.5 mm). All of ENTRELEC series 5000 blocks meet this requirement except M 35/16. The block described on this page R 35/16 was designed to comply with DIN 43 880's recommendation and may be mounted only on DIN 3 rail EN 50022.

### M 70/22.1

Spacing 22 mm - 0,1 (.866")



Type Part number

Grey body M 70/22.1 115 216.13

Note: Tighten clamp with 6 mm Allen Key

## Characteristics

| Wire size<br>(see generalities) | Solid wire<br>6-35 mm <sup>2</sup>    | DIN-VDE<br>10-0 AWG | UL<br>10-0 AWG | CSA<br>6-35 mm <sup>2</sup> | NFC-UTE<br>16-50 mm <sup>2</sup> | DIN-VDE<br>6-0 AWG    | UL<br>6-2 AWG | CSA<br>16-50 mm <sup>2</sup> | NFC-UTE<br>16-95 mm <sup>2</sup> | DIN-VDE<br>4-00 AWG | UL<br>4-00 AWG | CSA<br>16-95 mm <sup>2</sup> | NFC-UTE<br>16-70 mm <sup>2</sup> |
|---------------------------------|---------------------------------------|---------------------|----------------|-----------------------------|----------------------------------|-----------------------|---------------|------------------------------|----------------------------------|---------------------|----------------|------------------------------|----------------------------------|
|                                 | Stranded wire<br>6-35 mm <sup>2</sup> |                     |                |                             | 6-35 mm <sup>2</sup>             | 16-35 mm <sup>2</sup> |               |                              | 16-35 mm <sup>2</sup>            |                     |                |                              |                                  |

Rated voltage

V - AC

= DC

750 Gr.C

600

750 Cat.C

750 Gr.C

900 Gr.C

600

900 Gr.C

500 Cat.C

1000 Gr.C

1200 Gr.C

500 Cat.C

750 Cat.C

239

Rated current

A

138

150

160

155

138

150

160

155

213

175

150

239

Rated wire size

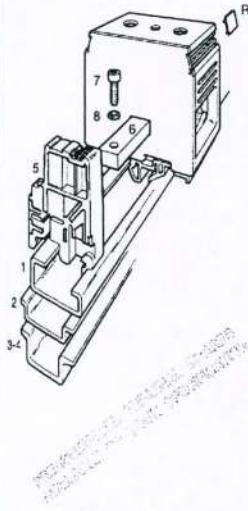
Wire stripping length

0 AWG

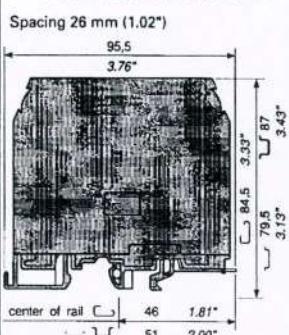
0 AWG

35 mm<sup>2</sup>

### Compression clamp terminal blocks



### M 95/26



#### Type                              Part number

|                                         |            |
|-----------------------------------------|------------|
| Grey body                               |            |
| M 95/26                                 | 115 556.10 |
| Blue body                               |            |
| M 95/26.N                               | 125 556.12 |
| Green and yellow body (isolated ground) |            |
| M 95/26.PI                              | 165 556.22 |

Note: Tighten clamp with  
6 mm Allen Key

#### Characteristics

| Wire size<br>(see generalities) | Solid wire    | DIN-VDE                                         | UL       | CSA            | NFC-UTE                                         |
|---------------------------------|---------------|-------------------------------------------------|----------|----------------|-------------------------------------------------|
|                                 | Stranded wire | 35-120 mm <sup>2</sup><br>32-95 mm <sup>2</sup> | 0000 AWG | 000 AWG<br>max | 35-120 mm <sup>2</sup><br>35-95 mm <sup>2</sup> |

| Rated voltage | V ~ AC | 1000 Gr.C | 600 | 600 | 1000 Cat.C |
|---------------|--------|-----------|-----|-----|------------|
|               | = DC   | 1200 Gr.C |     |     | 1000 Cat.C |

| Rated current | A | 258                | 230      | 250     | 289                |
|---------------|---|--------------------|----------|---------|--------------------|
|               |   | 95 mm <sup>2</sup> | 0000 AWG | 000 AWG | 95 mm <sup>2</sup> |

| Rated wire size | Wire stripping length | Recommended screwdriver | Recommended torque     | Protection |
|-----------------|-----------------------|-------------------------|------------------------|------------|
|                 | 26 mm<br>1.02"        | 6 mm<br>Allen Key       | 4-6 Nm<br>35-52 lb.in. | IP 20      |

#### Other characteristics

| Approvals (Contact Entrelec) | CE | UL | CSA | NFC-UTE |
|------------------------------|----|----|-----|---------|
|                              |    |    |     |         |

#### Accessories

| Type                          | Part number |
|-------------------------------|-------------|
| 1 Rail 32 x 15                | DIN 1       |
| 2 Rail 35 x 7,5 x 1           | DIN 3       |
| 3 Rail 35 x 15 x 2,3          | DIN 3       |
| 4 Rail 35 x 15 x 1,5          |             |
| 5 High end stop (all rails)   |             |
| 6 Jumper bar not preassembled |             |
| 7 Screw CHC M5 for BJS        |             |
| 8 Washer for VSJ              |             |

R See markers and other accessories      Marking method

⑪ ⑫

### Installation of jumper bar

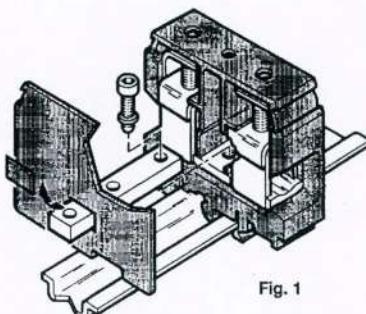


Fig. 1

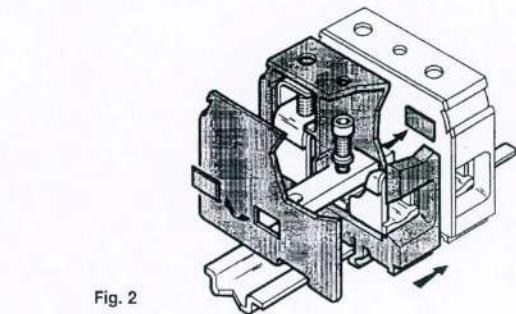


Fig. 2

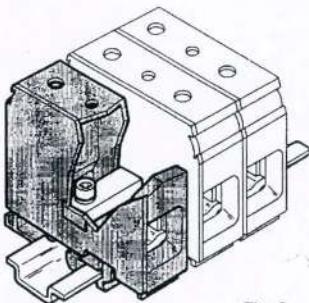
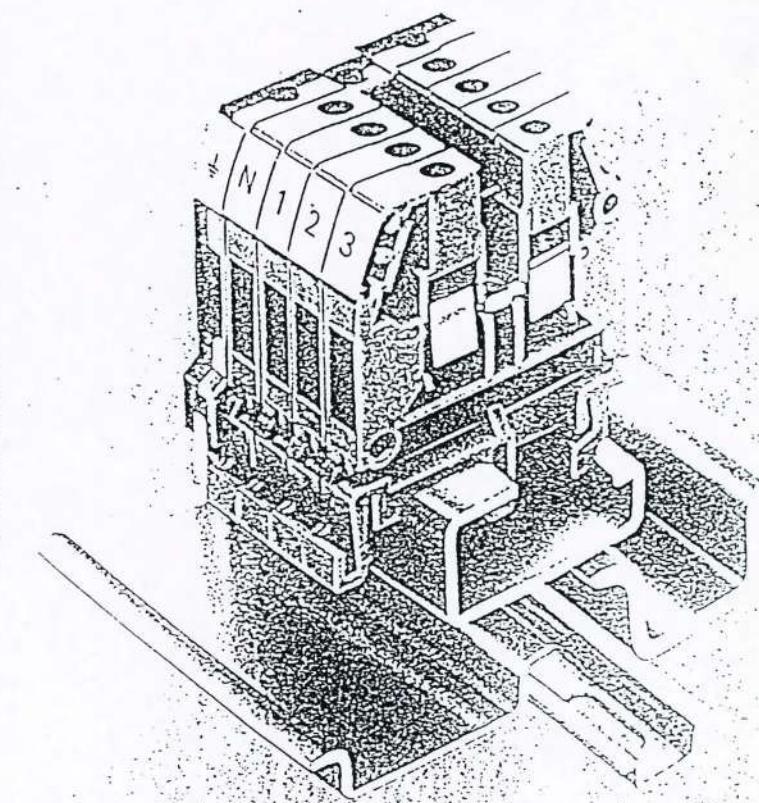


Fig. 3

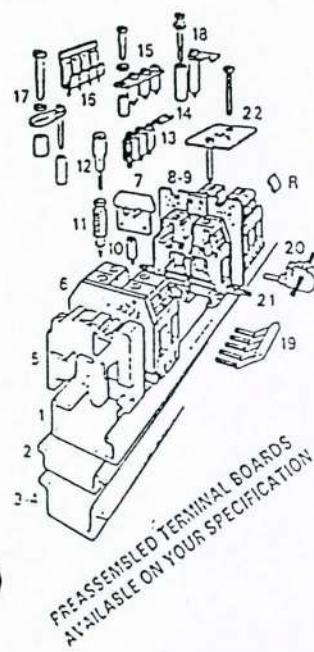
# TERMINAL BLOCKS



- Series 5000 (DIN 1-3)
- Series DR (DIN 2)

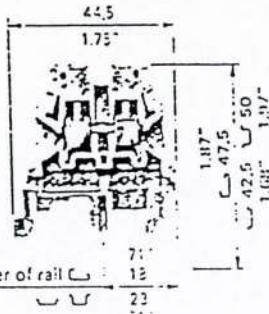
entrelec®

# Compression clamp terminal blocks



## M 2,5/5 M 2,5/5.N

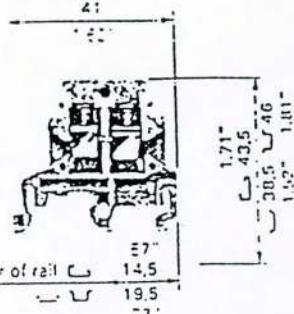
Spacing 5 mm + 0,03 (0.20")



Standard 5 mm block

## MS 4/6 MS 4/6.N

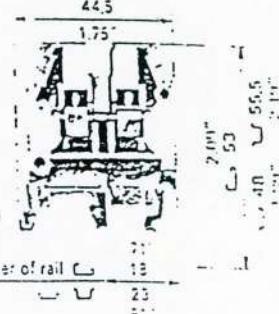
Spacing 6 mm + 0,05 (0.238")



Simplified 6 mm block  
reduced size

## M 4/6 M 4/6.N

Spacing 6 mm + 0,05 (0.238")



Standard 6 mm block

| Type      |           | Type        |          | Type      |         |
|-----------|-----------|-------------|----------|-----------|---------|
| Grey body | M 2,5/5   | Grey body   | MS 4/6   | Grey body | M 4/6   |
| Blue body | M 2,5/5.N | Blue body   | MS 4/6.N | Blue body | M 4/6.N |
|           |           | Orange body | MS 4/6   |           |         |

| Type       |  | Type       |  | Type       |  |
|------------|--|------------|--|------------|--|
| 115 125.00 |  | 115 265.24 |  | 115 115.07 |  |
| 125 125.02 |  | 125 265.25 |  | 125 116.01 |  |
|            |  | 105 013.12 |  |            |  |

### Other characteristics

| Wire size<br>(see generalities) | Solid wire    | 0.4 mm²                        | 12-12 AWG | 23-12 AWG | 0.4 mm²   | 0.4 mm²  | 22-12 AWG | 22-12 AWG | 0.4 mm²   | 0.4 mm²  | 22-12 AWG | 23-10 AWG | 0.4 mm²   |
|---------------------------------|---------------|--------------------------------|-----------|-----------|-----------|----------|-----------|-----------|-----------|----------|-----------|-----------|-----------|
|                                 | Stranded wire | 0.25 mm²                       |           |           | 0.25 mm²  | 0.4 mm²  |           |           | 0.4 mm²   | 0.4 mm²  |           |           | 0.4 mm²   |
| Rated voltage                   | V             | ~ AC 750 Gr C<br>= DC 900 Gr.C | 600       | 600       | 500 Cat.C | 750 Gr.C | 300       | 300       | 500 Cat.C | 750 Gr.C | 600       | 600       | 500 Cat.C |
| Rated current                   | A             | 25                             | 10        | 1         | 20        | 1        | 30        | 35        | 20        | 25       | 30        | 1         | 25        |
| Rated wire size                 | 2,5 mm²       | 18 AWG                         | 12 AWG    | 2,5 mm²   | 4 mm²     | 12 AWG   | 12 AWG    | 2,5 mm²   | 4 mm²     | 12 AWG   | 10 AWG    | 2,5 mm²   |           |

### Other characteristics

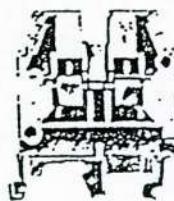
|                            | 8.5 mm<br>.33" | 3.5 mm<br>.137" | 0.406 Nm<br>3.65 lb.in | IP 20<br>NEMA 1 | 10 mm<br>.39" | 4 mm | 0.4-0.6 Nm<br>3.5-5.3 lb.in | IP 20<br>NEMA 1 | 9.5 mm<br>.37" | 4 mm  | 14-0.5 Nm<br>13.5-3.16 in<br>Nm | IP 20<br>NEMA 1 |
|----------------------------|----------------|-----------------|------------------------|-----------------|---------------|------|-----------------------------|-----------------|----------------|-------|---------------------------------|-----------------|
| Approvals (see section II) | PR1 C          | PR3 C           | G.L.O                  |                 | PR1 C         | PR3  |                             |                 | PR1 C          | PR3 C | G.L.O                           | PR1 C           |

### Accessories

|  | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 | 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 | 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 125 | 126 | 127 | 128 | 129 | 130 | 131 | 132 | 133 | 134 | 135 | 136 | 137 | 138 | 139 | 140 | 141 | 142 | 143 | 144 | 145 | 146 | 147 | 148 | 149 | 150 | 151 | 152 | 153 | 154 | 155 | 156 | 157 | 158 | 159 | 160 | 161 | 162 | 163 | 164 | 165 | 166 | 167 | 168 | 169 | 170 | 171 | 172 | 173 | 174 | 175 | 176 | 177 | 178 | 179 | 180 | 181 | 182 | 183 | 184 | 185 | 186 | 187 | 188 | 189 | 190 | 191 | 192 | 193 | 194 | 195 | 196 | 197 | 198 | 199 | 200 | 201 | 202 | 203 | 204 | 205 | 206 | 207 | 208 | 209 | 210 | 211 | 212 | 213 | 214 | 215 | 216 | 217 | 218 | 219 | 220 | 221 | 222 | 223 | 224 | 225 | 226 | 227 | 228 | 229 | 230 | 231 | 232 | 233 | 234 | 235 | 236 | 237 | 238 | 239 | 240 | 241 | 242 | 243 | 244 | 245 | 246 | 247 | 248 | 249 | 250 | 251 | 252 | 253 | 254 | 255 | 256 | 257 | 258 | 259 | 260 | 261 | 262 | 263 | 264 | 265 | 266 | 267 | 268 | 269 | 270 | 271 | 272 | 273 | 274 | 275 | 276 | 277 | 278 | 279 | 280 | 281 | 282 | 283 | 284 | 285 | 286 | 287 | 288 | 289 | 290 | 291 | 292 | 293 | 294 | 295 | 296 | 297 | 298 | 299 | 300 | 301 | 302 | 303 | 304 | 305 | 306 | 307 | 308 | 309 | 310 | 311 | 312 | 313 | 314 | 315 | 316 | 317 | 318 | 319 | 320 | 321 | 322 | 323 | 324 | 325 | 326 | 327 | 328 | 329 | 330 | 331 | 332 | 333 | 334 | 335 | 336 | 337 | 338 | 339 | 340 | 341 | 342 | 343 | 344 | 345 | 346 | 347 | 348 | 349 | 350 | 351 | 352 | 353 | 354 | 355 | 356 | 357 | 358 | 359 | 360 | 361 | 362 | 363 | 364 | 365 | 366 | 367 | 368 | 369 | 370 | 371 | 372 | 373 | 374 | 375 | 376 | 377 | 378 | 379 | 380 | 381 | 382 | 383 | 384 | 385 | 386 | 387 | 388 | 389 | 390 | 391 | 392 | 393 | 394 | 395 | 396 | 397 | 398 | 399 | 400 | 401 | 402 | 403 | 404 | 405 | 406 | 407 | 408 | 409 | 410 | 411 | 412 | 413 | 414 | 415 | 416 | 417 | 418 | 419 | 420 | 421 | 422 | 423 | 424 | 425 | 426 | 427 | 428 | 429 | 430 | 431 | 432 | 433 | 434 | 435 | 436 | 437 | 438 | 439 | 440 | 441 | 442 | 443 | 444 | 445 | 446 | 447 | 448 | 449 | 450 | 451 | 452 | 453 | 454 | 455 | 456 | 457 | 458 | 459 | 460 | 461 | 462 | 463 | 464 | 465 | 466 | 467 | 468 | 469 | 470 | 471 | 472 | 473 | 474 | 475 | 476 | 477 | 478 | 479 | 480 | 481 | 482 | 483 | 484 | 485 | 486 | 487 | 488 | 489 | 490 | 491 | 492 | 493 | 494 | 495 | 496 | 497 | 498 | 499 | 500 | 501 | 502 | 503 | 504 | 505 | 506 | 507 | 508 | 509 | 510 | 511 | 512 | 513 | 514 | 515 | 516 | 517 | 518 | 519 | 520 | 521 | 522 | 523 | 524 | 525 | 526 | 527 | 528 | 529 | 530 | 531 | 532 | 533 | 534 | 535 | 536 | 537 | 538 | 539 | 540 | 541 | 542 | 543 | 544 | 545 | 546 | 547 | 548 | 549 | 550 | 551 | 552 | 553 | 554 | 555 | 556 | 557 | 558 | 559 | 560 | 561 | 562 | 563 | 564 | 565 | 566 | 567 | 568 | 569 | 570 | 571 | 572 | 573 | 574 | 575 | 576 | 577 | 578 | 579 | 580 | 581 | 582 | 583 | 584 | 585 | 586 | 587 | 588 | 589 | 590 | 591 | 592 | 593 | 594 | 595 | 596 | 597 | 598 | 599 | 600 | 601 | 602 | 603 | 604 | 605 | 606 | 607 | 608 | 609 | 610 | 611 | 612 | 613 | 614 | 615 | 616 | 617 | 618 | 619 | 620 | 621 | 622 | 623 | 624 | 625 | 626 | 627 | 628 | 629 | 630 | 631 | 632 | 633 | 634 | 635 | 636 | 637 | 638 | 639 | 640 | 641 | 642 | 643 | 644 | 645 | 646 | 647 | 648 | 649 | 650 | 651 | 652 | 653 | 654 | 655 | 656 | 657 | 658 | 659 | 660 | 661 | 662 | 663 | 664 | 665 | 666 | 667 | 668 | 669 | 670 | 671 | 672 | 673 | 674 | 675 | 676 | 677 | 678 | 679 | 680 | 681 | 682 | 683 | 684 | 685 | 686 | 687 | 688 | 689 | 690 | 691 | 692 | 693 | 694 | 695 | 696 | 697 | 698 | 699 | 700 | 701 | 702 | 703 | 704 | 705 | 706 | 707 | 708 | 709 | 710 | 711 | 712 | 713 | 714 | 715 | 716 | 717 | 718 | 719 | 720 | 721 | 722 | 723 | 724 | 725 | 726 | 727 | 728 | 729 | 730 | 731 | 732 | 733 | 734 | 735 | 736 | 737 | 738 | 739 | 740 | 741 | 742 | 743 | 744 | 745 | 746 | 747 | 748 | 749 | 750 | 751 | 752 | 753 | 754 | 755 | 756 | 757 | 758 | 759 | 760 | 761 | 762 | 763 | 764 | 765 | 766 | 767 | 768 | 769 | 770 | 771 | 772 | 773 | 774 | 775 | 776 | 777 | 778 | 779 | 780 | 781 | 782 | 783 | 784 | 785 | 786 | 787 | 788 | 789 | 790 | 791 | 792 | 793 | 794 | 795 | 796 | 797 | 798 | 799 | 800 | 801 | 802 | 803 | 804 | 805 | 806 | 807 | 808 | 809 | 810 | 811 | 812 | 813 | 814 | 815 | 816 | 817 | 818 | 819 | 820 | 821 | 822 | 823 | 824 | 825 | 826 | 827 | 828 | 829 | 830 | 831 | 832 | 833 | 834 | 835 | 836 | 837 | 838 | 839 | 840 | 841 | 842 | 843 | 844 | 845 | 846 | 847 | 848 | 849 | 850 | 851 | 852 | 853 | 854 | 855 | 856 | 857 | 858 | 859 | 860 | 861 | 862 | 863 | 864 | 865 | 866 | 867 | 868 | 869 | 870 | 871 | 872 | 873 | 874 | 875 | 876 | 877 | 878 | 879 | 880 | 881 | 882 | 883 | 884 | 885 | 886 | 887 | 888 | 889 | 890 | 891 | 892 | 893 | 894 | 895 | 896 | 897 | 898 | 899 | 900 | 901 | 902 | 903 | 904 | 905 | 906 | 907 | 908 | 909 | 910 | 911 | 912 | 913 | 914 | 915 | 916 | 917 | 918 | 919 | 920 | 921 | 922 | 923 | 924 | 925 | 926 | 927 | 928 | 929 | 930 | 931 | 932 | 933 | 934 | 935 | 936 | 937 | 938 | 939 | 940 | 941 | 942 | 943 | 944 | 945 | 946 | 947 | 948 | 949 | 950 | 951 | 952 | 953 | 954 | 955 | 956 | 957 | 958 | 959 | 960 | 961 | 962 | 963 | 964 | 965 | 966 | 967 | 968 | 969 | 970 | 971 | 972 | 973 | 974 | 975 | 976 | 977 | 978 | 979 | 980 | 98 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |

**M 4/6**  
coloured

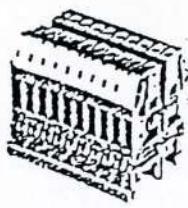
19.5 mm + 0.05 (233")



Standard 6 mm block

**M 4/6.10R**

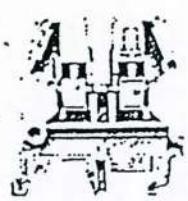
Spacing 6 mm + 0.05 (233")



10 M 4/6 blocks assembled  
and marked on 2 faces from 1 to 9  
+ last marker blank

**M 4/6.T**

Spacing 6 mm + 0.05 (233")



M 4/6 with 1 screw-socket  
DIA. 2 mm/.079" on the right

**M 4/6.1**

Spacing 5 mm + 0.05 (233")



M 4/6 with cut-out partition

| Type        | Part number | Type      | Part number | Type      | Part number | Type      | Part number |
|-------------|-------------|-----------|-------------|-----------|-------------|-----------|-------------|
| Yellow body |             | Grey body |             | Grey body |             | Grey body |             |
| M 4/6       | 105 116.16  | M 4/6.10R | 115 367.22  | MS 4/6.T  | 115 224.13  | M 4/6.1   | 115 259.06  |
| Green body  |             |           |             |           |             |           |             |
| M 4/6       | 105 001.27  |           |             |           |             |           |             |
| Orange body |             |           |             |           |             |           |             |
| A 4/6       | 105 002.20  |           |             |           |             |           |             |

| 0.4 mm² | 23-12 AWG | 22-10 AWG | 0.4 mm²   | 0.4 mm²  | 22-12 AWG | 22-10 AWG | 0.4 mm²   | 0.4 mm²  |  |    | 0.4 mm²   | 0.4 mm²  |    | 0.4 mm² |
|---------|-----------|-----------|-----------|----------|-----------|-----------|-----------|----------|--|----|-----------|----------|----|---------|
| 0.4 mm² |           |           | 0.4 mm²   | 0.4 mm²  |           |           | 0.4 mm²   | 0.4 mm²  |  |    | 0.4 mm²   | 0.4 mm²  |    | 0.4 mm² |
|         |           |           |           |          |           |           |           |          |  |    |           |          |    |         |
| 750 G+C | 600       | 600       | 500 Cat.C | 750 Gr.C | 600       | 600       | 500 Cat.C | 750 Gr.C |  |    | 500 Cat.C | 750 Gr.C |    | 500 G+C |
| 500 G+C |           |           | 500 Cat.C | 900 Gr.C |           |           | 500 Cat.C | 900 Gr.C |  |    | 500 Cat.C | 900 Gr.C |    | 500 G+C |
| 35      |           | 25        | 30        | 35       |           | 25        | 30        | 35       |  | 30 | 35        |          | 30 | 35      |
| 4 mm²   | 12 AWG    | 10 AWG    | 2.5 mm²   | 4 mm²    | 12 AWG    | 10 AWG    | 2.5 mm²   | 4 mm²    |  |    | 2.5 mm²   | 4 mm²    |    | 2.5 mm² |

| 9.5 mm<br>.37" | 4 mm | 0.4-0.5 Nm<br>3.5-5.3 lb.in | IP 20<br>NEMA 1 | 9.5 mm<br>.37" | 4 mm | 0.4-0.6 Nm<br>3.5-5.3 lb.in | IP 20<br>NEMA 1 | 9.5 mm<br>.37" | 4 mm | 0.4-0.6 Nm<br>3.5-5.3 lb.in | IP 20<br>NEMA 1 | 9.5 mm<br>.37" | 4 mm | 0.4-0.6 Nm<br>3.5-5.3 lb.in | IP 20<br>NEMA 1 |  |
|----------------|------|-----------------------------|-----------------|----------------|------|-----------------------------|-----------------|----------------|------|-----------------------------|-----------------|----------------|------|-----------------------------|-----------------|--|
| PR1 Z2         |      |                             |                 |  |

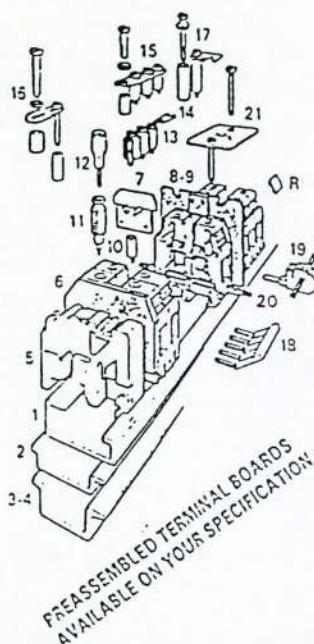
|          |              |              |          |              |              |          |              |              |          |              |              |          |              |              |          |              |              |
|----------|--------------|--------------|----------|--------------|--------------|----------|--------------|--------------|----------|--------------|--------------|----------|--------------|--------------|----------|--------------|--------------|
| PR3      |              | 164 800.03   | PR3      |              |              |
| PR4      |              | 168 500.12   | PR4      |              |              |
| PR5      |              | 168 700.22   | PR5      |              |              |
| AM       | th. 9.1 mm   | 103 002.25   | BAM      | th. 9.1 mm   | 103 002.25   | BAM      | th. 9.1 mm   | 103 002.25   | BAM      | th. 9.1 mm   | 103 002.25   | BAM      | th. 9.1 mm   | 103 002.25   | BAM      | th. 9.1 mm   |              |
| F.       | th. 2.5 mm   | 103 062.21   | FEM5     | th. 2.5 mm   | 118 366.16   | FEM5     | th. 2.5 mm   | 118 366.16   | FEM5     | th. 2.5 mm   | 118 366.16   | FEM5     | th. 2.5 mm   | 118 366.16   | FEM5     | th. 2.5 mm   |              |
| F.       | th. 2.5 mm   | 103 125.15   |          |              |              |          |              |              |          |              |              |          |              |              |          |              |              |
| FEM5     | th. 2.5 mm   | 103 126.15   |          |              |              |          |              |              |          |              |              |          |              |              |          |              |              |
| SCM6     |              | 113 003.10   | SCM6     |              |              |
| SCF6     | th. 3 mm     | 118 707.03   | SCF6     | th. 3 mm     | 118 707.03   | SCF6     | th. 3 mm     | 118 707.03   | SCF6     | th. 3 mm     | 118 707.03   | SCF6     | th. 3 mm     | 118 707.03   | SCF6     | th. 3 mm     |              |
| SCF6     | th. 3 mm     | 128 707.05   | SCF6     | th. 3 mm     | 128 707.05   | SCF6     | th. 3 mm     | 128 707.05   | SCF6     | th. 3 mm     | 128 707.05   | SCF6     | th. 3 mm     | 128 707.05   | SCF6     | th. 3 mm     |              |
| SCFM6    | th. 3 mm     | 114 825.05   | SCFM6    | th. 3 mm     | 114 825.05   | SCFM6    | th. 3 mm     | 114 825.05   | SCFM6    | th. 3 mm     | 114 825.05   | SCFM6    | th. 3 mm     | 114 825.05   | SCFM6    | th. 3 mm     |              |
| AL2 (I)  | DIA. 2 mm    | 163 043.21   | AL2 (I)  | DIA. 2 mm    | 163 043.21   | AL2 (I)  | DIA. 2 mm    | 163 043.21   | AL2 (I)  | DIA. 2 mm    | 163 043.21   | AL2 (I)  | DIA. 2 mm    | 163 043.21   | AL2 (I)  | DIA. 2 mm    |              |
| AL3 (I)  | DIA. 3 mm    | 163 261.03   | AL3 (I)  | DIA. 3 mm    | 163 261.03   | AL3 (I)  | DIA. 3 mm    | 163 261.03   | AL3 (I)  | DIA. 3 mm    | 163 261.03   | AL3 (I)  | DIA. 3 mm    | 163 261.03   | AL3 (I)  | DIA. 3 mm    |              |
| DCJ      | yellow       | 173 059.03   | DCJ      | yellow       |              |
| FC       | (see access) |              | FC       | (see access) |              | FC       | (see access) |              | FC       | (see access) |              | FC       | (see access) |              | FC       | (see access) |              |
| BJM5 (I) | 2 poles      | 163 515.25   | BJM5 (I) | 2 poles      | 163 515.25   | BJM5 (I) | 2 poles      | 163 515.25   | BJM5 (I) | 2 poles      | 163 515.25   | BJM5 (I) | 2 poles      | 163 515.25   | BJM5 (I) | 2 poles      |              |
| BJM5 (I) | 3 poles      | 163 517.23   | BJM5 (I) | 3 poles      | 163 517.23   | BJM5 (I) | 3 poles      | 163 517.23   | BJM5 (I) | 3 poles      | 163 517.23   | BJM5 (I) | 3 poles      | 163 517.23   | BJM5 (I) | 3 poles      |              |
| BJM5 (I) | 4 poles      | 163 518.07   | BJM5 (I) | 4 poles      | 163 518.07   | BJM5 (I) | 4 poles      | 163 518.07   | BJM5 (I) | 4 poles      | 163 518.07   | BJM5 (I) | 4 poles      | 163 518.07   | BJM5 (I) | 4 poles      |              |
| BJM5 (I) | 5 poles      | 163 519.00   | BJM5 (I) | 5 poles      | 163 519.00   | BJM5 (I) | 5 poles      | 163 519.00   | BJM5 (I) | 5 poles      | 163 519.00   | BJM5 (I) | 5 poles      | 163 519.00   | BJM5 (I) | 5 poles      |              |
| BJM5 (I) | 10 poles     | 163 973.07   | BJM5 (I) | 10 poles     | 163 973.07   | BJM5 (I) | 10 poles     | 163 973.07   | BJM5 (I) | 10 poles     | 163 973.07   | BJM5 (I) | 10 poles     | 163 973.07   | BJM5 (I) | 10 poles     |              |
| EL6      |              | 173 627.21   | EL6      |              |              |
| BJS6 (I) | 83 poles     | (see access) | BJS6 (I) | 83 poles     | (see access) | BJS6 (I) | 83 poles     | (see access) | BJS6 (I) | 83 poles     | (see access) | BJS6 (I) | 83 poles     | (see access) | BJS6 (I) | 83 poles     | (see access) |
| BJA5 (I) | (see access) |              | BJA5 (I) | (see access) |              | BJA5 (I) | (see access) |              | BJA5 (I) | (see access) |              | BJA5 (I) | (see access) |              | BJA5 (I) | (see access) |              |
| BJDP (I) | (see access) |              | BJDP (I) | (see access) |              | BJDP (I) | (see access) |              | BJDP (I) | (see access) |              | BJDP (I) | (see access) |              | BJDP (I) | (see access) |              |
| BJP6     |              | 174 413.14   | BJP6     |              |              |
| PC6      | (see access) |              | PC6      | (see access) |              | PC6      | (see access) |              | PC6      | (see access) |              | PC6      | (see access) |              | PC6      | (see access) |              |
| AD2,5    |              | 114 205.20   | AD2,5    |              |              |
| CBM      | (see access) |              | CBM      | (see access) |              | CBM      | (see access) |              | CBM      | (see access) |              | CBM      | (see access) |              | CBM      | (see access) |              |
| EP6      | 4 blocks     | 163 427.17   | EP6      | 4 blocks     |              |

\* Use of securator SC's required with the use of these accessories.

\*\* Use of these accessories requires the cut-out of the block body by the user (precut).

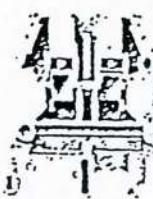
**entrellec**

# Compression clamp terminal blocks



M 4/6.2

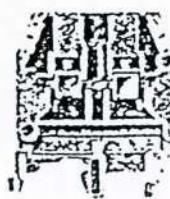
Spacing 6 mm + 0.05 (.238")



M 4/6.1 equipped with a test socket  
DIA. 2mm/.075"

M 4/6.3

Spacing 6 mm + 0.05 (.238")



M 4/6.1 equipped with a test socket  
DIA. 3mm/.12"

M 4/6.4

Spacing 6 mm + 0.05 (.238")



M 4/6.1 equipped with a test socket  
DIA. 4mm/.16"

| Type      | Part number | Type      | Part number | Type      | Part number |
|-----------|-------------|-----------|-------------|-----------|-------------|
| Grey body | M 4/6.2     | Grey body | M 4/6.3     | Grey body | M 4/6.4     |
|           | 115 217.14  |           | 115 263.07  |           | 115 192.04  |

## Characteristics

| Wire size<br>(see generalities) | Solid wire        | 0.4 mm <sup>2</sup>  |  |                     | 0.4 mm <sup>2</sup>  | 0.4 mm <sup>2</sup> |  |                     | 0.4 mm <sup>2</sup> | 0.4 mm <sup>2</sup> |                     |                     |
|---------------------------------|-------------------|----------------------|--|---------------------|----------------------|---------------------|--|---------------------|---------------------|---------------------|---------------------|---------------------|
|                                 | Stranded wire     | 0.25 mm <sup>2</sup> |  |                     | 0.25 mm <sup>2</sup> | 0.4 mm <sup>2</sup> |  |                     | 0.4 mm <sup>2</sup> | 0.4 mm <sup>2</sup> |                     | 0.4 mm <sup>2</sup> |
| Rated voltage<br>V              | ~ AC              | 750 Gr.C             |  |                     | 500 Cat.C            | 750 Gr.C            |  |                     | 500 Cat.C           | 750 Gr.C            |                     | 500 Cat.C           |
|                                 | = DC              | 900 Gr.C             |  |                     | 500 Cat.C            | 900 Gr.C            |  |                     | 500 Cat.C           | 900 Gr.C            |                     | 500 Cat.C           |
| Rated current<br>A              |                   | 35                   |  |                     | 30                   | 35                  |  |                     | 30                  | 35                  |                     | 30                  |
| Rated wire size                 | 4 mm <sup>2</sup> |                      |  | 2.5 mm <sup>2</sup> | 4 mm <sup>2</sup>    |                     |  | 2.5 mm <sup>2</sup> | 4 mm <sup>2</sup>   |                     | 2.5 mm <sup>2</sup> |                     |

## Other characteristics

|  |                |      |                             |                 |                |      |                             |                 |                |      |                             |                 |
|--|----------------|------|-----------------------------|-----------------|----------------|------|-----------------------------|-----------------|----------------|------|-----------------------------|-----------------|
|  | 9.5 mm<br>.37" | 4 mm | 0.4-0.6 Nm<br>3.5-5.3 lb in | IP 20<br>NEMA 1 | 9.5 mm<br>.37" | 4 mm | 0.4-0.6 Nm<br>3.5-5.3 lb in | IP 20<br>NEMA 1 | 9.5 mm<br>.37" | 4 mm | 0.4-0.6 Nm<br>3.5-5.3 lb in | IP 20<br>NEMA 1 |
|--|----------------|------|-----------------------------|-----------------|----------------|------|-----------------------------|-----------------|----------------|------|-----------------------------|-----------------|

## Approvals (see section I)

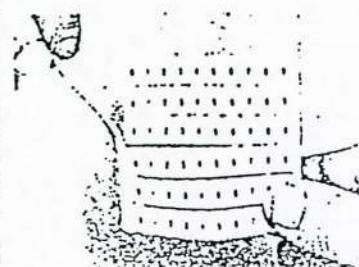
| Accessories                                       | Type   | Code number | Type         | Code number | Type       | Code number  |
|---------------------------------------------------|--------|-------------|--------------|-------------|------------|--------------|
| 1 Rail                                            | DIN 1  | PR1Z2       |              | 153 050.04  | PR1Z2      | 153 053.04   |
| 2 Rail                                            | DIN 3  | PR3         |              | 154 800.03  | PR3        | 154 800.03   |
| 3 Rail                                            | DIN 3  | PR4         |              | 153 500.12  | PR4        | 153 500.12   |
| 4 Rail                                            |        | PR5         |              | 155 700.22  | PR5        | 155 700.22   |
| 5 End stop (all rails)                            | BAM    | th. 9.1 mm  | 103 002.25   | BAM         | th. 9.1 mm | 103 002.25   |
| End section                                       | grey   | FEM5        | th. 2.5 mm   | 118 358.16  | FEM5       | th. 2.5 mm   |
|                                                   | yellow |             |              |             |            |              |
|                                                   | green  |             |              |             |            |              |
|                                                   | orange |             |              |             |            |              |
|                                                   | blue   |             |              |             |            |              |
| 7 Circuit separator                               | gray   |             |              |             |            |              |
| 8 Separator end section (block)                   | gray   | SCF6        | th. 3 mm     | 118 707.03  | SCF6       | th. 3 mm     |
|                                                   | blue   |             |              |             |            |              |
| 9 Separator end section (rail)                    |        | SCFM6       | th. 3 mm     | 114 825.06  | SCFM6      | th. 3 mm     |
| 10 Test socket                                    |        |             |              |             |            |              |
| 11 Test device                                    |        |             |              |             |            |              |
| 12 Test plug                                      |        |             |              |             |            |              |
| 13 Assembled jumper bar                           | FC     |             | (see access) |             | FC         |              |
| 14 Connector plate                                |        |             |              |             |            |              |
| 15 Jumper bar not preassembled                    |        |             |              |             |            |              |
| 16 Universal jumper bar                           |        |             |              |             |            |              |
| 17 Floating jumper bar                            |        |             |              |             |            |              |
| 18 Comb type jumper bar                           | PC6    |             | (see access) | PC6         |            | (see access) |
| 19 DC jumper                                      | AD2.5  |             | 114 205.22   | AD2.5       |            | 114 205.22   |
| 20 Shielding connector                            | CBM    |             | (see access) | CBM         |            | (see access) |
| 21 Protection face                                |        |             |              |             |            |              |
| 22 See markers and other accessories in section H |        | 2           |              | 2           |            | 2            |

**5.1.2.1:** separator SC is required with the use of these accessories

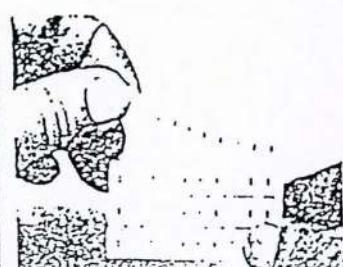
## RC6 Standard markers in cards

These markers are supplied in cards of 10 strips of 10 markers, i.e. 100 markers per card.  
White polyamide 6 moulding, black lettering

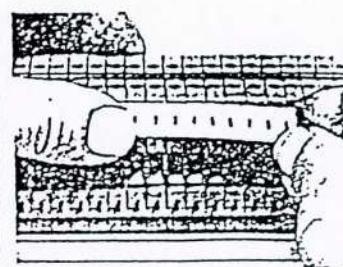
### How to use



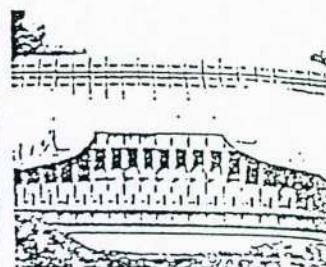
- Remove one of the side band of card.



- 2/4 Detach the chosen strip from the rest of the card.



- 3/4 Single markers.  
Press the chosen marker in place, hold it, and tear off the rest of the strip.

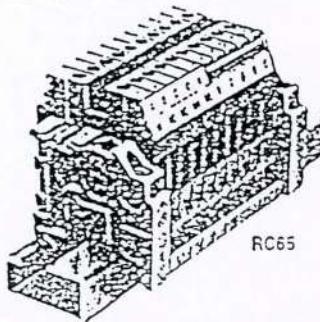


- 3/4 a' Marking in strips of 10 marker for blocks with 6 mm spacing only.  
Press on the first marker, hold it in place and press the rest of the strip by sliding your thumb along the strip.

5 types of marker are available.

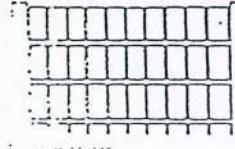
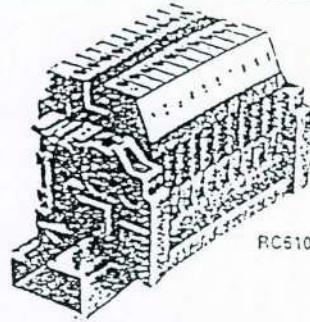
RC65

- 6 mm .238" x .20" markers
- 1 used on blocks from 6 mm .238" spacing, with possibility of putting 2 markers per housing.

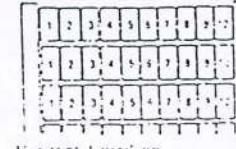


RC610

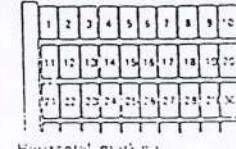
- 6 x 10 mm .238" x .40" markers  
Can be used on blocks from 6 mm .238" spacing; 1 marker per housing.



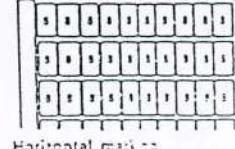
1 markers



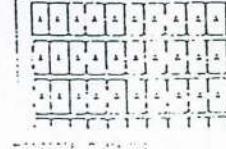
Horizontal marking  
Increasing/repeated order  
10 times 0 to 9  
or 10 times 1 to 10  
or 10 times 11 to 20 etc up to  
10 times 101 to 200 RC65  
10 times 49 to 510 RC610



Horizontal marking  
Increasing order  
1 time 1 to 100  
or 1 time 101 to 200 etc up to  
1 time 901 to 1000



Horizontal marking  
Identical numbers repeated  
100 times 0  
or 100 times 1 etc up to  
100 times 100  
100 times 200



Horizontal marking  
Identical numbers repeated  
100 times A  
or 100 times B etc up to  
100 times Z

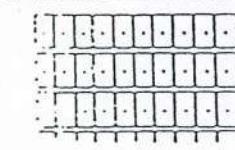
RC65 103 023.12  
RC610 103 024.10

RC65 103 059.00  
RC610 103 059.11

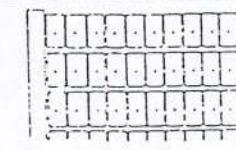
RC65 103 117.15  
RC610 103 119.27

RC65 103 071.22  
RC610 103 071.13

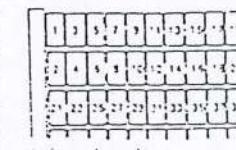
RC65 103 073  
RC610 103 083



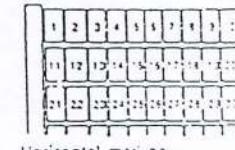
Horizontal marking  
Even signs  
1 time each sign  
1 time 0 to 10



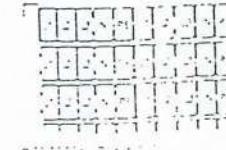
Horizontal marking  
Common signs  
100 times the sign + 0 or the sign + 1 or the sign + 2 or the sign + 3



Horizontal marking  
alternately even / odd  
for M 4/6 D - 2 dec+3  
block  
1 time 1 to 100



Horizontal marking  
Increasing order  
2 times 1 to 50



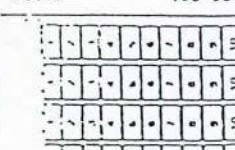
Horizontal marking  
Increasing order  
10 times 1 to 10  
10 times 11 to 20 etc up to  
10 times 101 to 200

RC65 103 075.26  
RC610 103 091.17

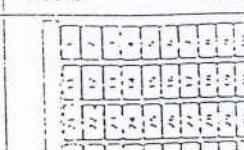
RC65 103 103.25  
RC610 103 104.26

RC65 103 112.10  
RC610 103 207.00

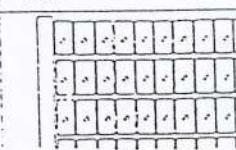
RC65 103 112  
RC610 103 114



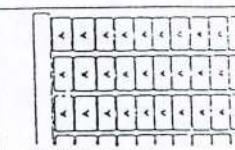
Vertical marking  
Increasing/repeated order  
10 times 0 to 9  
10 times 1 to 10  
10 times 11 to 20 etc up to  
10 times 101 to 200



Vertical marking  
Increasing order  
1 time 1 to 100  
or 10 times 101 to 200 etc up to  
10 times 1001 to 2000



Vertical marking  
Identical numbers repeated  
100 times 0  
or 100 times 1 etc up to  
100 times 100  
100 times 200



Vertical marking  
Identical numbers repeated  
100 times A  
or 100 times B etc up to  
100 times Z

RC65 103 070.05  
RC610 103 088.12

RC65 103 113.08  
RC610 103 113.24

RC65 103 072.23  
RC610 103 088.24

RC65 103 113.11  
RC610 103 113.12

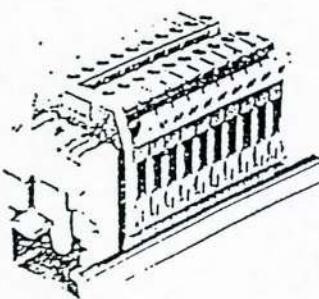
RC65 103 113  
RC610 103 114

RC65 Marking method ③ and ④  
RC610 Marking method ③ ④ and ⑤

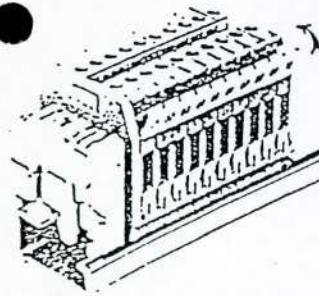
# RB Strips of markers for 5 mm .20" and 8 mm .315" blocks

and RB8

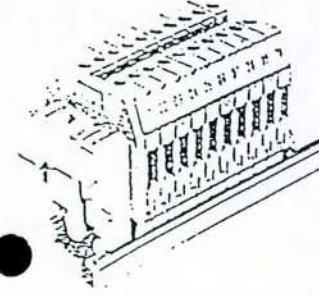
**S**et of 10 markers with or without lettering particularly adapted to marking in increasing numbers. This method is quick and easy.



**O** Engage 1 row of flexible tabs in the top block housings.



**O** Flatten the strip against the unit.



**O** Engage the 2nd row of flexible tabs.

## Standard marking

Strip of 10 blank markers with 5 mm .20" and 8 mm .315" spacing.

|   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|

R85 167 308.14

R88 163 456.24

**H**orizontal marking  
Black lettering on white background.

- Strip of 10 markers of increasing numbers.  
5 mm .20" : 01 to 10 up to 291 to 300  
8 mm .315" : 01 to 10 up to 991 to 1000

|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 |
|----|----|----|----|----|----|----|----|----|----|

R85 167 309.15

R88 163 455.23

**V**ertical marking  
Black lettering on white background.

- Strip of 10 markers of increasing numbers.  
8 mm .315" : 01 to 10 up to 991 to 1000

|   |   |   |   |   |   |   |   |   |   |    |
|---|---|---|---|---|---|---|---|---|---|----|
| 5 | 1 | 8 | 1 | 8 | 5 | 8 | 5 | 8 | 5 | 10 |
|---|---|---|---|---|---|---|---|---|---|----|

R88 163 543.01

R85 Marking method ③ ④ and ⑤

R88 Marking method ④ and ⑤

## Simplified marking

**H**orizontal marking

Black lettering on white background.

- Strip of 10 markers of increasing numbers.  
5 mm .20" : 1 to 9  
8 mm .315" : 1 to 9

|   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|

R85 163 189.06

R88 164 866.20

8 mm .315" : 0 to 9

|   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|

R88 168 231.07

- Strip of 10 markers of increasing numbers.  
5 mm .20" : 10 to 100  
8 mm .315" : 10 to 100 up to 910 to 1000

|    |    |    |    |    |    |    |    |    |     |
|----|----|----|----|----|----|----|----|----|-----|
| 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
|----|----|----|----|----|----|----|----|----|-----|

R85 168 446.07

R88 164 867.21

**V**ertical marking

Black lettering on white background.

- Strip of 10 markers of increasing numbers.  
8 mm .315" : 1 to 9

|   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|
| — | — | — | — | — | — | — | — | — | — |
|---|---|---|---|---|---|---|---|---|---|

R88 168 026.25

- Strip of 10 markers of numbers increasing by tens.  
8 mm .315" : 10 to 100 up to 210 to 300

|   |    |    |    |    |    |    |    |     |
|---|----|----|----|----|----|----|----|-----|
| 0 | 20 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
|---|----|----|----|----|----|----|----|-----|

R88 168 027.26

R85 Marking method ③ ④ and ⑤

R88 Marking method ④ and ⑤

## Special marking

**H**orizontal marking

Black lettering on white background.

- Strip of 10 identical signs.  
8 mm .315" : R, S, T, U, V, W, Y, Z,  
MP, SL, +, -, =, ≠, ½

|   |   |   |   |   |   |   |   |   |   |
|---|---|---|---|---|---|---|---|---|---|
| R | R | R | R | R | R | R | R | R | R |
|---|---|---|---|---|---|---|---|---|---|

R88 167 183.26

- Strip of 10 identical numbers.  
5 mm .20" : 10 times 10, to 100, to 1000 in tens

|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 | 12 |
|----|----|----|----|----|----|----|----|----|----|

R85 168 190.03

8 mm .315" : 10 times 00, to 10 times 99

|    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|
| 05 | 05 | 05 | 05 | 05 | 05 | 05 | 05 | 05 | 05 |
|----|----|----|----|----|----|----|----|----|----|

R88 167 354.01

- Strip of 10 markers marked in order N, L1, L2, L3  
8 mm .315"

|   |    |    |    |   |    |    |    |   |    |
|---|----|----|----|---|----|----|----|---|----|
| N | L1 | L2 | L3 | N | L1 | L2 | L3 | N | L1 |
|---|----|----|----|---|----|----|----|---|----|

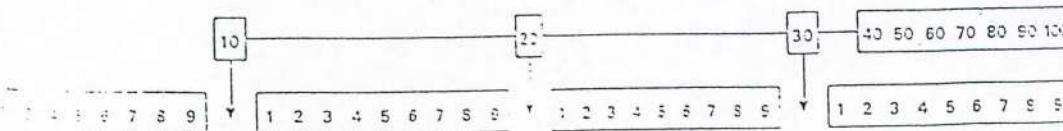
R88 167 733.25

R85 Marking method ③ ④ and ⑤

R88 Marking method ④ and ⑤

**N**OTE: We recommend the use of the simplified marking as this permits reduction of stocks.

Example of marking using strips R85 - 168 026.25 and 168 446.07  
or R88 - 164 866.20 and 164 867.21



Standard packaging  
10 identical strips

Examples of order

• 100 strips R85 P.N. 167 308.15  
i.e.: 10 of each from 01-10  
to 91-100

• 260 strips R88 P.N. 163 455.23  
i.e. 10 of each from 01-10  
to 91-100

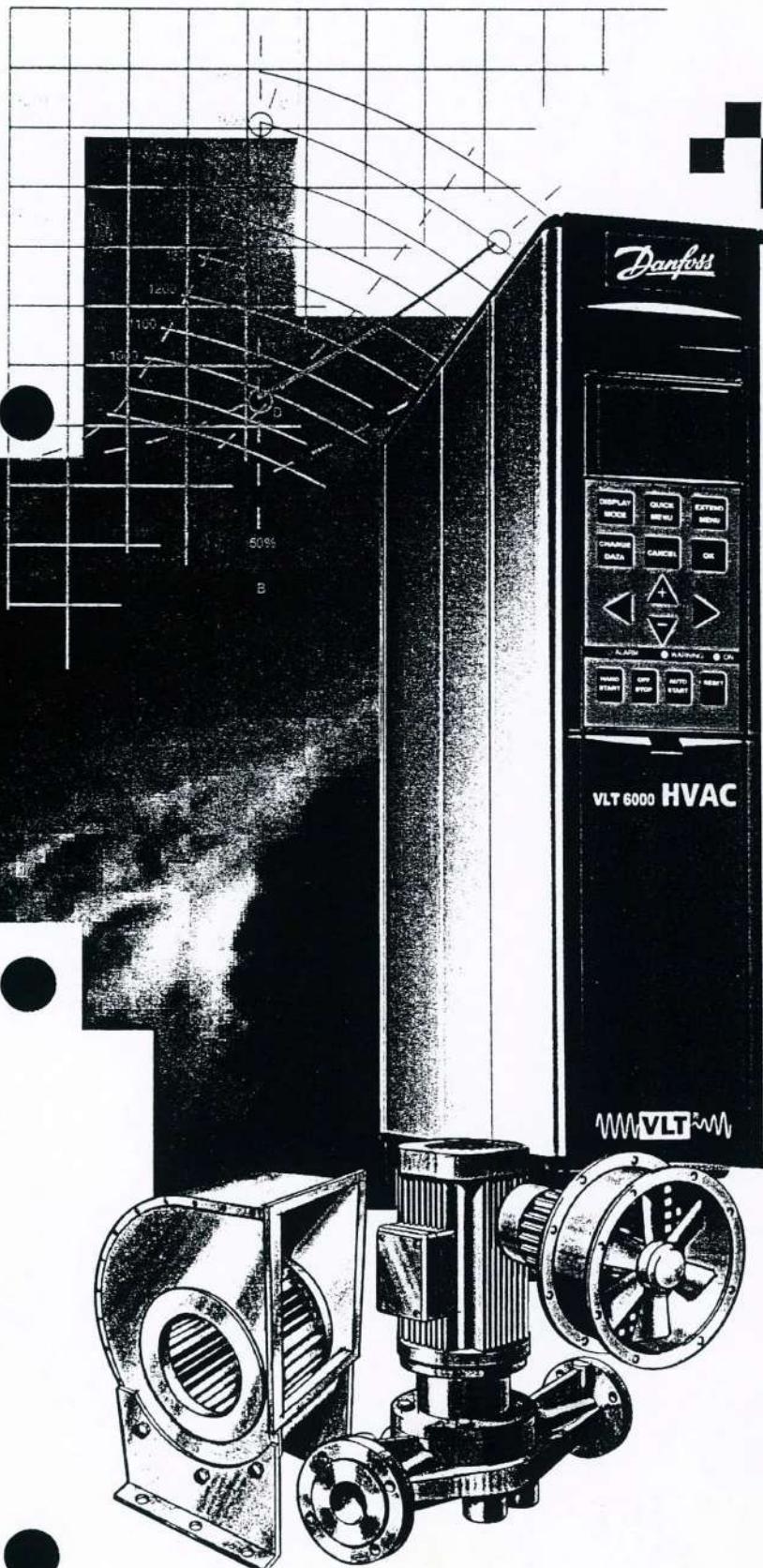
10 of each from 101-10  
to 201-200

10 of each from 301-30  
to 501-500





## Data sheet

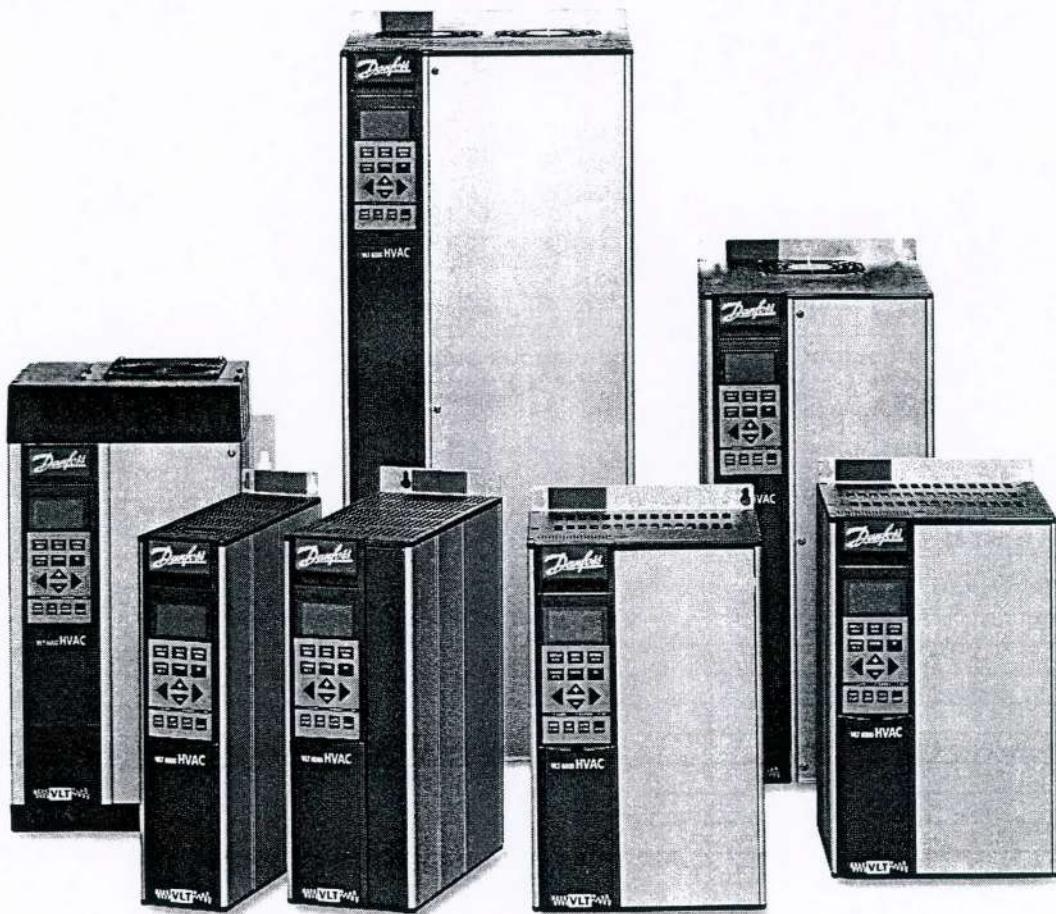


VLT® 6000 HVAC



Frequency  
converters



■ **VLT 6000 HVAC**

## ■ Ordering guide

This section makes it easier for you to specify and order a VLT 6000 HVAC.

### ■ Choice of frequency converter

The frequency converter should be chosen on the basis of the given motor current at maximum load on the system. The rated output current  $I_{VLT,N}$  must be equal to or higher than the required motor current.

VLT 6000 HVAC is available for two mains voltage ranges: 200-240 V and 380-460 V.

### ■ Mains voltage

Choose mains voltage for 50/60 Hz:

- 200-240 V three-phase AC voltage
- 380-460 V three-phase AC voltage

Mains voltage 200 - 240 V

| VLT type | Typical shaft output<br>$P_{VLT,N}$ |      | $I_{VLT,N}$<br>[A] | Max continuous output power<br>at 240 V $S_{VLT,N}$<br>[kVA] |
|----------|-------------------------------------|------|--------------------|--------------------------------------------------------------|
|          | [kW]                                | [HP] |                    |                                                              |
| 6002     | 1.1                                 | 1.5  | 6.6                | 2.7                                                          |
| 6003     | 1.5                                 | 2.0  | 7.5                | 3.1                                                          |
| 6004     | 2.2                                 | 3.0  | 10.6               | 4.4                                                          |
| 6005     | 3.0                                 | 4.0  | 12.5               | 5.2                                                          |
| 6006     | 4.0                                 | 5.0  | 16.7               | 6.9                                                          |
| 6008     | 5.5                                 | 7.5  | 24.2               | 10.1                                                         |
| 6011     | 7.5                                 | 10   | 30.8               | 12.8                                                         |
| 6016     | 11                                  | 15   | 46.0               | 19.1                                                         |
| 6022     | 15                                  | 20   | 59.4               | 24.7                                                         |
| 6027     | 18.5                                | 25   | 74.8               | 31.1                                                         |
| 6032     | 22                                  | 30   | 88.0               | 36.6                                                         |
| 6042     | 30                                  | 40   | 115/104*           | 43.2                                                         |
| 6052     | 37                                  | 50   | 143/130*           | 54.0                                                         |
| 6062     | 45                                  | 60   | 170/154*           | 64.0                                                         |

\* The first figure is for a motor voltage of 200-230 V.  
The next figure is for a motor voltage of 231-240 V.

## VLT® 6000 HVAC

Mains voltage 380 - 415 V

| Typical shaft output<br>$P_{VLT.N}$ |      |      | Max continuous output current<br>$I_{VLT.N}$ | Max continuous output power<br>at 400 V $S_{VLT.N}$<br>[kVA] |
|-------------------------------------|------|------|----------------------------------------------|--------------------------------------------------------------|
| VLT type                            | [kW] | [HP] | [A]                                          |                                                              |
| 6002                                | 1.1  | 1.5  | 3.0                                          | 2.2                                                          |
| 6003                                | 1.5  | 2.0  | 4.1                                          | 2.9                                                          |
| 6004                                | 2.2  | 3.0  | 5.6                                          | 4.0                                                          |
| 6005                                | 3.0  | -    | 7.2                                          | 5.2                                                          |
| 6006                                | 4.0  | 5.0  | 10.0                                         | 7.2                                                          |
| 6008                                | 5.5  | 7.5  | 13.0                                         | 9.3                                                          |
| 6011                                | 7.5  | 10   | 16.0                                         | 11.5                                                         |
| 6016                                | 11   | 15   | 24.0                                         | 17.3                                                         |
| 6022                                | 15   | 20   | 32.0                                         | 23.0                                                         |
| 6027                                | 18.5 | 25   | 37.5                                         | 27.0                                                         |
| 6032                                | 22   | 30   | 44.0                                         | 31.6                                                         |
| 6042                                | 30   | 40   | 61.0                                         | 43.8                                                         |
| 6052                                | 37   | 50   | 73.0                                         | 52.5                                                         |
| 6062                                | 45   | 60   | 90.0                                         | 64.7                                                         |
| 6075                                | 55   | 75   | 106                                          | 73.0                                                         |
| 6100                                | 75   | 100  | 147                                          | 102                                                          |
| 6125                                | 90   | 125  | 177                                          | 123                                                          |
| 6150                                | 110  | 150  | 212                                          | 147                                                          |
| 6175                                | 132  | 200  | 260                                          | 180                                                          |
| 6225                                | 160  | 250  | 315                                          | 218                                                          |
| 6275                                | 200  | 300  | 368                                          | 255                                                          |

Mains voltage 440 - 460 V

| Typical shaft output<br>$P_{VLT.N}$ |      |      | Max continuous output current<br>$I_{VLT.N}$ | Max continuous output power<br>at 460 V $S_{VLT.N}$<br>[kVA] |
|-------------------------------------|------|------|----------------------------------------------|--------------------------------------------------------------|
| VLT type                            | [kW] | [HP] | [A]                                          |                                                              |
| 6002                                | 1.1  | 1.5  | 3.0                                          | 2.4                                                          |
| 6003                                | 1.5  | 2.0  | 3.4                                          | 2.7                                                          |
| 6004                                | 2.2  | 3.0  | 4.8                                          | 3.8                                                          |
| 6005                                | 3.0  | -    | 6.3                                          | 5.0                                                          |
| 6006                                | 4.0  | 5.0  | 8.2                                          | 6.5                                                          |
| 6008                                | 5.5  | 7.5  | 11.0                                         | 8.8                                                          |
| 6011                                | 7.5  | 10   | 14.0                                         | 11.2                                                         |
| 6016                                | 11   | 15   | 21.0                                         | 16.7                                                         |
| 6022                                | 15   | 20   | 27.0                                         | 21.5                                                         |
| 6027                                | 18.5 | 25   | 34.0                                         | 27.1                                                         |
| 6032                                | 22   | 30   | 40.0                                         | 31.9                                                         |
| 6042                                | 30   | 40   | 52.0                                         | 41.4                                                         |
| 6052                                | 37   | 50   | 65.0                                         | 51.8                                                         |
| 6062                                | 45   | 60   | 77.0                                         | 61.3                                                         |
| 6075                                | 55   | 75   | 106                                          | 84.5                                                         |
| 6100                                | 75   | 100  | 130                                          | 104                                                          |
| 6125                                | 90   | 125  | 160                                          | 127                                                          |
| 6150                                | 110  | 150  | 190                                          | 151                                                          |
| 6175                                | 132  | 200  | 240                                          | 191                                                          |
| 6225                                | 160  | 250  | 302                                          | 241                                                          |
| 6275                                | 200  | 300  | 361                                          | 288                                                          |

### ■ Enclosure

VLT 6000 HVAC is available with the following enclosures:

|                    |                           |
|--------------------|---------------------------|
| - IP 00:           | 30 to 45 kW / 200-240 V   |
| - IP 00:           | 55 to 200 kW / 380-460 V  |
| - Bookstyle IP 20: | 1.1 to 3.0 kW / 200-240 V |
| - Bookstyle IP 20: | 1.1 to 7.5 kW / 380-460 V |
| - IP 20:           | 1.1 to 45 kW / 200-240 V  |
| - IP 20:           | 1.1 to 200 kW / 380-460 V |
| - IP 54:           | 1.1 to 45 kW / 200-240 V  |
| - IP 54:           | 1.1 to 200 kW / 380-460 V |

IP 00: This enclosure is only available for the larger power sizes of the VLT 6000 HVAC series. It is recommended for installation in standard cabinets.

IP 20 Bookstyle: This enclosure is designed for cabinet installation. It takes up a minimum of space and can be fitted side-by-side without installation of extra cooling equipment.

IP 20: This enclosure is used as standard enclosure for VLT 6000 HVAC. It is ideal for cabinet installation in areas where a high degree of protection is required. This enclosure also permits side-by-side installation.

IP 54: This enclosure can be fitted direct to the wall. Cabinets are not required. IP 54 units can also be installed side-by-side.

### ■ RFI filter

As standard, the VLT 6000 HVAC has an integral RFI filter up to and including 7.5 kW (3 kW 200 V).

These RFI filters comply with EMC standards EN 55011-1A, provided max. 150 m screened/armoured cable is used, and with EN 55011-1B, provided 50 m screened/armoured cable is used (Bookstyle max. 20 m screened/armoured).

Select a RFI filter for dampening of interference in accordance with EN 55011-1A and EN 55011-1B.

### ■ Harmonic filter

The harmonic currents do not directly affect the electricity consumption, but they do increase the heat losses in the installation (transformers, cables). That is why in systems with a rather high percentage of rectifier load it is important to keep the harmonic currents at a low level in order to avoid transformer overloads and high cable temperatures.

As standard, the VLT 6000 HVAC has coils in the intermediate circuit in order to ensure low harmonic currents. This typically reduces the input current  $I_{RMS}$  by 40 %.

### ■ Control unit (LCP)

The VLT 6000 HVAC is available with or without control unit (LCP); however, IP 54 units always come with the control unit.

This control unit makes up a complete interface for control and programming of the VLT 6000 HVAC. The control panel is detachable and may - as an alternative - be mounted up to 3 metres away from the VLT frequency converter, i.e. in a cabinet, by means of a fitting kit delivered with the unit.

Data information is given in a 4-line alpha-numerical display, which under normal operation is able to continuously show four operating data items and three operating modes. During programming, all the information required for quickly and efficiently setting up VLT frequency converter parameters will be shown.

As a supplement to the display, there are three indicator lamps for voltage (ON), warning (WARNING) and alarm (ALARM).

All VLT frequency converter parameter Setups can be changed directly via the control panel.

The following options are available:

- Control panel LCP (only for IP 20 units).
- LCP remote-mounting kit for remote control of IP 00 and IP 20 units.
- LCP remote-mounting kit for remote control of IP 54.
- 3 metre cable for LCP.

**■ Fieldbus protocols**

Danfoss VLT frequency converters are able to fulfil many different functions in an automated building management system. The VLT frequency converter can be integrated directly in an overall monitoring system.

This means that detailed process data can be transmitted via serial communication. The protocols listed below are based on a RS 485 bus system with a maximum transmission speed of 9600 bauds.

As standard, the following protocols are supported:

- Danfoss FC protocol
- Johnson's Control Metasys N2
- Landis/Staefa FLN <sup>1)</sup>

<sup>1)</sup> Available from approx. October 1998.

A frequency converter can be set and applied in all building management control systems.

Status messages, warnings and alarms provide valuable assistance in visualising and assessing processes.

**■ Fieldbus options**

The increasing need for information in building management systems makes it necessary to collect or visualise many different types of process data. Important process data can help the system technician in the day-by-day monitoring of the system, which means that a negative development - e.g. an increase in energy consumption - can be rectified in time.

The substantial amount of data in large buildings may generate a need for a higher transmission speed than 9600 bauds. Danfoss VLT 6000 HVAC is available with LonWorks® or Profibus®, both of which have higher performance than standard integrated serial communication.

**■ Profibus**

Profibus is a fieldbus system with FMS and DP, which can be used for linking automation units, such as sensors and actuators, to the controls by means of a two-conductor cable.

Profibus FMS is used if major communication tasks are to be solved at cell and system level by means of large volumes of data.

Profibus DP is an extremely fast communication protocol, made specially for communication between the automation system and various units.

**■ LON - Local Operating Network**

LonWorks is an intelligent fieldbus system which improves the possibility of decentralising control, as communication is enabled between individual units in the same system (Peer-to-Peer).

This means that there is no need for a big main station for handling all the signals of the system (Master-Slave). Signals are sent direct to the unit that needs them via a common network medium. This makes communication much more flexible and the central building state control and monitoring system can be changed into a dedicated building state monitoring system whose task is to ensure that everything is running as planned. If the potential of LonWorks is fully utilised, sensors will also be connected to the bus, which means that a sensor signal can quickly be moved to another controller. If room dividers are mobile, this is a particularly useful feature.

Two feedback signals can be linked to the VLT 6000 HVAC by means of LonWorks, thereby enabling the internal PID regulator to regulate directly on the bus feedback.

### ■ Unpacking and ordering a VLT frequency converter

Are you in doubt as to which VLT frequency converter you have received and which options it contains? Use the following table to find out. The table can also be used for ordering a VLT 6000 HVAC.

### ■ Type code ordering number string

On the basis of your order, the VLT frequency converter is given an ordering number that can be seen from the nameplate on the unit. The number may look as follows:

VLT-6008-H-T5-B20-R3-DL-F10-A10

This means that the frequency converter ordered is a VLT 6008 for three-phase mains voltage of 380-460 V (T4) in Bookstyle enclosure IP 20 (B20). The hardware variant is with integral RFI filter, classes A & B (R3). The frequency converter features a control unit (DL) with a PROFIBUS option card (F10). Character no. 8 (H) indicates the application range of the unit: H = HVAC.

#### Bookstyle IP 20

| Mains voltage, rated: |           |           |
|-----------------------|-----------|-----------|
| Motor power           | 200-240 V | 380-460 V |
| 1.1 kW                | VLT 6002  | VLT 6002  |
| 1.5 kW                | VLT 6003  | VLT 6003  |
| 2.2 kW                | VLT 6004  | VLT 6004  |
| 3.0 kW                | VLT 6005  | VLT 6005  |
| 4.0 kW                |           | VLT 6006  |
| 5.5 kW                |           | VLT 6008  |
| 7.5 kW                |           | VLT 6011  |

| Mains voltage, rated: |           |           |
|-----------------------|-----------|-----------|
| Motor power           | 200-240 V | 380-460 V |
| 1.1 kW                | VLT 6002  | VLT 6002  |
| 1.5 kW                | VLT 6003  | VLT 6003  |
| 2.2 kW                | VLT 6004  | VLT 6004  |
| 3.0 kW                | VLT 6005  | VLT 6005  |
| 4.0 kW                | VLT 6006  | VLT 6006  |
| 5.5 kW                | VLT 6008  | VLT 6008  |
| 7.5 kW                | VLT 6011  | VLT 6011  |
| 11 kW                 | VLT 6016  | VLT 6016  |
| 15 kW                 | VLT 6022  | VLT 6022  |
| 18.5 kW               | VLT 6027  | VLT 6027  |
| 22 kW                 | VLT 6032  | VLT 6032  |
| 30 kW                 | VLT 6042  | VLT 6042  |
| 37 kW                 | VLT 6052  | VLT 6052  |
| 45 kW                 | VLT 6062  | VLT 6062  |

Units in the range of 1.1-45 kW come with enclosure IP 20, IP 54.

|             | Mains voltage, rated: |                     |
|-------------|-----------------------|---------------------|
| Motor power | 400 V <sup>1)</sup>   | 460 V <sup>1)</sup> |
| 55 kW       | VLT 6075              | -                   |
| 75 kW       | VLT 6100              | VLT 6075            |
| 90 kW       | VLT 6125              | VLT 6100            |
| 110 kW      | VLT 6150              | VLT 6125            |
| 132 kW      | VLT 6175              | VLT 6150            |
| 160 kW      | VLT 6225              | VLT 6175            |
| 200 kW      | VLT 6275              | VLT 6225            |
| 250 kW      |                       | VLT 6275            |

Units in the range of 55-250 kW come with enclosure IP 00, IP 20 or IP 54.

<sup>1)</sup> The max. output depends on the mains voltage connected to the unit.

#### Hardware variants

All units in the programme are available in the following hardware variants:

ST: Standard unit w/ or w/o control unit.

#### RFI-filter

Bookstyle units always come with an integral RFI filter that complies with EN 55011-1B with 20 m screened /armoured motor cable and EN 55011-1A with 150 m screened/armoured motor cable.

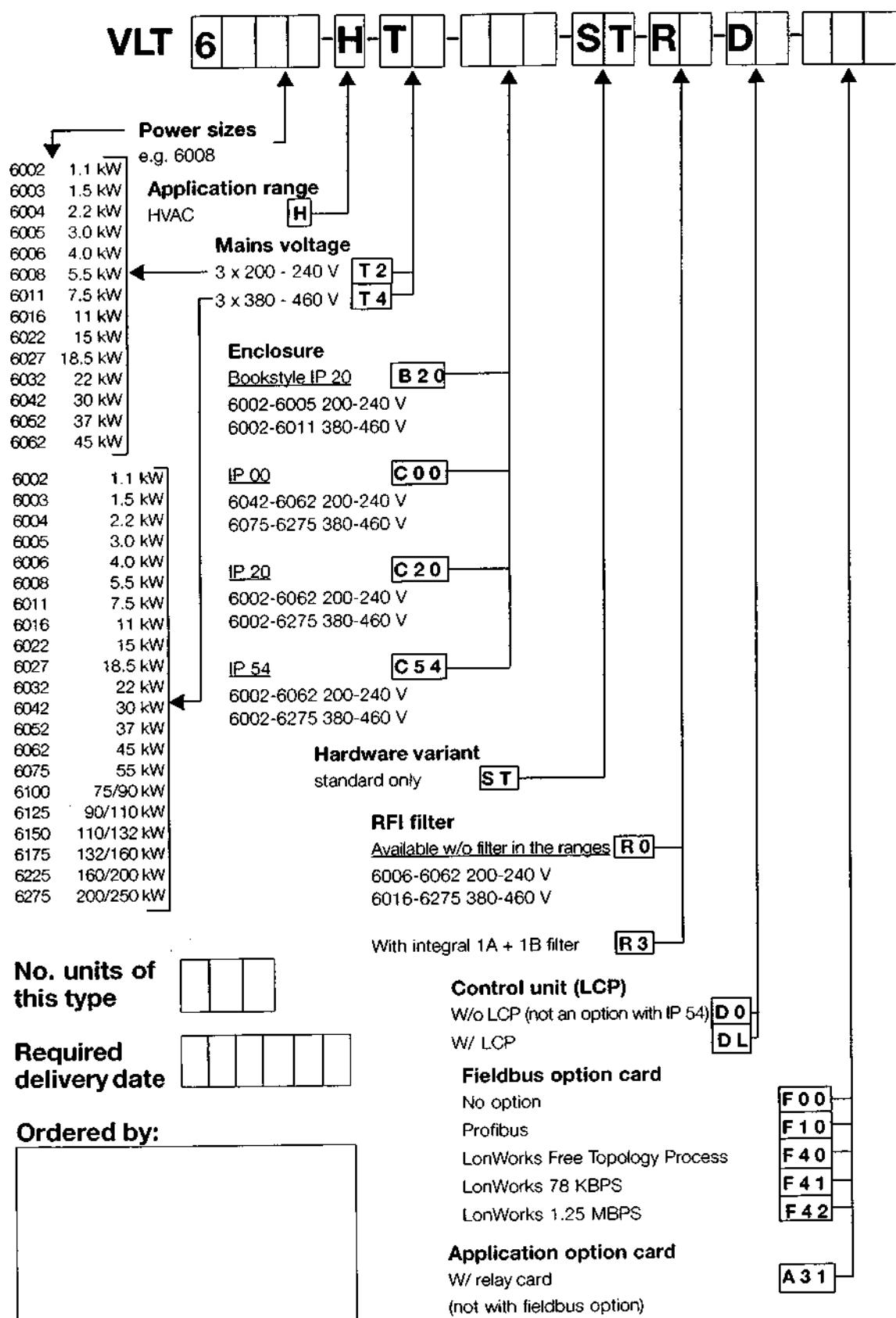
Units for a mains voltage of 240 V and a motor power of up to and including 4.0 kW (VLT 6006) and units for a mains voltage of 380-460 V and a motor power of up to 7.5 kW (VLT 6011) are always supplied with an integral class 1A & 1B filter.

Units for higher motor power than these (4.0 and 7.5 kW, respectively) can be ordered either with or without an RFI filter.

#### Control unit (keypad and display)

All types of units in the programme, except for IP 54 units, can be ordered either with or without the control unit. IP 54 units always come with a control unit.

## ■ Ordering form VLT 6000 HVAC



Date:

Take a copy of the ordering forms. Fill them in and send or fax your order to the nearest office of the Danfoss sales organisation.

### ■ PC software and serial communication

Danfoss offers various options for serial communication. Using serial communication makes it possible to monitor, programme and control one or several VLT 6000 HVAC from a centrally placed computer. For example, Danfoss offers an option card for Profibus. In addition, all VLT 6000 HVAC have an RS 485 port as standard, which enables them to communicate e.g. with a PC. A programme entitled VLT Software Dialog is available for this purpose.

VLT Software Dialog comes in three modules and - as a minimum - contains the programmes included in the Basic module.

The Basic module covers:



#### TEST RUN

is used for controlling and commissioning of a frequency converter, including:

- setting of reference value,
- simultaneous display of selected parameters in graphs,
- option of DDE link, e.g. to a spreadsheet.



#### PARAMETER SETUP

is used for setting up and transferring parameter sets, including:

- setting of frequency converter parameters,
- parameter sets can be obtained from and copied to a frequency converter,
- documentation/print-out of the Setup including diagrams.



#### HISTORY

provides information about the different stages of development of the VLT Software dialogue.



#### BUS ADDRESS SETUP

is only used for addressing the VLT FCM.

The Logging module covers:



#### LOGGING

is used for collecting and displaying historical or real-time operating data.

- graphical representation of selected parameters from several frequency converters,
- collection of log data to file,
- option of DDE link e.g. to a spreadsheet.



#### MODEM SETUP

is used for setting up the frequency converter modem.

- sets the frequency converter modem via the communication port of the PC.

The template module covers:



#### TEMPLATE SETUP

is used for setting up template files for PARAMETER SETUP:

- the template file functions as a mask that limits the number of accessible parameters when a parameter file is to be made or edited in PARAMETER SETUP,
- the template file may contain preset values for the parameters of the frequency converter.



#### NB!

The logging and template module calls for a Basic module to be installed on the same PC.

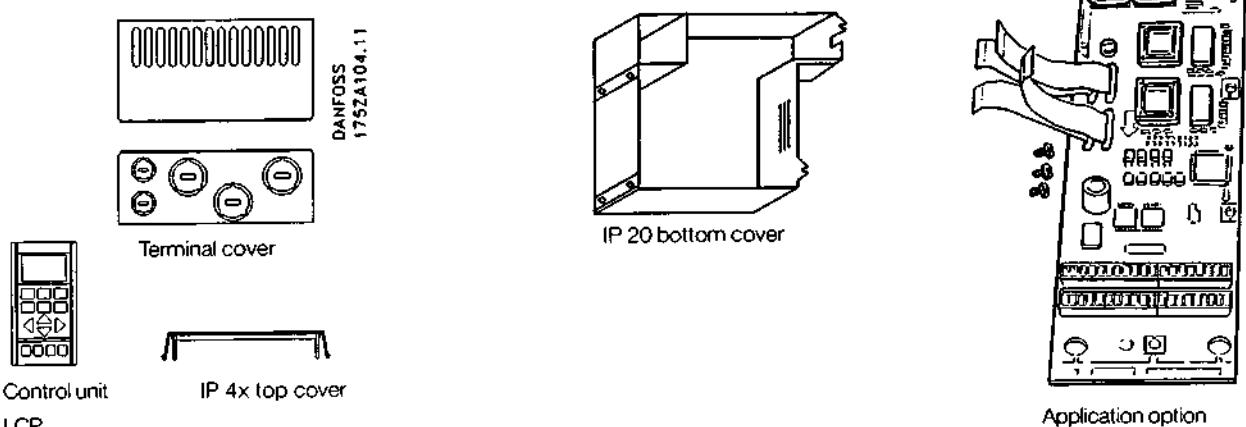
The guided tour covers:



#### GUIDED TOUR

offers a demonstration of the VLT Software Dialog programme.

## ■ Accessories for VLT 6000 HVAC



## ■ Ordering numbers, misc.

| Type                                             | Description                                            | Order no.                |
|--------------------------------------------------|--------------------------------------------------------|--------------------------|
| IP 4x top cover <sup>1)</sup>                    | Option, VLT type 6002-6005 200-240 V                   | 175Z0928                 |
| IP 4x top cover <sup>1)</sup>                    | Option, VLT type 6002-6011 380-460 V                   | 175Z0928                 |
| NEMA 12 bonding plate <sup>2)</sup>              | Option, VLT type 6002-6005 200-240 V                   | 175H4195                 |
| NEMA 12 bonding plate <sup>2)</sup>              | Option, VLT type 6002-6011 380-460 V                   | 175H4195                 |
| IP 20 terminal cover                             | Option, VLT type 6006-6016 200-240 V                   | 175Z4622                 |
| IP 20 terminal cover                             | Option, VLT type 6022-6027 200-240 V                   | 175Z4623                 |
| IP 20 terminal cover                             | Option, VLT type 6016-6032 380-460 V                   | 175Z4622                 |
| IP 20 terminal cover                             | Option, VLT type 6042-6062 380-460 V                   | 175Z4623                 |
| IP 20 bottom cover                               | Option, VLT type 6042-6062 200-240 V                   | 176F1800                 |
| IP 20 bottom cover                               | Option, VLT type 6060-6100 380-460 V                   | 176F1800                 |
| IP 20 bottom cover                               | Option, VLT type 6125-6250 380-460 V                   | 176F1801                 |
| Control panel LCP                                | Separate LCP                                           | 175Z7804                 |
| LCP remote-mounting kit IP 00 & 20 <sup>3)</sup> | Remote-mounting kit for LCP, for IP 00 and IP 20 units | 175Z0850 incl. 3 m cable |
| LCP remote-mounting kit IP 54 <sup>4)</sup>      | Remote-mounting kit for LCP, for IP 54 units           | 175Z7802 incl. 3 m cable |
| Cable for LCP                                    | Separate cable                                         | 175Z0929 3 m cable       |
| VLT® Software, Dialog                            | Basic module Danish manual                             | 175Z0900                 |
| VLT® Software, Dialog                            | Basic module English manual                            | 175Z0903                 |
| VLT® Software, Dialog                            | Basic module German manual                             | 175Z0904                 |
| VLT® Software, Dialog                            | Basic module Italian manual                            | 175Z0906                 |
| VLT® Software, Dialog                            | Basic module Spanish manual                            | 175Z0906                 |
| VLT® Software, Dialog                            | Basic module French manual                             | 175Z0907                 |
| VLT® Software, Dialog                            | Logging module                                         | 175Z0909                 |
| VLT® Software, Dialog                            | Template module                                        | 175Z0908                 |
| VLT® Software, Dialog                            | Guided tour                                            | 175Z0952                 |
| Relay card                                       | Application card with four relay outputs               | 175Z7803 3 m cable       |
| Profibus option                                  |                                                        | 175Z7800                 |
| LonWorks option, Free topology                   |                                                        | 176F1515                 |
| LonWorks option, 78 KBPS                         |                                                        | 176F1516                 |
| LonWorks option, 1.25 MBPS                       |                                                        | 176F1517                 |

- 1) IP 4x/NEMA 1 top cover is for IP 20 units only and only horizontal surfaces comply with IP 4x. The kit also contains a bonding plate (UL).
- 2) NEMA 12 bonding plate (UL) is only for IP 54 units.
- 3) The remote-mounting kit is only for IP 00 and IP 20 units. Enclosure of the remotemounting kit is IP 65.
- 4) The remote-mounting kit is only for IP 54 units. Enclosure of the remote-mounting kit is IP 65.

VLT 6000 HVAC is available with an integral fieldbus option or application option. Ordering numbers for the individual VLT types with integrated options can be seen from the relevant manuals or instructions. In addition, the ordering number system can be used for ordering a VLT frequency converter with an option.

### ■ LC filters for VLT 6000 HVAC

When a motor is controlled by a frequency converter, resonance noise will be heard from the motor. This noise, which is caused by the design of the motor, occurs each time one of the inverter switches in the frequency converter is activated. Consequently, the resonance noise frequency corresponds to the switching frequency of the frequency converter.

For the VLT 6000 HVAC, Danfoss offers a LC filter to dampen the acoustic motor noise.

This filter reduces the voltage rise time, the peak voltage  $U_{PEAK}$  and the ripple current  $\Delta I$  to the motor, thereby making current and voltage almost sinusoidal. The acoustic motor noise is therefore reduced to a minimum.

Because of the ripple current in the coils, there will be some noise from the coils. This problem can be solved entirely by integrating the filter in a cabinet or similar.

### ■ Examples of the use of LC filters

#### Submersible pumps

For small motors with up to and including 5.5 kW rated motor power, use a LC filter, unless the motor is equipped with phase separation paper. This applies e.g. to all wet running motors. If these motors are used without LC filter in connection with a frequency converter, the motor windings will short-circuit. If in doubt, ask the motor manufacturer whether the motor in question is equipped with phase separation paper.

#### Well pumps

If immersion pumps are used, e.g. submerged pumps or well pumps, the supplier should be contacted for clarification of requirements. It is recommended to use a LC filter if a VLT frequency converter is used for immersion operations.

#### Long motor cables

If screened/armoured motor cables longer than 150 m or unscreened/unarmoured motor cables longer than 300 m are used, a LC filter should be applied. The LC filter reduces the capacitive earth leakage currents and the voltage peak loads.

#### NB!:

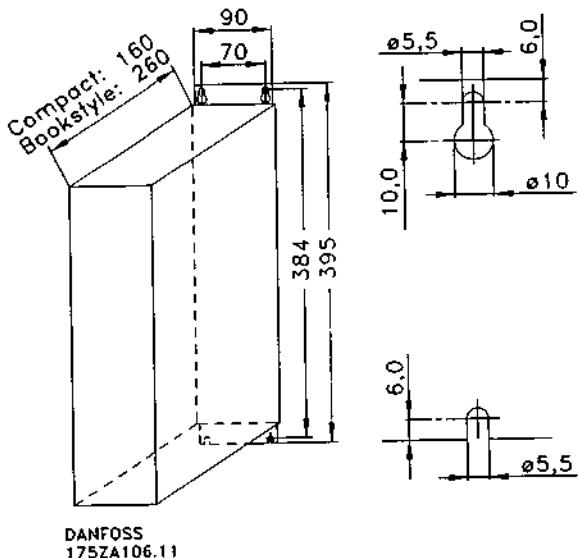
 If a VLT frequency converter controls several motors in parallel, the motor cables must be added up to give the total cable length.

**■ Ordering numbers, LC filter modules****Mains supply 3 x 200 - 240 V**

| LC filter<br>for VLT type | LC filter<br>enclosure | Rated current<br>at 200 V | Max. output<br>frequency | Power<br>loss | Order no. |
|---------------------------|------------------------|---------------------------|--------------------------|---------------|-----------|
| 6002-6003 Bookstyle       | IP 20 Bookstyle        | 7.8 A                     | 120 Hz                   |               | 175Z0825  |
| 6004-6005 Bookstyle       | IP 20 Bookstyle        | 15.2 A                    | 120 Hz                   |               | 175Z0826  |
| 6002-6005                 | IP 20                  | 15.2 A                    | 120 Hz                   |               | 175Z0832  |
| 6006-6008                 | IP 00                  | 25.0 A                    | 60 Hz                    | 85 W          | 175Z4600  |
| 6011                      | IP 00                  | 32 A                      | 60 Hz                    | 90 W          | 175Z4601  |
| 6016                      | IP 00                  | 46 A                      | 60 Hz                    | 110 W         | 175Z4602  |
| 6022                      | IP 00                  | 61 A                      | 60 Hz                    | 170 W         | 175Z4603  |
| 6027                      | IP 00                  | 73 A                      | 60 Hz                    | 250 W         | 175Z4604  |
| 6032                      | IP 00                  | 88 A                      | 60 Hz                    | 320 W         | 175Z4605  |

**Mains supply 3 x 380 - 460 V**

| LC filter<br>for VLT type | LC filter<br>enclosure | Rated current<br>at 400/460 V | Max. output<br>frequency | Power<br>loss | Order no. |
|---------------------------|------------------------|-------------------------------|--------------------------|---------------|-----------|
| 6002-6005 Bookstyle       | IP 20 Bookstyle        | 7.2 A / 6.3 A                 | 120 Hz                   |               | 175Z0825  |
| 6006-6011 Bookstyle       | IP 20 Bookstyle        | 16 A / 16 A                   | 120 Hz                   |               | 175Z0826  |
| 6002-6011                 | IP 20                  | 16 A / 16 A                   | 120 Hz                   |               | 175Z0832  |
| 6016                      | IP 00                  | 24 A / 21.7 A                 | 60 Hz                    | 125 W         | 175Z4606  |
| 6022                      | IP 00                  | 32 A / 27.9 A                 | 60 Hz                    | 130 W         | 175Z4607  |
| 6027                      | IP 00                  | 37.5 A / 32 A                 | 60 Hz                    | 140 W         | 175Z4608  |
| 6032                      | IP 00                  | 44 A / 41.4 A                 | 60 Hz                    | 170 W         | 175Z4609  |
| 6042                      | IP 00                  | 61 A / 54 A                   | 60 Hz                    | 250 W         | 175Z4610  |
| 6052                      | IP 00                  | 73 A / 65 A                   | 60 Hz                    | 360 W         | 175Z4611  |
| 6062                      | IP 00                  | 90 A / 78 A                   | 60 Hz                    | 450 W         | 175Z4612  |
| 6075                      | IP 20                  | 106 A / 106 A                 | 60 Hz                    |               | 175Z4701  |
| 6100                      | IP 20                  | 147 A / 130 A                 | 60 Hz                    |               | 175Z4702  |
| 6125                      | IP 20                  | 177 A / 160 A                 | 60 Hz                    |               | 175Z4703  |
| 6150                      | IP 20                  | 212 A / 190 A                 | 60 Hz                    |               | 175Z4704  |
| 6175                      | IP 20                  | 260 A / 240 A                 | 60 Hz                    |               | 175Z4705  |
| 6225                      | IP 20                  | 315 A / 302 A                 | 60 Hz                    |               | 175Z4706  |
| 6275                      | IP 20                  | 395 A / 361 A                 | 60 Hz                    |               | 175Z4707  |

**■ LC filters 6002-6006, 200 - 240 V / 6002-6011 380 - 460 V**


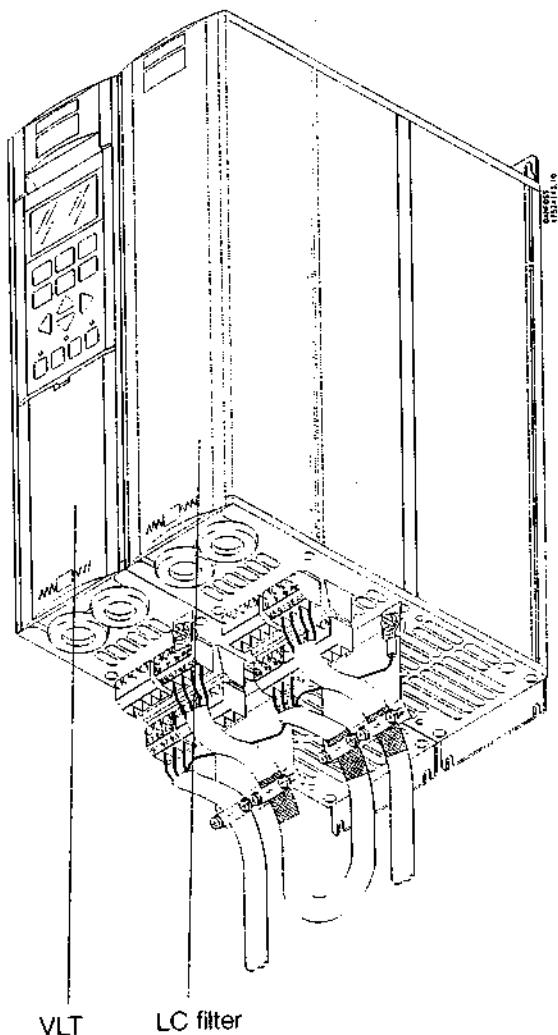
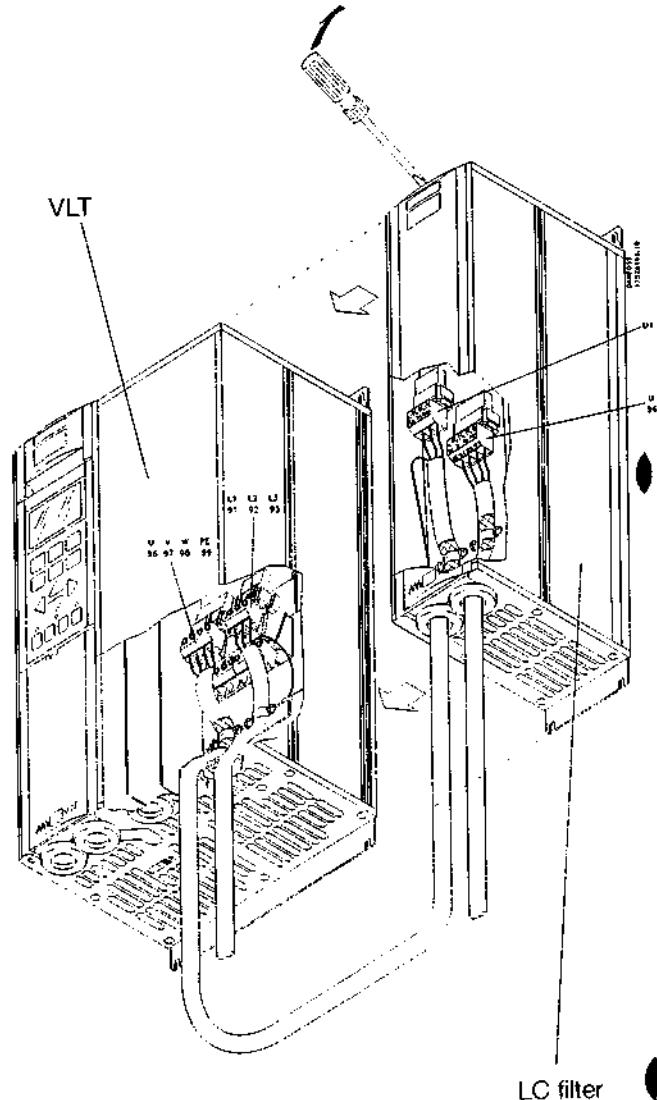
The drawing on the left gives the measurements of IP 20 LC filters for the above-mentioned power range.  
Min. space above and under enclosure: 100 mm.

IP 20 LC filters have been designed for side-by-side installation without any space between enclosures.

Max. motor cable length:

- 150 m screened/armoured cable
  - 300 m unscreened/unarmoured cable
- If EMC standards are to be complied with:
- EN 55011-1B: Max. 50 m screened/armoured cable  
Bookstyle: Max. 20 m screened/armoured cable
  - EN 55011-1A: Max. 150 m screened/armoured cable

|         |          |        |
|---------|----------|--------|
| Weight: | 175Z0825 | 7.5 kg |
|         | 175Z0826 | 9.5 kg |
|         | 175Z0832 | 9.5 kg |

**■ Installation of LC filter IP 20 Bookstyle**

**■ Installation of LC filter IP 20**


**■ LC filters VLT 6008-6032, 200 - 240 V / 6016-6062 380 - 460 V**

The table and the drawing give the measurements of IP 00 LC filters for Compact units.  
IP 00 LC filters must be integrated and protected against dust, water and corrosive gases.

Max. motor cable length:

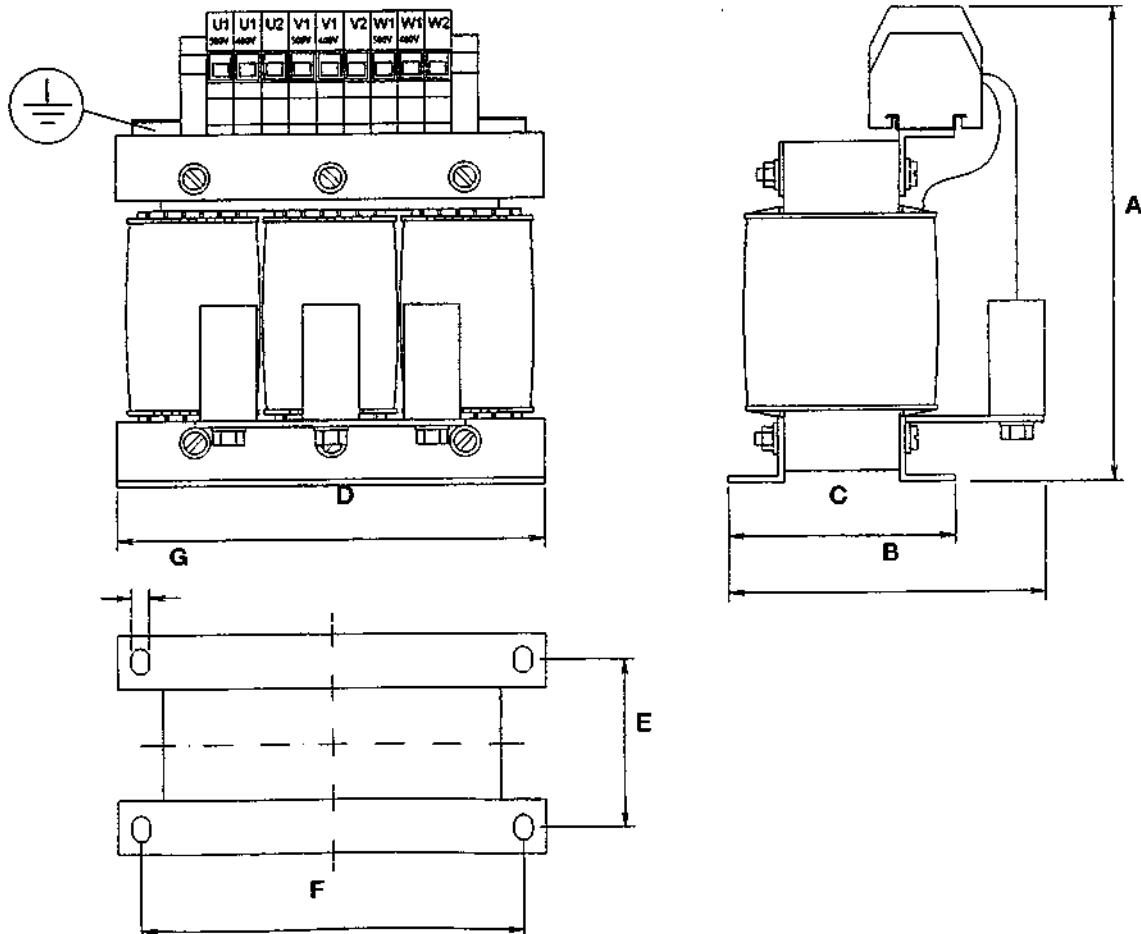
- 150 m screened/armoured cable
- 300 m unscreened/unarmoured cable

If EMC standards are to be complied with:

- EN 55011-1B: Max. 50 screened/armoured cable  
Bookstyle: Max. 20 m screened/armoured cable
- EN 55011-1A: Max. 150 m screened/armoured cable

**LC filter IP 00**

| LC type  | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | F [mm] | G [mm] | Weight [kg] |
|----------|--------|--------|--------|--------|--------|--------|--------|-------------|
| 175Z4600 | 220    | 135    | 92     | 190    | 168    | 170    | 8      | 10          |
| 175Z4601 | 220    | 145    | 102    | 190    | 178    | 170    | 8      | 13          |
| 175Z4602 | 250    | 165    | 117    | 210    | 192    | 180    | 8      | 17          |
| 175Z4603 | 295    | 200    | 151    | 240    | 126    | 190    | 11     | 29          |
| 175Z4604 | 355    | 205    | 152    | 300    | 121    | 240    | 11     | 38          |
| 175Z4605 | 360    | 215    | 165    | 300    | 134    | 240    | 11     | 49          |
| 175Z4606 | 280    | 170    | 121    | 240    | 96     | 190    | 11     | 18          |
| 175Z4607 | 280    | 175    | 125    | 240    | 100    | 190    | 11     | 20          |
| 175Z4608 | 280    | 180    | 131    | 240    | 106    | 190    | 11     | 23          |
| 175Z4609 | 295    | 200    | 151    | 240    | 126    | 190    | 11     | 29          |
| 175Z4610 | 355    | 205    | 152    | 300    | 121    | 240    | 11     | 38          |
| 175Z4611 | 355    | 235    | 177    | 300    | 146    | 240    | 11     | 50          |
| 175Z4612 | 405    | 230    | 163    | 360    | 126    | 310    | 11     | 65          |



**■ LC filter 6075-6275 380 - 460 V**

The table and the drawing give the measurements of IP 20 LC filters. IP 20 LC filters must be integrated and protected against dust, water and aggressive gases.

Max. motor cable length:

- 150 m screened/armoured cable

- 300 m unscreened/unarmoured cable

If EMC standards are to be complied with:

- EN 55011-1B: Max. 50 m screened/armoured cable

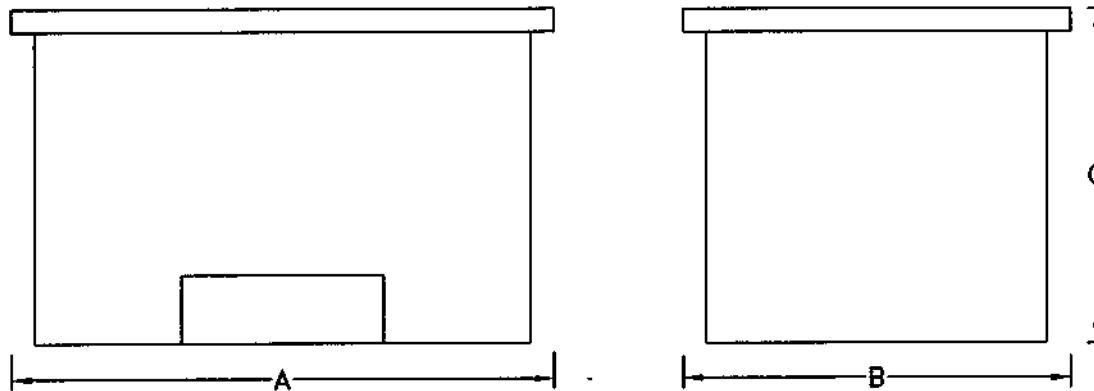
Bookstyle: Max. 20 m screened/armoured cable

- EN 55011-1A: Max. 150 m screened/armoured cable

**LC-filter IP 20**

| LC-type  | A [mm] | B [mm] | C [mm] | D [mm] | E [mm] | F [mm] | G [mm] | Weight [kg] |
|----------|--------|--------|--------|--------|--------|--------|--------|-------------|
| 175Z4701 | 740    | 550    | 600    |        |        |        |        | 70          |
| 175Z4702 | 740    | 550    | 600    |        |        |        |        | 70          |
| 175Z4703 | 740    | 550    | 600    |        |        |        |        | 110         |
| 175Z4704 | 740    | 550    | 600    |        |        |        |        | 120         |
| 175Z4705 | 830    | 630    | 650    |        |        |        |        | 220         |
| 175Z4706 | 830    | 630    | 650    |        |        |        |        | 250         |
| 175Z4707 | 830    | 630    | 650    |        |        |        |        | 250         |

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**■ General technical data****Mains supply (L1, L2, L3):**

|                                                  |                                |
|--------------------------------------------------|--------------------------------|
| Supply voltage 200-240 V units .....             | 3 x 200/208/220/230/240 V ±10% |
| Supply voltage 380-460 V units .....             | 3 x 380/400/415/440/460 V ±10% |
| Supply frequency .....                           | 50/60 Hz                       |
| Max. imbalance of supply voltage .....           | ±2% of rated supply voltage    |
| Power factor / cos. φ .....                      | 0.90/1.0 at rated load         |
| No. of switches on supply input L1, L2, L3 ..... | approx. 1 time/min.            |
| Max. short-circuit current .....                 | 100.000 A                      |

**VLT output data (U, V, W):**

|                                            |                           |
|--------------------------------------------|---------------------------|
| Output voltage .....                       | 0-100% of supply voltage  |
| Output frequency .....                     | 0 - 120 Hz, 0 - 1000 Hz   |
| Rated motor voltage, 200-240 V units ..... | 200/208/220/230/240 V     |
| Rated motor voltage, 380-460 V units ..... | 380/400/415/440/460/500 V |
| Rated motor frequency .....                | 50/60 Hz                  |
| Switching on output .....                  | Unlimited                 |
| Ramp times .....                           | 1- 3600 sec.              |

**Torque characteristics:**

|                                                              |                                |
|--------------------------------------------------------------|--------------------------------|
| Starting torque .....                                        | 110% for 1 min.                |
| Starting torque (parameter 110 High break-away torque) ..... | Max. torque: 160% for 0.5 sec. |
| Acceleration torque .....                                    | 100%                           |
| Overload torque .....                                        | 110%                           |

**Control card, digital inputs:**

|                                             |                                 |
|---------------------------------------------|---------------------------------|
| Number of programmable digital inputs ..... | 8                               |
| Terminal nos. ....                          | 16, 17, 18, 19, 27, 29, 32, 33  |
| Voltage level .....                         | 0-24 V DC (PNP positive logics) |
| Voltage level, logical '0' .....            | < 5 V DC                        |
| Voltage level, logical '1' .....            | > 10 V DC                       |
| Maximum voltage on input .....              | 28 V DC                         |
| Input resistance, $R_i$ .....               | approx. 2 kΩ                    |
| Scanning time per input .....               | 3 msec.                         |

*Reliable galvanic isolation: All digital inputs are galvanically isolated from the supply voltage (PELV). In addition, the digital inputs can be isolated from the other terminals on the control card by connecting an external 24 V DC supply and opening switch 4.*

**Control card, analogue inputs:**

|                                                   |                             |
|---------------------------------------------------|-----------------------------|
| No. of programmable analogue voltage inputs ..... | 2                           |
| Terminal nos. ....                                | 53, 54                      |
| Voltage level .....                               | 0 - 10 V DC (scalable)      |
| Input resistance, $R_i$ .....                     | approx. 10 kΩ               |
| No. of programmable analogue current inputs ..... | 1                           |
| Terminal no. ....                                 | 60                          |
| Current range .....                               | 0/4 - 20 mA (scalable)      |
| Input resistance, $R_i$ .....                     | approx. 200 Ω               |
| Resolution .....                                  | 10 bit + sign               |
| Accuracy on input .....                           | Max. error 1% of full scale |
| Scanning time per input .....                     | 3 msec.                     |

*Reliable galvanic isolation: All analogue inputs are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.*

**■ General technical data****Control card, pulse input:**

|                                                  |                                 |
|--------------------------------------------------|---------------------------------|
| No. of programmable pulse inputs .....           | 3                               |
| Terminal nos. ....                               | 17, 29, 33                      |
| Max. frequency on terminal 17 .....              | 5 kHz                           |
| Max. frequency on terminals 29, 33 .....         | 20 kHz (PNP open collector)     |
| Max. frequency on terminals 29, 33 .....         | 65 kHz (Push-pull)              |
| Voltage level .....                              | 0-24 V DC (PNP positive logics) |
| Voltage level, logic '0' .....                   | < 5 V DC                        |
| Voltage level, logic '1' .....                   | > 10 V DC                       |
| Maximum voltage on input .....                   | 28 V DC                         |
| Input resistance, R <sub>i</sub> .....           | approx. 2 kΩ                    |
| Scanning time per input .....                    | 3 msec.                         |
| Resolution .....                                 | 10 bit + sign                   |
| Accuracy (100-1 kHz), terminals 17, 29, 33 ..... | Max. error: 0.5% of full scale  |
| Accuracy (1-5 kHz), terminal 17 .....            | Max. error: 0.1% of full scale  |
| Accuracy (1-65 kHz), terminals 29, 33 .....      | Max. error: 0.1% of full scale  |

*Reliable galvanic isolation: All pulse inputs are galvanically isolated from the supply voltage (PELV). In addition, pulse inputs can be isolated from the other terminals on the control card by connecting an external 24 V DC supply and opening switch 4.*

**Control card, digital/pulse and analogue outputs:**

|                                                                   |                                |
|-------------------------------------------------------------------|--------------------------------|
| No. of programmable digital and analogue outputs .....            | 2                              |
| Terminal nos. ....                                                | 42, 45                         |
| Voltage level at digital/pulse output .....                       | 0 - 24 V DC                    |
| Minimum load to frame (terminal 39) at digital/pulse output ..... | 600 Ω                          |
| Frequency ranges (digital output used as pulse output) .....      | 0-32 kHz                       |
| Current range at analogue output .....                            | 0/4 - 20 mA                    |
| Maximum load to frame (terminal 39) at analogue output .....      | 500 Ω                          |
| Accuracy of analogue output .....                                 | Max. error: 1.5% of full scale |
| Resolution on analogue output .....                               | 8 bit                          |

*Reliable galvanic isolation: All digital and analogue outputs are galvanically isolated from the supply voltage (PELV) and other high-voltage terminals.*

**Control card, 24 V DC supply:**

|                                                                                                                                                                     |        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|
| Terminal nos. ....                                                                                                                                                  | 12, 13 |
| Max. load .....                                                                                                                                                     | 200 mA |
| <i>Reliable galvanic isolation: The 24 V DC supply is galvanically isolated from the supply voltage (PELV), but has the same potential as the analogue outputs.</i> |        |

**Control card, RS 485 serial communication:**

|                                                                     |                              |
|---------------------------------------------------------------------|------------------------------|
| Terminal nos. ....                                                  | 68 (TX+, RX+), 69 (TX-, RX-) |
| <i>Reliable galvanic isolation: Full galvanic isolation (PELV).</i> |                              |

**Relay outputs:**

|                                                                            |                               |
|----------------------------------------------------------------------------|-------------------------------|
| No. of programmable relay outputs .....                                    | 2                             |
| Terminal nos., control card .....                                          | 4-5 (make)                    |
| Max. terminal load (AC) on 4-5, control card .....                         | 50 V AC, 1 A, 60 VA           |
| Max. terminal load (DC) on 4-5, control card .....                         | 75 V DC, 1 A, 30 W            |
| Max. terminal load (AC) on 4-5, control card for UL/cUL applications ..... | 30 V AC, 1 A                  |
| Max. terminal load (DC) on 4-5, control card for UL/cUL applications ..... | 42.2 V DC, 1 A                |
| Terminal nos., power card and relay card .....                             | 1-3 (break), 1-2 (make)       |
| Max. terminal load (AC) on 1-3, 1-2, power card and relay card .....       | 240 V AC, 2 A, 60 VA          |
| Min. terminal load on 1-3, 1-2, power card and relay card .....            | 24 V DC 10 mA, 24 V AC 100 mA |

## ■ General technical data

### Cable lengths and cross-sections:

|                                                                           |                                          |
|---------------------------------------------------------------------------|------------------------------------------|
| Max. motor cable length, screened/armoured cable .....                    | 150 m                                    |
| Max. motor cable length, unscreened/unarmoured cable .....                | 300 m                                    |
| Max. motor cable length, screened/armoured cable VLT 6011 380-460 V ..... | 100 m                                    |
| Max. DC-bus cable length, screened/armoured cable .....                   | 25 m from frequency converter to DC bar. |
| Max. cable cross-section to motor, see next section                       |                                          |
| Max. cross-section for control cables .....                               | 1.5 mm <sup>2</sup> /16 AWG              |
| Max. cross-section for serial communication.....                          | 1.5 mm <sup>2</sup> /16 AWG              |

### Control characteristics:

|                                          |                                                                                    |
|------------------------------------------|------------------------------------------------------------------------------------|
| Frequency range .....                    | 0 - 1000 Hz                                                                        |
| Resolution on output frequency .....     | ±0.003 Hz                                                                          |
| System response time .....               | 3 msec.                                                                            |
| Speed, control range (open loop) .....   | 1:100 of synchro. speed                                                            |
| Speed, control range (closed loop) ..... | 1:1000 of synchro. speed                                                           |
| Speed, accuracy (open loop) .....        | < 1500 rpm: max. error ± 7.5 rpm<br>> 1500 rpm: max. error of 0.5% of actual speed |
| Speed, accuracy (closed loop) .....      | < 1500 rpm: max. error ± 1.5 rpm<br>> 1500 rpm: max. error of 0.1% of actual speed |

All control characteristics are based on a 4-pole asynchronous motor

### Accuracy of Display readout (parameters 009-012 Display readout):

|                                                |                                           |
|------------------------------------------------|-------------------------------------------|
| Motor current [5], 0 - 140% load .....         | Max. error: ±2.0% of rated output current |
| Power KW [6], Power HP [7], 0 - 90% load ..... | Max. error: ±5.0% of rated output power   |

### Externals:

|                                                       |                                                    |
|-------------------------------------------------------|----------------------------------------------------|
| Enclosure .....                                       | IP 00, IP 20, IP 54                                |
| Vibration test .....                                  | 0.7 g                                              |
| Max. relative humidity .....                          | 93 % +2 %, -3 % (IEC 68-2-3) for storage/transport |
| Ambient temperature IP 00/20/54 .....                 | Max. 45°C (24-hour average max. 40°C)              |
| Ambient temperature IP 20/54 VLT 6011 460 V .....     | Max. 40°C (24-hour average max. 35°C)              |
| Min. ambient temperature in full operation .....      | 0°C                                                |
| Min. ambient temperature at reduced performance ..... | -10°C                                              |
| Temperature during storage/transport .....            | -25 - +65/70°C                                     |
| Max. altitude above sea level .....                   | 1000 m                                             |

EMC standards applied, Emission ..... EN 50081-1/2, EN 61800-3, EN 55011, EN 55014  
Immunity ..... EN 50082-2, EN 61000-4-2, IEC 1000-4-3, EN 61000-4-4  
EN 61000-4-5, ENV 50204, EN 61000-4-6, VDE 0160/1990.12

### VLT 6000 HVAC protection:

- Electronic motor thermal protection against overload.
- Temperature monitoring of heat-sink ensures that the VLT frequency converter cuts out if the temperature reaches 90°C for IP 00 and IP 20. For IP 54, the cut-out temperature is 80°C. An overtemperature can only be reset when the temperature of the heat-sink has fallen below 60°C.
- The VLT frequency converter is protected against short-circuiting on motor terminals U, V, W.
- The VLT frequency converter is protected against earth fault on motor terminals U, V, W.
- Monitoring of the intermediate circuit voltage ensures that the VLT frequency converter cuts out if the intermediate circuit voltage gets too high or too low.
- If a motor phase is missing, the VLT frequency converter cuts out.
- If there is a mains fault, the VLT frequency converter is able to carry out a controlled deramping.
- If a mains phase is missing, the VLT frequency converter will cut out when a load is placed on the motor.

**■ Mains supply 3 x 200 - 240 V**

| According to international requirements                               | VLT type                     | 6002                                | 6003         | 6004          | 6005          | 6006         | 6008         | 6011          |
|-----------------------------------------------------------------------|------------------------------|-------------------------------------|--------------|---------------|---------------|--------------|--------------|---------------|
| Output current <sup>4)</sup>                                          | $I_{VLTN}$ [A]               | 6.6                                 | 7.5          | 10.6          | 12.5          | 16.7         | 24.2         | 30.8          |
|                                                                       | $I_{VLT, MAX}$ (60 s) [A]    | 7.3                                 | 8.3          | 11.7          | 13.8          | 18.4         | 26.6         | 33.9          |
| Output (240 V)                                                        | $S_{VLTN}$ [kVA]             | 2.7                                 | 3.1          | 4.4           | 5.2           | 6.9          | 10.1         | 12.8          |
| Typical shaft output                                                  | $P_{VLTN}$ [kW]              | 1.1                                 | 1.5          | 2.2           | 3.0           | 4.0          | 5.5          | 7.5           |
| Typical shaft output                                                  | $P_{VLTN}$ [HP]              | 1.5                                 | 2            | 3             | 4             | 5            | 7.5          | 10            |
| Max. cable cross-section to motor and DC-bus                          | [mm <sup>2</sup> /AWG]       | 4/10                                | 4/10         | 4/10          | 4/10          | 4/10         | 16/6         | 16/6          |
| Max. input current (200 V)                                            | $I_{LN}$ [A]                 | 6.0                                 | 7.0          | 10.0          | 12.0          | 16.0         | 23.0         | 30.0          |
| Max. cable cross-section power [mm <sup>2</sup> ]/[AWG] <sup>2)</sup> |                              | 4/10                                | 4/10         | 4/10          | 4/10          | 4/10         | 16/6         | 16/6          |
| Max. pre-fuses                                                        | [A]/UL <sup>1)</sup> [A]     | 16/10                               | 16/15        | 25/20         | 25/25         | 35/30        | 50           | 60            |
| Mains contactor                                                       | [Danfoss type]<br>[AC value] | Cl 6<br>AC-3                        | Cl 9<br>AC-3 | Cl 12<br>AC-3 | Cl 12<br>AC-3 | Cl 6<br>AC-1 | Cl 9<br>AC-1 | Cl 16<br>AC-1 |
| Efficiency <sup>3)</sup>                                              |                              | 0.95                                |              |               |               |              |              |               |
| Weight IP 20                                                          | [kg]                         | 7                                   | 7            | 9             | 9             | 23           | 23           | 23            |
| Weight IP 54                                                          | [kg]                         | 11.5                                | 11.5         | 13.5          | 13.5          | 35           | 35           | 38            |
| Power loss at max. load. [W]                                          | Total                        | 76                                  | 95           | 126           | 172           | 194          | 426          | 545           |
| Enclosure                                                             | VLT type                     | Bookstyle IP 20/Compact IP 20/IP 54 |              |               |               |              |              |               |
| (Bookstyle IP 20 is available in power range VLT 6002-6005).          |                              |                                     |              |               |               |              |              |               |

**■ Mains supply 3 x 200 - 240 V**

| According to international requirements      | VLT type                        | 6016          | 6022          | 6027          | 6032          | 6042   | 6052   | 6062    |
|----------------------------------------------|---------------------------------|---------------|---------------|---------------|---------------|--------|--------|---------|
| Output current <sup>4)</sup>                 | $I_{VLTN}$ [A]                  | 46.0          | 59.4          | 74.8          | 88.0          | 104    | 130    | 154     |
|                                              | $I_{VLT, MAX}$ (60 s) [A]       | 50.6          | 65.3          | 82.3          | 96.8          | 115    | 143    | 170     |
| Output (240 V)                               | $S_{VLTN}$ [kVA]                | 19.1          | 24.7          | 31.1          | 36.6          | 43.2   | 54.0   | 64.0    |
| Typical shaft output                         | $P_{VLTN}$ [kW]                 | 11            | 15            | 18.5          | 22            | 30     | 37     | 45      |
| Typical shaft output                         | $P_{VLTN}$ [HP]                 | 15            | 20            | 25            | 30            | 40     | 50     | 60      |
| Max. cable cross-section to motor and DC-bus | [mm <sup>2</sup> /AWG]          | 16/6          | 35/2          | 35/2          | 50/0          | 70/1/0 | 95/3/0 | 120/4/0 |
| Min. cable cross-section to motor and DC-bus | [mm <sup>2</sup> /AWG]          | 10/8          | 10/8          | 10/8          | 16/6          | 10/8   | 10/8   | 10/8    |
| Max. input current (200 V)                   | $I_{LN}$ [A]                    | 46.0          | 59.2          | 74.8          | 88.0          | 101.3  | 126.6  | 149.9   |
| Max. cable, cross-section, power             | [mm <sup>2</sup> ]/[AWG]        | 16/6          | 35/2          | 35/2          | 50/0          | 70/1/0 | 95/3/0 | 120/4/0 |
| Max. pre-fuses                               | [A]/UL <sup>1)</sup> [A]        | 60            | 80            | 125           | 125           | 150    | 200    | 250     |
| Mains contactor                              | [Danfoss type]<br>[AC value]    | Cl 32<br>AC-1 | Cl 32<br>AC-1 | Cl 37<br>AC-1 | Cl 45<br>AC-1 | -      | -      | -       |
| Efficiency <sup>3)</sup>                     |                                 | 0.95          |               |               |               |        |        |         |
| Weight IP 00                                 | [kg]                            | -             | -             | -             | -             | 90     | 90     | 90      |
| Weight IP 20                                 | [kg]                            | 23            | 30            | 30            | 48            | 101    | 101    | 101     |
| Weight IP 54                                 | [kg]                            | 38            | 49            | 50            | 55            | 104    | 104    | 104     |
| Power loss at max. load:                     | [W]                             | 545           | 783           | 1042          | 1243          | 1089   | 1361   | 1613    |
| Enclosure                                    | IP 20+NEMA 1 kit, IP 54/NEMA 12 |               |               |               |               |        |        |         |

- If UL/cUL is to be complied with, pre-fuses type Bussmann KTN-R 200 V, KTS-R 500 V or similar must be used.  
In the remainder of the world, the first-mentioned pre-fuses must be used. These pre-fuses must be semi-conductor fuses of the gL type. The fuses must be placed to protect a circuit capable of supplying max. 100,000 amps rms (symmetrical), 500 V maximum.
- American Wire Gauge.
- Measured using 30 m screened/armoured motor cable at rated load and rated frequency.
- Current ratings fulfill UL requirements for 208-240 V

**■ Technical data, mains supply 3 x 380 - 460 V**

| According to international requirements | VLT type                              | 6002                                | 6003         | 6004         | 6005         | 6006          | 6008         | 6011                                                            |
|-----------------------------------------|---------------------------------------|-------------------------------------|--------------|--------------|--------------|---------------|--------------|-----------------------------------------------------------------|
| Output current                          | $I_{VLT,N}$ [A] (380-415 V)           | 3.0                                 | 4.1          | 5.6          | 7.2          | 10.0          | 13.0         | 16.0                                                            |
|                                         | $I_{VLT,MAX}$ (60 s) [A] (380-415 V)  | 3.3                                 | 4.5          | 6.2          | 7.9          | 11.0          | 14.3         | 17.6                                                            |
|                                         | $I_{VLT,N}$ [A] (440-460 V)           | 3.0                                 | 3.4          | 4.8          | 6.3          | 8.2           | 11.0         | 14.0                                                            |
|                                         | $I_{VLT,MAX}$ (60 s) [A] (440-460 V)  | 3.3                                 | 3.7          | 5.3          | 6.9          | 9.0           | 12.1         | 15.4                                                            |
| Output                                  | $S_{VLT,N}$ [kVA] (400 V)             | 2.2                                 | 2.9          | 4.0          | 5.2          | 7.2           | 9.3          | 11.5                                                            |
|                                         | $S_{VLT,N}$ [kVA] (460 V)             | 2.4                                 | 2.7          | 3.8          | 5.0          | 6.5           | 8.8          | 11.2                                                            |
| Typical shaft output                    | $P_{VLT,N}$ [kW]                      | 1.1                                 | 1.5          | 2.2          | 3.0          | 4.0           | 5.5          | 7.5                                                             |
| Typical shaft output                    | $P_{VLT,N}$ [HP]                      | 1.5                                 | 2            | 3            | -            | 5             | 7.5          | 10                                                              |
| Max. cable cross-section<br>to motor    | [mm <sup>2</sup> /AWG]                | 4/10                                | 4/10         | 4/10         | 4/10         | 4/10          | 4/10         | 4/10                                                            |
| Max. input current                      | $I_{LN}$ [A] (380 V)                  | 2.8                                 | 3.8          | 5.3          | 7.0          | 9.1           | 12.2         | 15.0                                                            |
|                                         | $I_{LN}$ [A] (460 V)                  | 2.5                                 | 3.4          | 4.8          | 6.0          | 8.3           | 10.6         | 14.0                                                            |
| Max. cable cross-section,<br>power      | [mm <sup>2</sup> ]/[AWG] <sup>2</sup> | 4/10                                | 4/10         | 4/10         | 4/10         | 4/10          | 4/10         | 4/10                                                            |
| Max. pre-fuses                          | [A]/UL <sup>11</sup> [A]              | 16/6                                | 16/10        | 16/10        | 16/15        | 25/20         | 25/25        | 35/30                                                           |
| Mains contactor                         | [Danfoss type]<br>[AC value]          | CI 6<br>AC-3                        | CI 6<br>AC-3 | CI 6<br>AC-3 | CI 9<br>AC-3 | CI 12<br>AC-3 | CI 5<br>AC-3 | CI 6<br>AC-1                                                    |
| Efficiency <sup>3)</sup>                |                                       | 0.96                                |              |              |              |               |              |                                                                 |
| Weight IP 20                            | [kg]                                  | 8                                   | 8            | 8.5          | 8.5          | 10.5          | 10.5         | 10.5                                                            |
| Weight IP 54                            | [kg]                                  | 11.5                                | 11.5         | 12           | 12           | 14            | 14           | 14                                                              |
| Power loss at max. load. [W]            | Total                                 | 67                                  | 92           | 110          | 139          | 198           | 250          | 295                                                             |
| Enclosure                               | VLT type                              | Bookstyle IP 20/Compact IP 20/IP 54 |              |              |              |               |              | (Bookstyle IP 20 is available in the VLT 6002-6011 power range) |

**■ Mains supply 3 x 380 - 460 V**

| According to international requirements                       | VLT type                             | 6016        | 6022  | 6027  | 6032  | 6042  | 6052    | 6062    |
|---------------------------------------------------------------|--------------------------------------|-------------|-------|-------|-------|-------|---------|---------|
| Output current                                                | $I_{VLT,N}$ [A] (380-415 V)          | 24.0        | 32.0  | 37.5  | 44.0  | 61.0  | 73.0    | 90.0    |
|                                                               | $I_{VLT,MAX}$ (60 s) [A] (380-415 V) | 26.4        | 35.2  | 41.3  | 48.4  | 67.1  | 80.3    | 99.0    |
|                                                               | $I_{VLT,N}$ [A] (440-460 V)          | 21.0        | 27.0  | 34.0  | 40.0  | 52.0  | 65.0    | 77.0    |
|                                                               | $I_{VLT,MAX}$ (60 s) [A] (440-460 V) | 23.1        | 29.7  | 37.4  | 44.0  | 57.2  | 71.5    | 84.7    |
| Output                                                        | $S_{VLT,N}$ [kVA] (400 V)            | 17.3        | 23.0  | 27.0  | 31.6  | 43.8  | 52.5    | 64.7    |
|                                                               | $S_{VLT,N}$ [kVA] (460 V)            | 16.7        | 21.5  | 27.1  | 31.9  | 41.4  | 51.8    | 61.3    |
| Typical shaft output                                          | $P_{VLT,N}$ [kW]                     | 11          | 15    | 18.5  | 22    | 30    | 37      | 45      |
| Typical shaft output                                          | $P_{VLT,N}$ [HP]                     | 15          | 20    | 25    | 30    | 40    | 50      | 60      |
| Max. cable cross-section<br>to motor and DC-bus               | [mm <sup>2</sup> /AWG]               | 16/6        | 16/6  | 16/6  | 16/6  | 35/2  | 35/2    | 50/0    |
| Min. cable cross-section<br>to motor and DC-bus <sup>4)</sup> | [mm <sup>2</sup> /AWG]               | 10/8        | 10/8  | 10/8  | 10/8  | 10/8  | 10/8    | 16/6    |
| Max. input current                                            | $I_{LN}$ [A] (380 V)                 | 32.0        | 32.0  | 37.5  | 44.0  | 60.0  | 72.0    | 89.0    |
|                                                               | $I_{LN}$ [A] (460 V)                 | 27.6        | 27.6  | 34.0  | 41.0  | 53.0  | 64.0    | 77.0    |
| Max. cable cross-section,<br>power                            | [mm <sup>2</sup> ]/[AWG]             | 16/6        | 16/6  | 16/6  | 16/6  | 35/2  | 35/2    | 50/0    |
| Max. pre-fuses                                                | [A]/UL <sup>11</sup> [A]             | 63/40       | 63/40 | 63/50 | 63/60 | 80/80 | 100/100 | 125/125 |
| Efficiency at rated frequency                                 |                                      | 0.96        |       |       |       |       |         |         |
| Weight IP 20                                                  | [kg]                                 | 23          | 23    | 23    | 30    | 30    | 48      | 48      |
| Weight IP 54                                                  | [kg]                                 | 48          | 48    | 48    | 51    | 61    | 67      | 70      |
| Power loss at max. load.                                      | [W]                                  | 419         | 559   | 655   | 768   | 1065  | 1275    | 1571    |
| Enclosure                                                     |                                      | IP 20/IP 54 |       |       |       |       |         |         |

1. If UL/cUL is to be complied with, pre-fuses type Bussmann KTS-R or similar must be used. In the remainder of the world, the first-mentioned pre-fuses must be used. These pre-fuses must be semi-conductor fuses of the gL type. The fuses must be placed to protect a circuit capable of supplying max. 100,000 amps rms (symmetrical), 500 V maximum.

2. American Wire Gauge.

3. Measured using 30 m screened/armoured motor cable at rated load and rated frequency.

4. Min. cable cross-section is the smallest cable cross-section allowed to be fitted on the terminals.

Always comply with national and local regulations on min. cable cross-section.

**Technical data, mains supply 3 x 380 - 460 V**

| According to international requirements                                     | VLT type                             | 6075    | 6100    | 6125    | 6150    | 6175     | 6225     | 6275 |
|-----------------------------------------------------------------------------|--------------------------------------|---------|---------|---------|---------|----------|----------|------|
| Output current                                                              | $I_{VLT,N}$ [A] (380-415 V)          | 106     | 147     | 177     | 212     | 260      | 315      | 368  |
|                                                                             | $I_{VLT,MAX}$ (60 s) [A] (380-415 V) | 117     | 162     | 195     | 233     | 286      | 347      | 405  |
|                                                                             | $I_{VLT,N}$ [A] (440-460 V)          | 106     | 130     | 160     | 190     | 240      | 302      | 361  |
|                                                                             | $I_{VLT,MAX}$ (60 s) [A] (440-460 V) | 117     | 143     | 176     | 209     | 264      | 332      | 397  |
| Output                                                                      | $S_{VLT,N}$ [kVA] (400 V)            | 73      | 102     | 123     | 147     | 180      | 218      | 255  |
|                                                                             | $S_{VLT,N}$ [kVA] (460 V)            | 84,5    | 104     | 127     | 151     | 191      | 241      | 288  |
| Typical shaft output (380-415 V) $P_{VLT,N}$ [kW]                           | 55                                   | 75      | 90      | 110     | 132     | 160      | 200      |      |
| Typical shaft output (440-460 V) $P_{VLT,N}$ [HP]                           | 75                                   | 100     | 125     | 150     | 200     | 250      | 300      |      |
| Max. cross-section of copper cable to motor and DC-bus (380-415 V) [mm²]    | 70                                   | 95      | 120     | 2x70    | 2x70    | 2x95     | 2x120    |      |
| Max. cross-section of copper cable to motor and DC-bus (440-460 V) [mm²]    | 70                                   | 70      | 95      | 2x70    | 2x70    | 2x95     | 2x120    |      |
| Max. cross-section of aluminium cable to motor and DC-bus (380-415 V) [mm²] | 95                                   | 90      | 120     | 2x70    | 2x95    | 2x120    | 2x150    |      |
| Max. cross-section of aluminium cable to motor and DC-bus (440-460 V) [mm²] | 70                                   | 120     | 150     | 2x70    | 2x120   | 2x120    | 2x150    |      |
| Max. cross-section of copper cable to motor and DC-bus (380-415 V) [AWG]    | 1/0                                  | 3/0     | 4/0     | 2x1/0   | 2x2/0   | 2x3/0    | 2x250mcm |      |
| Max. cross-section of copper cable to motor and DC-bus (440-460 V) [AWG]    | 1/0                                  | 2/0     | 3/0     | 2x1/0   | 2x1/0   | 2x3/0    | 2x4/0    |      |
| Max. cross-section of aluminium cable to motor and DC-bus (380-415 V) [AWG] | 3/0                                  | 250mcm  | 300mcm  | 2x2/0   | 2x4/0   | 2x250mcm | 2x350mcm |      |
| Max. cross-section of aluminium cable to motor and DC-bus (440-460 V) [AWG] | 3/0                                  | 4/0     | 250mcm  | 2x2/0   | 2x3/0   | 2x250mcm | 2x300mcm |      |
| Max. cross-section of cable to motor, and DC-bus <sup>4)</sup> [mm²/AWG]    | 10/8                                 | 10/8    | 10/8    | 10/8    | 10/8    | 16/6     | 16/6     |      |
| Max. input current                                                          | $I_{LN}$ [A] (400 V)                 | 131     | 155     | 217     | 262     | 310      | 384      | 476  |
|                                                                             | $I_{LN}$ [A] (460 V)                 | 117     | 155     | 192     | 236     | 277      | 355      | 457  |
| Max. cross-section of copper cable to power (380-415 V) [mm²]               | 70                                   | 95      | 120     | 2x70    | 2x70    | 2x95     | 2x120    |      |
| Max. cross-section of copper cable to power (440-460 V) [mm²]               | 70                                   | 70      | 95      | 2x70    | 2x70    | 2x95     | 2x120    |      |
| Max. cross-section of aluminium cable to power (380-415 V) [mm²]            | 95                                   | 90      | 120     | 2x70    | 2x95    | 2x120    | 2x150    |      |
| Max. cross-section of aluminium cable to power (440-460 V) [mm²]            | 70                                   | 120     | 150     | 2x70    | 2x120   | 2x120    | 2x150    |      |
| Max. cross-section of copper cable to power (380-415 V) [AWG]               | 1/0                                  | 3/0     | 4/0     | 2x1/0   | 2x2/0   | 2x3/0    | 2x250mcm |      |
| Max. cross-section of copper cable to power (440-460 V) [AWG]               | 1/0                                  | 2/0     | 3/0     | 2x1/0   | 2x1/0   | 2x3/0    | 2x4/0    |      |
| Max. cross-section of aluminium cable to power (380-415 V) [AWG]            | 3/0                                  | 250mcm  | 300mcm  | 2x2/0   | 2x4/0   | 2x250mcm | 2x350mcm |      |
| Max. cross-section of aluminium cable to power (440-460 V) [AWG]            | 3/0                                  | 4/0     | 250mcm  | 2x2/0   | 2x3/0   | 2x250mcm | 2x300mcm |      |
| Min. cable cross-section to motor, and DC-bus <sup>4)</sup> [mm²/AWG]       | 10/8                                 | 10/8    | 10/8    | 10/8    | 10/8    | 16/6     |          |      |
| Max. pre-fuses [A]/UL <sup>1)</sup> [A]                                     | 150/150                              | 250/220 | 250/250 | 300/300 | 350/350 | 450/400  | 500/500  |      |
| Integral pre-fuses [A]/UL <sup>1)</sup> [A]                                 | 15/15                                | 15/15   | 15/15   | 30/30   | 30/30   | 30/30    | 30/30    |      |
| Pre-fuses SMPS [A]/UL <sup>1)</sup> [A]                                     | 5.0/5.0                              |         |         |         |         |          |          |      |
| Weight IP 00 [kg]                                                           | 109                                  | 109     | 109     | 146     | 146     | 146      | 146      |      |
| Weight IP 20 [kg]                                                           | 121                                  | 121     | 121     | 161     | 161     | 161      | 161      |      |
| Weight IP 54 [kg]                                                           | 124                                  | 124     | 124     | 177     | 177     | 177      | 177      |      |
| Efficiency at rated frequency                                               | 0.96-0.97                            |         |         |         |         |          |          |      |
| Power loss at max. load [W]                                                 | 1430                                 | 1970    | 2380    | 2860    | 3810    | 4770     | 5720     |      |
| Enclosure                                                                   | IP 00 / IP 20 / IP 54                |         |         |         |         |          |          |      |

1. If UL/cUL is to be complied with, pre-fuses type Bussmann KTN-R, KTS-R or similar must be used.

In the remainder of the world, the first-mentioned pre-fuses must be used. These pre-fuses must be semi-conductor fuses of the gL type. The fuses must be placed to protect a circuit capable of supplying max. 100,000 amps rms (symmetrical), 500 V maximum.

2. American Wire Gauge.

3. Measured using 30 m screened/armoured motor cable at rated load and rated frequency.

4. Min. cable cross-section is the smallest cable cross-section allowed to be fitted on the terminals.

Always comply with national and local regulations on min. cable cross-section.

**Mechanical dimensions**

All measurements in mm.

| VLT type                         | A   | B   | C   | a   | b  | a/b | Type |
|----------------------------------|-----|-----|-----|-----|----|-----|------|
| <b>Bookstyle IP 20 200-240 V</b> |     |     |     |     |    |     |      |
| 6002 - 6003                      | 395 | 90  | 260 | 384 | 70 | 100 | A    |
| 6004 - 6005                      | 395 | 130 | 260 | 384 | 70 | 100 | A    |

**Bookstyle IP 20 380-460 V**

|             |     |     |     |     |    |     |   |
|-------------|-----|-----|-----|-----|----|-----|---|
| 6002 - 6005 | 395 | 90  | 260 | 384 | 70 | 100 | A |
| 6006 - 6011 | 395 | 130 | 260 | 384 | 70 | 100 | A |

**IP 00 200-240 V**

|             |     |     |     |     |     |     |   |
|-------------|-----|-----|-----|-----|-----|-----|---|
| 6042 - 6062 | 800 | 370 | 335 | 780 | 270 | 250 | B |
|-------------|-----|-----|-----|-----|-----|-----|---|

**IP 00 380-460 V**

|             |      |     |     |      |     |     |   |
|-------------|------|-----|-----|------|-----|-----|---|
| 6075 - 6125 | 800  | 370 | 335 | 780  | 270 | 250 | B |
| 6150 - 6275 | 1400 | 420 | 400 | 1380 | 350 | 300 | B |

**IP 20 200-240 V**

|             |     |     |     |     |     |     |   |
|-------------|-----|-----|-----|-----|-----|-----|---|
| 6002 - 6003 | 395 | 220 | 160 | 384 | 200 | 100 | C |
| 6004 - 6005 | 395 | 220 | 200 | 384 | 200 | 100 | C |
| 6006 - 6011 | 560 | 242 | 260 | 540 | 200 | 200 | D |
| 6016 - 6022 | 700 | 242 | 260 | 680 | 200 | 200 | D |
| 6027 - 6032 | 800 | 308 | 296 | 780 | 270 | 200 | D |
| 6042 - 6062 | 975 | 370 | 335 | 780 | 270 | 250 | E |

**IP 20 380-460 V**

|             |      |     |     |      |     |     |   |
|-------------|------|-----|-----|------|-----|-----|---|
| 6002 - 6005 | 395  | 220 | 160 | 384  | 200 | 100 | C |
| 6006 - 6011 | 395  | 220 | 200 | 384  | 200 | 100 | C |
| 6016 - 6027 | 560  | 242 | 260 | 540  | 200 | 200 | D |
| 6032 - 6042 | 700  | 242 | 260 | 680  | 200 | 200 | D |
| 6052 - 6062 | 800  | 308 | 296 | 780  | 270 | 200 | D |
| 6075 - 6125 | 975  | 370 | 335 | 780  | 270 | 250 | E |
| 6150 - 6275 | 1575 | 420 | 400 | 1380 | 350 | 300 | E |

**VLT type**      **A**      **B**      **C**      **D**      **a**      **b**      **a/b**      **Type**

|                        |     |     |     |    |     |     |     |   |
|------------------------|-----|-----|-----|----|-----|-----|-----|---|
| <b>IP 54 200-240 V</b> |     |     |     |    |     |     |     |   |
| 6002 - 6003            | 460 | 282 | 195 | 85 | 260 | 258 | 100 | F |
| 6004 - 6005            | 530 | 282 | 195 | 85 | 330 | 258 | 100 | F |
| 6006 - 6011            | 810 | 355 | 280 | 70 | 560 | 330 | 200 | F |
| 6016 - 6032            | 940 | 400 | 280 | 70 | 690 | 375 | 200 | F |
| 6042 - 6062            | 937 | 495 | 421 | -  | 830 | 374 | 250 | G |

**IP 54 380-460 V**

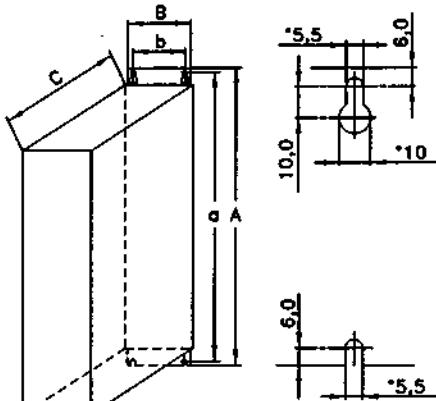
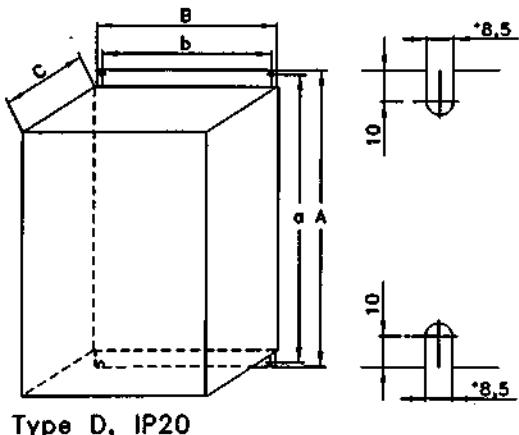
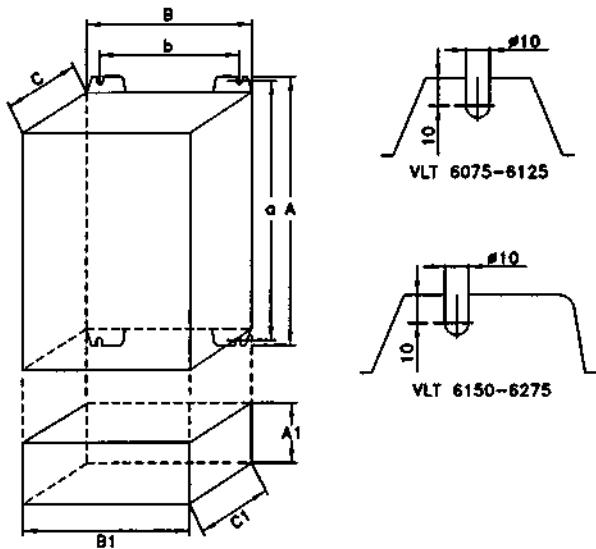
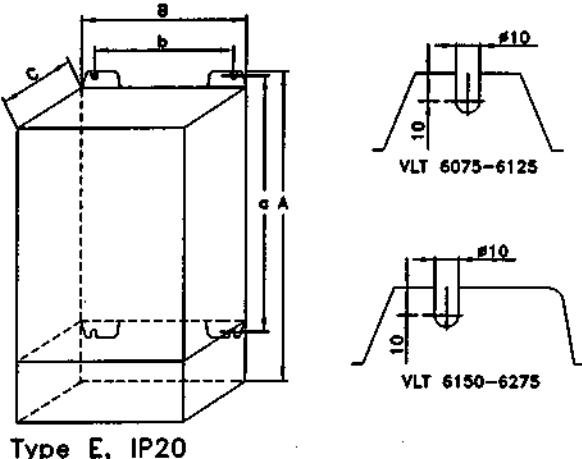
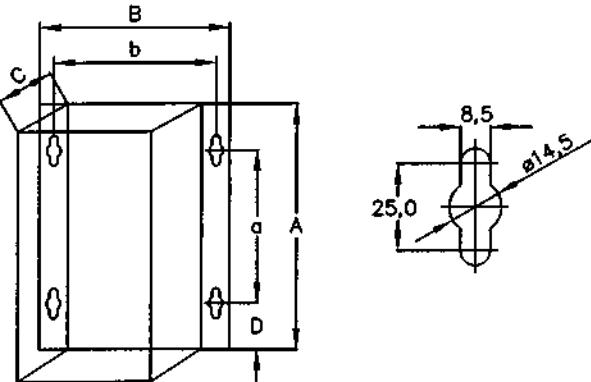
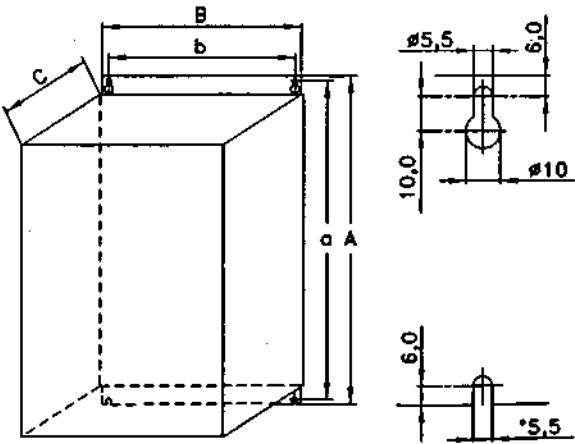
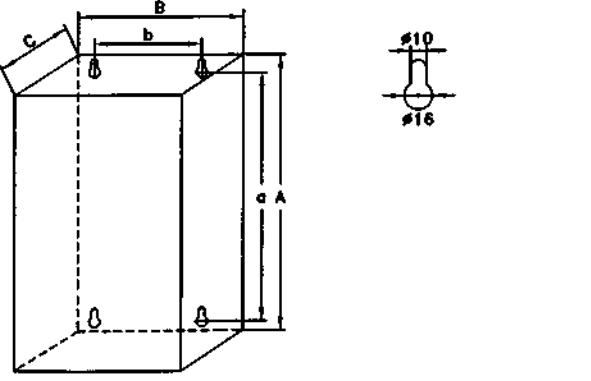
|             |      |     |     |    |      |     |     |   |
|-------------|------|-----|-----|----|------|-----|-----|---|
| 6002 - 6005 | 460  | 282 | 195 | 85 | 260  | 258 | 100 | F |
| 6006 - 6011 | 530  | 282 | 195 | 85 | 330  | 258 | 100 | F |
| 6016 - 6032 | 810  | 355 | 280 | 70 | 560  | 330 | 200 | F |
| 6042 - 6062 | 940  | 400 | 280 | 70 | 690  | 375 | 200 | F |
| 6075 - 6125 | 937  | 495 | 421 | -  | 830  | 374 | 250 | G |
| 6150 - 6275 | 1572 | 495 | 425 | -  | 1465 | 445 | 300 | G |

**Option for IP 00 VLT 6075-6275**      **A1**      **B1**      **C1**

|                           |     |     |     |  |  |  |  |
|---------------------------|-----|-----|-----|--|--|--|--|
| <b>IP 20 bottom cover</b> |     |     |     |  |  |  |  |
| 6075 - 6125               | 175 | 370 | 335 |  |  |  |  |
| 6150 - 6275               | 175 | 420 | 400 |  |  |  |  |

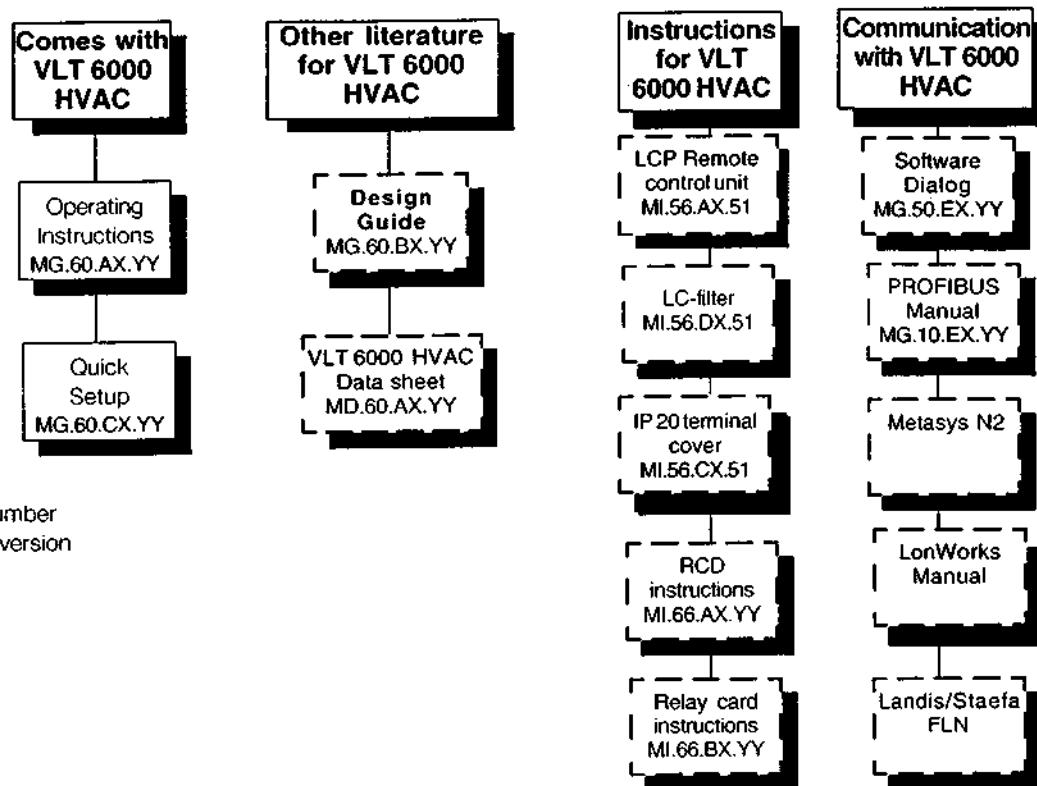
a: Min. air above enclosure

b: Min. air below enclosure

**Mechanical dimensions**

**Type A, IP20**

**Type D, IP20**

**Type B, IP00**  
With option and enclosure IP20

**Type E, IP20**

**Type F, IP54**

**Type C, IP20**

**Type G, IP54**

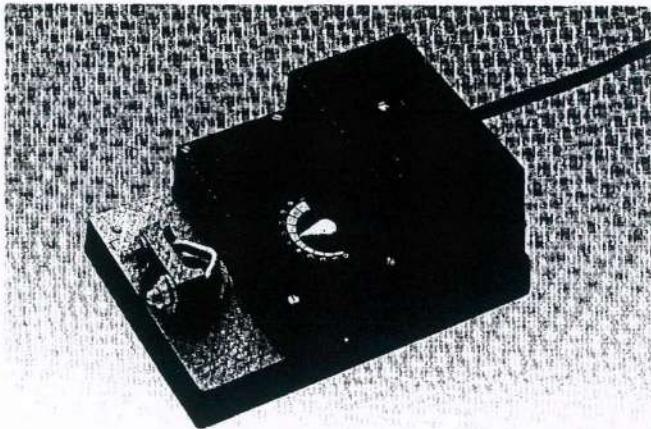
**■ Available literature**

The chart below gives an overview of the literature available for the VLT 6000 HVAC.  
Please note that variations may occur from one country to the next

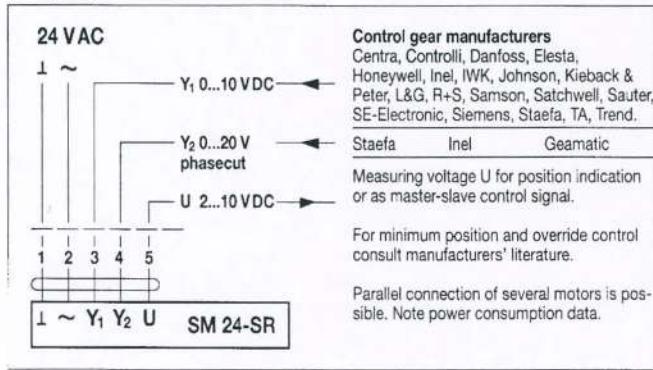


X = version number  
YY = language version  
01 = Danish  
02 = English  
03 = German  
04 = French  
05 = Spanish  
06 = Italian  
07 = Swedish  
10 = Dutch  
20 = Finnish  
28 = Brazilian-Portuguese  
51,52 = Danish, English, German





Wiring diagram



| Technical data            | SM 24-SR                                                                          |
|---------------------------|-----------------------------------------------------------------------------------|
| Power supply              | 24 VAC $\pm 20\%$ 50...60 Hz                                                      |
| Power consumption         | 3 W                                                                               |
| For wire sizing           | 5 VA                                                                              |
| Connecting cable          | 0.9 m long, 5 $\times$ 0.75 mm <sup>2</sup>                                       |
| Control signal Y          | Y <sub>1</sub> 0...10 VDC      Y <sub>2</sub> 0...20 V phasect                    |
| Input resistance          | 100 k $\Omega$ (0.1 mA)      8 k $\Omega$ (50 mW)                                 |
| Operating range           | 2...10 VDC      2...10 V phasect                                                  |
| Synchronism tolerance     | $\pm 5\%$                                                                         |
| Measuring voltage U       | 2...10 VDC (max. 0.5 mA) for 0...100%                                             |
| Angle of rotation         | mechanically limited to 95°                                                       |
| Torque at rated voltage   | 15 Nm min.                                                                        |
| Direction of rotation     | reversible with switch A/B<br>with 0 V at Y, switch position A $\cap$ or B $\cap$ |
| Position indication       | 0...10 (0 = stop $\cap$ ) and reversible indicator                                |
| Running time              | 100...200 s (0...15 Nm)                                                           |
| Degree of protection      | IP 42 (drip-proof)<br>ambient humidity class D to DIN 40040                       |
| Protection class          | III (safety extra-low voltage)                                                    |
| Ambient temperature range | -30...+50 °C                                                                      |
| EMC emitted interference  | to EN 50081-1                                                                     |
| Sound power level         | max. 45 dB (A)                                                                    |
| Maintenance               | maintenance-free                                                                  |
| Weight                    | 1460 g                                                                            |

Dampers up to approx. 3 m<sup>2</sup>Modulating damper motor  
(24 VAC)Control 0...10 VDC or 0...20 V  
phasect control

Position feedback 2...10 VDC

**Versatility of control**

Combining two different methods of control in a single damper motor ensures greater flexibility at the planning stage.

**Improved functional safety**

The damper motor has no limit switches and is overload-proof. It stops automatically when it reaches the damper or motor end-stop.

**Easy functional check**

A functional check of damper operation is simplicity itself: the gearing can be disengaged by simply pressing a pushbutton on top of the case. While the pushbutton remains depressed, the damper can be operated by hand.

**Simple installation**

The damper motor is fitted with a universal spindle clamp for quick and easy mounting directly on the damper spindle. The motor is supplied with an anti-rotation strap for fixing it in position.

**Electrical accessories**

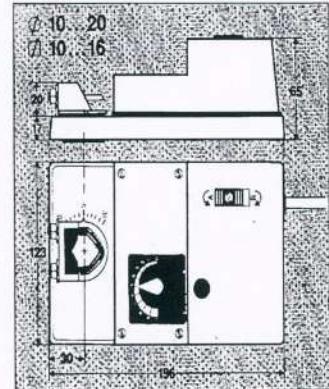
- S1, S2 Auxiliary switches, page 22
- P... Feedback potentiometer, page 24
- ZAD 24 Digital position indicator, page 28

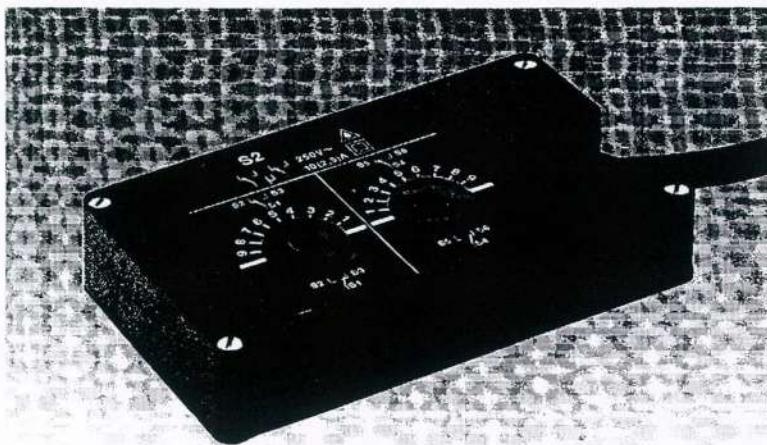
**Mechanical accessories**

- ZG-SM2 Damper linkage kit, page 30
- ZDB Limit stop, page 30

**Control and monitoring functions, page 32****Mounting instructions, page 36****Important**

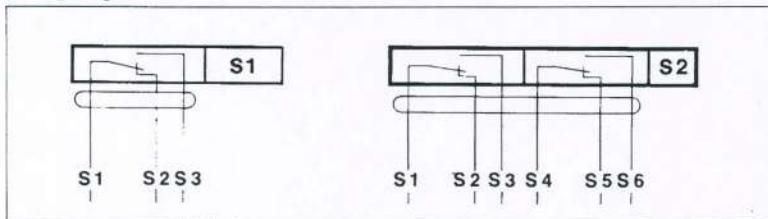
Read the notes about the use and torque requirements of the damper motors on page 1.

**Dimensions**



Compatible with SM... and GM... damper motors

#### Wiring diagram



| Technical data       | S1                                                                                                  | S2                                   |
|----------------------|-----------------------------------------------------------------------------------------------------|--------------------------------------|
| Number of switches   | 1 SPDT                                                                                              | 2 SPDT                               |
| Switching capacity   | 10 A (2.5 A) 250 VAC                                                                                | 10 A (2.5 A) 250 VAC                 |
| Connecting cable     | 0.9 m long, 3 × 0.75 mm <sup>2</sup>                                                                | 0.9 m long, 6 × 0.75 mm <sup>2</sup> |
| Switching point      | adjustable over full motor rotation 0...10.<br>Pre-setting by scale possible.<br>Settings lockable. |                                      |
| Degree of protection | IP 42<br>ambient humidity class D to DIN 40040                                                      |                                      |
| Protection class     | II (all-insulated)                                                                                  | II (all-insulated)                   |
| Ambient temp. range  | -30...+50 °C                                                                                        | -30...+50 °C                         |
| Weight               | 150 g                                                                                               | 210 g                                |

#### Switch setting

1. Turn the damper motor by hand to position 0.
  2. Loosen the locking screw in the centre of the setting dial.
  3. Rotate the dial until the arrow is pointing at the required switching point on the scale (0...10).
  4. Re-tighten the locking screw.
  5. Check the switching points by manual operation of the motor; the setting dial turns at the same time. The microswitches operate whenever the arrow passes position 0 or 10 (white lines). The symbols indicate the respective switch positions.
- The reversible indicator plate and the pointer must be removed when using an auxiliary switch unit S1, S2.

#### Application

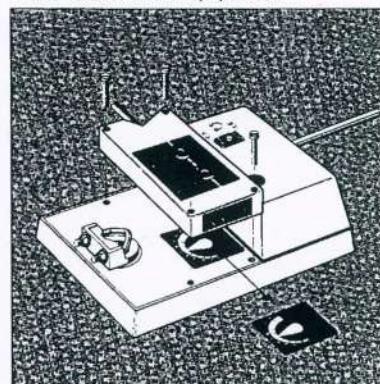
The auxiliary switch units S1 and S2 are intended for the signalling of end positions or for performing switching functions at any angular position.

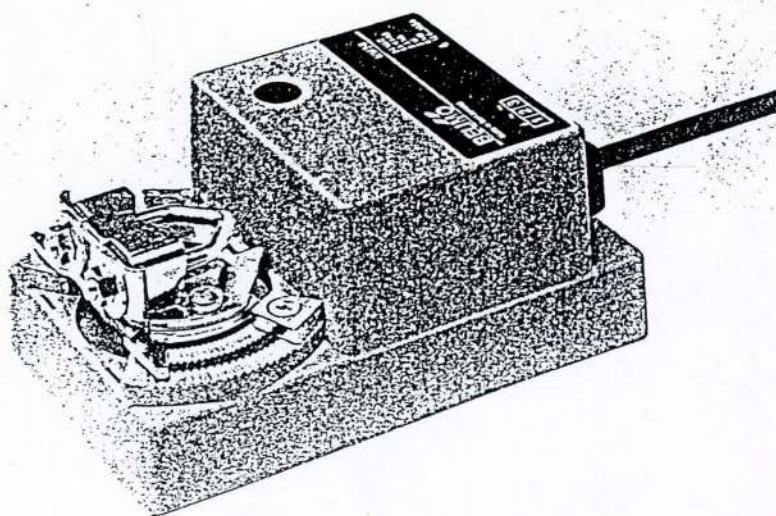
#### Easy switch setting

A spindle provides a positive drive to the switch mechanism from the rotary motion of the damper motor. The switching points of the microswitches can be set anywhere in the range from 0 to 10 by means of a dial and are then locked with a screw. The switch position can be read off at any time.

#### Simple installation

The auxiliary switch units S1 and S2 are suitable for direct mounting on Type SM... and GM... damper motors or on Type P... feedback potentiometers. (The stack-mounting of two auxiliary switch units or of one unit and a Type Szs mid-position switch unit is not possible.) Four extra-long screws are supplied for mounting the unit on Type SM...-SR, GM...-SR and P... equipment.



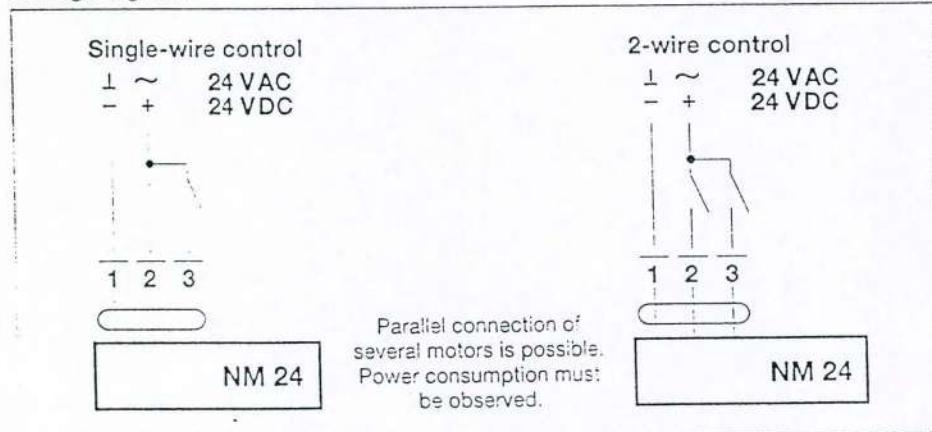


Dampers up to approx. 1 m<sup>2</sup>

Open/Close motor (24 VAC/DC)

Single-wire or 2-wire-control

#### Wiring diagram



#### Improved functional safety

The damper motor has no limit switches and is overload-proof. It stops automatically when it reaches the damper or motor end-stop.

#### Easy functional check

A functional check of damper operation is simplicity itself: the gearing can be disengaged by simply pressing a pushbutton on top of the case. While the pushbutton remains depressed, the damper can be operated by hand.

#### Simple installation

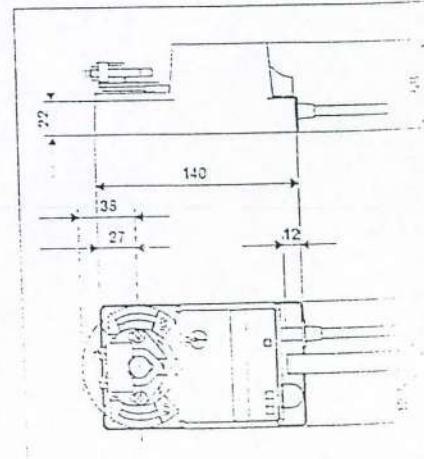
The damper motor is fitted with a universal spindle clamp for quick and easy mounting directly on the damper spindle. The motor is supplied with an anti-rotation strap for fixing it in position.

Mounting instructions, page 34

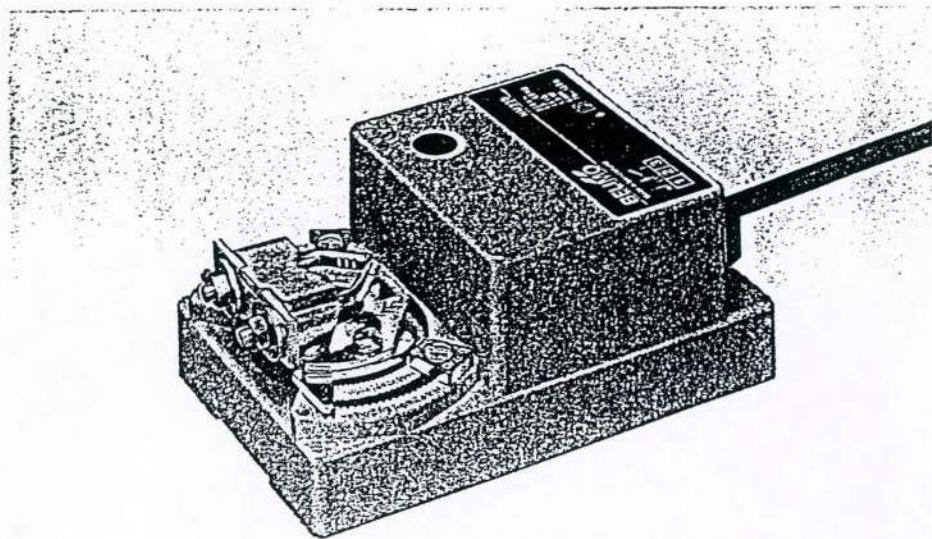
#### Important

Read the notes about the use and torque requirements of the damper motors on page 1.

#### Dimensions



|                                                    |                                                      |
|----------------------------------------------------|------------------------------------------------------|
| technical data                                     | NM 24                                                |
| Power supply                                       | 24 VAC ± 20%    50...60 Hz<br>24 VAC ± 20%           |
| Power consumption<br>For wire sizing               | 2 W<br>3.5 VA                                        |
| Protection class                                   | III (safety low voltage)                             |
| Degree of protection                               | IP 42 (drip-proof)                                   |
| Connecting cable                                   | 1 m long, 3 × 0.75 mm <sup>2</sup>                   |
| Angle of rotation                                  | max. 95°, adjustable by mechanical stops             |
| Torque                                             | min. 6 Nm                                            |
| Running time                                       | 75...150 s (0...6 Nm)                                |
| Direction of rotation                              | selected with L/R switch                             |
| Position indication                                | mechanical                                           |
| Ambient temp. range<br>Op.-temp., ambient humidity | -20...+50 °C<br>-40...+80 °C<br>Class D to DIN 40040 |
| EMC emitted interference                           | to EN 50081-1                                        |
| Sound power level                                  | max. 35 dB (A)                                       |
| Maintenance                                        | maintenance-free                                     |
| Weight                                             | 800 g                                                |



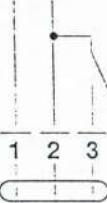
Dampers up to approx. 1 m<sup>2</sup>

Open/Close motor (230 VAC)

Control by single-pole contact  
(single-wire control)

#### Wiring diagram

N L1 230 VAC



NM 230

Parallel connection of several motors is possible. Power consumption must be observed.

#### Technical data

|                                      |                                                   |
|--------------------------------------|---------------------------------------------------|
| Power supply                         | NM 230                                            |
| Power consumption<br>For wire sizing | 220 VAC $-15\%$ ... 240 VAC $+10\%$<br>50...60 Hz |
| Protection class                     | II (all insulated)                                |
| Degree of protection                 | drip-proof (IP 42)                                |
| Connecting cable                     | 1 m long, 3 $\times$ 0,75 mm <sup>2</sup>         |
| Angle of rotation                    | max. 95°, adjustable by mechanical stops          |
| Torque                               | min. 6 Nm                                         |
| Running time                         | 75...150 s (0...6 Nm)                             |
| Direction of rotation                | selected with L/R switch                          |
| Position indication                  | mechanical                                        |
| Ambient temp. range                  | -20...+50 °C                                      |
| Non-operating temp.                  | -40...+80 °C                                      |
| Ambient humidity                     | Class D to DIN 43040                              |
| EMC emitted interference             | to EN 50081-1                                     |
| Sound power level                    | max. 35 dB (A)                                    |
| Maintenance                          | maintenance-free                                  |
| Weight                               | 600 g                                             |

#### Improved functional safety

The damper motor has no limit switches and is overload-proof. It stops automatically when it reaches the damper or motor end-stop.

#### Easy functional check

A functional check of damper operation is simplicity itself: the gearing can be disengaged by simply pressing a pushbutton on top of the case. While the pushbutton remains depressed, the damper can be operated by hand.

#### Simple installation

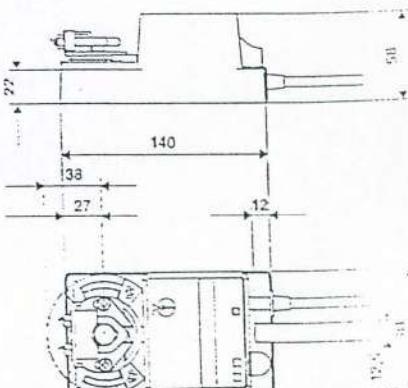
The damper motor is fitted with a universal spindle clamp for quick and easy mounting directly on the damper spindle. The motor is supplied with an anti-rotation strap for fixing it in position.

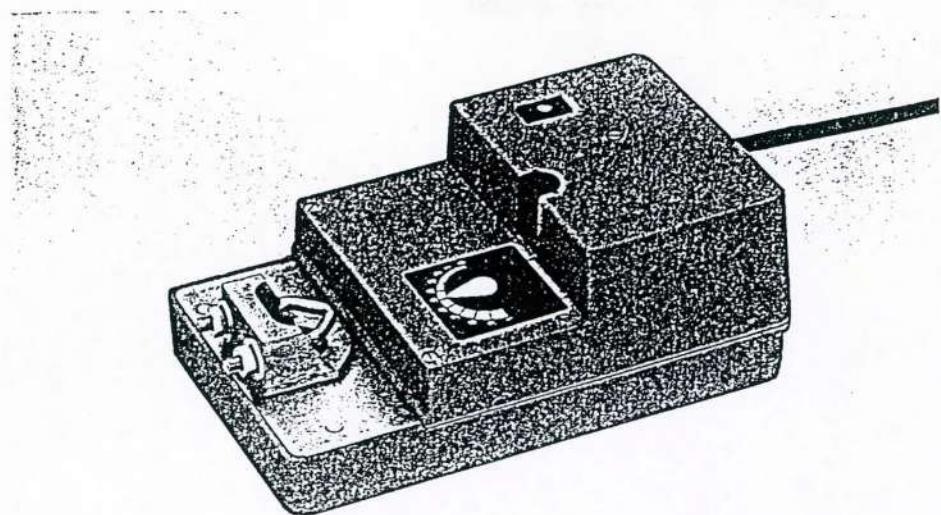
#### Mounting instructions, page 34

#### Important

Read the notes about the use and torque requirements of the damper motors on page 1.

#### Dimensions





Dampers up to approx. 6 m<sup>2</sup>

Modulating damper motor  
(24 VAC)

Control 0...10 VDC or 0...20 V  
phasicut control

Position feedback 2...10 VDC

#### Versatility of control

Combining two different methods of control in a single damper motor ensures greater flexibility at the planning stage.

#### Improved functional safety

The damper motor has no limit switches and is overload-proof. It stops automatically when it reaches the damper or motor end-stop.

#### Easy functional check

A functional check of damper operation is simplicity itself: the gearing can be disengaged by simply pressing a pushbutton on top of the case. While the pushbutton remains depressed, the damper can be operated by hand.

#### Simple installation

The damper motor is fitted with a universal spindle clamp for quick and easy mounting directly on the damper spindle. The motor is supplied with an anti-rotation strap for fixing it in position.

#### Electrical accessories

- S1, S2 Auxiliary switches, page 22
- P... Feedback potentiometer, page 24
- ZAD 24 Digital position indicator, page 28

#### Mechanical accessories

- ZG-GM2 Damper linkage kit, page 30
- \*ZK20 Clamp for 18...20 mm Ø

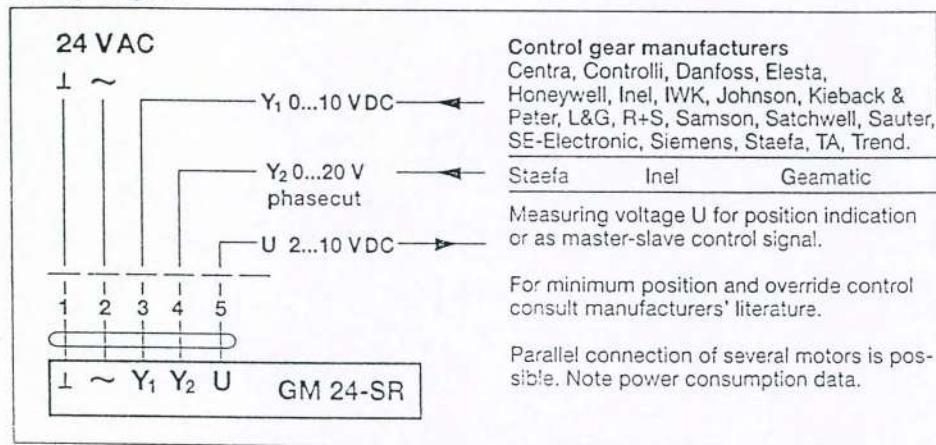
#### Control and monitoring functions, page 32

#### Mounting instructions, page 36

#### Important

Read the notes about the use and torque requirements of the damper motors on page 1.

#### Wiring diagram



#### Technical data

Power supply

GM 24-SR

24 VAC ± 20% 50...60 Hz

Power consumption

4 W

For wire sizing

7.5 VA

Connecting cable

0.9 m long, 5 × 0.75 mm<sup>2</sup>

Control signal Y

Y<sub>1</sub> 0...10 VDC

Y<sub>2</sub> 0...20 V phasicut

Input resistance

100 kΩ (0.1 mA)

8 kΩ (50 mW)

Operating range

2...10 V DC

2...10 V phasicut

Synchronism tolerance

± 5%

Measuring voltage U

2...10 VDC (max. 0.5 mA) for 0...100%

Angle of rotation

mechanically limited to 95°

Torque at rated voltage

30 Nm min.

Direction of rotation

reversible with switch A/B

XXXX

with 0 V at Y, switch position A ↗ or B ↘

Position indication

0...10 (0 = stop ↗) and reversible indicator ☐ ☒

Running time

100...240 s (0...30 Nm)

Degree of protection

IP 42 (drip-proof)

ambient humidity class D to DIN 40040

Protection class

III (safety extra-low voltage)

Ambient temperature range

-30...+50 °C

EMC emitted interference

to EN 50081-1

Sound power level

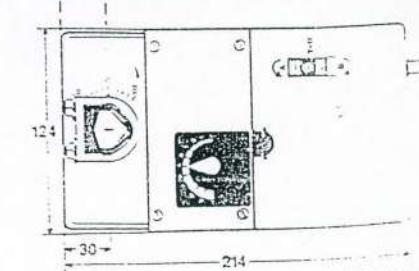
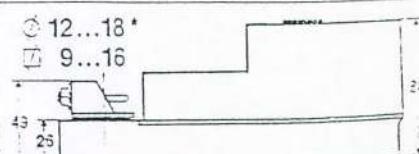
max. 45 dB (A)

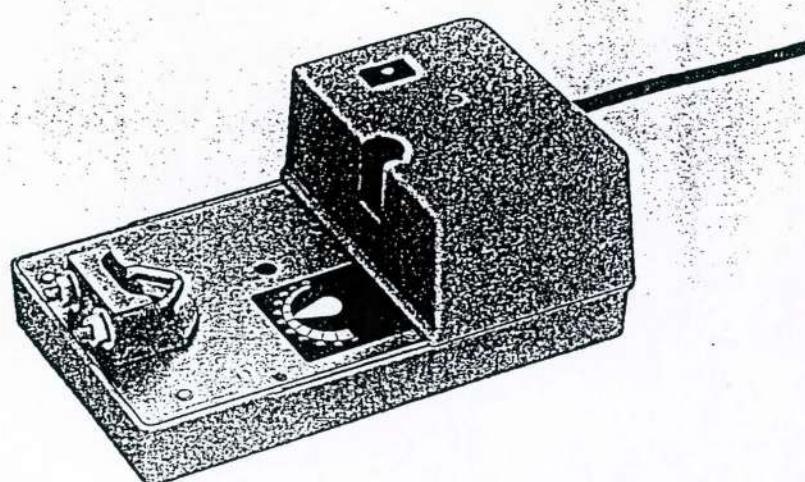
Maintenance

maintenance-free

Weight

2000 g





Damper up to approx. 6 m<sup>2</sup>

Open/Close motor  
(24 VAC/DC resp. 240 (220) VAC)

2-wire-control

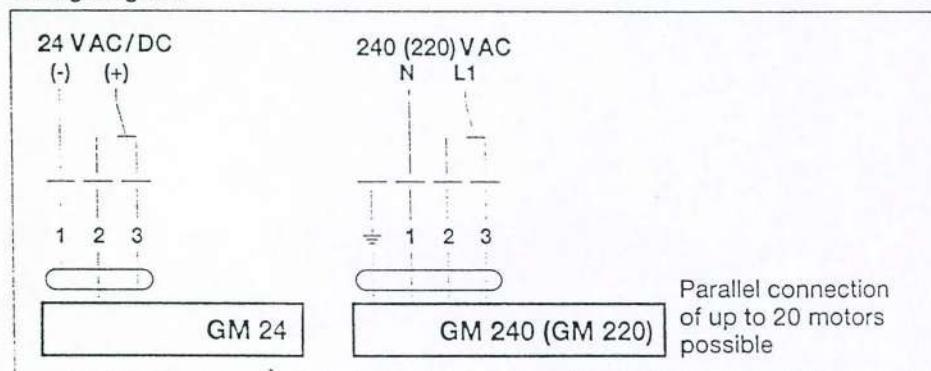
#### Improved functional safety

The damper motor has no limit switches and is overload-proof. It stops automatically when it reaches the damper or motor end-stop.

#### Easy functional check

A functional check of damper operation is simplicity itself: the gearing can be disengaged by simply pressing a pushbutton on top of the case. While the pushbutton remains depressed, the damper can be operated by hand.

#### Wiring diagram



#### Mechanical data

|                          | GM 24                                            | GM 240 (GM 220)                      |                                   |
|--------------------------|--------------------------------------------------|--------------------------------------|-----------------------------------|
| Power supply             | 24 VAC ± 20%<br>24 V DC ± 10%                    | 50...60 Hz                           | 240 (220) VAC ± 10%<br>50...60 Hz |
|                          |                                                  | 50 Hz                                | 60 Hz                             |
| Power consumption        | 3 W                                              | 11.5(10)W                            | 15(13)W                           |
| For wire sizing          | 6.5 VA                                           | 11.5(10)VA                           | 15(13)VA                          |
| Torque at rated voltage  | min. 30 Nm                                       | min. 30 Nm                           | 20 Nm                             |
| Running time             | 80...150 s (0...30 Nm)                           | = 180 s                              | = 210 s                           |
| Protection class         | III (safety extra-low voltage)                   | I (with PE conductor)                |                                   |
| Connecting cable         | 0.9 m long, 3 × 0.75 mm <sup>2</sup>             | 0.9 m long, 4 × 0.75 mm <sup>2</sup> |                                   |
| Angle of rotation        | mechanically limited to 95°                      |                                      |                                   |
| Direction of rotation    | reversible with switch A/B                       |                                      |                                   |
| Position indication      | 0...10 (0 = stop ↗) and reversible indicator ■ ■ |                                      |                                   |
| Degree of protection     | IP 42<br>ambient humidity class D to DIN 40040   |                                      |                                   |
| Op. temp. range          | -30...+50 °C                                     |                                      |                                   |
| EMI emitted interference | to EN 50081-1                                    |                                      |                                   |
| Sound power level        | max. 45 dB (A)                                   |                                      |                                   |
| Maintenance              | maintenance-free                                 |                                      |                                   |
| Weight                   | 2000 g                                           |                                      |                                   |

#### Mechanical accessories

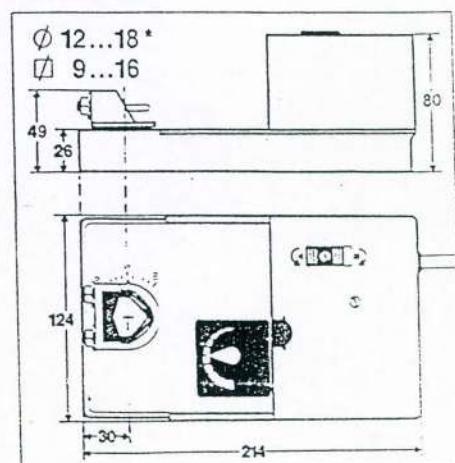
- ZG-GM2 Damper linkage kit, page 30
- \*ZK 20 Clamp for 18...20 mm Ø
- S1, S2 Auxiliary switches, page 22
- SZS Mid-position switch, page 23
- P... Feedback potentiometer, page 24

#### Mounting instructions, page 36

#### Important

Read the notes about the use and torque requirements of the damper motors on page 1.

#### Dimensions

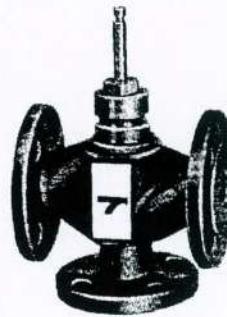




## Three-Port Seat Valves PN10

VXF31...

Scale 1:5



Flange valves made from cast iron, sizes DN25...150.

- Nominal stroke 20 mm for DN25...80
  - Nominal stroke 40 mm for DN100...150
- For use with electric actuators.

**Application**

Suitable for use as control or changeover valves in heating, ventilating and air conditioning systems.

**Permissible fluids**

- Hot water: 120 °C max.
- Chilled water: -15 °C max., in closed systems only (for spindle heating refer to "Accessories")
- Water with the following additives:
  - Oxygen absorbing compounds
  - Glycol, up to a maximum of 50% (as anti-freeze)

**Operating pressure:** 1000 kPa (10 bar) max.**Summary of Types**

| Valves<br>DN<br>size<br>mm | Type<br>reference | k <sub>vs</sub> -<br>value<br>m <sup>3</sup> /h | Rangea-<br>bility<br>k <sub>vs</sub> /K <sub>vr</sub> | Nominal |                                                           | Actuators    |                  | SKB...                                              |        | SKC...                                              |        |                                                     |
|----------------------------|-------------------|-------------------------------------------------|-------------------------------------------------------|---------|-----------------------------------------------------------|--------------|------------------|-----------------------------------------------------|--------|-----------------------------------------------------|--------|-----------------------------------------------------|
|                            |                   |                                                 |                                                       | mixing  | max. ΔP <sub>v100</sub> in kPa <sup>1)</sup><br>diverting | stroke<br>mm | SKD...<br>mixing | ΔP <sub>max</sub> in kPa <sup>1)</sup><br>diverting | mixing | ΔP <sub>max</sub> in kPa <sup>1)</sup><br>diverting | mixing | ΔP <sub>max</sub> in kPa <sup>1)</sup><br>diverting |
| 25/20                      | VXF31.24          | 5                                               | > 50                                                  | 100     | 100                                                       | 20           | 100              | 100                                                 | 100    | 100                                                 | -      | -                                                   |
| 25                         | VXF31.25          | 7,5                                             | > 50                                                  | 100     | 100                                                       | 20           | 100              | 100                                                 | 100    | 100                                                 | -      | -                                                   |
| 40/32                      | VXF31.39          | 12                                              | > 50                                                  | 100     | 100                                                       | 20           | 100              | 100                                                 | 100    | 100                                                 | -      | -                                                   |
| 40                         | VXF31.40          | 19                                              | >100                                                  | 100     | 100                                                       | 20           | 100              | 100                                                 | 100    | 100                                                 | -      | -                                                   |
| 50                         | VXF31.50          | 31                                              | >100                                                  | 100     | 100                                                       | 20           | 100              | 100                                                 | 100    | 100                                                 | -      | -                                                   |
| 65                         | VXF31.65          | 49                                              | >100                                                  | 100     | 100                                                       | 20           | 60               | 60                                                  | 100    | 100                                                 | -      | -                                                   |
| 80                         | VXF31.80          | 78                                              | >100                                                  | 80      | 70                                                        | 20           | 40               | 40                                                  | 80     | 70                                                  | -      | -                                                   |
| 100                        | VXF31.90          | 124                                             | >100                                                  | 70      | 70                                                        | 40           | -                | -                                                   | -      | -                                                   | 70     | 70                                                  |
| 125                        | VXF31.91          | 200                                             | >100                                                  | 60      | 60                                                        | 40           | -                | -                                                   | -      | -                                                   | 60     | 60                                                  |
| 150                        | VXF31.92          | 300                                             | >100                                                  | 50      | 50                                                        | 40           | -                | -                                                   | -      | -                                                   | 50     | 50                                                  |

 Reduced k<sub>vs</sub>-value, corresponding to that of the valve size indicated  
Nominal size of valve

**Explanation**

- 1) 100 kPa = 1 bar = 10 mWG
- max. ΔP<sub>v100</sub> = max. permissible differential pressure across open valve
- ΔP<sub>v100</sub> = differential pressure across fully open valve in installation with full load
- ΔP<sub>max</sub> = max. permissible differential pressure across closed valve

k<sub>vs</sub> = nominal flow value of valve in m<sup>3</sup>/h at nominal stroke and a pressure drop of 1 bar

k<sub>vr</sub> = smallest flow value in m<sup>3</sup>/h for a pressure drop of 1 bar at which the flow characteristic tolerances are still maintained

**Accessories**

Electric spindle heating element;  
required for fluid temperatures below 0°C

ASZ6.5

**Ordering**

When ordering, please give designation and type reference,  
e.g.: Three-port valve VXF31.24.

**Actuators**

The VXF31... valves may be operated with the following actuators:

| Type   | Stroke | Data Sheet   |
|--------|--------|--------------|
| SKB... | 20 mm  |              |
| SKC... | 40 mm  |              |
| SKD... | 20 mm  |              |
| SQX... | 20 mm  |              |
|        |        | { 4500..4599 |

## Technical Data

Flow characteristic  
Through-port

$n_{\text{gl}} = 3$ , VDI/VDE 2173  
(equal percentage, corrected for  
a large controllable range)  
linear  
see «Summary of Types»

Bypass  
Rangeability

Leakage

Through-port

Bypass

Flange dimensions

Stroke, up to DN 80

Stroke, from DN100

Weight

max. 0.05% of  $K_{vs}$ -value  
approx. 2% of  $K_{vs}$ -value  
ISO 7005

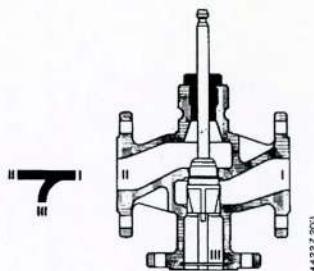
20 mm

40 mm

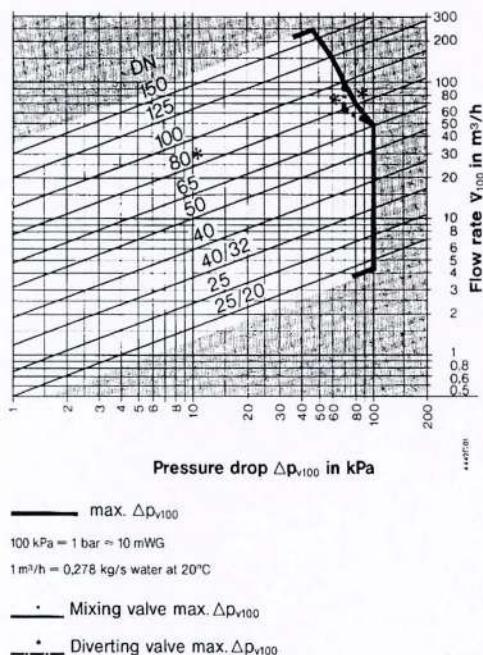
see «Dimensions»

Other features:

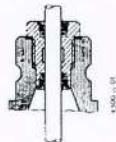
Valve body with  
machined seat



## Sizing



Sealing gland with double O-ring  
and dirt protection strip.  
The sealing gland may be replaced  
without removal of the valve.



## Accessories

Electric spindle heating element; this is required for fluid temperatures below 0°C.

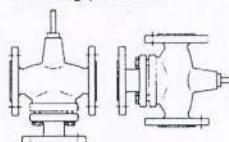
## Application Guide

Suitable for use as a mixing or diverting valve. The first is to be preferred (less noise). The bypass may not be used as a controlled through-port. The use of a strainer in the line is recommended. When using the valve for cold fluids, it should be protected against corrosion by condensed water (by means of paint or lagging).

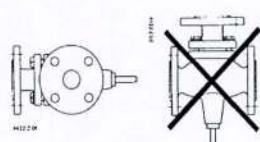
Accessories: Electric spindle heating element for cooling media below 0°C.

## Mounting and Installation Guide

Mounting positions:



Permitted



Not permitted

Care must be taken to see that the valve is installed  
with the flow in accordance with the flow sign on the valve body.



Used as a mixing valve: From II and III to I  
Used as a diverting valve: From I to II and III

Mounting instructions are supplied with every valve.

## Commissioning Guide

Spindle moves in: Through-port opens, bypass closes.  
Spindle moves out: Through-port closes, bypass opens.

## Design Features

Valve and actuator are delivered separately; assembly is straightforward, neither special tools nor adjustments are required.

The valve bodies are made from GG20 cast iron. The spindle is made from stainless steel.

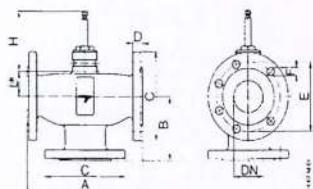
Parabolic plug:

— DN 25...80 brass

— DN 100...150 gun metal

The valves are delivered without counter-flanges and without flange gaskets.

## Dimensions



\* Connection dimension for actuator

Dimensions in mm

CE1N4442 E

| DN  | A   | B   | C   | D  | E   | F       | H     | L*  | Weight in kg |
|-----|-----|-----|-----|----|-----|---------|-------|-----|--------------|
| 25  | 160 | 80  | 115 | 16 | 85  | 14 (4x) | 96,5  | 34  | 4,6          |
| 40  | 200 | 100 | 150 | 18 | 110 | 19 (4x) | 96,5  | 39  | 8,0          |
| 50  | 230 | 115 | 165 | 20 | 125 | 19 (4x) | 96,5  | 39  | 11,7         |
| 65  | 290 | 145 | 185 | 20 | 145 | 19 (4x) | 96,5  | 60  | 14,7         |
| 80  | 310 | 155 | 200 | 22 | 160 | 19 (8x) | 96,5  | 60  | 18,8         |
| 100 | 350 | 175 | 220 | 19 | 180 | 19 (8x) | 116,5 | 91  | 29           |
| 125 | 400 | 200 | 250 | 26 | 210 | 19 (8x) | 116,5 | 102 | 42           |
| 150 | 480 | 240 | 285 | 26 | 240 | 23 (8x) | 116,5 | 118 | 61           |

For height of actuators see Data Sheets 4500...4599.

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0,59404 H

**VALVES AND ACTUATORS****2 and 3-Port Motorised Screwed Seat Valves**

Spring return available on SKB, SKC, SKD motors

SQS SKD SKB SKC SQX

Design  
Characteristics  
and ConnectionsSize  
mm

Ref

 $k_{vs}$ 

VVG41...

**VVG41...** 2 Port seat  
valve 120°C max.  
**water.** Complete with  
ALG...couplings  
suitable for 16 bar.

|    |      |      |   |   |   |
|----|------|------|---|---|---|
| 15 | 11 C | 0.63 | X | X | X |
| 15 | 12 C | 1    | X | X | X |
| 15 | 13 C | 1.6  | X | X | X |
| 15 | 14 C | 2.5  | X | X | X |
| 15 | 15 C | 4    | X | X | X |
| 20 | 20 C | 6.3  | X | X | X |
| 25 | 25 C | 10   | X | X | X |
| 32 | 32 C | 16   | X | X | X |
| 40 | 40 C | 25   | X | X | X |
| 50 | 50 C | 40   | X | X | X |

Data Sheet 4363



VXG41...

**VXG41...** 3 Port seat  
valve 120°C max.  
**water.** Complete with  
ALG...couplings  
suitable for 16 bar.

|    |        |     |   |   |   |
|----|--------|-----|---|---|---|
| 15 | 1301 C | 1.6 | X | X | X |
| 15 | 1401 C | 2.5 | X | X | X |
| 15 | 15 C   | 4   | X | X | X |
| 20 | 20 C   | 6.3 | X | X | X |
| 25 | 25 C   | 10  | X | X | X |
| 32 | 32 C   | 16  | X | X | X |
| 40 | 40 C   | 25  | X | X | X |
| 50 | 50 C   | 40  | X | X | X |

Data Sheet 4463



VVG44...

**VVG44...** 2 Port  
seat valve 120°C max.  
**water.** Complete with  
ALG...couplings  
suitable for 16 bar.

|    |           |      |   |  |  |
|----|-----------|------|---|--|--|
| 15 | 15-0.25 C | 0.25 | X |  |  |
| 15 | 15-0.4 C  | 0.4  | X |  |  |
| 15 | 15-0.63 C | 0.63 | X |  |  |
| 15 | 15-1.0 C  | 1.0  | X |  |  |
| 15 | 15-1.6 C  | 1.6  | X |  |  |
| 15 | 15-2.5 C  | 2.5  | X |  |  |
| 15 | 15-4 C    | 4    | X |  |  |
| 20 | 20-6.3 C  | 6.3  | X |  |  |
| 25 | 25-10 C   | 10   | X |  |  |
| 32 | 32-16 C   | 16   | X |  |  |
| 40 | 40-25 C   | 25   | X |  |  |

Data Sheet 4364



VXG44...

**VXG44...** 3 Port  
seat valve 120°C max.  
**water.** Complete with  
ALG...couplings  
suitable for 16 bar.

|    |           |      |   |  |  |
|----|-----------|------|---|--|--|
| 15 | 15-0.25 C | 0.25 | X |  |  |
| 15 | 15-0.4 C  | 0.4  | X |  |  |
| 15 | 15-0.63 C | 0.63 | X |  |  |
| 15 | 15-1.0 C  | 1.0  | X |  |  |
| 15 | 15-1.6 C  | 1.6  | X |  |  |
| 15 | 15-2.5 C  | 2.5  | X |  |  |
| 15 | 15-4 C    | 4    | X |  |  |
| 20 | 20-6.3 C  | 6.3  | X |  |  |
| 25 | 25-10 C   | 10   | X |  |  |
| 32 | 32-16 C   | 16   | X |  |  |
| 40 | 40-25 C   | 25   | X |  |  |

Data Sheet 4464

Please refer to pages 4.15...4.20 for actuator control signal options

## VALVES AND ACTUATORS

### 2, 3 and 4-Port Motorised Screwed Seat Valves

SQS SKD SKB SKC SQX

| Design Characteristics and Connections                                                   | Size mm                          | Ref                                                | $K_{vs}$                                 |                            |
|------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------------|------------------------------------------|----------------------------|
|         |                                  |                                                    |                                          |                            |
| <b>VMP43... 2 Port valve 90°C max. water.</b><br>Screwed externally suitable for 16 Bar. | 15<br>15<br>15<br>15<br>20<br>20 | 09(2)<br>10(2)<br>11(2)<br>12(2)<br>13(2)<br>14(2) | 0.25<br>0.4<br>0.63<br>1.0<br>1.6<br>2.5 | X<br>X<br>X<br>X<br>X<br>X |
| Data Sheet 4841                                                                          |                                  |                                                    |                                          |                            |
|         |                                  |                                                    |                                          |                            |
| <b>VMP43... 3 Port valve 90°C max. water.</b><br>Screwed externally suitable for 16 Bar. | 15<br>15<br>15<br>15<br>20<br>20 | 09<br>10<br>11<br>12<br>13<br>14                   | 0.25<br>0.4<br>0.63<br>1.0<br>1.6<br>2.5 | X<br>X<br>X<br>X<br>X<br>X |
| Data Sheet 4841                                                                          |                                  |                                                    |                                          |                            |
|        |                                  |                                                    |                                          |                            |
| <b>VMP43... 4 Port valve 90°C max. water.</b><br>Screwed externally suitable for 16 Bar. | 15<br>15<br>15<br>15<br>20<br>20 | 09(4)<br>10(4)<br>11(4)<br>12(4)<br>13(4)<br>14(4) | 0.25<br>0.4<br>0.63<br>1.0<br>1.6<br>2.5 | X<br>X<br>X<br>X<br>X<br>X |
| Data Sheet 4841                                                                          |                                  |                                                    |                                          |                            |
|       |                                  |                                                    |                                          |                            |
| <b>VMP44... 2 Port valve 90°C max. water.</b><br>Screwed externally suitable for 16 Bar. | 15<br>15<br>15<br>15<br>20<br>20 | 09(2)<br>10(2)<br>11(2)<br>12(2)<br>13(2)<br>14(2) | 0.25<br>0.4<br>0.63<br>1.0<br>1.6<br>2.5 | X<br>X<br>X<br>X<br>X<br>X |
| Data Sheet 4844                                                                          |                                  |                                                    |                                          |                            |
|       |                                  |                                                    |                                          |                            |
| <b>VMP44... 3 Port valve 90°C max. water.</b><br>Screwed externally suitable for 16 Bar. | 15<br>15<br>15<br>15<br>20<br>20 | 09(4)<br>10(4)<br>11(4)<br>12(4)<br>13(4)<br>14(4) | 0.25<br>0.4<br>0.63<br>1.0<br>1.6<br>2.5 | X<br>X<br>X<br>X<br>X<br>X |
| Data Sheet 4844                                                                          |                                  |                                                    |                                          |                            |
|       |                                  |                                                    |                                          |                            |
| <b>VMP44... 4 Port valve 90°C max. water.</b><br>Screwed externally suitable for 16 Bar. | 15<br>15<br>15<br>15<br>20<br>20 | 09(4)<br>10(4)<br>11(4)<br>12(4)<br>13(4)<br>14(4) | 0.25<br>0.4<br>0.63<br>1.0<br>1.6<br>2.5 | X<br>X<br>X<br>X<br>X<br>X |
| Data Sheet 4844                                                                          |                                  |                                                    |                                          |                            |

Please refer to pages 4.15...4.20 for actuator control signal options

## VALVES AND ACTUATORS

## Actuators for Slipper and Butterfly Valves 240V ac

|                                                                                                                                                                                                                                                                                                                                  | Type                                                                         | Data Sheet No.                                                   |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|------------------------------------------------------------------|--|
| SQK.../SQL...                                                                                                                                                                                                                                                                                                                    |                                                                              |                                                                  |  |
| - Operating Voltage: 240V ac<br>- 3-position control<br>- Operating positions<br>– automatic or manual<br>- Turning angle: 90°C<br>- for slipper and butterfly valves                                                                                                                                                            |                                                                              |                                                                  |  |
| Power consumption: 3VA<br>Running time: 125 sec<br>Without space for auxiliary units                                                                                                                                                                                                                                             | SQK33.00                                                                     | 4506                                                             |  |
| Power consumption: 4VA<br>Running time: 125 sec<br>With space for auxiliary units                                                                                                                                                                                                                                                | SQL33.00                                                                     | 4506                                                             |  |
| Power consumption: 6.5VA<br>Running time: 30 sec<br>With space for auxiliary units                                                                                                                                                                                                                                               | SQL33.03                                                                     | 4506                                                             |  |
| Power consumption: 6.5VA<br>Running time: 125 sec<br>With space for auxiliary units                                                                                                                                                                                                                                              | SQL35.00                                                                     | 4506                                                             |  |
| Power consumption: 3VA<br>Running time: 135 sec<br>With space for auxiliary units                                                                                                                                                                                                                                                | SQK34.00<br>1) 2) 3)                                                         | 4508                                                             |  |
| <b>Accessories</b>                                                                                                                                                                                                                                                                                                               |                                                                              |                                                                  |  |
| - Mounting set (console):<br>– For valves VBF21.65 to VBF21.150<br>– For valves VBF21.40 and VBF21.50/<br>VBG31...<br>– For valves K1i.../VKF41<br>– For valves VKF45...<br>- Auxiliary Units:<br>– 1 potentiometer 0..1000Ω and<br>1 auxiliary switch<br>– 2 auxiliary switches<br>– 1 auxiliary switch<br>– 1 auxiliary switch | ASK31<br>ASK32<br>ASK33<br>ASK35<br><br>ASZ7.4<br>ASC9.4<br>ASC9.5<br>ASC9.7 | 4506<br>4506<br>4506<br>4506<br><br>4506<br>4506<br>4506<br>4508 |  |

- 1) SQK34.00 does not require a mounting set  
 2) SQK34.00 only accepts 1 auxiliary unit, the ASC9.7  
 3) SQK34.00 is only suitable for slipper valves up to 50mm

## VALVES AND ACTUATORS

### Actuators for Slipper and Butterfly Valves 24V ac

|                                                                                                                                                                                                                                                                                                           | Type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Data Sheet No. |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| SQK.../SQL...                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |
| <ul style="list-style-type: none"> <li>- Operating Voltage: 24V ac</li> <li>- 3-position control</li> <li>- Operating positions:           <ul style="list-style-type: none"> <li>- automatic or manual</li> <li>- Turning angle: 90°C</li> <li>- for slipper and butterfly valves</li> </ul> </li> </ul> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |
|                                                                                                                                                                                                                          | Power consumption: 4VA<br>Running time: 125 sec<br>With space for auxillary units                                                                                                                                                                                                                                                                                                                                                                                                                                   | SQL83.00 4507  |
| SQL83.00                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |
|                                                                                                                                                                                                                         | Power consumption: 6.5VA<br>Running time: 30 sec<br>With space for auxilliary units                                                                                                                                                                                                                                                                                                                                                                                                                                 | SQL83.03 4507  |
| SQL83.03                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |
|                                                                                                                                                                                                                        | Power consumption: 6.5VA<br>Running time: 125 sec<br>With space for auxillary units                                                                                                                                                                                                                                                                                                                                                                                                                                 | SQL85.00 4507  |
| SQL85.00                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |
| <b>Accessories</b>                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                |
|                                                                                                                                                                                                                                                                                                           | <ul style="list-style-type: none"> <li>- Mounting set (console):           <ul style="list-style-type: none"> <li>- for valves VBF21.65 to VBF21.150</li> <li>- for valves VBF21.40 and VBF21.50/VBG31...</li> <li>- for valves K1i.../VKF41...</li> <li>- for valves VKF45...</li> </ul> </li> <li>- Auxilliary units:           <ul style="list-style-type: none"> <li>- 1 potentiometer 0...1000Ω and 1 auxilliary switch</li> <li>- 2 auxilliary switches</li> <li>- 1 auxilliary switch</li> </ul> </li> </ul> |                |
| ASK31                                                                                                                                                                                                                                                                                                     | 4507                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |
| ASK32                                                                                                                                                                                                                                                                                                     | 4507                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |
| ASK33                                                                                                                                                                                                                                                                                                     | 4507                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |
| ASK35                                                                                                                                                                                                                                                                                                     | 4507                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |
| ASZ7.4                                                                                                                                                                                                                                                                                                    | 4507                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |
| ASC9.4                                                                                                                                                                                                                                                                                                    | 4507                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |
| ASC9.5                                                                                                                                                                                                                                                                                                    | 4507                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |

**VALVES AND ACTUATORS****Actuators for Seat Valves 24V ac – 3 position control**

SQX81...



SKD82...



SKB82...



SKC82...



ASC9.3

| Type | Data Sheet No. |
|------|----------------|
|------|----------------|

**Electro – Mechanical Actuators**

Power consumption: 3VA  
 Running time: 150 sec  
 Stroke: 20mm  
 Space for auxilliary units

|          |      |
|----------|------|
| SQX81.00 | 4552 |
|----------|------|

Power consumption: 6.5VA  
 Running time: 35 sec  
 Stroke: 20mm  
 Space for auxilliary units

|          |      |
|----------|------|
| SQX81.03 | 4552 |
|----------|------|

**Accessories**

Potentiometer and auxilliary switch  
 Double auxilliary switch  
 Auxilliary switch

|        |      |
|--------|------|
| ASZ7.4 | 4552 |
| ASC9.4 | 4552 |
| ASC9.5 | 4552 |

**Electro – Hydraulic Actuators**

Power consumption: 10VA  
 Running time: 2 min  
 Stroke: 20mm  
 Space for: 1 potentiometer and double auxilliary switch

|          |      |
|----------|------|
| SKD82.50 | 4562 |
|----------|------|

**With spring return**

Power consumption: 15VA  
 Running time: 2 min  
 Stroke: 20mm  
 Space for: 1 potentiometer and double auxilliary switch  
 Return time: 8 sec

|          |      |
|----------|------|
| SKD82.51 | 4562 |
|----------|------|

Power consumption: 10VA  
 Running time: 2 min  
 Stroke: 20mm  
 Standard built in: 2 auxilliary switches  
 Space for: 1 potentiometer

|          |      |
|----------|------|
| SKB82.50 | 4565 |
|----------|------|

**With spring return**

Power consumption: 15VA  
 Running time: 2 min  
 Stroke: 20mm  
 Standard built in: 2 auxilliary switches  
 Space for: 1 potentiometer  
 Return time: 10 sec

|          |      |
|----------|------|
| SKB82.51 | 4565 |
|----------|------|

Power consumption: 19VA  
 Running time: 2 min  
 Stroke: 40mm  
 Standard built in: 2 auxilliary switches  
 Space for: 1 potentiometer

|          |      |
|----------|------|
| SKC82.60 | 4565 |
|----------|------|

**With spring return**

Power consumption: 24VA  
 Running time: 2 min  
 Stroke: 40mm  
 Standard built in: 2 auxilliary switches  
 Space for: 1 potentiometer  
 Return time: 18 sec

|          |      |
|----------|------|
| SKC82.61 | 4565 |
|----------|------|

**Accessories:**

Potentiometer 1000Ω for SKB/C/D32...  
 Double auxilliary switch for SKB/C/D32...  
 Stroke inverter for SKD...  
 Stroke inverter for SKB...

|        |  |
|--------|--|
| ASZ7.3 |  |
| ASC9.3 |  |
| ASK50  |  |
| ASK51  |  |

## VALVES AND ACTUATORS

| Type | Data Sheet No. |
|------|----------------|
|------|----------------|

**Actuators for Seat Valves 24V ac - Modulated Control****Electro - Hydraulic Actuators  
0..10V dc control signal**

SKD62

Power consumption: 18VA  
 Potentiometer input: 0...1000Ω  
 Stroke: 20mm  
 Running time: 30 sec  
 Spring return time: 15 sec

SKD62

4563

Power consumption: 18VA  
 Potentiometer input: 0...1000Ω  
 Stroke: 20mm  
 Running time: 120 sec  
 Spring return time: 15 sec

SKB62

4566

Power consumption: 28VA  
 Potentiometer input: 0...1000Ω  
 Stroke: 40mm  
 Running time: 120 sec  
 Spring return time: 20 sec

SKC62

4566

**Accessories:**

Stroke inverter for SKD62  
 SKB62  
 Auxilliary switch for SKD62  
 Stroke limiter for SKD62

ASK50

ASK51

ASC1.6

ASZ62.6

Spindle heating element 24V ac 20W (SKB/C62)  
 Mounting console for VVG/VXG45  
 and X3ir (SQS...)

ASZ6.5

ASK30



ASZ62.6



SQB21.1

**Air Damper Actuators – 2 & 3 Position Control****2 – position**

With spring return  
 Action: Rotary  
 Power consumption:  
 Opening: 25VA  
 Holding: 6A  
 Running time: 80 sec  
 Spring return time: 30 sec  
 Torque: 12 Nm  
 With space for auxilliaries  
 Operating voltage: 240V ac  
 24V ac

SQB21.1

4645



SQR81.1

**3 – position**

Without spring return  
 Action: Rotary  
 Power consumption:  
 Running time: 150 sec  
 Torque: 12 Nm  
 Operating voltage: 24V ac

SQR81.1

4664



SQR81.2

**3 – position**

Without spring return  
 Action: Linear  
 Power consumption:  
 Running time: 150 sec  
 Force: 200N  
 Operating voltage: 24V ac

SQR81.2

4665

## **VALVES AND ACTUATORS**

Type Data Sheet  
No.

**Air Damper Actuators – Modulated Control (cont.)**

|                                    |            |          |      |
|------------------------------------|------------|----------|------|
| Action:                            | Linear     |          |      |
| Control input:                     | 0...10V dc |          |      |
| Power consumption:                 | 3VA        |          |      |
| Running time:                      | 150 sec    |          |      |
| Nominal force:                     | 400 N      |          |      |
| Operating voltage:                 | 24V ac     |          |      |
| With space for auxilliary units    |            | SQR65.2  | 4670 |
| With adjustable start & end points |            | SQR65.28 | 4672 |

Without spring return

|                    |            |         |      |
|--------------------|------------|---------|------|
| Action:            | Rotary     |         |      |
| Control input:     | 0...10V dc |         |      |
| Power consumption: | 3VA        |         |      |
| Running time:      | 125 sec    |         |      |
| Torque:            | 3 Nm       |         |      |
| Operating voltage: | 24V ac     |         |      |
|                    | 24V ac     | SQE61.1 | 4685 |
|                    |            | SQE62.1 | 4685 |

Without spring return

|                    |            |         |      |
|--------------------|------------|---------|------|
| Action:            | Linear     |         |      |
| Control input:     | 0...10V dc |         |      |
| Power consumption: | 3VA        |         |      |
| Running time:      | 125 sec    |         |      |
| Force:             | 75 N       |         |      |
| Operating voltage: | 24V ac     |         |      |
|                    |            | SQE61.2 | 4686 |

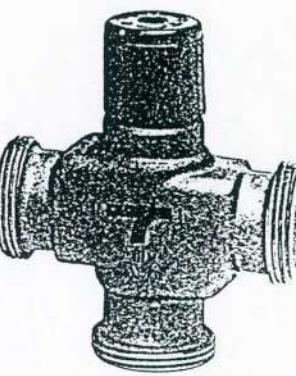
SQR65.2

SQE61.1

SQE61.2



Scale 1:2,5

**Threaded valves made from gun metal, DN15...40**

- Nominal stroke 5.5 mm
- Valve neck for fitting actuator (threaded coupling)
- Manual adjusting knob as standard
- Fittings for connection to pipes are supplied on request.  
For use with electric actuators.

**Application**

Suitable for use as control or changeover valves in small to medium heating systems, as well as in ventilating and air conditioning plants.

**Permissible fluids**

- Water from 5 to 120°C
  - Heating water, domestic hot water
  - Chilled water, mains water
- Water with the following additives:
  - Oxygen absorbing compounds
  - Glycol, up to a maximum of 50% (as anti-freeze)

**Operating pressure**  
Max. 1,600 kPa (16 bar)

**Summary of Types****Valves**

| DN        | Type reference | K <sub>vs</sub> -value<br>m <sup>3</sup> /h | Range-ability<br>K <sub>vs</sub> /K <sub>vr</sub> | Max Δp <sub>v100</sub><br>kPa <sup>1)</sup> | Δp <sub>max</sub><br>kPa <sup>1)</sup> | Fittings<br>Type reference |
|-----------|----------------|---------------------------------------------|---------------------------------------------------|---------------------------------------------|----------------------------------------|----------------------------|
| Inch. mm  |                |                                             |                                                   |                                             |                                        |                            |
| 1/2" 15   | VXG44.15-0.25  | 0.25                                        | > 50                                              | 400                                         | 400                                    | ALG15                      |
| 1/2" 15   | VXG44.15-0.4   | 0.4                                         | > 50                                              | 400                                         | 400                                    | ALG15                      |
| 1/2" 15   | VXG44.15-0.63  | 0.63                                        | > 50                                              | 400                                         | 400                                    | ALG15                      |
| 1/2" 15   | VXG44.15-1     | 1                                           | > 50                                              | 400                                         | 400                                    | ALG15                      |
| 1/2" 15   | VXG44.15-1.6   | 1.6                                         | >100                                              | 400                                         | 400                                    | ALG15                      |
| 1/2" 15   | VXG44.15-2.5   | 2.5                                         | >100                                              | 400                                         | 400                                    | ALG15                      |
| 1/2" 15   | VXG44.15-4     | 4                                           | >100                                              | 400                                         | 400                                    | ALG15                      |
| 3/4" 20   | VXG44.20-6.3   | 6.3                                         | >100                                              | 300                                         | 300                                    | ALG20                      |
| 1" 25     | VXG44.25-10    | 10                                          | >100                                              | 200                                         | 200                                    | ALG25                      |
| 1 1/4" 32 | VXG44.32-16    | 16                                          | >100                                              | 100                                         | 100                                    | ALG32                      |
| 1 1/2" 40 | VXG44.40-25    | 25                                          | >100                                              | 60                                          | 60                                     | ALG40                      |

**Explanations**

- 1) 100 kPa = 1 bar ≈ 10 mWG  
 max. Δp<sub>v100</sub> = max. permissible differential pressure across fully open valve  
 Δp<sub>max</sub> = max. permissible differential pressure across closed valve  
 K<sub>vs</sub> = nominal flow value of valve with valve fully open and a pressure drop of 1 bar  
 K<sub>vr</sub> = smallest flow value of valve in m<sup>3</sup>/h for a pressure drop of 1 bar at which the flow characteristic tolerances are still maintained

**Ordering**

When ordering, please give designation and type reference of valve and, if required, of fittings, e.g.: Three-port seat valve type VXG44.15-4 and quantity of ALG15 fittings.

The fittings are to be ordered separately. They are also packed separately.

**Actuators**

The VXG44...valves are suitable for use with actuators that have

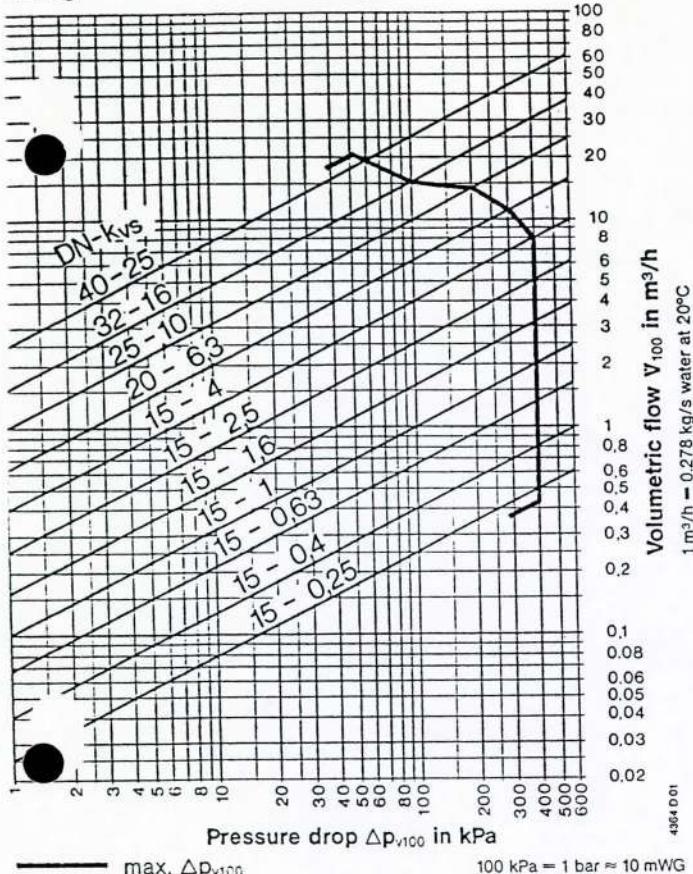
- 5.5 nominal stroke, and
- a threaded coupling ring for fitting the actuator

Refer to Data Sheets 4500...4599.

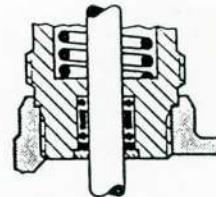
**Technical Data**

|                      |                                          |
|----------------------|------------------------------------------|
| Flow characteristic  | linear                                   |
| Throughport          | linear                                   |
| Bypass               |                                          |
| Leakage rate         |                                          |
| Throughport          | C <sub>1</sub> , C <sub>2</sub> DIN 3202 |
| Bypass               | C <sub>1</sub> , C <sub>2</sub> DIN 3202 |
| Threaded connections |                                          |
| Valve body           | G 1/2", G 3/4"                           |
| Fittings             | G 1/2", G 3/4"                           |
| Nominal stroke       | 5.5 mm                                   |
| Dimensions           | see Order-Dimension                      |
| Weight               |                                          |

## Sizing



Sealing gland with double O-ring and dirt protection strip.



4.04.2.01

### Accessory

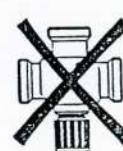
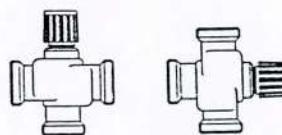
Fittings made from galvanised malleable cast iron, and flat seals to ISO 7/1.

### Application Guide

Recommended as a mixing valve from II and III to I (also refer to «Mounting and Installation Guide»).

### Mounting and Installation Guide

Mounting positions:



Not permitted

When mounting the valve, care must be taken that the arrow on the valve body corresponds with the flow direction.

Mixing: From II and III to I  
Diverting: From I to II and III

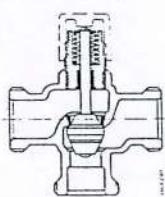
Mounting instructions are supplied with every valve.

### Design Features

The valve bodies are made from gun metal; plug and spindle are made from stainless steel. The valve is provided with a valve neck for fitting the actuator to the valve using a threaded coupling. Manual adjusting knob as standard.

The valve (throughport) is opened by the actuator and closed by the built-in return spring.

Assembly of valve and actuator is straightforward, neither special tools nor adjustments are required.



Other features:

Stainless steel seat for sizes up to DN 20.

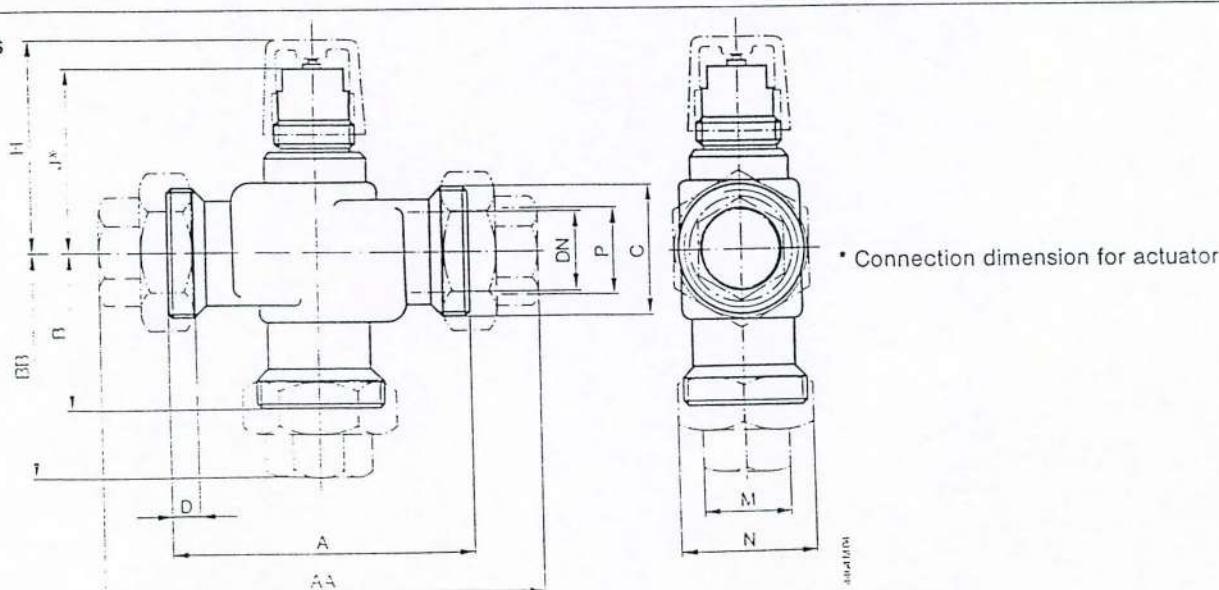
Machined seat for sizes DN25 and larger.

### Commissioning Guide

Spindle moves in: Throughport opens, bypass closes.

Spindle moves out: Throughport closes, bypass opens.

Dimensions

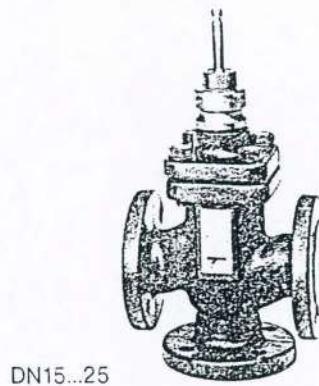


| N<br>in.<br>mm | A   | AA  | B    | SE  | C     | D   | H    | J*   | M  | N  | P<br>O  | Weight<br>in kg |      |
|----------------|-----|-----|------|-----|-------|-----|------|------|----|----|---------|-----------------|------|
|                |     |     |      |     |       |     |      |      |    |    |         | VXG44... ALG... |      |
| 15             | 100 | 150 | 50   | 7.3 | G 1"  | 8.5 | 63   | 53   | 25 | 41 | Rp 1½"  | 0.5             | 0.10 |
| 20             | 100 | 152 | 50   | 7.8 | G 1¼" | 9   | 69.5 | 59.5 | 32 | 50 | Rp 3/4" | 0.85            | 0.16 |
| 25             | 105 | 160 | 52.5 | 8.0 | G 1½" | 11  | 72.5 | 62.5 | 38 | 54 | Rp 1"   | 1.20            | 0.23 |
| 32             | 105 | 170 | 52.5 | 8.5 | G 2"  | 11  | 79   | 69   | 47 | 66 | Rp 1¼"  | 1.60            | 0.37 |
| 40             | 130 | 198 | 65   | 9.9 | G 2½" | 11  | 82   | 72   | 53 | 73 | Rp 1½"  | 2.30            | 0.46 |

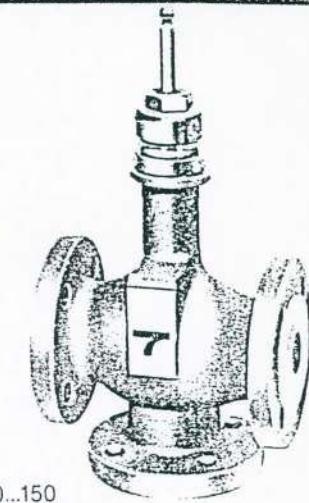
## Three-port flange seal valves EN1034

VXF61

Scale 1:5



DN15...25



DN40...150

Flange valves made from cast steel, sizes DN15...150.

- Nominal stroke 20 mm for DN15...50
  - Nominal stroke 40 mm for DN65...150
- For use with electric actuators.

**Application**

Suitable for use as control or changeover valves in district heating, heating, ventilating and air conditioning systems.

**Permissible fluids**

- Hot water: Max. 220°C
- Chilled water: Max. -15°C, in closed systems only (for spindle heating refer to «Accessories»)

- Water with the following additives:
  - Oxygen absorbing compounds
  - Glycol, up to a maximum of 50% (as anti-freeze)
  - Hot oil up to max. 350°C !)
  - Refrigerants R12, R22, R502 !) (for spindle heating refer to «Accessories»)

! Note special sealing gland required

**Operating pressures for given temperature ranges**

|                                               |
|-----------------------------------------------|
| Max. 120°C: Max. 4000 kPa (40 bar)            |
| >120...200°C: Max. 3200 kPa (32 bar)          |
| >200...250°C: Max. 2800 kPa (28 bar)          |
| >250...300°C: Max. 2400 kPa (24 bar)          |
| Hot oil: >300...350°C: Max. 1000 kPa (10 bar) |

**Summary of Types**

| Valves<br>DN<br>size<br>mm | Type<br>reference | k <sub>vs</sub> -<br>value<br>m <sup>3</sup> /h | Rangea-<br>bility<br>k <sub>vs</sub> /k <sub>vs</sub> | max. Δp <sub>mixing</sub><br>in kPa <sup>1)</sup> | Nominal<br>stroke<br>mm | Actuators                                              |           |                                                        | SKC...<br>Δp <sub>mixing</sub><br>in kPa <sup>1)</sup> | SKC...<br>Δp <sub>mixing</sub><br>in kPa <sup>1)</sup> |     |
|----------------------------|-------------------|-------------------------------------------------|-------------------------------------------------------|---------------------------------------------------|-------------------------|--------------------------------------------------------|-----------|--------------------------------------------------------|--------------------------------------------------------|--------------------------------------------------------|-----|
|                            |                   |                                                 |                                                       |                                                   |                         | SKD...<br>Δp <sub>mixing</sub><br>in kPa <sup>1)</sup> | diverting | SKB...<br>Δp <sub>mixing</sub><br>in kPa <sup>1)</sup> | diverting                                              |                                                        |     |
| 15/10                      | VXF61.14          | 1,9                                             | > 50                                                  | 1600                                              | 500 <sup>2)</sup>       | 20                                                     | 800       | 500                                                    | 1600                                                   | 500                                                    |     |
| 15                         | VXF61.15          | 3                                               | > 50                                                  | 1600                                              | 500 <sup>2)</sup>       | 20                                                     | 800       | 500                                                    | 1600                                                   | 500                                                    |     |
| 25/20                      | VXF61.24          | 5                                               | > 50                                                  | 1600                                              | 500 <sup>2)</sup>       | 20                                                     | 400       | 500                                                    | 1600                                                   | 500                                                    |     |
| 25                         | VXF61.25          | 7,5                                             | > 100                                                 | 1600                                              | 500 <sup>2)</sup>       | 20                                                     | 400       | 500                                                    | 1600                                                   | 500                                                    |     |
| 40/32                      | VXF61.39          | 12                                              | > 50                                                  | 1200                                              | 500 <sup>2)</sup>       | 20                                                     | -         | -                                                      | 1200                                                   | 500                                                    |     |
| 40                         | VXF61.40          | 19                                              | > 100                                                 | 1200                                              | 500 <sup>2)</sup>       | 20                                                     | -         | -                                                      | 1200                                                   | 500                                                    |     |
| 50                         | VXF61.50          | 31                                              | > 100                                                 | 700                                               | 500 <sup>2)</sup>       | 20                                                     | -         | -                                                      | 700                                                    | 500                                                    |     |
| 65                         | VXF61.65          | 49                                              | > 100                                                 | 350                                               | 350                     | 40                                                     | -         | -                                                      | -                                                      | 350                                                    | 350 |
| 80                         | VXF61.80          | 78                                              | > 100                                                 | 250                                               | 250                     | 40                                                     | -         | -                                                      | -                                                      | 250                                                    | 250 |
| 100                        | VXF61.90          | 124                                             | > 100                                                 | 150                                               | 150                     | 40                                                     | -         | -                                                      | -                                                      | 150                                                    | 150 |
| 125                        | VXF61.91          | 200                                             | > 100                                                 | 100                                               | 100                     | 40                                                     | -         | -                                                      | -                                                      | 100                                                    | 100 |
| 150                        | VXF61.92          | 300                                             | > 100                                                 | 70                                                | 70                      | 40                                                     | -         | -                                                      | -                                                      | 70                                                     | 70  |

— Reduced k<sub>vs</sub>-value, corresponding to the valve size indicated  
— Nominal size of valve

**Special versions**

Example:

VXF61.24

Type reference

according to table

With sealing gland for:

- Refrigerants

- Hot oil of &gt;220°C

**Accessories**Spindle heating element  
(required for fluid temperatures <0°C)

ASZ6.5

**Explanations**

!) 100 kPa = 1 bar = 10 m.WG

?) If noise is permitted, the same figures apply  
as with mixing

max. Δp<sub>mixing</sub> = max. permissible differential pressure across fully open valve  
Δp<sub>mixing</sub> = differential pressure across valve in installation with fully open valve  
Δp<sub>max</sub> = max. permissible differential pressure across closed valve  
k<sub>vs</sub> = nominal flow value of valve at 100% of nominal stroke and a pressure drop of 1 bar  
k<sub>vs</sub><sub>min</sub> = smallest flow value of valve at 100% of the pressure drop of 1 bar at which the valve characteristic tolerances are still met

**Ordering**

When ordering, please give designation and type reference together with any type suffix, e.g.: Three-port valve VXF61.242

**Actuators**

The VXF61... valves may be operated with the following actuators:

Type

Stroke

Data Sheet

SKB...

20 mm

SKC...

40 mm

SKD...

20 mm

{}

4500...4599

**Technical Data**

Characteristic through-port

Characteristic bypass

Rangeability

Δp<sub>mixing</sub>Δp<sub>max</sub>

Range dimensions

Stroke, up to DN 50

Stroke, from DN 65

Δp<sub>mixing</sub>

n<sub>g</sub> = 3, VDI/VDE 2173  
(equal percentage, corrected for large controlled Δp<sub>mixing</sub>)  
see «Summary of»

n<sub>g</sub> = 3, VDI/VDE 2173(equal percentage, corrected for large controlled Δp<sub>mixing</sub>)

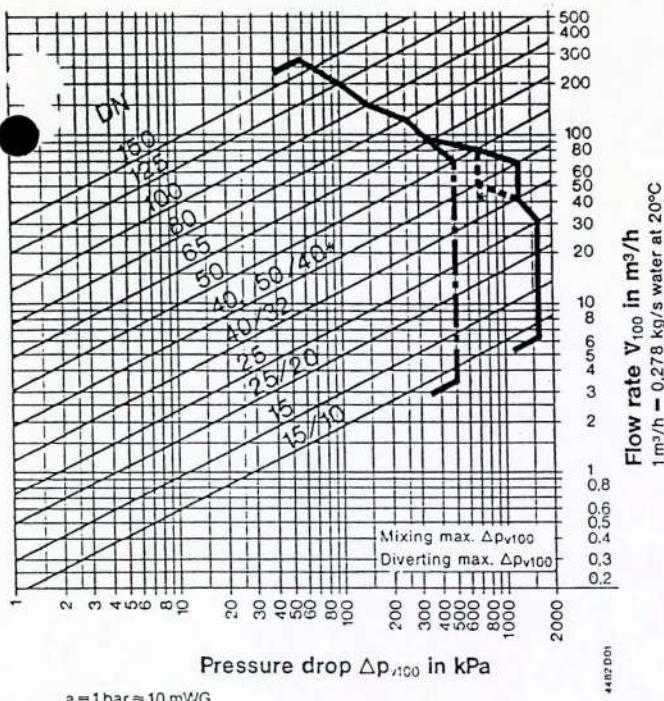
see «Summary of»

n<sub>g</sub> = 3, VDI/VDE 2173(equal percentage, corrected for large controlled Δp<sub>mixing</sub>)

see «Dimensions»

n<sub>g</sub> = 3, VDI/VDE 2173

## Sizing



## Design Features

Valve and actuator are delivered separately; assembly is straightforward, neither special tools nor adjustments are required.

The valve bodies are made from cast steel:

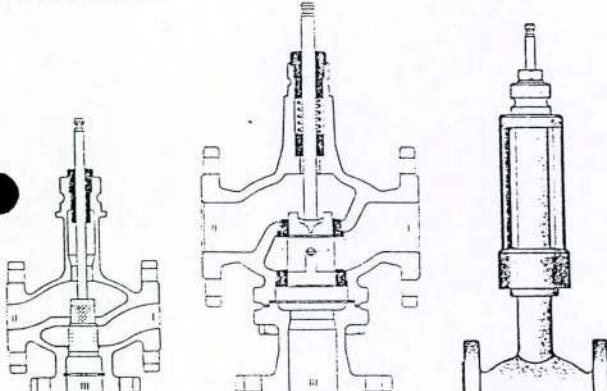
- DN 15 and 25: GS-C25N
- DN 40...150: GS45

Spindle, seat and plug are made from stainless steel.

According to size the plugs may be parabolic, notched or perforated.

Valves are delivered without counter-flanges and without flange gaskets.

Other features:

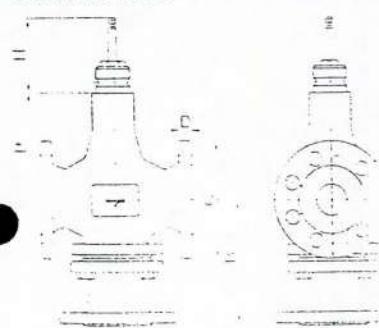


DN 15 and 25  
Valve body with screwed or press-fit seat

DN 40..150

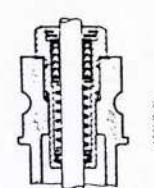
Special thermal insulator for use in hot oil applications, DN 15...150

## Dimensions



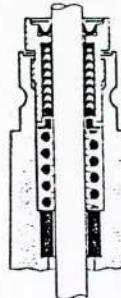
\* Connection dimension for actuator

Sealing gland with self-adjusting Teflon sleeve. Standard and hot oil versions.



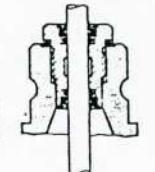
DN 15 and 25

The sealing gland may be replaced without removal of the valve.



DN 40...150

Sealing gland with double O-ring and dirt protection strip. Special version for refrigerants.



DN 15...150

## Special versions of sealing glands

- For hot oil >220°C: With special gland and thermal insulator
- For refrigerants: With special O-ring

## Application Guide

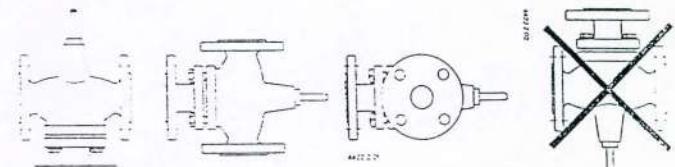
Suitable for use as a mixing or diverting valve. The first is to be preferred (less noise). The bypass cannot be used as a controlled through-port.

The use of a strainer in the line is recommended.

When using the valve for cold fluids, it should be protected against corrosion by condensed water (by means of paint or lagging).

## Mounting and Installation Guide

Mounting positions:



Permitted

Not permitted

Care must be taken to see that the valve is installed with the flow in accordance with the flow sign on the valve body.

Used as a mixing valve: From II and III to I  
Used as a diverting valve: From I to II and III

Mounting instructions are supplied with every valve.

## Commissioning Guide

Spindle moves in: Through-port opens, bypass closes.  
Spindle moves out: Through-port closes, bypass opens.

| DN  | A   | B   | C   | D  | E   | F      | H<br>max. | L*  | Weight<br>in kg |
|-----|-----|-----|-----|----|-----|--------|-----------|-----|-----------------|
| 15  | 130 | 65  | 95  | 16 | 65  | 14(4x) | 96,5      | 96  | 4,5             |
| 25  | 160 | 80  | 115 | 18 | 85  | 18(4x) | 96,5      | 111 | 7,4             |
| 40  | 200 | 162 | 150 | 18 | 110 | 18(4x) | 96,5      | 136 | 17              |
| 50  | 230 | 170 | 165 | 20 | 125 | 18(4x) | 96,5      | 136 | 21              |
| 65  | 290 | 215 | 185 | 22 | 145 | 18(8x) | 116,5     | 162 | 34              |
| 80  | 310 | 230 | 200 | 24 | 160 | 18(8x) | 116,5     | 170 | 42              |
| 100 | 350 | 250 | 235 | 24 | 190 | 22(8x) | 116,5     | 180 | 62              |
| 125 | 400 | 280 | 270 | 26 | 220 | 26(8x) | 116,5     | 200 | 88              |
| 150 | 400 | 305 | 300 | 28 | 250 | 26(8x) | 116,5     | 225 | 124             |

For height of actuators see Data Sheets 4500...4599.

For hot oil versions (type suffix 2) add 180 mm for insulator.

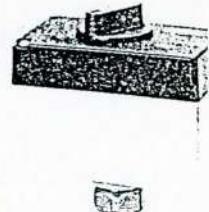
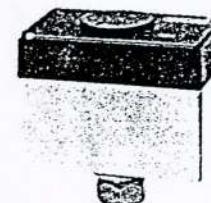
## Valve Actuators

OVERSPEECH  
RECEIVED

1 AUG 1988

JOB NO.

54015



SQS65.5

SQS65

24 V a.c. operating voltage, 0...10 V d.c. control, electric actuator, 5.5 mm nominal stroke, with or without spring return, equal percentage or linear flow characteristic.

**Application**

In heating, ventilating and air conditioning plants for the actuation of Landis & Gyr valves with a stroke of 5.5 mm and a valve neck for fitting the actuator.

| Type of valve | Data Sheet  |
|---------------|-------------|
| Two-port      | 4300...4399 |
| Three-port    | 4400...4499 |

**Summary of Types**

- SQS 65 actuator without spring return  
 SQS 65.5 actuator with spring return

**Ordering**

When ordering, please give designation and type reference, e.g. actuator type SQS 65.

**Technical Data**

|                                |                                    |
|--------------------------------|------------------------------------|
| Operating voltage              | 24 V a.c. +/- 20%                  |
| Frequency                      | 50 Hz, 60 Hz *)                    |
| Power consumption              |                                    |
| SQS 65                         | 3 VA                               |
| SQS 65.5                       | 7 VA                               |
| Mode of control                | 0...10 V d.c.                      |
| Running time for 5.5 mm stroke |                                    |
| SQS 65                         | 35 s                               |
| SQS 65.5                       | 35 s                               |
| Spring return (SQS 65.5 only)  | to DIN 32730                       |
| Spring return time (SQS 65.5)  | approx. 8 s                        |
| Nominal stroke                 | 5.5 mm                             |
| Nominal force                  | 300 N                              |
| Control signal (Y)             |                                    |
| Voltage                        | 0...10 V d.c.<br>(0...100% stroke) |
| Current                        | 0.1 mA                             |
| Control signal (R)             |                                    |
| Resistance                     | 0...1000 Ohm<br>(0...100% stroke)  |

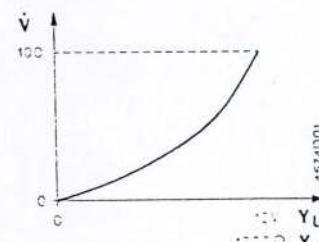
|                                 |                                    |
|---------------------------------|------------------------------------|
| Control output (U)              |                                    |
| Voltage                         | 0...10 V d.c.<br>(0...100% stroke) |
| Current                         | 0.5 mA max.                        |
| Protection standard of housing  | IP54 to DIN 40052 (IEC 52)         |
| Cable entry glands              | Pg 11 (2x)                         |
| Permissible ambient temperature |                                    |
| Operation                       | -15...+50°C                        |
| Transport and storage           | -30...+65°C                        |
| Permissible ambient humidity    | class D to DIN 40040               |
| Weight                          |                                    |
| SQS 65                          | 0.5 kg                             |
| SQS 65.5                        | 0.6 kg                             |

\*) Voltage tolerance at 60 Hz: -15%...+20% (with SQS 65.5 only)

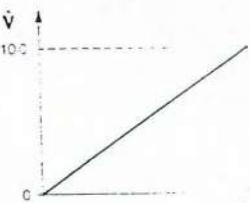
**Function**

The actuator is driven by a 0...10 V d.c. signal received from the controller. In connection with Landis & Gyr seat valves type VVG/VXG4 with linear flow characteristic, the following characteristics are obtained, depending on the position of the selector plug (see under "Commissioning Guide"):

Equal percentage flow characteristic (selector plug position A-C, factory setting)



Linear flow characteristic (selector plug position C-D)



$V$  = Volumetric flow 0...100%  
 $Y_U$  = 0...10 V d.c. control signal  
 $Y_R$  = 0...1000 Ohm positioning signal

Control input R for a 0...1000 Ohm potentiometer permits control of the actuator by a frost protection unit or a remote setting unit, for example.

A position indicating instrument or on/off switch for auxiliary circuit can be connected to control output U (0...10 V d.c.).

The SQS 65.5 is provided with spring return: In the event of a power failure or when operating voltage is switched off, the actuator returns to the closed position, i.e. the valve fully closes.

SQS65  
SQS65.5

## Design Features

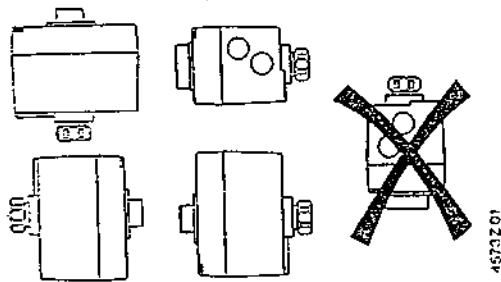
- Maintenance-free electric actuators with reversible motor
- Blocking-proof gear train which can be disengaged with type SGS 65.5 (spring return)
- Final adjusting knob with indication of stroke (actuator type 35.5 only has indication of stroke)
- Housing, cover, manual adjusting knob and stroke indicator are made from plastic
- Selector plug for linear or equal percentage flow characteristic and connecting terminals are located under the housing cover
- Cable entry glands Pg 11 (18.5 mm dia.)

## Application Guide

Data Sheet 3401 contains basic system data on POLYGYR. All hints and explanations given in this sheet must be observed. The permissible ambient conditions (temperatures and humidity) must be observed. For details refer to "Technical Data". The SQS actuators are suitable for use with valves regulating fluids with temperatures up to 130°C. All units connected to terminals Y and U, together with the SQS 65..., must be connected to the same GO. The factory fitted link across terminals R and M may be removed only if a unit is connected between these terminals. Further details relating to the complete regulating unit consisting of actuator and valve are given in Data Sheet 4300...4499.

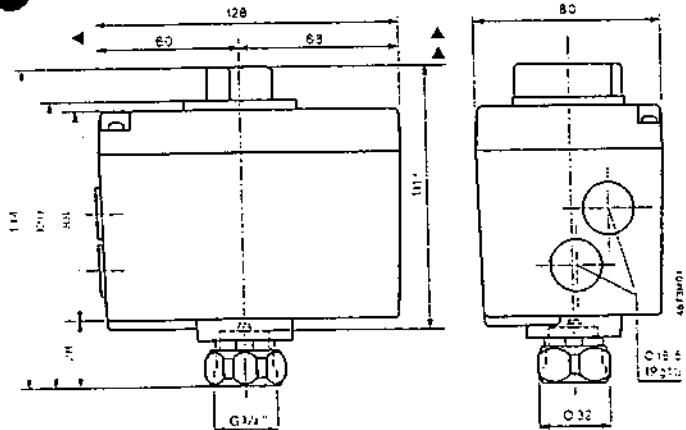
## Mouting and Installation Guide

### Mounting positions:



The actuators are supplied with mounting instructions.

## Dimensions



Dimensions in mm

CE1N4574 E

February 1989

## Commissioning Guide

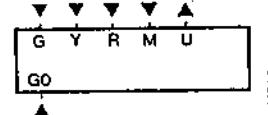
When commissioning the installation, the wiring must be checked and a functional test carried out.

The position of the selector plug must be checked:

- Position A-C (factory setting): Equal percentage valve characteristic
- Position C-B: Linear valve characteristic. For special applications such as chilled water coolers and pressure control on the water side

## Wiring Diagram

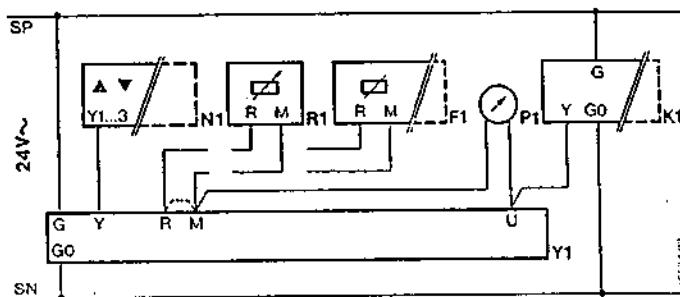
### Connecting terminals



|      |                                                                     |
|------|---------------------------------------------------------------------|
| G,GO | 24 V a.c. operating voltage                                         |
| G    | System potential (SP)                                               |
| GO   | System neutral (SN)                                                 |
| Y    | 0...10 V d.c. control signal                                        |
| R    | Input for 0...1000 Ohm remote setting unit or frost protection unit |
| M    | Measuring neutral                                                   |
| U    | Output for 0...10 V d.c. measuring voltage                          |

### Wiring diagram

The wiring diagram shows all possible connections. How many and which of these are used depends on the system involved.



F1 Frost protection unit  
K1 On/off switch  
N1 Controller

P1 Indicating unit  
R1 Remote setting unit  
Y1 Actuator

x = connection dimension for valve

▲ = min. clearance 100 mm

▲ = min. clearance 200 mm



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**PT100 2 wire Sensors 4 - 20ma Output**

Range: -10 to 400°C (actual sensor range varies with type)

Accuracy: ± 0.1°C

Compatible with:- Most controllers that accept a 4-20ma input.

| DESCRIPTION                                                       | TITAN PART NO          | PRICE  |
|-------------------------------------------------------------------|------------------------|--------|
| Outside Sensor range -10+50°C (IP65 enclosure)                    | TPOS/50                | £30.00 |
| Clamp On Sensor range -10+40°C                                    | TPCS/40                | £34.50 |
| Clamp On Sensor range -10+110°C                                   | TPCS/110               | £34.50 |
| Clamp On Sensor range -10+160°C                                   | TPCS/110               | £34.50 |
| Room Sensor range -10+40°C - White or Grey                        | TPRS/40 (state colour) | £27.00 |
| Room Sensor range -10+40°C - Black Bulb                           | TP2RS/BB/40            | £38.50 |
| Immersion Sensor range -10+40°C (inc. Brass Pocket)               | TPIS/40                | £43.00 |
| Immersion Sensor range -10+110°C (inc. Brass Pocket)              | TPIS/110               | £43.00 |
| Immersion Sensor range -10+160°C (inc. Brass Pocket)              | TPIS/160               | £46.50 |
| Immersion Sensor range -10+40°C (inc. Stainless Steel Pocket)     | TPIS/40/SS             | £49.00 |
| Immersion Sensor range -10+110°C (inc. Stainless Steel Pocket)    | TPIS/110/SS            | £49.00 |
| Immersion Sensor range -10+160°C (inc. Stainless Steel Pocket)    | TPIS/160/SS            | £52.50 |
| Duct Sensor range -10+40°C (150 mm probe)                         | TPDS/S/40              | £34.50 |
| Duct Sensor range -10+110°C (150 mm probe)                        | TPDS/S/110             | £34.50 |
| Duct Sensor range -10+40°C (300 mm probe)                         | TPDS/L/40              | £35.50 |
| Duct Sensor range -10+110°C (300 mm probe)                        | TPDS/L/110             | £35.50 |
| Flue Gas Sensor standard range 0-400°C                            | TPFG-20/400S           | £56.00 |
| Flue or Duct Sensor Mounting Flange for use with DS/S, DS/S or FG | TPMTG/F                | £ 3.50 |
| Light Level Transmitter - internal                                | TPLLR                  | £55.00 |
| Light Level Transmitter - external (IP 65 enclosure)              | TPLLO                  | £55.00 |

**0 - 10 Volt Output Active Sensors**

Range: -10 to + 100°C (actual sensor range varies with type)

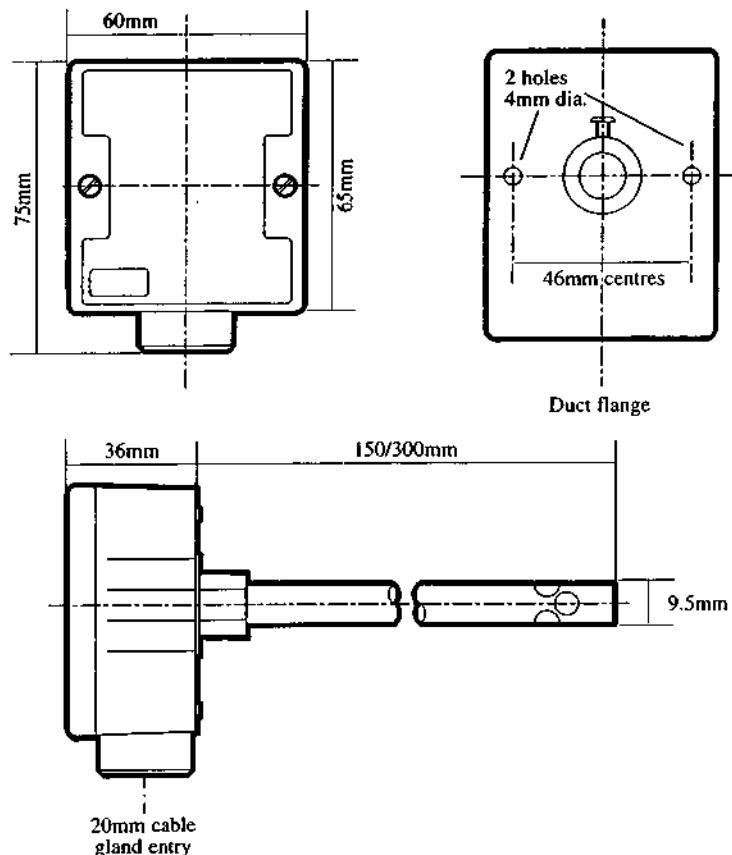
Accuracy: ± 0.5°C

Compatible with:- Most Controllers that accept 0-10V input

| DESCRIPTION                                                   | TITAN PART NO        | PRICE  |
|---------------------------------------------------------------|----------------------|--------|
| Outside Sensor range -10+40°C (IP65 enclosure)                | TPVOS                | £27.52 |
| Clamp On Sensor range 0+100°C                                 | TPVCS                | £21.81 |
| Clamp On Sensor range -10+40°C                                | TPVCS/R              | £33.81 |
| Room Sensor range 0+40°C - White or Grey                      | TPVRS (state colour) | £16.05 |
| Room Sensor range 0+40°C - Black Bulb                         | TPVRS/BB             | £21.50 |
| Immersion Sensor range -10+40°C (inc. Brass Pocket)           | TPVIS/40             | £35.00 |
| Immersion Sensor range 0+100°C (inc. Brass Pocket)            | TPVIS/100            | £23.50 |
| Immersion Sensor range -10+40°C (inc. Stainless Steel Pocket) | TPVIS/40/SS          | £42.50 |
| Immersion Sensor range 0+100°C (inc. Stainless Steel Pocket)  | TPVIS/100/SS         | £31.00 |
| Duct Sensor range 0+40°C (150 mm probe)                       | TPVDS/S              | £22.58 |
| Duct Sensor range 0+40°C (300 mm probe)                       | TPVDS/L              | £23.08 |
| Duct Sensor range 0+100°C (1500 mm probe)                     | TPVDS/S              | £22.58 |
| Duct Sensor range 0+100°C (300 mm probe)                      | TPVDS/L              | £23.08 |
| Duct Sensor Mounting Flange for use with DS/S and DS/L        | TPMTG/F              | £ 3.50 |
| Light Level Transmitter - internal                            | TPVLLR               | £35.00 |
| Light Level Transmitter - external (IP65 enclosure)           | TPVLLO               | £35.00 |

Note:- Supply Voltage 12-30 volts AC or DC.

## DUCT AIR TEMPERATURE SENSOR :: TPDS



### DESCRIPTION

The TPDS temperature sensor is designed to measure temperature conditions in duct ventilated systems. The sensor body is IP65 rated made from Flame Retardant Polycarbonate. The sensor element is enclosed in the end of a rigid brass tube which is mounted in the air duct. The TPDS is available in two standard lengths 150mm or 300mm with other lengths made to order.

### FEATURES

- \* IP65 housing.
- \* Flame Retardant Polycarbonate Body.
- \* Brass Probe (optional copper made to order).
- \* 150mm or 300mm length probes (other lengths made to order).
- \* Available with all temperature measurement elements.
- \* Optional Duct Mounting Flange.

### SPECIFICATION

|                       |       |                                                                                                  |
|-----------------------|-------|--------------------------------------------------------------------------------------------------|
| Material              | Body  | Flame Retardant Polycarbonate                                                                    |
|                       | Probe | Brass (optional copper to order)                                                                 |
| Sensing Elements      |       | All Thermistors                                                                                  |
|                       |       | PT100                                                                                            |
|                       |       | PT1000                                                                                           |
|                       |       | 0-10v                                                                                            |
|                       |       | 4-20mA                                                                                           |
| Accuracy              |       | ±0.2°C @ 70°C Thermistor                                                                         |
|                       |       | ±0.1°C @ 4-20mA                                                                                  |
|                       |       | ±0.5°C 0-10 volts                                                                                |
| Operating Temperature |       | -10 to +110°C                                                                                    |
| Terminals             |       | 1.0mm recommended 2.5mm max.                                                                     |
| Location              |       | In duct to measure mixed air flow a minimum of 2 metres from batteries                           |
| Order Code            |       | TPDS/ (S for 150mm or L for 300mm) (state element required)<br>(contact TITAN for other options) |

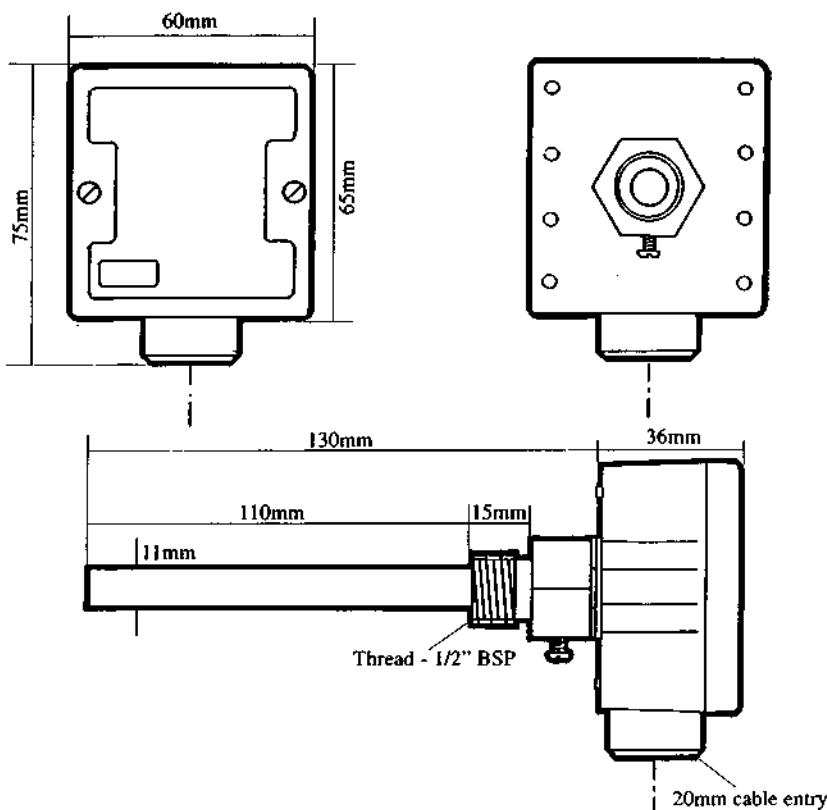


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## IMMERSION TEMPERATURE SENSOR :- TPIS



### DESCRIPTION

The TPIS temperature sensor is designed to measure temperature conditions in liquid flow lines. The standard sensor body is IP65 rated made from Flame Retardant Polycarbonate. The sensor element is enclosed in a rigid stem which is mounted into a pocket with options for brass or stainless steel.

The TPIS is available in two standard lengths 65mm or 125mm probe with other lengths made to order.

For chilled water applications the TPIS/R sensor stem, sensor element and terminal board is epoxy sealed to prevent the influence of condensation in low temperature conditions.

For medium and high pressure systems above 110° the TPIS/H is supplied with an aluminium die cast body.

### FEATURES

- \* IP 65 housing
- \* Flame Retardant Polycarbonate Body or Die Cast Aluminium
- \* Brass or Stainless Steel Pocket
- \* 65mm or 125mm length probes (other lengths made to order)
- \* Optional encapsulated sensor TPIS/R for chilled water applications
- \* Available with all temperature measurement elements

### SPECIFICATION

|                                   |                                                                                                                                                                       |                               |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| Material                          | Body                                                                                                                                                                  | Flame Retardant Polycarbonate |
|                                   | Stem                                                                                                                                                                  | Brass                         |
|                                   | Pocket                                                                                                                                                                | Brass or Stainless Steel      |
| Sensing Elements                  | All Thermistors                                                                                                                                                       |                               |
|                                   | PT100                                                                                                                                                                 |                               |
|                                   | PT1000                                                                                                                                                                |                               |
|                                   | 0-10v                                                                                                                                                                 |                               |
|                                   | 4-20mA                                                                                                                                                                |                               |
| Accuracy                          | ±0.2°C @ 70°C Thermistor<br>±0.1°C 4-20mA<br>±0.5°C 0-10 volts                                                                                                        |                               |
| Operating Temperature             | -40 to + 110°C standard body<br>-40 to + 150°C die cast body                                                                                                          |                               |
| Terminals                         | 1.0mm recommended 2.5mm max.                                                                                                                                          |                               |
| Location                          | Positioned to measure the controlled condition                                                                                                                        |                               |
| Order Code                        | TPIS/<br>State R for chilled water,<br>H for high temp<br>state SS for stainless steel pocket<br>state 65 or 125 for length required<br>state sensor element required |                               |
| For further options contact TITAN |                                                                                                                                                                       |                               |



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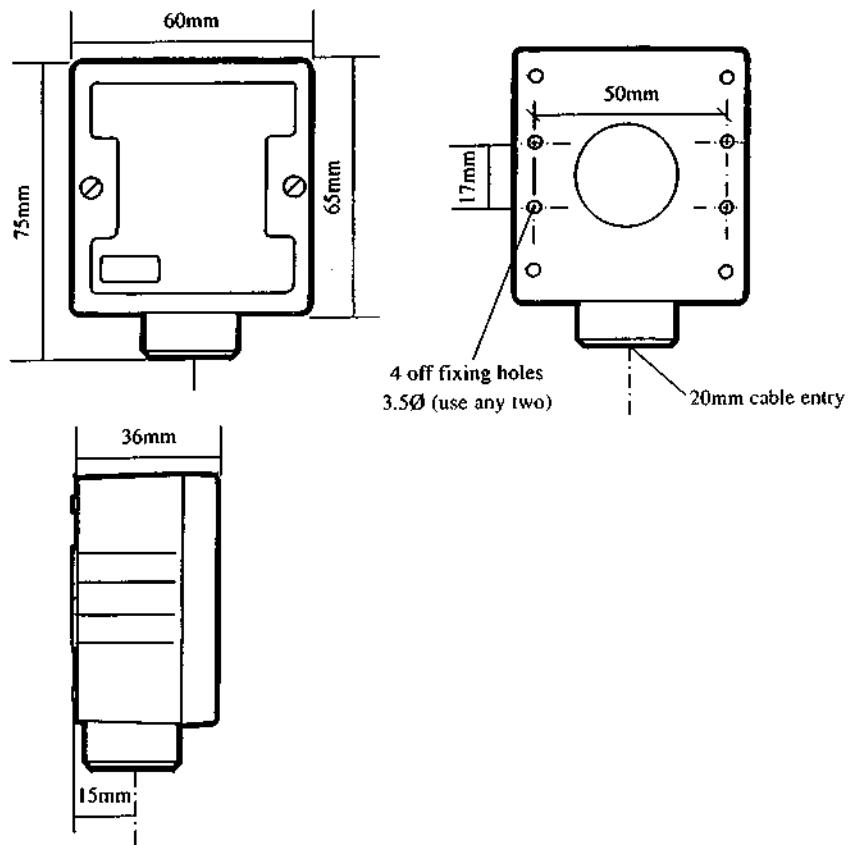
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## OUTSIDE AIR TEMPERATURE SENSOR:- TPOS



### DESCRIPTION

The TPOS temperature sensor is designed to measure external temperature conditions. The sensor body is IP65 rated and made from Flame Retardant Polycarbonate. The sensor element is encapsulated to prevent the influence of condensation in low temperature conditions.

The TPOS is available with all temperature measurement elements.

### FEATURES

- \* IP65 housing.
- \* Flame Retardant Polycarbonate Body.
- \* Encapsulated sensor element.
- \* Available with all temperature measurement elements

### SPECIFICATION

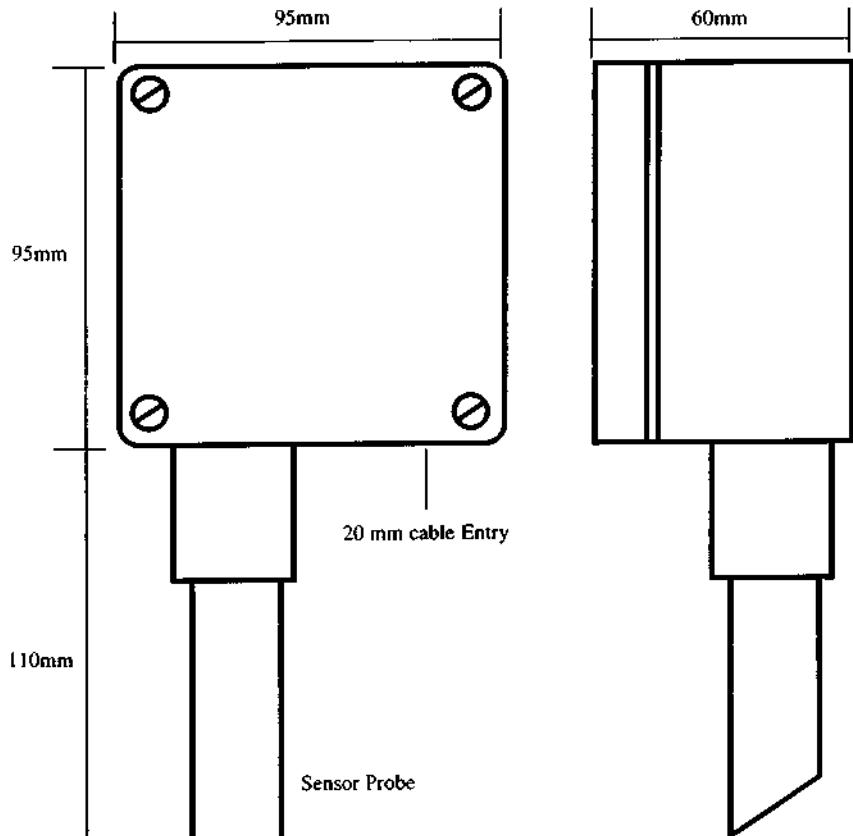
|                       |                                                       |                               |
|-----------------------|-------------------------------------------------------|-------------------------------|
| Material              | Body                                                  | Flame Retardant Polycarbonate |
| Sensing Elements      | All Thermistors                                       |                               |
|                       | PT100                                                 |                               |
|                       | PT1000                                                |                               |
|                       | 0-10v                                                 |                               |
|                       | 4-20mA                                                |                               |
| Accuracy              | ±0.2°C @ 70°C Thermistor                              |                               |
|                       | ±0.1°C 4-20mA                                         |                               |
|                       | ±0.5°C 0-10 volts                                     |                               |
| Operating Temperature | -50 to +70°C                                          |                               |
| Terminals             | 1.0mm recommended 2.5mm max.                          |                               |
| Location              | North facing wall not influenced by direct sun light. |                               |
| Order Code            | TPOS (state element required)                         |                               |



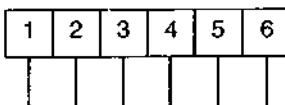
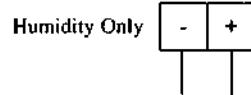
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## EXTERNAL TEMPERATURE / HUMIDITY SENSOR :- TPOH and TPOHT



### CONNECTIONS



- 1 - AC or DC Supply
- 2 - Common / 0V & Signal Common
- 3 - 4-20mA TEMP 0-50°C
- 4 - 0-10V TEMP 0-50°C
- 5 - 4-20mA 0-100% RH
- 6 - 0-10V 0-100% RH

### DESCRIPTION

The TPOH and TPOHT sensors are designed to measure the external relative humidity and temperature conditions. The measurement element is based on a monolithic integrated circuit combining a capacitance measurement for humidity and PT1000 for temperature. The sensor housing is IP66 rated and is available for humidity only or combined with a temperature measurement.

### FEATURES

- \* IP66 Polycarbonate Housing
- \* Humidity or Humidity with Temperature
- \* Measurement by Monolithic integrated circuit
- \* AC or DC supply voltage - See Specification.

### SPECIFICATION

|                       |                                                               |
|-----------------------|---------------------------------------------------------------|
| Material Body         | Polycarbonate IP66                                            |
| Sensing Elements      | Monolithic integrated circuit                                 |
| Supply                | 12 to 36V DC Humidity only<br>12 to 36V AC or DC Combined     |
| Outputs               |                                                               |
| Humidity only         | 4-20mA (2 wire)                                               |
| Humidity & Temp       | 4-20mA or 0-10 volts (4 wire)                                 |
| Range                 | Humidity 0-100% RH<br>Temperature 0-50°C                      |
| Accuracy              | Humidity $\pm 2\%$<br>Temperature $\pm 0.2^\circ\text{C}$ RTD |
| Operating Temperature | -10 to + 50°C                                                 |
| Terminals             | 1.0mm recommended 2.5mm max.                                  |
| Location              | External away from direct sun                                 |
| Order Code            | TPOH Humidity only<br>TPOHT Humidity and temperature          |

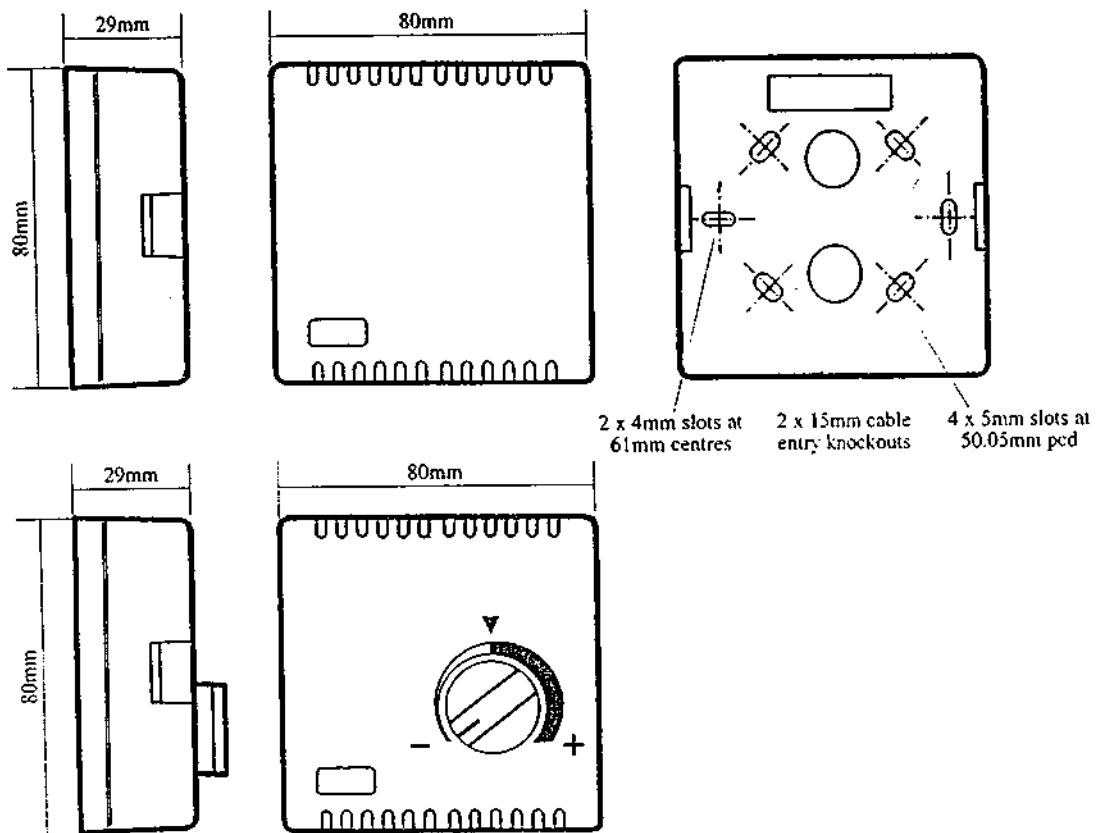


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## ROOM AIR TEMPERATURE SENSOR :- TPRS



### DESCRIPTION

The TPRS sensor is designed for the measurement of room temperature conditions. The sensor housing is aesthetically designed for wall mounting and is made from Flame Retardant Polycarbonate.

The TPRS is available with all temperature measurement elements compatible with most leading BMS controls the sensor can be supplied with or without a local reset potentiometer.

Standard colour options Grey, White or Black.

### FEATURES

- \* Aesthetically designed housing.
- \* With or without Local Reset Potentiometer.
- \* Available with all temperature measurement elements.
- \* Colour options Grey, White or Black.

### SPECIFICATION

|                       |                                    |                               |
|-----------------------|------------------------------------|-------------------------------|
| Material              | Body                               | Flame Retardant Polycarbonate |
| Sensing Elements      | Ali Thermistors                    |                               |
|                       | PT100                              |                               |
|                       | PT1000                             |                               |
|                       | 0-10v                              |                               |
|                       | 4-20mA                             |                               |
| Accuracy              | =0.2°C @ 70°C Thermistor           |                               |
|                       | =0.1°C 4-20mA                      |                               |
|                       | =0.5°C 0-10 volts                  |                               |
| Operating Temperature | -10 to + 70°C                      |                               |
| Terminals             | 1.0mm recommended 2.5mm max        |                               |
| Location              | Wall mounted 1.5m from floor level |                               |
| Order Code            | TPRS                               |                               |
|                       | TPRS/LC (local control)            |                               |
|                       | state colour and element required. |                               |



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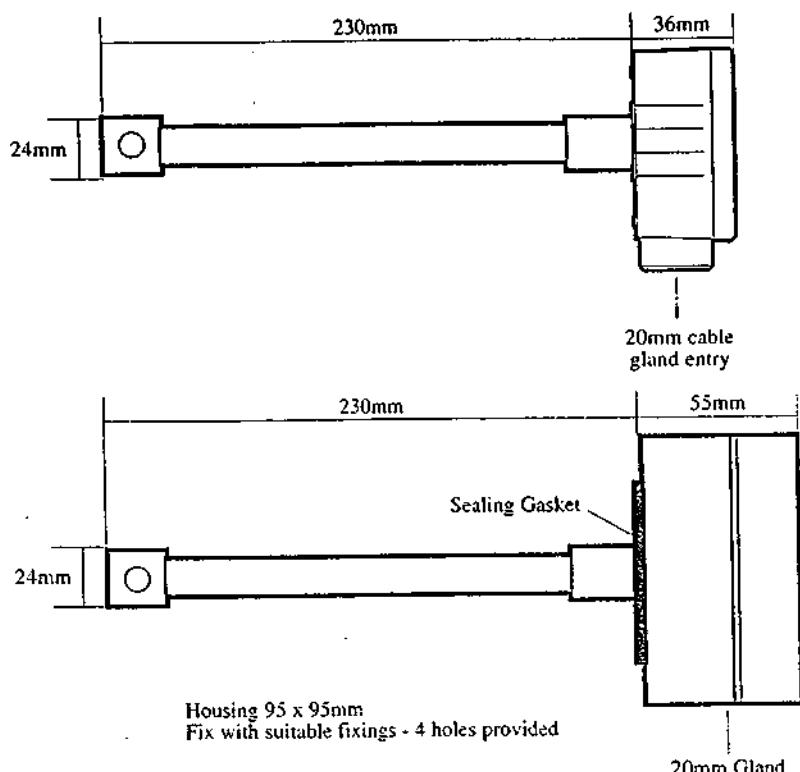
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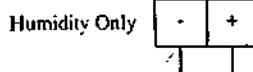
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## DUCT HUMIDITY SENSOR :- TPDH & TPDHT

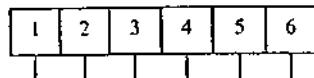


### CONNECTIONS



Note:- DC Supply only

### COMBINED HUMIDITY & TEMPERATURE



- 1 - AC or DC Supply
- 2 - Common/OV & Signal common
- 3 - 4-20mA TEMP 0-50°C
- 4 - 0-10V TEMP 0-50°C
- 5 - 4-20mA 0-100% RH
- 6 - 0-10V 0-100% RH

#### DESCRIPTION

The TPDH & TPDHT sensors are designed to measure the relative humidity and temperature conditions in ventilation ducts. The measurement element is based on a capacitance measurement for humidity and PT1000 element for temperature.

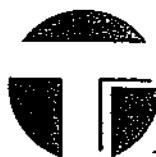
The TPDH is for humidity only and the TPDHT is combined with a temperature measurement.

#### FEATURES

- \* Polycarbonate Housing IP65
- \* Humidity or Humidity with Temperature
- \* Measurement by Monolithic integrated circuit
- \* AC or DC supply voltage

#### SPECIFICATION

|                       |                                                                                    |
|-----------------------|------------------------------------------------------------------------------------|
| Material              | Body: Polycarbonate<br>Probe: 20mm PVC tube                                        |
| Sensing Elements      | Monolithic integrated circuit                                                      |
| Supply                | 12 to 36V DC Humidity only<br>12 to 36V AC or DC Combined                          |
| Outputs               |                                                                                    |
| Humidity only         | 4-20mA (2 wire)                                                                    |
| Humidity & Temp       | 4-20mA or 0-10 volts (4 wire)                                                      |
| Range                 | Humidity 0-100% RH<br>Temperature 0-50°C                                           |
| Accuracy              | Humidity $\pm 2\%$<br>Temperature $\pm 0.2^\circ\text{C}$ RTD                      |
| Operating Temperature | 0-50°C                                                                             |
| Terminals             | 1.0mm recommended 2.5mm max.                                                       |
| Location              | In ventilation duct                                                                |
| Order Code            | TPDH Humidity only<br>TPDHT Humidity and Temperature<br>state colour grey or white |



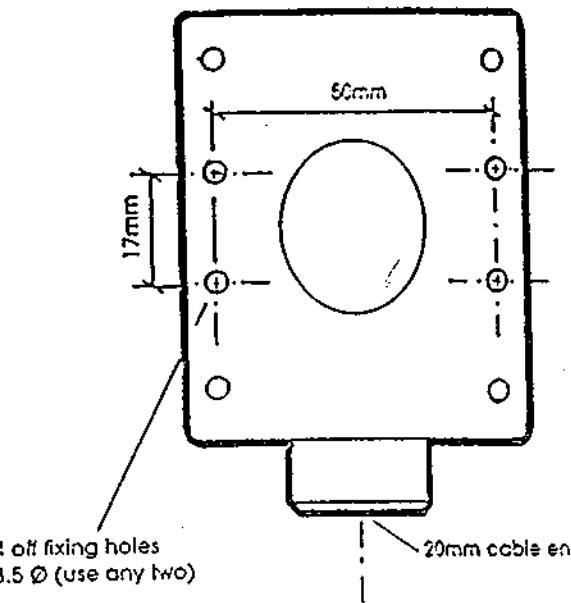
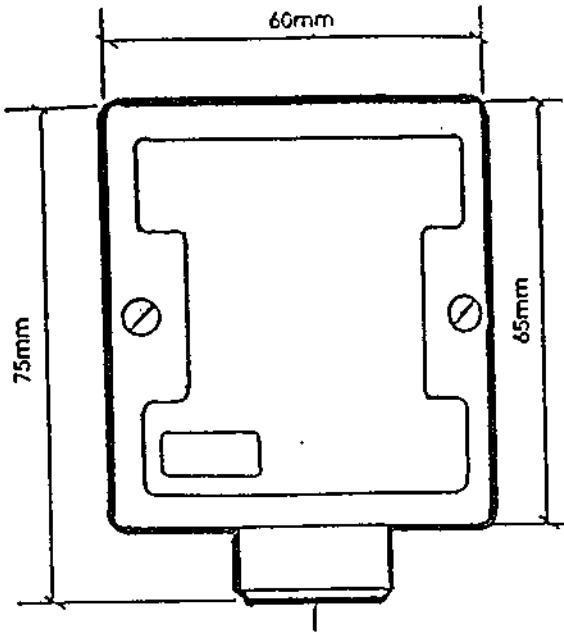
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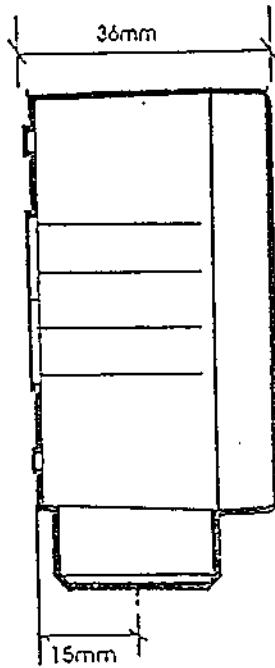
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### Technical Information

1. IP rating: IP65. Max Temp 150°C.
2. Material : Flame Retardant Polycarbonate
3. Mount with cable entry downwards on a north wall (or orientation of controlled zone).
4. Avoid heat emitting areas such as flues, doors, windows, warm boilerhouse walls and extract ducts.
5. Use sealing compound on cable gland threads.
6. Fix with 2 off No. 6 x 30mm screws.
7. Recommended conductor size 1.0mm csa. Max conductor size 2.5mm csa.

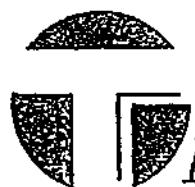


### Sensor Options

Thermistor Accuracy  $\pm 0.2^\circ\text{C}$  @  $0-70^\circ\text{C}$   
Overall Range -50°C to +150°C  
See price list for options

4-20 MA Accuracy  $\pm 0.1^\circ\text{C}$   
Supply Voltage 12 to 35 VDC  
See price list for options

0-10V Accuracy  $\pm 0.5^\circ\text{C}$   
Supply Voltage 12-35 VDC or  
Supply Voltage 12-35 VAC (Specify when ordering)



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*products*

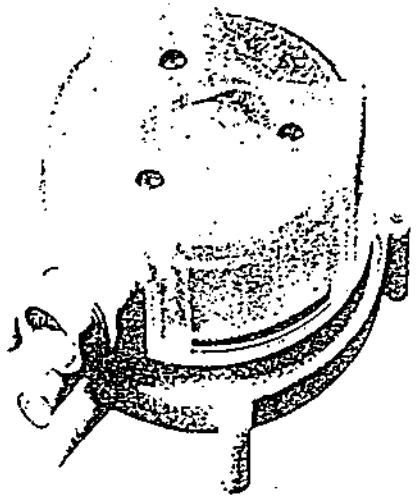
Tel: 0161 406 6480 Fax: 0161 494 6309

### OUTSIDE SENSOR

16 THE GATE CENTRE  
BREDSBURY PARK WAY  
BREDSBURY STOCKPORT SK6 2SN  
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|           |          |
|-----------|----------|
| Date:     | 02/01/93 |
| Drawn:    | RM       |
| Approved: | LAS      |
| Dir. No.  | TP 03    |

# 930 Series



**Installation Guide for 930 Series Beck Differential Switches.** Please read these instructions carefully before installing the switch.

Note: Always isolate all electrical connections before commencing installation. Install and operate as follows:

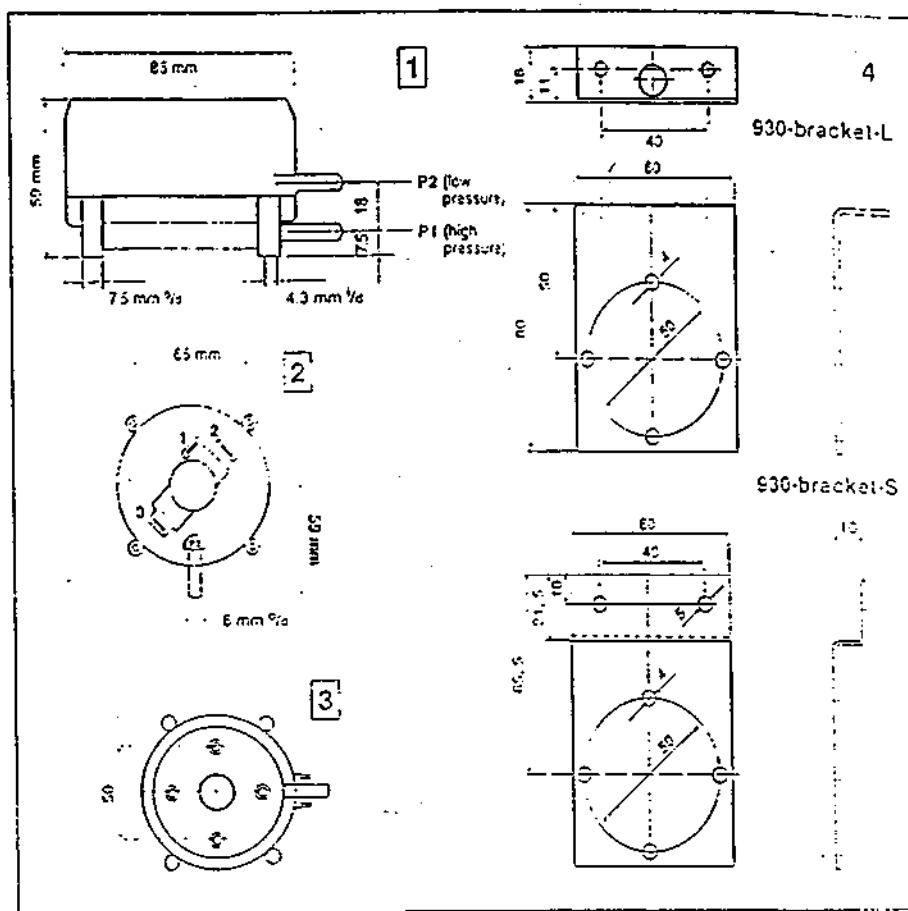
- ▶ Pressure medium, air and non-inflammable, non-aggressive gases
- ▶ Pressure indicating range adjustment knob marked in Pascals
- ▶ Manually adjustable visible Set Point, requires no manometer to set up
- ▶ Pressure connections moulded push-on for 5/6 mm i/d plastic tubing P1 port is high pressure P2 the low pressure side
- ▶ 3 position 1/2" Conduit entry with PGII connector
- ▶ Electrical Connections 6.3 mm blade terminals 1 x NO, 1 x NC and 1 x COMMON
- ▶ Electrical Switch Rating SPDT 1.5 amp (0.4) 250 volts
- ▶ Diaphragm, Silicone Rubber
- ▶ Cover - 'O' Ring sealed to IP44 rating or better. A version with IP65 enclosure is available
- ▶ Maximum Operating Pressure 5 KPA WC (30" WC)

## Low Differential Pressure Switches

930 Series Beck Sensors Ultra-Low Operation Differential Air Pressure Switch Range with Visible Set Point providing Manual adjustment of the Pressure Set Points.

**IIIAV products**

16 THE GATE CENTRE,  
BREDBURY PARK WAY, BREDBURY,  
STOCKPORT, CHESHIRE SK6 2SN.  
TEL: 0161-406 6480 FAX: 0161-494 8309



These range details apply to all switch models

| Diaphragm<br>Horizontal | Range Pascals wc | Pascals wc | Inches wc  | Differential<br>Switching<br>Ranges |
|-------------------------|------------------|------------|------------|-------------------------------------|
| 930-01-ATP              | 40 - 100         | 40 - 100   | 0.16 - 0.4 | 20                                  |
| 930-02-ATP              | 40 - 200         | 40 - 200   | 0.16 - 0.8 | 20                                  |
| 930-03-ATP              | 50 - 500         | 50 - 500   | 0.20 - 2.0 | 50                                  |
| 930-05-ATP              | 200 - 1000       | 200 - 1000 | 0.80 - 4.0 | 100                                 |
| Diaphragm<br>Vertical   |                  |            |            |                                     |
| 930-01-ATP              | 40 - 100         | 20 - 80    | 0.08 - 0.3 | 20                                  |
| 930-02-ATP              | 40 - 200         | 20 - 180   | 0.08 - 0.7 | 20                                  |
| 930-03-ATP              | 50 - 500         | 30 - 450   | 0.12 - 1.2 | 50                                  |
| 930-05-ATP              | 200 - 1000       | 180 - 950  | 0.70 - 3.5 | 100                                 |

**NS**  
For IP44 and IP65 versions of the differential pressure switch refer to the above instructions. It is always ensure the physical and electrical connections are mounted to the switch to provide reliable protection against water ingress. This may be achieved by accepting a minimum IP65/7 and 300° F.

- ▶ Temperature Limits -40 to 100°C
- ▶ The switch must be installed in a position free from vibration
- ▶ Do not install in a corrosive atmosphere
- ▶ Vertical or horizontal mounting is acceptable but please see the pressure range information above and illustrations 5. and 6. overleaf.
- ▶ Use the 4 fixing lugs provided to secure the switch to any flat surface, illustrations 1. and 2. Do not overtighten fixing screws, this

could distort the switch housing causing a shift in the switching set point  
see illustration 2

- ▶ Alternatively use the 4 fixing points in the base of the switch. Use only correct screw size 1/4" M4 x 6 otherwise you risk penetrating the pressure caped of the switch or distorting the switch housing causing a shift in the switching set point  
see illustration 3
- ▶ Fixing Brackets, if required, shown above, in illustration 4

connect pressure lines as follows in 5 or 6 mm i.d plastic tubing of a wall thickness that deters kinking (our 1115 8 and A220 tubing is ideal)

**Connections for Differential Pressure**  
Connect Low Pressure Supply to Port marked P2. Connect High Pressure Supply to Port marked P1. See illustration 7.

**Connections for Pressure only** (pressure supply must be above atmospheric pressure) – leave Low Pressure Port marked P2 open to atmosphere. Connect pressure source to high pressure port marked P1 only. See illustration 8.

**Connections for Vacuum/negative Pressure only** (vacuum/negative pressure supply must be below atmospheric pressure) – connect Vacuum Supply to Low Pressure Port marked P2 only. Leave High Pressure marked P1 open to atmosphere. See illustration 9.

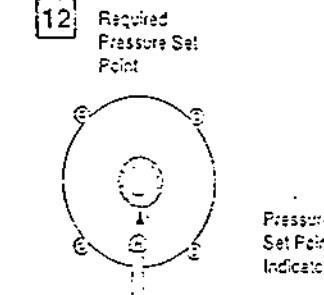
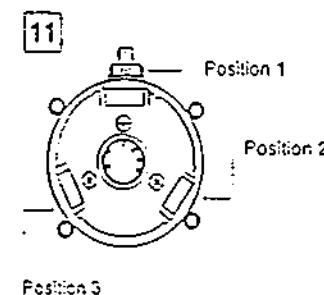
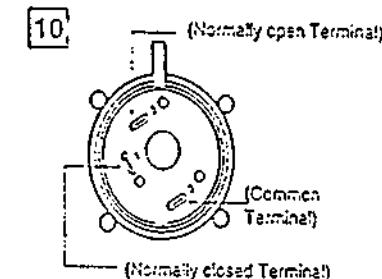
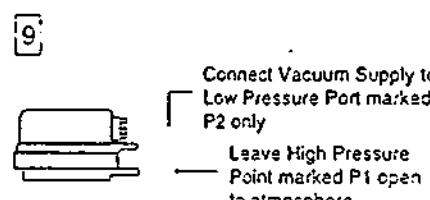
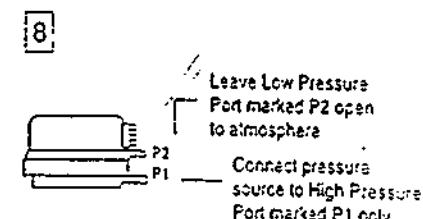
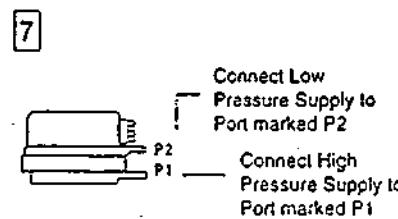
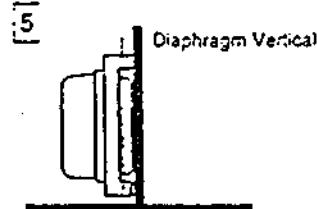
**Pressure Sensing** – Use good quality static pressure sensors at the pressure source. Very low pressures cannot be controlled or sensed accurately with poor static pick up or leakage around the point of entry of sensors into ductwork or other fittings. We recommend our duct fitting kit 930-DFK-2 comprising 2 metres PVC tube, 2 duct mounting grommets, 2 static tips or any of our line of low pressure fittings and tubing.

**Electrical Connections** – **ALWAYS ENSURE ALL WIRING/ CONNECTIONS ARE ISOLATED BEFORE REMOVING COVER.** Complete all wiring in accordance with published regulations.

**Electrical Connections** – Remember to pass cable entry connector assembly onto wiring before making any connection. Standard switch connections are 6.4 mm blade terminals. Fit appropriate shrouded female insulated terminals to your wiring. See illustration 10.

**Cable entry** – adjustable for 3 positions. Rotate cover with gland nut to required position after making all necessary electrical connections. Ensure adequate wire lengths are used to allow required cable entry length without straining switch settings. Fasten cable entry fitting and nut and the cover.

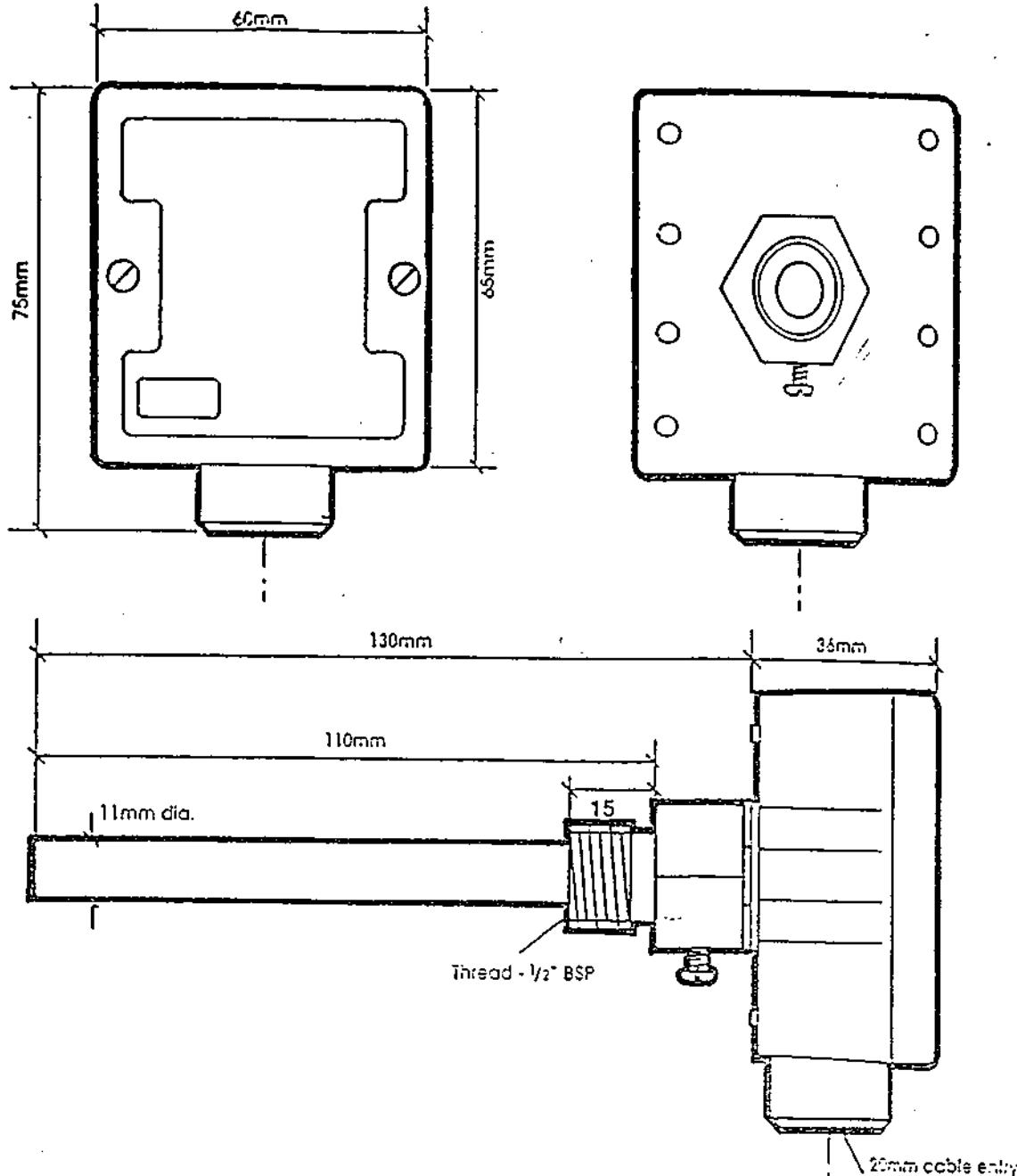
See illustration 11



**Pressure Switching Point Setting** – **ISOLATE ALL ELECTRICAL SUPPLY TO SWITCH.** Remove cover if fitted. The Pointer (a red arrow), indicating the pressure setting point is in line with the pressure port connections P1 and P2. Rotate pressure selection knob until desired trip pressure is opposite the set point indicator. Please remember that with switches mounted as shown in 5, the switch actuation point will vary by approx. 20Pa from the indicated pressure on the adjustment knob. Replace cover and reinstate electrical supply if safe to do so. See illustration 12.

**Pressure Connections** – make final check that pressure connections remain secure at both switch and pressure source and check all tubing to ensure there are no sharp bends or kinks, tubing should be supported where necessary.

**SAFETY** – Never remove cover of any electrical control before isolating all electrical circuits.

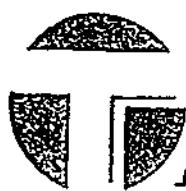


### Technical Information

1. IP rating: IP65. Max Temp 150°C.
2. Material Body: Flame Retardant Polycarbonate. Pocket: Brass or Stainless Steel
3. Locate in a good mixed water flow position preferably in an elbow and 1.5m from pumps.
4. Provide a 15mm BSPT socket, avoid excessive turbulence or dead spots..
5. Recommended conductor size 1.0mm csa.  
Maximum 2.5mm csa.

### Sensor Options

|            |                                                                                                                                                      |
|------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Thermistor | Accuracy $\pm 0.2^\circ\text{C}$ @ 0-70°C<br>Overall Range -50°C to +150°C<br>See price list for options                                             |
| 4-20 MA    | Accuracy $\pm 0.1^\circ\text{C}$<br>Supply Voltage 12 to 36 VDC<br>See price list for options                                                        |
| 0-10V      | Accuracy $\pm 0.5^\circ\text{C}$<br>Supply Voltage 12-36 VDC or<br>Supply Voltage 12-36 VAC<br>(Specify when ordering)<br>See price list for options |



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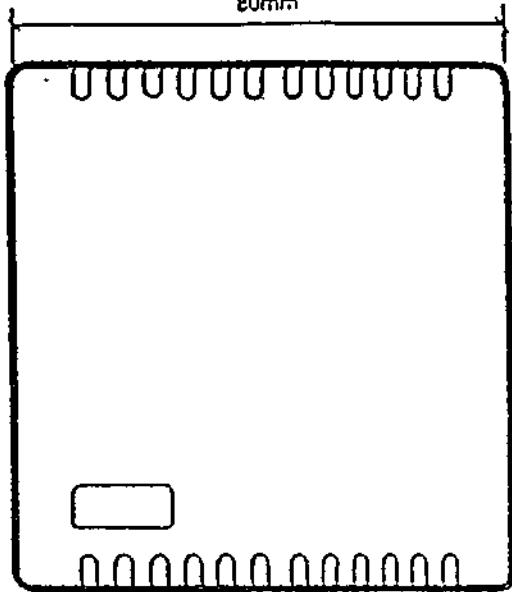
Tel: 0161 406 6460 Fax: 0161 494 6309

### IMMERSION SENSOR

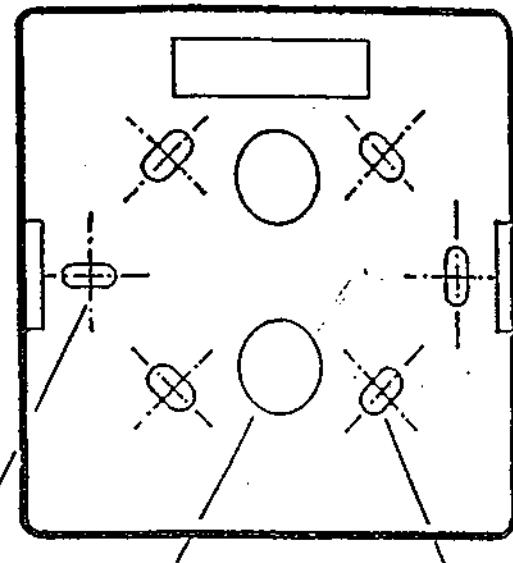
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BREDBURY STOCKPORT SK6 2SN

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| Date:     | 02/01/90 |
| Drawn:    | RM       |
| Approved: | LAB      |
| Des. No.  | TP 03    |

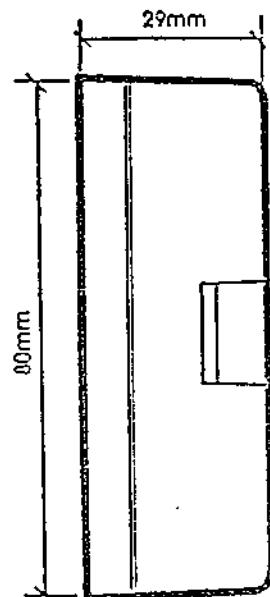


2 x 4mm slots at  
61mm centres



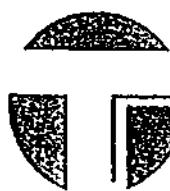
2 x 15mm cable  
entry knockouts

4 x 5mm slots at  
50.05mm pcd



### Technical Information

1. The product is based on a monolithic integrated circuit combining capacitance measurement for humidity and 1000 ohm platinum temperature sensing.
2. Humidity Range: 0 - 100% RH
3. Humidity Accuracy:  $\pm 2\%$  RH 0-100% RH @ 25°
4. Temperature Range: 0-50°C
5. Temperature Accuracy: 0.2°C over it's range
6. Output Options - Specify when ordering see price list
  - A. 4-20MA Humidity only (2 wire)
  - B. Combined Humidity & Temperature with wiring option of 4-20MA or 0-10V (4 wire)
7. Supply Voltage: 12-36V AC/DC
  - A. Humidity only (2 wire) 12-36 VDC
  - B. Humidity & Temperature (4 wire) 12-36VAC/DC
8. Housing Body Material: Polycarbonate.
9. Cleaning: The Sensor element can be cleaned with a stiff brush and clean water.



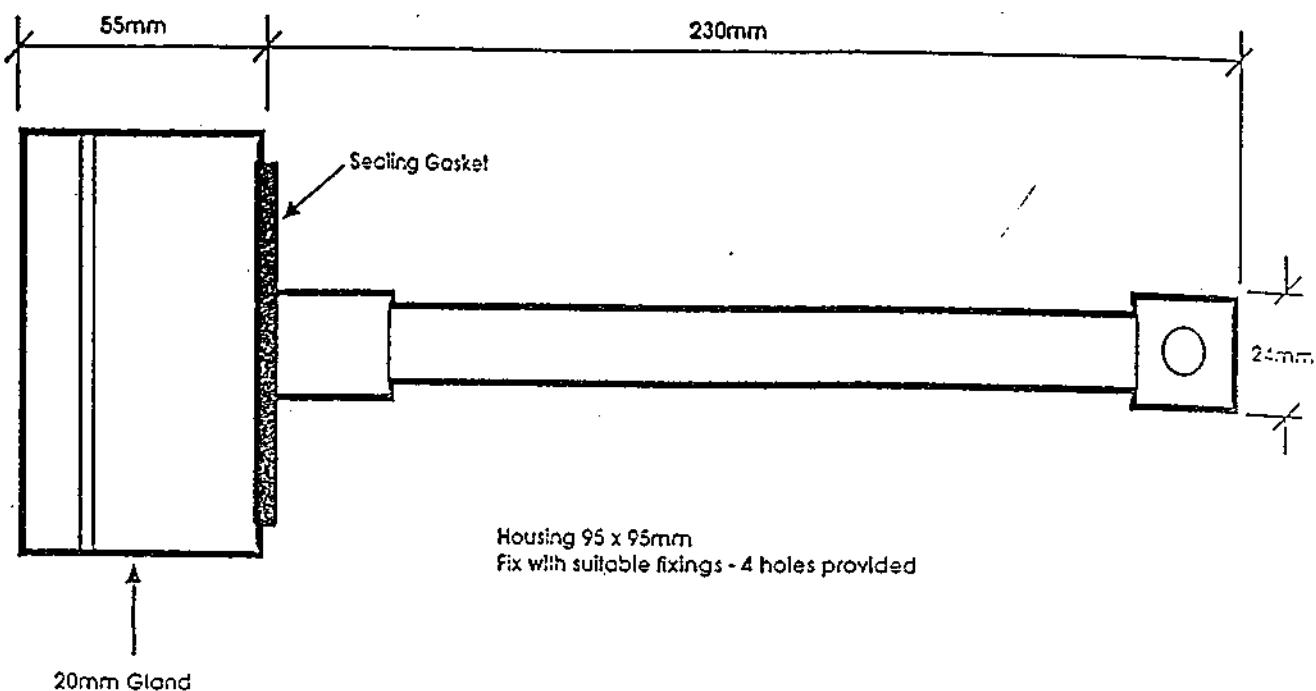
**TITAN**  
*products*

Tel: 0161 406 6480 Fax: 0161 494 8309

### ROOM HUMIDITY SENSOR

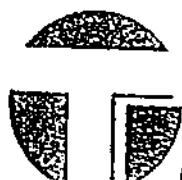
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BREDBURY STOCKPORT SK6 2SN  
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|           |          |
|-----------|----------|
| Date:     | 16/06/93 |
| Drawn:    | RM       |
| Approved: | LAS      |
| Dig. No.  | TP 24    |



### Technical Information

1. The product is based on a monolithic integrated circuit combining capacitance measurement for humidity and 1000 ohm platinum temperature sensing.
2. Humidity Range: 0 - 100% RH
3. Humidity Accuracy:  $\pm 2\%$  RH 0-100% RH @ 25°
4. Temperature Range: 0-50°C
5. Temperature Accuracy: 0.2°C over it's range
6. Output Options - Specify when ordering see price list
  - A. 4-20MA Humidity only (2 wire)
  - B. Combined Humidity & Temperature (4 wire) with wiring option of 4-20MA or 0-10V
7. Supply Voltage: 12-36V AC/DC
  - A. Humidity only (2 wire) 12-36 VDC
  - B. Humidity & Temperature (4 wire) 12-36 VAC/DC
8. Housing IP 66 Body Material: Polystyrene Tube: PVC
9. Cleaning: The Sensor element can be cleaned with a stiff brush and clean water



**TITAN**  
*products*

Tel: 0161 406 6450 Fax: 0161 494 6309

### DUCT HUMIDITY SENSOR

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BREDBURY STOCKPORT SK5 2SN

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|           |          |
|-----------|----------|
| Date:     | 18/06/93 |
| Drawn:    | RM       |
| Approved: | LAS      |
| Dig. No.  | TP 23    |



## Technical Overview

The PL-1382 differential pressure switches are suitable for use with liquids and non-aggressive gases. The units have adjustable switching threshold and a fixed reset differential. Applications include boiler flow, pump and filter monitoring, using the signal as an alarm or for a control action, such as switching a pump or valve. If fitted across an orifice plate the differential pressure switch will act as a flow switch. The diaphragm is protected by a support plate which enables the unit to withstand 4 x range over pressure without damage, except for a possible 2% setting shift.

- \* 2 ranges: 1 or 4 bar
- \* 4 x range over pressure without damage
- \* Suitable for water, oil, steam, or air
- \* Robust construction



### Specifications:

|           |                  |                        |
|-----------|------------------|------------------------|
| Type      | Adjustment range | Switching differential |
| PL-1382-1 | 0.07 to 1 bar    | 0.04 bar approx.       |
| PL-1382-4 | 0.2 to 4 bar     | 0.1 bar approx.        |

Max. operating pressure 34 bar

Pressure connections: 1/4" BSP (G)

Media Water, oil, air, steam

Switch rating 5A @ 250Vac

Electrical connections Screw terminals for cable 1.5mm<sup>2</sup> max.

### Materials:

|                   |                  |
|-------------------|------------------|
| Pressure chambers | Brass            |
| Diaphragm         | Beryllium copper |
| Seals             | Nitrile          |
| Housing           | Diecast zinc     |
| Lid               | ABS moulding     |

Mounting Zinc plated steel bracket

Protection IP66

Operating range -10 to 85°C

Dimensions: 92 x 100 x 77 diameter housing

Weight 1.28 kg

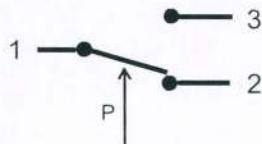
Installation category IEC 664 Category II

Pollution degree IEC 664 Degree 1

Weight 1.3 kg

Origin UK

### Connections:



### Product Codes:

PL-1382-R

where R = measurement range in bar

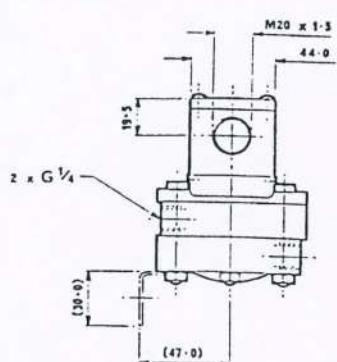
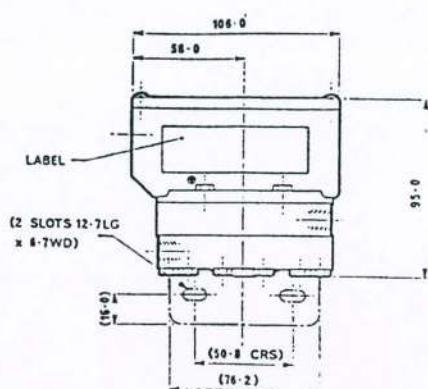
PL-1382-1

1 bar

PL-1382-4

4 bar

**Dimensions:**



**Adjusting the setpoint:**

1) Using a pressure gauge, apply the required pressure to the switch.

2) Turn the adjusting nut anticlockwise until the switch operates. The switch is now set to operate on rising pressure.  
( Contacts 1 & 3 make)

3) To set the switch to operate on falling pressure, turn the adjusting nut clockwise until the switch resets.  
( Contacts 1 & 2 make)

**N.B.** A  $\frac{1}{4}$  turn of the adjusting nut will change the setpoint by approx. 10% of the switch range.

4) Setting the hysteresis ( where fitted ). Rotate the adjustment wheel clockwise until tight. (Sets hysteresis to minimum)

5) Set switch to required setpoint as above.

6) Rotate hysteresis wheel anticlockwise until required hysteresis is achieved.

**N.B.** During the setting of the hysteresis, there may be a small change in the setpoint, and slight readjustment of this may be needed.

**N.B.** If the hysteresis is greater than the setpoint, the switch will not reset.

**Installation notes:**

The switch will operate mounted in any orientation.

## Technical Overview

The PL-1381 pressure switch is suitable for use with liquids and non-aggressive gases. The unit has adjustable switching threshold and a fixed reset differential of about 3% of range. Applications include switching an alarm or warning light, cutting off the electrical supply to a pump, and sequence control of automatic plant operated by air or hydraulic systems.

### Features:

- \* Ranges up to 40 bar
- \* Suitable for water, oil, steam, or air
- \* Robust construction
- \* ½" BSP male pressure connection
- \* Minimum moving parts



### Specifications:

#### Pressure ranges:

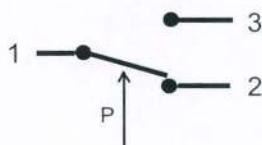
| Type       | Adjustment range | Switching differential |
|------------|------------------|------------------------|
| PL-1381-4  | 0.2 to 4 bar     | 0.07 bar approx.       |
| PL-1381-11 | 0.5 to 11 bar    | 0.3 bar approx.        |
| PL-1381-28 | 2 to 28 bar      | 0.6 bar approx.        |
| PL-1381-40 | 2 to 40 bar      | 0.8 bar approx.        |

|                         |                                                   |
|-------------------------|---------------------------------------------------|
| Max. operating pressure | Same as range limit                               |
| Pressure connection     | ½" BSP                                            |
| Media                   | Water, oil, air, steam                            |
| Electrical rating       | 5A at 250Vac                                      |
| Electrical connections  | Screw terminals for cable 1.5mm <sup>2</sup> max. |

#### Materials:

|                         |                              |
|-------------------------|------------------------------|
| Pressure chamber        | Brass                        |
| Diaphragm               | Beryllium copper             |
| Sealing gasket          | PTFE                         |
| Housing                 | Diecast zinc                 |
| Lid                     | ABS moulding                 |
| Dimensions              | 92 x 105 x 77mm dia. housing |
| Mounting                | Zinc plated steel bracket    |
| Protection              | IP66                         |
| Operating range         | -10 to 85°C                  |
| Temperature coefficient | -1% per 30°C                 |
| VInstallation category  | IEC 664 Category II          |
| Pollution degree        | IEC 664 Degree 1             |
| Weight                  | 760 g                        |
| Origin                  | UK                           |

### Connections:



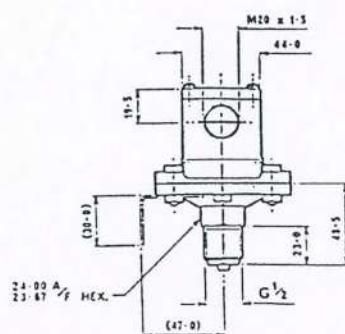
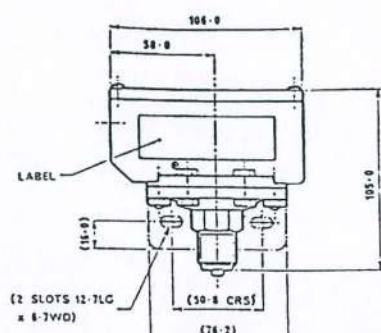
### Product Codes:

#### PL-1381-R

where R = measurement range in Pascals

|            |        |
|------------|--------|
| PL-1381-4  | 4 bar  |
| PL-1381-11 | 11 bar |
| PL-1381-28 | 28 bar |
| PL-1381-40 | 40 bar |

**Dimensions:**



**Adjusting the setpoint:**

1) Using a pressure gauge, apply the required pressure to the switch.

2) Turn the adjusting nut anticlockwise until the switch operates. The switch is now set to operate on rising pressure.  
( Contacts 1 & 3 make)

3) To set the switch to operate on falling pressure, turn the adjusting nut clockwise until the switch resets.  
( Contacts 1 & 2 make)

**N.B.** A  $\frac{1}{4}$  turn of the adjusting nut will change the setpoint by approx. 10% of the switch range.

4) Setting the hysteresis ( where fitted ). Rotate the adjustment wheel clockwise until tight. (Sets hysteresis to minimum)

5) Set switch to required setpoint as above.

6) Rotate hysteresis wheel anticlockwise until required hysteresis is achieved.

**N.B.** During the setting of the hysteresis, there may be a small change in the setpoint, and slight readjustment of this may be needed.

**N.B.** If the hysteresis is greater than the setpoint, the switch will not reset.

**Installation notes:**

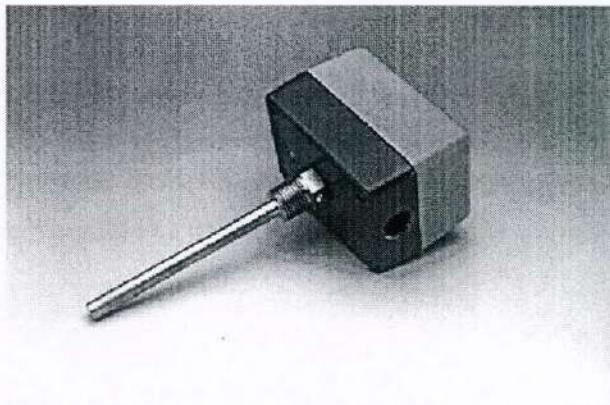
The switch will operate mounted in any orientation.

## Technical overview

**ST-SW** immersion thermostats can be used to control the temperature of liquid flows in pipework systems. Liquid filled sensing elements ensure rapid response and accurate switching differentials.

### Features

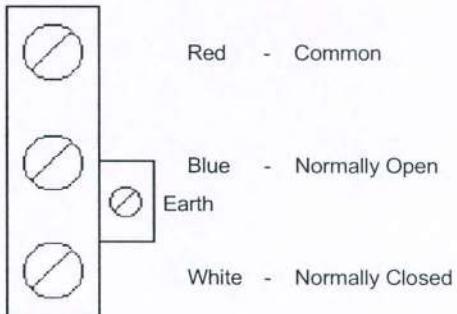
- \* Protection to IP65
- \* Concealed or exposed adjustment
- \* Units supplied with pockets



### Specification:

|                   |                      |
|-------------------|----------------------|
| Case construction | Plastic              |
| Protection        | IP65                 |
| No. of stages     | 1                    |
| Switch rating     | 15(8)A @ 240Vac SPDT |
| Adjustment        | Concealed standard   |
| Weight            | 300 grams            |
| Country of origin | Italy                |
| Pocket thread     | ½" BSPT              |
| Pocket length     | 160mm                |
| Pressure rating   | 8 bar                |

### Connections:



All connections to BEMS controllers, data recorders etc. should be made using screened cable. Normally, the screen should be earthed at one end only (usually the controller end) to avoid earth hum loops which can create noise. Low voltage signal and supply cables should be routed separately from high voltage or mains cabling. Separate conduit or cable trays should be used. Where possible, the screen of the cable feeding the sensor should be connected to a FUNCTIONAL EARTH, rather than the mains safety earth. This will provide better immunity to high frequency noise. Most modern buildings have a separate earth for this purpose.

### Product codes:

| Part Code | Temp. Range    | Differential         | Max. Bulb Temp. |
|-----------|----------------|----------------------|-----------------|
| ST-SW-2P  | -15 to +30 °C  | 1 °C Fixed           | 55 °C           |
| ST-SW-2MP | -15 to +30 °C  | Man. reset Open Low  | 55 °C           |
| ST-SW-3P  | 0 to +60 °C    | 2 - 20 °C Adjustable | 90 °C           |
| ST-SW-3MP | 0 to +60 °C    | Man. reset Open High | 90 °C           |
| ST-SW-6P  | +20 to +90 °C  | 2 - 20 °C Adjustable | 110 °C          |
| ST-SW-6MP | +20 to +90 °C  | Man. reset Open High | 110 °C          |
| ST-SW-7P  | +50 to +120 °C | 2 - 20 °C Adjustable | 140 °C          |
| ST-SW-7MP | +50 to +120 °C | Man. reset Open High | 140 °C          |

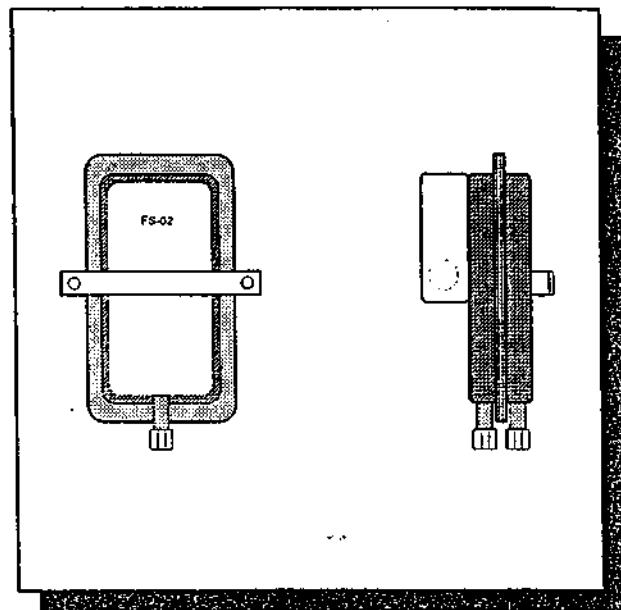
Data sheet : ST-SW Iss. 4.0 17/08/1998

**PA - FS****AIR DIFFERENTIAL PRESSURE SWITCH :**  
**for high temperature applications**

A high sensitivity air differential pressure switches for high temperature applications. Suitable for proving air flow, dirty filters and flue draughts. Can be used for positive, negative, vacuum and differential pressure.

The unit is suitable for use with non-corrosive air or gases.

Units are supplied with two 1/4" brass compression fittings for connection to metal (copper) tubing (see also PL accessories on page 59). Ensure that the pressure line is at least 2 metres long in order to dissipate the heat.

**Installation:**

The unit should be mounted vertically. If mounted in any other position, there may be a small increase in pressure needed to operate the switch.

**Port P1 is the high pressure port.**

Connect to fan discharge or the high pressure side of a filter.

**Port P2 is the low pressure port.**

Connect to fan suction side or the low pressure side of a filter.

The low pressure port can be open to atmosphere for fan status monitoring.

Connect the low pressure port only for vacuum monitoring.

Ensure that the pressure line is at least 2M long.

**Specification :**

|                     |                                  |
|---------------------|----------------------------------|
| Max. Pressure       | 3.5 KPa                          |
| Range               | 130 Pa / 3.0 KPa                 |
| Differential        | 50 - 200 Pa.                     |
| Switch rating       | 10(2)A @ 250VAC                  |
| Connections         | Screw terminals                  |
| Pressure connection | 1/4" compression                 |
| Protection          | IP30                             |
| Media temperature   | 0 / +80 C at diaphragm           |
|                     | 0 / +300 C for 2 metre capillary |
| Weight              | 0.25 kg                          |
| Country of origin   | USA                              |

**Connections :**

|  |   |       |                 |
|--|---|-------|-----------------|
|  | 1 | Relay | Normally Closed |
|  | 2 | Relay | Normally Open   |
|  | 3 | Relay | Common          |

Data sheet: PA-FS3 Iss. 1.0 22.5.95.

Sontay Limited:  
Four Elms Road, Edenbridge  
Kent TN8 6AB England  
Tel.: 01732 865 548 Fax.: 01732 867 164

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## Technical overview

The PA-KS is designed for overpressure, underpressure, and differential pressure switching of neutral gases. The unit is especially suited for measurement, control and monitoring functions in air-conditioning, ventilation and environmental technology, for detection of flow failure across fans and filter dirty indication.

An elastomer diaphragm is used as the measurement cell. The differential pressure to be measured induces a corresponding movement of the spring-loaded diaphragm. Isolated from the medium, this movement is converted to an electronic output signal by a Hall effect sensor and a connected electronic circuit.

- Adjustable setpoint
- Supplied with fixing kit

|                   |                                         |              |                   |                                               |
|-------------------|-----------------------------------------|--------------|-------------------|-----------------------------------------------|
| Specification:    | Case construction Polycarbonate         |              |                   |                                               |
| Pressure ranges : | Protection IP54                         |              |                   |                                               |
| Model             | Adj. range                              | Differential | Diaphragm         | EPDM based                                    |
| PA-KS150          | 20-150 Pa                               | < 18 Pa      | Overload          | 500 KPa                                       |
| PA-KS300          | 40-300 Pa                               | < 20 Pa      |                   |                                               |
| PA-KS600          | 70-600 Pa                               | < 30 Pa      | Rupture pressure  | 50 KPa                                        |
| PA-KS1000         | 100-1000 Pa                             | < 40 Pa      |                   |                                               |
| PA-KS3000         | 300-3000 Pa                             | < 80 Pa      | Pressure conns.   | Push-fit for pipe 6mm OD nominal Thread G 1/8 |
| Mounting          | Vertical only                           |              |                   | Thread G 1/8 for P1 at top, centric P1 > P2   |
| Temp. range       | -15 / +60°C                             |              | Electrical conns. | Via PG11 cable gland                          |
| Switch rating     | Au plated Ag contacts<br>5(3)A / 250VAC |              | Weight            | 250grams                                      |
|                   |                                         |              | Country of origin | Germany                                       |

Product code PA-KS / R = xx  
where : R = pressure range

Data sheet : PA-KS Iss. 1.0 27.6.96

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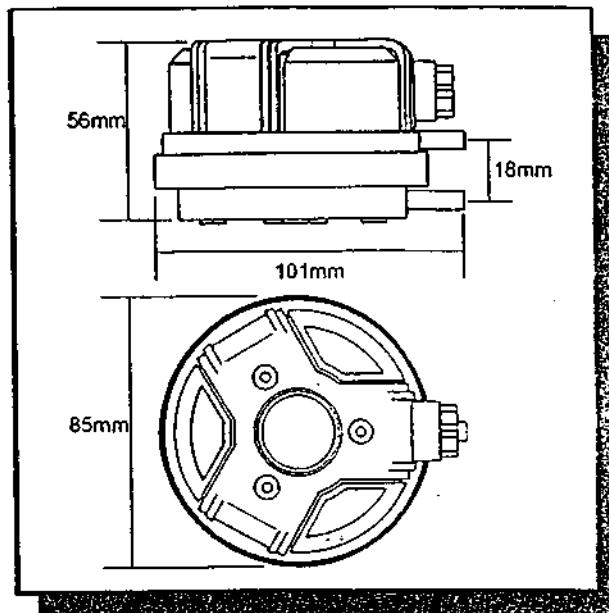
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## Technical Overview

The PA-930 range are high sensitivity air differential pressure switches for low differential pressure switching applications. Suitable for use in air-conditioning systems for to provide an indication of fan status and 'filter dirty' condition.

The switching set-point is adjusted by means of a calibrated knob, mounted under the main cover to avoid tampering. Units are supplied complete with a duct fixing kit and mounting bracket.

- Close switching differential
- 5 ranges to cover all applications
- Duct fixing kit included
- IP65 housing option



## Specification:

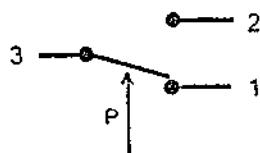
## Connections:

## Operating range

| Type      | Adjustment range | Switching differential |
|-----------|------------------|------------------------|
| PA-930-81 | 40 to 100Pa      | 20Pa                   |
| PA-930-82 | 40 to 200Pa      | 20Pa                   |
| PA-930-83 | 50 to 500Pa      | 20Pa                   |
| PA-930-84 | 100 to 500Pa     | 50Pa                   |
| PA-930-85 | 200 to 1000Pa    | 100Pa                  |

The trip pressure refers to horizontal mounting. In case of vertical mounting the trip pressure differs by -20Pa

|                         |                                                                                   |
|-------------------------|-----------------------------------------------------------------------------------|
| Max. operating pressure | 5000Pa                                                                            |
| Pressure connections    | 6mm ID push-on tubing                                                             |
| Electrical rating       | 1.5A (0.4)/250Vac                                                                 |
|                         | AgCdO contacts                                                                    |
| Approvals               | Switch according to VDE 0630 UG 1652                                              |
| Connections             | Spade terminals + screw terminal adaptors for cable up to 1.5mm <sup>2</sup> max. |
| Dimensions              | 85mm dia. x 56mm                                                                  |
| Housing material        | Plastic moulding                                                                  |
| Fixing                  | Metal mounting bracket                                                            |
| Protection              | IP54 (IP65 box option)                                                            |
| Ambient range           | 0 to +80°C                                                                        |
| Weight                  | 250g                                                                              |
| Origin                  | Germany                                                                           |



## Product codes:

## PA-930-R-IP65

where R = measurement range in Pascals  
IP65 = IP65 box option

|                 |           |                    |
|-----------------|-----------|--------------------|
| Pressure ranges | PA-930-81 | 20/40* to 100 Pa   |
|                 | PA-930-82 | 20/40* to 200 Pa   |
|                 | PA-930-83 | 20/40* to 500 Pa   |
|                 | PA-930-84 | 30/50* to 500 Pa   |
|                 | PA-930-85 | 80/100* to 1000 Pa |

\* depending on mounting orientation

A duct fixing kit is supplied with the PA-930. It consists of 2m of 6mm dia. plastic tubing, 2 x pitot tubes, and 4 x fixing screws.

Data sheet: PA-930 Iss. 1.0 23.4.96.

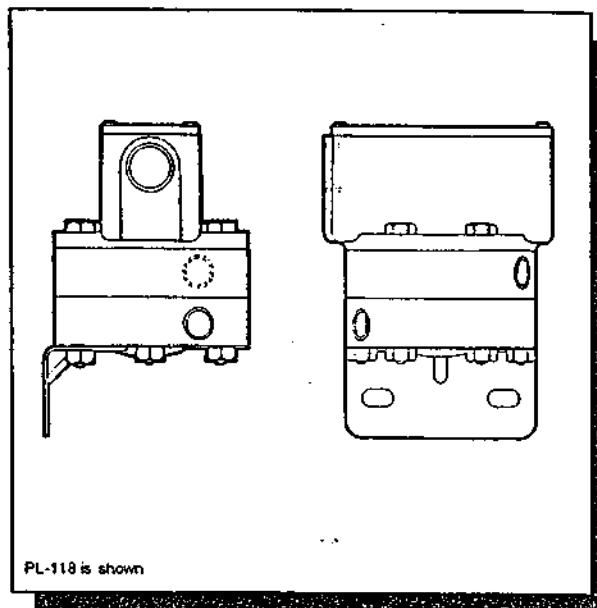
Sontay Limited,  
Four Elms Road, Edenbridge,  
Kent TN8 6AB England  
Tel.: 01732 865 548 Fax.: 01732 867 164

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## Technical Overview

The PL-118/167 differential pressure switches are suitable for use with liquids and non-aggressive gases. The units have adjustable switching threshold and a fixed reset differential. Applications include boiler flow, pump and filter monitoring, using the signal as an alarm or for a control action, such as switching a pump or valve. If fitted across an orifice plate the differential pressure switch will act as a flow switch. The diaphragm is protected by a support plate which enables the unit to withstand 4 x range over pressure without damage, except for a possible 2% setting shift.

- Ranges from 0.125 mbar to 4 bar
- Maximum line pressure 34 bar
- 4 x range over pressure without damage
- Suitable for water, oil, steam, or air
- Robust construction
- 1/4" BSP female pressure connections



## Specifications:

## Pressure ranges

| Type         | Adjustment range | Switching differential |
|--------------|------------------|------------------------|
| PL-167-0.125 | 8-125 mbar       | 6 mbar approx.         |
| PL-167-0.25  | 12-250 mbar      | 7 mbar approx.         |
| PL-167-0.4   | 20-400 mbar      | 10 mbar approx.        |
| PL-118-1     | 0.07 to 1 bar    | 0.04 bar approx.       |
| PL-118-4     | 0.2 to 4 bar     | 0.1 bar approx.        |

Max. operating pressure 34 bar

## Pressure connections:

|        |              |
|--------|--------------|
| PL-167 | 1/8" BSP (G) |
| PL-118 | 1/4" BSP (G) |

Media Water, oil, air, steam

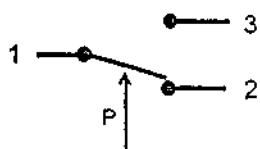
Electrical rating 5A at 250Vac

Electrical connections Screw terminals for cable 1.5mm<sup>2</sup> max.

## Materials:

|                   |                           |
|-------------------|---------------------------|
| Pressure chambers | Brass                     |
| Diaphragm         | Beryllium copper          |
| Seals             | Nitrile                   |
| Housing           | Diecast zinc              |
| Lid               | ABS moulding              |
| Mounting          | Zinc plated steel bracket |
| Protection        | IP54                      |
| Operating range   | -10 to 85°C               |
| Weight            | 1.28 kg                   |
| Origin            | UK                        |

## Connections:



## Dimensions:

|        |                                |
|--------|--------------------------------|
| PL-167 | 92 x 100 x 90 diameter housing |
| PL-118 | 92 x 100 x 77 diameter housing |

## Product Codes:

## PL-118-R

where R = measurement range in bar

|                 |              |           |
|-----------------|--------------|-----------|
| Pressure ranges | PL-167-0.125 | 0.125 bar |
|                 | PL-167-0.25  | 0.25 bar  |
|                 | PL-167-0.4   | 0.4 bar   |
|                 | PL-118-1     | 1 bar     |
|                 | PL-118-4     | 4 bar     |

Data Sheet: PL-118 Iss. 1.0 2.7.96.

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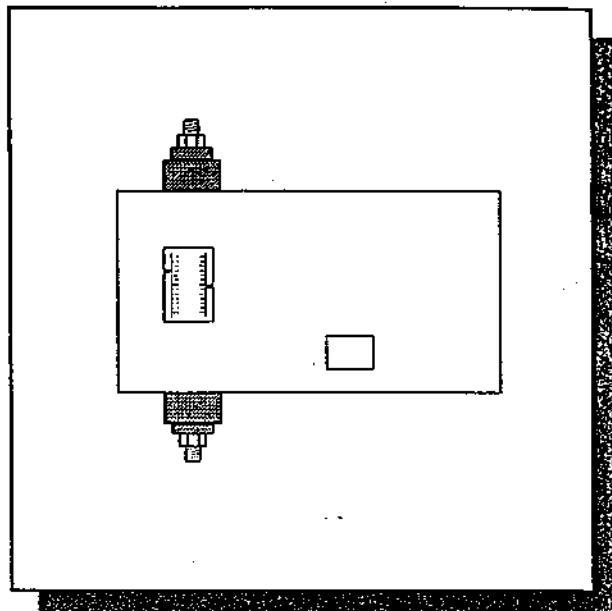
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**PL-S-FD113****LIQUID D.P. SWITCH : with setting switch**

Liquid differential pressure switch suitable for monitoring for flow failure across pumps, chillers, valves etc. Adjustable setpoint in the range 0.20 to 4.0 Bar (20 to 400 KPa), with fixed differential of 0.1 Bar (10 KPa).

The PL-FD113 has a dial to show the liquid pressure. It is not recommended that this dial be used for accurate setting of the switch position.

- Immediate reset - No cooling down period
- Precise timing
- Supply voltage 24 - 240VAC
- Adjustable cut-out range

**Specification :**

Setting range 0.3 to 4.5 Bar (30 to 450 KPa)  
Factory setting 0.7 Bar (70 KPa)  
Switching differential 0.1 Bar (10 KPa)

Pressure conns 1/4" BSP female

Ambient temperature -20 / +50 C  
Liquid temperature 0 / +110 C

Electrical conns Screw terminals for 1.5mm<sup>2</sup> max. cable  
Switch rating 3A @ 250 VAC

Protection IP30  
Vibration resistance 4G

Weight 1000 g  
Country of origin EU

**Connections :**

|  |   |       |                 |
|--|---|-------|-----------------|
|  | 1 | Relay | Normally open   |
|  | 2 | Relay | Common          |
|  | 3 | Relay | Normally closed |

Data sheet: PL-S-FD113 Iss. 1.0 3.5.96.

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Four Elms Road, Edenbridge  
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Whilst every effort has been made to ensure the accuracy of this specification, Sontay cannot accept responsibility for damage, injury, loss or expense resulting from errors or omissions. In the interest of technical improvement, this specification may be altered without notice.

The TT511 is a low cost, direct output temperature sensor used for the detection of air temperature in indoor spaces. Units contain either a high quality thermistor or a platinum sensing element suitable for use in the range -10 to +60°C. Sensor types compatible with most controls manufacturers' equipment are available. Refer to the latest catalogue for data on system compatibility, or consult the Sales Office if you are unsure of compatibility or require a type not listed. The sensing element is mounted in an attractive white moulded enclosure for wall mounting. Various additions to the basic sensor are available; the /SP option provides a set-point adjustment input to a BEMS controller, the /MS option provides a momentary contact push-button for local override applications, and the /LS option includes a 5 position slide switch for fan-speed control. Consult the latest catalogue for the full range, or contact the Sales Office.

The TT511/PT100A version can be fitted with a 4-20mA or 0-10V transmitter (order as a separate item TC511 or TV511 for the range -10 to +40°C).

#### Specification:

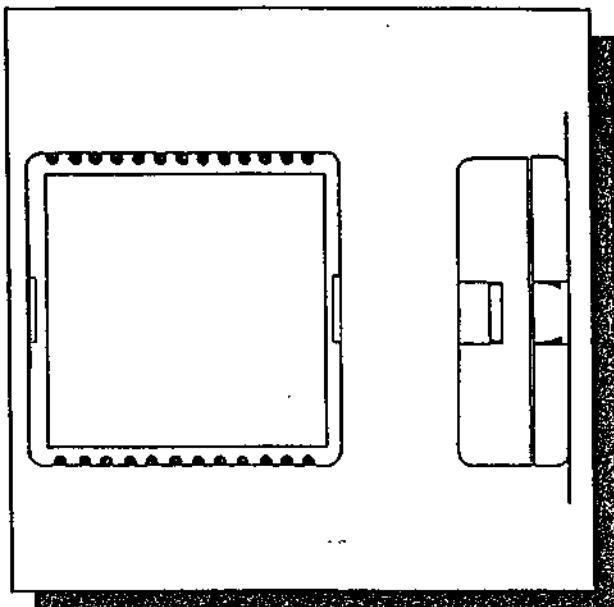
Thermistors are identified by their base resistance at 25°C (eg. 10KΩ), their curve shape (eg. type 3A) and their tolerance (all Sontay sensors use Grade 1 elements ( $\pm 0.2^\circ\text{C}$ , 0-70°C)). Platinum element types are identified by PT and their nominal resistance at 0°C as either 100Ω or 1000Ω. All Sontay sensors use grade A elements as defined by DIN standards.

|                  |                                        |
|------------------|----------------------------------------|
| Output           | Direct resistance                      |
| Accuracy         | $\pm 0.2^\circ\text{C}$ , (0 to 70°C)  |
| Housing material | ABS (flame retardant)                  |
| Dimensions       | 84mm x 84mm x 37mm                     |
| Ambient range    | -10 to +60°C                           |
| Connections      | Two wire, screen earthed at controller |

#### Installation:

Unclip the front cover by gripping the sides with thumb and fore finger squeezing gently. Using the base of the housing as a template mark the hole centres and fix to the wall with suitable screws. Alternatively, the box can be mounted on to a square or circular sinking box.

The two wire connection is not polarity sensitive, and should be connected to a resistance input on the controller.



#### Product codes:

Thermistor types      TT511 / xxx K yy 1

where : xxx = nominal resistance at 25°C  
              in KΩ (eg. 10)  
              yy = curve shape (eg. 3A)

e.g.      TT511/10K3A1

#### Thermistor types:

|                         |                      |
|-------------------------|----------------------|
| 1K7A1                   | INT01 = Intec        |
| 2.2K3A1                 | LAN01 = Landis & Gyr |
| 3K3A1 Allerton          | SAT01 = Satchwell    |
| 10K3A1 Trend + others   | SAT02 = Satchwell    |
| 10K4A1 Andover + others | SAT03 = Satchwell    |
| 20K6A1                  | SIE01 = Siebe        |
| 30K6A1 Drayton          | ST1 = Staefa         |
| 50K6A1                  | ST2 = Staefa         |
| 100K6A1                 | TA1 = T&A            |
|                         | TA2 = T&A            |

Platinum types:      TT511/PT100A  
                         TT511/PT1000A

Data sheet: TT511 Iss. 1.0 7.5.96.

Sontay Limited,  
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Whilst every effort has been made to ensure the accuracy of this specification, Sontay cannot accept responsibility for damage, injury, loss or expense resulting from errors or omissions. In the interest of technical improvement, these specifications may be altered without notice.

The TT511 lowcost, direct output temperature sensor can be fitted with a wide range of user adjustment options. Units contain either a high quality thermistor or a platinum sensing element suitable for use in the range -10 to +60°C. Sensor types compatible with most controls manufacturers' equipment are available. Refer to the latest catalogue for data on system compatibility, or consult the Sales Office if you are unsure of compatibility or require a type not listed. The sensing element is mounted in an attractive white moulded enclosure for wall mounting. Various additions to the basic sensor are available; the /SP option provides a set-point adjustment input to a BEMS controller, the /MS option provides a momentary contact push-button for local override applications, and the /FS option includes a 5 position slide switch for fan-speed control. Consult the latest catalogue for the full range, or contact the Sales Office as custom options are also available.

The TT511/PT100A version can be fitted with a 4-20mA or 0-10V transmitter (order as a separate item TC511 or TV511 for the range -10 to +40°C), but the only addition available for this is the /SP option.

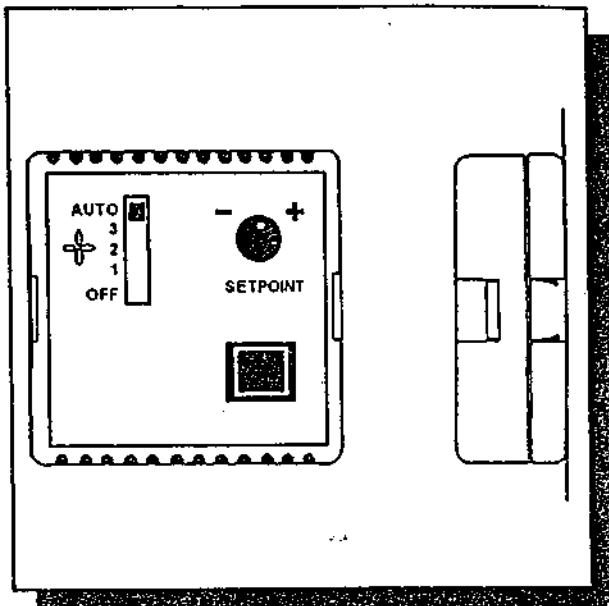
#### Specification:

Thermistors are identified by their base resistance at 25°C (eg. 10KΩ), their curve shape (eg. type 3A) and their tolerance (all Sontay sensors use Grade 1 elements ( $\pm 0.2^\circ\text{C}$ , 0-70°C). Platinum element types are identified by PT and their nominal resistance at 0°C as either 100Ω or 1000Ω. All Sontay sensors use grade A elements as defined by DIN standards.

|                  |                                         |
|------------------|-----------------------------------------|
| Output           | Direct resistance                       |
| Accuracy         | $\pm 0.2^\circ\text{C}$ , ( 0 to 70°C ) |
| Housing material | ABS (flame retardant)                   |
| Dimensions       | 84mm x 84mm x 37mm                      |
| Ambient range    | -10 to +60°C                            |
| Connections      | Two wire, screen earthed at controller  |

#### Thermistor types:

|                         |                      |
|-------------------------|----------------------|
| 1K7A1                   | INT01 = Intec        |
| 2.2K3A1                 | LAN01 = Landis & Gyr |
| 3K3A1 Allerton          | SAT01 = Satchwell    |
| 10K3A1 Trend + others   | SAT02 = Satchwell    |
| 10K4A1 Andover + others | SAT03 = Satchwell    |
| 20K6A1                  | SIE01 = Siebe        |
| 30K6A1 Drayton          | ST1 = Staefa         |
| 50K6A1                  | ST30 = Staefa        |
| 100K6A1                 | TA1 = T&A            |
|                         | TA2 = T&A            |



Product codes: (see page 2 for full descriptions)

Thermistor types: TT511/xxx K yy 1/z/z...

where : xxx = nominal resistance at 25°C

in KΩ (eg. 10)

yy = curve shape (eg. 3A)

zz = option (see list overleaf)

#### Examples:

TT511/10K3A1

10K3A1 thermistor sensor

TT511/10K4A1/SP/FS/LB6

10K4A1 thermistor with set-point adjustment, fan speed switch and standard label

TT511/SAT01/MS/LD/LB4

Satchwell compatible (BAS2000) thermistor with momentary override switch with LED and standard label

Platinum types: TT511/PT100A/zz

TT511/PT1000A/zz

Data sheet: TT511 Iss. 1.0 3.7.96.

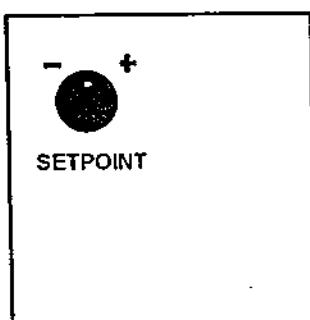
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Kent TN8 6AB England  
Tel.: 01 732 865 548 Fax.: 01 732 867 164

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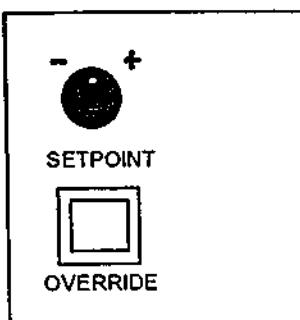
TT511 / LB

STANDARD LABELS ROOM TEMPERATURE SENSORS

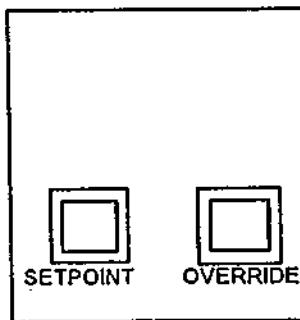
Type 1



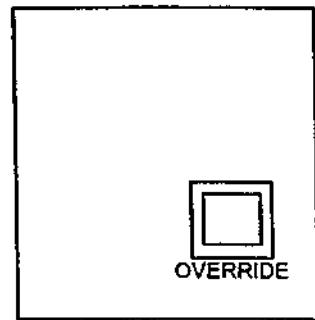
Type 2



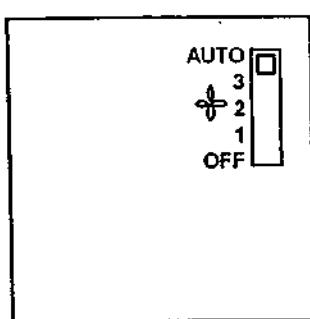
Type 3



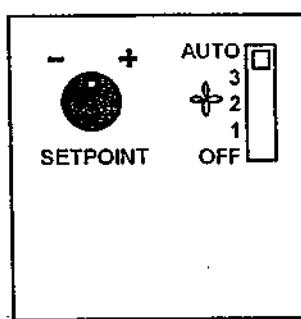
Type 4



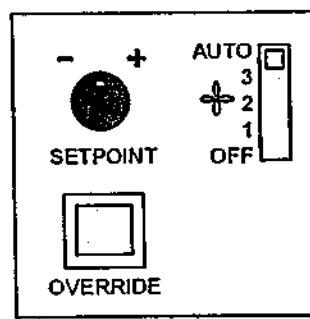
Type 5



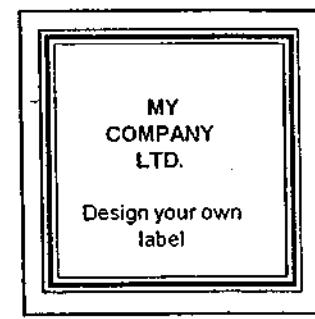
Type 6



Type 7



Type x



When ordering a combination of options, please consult the Sales Office before ordering.

Custom designs as required for your project

Additional resistors and other components can be incorporated if required.

When ordering an RJ11 data port option the pin out must be specified at the time of ordering.

Other options may be possible, please ask.

| Part code | Compatibility                                                                                 | Price | Stk  |
|-----------|-----------------------------------------------------------------------------------------------|-------|------|
| TT511 /SP | Supplement for setpoint adjustment (0-10 kΩ pot. with 1 kΩ resistor in series)                | 6.00  | Stk  |
| /MS       | Supplement for momentary switch (momentary push-button)                                       | 11.00 | 3d   |
| /LS       | Supplement for latching switch (latching rocker switch)                                       | 11.00 | 3d   |
| /LD       | Supplement for local LED (LED)                                                                | 4.00  | 7d   |
| /FS       | Supplement for fan speed selector (five position slide switch)                                | 11.00 | 7d   |
| /DP       | Supplement for RJ11 data port (RJ11)                                                          | 11.00 | 7d   |
| /LB1      | Supplement for label : style 1                                                                | 2.00  | call |
| /LB2      | Supplement for label : style 2                                                                | 2.00  | call |
| /LB3      | Supplement for label : style 3                                                                | 2.00  | call |
| /LB4      | Supplement for label : style 4                                                                | 2.00  | call |
| /LB5      | Supplement for label : style 5                                                                | 2.00  | call |
| /LB6      | Supplement for label : style 6                                                                | 2.00  | call |
| /LB7      | Supplement for label : style 7                                                                | 2.00  | call |
| /LB8      | Supplement for label : style 8 : custom<br>Cost of labels is negotiable depending on quantity | POA   | 6w   |

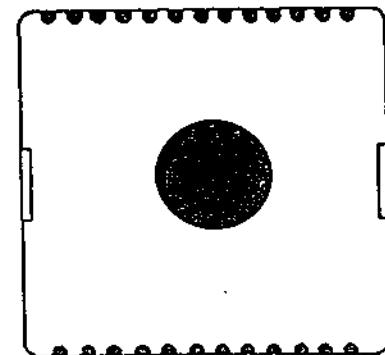
## Technical Overview

The TT515 is a low cost sensor used for the detection of mean radiant / comfort temperature in a space, utilising a black bulb.

Units contain a high quality thermistor suitable for use in the range -40/+60°C. Thermistors are identified by their base resistance at 25C (eg. 10Kohm), their curve shape (eg. 3A) and their tolerance (all Sontay sensors use Grade 1 elements (+/- 0.2C, 0-70C).

The TT515 can also be supplied with components in series or parallel, to suit specific requirements and thermistors are sometimes duplicated into a single housing to provide an averaging or redundancy capability.

The TT515 is housed in an attractive white enclosure and is designed for direct wall mounting within the controlled space.



## Specification:

## Housing

Material : ABS (flame ret.)  
Dimensions : (84 x 84 x 37))mm

## Bulb

Material : Polycarbonate  
Dimensions : 22mm radius

## Output

Direct resistance

 $\pm 0.2^\circ\text{C}$ , (0 to 70°C)

## Accuracy

84mm x 84mm x 37mm

## Dimensions

-10 to +60°C

## Ambient range

Two wire, screen earthed at controller

## Connections

## Installation:

Unclip the front cover by gripping the sides with thumb and fore finger squeezing gently. Using the base of the housing as a template mark the hole centres and fix to the wall with suitable screws. Alternatively, the box can be mounted on to a square or circular sinking box.

The two wire connection is not polarity sensitive, and should be connected to a resistance input on the controller.

## Product codes:

## Thermistor types

TT515 / xxx K yy 1

where : xxx = nominal resistance at 25°C  
in KΩ (eg. 10)  
yy = curve shape (eg. 3A)  
e.g. TT515/10K3A1

## Thermistor types:

|                         |                      |
|-------------------------|----------------------|
| 1K7A1                   | INT01 = Intecc       |
| 2.2K3A1                 | LAN01 = Landis & Gyr |
| 3K3A1 Allerton          | SAT01 = Satchwell    |
| 10K3A1 Trend + others   | SAT02 = Satchwell    |
| 10K4A1 Andover + others | SAT03 = Satchwell    |
| 20K6A1                  | SIE01 = Siebe        |
| 30K6A1 Drayton          | ST1 = Staefa         |
| 50K6A1                  | ST2 = Staefa         |
| 100K6A1                 | TA1 = T&A            |
|                         | TA2 = T&A            |

## Platinum types:

TT515PT100A

TT515/PT1000A

Data sheet: TT515 Iss. 1.0 8.8.96

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Tel.: 01 732 865 548 Fax.: 01 732 867 164

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The TT522 is a low cost, direct output temperature sensor used for the detection of air temperature in ducts. Units contain either a high quality thermistor or a platinum sensing element suitable for use in the range -10 to +60°C. Sensor types compatible with most controls manufacturers' equipment are available. Refer to the latest catalogue for data on system compatibility, or consult the Sales Office if you are unsure of compatibility or require a type not listed.

The TT522 sensing element is fitted into a 150mm long brass probe with holes to allow air to flow directly over the sensing element. The IP67 rated enclosure has fixing lugs for direct duct mounting. A neoprene gasket is supplied to ensure a good seal onto the duct. A flange plate is available for adjustment of penetration depth (order as AC-F522).

The TT522/PT100A version can be fitted with a 4-20mA or 0-10V transmitter (order as a separate item TC51x or TV51x for the temperature range required; where x=1 for -10 to +40°C, x=2 for -10 to +110°C).

#### Specification:

Thermistors are identified by their base resistance at 25°C (eg. 10KΩ), their curve shape (eg. type 3A) and their tolerance (all Sontay sensors use Grade 1 elements ( $\pm 0.2^\circ\text{C}$ , 0-70°C). Platinum element types are identified by PT and their nominal resistance at 0°C as either 100Ω or 1000Ω. All Sontay sensors use grade A elements as defined by DIN standards.

**Output** Direct resistance  
**Accuracy**  $\pm 0.2^\circ\text{C}$ , (0 to 70°C)

#### Probe:

**Material** Brass  
**Dimensions** 150mm x 6mm diameter

#### Housing:

**Material** ABS (flame retardant)  
**Dimensions** 55mm x 90mm diameter

#### Ambient range

-10 to +60°C

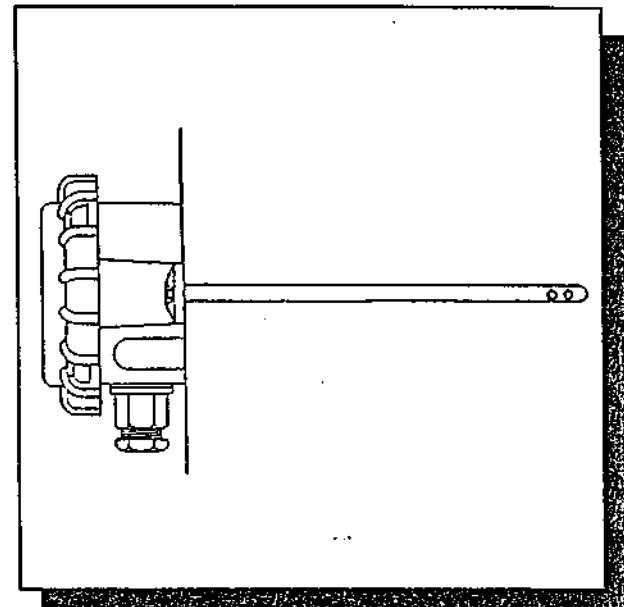
#### Connections

Two wire, screen earthed at controller

#### Installation:

Drill an 8mm diameter hole in the duct for the sensor probe, and two pilot holes either side at 85mm centres. Fix the probe to the duct with the self-tapping screws supplied.

The two wire connection is not polarity sensitive, and should be connected to a resistance input on the controller.



#### Product codes:

Thermistor types      TT522 / xxx K yy 1

where : xxx = nominal resistance at 25°C  
in KΩ (eg. 10)

yy = curve shape (eg. 3A)

e.g. TT522/10K3A1

#### Thermistor types:

|         |                      |
|---------|----------------------|
| 1K7A1   | INT01 = Intec        |
| 2.2K3A1 | LAN01 = Landis & Gyr |
| 3K3A1   | Allerton             |
| 10K3A1  | Trend + others       |
| 10K4A1  | Andover + others     |
| 20K6A1  | SIE01 = Siebe        |
| 30K6A1  | ST1 = Staefa         |
| 50K6A1  | ST2 = Staefa         |
| 100K6A1 | TA1 = T&A            |
|         | TA2 = T&A            |

#### Platinum types:

TT522/PT100A

TT522/PT1000A

Data sheet : TT522 Iss. 1.0 3.5.96.

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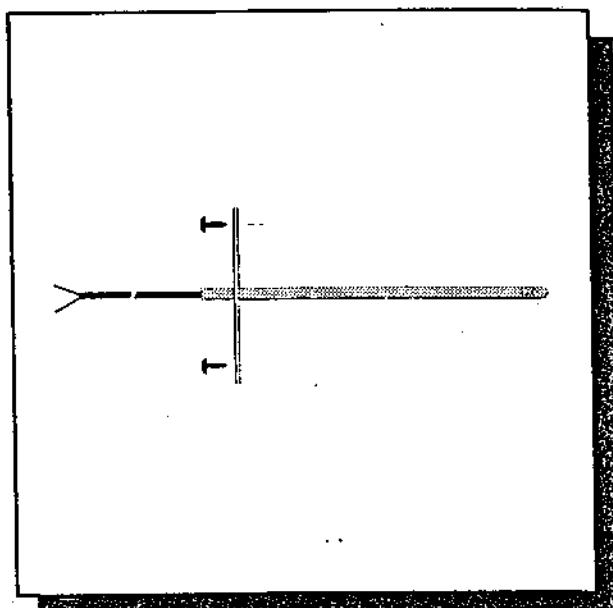
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**Sontay****DUCT TEMPERATURE SENSOR WITH FLYING LEAD****TT523**

The TT523 is a lowcost, direct output temperature sensor used for the detection of airtemperature inducts. Units contain either a high quality thermistor or a platinum sensing elements suitable for use in the range -10 to +60°C. Sensor types compatible with most controls manufacturers' equipment are available. Refer to the latest catalogue for data on system compatibility, or consult the Sales Office if you are unsure of compatibility or require a type not listed.

The TT523 sensing element is fitted into a 150mm long brass probe with holes to allow air to flow directly over the sensing element. This is fixed to a 70mm diameter brass flange plate for direct duct mounting. No housing is supplied and is instead fitted with 2M of flying lead.

The TT523/PT100A version can be connected to a 4-20mA or 0-10V transmitter (order as a separate item TC51x or TV51x for the temperature range required; where x=1 for -10 to +40°C, x=2 for -10 to +110°C).

**Specification:**

Thermistors are identified by their base resistance at 25°C (eg. 10KΩ), their curve shape (eg. type 3A) and their tolerance (all Sontay sensors use Grade 1 elements ( $\pm 0.2^\circ\text{C}$ , 0-70°C). Platinum element types are identified by PT and their nominal resistance at 0°C as either 100Ω or 1000Ω. All Sontay sensors use grade A elements as defined by DIN standards.

**Output** Direct resistance  
**Accuracy**  $\pm 0.2^\circ\text{C}$ , ( 0 to 70°C )

**Probe:**

**Material** Brass  
**Dimensions** 150mm x 6mm diameter

**Flange:**

**Material** Brass  
**Dimension** 70mm diameter

**Ambient range** -10 to +60°C

**Connections** Two wire flying lead 2 Metres long.

**Installation:**

Drill an 6mm diameter hole in the duct for the sensor probe, and two pilot holes either side for the flange mounting. Fix the probe to the duct with the self-tapping screws supplied.

The two wire connection is not polarity sensitive, and should be connected to a resistance input on the controller.

**Product codes:**

**Thermistor types** TT523 / xxx K yy 1

where : xxx = nominal resistance at 25°C  
in KΩ (eg. 10)  
yy = curve shape (eg. 3A)

e.g. TT523/10K3A1

**Thermistor types:**

|                         |                      |
|-------------------------|----------------------|
| 1K7A1                   | INT01 = Intecc       |
| 2.2K3A1                 | LAN01 = Landis & Gyr |
| 3K3A1 Allerton          | SAT01 = Satchwell    |
| 10K3A1 Trend + others   | SAT02 = Satchwell    |
| 10K4A1 Andover + others | SAT03 = Satchwell    |
| 20K6A1                  | SIE01 = Siebe        |
| 30K6A1 Drayton          | ST1 = Staefa         |
| 50K6A1                  | ST2 = Staefa         |
| 100K6A1                 | TA1 = T&A            |
|                         | TA2 = T&A            |

**Platinum types:**

TT523/PT100A

TT523/PT1000A

Data sheet : TT523 Iss. 1.0 14.6.96.

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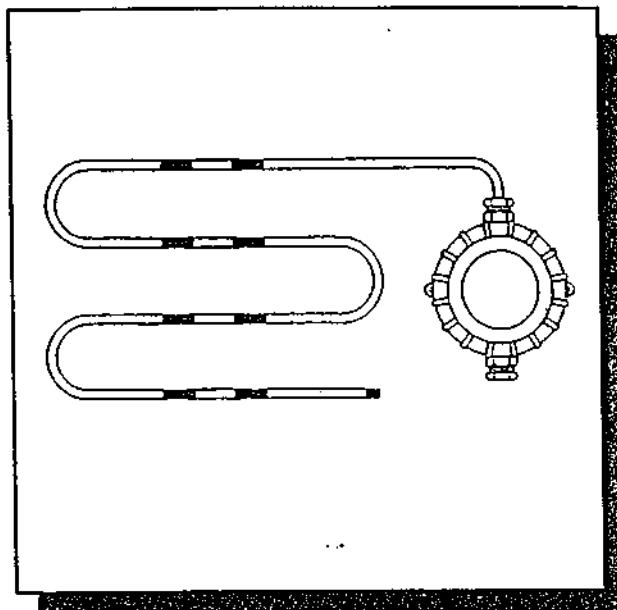
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The TT525 is a low cost, direct output temperature sensor used for the detection of temperature in ducts where an average reading across the air flow is required.

Units contain either a high quality thermistor or a platinum sensing element suitable for use in the range -10 to +110°C. Sensor types compatible with most controls manufacturers' equipment are available. Refer to the latest catalogue for information on system compatibility, or consult the Sales Office if you are unsure of compatibility or require a type not listed.

The TT525 sensing elements are housed in 35 x 6mm diameter brass tubes, spaced at 0.5m intervals along a 2.5m screened cable, which is terminated in an IP67 sensor head.

The TT525/PT100A version can be fitted with a 4-20mA or 0-10V transmitter (order as a separate item TC51x or TV51x for the temperature range required; where x=1 for -10 to +40°C, x=2 for -10 to +110°C).



#### Specification:

Thermistors are identified by their base resistance at 25°C (eg. 10KΩ), their curve shape (eg. type 3A) and their tolerance (all Sontay sensors use Grade 1 elements (+/- 0.2°C, 0-70°C). Platinum element types are identified by PT and their nominal resistance at 0°C as either 100Ω or 1000Ω. All Sontay sensors use grade A elements as defined by DIN standards.

|                 |                            |
|-----------------|----------------------------|
| Output          | Direct resistance          |
| Accuracy        | +/- 0.2°C, (0 to 70°C)     |
| Probe: Material | Brass                      |
| Dimensions      | 50mm x 6mm diameter shaped |

#### Housing:

|               |                                 |
|---------------|---------------------------------|
| Material      | ABS (fire retardant)            |
| Dimensions    | 50mm x 90mm diameter            |
| Cable         | 2.5m flying lead PVC insulation |
| Ambient range | -40 to +60°C                    |
| Connections   | Two wire                        |
|               | Screen earthed at controller    |

#### Installation:

Drill an 8mm hole in the duct and feed the averaging sensing lead through it into the duct. Fix the IP67 housing to the duct using the screws provided. Fix the averaging sensing lead inside the duct by strapping it to wires or metal strips strung across the duct so that the sensor elements are evenly spaced.

#### Product codes:

Thermistor types      TT525 / xxx K yy.1

where : xxx = nominal resistance at 25°C  
in KΩ (eg. 10)  
yy = curve shape (eg. 3A)

e.g. TT525/10K3A1

#### Thermistor types:

|         |                      |
|---------|----------------------|
| 1K7A1   | INT01 = Intecc       |
| 2.2K3A1 | LAN01 = Landis & Gyr |
| 3K3A1   | Allerton             |
| 10K3A1  | Trend + others       |
| 10K4A1  | Andover + others     |
| 20K6A1  | SAT01 = Satchwell    |
| 30K6A1  | Drayton              |
| 50K6A1  | SIE01 = Siebe        |
| 100K6A1 | ST1 = Staefa         |
|         | ST2 = Staefa         |
|         | TA1 = T&A            |
|         | TA2 = T&A            |

Platinum types:      TT525/PT100A  
TT525/PT1000A

Data sheet : TT525 Iss. 1.0 8.5.96.

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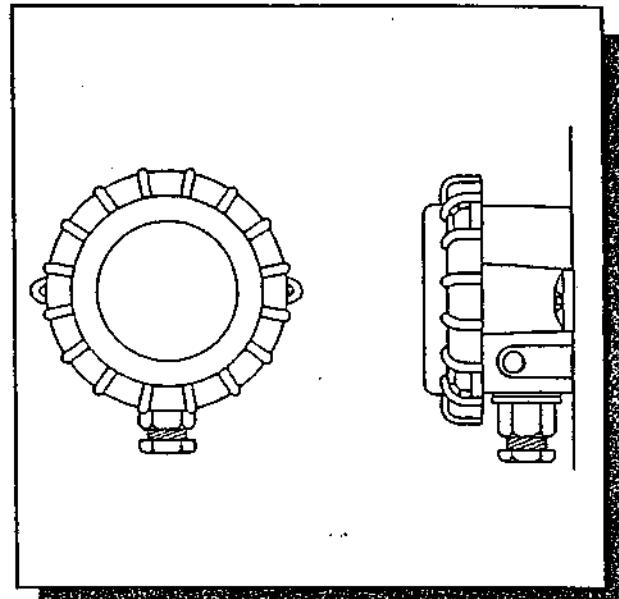
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The TT531 is a low cost, direct output temperature sensor used for the detection of outside air temperature.

Units contain either a high quality thermistor or a platinum sensing element suitable for use in the range -40 to +60°C. Sensor types compatible with most controls manufacturers' equipment are available. Refer to the latest catalogue for information on system compatibility, or consult the Sales Office if you are unsure of compatibility or require a type not listed.

The TT531 is housed in an IP67 rated enclosure, with a 10mm diameter brass cap containing the sensing element located externally in the shadow of the lid to avoid solar gain in most applications. Outside air sensors should always be situated in a sheltered position on a north facing wall.

The TT531 can also be supplied with components in series or parallel, to suit specific requirements. Thermistors can be duplicated into a single housing to provide an averaging or redundancy



#### Specification:

Thermistors are identified by their base resistance at 25°C (eg. 10KW), their curve shape (eg. type 3A) and their tolerance (all Sontay sensors use Grade 1 elements ( $\pm 0.2^\circ\text{C}$ , 0-70°C)). Platinum element types are identified by PT and their nominal resistance at 0°C as either 100W or 1000W. All Sontay sensors use grade A elements as defined by DIN standards.

**Output** Direct resistance  
**Accuracy**  $\pm 0.2^\circ\text{C}$ , (0 to 70°C)  
**Sensing cap** Brass, 10mm diameter

**Housing:**  
**Material** ABS (flame retardant)  
**Dimensions** 55mm x 90mm diameter

**Ambient range** -40 to +110°C  
**Connections** Two wire, screen earthed at controller

#### Installation:

The TT531 should always be mounted with the cable entry facing downwards. Drill two pilot holes at 85mm centres in the surface on which the sensor is to be mounted, and fix the sensor with appropriate screws. The housing is designed to make it easy for an electric screwdriver to be used if desired.

The two wire connection is not polarity sensitive, and should be connected to a resistance input on the controller.

#### Product codes:

**Thermistor types** TT531 / xxx K yy 1

where : xxx = nominal resistance at 25°C  
in KW (eg. 10)  
yy = curve shape (eg. 3A)

e.g. TT531/10K3A1

#### Thermistor types:

|                         |                      |
|-------------------------|----------------------|
| 1K7A1                   | INT01 = Intecc       |
| 2.2K3A1                 | LAN01 = Landis & Gyr |
| 3K3A1 Allerton          | SAT01 = Satchwell    |
| 10K3A1 Trend + others   | SAT02 = Satchwell    |
| 10K4A1 Andover + others | SAT03 = Satchwell    |
| 20K6A1                  | SIE01 = Siebe        |
| 30K6A1 Drayton          | ST1 = Staefa         |
| 50K6A1                  | ST2 = Staefa         |
| 100K6A1                 | TA1 = T&A            |
|                         | TA2 = T&A            |

**Platinum types:** TT531/PT100A  
TT531/PT1000A

Data sheet : TT531 Iss. 1.0 3.5.96.

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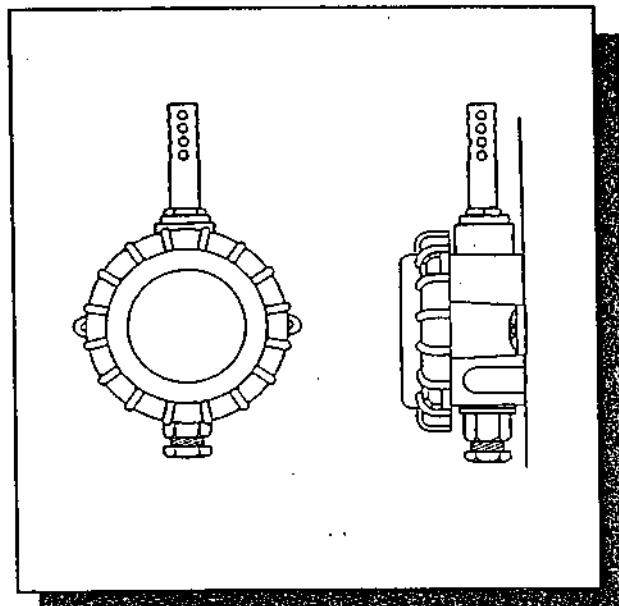
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The TT532 is a low cost, direct output temperature sensor have elements fitted into a stainless steel radiation shield. The radiation shield is designed to provide fast response times to changes in outside air temperature and to protect the element from the effects of direct sunlight.

Units contain either a high quality thermistor or a platinum sensing element suitable for use in the range -40 to +60°C. Sensor types compatible with most controls manufacturers' equipment are available. Refer to the latest catalogue for information on system compatibility, or consult the Sales Office if you are unsure of compatibility or require a type not listed.

The TT532 is housed in an IP67 rated enclosure, with a 10mm diameter brass cap containing the sensing element located externally in the shadow of the lid to avoid solar gain in most applications. Outside air sensors should always be situated in a sheltered position on a north facing wall.

The TT532 can also be supplied with components in series or parallel, to suit specific requirements. Thermistors can be duplicated into a single housing to provide an averaging or redundancy capability.



#### Specification:

Thermistors are identified by their base resistance at 25°C (eg. 10KW), their curve shape (eg. type 3A) and their tolerance (all Sontay sensors use Grade 1 elements ( $\pm 0.2^\circ\text{C}$ , 0-70°C). Platinum element types are identified by PT and their nominal resistance at 0°C as either 100W or 1000W. All Sontay sensors use grade A elements as defined by DIN standards.

|             |                                       |
|-------------|---------------------------------------|
| Output      | Direct resistance                     |
| Accuracy    | $\pm 0.2^\circ\text{C}$ , (0 to 70°C) |
| Sensing cap | Brass, 10mm diameter                  |

|               |                                        |
|---------------|----------------------------------------|
| Housing:      |                                        |
| Material      | ABS (flame retardant)                  |
| Dimensions    | 55mm x 90mm diameter                   |
| Ambient range | -40 to +110°C                          |
| Connections   | Two wire, screen earthed at controller |

#### Installation:

The TT532 should always be mounted with the cable entry facing downwards. Drill two pilot holes at 85mm centres in the surface on which the sensor is to be mounted, and fix the sensor with appropriate screws. The housing is designed to make it easy for an electric screwdriver to be used if desired.

The two wire connection is not polarity sensitive, and should be connected to a resistance input on the controller.

#### Product codes:

Thermistor types      TT532 / xxx K yy 1

where : xxx = nominal resistance at 25°C  
in KW (eg. 10)  
yy = curve shape (eg. 3A)

e.g.      TT532/10K3A1

#### Thermistor types:

|                         |                      |
|-------------------------|----------------------|
| 1K7A1                   | INT01 = Intec        |
| 2.2K3A1                 | LAN01 = Landis & Gyr |
| 3K3A1 Allerton          | SAT01 = Satchwell    |
| 10K3A1 Trend + others   | SAT02 = Satchwell    |
| 10K4A1 Andover + others | SAT03 = Satchwell    |
| 20K6A1                  | SIE01 = Siebe        |
| 30K6A1 Drayton          | ST1 = Staefa         |
| 50K6A1                  | ST2 = Staefa         |
| 100K6A1                 | TA1 = T&A            |
|                         | TA2 = T&A            |

Platinum types:      TT532/PT100A  
TT532/PT1000A

Data sheet: TT532 Iss. 1.0 3.5.96.

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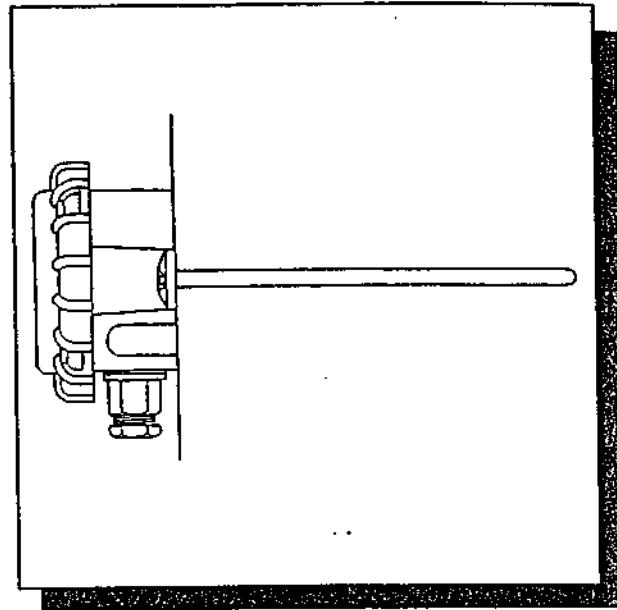
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The TT541 is a lowcost, direct output temperature sensor used for the detection of liquid temperature in pipes.

Units contain either a high quality thermistor or a platinum sensing element suitable for use in the range -40 to +110°C. Sensor types compatible with most controls manufacturers' equipment are available. Refer to the latest catalogue for information on system compatibility, or consult the Sales Office if you are unsure of compatibility or require a type not listed.

The TT541 sensing element is housed in a 150mm long brass probe fitted to an IP67 rated enclosure, for direct mounting into a brass or stainless steel pocket (order as AC-PO511 or AC-PO521).

The TT541 can also be supplied with components in series or parallel, to suit specific requirements. Thermistors can be duplicated into a single housing to provide an averaging or redundancy capability.



#### Specification:

Thermistors are identified by their base resistance at 25°C (eg. 10KW), their curve shape (eg. type 3A) and their tolerance (all Sontay sensors use Grade 1 elements ( $\pm 0.2^\circ\text{C}$ , 0-70°C). Platinum element types are identified by PT and their nominal resistance at 0°C as either 100W or 1000W. All Sontay sensors use grade A elements as defined by DIN standards.

**Output** Direct resistance  
**Accuracy**  $\pm 0.2^\circ\text{C}$ , (0 to 70°C)

#### Probe:

**Material** Brass  
**Dimensions** 150mm x 6mm diameter

#### Housing:

**Material** ABS (flame retardant)  
**Dimensions** 55mm x 90mm diameter

**Ambient range** -40 to +110°C

**Connections** Two wire, screen earthed at controller

#### Installation:

The brass or stainless steel pocket is screwed into a 1/2" BSP female boss in the pipe, and the sensor probe then inserted in the pocket. The nut on the pocket can be tightened to hold the sensor in firmly, if required. Probe collars are available to fit larger diameter pockets (contact the Sales Office).

The two wire connection is not polarity sensitive, and should be connected to a resistance input on the controller.

#### Product codes:

**Thermistor types** TT541 / xxx K yy 1

where : xxx = nominal resistance at 25°C  
in KW (eg. 10)  
yy = curve shape (eg. 3A)

e.g. TT541/10K3A1

#### Thermistor types:

|                         |                      |
|-------------------------|----------------------|
| 1K7A1                   | INT01 = Intec        |
| 2.2K3A1                 | LAN01 = Landis & Gyr |
| 3K3A1 Allerton          | SAT01 = Satchwell    |
| 10K3A1 Trend + others   | SAT02 = Satchwell    |
| 10K4A1 Andover + others | SAT03 = Satchwell    |
| 20K6A1                  | SIE01 = Siebe        |
| 30K6A1 Drayton          | ST1 = Staefa         |
| 50K6A1                  | ST2 = Staefa         |
| 100K6A1                 | TA1 = T&A            |
|                         | TA2 = T&A            |

#### Platinum types:

TT541/PT100A  
TT541/PT1000A

Data sheet : TT541 Iss. 1.0 3.5.96.

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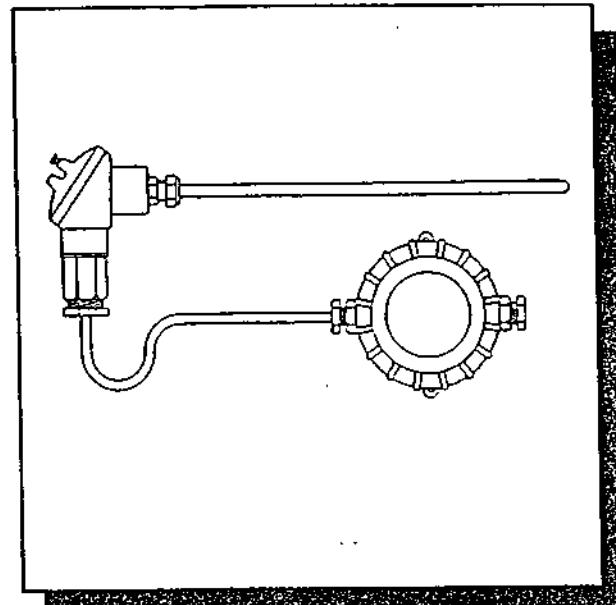
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Kent TN8 6AB England  
Tel.: 01 732 865 548 Fax.: 01 732 867 164

## Technical Overview

The TT542 is an immersion sensor for use in high temperature applications, such as in boiler flues and on medium/high temperature hot water systems, up to 400°C. The unit consists of a stainless steel probe, fitted to an aluminium head. This is connected by a 1000mm cable to a plant sensor housing, where terminations and transmitters can be located.

The TT542 can be supplied in 2 standard lengths, either 150mm or 230mm.

Since thermistors are not suitable for such high temperatures, the TT542 is only offered with RTD elements. TC and TV transmitters can be used to provide 4-20mA & 0-10VDC signals.

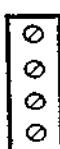


## Specification:

|                   |               |              |
|-------------------|---------------|--------------|
| Temperature range | Probe         | -20 / +400°C |
|                   | Housing       | -20 / +60°C  |
| Protection        | IP65          |              |
| Accuracy          | RTD           | DIN Class A  |
| Supplied with:    | Fixing screws |              |
| Country of origin | UK            |              |

## Connections:

For connection details, refer to the appropriate data sheet for the transmitter card used. For direct connection, with a transmitter card, use the drawing below.



- |   |           |
|---|-----------|
| 1 | Element + |
| 2 | Element - |
| 3 | Element + |
| 4 | Screen    |

## Installation:

The brass or stainless steel pocket is screwed into a 1/2" BSP female boss in the pipe, and the sensor probe then inserted in the pocket. The nut on the pocket can be tightened to hold the sensor in firmly, if required. Probe collars are available to fit larger diameter pockets (contact the Sales Office).

The two wire connection is not polarity sensitive, and should be connected to a resistance input on the controller.

## Product codes:

TT 542      / E = \_\_\_\_\_ / L = \_\_\_\_\_ / C = \_\_\_\_\_

/ E = element type

/ L = probe length mm

(where non-standard)

/ C = cable mm

(where non-std)

Data sheet : TT542 Iss. 1.0 3.5.96.

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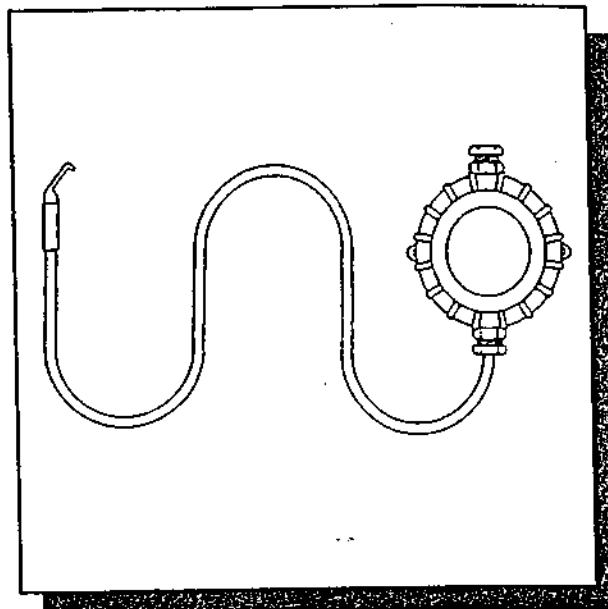
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The TT551 is a low cost, direct output temperature sensor used for the detection of pipe temperature.

Units contain either a high quality thermistor or a platinum sensing element suitable for use in the range -10 to +110°C. Sensor types compatible with most controls manufacturers' equipment are available. Refer to the latest catalogue for information on system compatibility, or consult the Sales Office if you are unsure of compatibility or require a type not listed.

The TT551 sensing element is housed in a 50mm long shaped brass probe, with 1.5 metres of PTFE 2-core screened cable as standard. Longer lengths can be made to special order.

The TT551/PT100A version can be fitted with a 4-20mA or 0-10V transmitter (order as a separate item TC51x or TV51x for the temperature range required; where x=1 for -10 to +40°C, x=2 for -10 to +110°C).



#### Specification:

Thermistors are identified by their base resistance at 25°C (eg. 10KΩ), their curve shape (eg. type 3A) and their tolerance (all Sontay sensors use Grade 1 elements (+/- 0.2°C, 0-70°C). Platinum element types are identified by PT and their nominal resistance at 0°C as either 100Ω or 1000Ω. All Sontay sensors use grade A elements as defined by DIN standards.

|                   |                                                                              |
|-------------------|------------------------------------------------------------------------------|
| Output            | Direct resistance                                                            |
| Accuracy          | +/- 0.2°C, (0 to 70°C)                                                       |
| Probe: Material   | Brass                                                                        |
| Dimensions        | 50mm x 6mm diameter shaped                                                   |
| Housing:          |                                                                              |
| Material          | ABS (fire retardant)                                                         |
| Dimensions        | 50mm x 90mm diameter                                                         |
| Cable             | 1.5m flying lead PTFE insulation                                             |
| Pipe fixing strap | 300mm long, if larger size required, order separately as AC-SQ50, 100 or 160 |
| Ambient range     | -40 to +110°C                                                                |
| Connections       | Two wire                                                                     |
|                   | Screen earthed at controller                                                 |

#### Installation:

Fit the strap around the pipe and screw up until nearly tight. Slip the sensor under the strap and tighten into position. Mount the housing on a convenient surface nearby. The two wire connection is not polarity sensitive, and should be connected to a resistance input on the controller.

#### Product codes:

Thermistor types      TT551/xxx K yy 1

where : xxx = nominal resistance at 25°C  
              in KΩ (eg. 10)  
              yy = curve shape (eg. 3A)

e.g.      TT551/10K3A1

#### Thermistor types:

|         |                      |
|---------|----------------------|
| 1K7A1   | INT01 = Intecc       |
| 2.2K3A1 | LAN01 = Landis & Gyr |
| 3K3A1   | Allerton             |
| 10K3A1  | Trend + others       |
| 10K4A1  | Andover + others     |
| 20K6A1  | SAT01 = Satchwell    |
| 30K6A1  | Drayton              |
| 50K6A1  | SAT02 = Satchwell    |
| 100K6A1 | SIE01 = Siebe        |
|         | ST1 = Staefa         |
|         | ST2 = Staefa         |
|         | TA1 = T&A            |
|         | TA2 = T&A            |

Platinum types:      TT551/PT100A  
                          TT551/PT1000A

Data sheet : TT551 Iss. 1.0 3.5.96.

Sontay Limited.  
Four Elms Road, Edenbridge  
Kent TN8 6AB England  
Tel: 01 732 865 548 Fax: 01 732 867 164

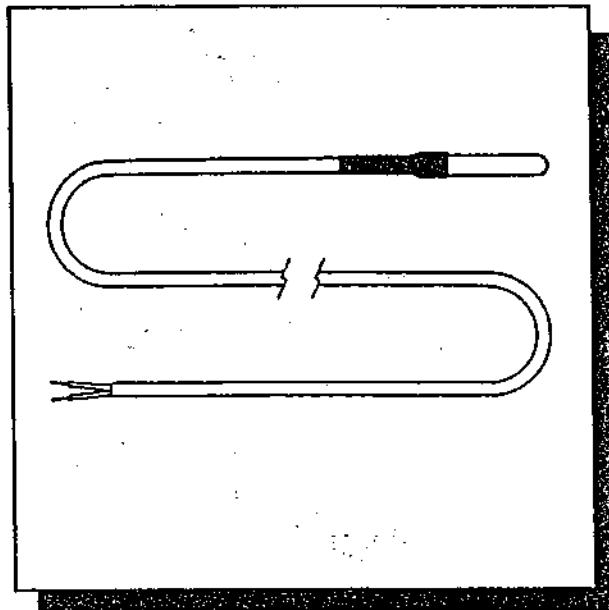
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The TT555 is a low cost, direct output temperature sensor used for the detection of air temperature, especially in fan-coil units etc.

Units contain either a high quality thermistor or a platinum sensing element suitable for use in the range -40 to +60°C. Sensor types compatible with most controls manufacturers' equipment are available. Refer to the latest catalogue for information on system compatibility, or consult the Sales Office if you are unsure of compatibility or require a type not listed.

The TT555 sensing element is housed in a 35mm long stainless steel probe, with 2 metres of 2-core screened cable as standard. Longer lengths can be made to special order.

The TT555 can also be supplied with components in series or parallel, to suit specific requirements. Thermistors can be duplicated into a single housing to provide an averaging or redundancy capability.



#### Specification:

Thermistors are identified by their base resistance at 25°C (eg. 10KW), their curve shape (eg. type 3A) and their tolerance (all Sontay sensors use Grade 1 elements (+/- 0.2°C, 0-70°C). Platinum element types are identified by PT and their nominal resistance at 0°C as either 100W or 1000W. All Sontay sensors use grade A elements as defined by DIN standards.

|                  |                                          |
|------------------|------------------------------------------|
| Output           | Direct resistance                        |
| Accuracy         | +/- 0.2°C, ( 0 to 70°C )                 |
| Probe material   | 316 stainless steel                      |
| Probe dimensions | 35mm x 6mm diameter                      |
| Ambient range    | -40 to +60°C                             |
| Connections      | Two wire<br>Screen earthed at controller |

#### Installation:

The sensor probe should be mounted in the airflow to be measured by strapping it to a grille, or bracket using a cable tie or similar fixing.

The two wire connection is not polarity sensitive, and should be connected to a resistance input on the controller.

#### Product codes:

Thermistor types      TT555 / xxx K yy 1

where : xxx = nominal resistance at 25°C  
in KW (eg. 10)

yy = curve shape (eg. 3A)

/R = Potted for refrigeration use.

e.g. TT555/10K3A1

#### Thermistor types:

|                         |                      |
|-------------------------|----------------------|
| 1K7A1                   | INT01 = Intecc       |
| 2.2K3A1                 | LAN01 = Landis & Gyr |
| 3K3A1 Allerton          | SAT01 = Satchwell    |
| 10K3A1 Trend + others   | SAT02 = Satchwell    |
| 10K4A1 Andover + others | SAT03 = Satchwell    |
| 20K6A1                  | SIE01 = Siebe        |
| 30K6A1 Drayton          | ST1 = Staefa         |
| 50K6A1                  | ST2 = Slaefa         |
| 100K6A1                 | TA1 = T&A            |
|                         | TA2 = T&A            |

#### Platinum types:

TT555/PT100A

TT555/PT1000A

Data sheet : TT555 Iss. 1.0 3.5.96.

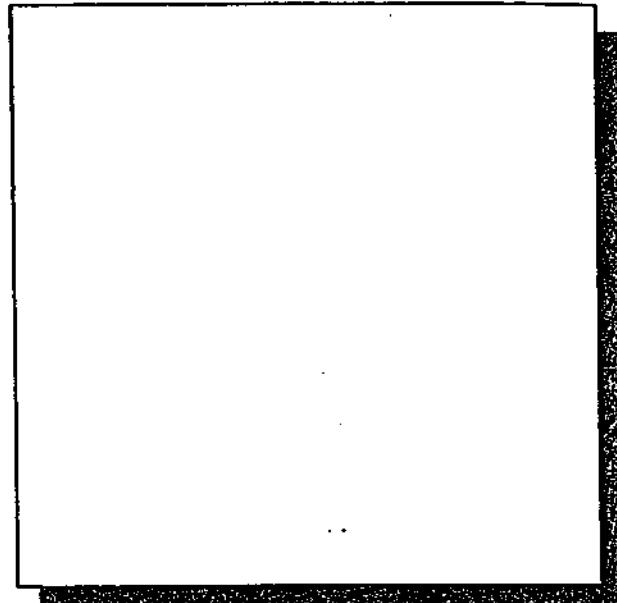
Sontay Limited,  
Four Elms Road, Edenbridge  
Kent TN8 6AB England  
Tel.: 01 732 865 548 Fax.: 01 732 867 164

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**Technical overview**

ST-SC capillary thermostats can be used to control the temperature of liquids and gases in a variety of applications. Liquid filled sensing elements ensure rapid response and accurate switching differentials.

- Protection to IP65
- Concealed adjustment

**Specification:**

|           |            |                |                   |                                 |
|-----------|------------|----------------|-------------------|---------------------------------|
| Part code | Temp range | Differential   | Case construction | Aluminium                       |
|           |            |                | Protection        | IP67                            |
|           |            |                | Capillary length  | 1.5 metres                      |
| ST-SC-01  | -35/+10C   | 1C             | No of stages      | 1 (2 & 4 stage units available) |
| ST-SC-01M | -35/+10C   | Man reset low  | Switch rating     | 15(8)A @ 240VAC                 |
| ST-SC-02  | -15/+30C   | 2/20C          | Adjustment        | Concealed standard              |
| ST-SC-02M | -15/+30C   | Man reset low  |                   | Add suffix 'E' for exposed      |
| ST-SC-03  | +10/+80C   | 2/20C          |                   |                                 |
| ST-SC-03M | +10/+80C   | Man reset high | Weight            | 200 grams                       |
| ST-SC-05  | +20/+80C   | 2/20C          | Country of origin | Italy                           |
| ST-SC-05M | +20/+80C   | Man reset high |                   |                                 |
| ST-SC-07  | +50/+120C  | 2/20C          |                   |                                 |
| ST-SC-07M | +50/+120C  | Man reset high |                   |                                 |
| ST-SC-08  | +100/+300C | 2/20C          |                   |                                 |
| ST-SC-08M | +100/+300C | Man reset high |                   |                                 |

Product code: ST-SC

Data sheet : ST-SC Iss. 1.0 2.7.96

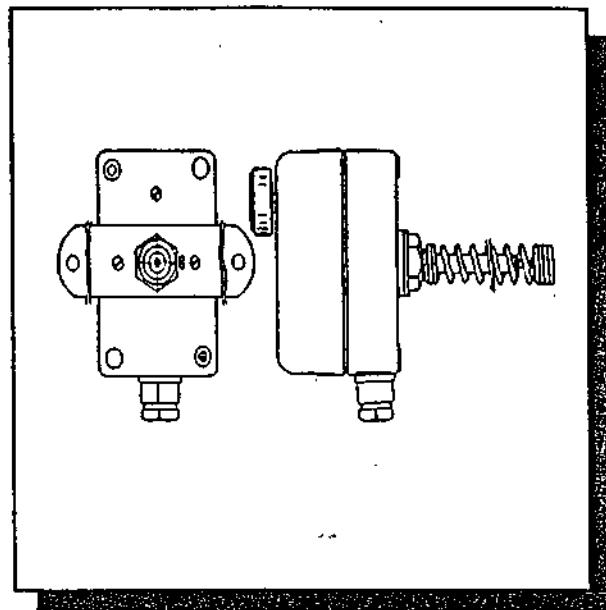
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Kent TN8 6AB England  
Tel.: 01732 865 548 Fax.: 01732 867 164

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**Technical overview**

ST-SD duct thermostats can be used to control the temperature of gas flows in a ducts. Liquid filled sensing elements ensure rapid response and accurate switching differentials.

- Protection to IP65
- Concealed or exposed adjustment
- Adjustable probe

**Specification:**

| Part code | Temprange | Differential         | Max bulb temp. |
|-----------|-----------|----------------------|----------------|
| ST-SD1    | -15/+30C  | 1C fixed             | 55C            |
| ST-SD2    | -15/+30C  | 2-20C adjustable     | 55C            |
| ST-SD2M   | -15/+30C  | Man. reset open low  | 55C            |
| ST-SD5    | +20/+80C  | 2-20C adjustable     | 100C           |
| ST-SD5M   | +20/+80C  | Man. reset open high | 100C           |
| ST-SD7    | +50/+120C | 2-20C adjustable     | 140C           |
| ST-SD7M   | +50/+120C | Man. reset open high | 140C           |

Case construction      Aluminium

Protection      IP65

No. of stages      1

Switch rating      15(8)A

Adjustment      Concealed standard  
Add suffix 'E' for exposed

Weight      300 grams

Product code:      ST-SD

Country of origin      Italy

Data sheet : ST-SD Iss. 1.0 14.06.96

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**Technical overview**

ST-SH humidistats are designed for space and duct mounting for the ON/OFF control of humidification and dehumidification equipment, or the initiation of alarms or over-ride controls.

High quality sensing elements ensure accurate measurement and switching differential.

- Single and two stage units available

**Specification:**

|                    |                                           |                   |                                                    |
|--------------------|-------------------------------------------|-------------------|----------------------------------------------------|
|                    |                                           | No. of stages     | 1 or 2                                             |
|                    |                                           | Switch rating     | Space : 6(0.2)A @ 240VAC<br>Duct : 15(8)A @ 240VAC |
| Case construction  | Space : ABS IP20<br>Duct : Aluminium IP65 | Adjustment        | Concealed standard<br>Add suffix 'E' for exposed   |
| Operating range    | 30-100 %RH                                | Weight            | Space : 200 grams                                  |
| Differential       | 4 %RH                                     |                   | Duct : 300 grams                                   |
| Stage differential | 2 to 15 %RH                               | Country of origin | Italy                                              |

|               |          |                    |
|---------------|----------|--------------------|
| Product code: | ST-SH-1R | Single stage space |
|               | ST-SH-2R | Dual stage space   |
|               | ST-SH-1D | Single stage duct  |
|               | ST-SH-2D | Dual stage duct    |

Data sheet : ST-SH Iss. 1.0 2.7.96

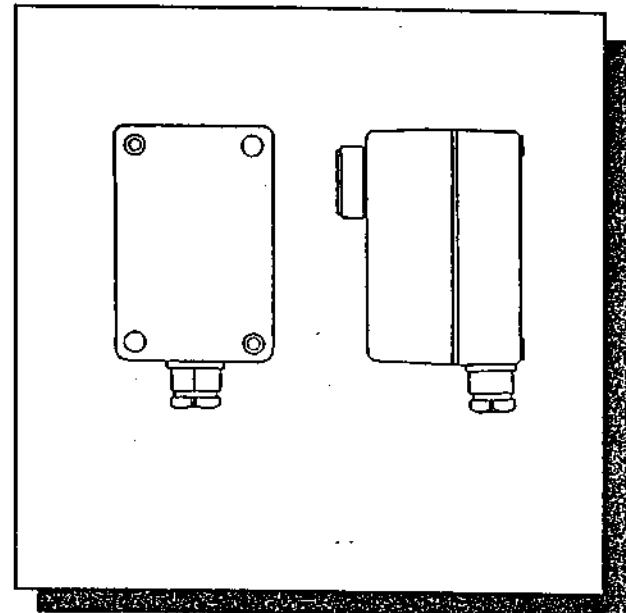
Sontay Limited.  
Four Elms Road, Edenbridge  
Kent TN8 6AB England  
Tel.: 01732 865 548 Fax.: 01732 867 164

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**Technical Overview**

ST-SO outside frost thermostats are housed in an IP65 enclosure suitable for outside mounting.

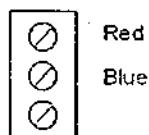
Control thermostats have adjustable setpoint, adjustable differential and auto reset, to provide a switched output to the heater controller.

**Specification:**

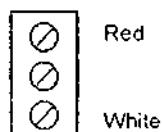
|                   |                             |
|-------------------|-----------------------------|
| Protection        | IP65                        |
| No of stages      | 1                           |
| Switch rating     | 15A(8) @ 240VAC             |
| Max Bulb Temp.    | 75 Deg. C.                  |
| Max Ambient Temp. | 60 Deg. C                   |
| Range             | 10 - 55 Deg. C.             |
| Differential      | 2 - 15 Deg. C. (Adjustable) |
| Country of origin | U.K.                        |

**Connections:**

For heating control: (Contacts open on temperature rise)



For cooling control: (Contacts open on temperature fall)



Product code

ST-TCC

ST-TCS

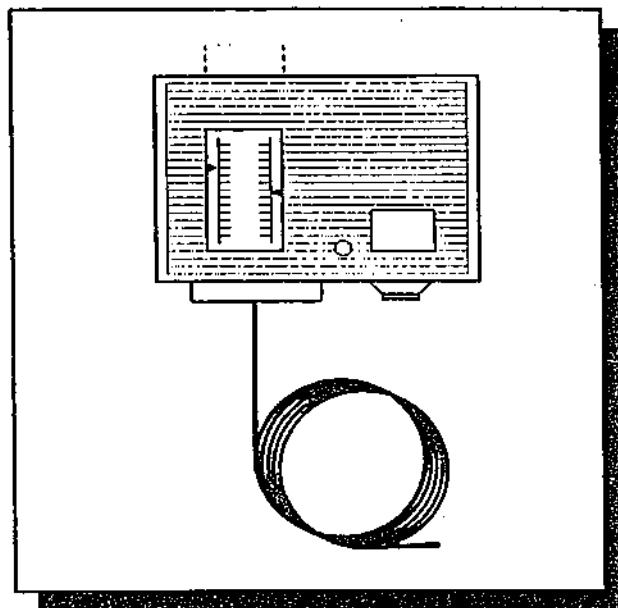
Data sheet : ST-SO Iss 1.0 30.05.96

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## Technical Overview

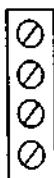
Thermostat providing a switch output based on the average temperature detected along a six metre capillary sensor. Most common application is for frost protection on fresh air intakes of air-conditioning systems, to prevent the icing up of filters, fans and coils. The capillary is fixed in a matrix across the duct (usually using duct fixing clips), in a position downstream of the pre-heater or frost coil. If the frost coil fails to operate, the thermostat switching can be used to close down the fresh air damper or supply fan. Not more than 100mm of the capillary should be located outside the control temperature. Unit trips when 300mm of capillary falls below setpoint temperature.



## Specifications:

|                         |                                        |                      |                                                   |
|-------------------------|----------------------------------------|----------------------|---------------------------------------------------|
| Control range           | -18 to +13°C                           | Housing material     | ABS                                               |
| Differential (fixed)    | 3°C                                    | Housing dimensions   | 87 x 50 x 85mm (IP44)<br>130 x 130 x 100mm (IP65) |
| Switch rating           | 240VAC, 24A resistive<br>10A inductive | Capillary material   | Copper                                            |
| Manual reset (optional) | On low temperature                     | Capillary dimensions | 6m x 2mm diam.                                    |
|                         |                                        | Ambient range        | 0 to +50°C                                        |
|                         |                                        | Housing              | -15 to +50°C                                      |
|                         |                                        | Capillary            |                                                   |
|                         |                                        | Protection           | IP44 or IP65                                      |
|                         |                                        | Country of origin    | EU                                                |

## Connections:



- 1 Relay: common
- 2 Relay: normally closed
- 3 not used
- 4 Relay: normally open

## Product Codes:

|                |                         |
|----------------|-------------------------|
| ST-016H        | Auto reset              |
| ST-016H-M      | Manual reset            |
| ST-016H-IP65   | Auto reset + IP65 box   |
| ST-016H-M-IP65 | Manual reset + IP65 box |

Data Sheet: ST-016H Iss 1.0 8.5.96.

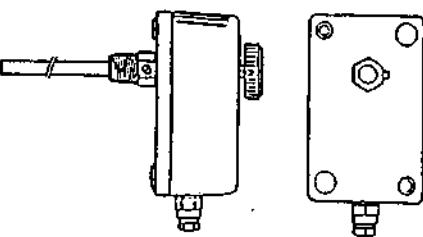
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Kent TN8 6AB England  
Tel.: 01732 865 548 Fax.: 01732 867 164

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**Technical overview**

**ST-SW** immersion thermostats can be used to control the temperature of liquid flows in pipework systems. Liquid filled sensing elements ensure rapid response and accurate switching differentials.

- \* Protection to IP65
- \* Concealed or exposed adjustment
- \* Units supplied with pockets

**Specification:**

| Part code | Temp range | Differential         | Max bulb temp. |
|-----------|------------|----------------------|----------------|
| ST-SW-2P  | -15/+30C   | 1C fixed             | 55C            |
| ST-SW-2MP | -15/+30C   | Man. reset open low  | 55C            |
| ST-SW-3P  | 0/+60C     | 2-20C adjustable     | 90C            |
| ST-SW-3MP | 0/+60C     | Man. reset open high | 90C            |
| ST-SW-6P  | +20/+90C   | 2-20C adjustable     | 110C           |
| ST-SW-6MP | +20/+90C   | Man. reset open high | 110C           |
| ST-SW-7P  | +50/+120C  | 2-20C adjustable     | 140C           |
| ST-SW-7MP | +50/+120C  | Man. reset open high | 140C           |

|                   |                                                  |                 |                |
|-------------------|--------------------------------------------------|-----------------|----------------|
| Case construction | Aluminium                                        | Pocket thread   | 1/2"BSPT       |
| Protection        | IP65                                             | Pocket length   | 160mm          |
| No. of stages     | 1                                                | Pressure rating | 8 Bar          |
| Switch rating     | 15(8)A @ 240VAC SPDT                             |                 |                |
| Adjustment        | Concealed standard<br>Add suffix 'E' for exposed |                 |                |
| Weight            | 300 grams                                        | Product code:   | ST-SW / R = xx |
| Country of origin | Italy                                            | where :         | R = range      |

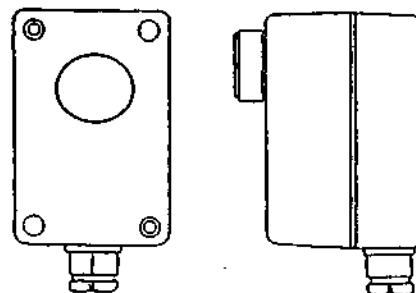
Data sheet : ST-SW Iss. 1.0 2.7.96

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Four Elms Road, Edenbridge  
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Tel.: 01732 865 548; Fax.: 01732 867 164

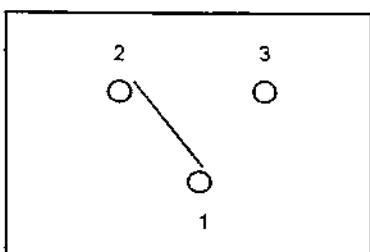
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**Technical Overview**

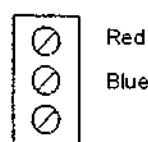
**ST-TCC STRAP-ON** thermostat can be used to control the temperature of liquids in pipes, boilers and cylinders. The thermostat is fixed to the pipe using a strap (supplied). Insulation should be fitted around the sensor to prevent ambient temperature affecting the switching point. The fixing strap is suitable for pipes up to 6" diameter. Longer straps are available if required.

**Specification:**

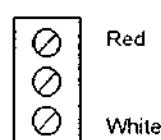
|                   |                 |
|-------------------|-----------------|
| No of stages      | 1               |
| Switch rating     | 15A(8) @ 240VAC |
| Max Bulb Temp.    | 90 Deg. C.      |
| Max Ambient Temp. | 55 Deg. C       |
| Range             | 30 - 90 Deg. C. |
| Differential      | 5 Deg. C.       |

**Country of origin****Connections:****Connections:**

For heating control: (Contacts open on temperature rise)



For cooling control: (Contacts open on temperature fall)

**Product codes:**

|        |           |
|--------|-----------|
| ST-TCC | Concealed |
| ST-TCS | External  |

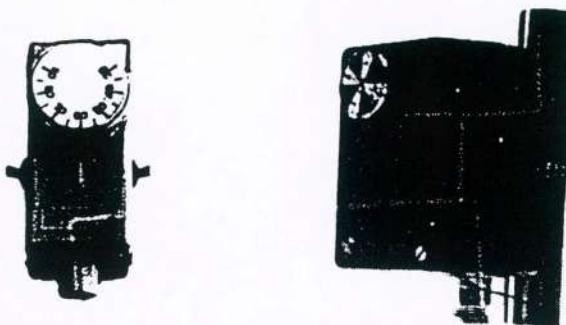
Data sheet : ST-TCC Iss 1.0 30.05.95

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# STRAP - ON / BOILER THERMOSTATS



**SLANEY**  
CONTROLS

## Application

To control the temperature of liquids in pipes and boilers/cylinders. The thermostat is securely fixed to the pipe with a fixing strap, which is supplied. Insulation should be fitted around the sensor to prevent the ambient temperature affecting the switching point. All Thermostats are supplied complete with strap for 6" dia. pipe.

## Technical Specification

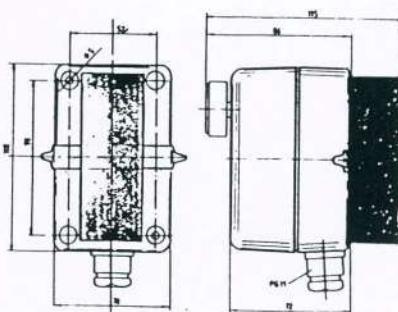
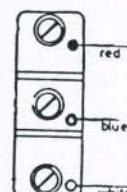
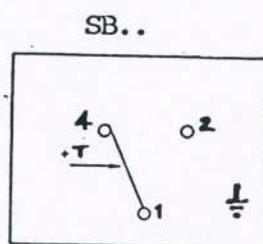
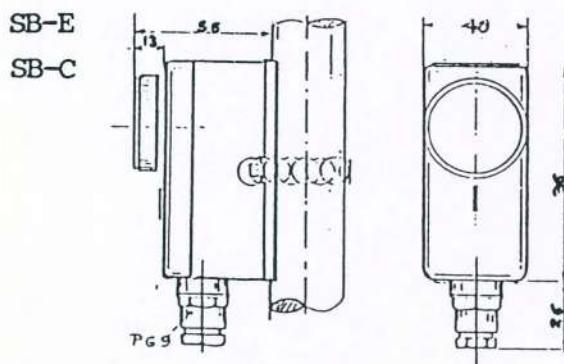
| Type  | Range                                           | Diff 'C             | 240VAC MaxBulb | Max.Amb | Scale  | Knob adj. | Encl. |
|-------|-------------------------------------------------|---------------------|----------------|---------|--------|-----------|-------|
|       |                                                 |                     | SPDT           | Temp'C  | Temp'C |           |       |
| SB-E  | 30/90'C                                         | 5                   | 10( )A         | 90      | 55     | External  |       |
| SB-C  | 30/90'C                                         | 5                   | 10( )A         | 90      | 55     | Concealed | IP30  |
| SB-2  | -15/+30'C                                       | 2-20 adj.           | 15(8)A         | 65      | 55     | Concealed |       |
| SB-2M | -15/+30'C                                       | Man.reset open low  | 15(8)A         | 65      | 55     | Concealed | IP65  |
| SB-3  | 0/ 60'C                                         | 2-20 adj.           | 15(8)A         | 75      | 55     | Concealed | IP65  |
| SB-3M | 0/ 60'C                                         | Man.reset open high | 15(8)A         | 75      | 55     | Concealed | IP65  |
| SB-5  | 20/ 80'C                                        | 2-20 adj.           | 15(8)A         | 110     | 55     | Concealed | IP65  |
| SB-5M | 20/ 80'C                                        | Man.reset open high | 15(8)A         | 110     | 55     | Concealed | IP65  |
| SB-7  | 50/120'C                                        | 2-20 adj.           | 15(8)A         | 150     | 55     | Concealed | IP65  |
| SB-7M | 50/120'C                                        | Man.reset open high | 15(8)A         | 150     | 55     | Concealed | IP65  |
| SB-8  | 100/300'C                                       | 2-20 adj.           | 15(8)A         | 340     | 55     | Concealed | IP65  |
| SB-8M | 100/300'C                                       | Man.reset open high | 15(8)A         | 340     | 55     | Concealed | IP65  |
| SB-S  | Longer length strap & fixings. Order per metre. |                     |                |         |        |           |       |

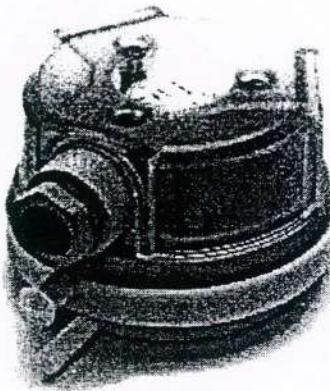
## wiring

HEATING - Connect red to blue terminal.  
Contacts open on temp. rise.

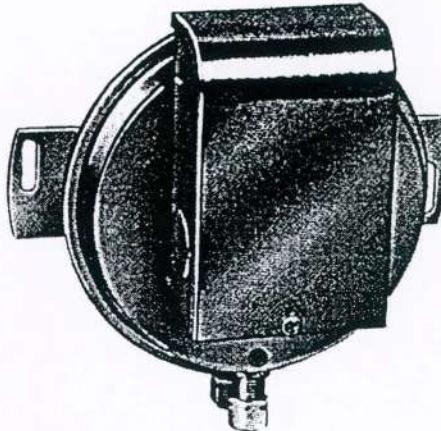
COOLING - Connect red to white terminal.  
Contacts open on temp. fall.

## Dimensions





SA-2



SA-FS2

### Application

A Range of Air Differential Pressure Switches suitable for monitoring fan operation, flue draughts and blocked filters.

### Type Reference

|              |                                                                  |               |                                          |
|--------------|------------------------------------------------------------------|---------------|------------------------------------------|
| <b>SA-2</b>  | <b>Range 0.4 to 2 mBar</b>                                       | <b>SA-FS1</b> | <b>Range 0.1 to 30 mBar</b>              |
| <b>SA-3</b>  | <b>Range 0.5 to 5 mBar</b>                                       | <b>SA-FS2</b> | <b>Range 0.1 to 30 mBar</b>              |
| <b>SA-4</b>  | <b>Range 1 to 5 mBar</b>                                         |               | <b>High Temp c/w Brass Duct Fittings</b> |
| <b>SA-5</b>  | <b>Range 2 to 10 mBar</b>                                        |               |                                          |
| <b>SS-DS</b> | <b>Duct Connection Set<br/>2 metres Tubing and 2 Pitot tubes</b> | <b>SS-PT</b>  | <b>Plastic Duct Pitot tube</b>           |
|              |                                                                  | <b>SS-TE</b>  | <b>Tee connector</b>                     |
|              |                                                                  | <b>SS-PH</b>  | <b>Clear PVC tubing (per Metre)</b>      |

### Technical Specification

#### SA-FS1, SA-FS2

|                          |                                                                                                |
|--------------------------|------------------------------------------------------------------------------------------------|
| Electrical Rating:       | SPCO Switch rated 1(0.5) Amp 240 Volt                                                          |
| Enclosure:               | Zinc Plated Steel Enclosure rated IP30                                                         |
| Cable Entry/Connections: | 2 x 20mm Conduit Knockouts, Clamp type Screw terminals                                         |
| Air Connections:         | FS-1 6mm push on connectors FS-2 6mm Compression fittings                                      |
| Switching Differential:  | 0.007 mBar to 0.3 mBar dependant on setpoint                                                   |
| Max pressure:            | 35 mBar                                                                                        |
| Temperature limits:      | Ambient: -40 to 80°C<br>Operating: FS-1 -40 to 80°C, FS-2 -40 to 300°C (See Installation Note) |

#### SA-2 - SA-5

|                          |                                                                         |
|--------------------------|-------------------------------------------------------------------------|
| Electrical Rating:       | SPCO Switch rated 1.5(0.5) Amp 240 Volt                                 |
| Enclosure:               | Plastic Enclosure rated IP54, Zinc Plated Steel mounting Bracket        |
| Cable Entry/Connections: | PG11 Cable Gland, 0.25" Spade Connections or Clamp type Screw terminals |
| Air Connections:         | 6mm push on connectors                                                  |
| Switching Differential:  | SA-2 SA-3 0.2 mBar, SA4 0.5 mBar, SA-5 1.0 mBar                         |
| Max pressure:            | 50 mBar                                                                 |
| Temperature limits:      | Ambient/Operating: -20 to 85°C                                          |

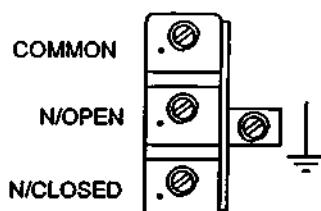
## Installation

- Pressure Switches must be mounted with the diaphragm in the vertical plane
- 2/ All Pressure Switches must be mounted in a clean environment in a position which is not subject to vibration
- 3/ SA-2 - SA-5, SA-FS1

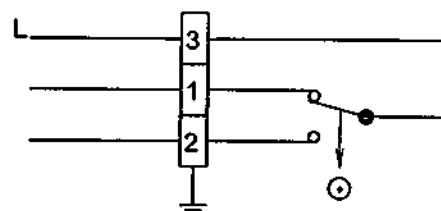
The pressure connections can be installed using 6mm plastic tubing ( SSPH ) ensuring that there are no kinks or obstructions. For Absolute Pressure applications the High or Low connection may be left open to atmosphere. Site the Duct Pitot tubes ( SSPT ) in a position to sample the required pressure. Ensure that the arrows indicate the direction of the airflow  
**SA-FS2 High Temperature applications**

The pressure connections should be installed with 6mm Copper tubing utilising the flanged Duct connectors provided. Ensure a minimum run of 2 Metres of tubing in order to dissipate the heat away from the diaphragm.

## Wiring

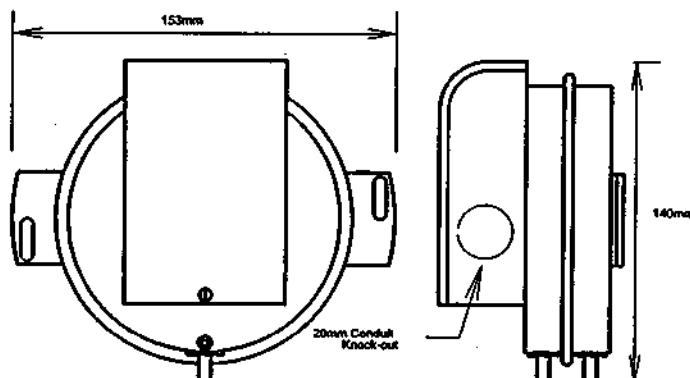


SA-FS1, SA-FS2

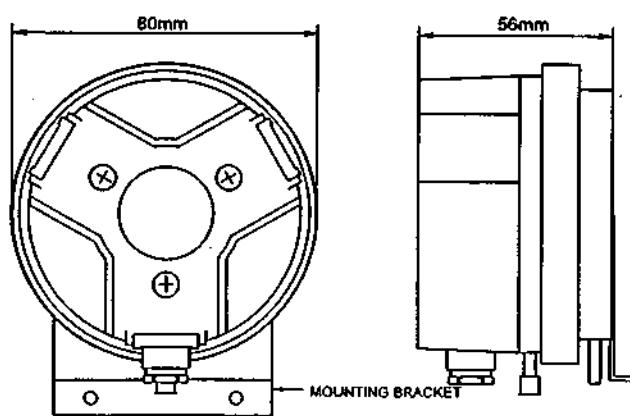


SA-2 - SA-5

## Dimensions

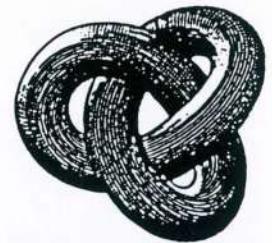
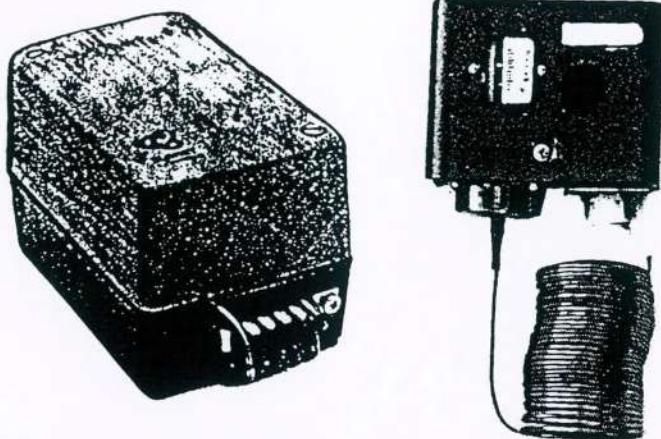


SA-FS1, SA-FS2



SA-2 - SA-5

FREEZE PROTECTION THERMOSTATS and  
OUTSIDE FROST THERMOSTATS



Application

OUTSIDE FROST THERMOSTATS - Model no: SO-2/SO-4

These thermostats have a non-ventilated weatherproof housing suitable for mounting outside for frost protection or high limit function.

FREEZE PROTECTION THERMOSTATS - Model no: ST..

These thermostats are used to prevent freezing of liquids inside pipes or heating/cooling coils. Capillaries are available in 1.8m, 3m or 6m lengths which the sensing element should be fixed to the front of the coil (downstream/air off side) or wrapped around the pipe, or laced across the face of a heater battery, to guard against freezing at any point. The thermostat will switch when any 30cm or more of the capillary senses the set-point temperature. In the event of damage to the capillary the thermostat will cut-out to the safety side.

Installation

Model no: ST.. can be mounted in any position. Not more than 10cm of the capillary should be outside the controlled space. The ambient temperature around the housing should be higher than the sensor. Model no: ST.. is available with 1.8 metre capillary with a sensing head suitable for insertion into a pocket.

Technical Specification

| Type                                 | Range     | Diff.        | Cap. Length | 240VAC SPDT | MaxBulb Temp | MaxAmbient Temp | Enclosure |
|--------------------------------------|-----------|--------------|-------------|-------------|--------------|-----------------|-----------|
| <b>OUTSIDE FROST THERMOSTATS</b>     |           |              |             |             |              |                 |           |
| SO-2                                 | -15/+30°C | 2/15°C adj.  | -           | 15(8)A      | 55           | 60              | IP65      |
| SO-4                                 | +10/+55°C | 2/15°C adj.  | -           | 15(8)A      | 75           | 60              | IP65      |
| <b>FREEZE PROTECTION THERMOSTATS</b> |           |              |             |             |              |                 |           |
| ST-6                                 | -10/+12°C | 1°C          | 6m          | 15(8)A      | 200          | 55              | IP40+     |
| ST-6M                                | -10/+12°C | Manual Reset | 6m          | 15(8)A      | 200          | 55              | IP40      |
| ST-3                                 | -10/+12°C | 1°C          | 3m          | 15(8)A      | 200          | 55              | IP40      |
| ST-3M                                | -10/+12°C | Manual Reset | 3m          | 15(8)A      | 200          | 55              | IP40      |
| ST-1.8                               | -10/+12°C | 1°C          | 1.8m        | 15(8)A      | 200          | 55              | IP40      |
| ST-1.8M                              | -10/+12°C | Manual Reset | 1.8m        | 15(8)A      | 200          | 55              | IP40      |

Available on Request

Model no: ST.. available with weatherproof enclosures use suffix "P" (i.e. ST-6MP)

FREEZE PROTECTION THERMOSTATS and  
OUTSIDE FROST THERMOSTATS

Datasheet no: SO-ST/Feb94

wiring

Type: SO-2/SO-4

Heating - Connect red to blue terminal.

Contact opens on temp. rise.

Cooling - Connect red to white terminal.

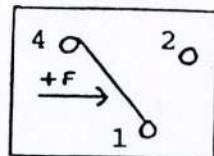
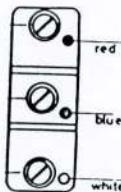
Contact opens on temp. fall.

Type: ST..

Contacts red & white opens on temp. fall.

Contacts red & blue closes simultaneously.

Temperature must rise to allow resetting.

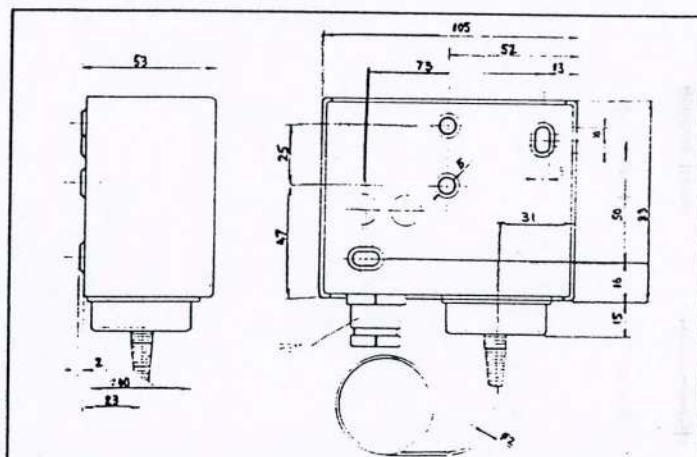
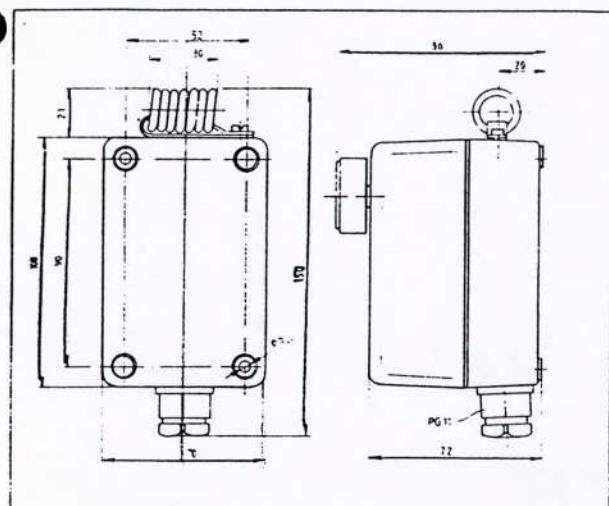


The scale may be reset by turning the internal hexagon nut.

Dimensions

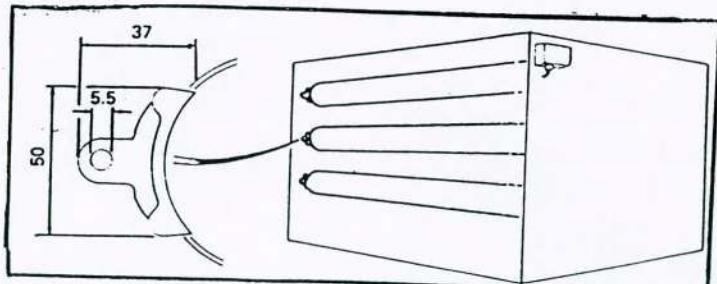
SO-2/SO-4

ST..



Accessories for Model: ST.. only

SSOC - Capillary clips (6 per pack)



## Installation

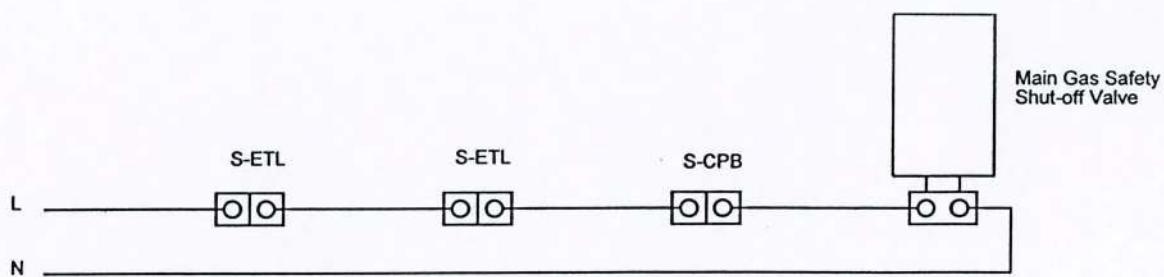
### S-ETL

The Thermal Link should be suspended between 0.3 and 1.3 metres over the potential fire hazard in a position which allows a free air flow through the ventilated enclosure.

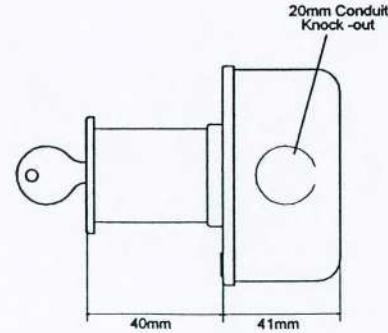
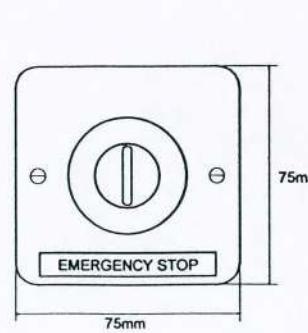
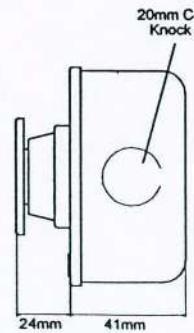
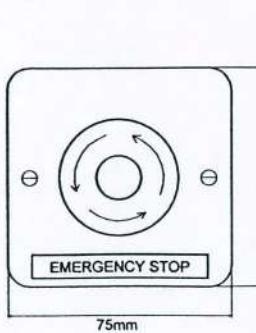
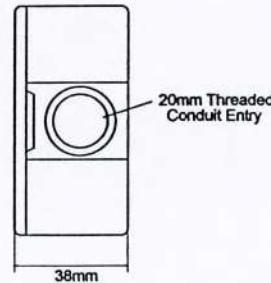
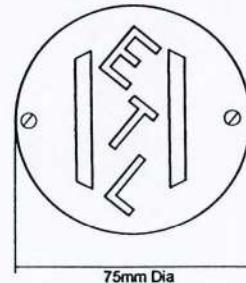
### S-CPB

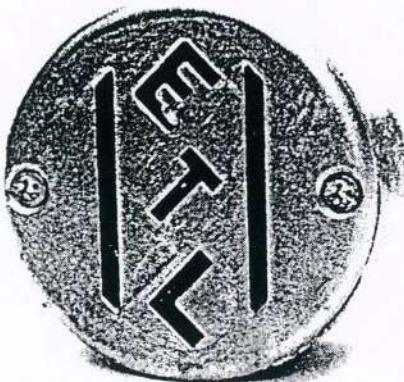
The fitting of an Emergency Panic Button is mandatory in Boiler Rooms and Plant Rooms. The unit should be located at a height of 1.4 metres adjacent to the entrance of the Plant Room.

### Wiring



### Dimensions





S-ETL



S-CPB

## Application

### S-ETL

The Electro Thermal link is used to detect a rise in temperature caused by fire. The unit is fitted immediately above a potential fire hazard in a position which allows an unrestricted air flow through its ventilated housing. The thermal fuse is designed to melt at 72°C and break the power supply to a safety shut off valve and associated equipment. The fuse link is not resettable but is easily replaced.

### S-CPB

A manual emergency panic button which is generally fitted inside a boiler or plant room and is pressed to break the power supply to a safety shut off valve and associated equipment. The button is normally wired in series with a thermal link. Once operated the unit is reset by manually twisting the button which restores the power and primes the button for further use. The C-KPB button requires a key to reset the button after operation thereby preventing unauthorised resetting of the unit following operation.

## Specification

### S-ETL

#### Electro Thermal Link

Electrical rating: 5 Amp 240 Volt. Screw Terminals accept 1.5mm cable

Thermal Fuse: Non - resettable fuse breaks at 72°C Other temps available on request  
Spare fuse available Ref: S-ETL/S

Enclosure: Cast Aluminium rated to IP54  
Cable Entry: Conduit entry screwed 20mm

### C-CPB C-KPB

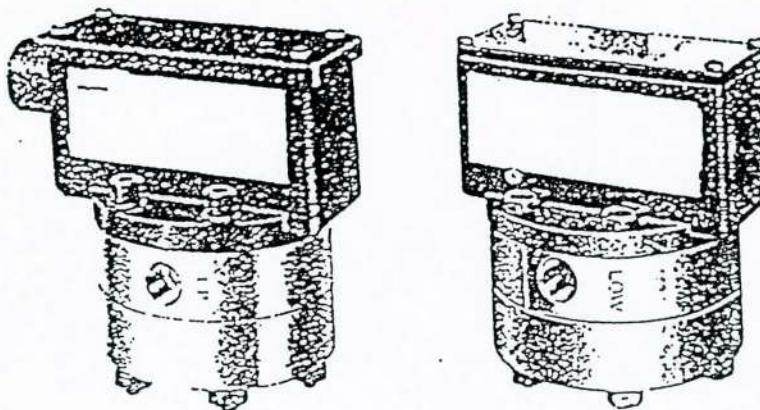
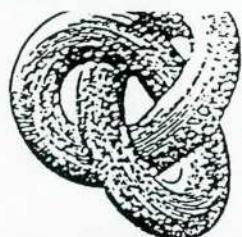
#### Manual Panic Button Key Reset Panic Button

Electrical rating: Normally Closed Contacts rated 10 Amp 240 Volt.  
Screw Terminals accept 1.5mm cable

Operation: C-CPB  
C-KPB  
Push to Break Contacts - Twist Knob to reset  
Push to Break Contacts - Key required to reset

Enclosure: Pressed Aluminium rated to IP 54  
Cable Entry: 20 mm conduit knockouts

# WATER DIFFERENTIAL PRESSURE SWITCHES



**SLANEY**  
CONTROLS

## Application

Differential Pressure Switches are used to monitor the difference in pressure between two points, of liquids across pumps, boilers, chillers and valves etc. They can also be used to monitor filter conditions. The differential pressure across the filter increases as the filter becomes clogged.

## Technical Specification

| Type   | Range       | Diff.    | 240VAC<br>SPDT | Max.Diff.*<br>Press.Bar | Connection<br>BSP Female | Encl |
|--------|-------------|----------|----------------|-------------------------|--------------------------|------|
| SP-007 | 0.07/1 bar  | 0.04 bar | 5(3)A          | 6                       | 1/4"                     | IP40 |
| SP-020 | 0.2 /4 bar  | 0.1 bar  | 5(3)A          | 6                       | 1/4"                     | IP40 |
| SP 100 | 12/250 mbar | 7 mbar   | 5(3)A          | 6                       | 1/8"                     | IP65 |

\* Max. test pressure can be 4 times higher for short periods.

Max. media temp. 85°C. The pressure line can be formed into a 'U' shape/syphon for temperatures up to 300°C.

For flow failure it is important to have a close switching differential. It is advisable to select a switch which can be adjusted well below the differential pressure in the system.

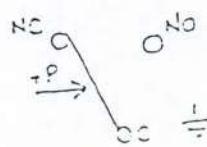
## Adjustment

The adjustment nut is under the cover. Turn adjusting nut clockwise to reduce setting and anti-clockwise to increase setting. A quarter turn of the adjusting nut will give a change of setting of about 10% of the range of the switch.

## Wiring

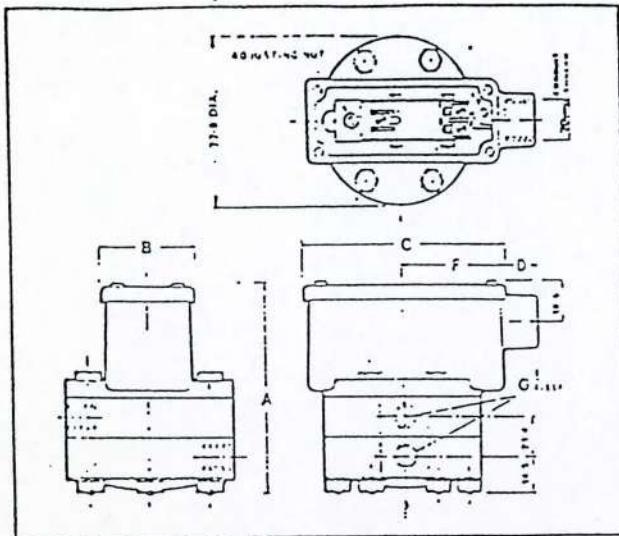
Use terminals 1 and 2 or (C and NC) for closed circuit below operating pressure.

Use terminals 1 and 3 or (C and NO) for closed circuit above operating pressure



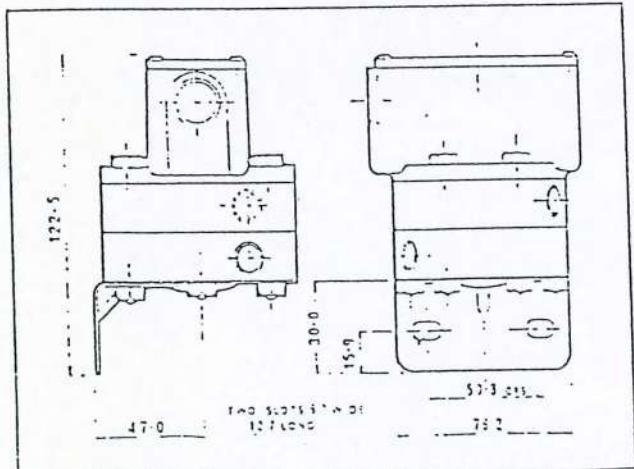
Dimensions

SP-007 / SP-020

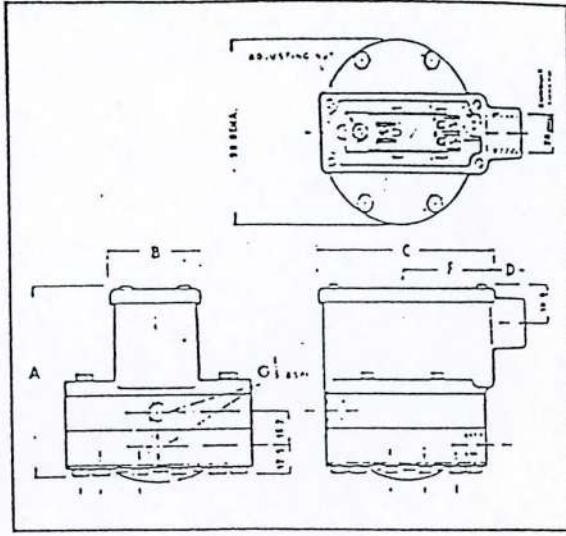


|     | A   | B    | C   | D  | F    | Weight |
|-----|-----|------|-----|----|------|--------|
| 117 | 100 | 42.9 | 100 | 17 | 53.2 | 1.4 kg |
| 118 | 100 | 38   | 92  | *  | 47.6 | 1.3 kg |

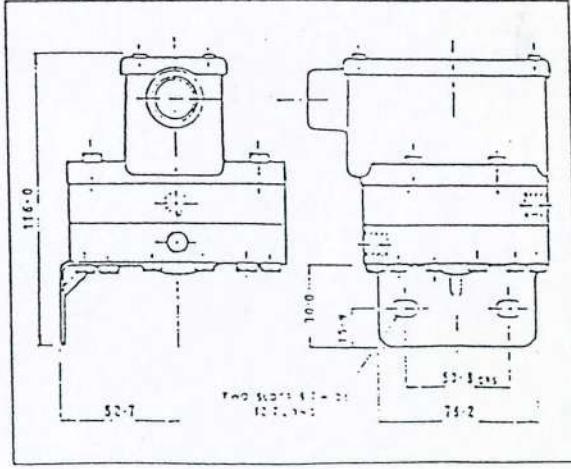
\* 4.8 mm long conduit thread in end wall of box.

SP-007 / SP-020 with  
Mounting Bracket

SP-100



|     | A  | B    | C   | D  | F    | Weight |
|-----|----|------|-----|----|------|--------|
| 167 | 92 | 42.9 | 100 | 17 | 53.2 | 1.8 kg |

SP-100 with  
Mounting Bracket



# Temperature Sensor

## Model TE-205 Euro-Series

The TE-205 Euro-Series Temperature Sensor incorporates a precision thermistor or platinum RTD temperature sensor. Different sensors are available to guarantee compatibility with most of the control systems worldwide. The sensors are available with different packaging styles to accommodate installation in duct, pipe, outside or any other temperature measurement application.

The TE-205 temperature sensors incorporate state-of-the-art manufacturing techniques to ensure fast response, high quality, rugged and repeatable performance. After extensive research and development, a process was developed to mechanically splice the lead wires to the sensing element eliminating soldering and flux-related problems. In this way, by mechanically splicing the lead wires, a repeatable connection is obtained without any soldering related problems such as cold joints, flux contamination or overheating of the sensing element. In order to ensure an environmental seal against condensation, the sub-assembly is conformal coated with a urethane compound. The conformal coating is individually inspected to ensure that there are no pinholes and/or voids. With all the above manufacturing enhancements, the TE-205 Euro-Series Temperature Sensor incorporates the highest standards of quality, reliability, and trouble-free performance and all the problems associated with soldering, flux contamination, condensation and shorts due to condensation have been eliminated.

With all the above features, the TE-205 Euro-Series Temperature Sensors are the most reliable, high performance products available and at the same time, significantly decrease installation time out in the field.

### SPECIFICATIONS:

#### THERMISTOR SENSORS

Resistance: See ordering information.

Accuracy:  $\pm 0.2^\circ \text{C}$

Interchangeability:  $\pm 0.2^\circ \text{C}$

Heat Dissipation:  $3.0 \text{mW}/^\circ \text{C}$

Operating Temperature Range:  $-30^\circ \text{C} \text{ TO } +100^\circ \text{C}$

#### PLATINUM RTD SENSORS

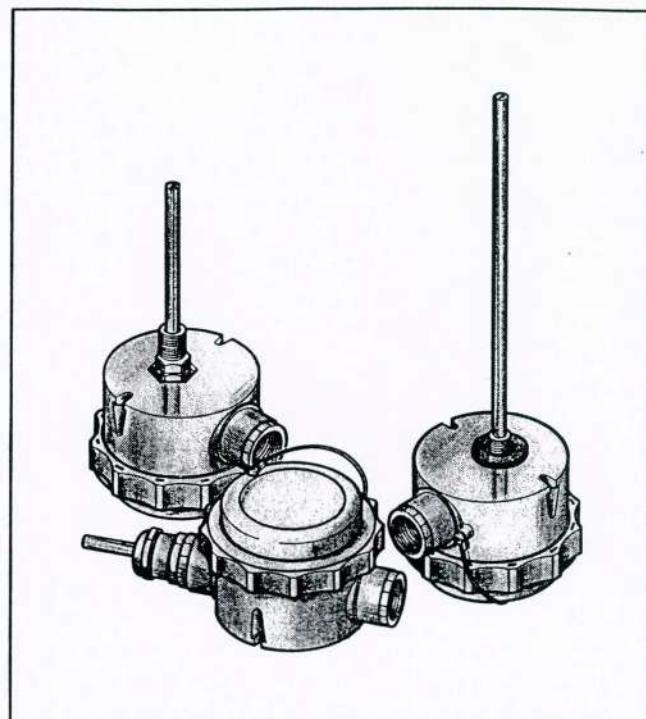
Resistance: See ordering information.

Accuracy:  $\pm 0.1\% @ 0^\circ \text{C}$

Interchangeability:  $\pm 0.1\% @ 0^\circ \text{C}$

Heat Dissipation:  $5.0 \text{mW}/^\circ \text{C}$

Operating Temperature Range:  $-30^\circ \text{C} \text{ TO } +100^\circ \text{C}$



Probe Material: 6061T Aluminum/304 SS

Enclosure: General purpose impact resistant ABS plastic construction; maximum temperature  $70^\circ \text{C}$ .

Rating: Sealed IP67 to IEC 529. Sealed by means of nitrile "O" rings. Fitted to entry port and cap flange.

Specifications: M20 threaded entry, Isometric 1.5 mm pitch constant series to BS3643: 1981. Cap retaining strap complete with fixing screws. External fixing points providing simple and rapid means of mounting sensors directly onto ducts, walls, etc.



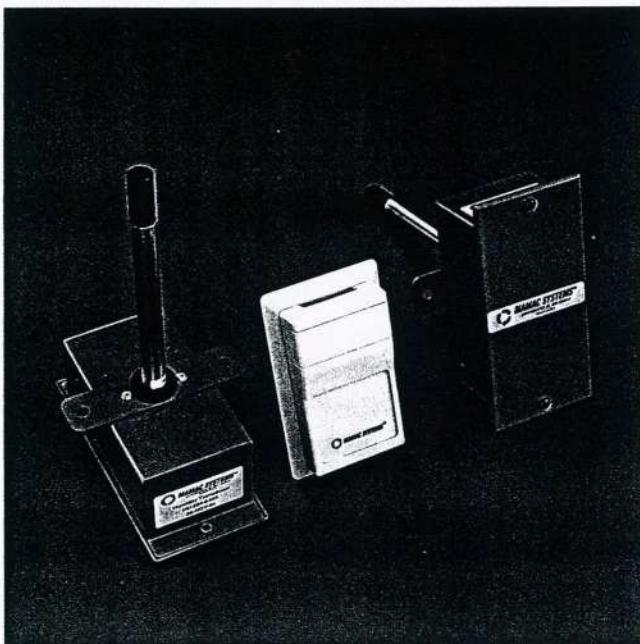
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Adelaide • S. A. 5000 • Australia  
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# Humidity Transducer

## Model HU-224/225



- Ultra-fast response polymer capacitance sensor
- Not affected by condensation, fog, high humidity or contaminants
- Highly accurate, repeatable, stable output with negligible hysteresis
- Wide 12-40 VDC/12-35 VAC unregulated supply voltage
- Two temperature compensated output versions, 4-20 mA 2-wire or field selectable 0-5 VDC/0-10 VDC
- Non-interacting zero and span trimmers
- NIST traceable  $\pm 2\%$  or  $\pm 3\%$  calibration
- Two enclosure types NEMA 4 (IP-65) duct mount or aesthetically appealing ABS plastic wall mount
- Short circuit and reverse polarity protected
- Conforms to EMC standards EN50082-1/EN55014/EN60730-1

The HU-224/225 is an extremely fast, stable and accurate humidity transducer designed for harsh environments. The polymer capacitance sensor is not affected by harsh contaminants, condensation, fog or extremely high humidity over a prolonged period of time. If dust or other contaminants accumulate on the sensor, the probe can be washed in industrial grade isopropyl alcohol and put back in service without any calibration shift. Each unit is individually calibrated in an environmental test chamber to meet or exceed NIST traceable  $\pm 2\%$  or  $\pm 3\%$  accuracies. The HU-224/225 is temperature compensated for -30°F to +130°F operation with negligible error. For space humidity, an aesthetically appealing ABS enclosure which may be flush mounted or fits a standard 2" x 4" handy box is available and for duct humidity applications, a rugged NEMA 4 (IP-65) steel enclosure with external mounting bracket is also available. Two enclosure types, field selectable outputs, fully temperature compensated NIST traceable accuracy, non-interacting zero and span adjustments, short circuit and reverse polarity protected output, and a liberal two year warranty are some of the features which make the HU-224/225 the industry's highest performance, most reliable humidity transducer.



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5611 North Bridge Road  
03-06 • Eng Cheong Tower  
Singapore • 198782  
65-3927273 • Fax 65-3927276

## HU-224/225

The HU-224/225 incorporates a bulk polymer capacitive ultra-fast sensing element which is immune to most contaminants and at the same time provides a stable, repeatable, and accurate humidity measurement with negligible hysteresis. The sensing element is not affected by condensation. In fact, it may be immersed in distilled water without degrading the calibration accuracy. The HU-224/225 utilizes sophisticated integrated circuits to provide a high level, fully conditioned, and temperature compensated output.

On VDC output units, two additional field selectable options are available; dual outputs 0-5 or 0-10 VDC, and dual unregulated supply voltages 12-35 VAC or 12-40 VDC. By merely moving a shorting plug, one can select the desired output for the specific application. As far as supply voltage is concerned, the unit automatically configures for AC or DC and no field selection is necessary. Another feature is that the output is fully protected from short circuit to ground, or if the supply voltage is applied by mistake to the output. Past experience demonstrates that field related wiring problems do occur. Instead of denying this fact, this protection circuit is designed in to ensure trouble-free start-up. The VDC output unit is also designed to handle low impedance circuits. In fact, the unit can drive up to 1k ohm minimum. In this way, multiple controllers, indicators, or other devices can be paralleled to the output without performance degradation.

The mA output units can function over a wide unregulated supply voltage range: 12-40 VDC without any effect on calibration or performance. The unit has reverse polarity protection built in. As a result, it is next to impossible to damage the unit by mis-wiring. By using sophisticated low drop-out voltage regulators and CMOS integrated circuits, the

mA output unit can drive very high output impedance. In fact, with only 12 VDC supply, the unit can drive 400 ohms. At 40 VDC, the unit is capable of handling up to 3000 ohms load. In this way, the output loop can be tied in series to multiple controllers, indicators, and other devices without degrading the performance.

NIST traceable humidity standards are utilized to calibrate and certify the HU-224/225. Calibration data on each unit is archived digitally for SPC and QC purposes. All automated calibration systems are networked and data is available on-line to numerous individuals at the same time. In this way, extremely high standards of quality and calibration integrity are maintained.

The HU-224/225 incorporates a rugged NEMA 4 (IP-65) fully gasketed, dust proof and splash proof enclosure for monitoring duct humidity or an aesthetically appealing ABS plastic wall mount enclosure for monitoring space humidity. The enclosure has an external mounting bracket to facilitate field installation. A 1/2" (.875"/22.25mm dia.) knock-out for conduit connection is also provided. A liquid tight cable connector is also supplied if the unit is not being hard wired. Once installed, the enclosure maintains its environmental rating and protects the electronics and the sensing element from condensation, corrosive contaminants and other environmental pollutants. The wall mount enclosure may be flush mounted on any flat surface or fits a standard 2" x 4" handy box. Louvers are provided on the top and bottom of the enclosure to ensure ample air flow for fast response. Both enclosure options also have additional features for ease of installation including unpluggable terminal block, easily accessible zero and span trimmers, and conveniently located shorting plugs for field selection.

# HU-224/225

## SPECIFICATIONS:

**Accuracy\***:  $\pm 2\% / \pm 3\%$  RH

**Range**: 0-100% RH

**Hysteresis**:  $\pm 1\%$

**Supply Voltage**: 12-40 VDC  
12-35 VAC (VDC output units only)

**Supply Current**: VDC Units - 10 mA max.  
mA Units - 20 mA max.

**Enclosure**: 18 Ga C. R. Steel NEMA 4 (IP-65)  
or ABS Plastic

**Finish**: Baked on enamel-PMS2GR88B  
or off-white

**Conformance**: EMC Standards EN50082-1(1992)  
EN55014(1993)/EN60730-1(1992)

**Compensated Temp Range**: -30°F-130°F (-35°C-55°C)

**Environmental**: 10-90%RH Non-Condensing

**Termination**: Unpluggable screw terminal block

**Wire Size**: 12 Ga max.

**Load Impedance**: 3K ohms max. at 40 VDC (mA output units)  
1K ohms min. (VDC output units)

**Weight**: Duct mount: 1.0 lbs. (.45 kg)  
Wall mount: 0.5 lbs. (.25 kg)

\*Includes non-linearity and non-repeatability

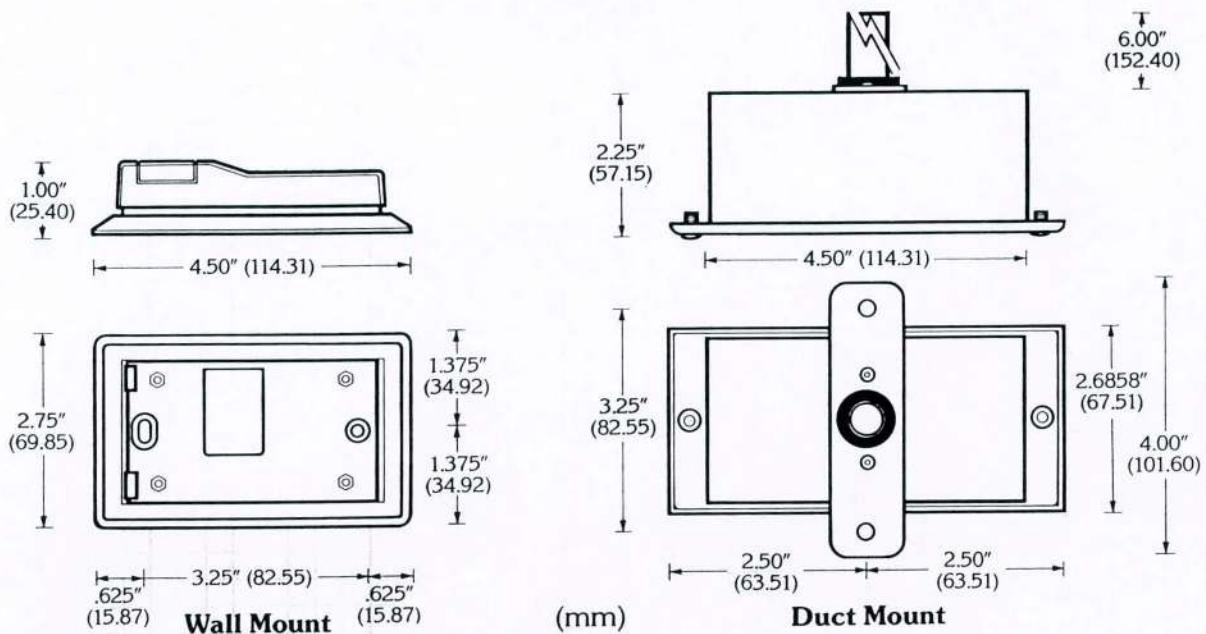
## ORDERING INFORMATION: HU-

| PACKAGING               | ACCURACY  | OUTPUT                                            |
|-------------------------|-----------|---------------------------------------------------|
| <b>224</b> (duct mount) | $\pm 2\%$ | <b>mA</b> (4-20 mA 2-wire)                        |
| <b>225</b> (wall mount) | $\pm 3\%$ | <b>VDC</b> (0-5 VDC or 0-10 VDC field selectable) |

**Example: HU-224-2-mA**: Duct humidity transducer,  $\pm 2\%$  RH accuracy with 4-20 mA output.

**CAUTION: Do not use in explosive/hazardous environment or with flammable/combustible media.**

## HU-224/225



**WARRANTY:** MAMAC Systems, Inc. warrants its products to be free of defects in material and workmanship for a period of two (2) years from date of shipment. If a unit is malfunctioning, it must be returned to the factory for evaluation. A return authorization number (RMA) will be issued by the customer service department and this number must be written or prominently displayed on the shipping boxes and all related documents. The defective part should be shipped freight pre-paid to the factory. Upon examination by MAMAC Systems, Inc., if the unit is found to be defective, it will be repaired or replaced at no charge to the customer. However, this warranty is void if the unit shows evidence of being tampered with, damaged during installation, misapplied, misused, or used in any other operating condition outside of the unit's published specifications.

**MAMAC Systems, Inc. makes no other warranties or representations of any kind whatsoever, expressed or implied, except that of title. All implied warranties including any warranty of merchantability and fitness for a particular purpose are hereby disclaimed. User is responsible to determine suitability for intended use.**

**LIMITATIONS OF LIABILITY:** The remedies of buyer set forth herein are exclusive and the total liability of MAMAC Systems, Inc. with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the product upon which liability is based. **In no event shall MAMAC Systems, Inc. be liable for consequential, incidental or special damages.** MAMAC Systems, Inc. reserves the right to change any specifications without notice to improve performance, reliability, or function of our products.

Every precaution for accuracy has been taken in the preparation of this manual, however, MAMAC Systems, Inc. neither assumes responsibility for any omissions or errors that may appear nor assumes liability for any damages that result from the use of the product in accordance with the information contained in the manual.



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**Model HU-224/225**  
**Technical Information**  
TI.224/225-

## Humidity Transduc

### FOR ADDITIONAL INFORMATION SEE HU-224/225 DATA SHEET

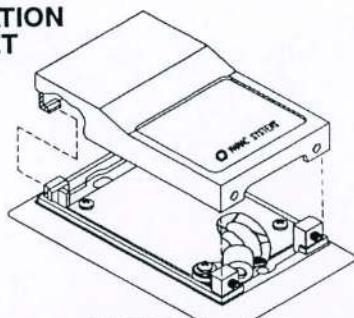
### SPECIFICATIONS

**Accuracy\***:  $\pm 2\%$  /  $\pm 3\%$  RH

**Range:** 0-100% RH

**Hysteresis:**  $\pm 1\%$

**Supply Voltage:** 12-40 VDC  
12-35 VAC (VDC output units only)

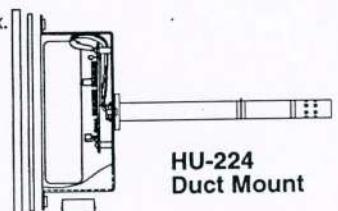


**Supply Current:** VDC Units - 10 mA max.  
mA Units - 20 mA max.

**Enclosure:** 18 Ga C. R. Steel NEMA 4  
(IP-65) or ABS Plastic

**Finish:** Baked on enamel-  
PMS2GR88B or off white

**Conformance:** EMC Standards EN50082-1(1992)  
EN55014(1993)/EN60730-1(1992)



**Compensated Temp Range:** -30°F-130°F (-35°C-55°C)

**Environmental:** 10-90%RH Non-Condensing

**Termination:** Unpluggable screw terminal block

**Wire Size:** 12 Ga max.

**Load Impedance:** 3K ohms max. at 40 VDC (mA output units)  
1K ohms min. (VDC output units)

**Weight:** Duct mount: 1.0 lbs. (.45 kg)  
Wall mount: 0.5 lbs. (.25 kg)

\*Includes non-linearity and non-repeatability

### ORDERING

| PACKAGING           | ACCURACY  | OUTPUT                                     |
|---------------------|-----------|--------------------------------------------|
| HU-224 (duct mount) | $\pm 2\%$ | mA (4-20 mA 2 wire)                        |
| HU-225 (wall mount) | $\pm 3\%$ | VDC (0-5 VDC or 0-10 VDC field selectable) |

### INSTALLATION

**Inspection** Inspect the package for damage. If damaged, notify the appropriate carrier immediately. If undamaged, open the package and inspect the device for obvious damage. Return damaged products.

**Requirements** • Tools (not provided)  
- Digital Volt-ohm Meter (DVM)  
- Appropriate screwdriver for mounting screws  
- Appropriate drill and drill bit for mounting screws  
• Appropriate accessories  
• Two #8 self-tapping mounting screws (not provided)  
• Training: Installer must be a qualified, experienced technician



#### Warning:

- Disconnect power supply before installation to prevent electric shock and equipment damage.
- Make all connections in accordance with the job wiring diagram and in accordance with national and local electrical codes. Use copper conductors only.

#### Caution:

- Use electrostatic discharge precautions (e.g., use of wrist strap) during installation and wiring to prevent equipment damage.
- Avoid locations where severe shock or vibration, excessive moisture or corrosive fumes are present. NEMA Type 4 housings are intended for outdoor use primarily to provide a degree of protection against wind-blown dust, rain, and hose-directed water.
- Do not exceed ratings of the device.

#### Mounting

**HU-224 (DUCT)** The HU-224 must be mounted as referenced in figure 5.

1. Drill 5/8" hole in appropriate location.
2. Mount transducer on a vertical surface with two #8 self-tap screws (not provided).
3. Pull wires through knockout and make necessary connections (see wiring drawings).
4. Replace cover and tighten phillips screws.

**HU-225 (WALL)** The HU-225 must be mounted as referenced in figure 5.

1. Turn both allen screws CW on bottom of unit - remove cover.
2. Select the mounting location, locate away from diffusers, lights or any external influences.
3. Mount transducer on a vertical surface with two screws provided.
4. Pull wires through sub base hole and make necessary connections (see wiring drawings).
4. Replace plastic cover and turn allen screws CCW.

#### Wiring

Use maximum 12 AWG wire for wiring terminals. Refer to figures 1, 2, 3, & 4 for wiring information.

#### Wiring HU-224/225 Units with mA Output

HU-224/225 humidity transducers are 4-20 mA output units powered with a 12-40 VDC supply.

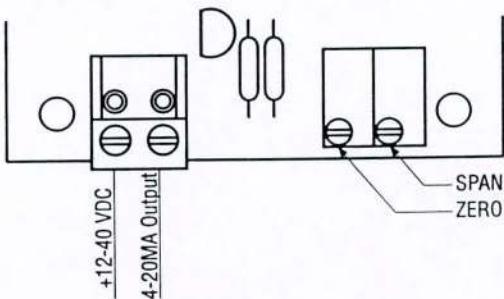
The following describes the proper wiring of these pressure transducers with mA output:

1. Remove the blue terminal block by carefully pulling it off the circuit board.
2. Locate the [+] and [-] terminal markings on the board.
3. Attach the supply voltage to the [+] lead.
4. Connect the 4-20 mA output ([+] terminal) to the controller's input terminal.
5. Ensure that the power supply common is attached to the common bus of the controller.
6. Re-insert the terminal block to the circuit board and apply power to the unit.
7. Check for the appropriate output signal using a DVM set on milliamperes connected in series with the [-] terminal.

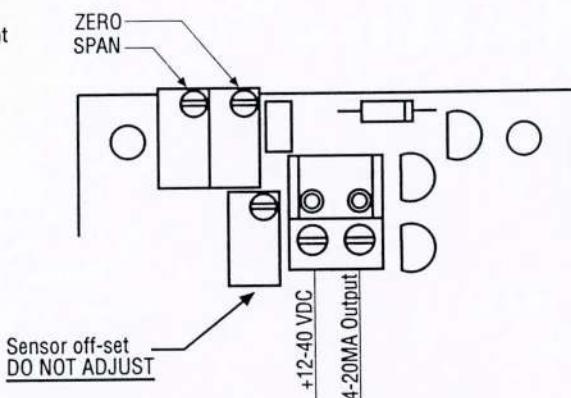
## Humidity Transducer

### HU-224/225 Humidity Transducers with mA Output

HU-224  
Duct Mount



HU-225  
Wall Mount



### Wiring HU-224/225 Units with VDC Output

HU-224/225 humidity transducers with VDC output are field selectable 0-5 Vdc or 0-10 VDC output and can be powered with either 12-40 VDC or 12-35 VAC. The following describes the proper wiring of these humidity transducers with VDC output:

1. Remove the blue terminal block by carefully pulling it off the circuit board.
2. Locate the (+), (-), and (0) terminal markings on the board.
3. Attach the power wires to the (+) and (-) terminals. The (-) terminal is also the negative output terminal.
4. Connect the (0) terminal, which is the positive VDC output terminal, to the controller's input.
5. Re-insert the terminal block to the circuit board and apply power to the unit.
6. Check the appropriate VDC output using a voltmeter set on DC volts across the (0) and (-) terminals.

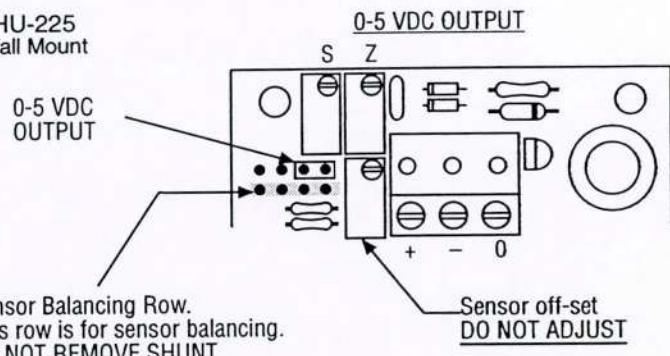
**Caution:** If you are using grounded AC, the hot wire must be on the (+) terminal. Also, if you are using a controller without built-in isolation, use an isolation transformer to supply the HU-224/225 transducer.

**Caution:** This product contains a half-wave rectifier power supply and must not be powered off transformers used to power other devices utilizing non-isolated full-wave rectifier power supplies.

**Caution:** When multiple HU-224/225 units are powered from the same transformer, damage will result unless all 24G power leads are connected to the same power lead on all devices. It is mandatory that correct phasing be maintained when powering more than one device from a single transformer.

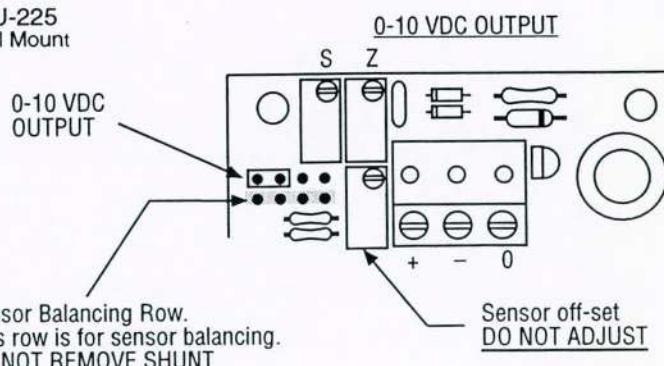
### HU-225 Humidity Transducers with VDC Output

HU-225  
Wall Mount



Sensor Balancing Row.  
This row is for sensor balancing.  
DO NOT REMOVE SHUNT

HU-225  
Wall Mount



Sensor Balancing Row.  
This row is for sensor balancing.  
DO NOT REMOVE SHUNT

#### LEGEND:

S= SPAN ADJUST

SUPPLY: 12-35 VAC

Z= ZERO ADJUST

12-40 VDC

+= + SUPPLY VOLTAGE

OUTPUT: 0-5/0-10 VDC

-= COMMON

RANGE: 0-100% RH

0= OUTPUT

### Humidity Transdu

#### HU-224 Humidity Transducers with VDC Output

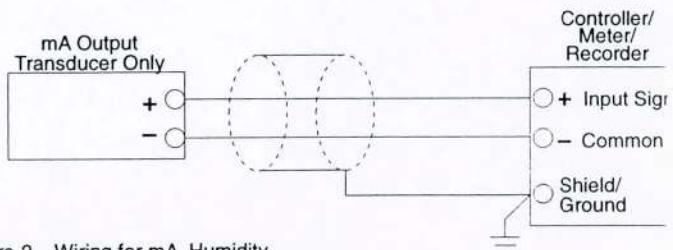
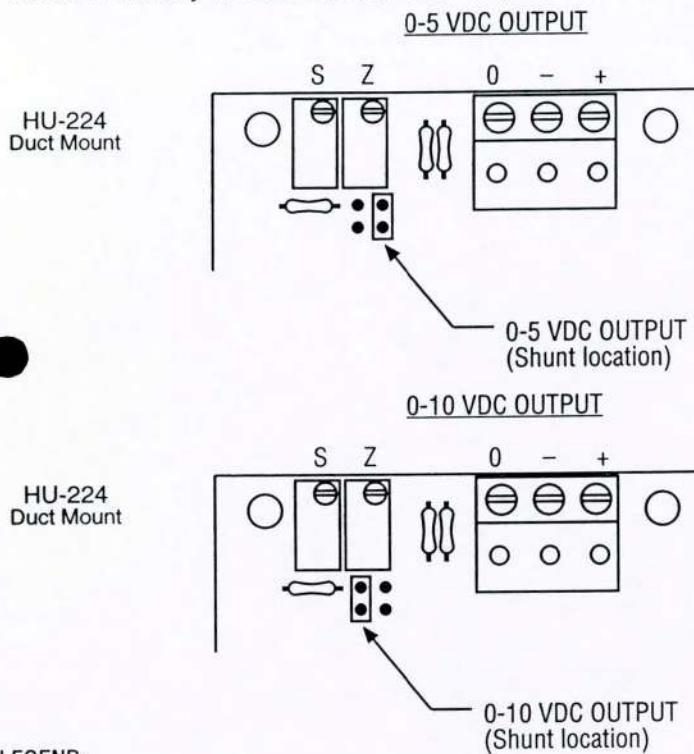


Figure-2 Wiring for mA Humidity Transducers Where Controller or Meter has Internal DC Power Supply

Figure-3 and Figure-4 Illustrate typical wiring diagrams for the HU-224/225, 0-5/0-10 VDC output Humidity Transducers.

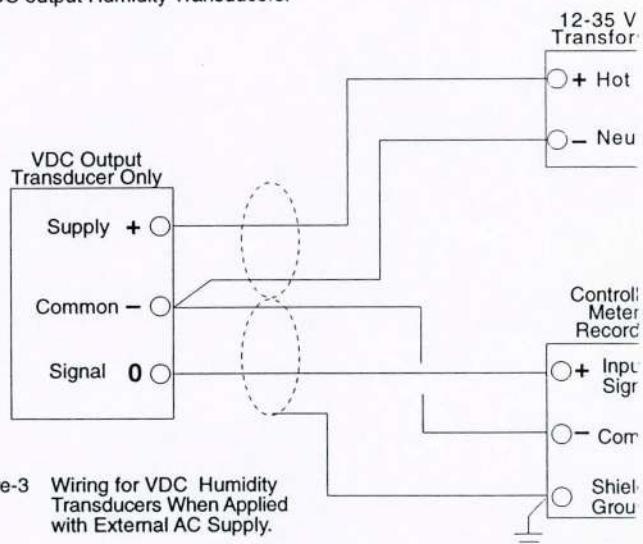


Figure-3 Wiring for VDC Humidity Transducers When Applied with External AC Supply.

#### TYPICAL APPLICATIONS (wiring diagrams)

Figure-1 and Figure-2 Illustrate typical wiring diagrams for the HU-224/225, 4-20 mA, two-wire Humidity Transducers.

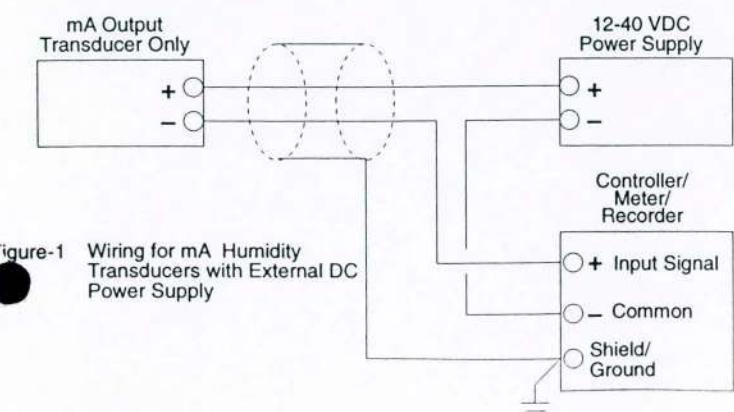


Figure-1 Wiring for mA Humidity Transducers with External DC Power Supply

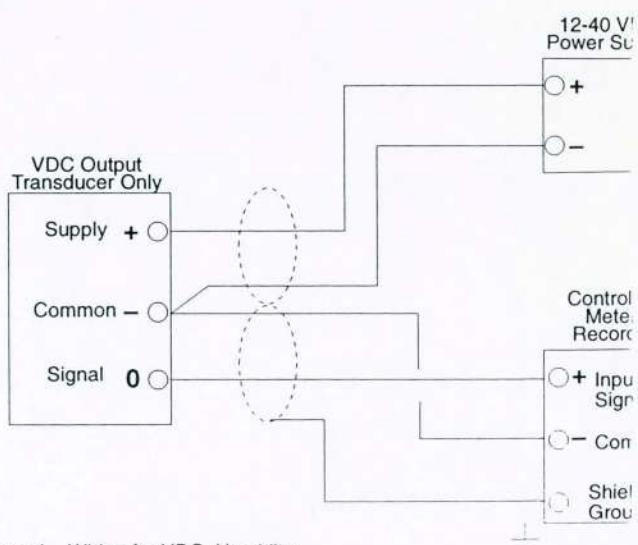


Figure-4 Wiring for VDC Humidity Transducers When Applied with External DC Supply.

**Model HU-224/225**  
**Technical Information**  
**TI.224/225-01**

**Humidity Transducer**

**HECKOUT**

1. Verify that the unit is mounted in the correct position.
2. Verify appropriate input signal and supply voltage.

**Caution:** Never connect 120 VAC to these transducers.  
Never connect AC voltage to a unit intended for DC supply.

3. Verify appropriate configuration range.

**ransducer  
operation**

**Note:** The HU-224/225 is a highly accurate device. For applications requiring a high degree of accuracy, the use of laboratory quality meters and gauges are recommended.

**CALIBRATION** All units are factory calibrated to meet or exceed published specifications. If field adjustment is necessary, follow the instructions below.

Calibration of HU-224/225-2/3-mA/VDC Humidity Transducer Field Calibration instructions are provided with the following precautions and advice.

1. Do not verify comparative RH with a sling Psychrometer. There are far too many variables which induce errors into this process. New HU-224/225 RH transducers are already supplied with calibration.

2. Recalibration must be done in a controlled environment. Relative humidity must be held stable while making any adjustment.

3. Verify the output from the device directly with calibrated instrumentation and verify the RH with calibrated instrumentation, (NOT A CONTROLLER OUTPUT). With the correct power applied and only a meter connected to the output of the transducer, ensure that the output is proportional to the true RH.

**4. A. SINGLE POINT CALIBRATION, NOTE; SELECT EITHER OPTION 1 OR OPTION 2, BUT NOT BOTH.**

- OPTION 1** 1. Select a controlled humidity environment between 10 & 40% R.H. insure humidity is stable and adjust zero trimmer (z).

- OPTION 2** 2. Select a controlled humidity environment between 40 & 70% R.H. insure humidity is stable and adjust span trimmer (s).

**B. TWO POINT CALIBRATION**

1. Select a controlled humidity environment between 10 & 40% R.H. insure humidity is stable and adjust zero trimmer (z). Then select a controlled humidity environment between 70 & 75% R.H. insure humidity stable and then adjust span trimmer (s).

**MAINTENANCE** Regular maintenance of the total system is recommended to assure sustained optimum performance.

**FIELD REPAIR** None. Replace with a functional unit.

**WARRANTY** See Data Sheet for additional information.

**DIMENSIONAL DATA**

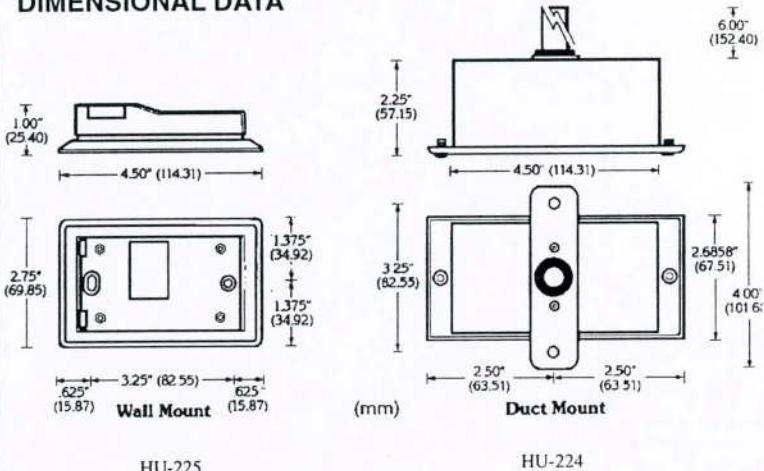


Figure-5 Hu-224/225 Humidity Transducer Dimensions shown in inches and millimeters (mm)

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# PNC2 Printer Node Controller

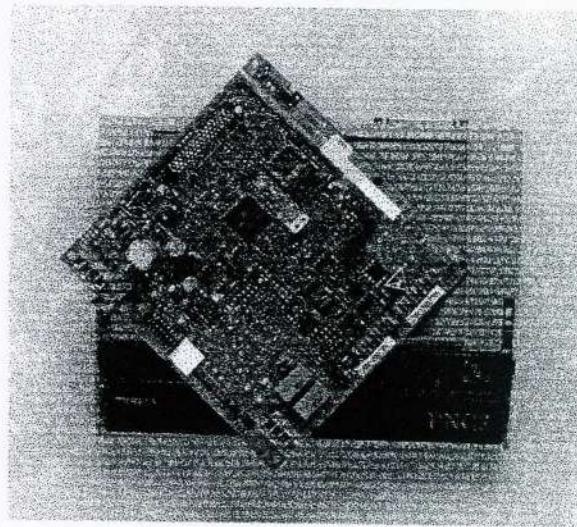
Lx300+

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## PRINTER NODE CONTROLLER

This product is not yet available



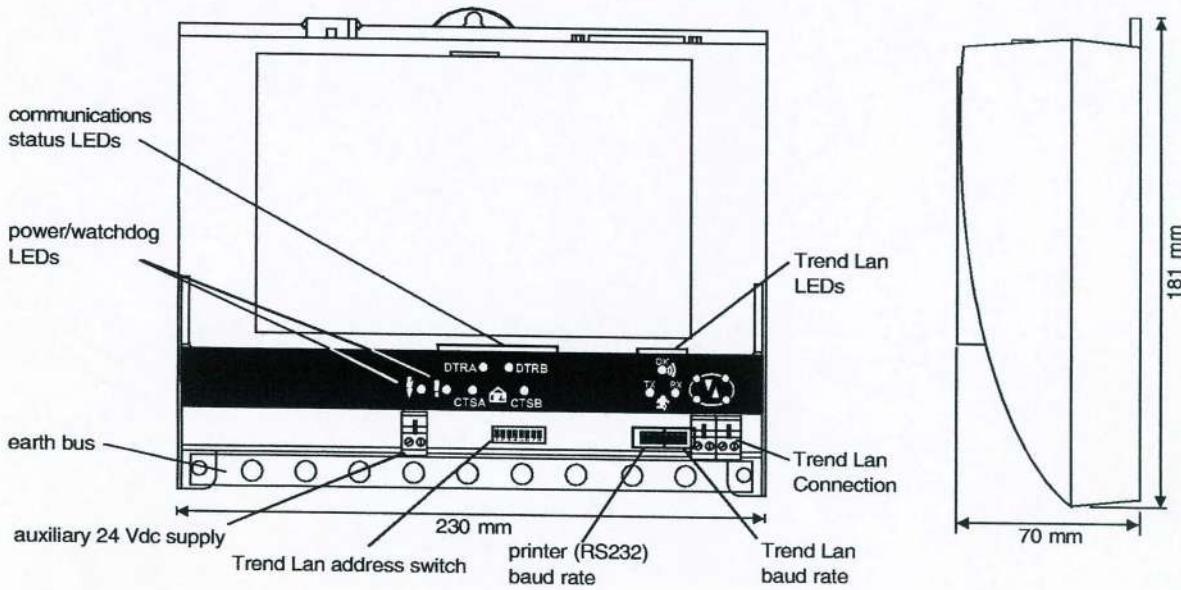
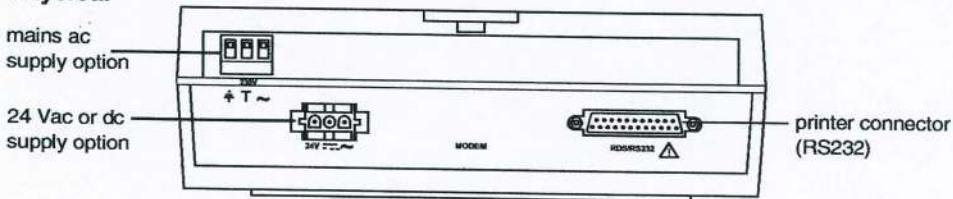
### Description

The Printer Node Controller (PNC2) interfaces between the Trend network and a printer (Lan to RS232) allowing alarms to be sent to a printer. It is available in an IP30 enclosure (NBOX) or can be supplied without an enclosure for mounting inside a Trend device, e.g. an IQ controller. There are 230 V and 24 V supply versions.

### Features

- Automatic network test.
- 116 node addressable.
- 24 Vdc auxiliary supply output.
- 230 Vac or 24 Vac/dc supply versions.

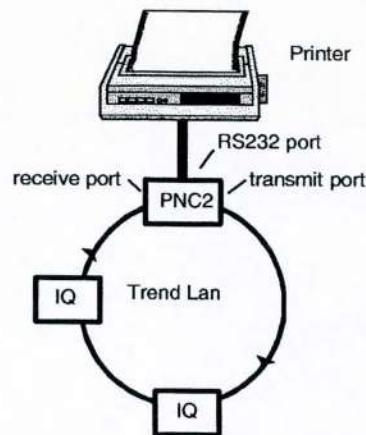
### Physical



## FUNCTIONALITY

The PNC2 interfaces between a printer connected via the RS232 port and the Trend Lan; it also provides certain network maintenance operations. It allows messages such as alarms to be printed out. Alarms intended for the printer are simply sent to the PNC2 which in turn passes them to the printer. The PNC2 continually monitors the Lan; if it receives data that is addressed to a different node it passes it on around the Lan via its transmit port. If it receives data for its own address, it will transmit it to the RS232 port.

The PNC2 also monitors Lan integrity by performing continuous checking of network messages. Alarm messages are generated whenever a problem occurs.



## HARDWARE

**Packaging:** The PNC2 can be provided boxed, or as a board version.

**Boxed version:** The PNC2 can be supplied in a plastic enclosure with a transparent plastic flip-up terminal cover (NBOX/PNC2/...). It has 3 point mounting to facilitate installation. An optional metal enclosure with cable glands is available.

**Board version:** The board version will fit inside certain IQ controllers. The controllers can be ordered pre-fitted with the node (e.g. IQ241/PNC2/...), or the node can be retrofitted by using the appropriate fitting kit (KIT/node/IQ24x for IQ241/242, or KIT/node/IQ25x for IQ250/251).

**Network :** The two part network terminals are for 2 wire cables.

**Address Switch :** The PNC2 device address on the local Lan is selected by address switch poles 1 to 7. It may be set in the range 1, 4 to 9, 11 to 119 and must be unique on the local Lan.

**Dumb/Normal Switch:** The dumb/normal switch setting (SW1, pole 8) is ignored by the PNC2. The PNC2 will only operate on a network+, post 1985 Lan.

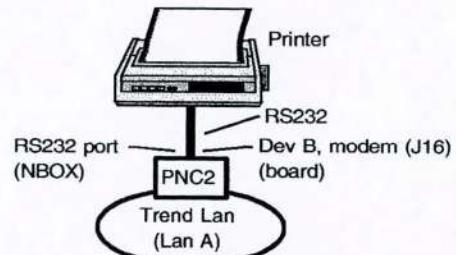
**Baud Rate Links :** The local Lan and printer (RS232) baud rates are set by two sets of links to 19k2, 9k6, 4k8, or 1k2. The local Lan baud rate must be set to match other nodes on the local Lan. The RS232 port baud rate must match the printer.

**Network bypass relay :** In order that the network continues to operate if the PNC2 fails, a node bypass relay is fitted to maintain network integrity in the event failure of the node's power supply, or failure of the node itself. The bypassing of a node will be recognised by the downstream node, and reported as a Lan Changed alarm.

**Power:** The boxed version (NBOX/PNC2/..) can be supplied in 230 Vac and 24 V(ac or dc) versions. The 230 Vac version is supplied with an optional supply terminal shroud. The board version requires 24 Vdc, or 18 Vac (transformer isolated), or 18-0-18 Vac (transformer centre tapped)

**Fusing:** No replaceable fuses are fitted. Protection is proved by a self-resetting thermally protected transformer. The 24 V version is protected by a self-resetting PTC device.

**RS232/Lan connections:** The printer connection is referred to as the RS232 port on the NBOX version, and as the Device B connection on the board version. The Trend Lan is referred to as Lan A.



The local Lan (Lan A) connection is duplicated on the PNC2 board as the Device A RS232 connection (J15). If an RS232 device were to be connected to the RS232 connector (Dev A), the Lan connection (Lan A) would be effectively disconnected.

**Printer:** The printer must have an RS232 serial interface. It must be set up as a serial printer with even parity, 7 data bits. The baud rate may be set to any of those available on the PNC2 (19k2, 9k6, 4k8 or 1k2).

**HARDWARE** (continued)

**Indicators:** The PNC2 has 9 indicators to monitor unit status.

|              |                                                                             |      |                                                                                                                                                               |
|--------------|-----------------------------------------------------------------------------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ⚡ (Power)    | (green) On when supply is on (normally ON); if OFF, power fail.             | TX   | (yellow) Monitors current flow from PNC2 to Trend Lan (Lan A). (normally ON). If OFF, transmit connection to next node may be broken.                         |
| ❗ (Watchdog) | (red) On if a processor or software fault (normally OFF); if ON, PNC2 fail. | RX   | (yellow) Monitors current flow to PNC2 from Trend Lan (Lan A). (normally ON). If OFF, receive connection from previous node may be broken or short-circuited. |
| DTRA         | (yellow) PNC2 busy to local Lan (Lan A) (normally flashes).                 |      | (green) ON if local Lan (Lan A) OK. Flashes if prohibited Lan address (0, 2, 3, >119) set on address switch. OFF if Lan fault (e.g. baud rate conflict).      |
| CTSA         | (yellow) RS232 Device A busy to PNC2.                                       |      |                                                                                                                                                               |
| DTRB         | (yellow) PNC2 busy to printer (RS232 port or Dev B). (normally flashes).    | OK ↳ |                                                                                                                                                               |
| CTSB         | (yellow) Printer (RS232 port or Dev B) busy to PNC2.                        |      |                                                                                                                                                               |

**Connectors:** Two part connectors are used throughout to facilitate wiring. A busbar is provided for screen termination.

**FIRMWARE**

**Alarms:** The PNC2 also helps to maintain a high level of network integrity by performing continuous checking of network messages.

The following alarms are generated when faults are found:

**Lan Broken** - a break in communications over the local Lan.

**Lan OK** - local Lan communications are restored.

**Lan Changed** - a node has gone from or been added to the local Lan.

It will deliver these alarms to the RS232 port local device in the format required by the printer (text).

**INSTALLATION**

The PNC2 installation involves the following procedure:

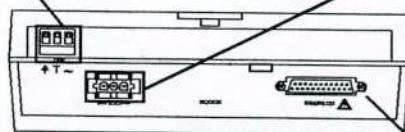
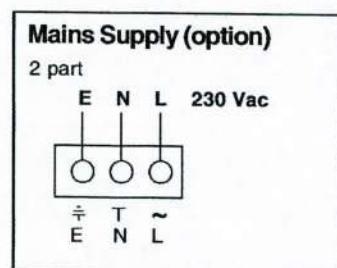
- |                          |                                           |
|--------------------------|-------------------------------------------|
| Fix the unit in position | Connect power supply                      |
| Route cables             | Connect to printer                        |
| Connect the network      | Connect Auxiliary Supply output (if used) |
| Set network address      | Test                                      |
| Set network baud rate    |                                           |

A full description of installing the NBOX/PNC2 is provided in the NBOX/PNC2 Installation Instructions, TG200266. Instructions for installing a PNC2 board only are provided in the PNC2 Installation Instructions, TG200264.

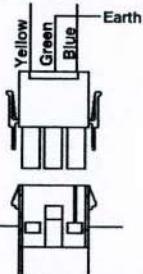
The installation of an NBOX/PNC2 using an MBOX is covered by ENCLS/MBOX Installation Instructions TG200204.

## CONNECTIONS

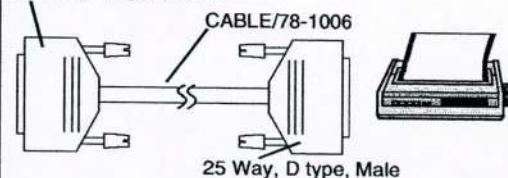
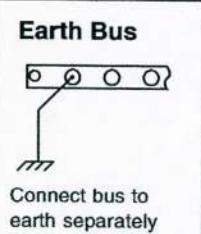
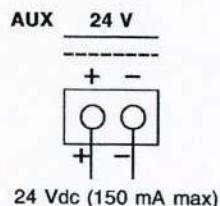
Boxed NBOX/PNC2

**24 V Supply (option)**

2 part Mat-N-Loc connector

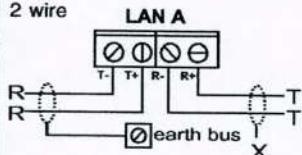
24 Vdc: +24V 0V  
24 Vac: 24 Vac 0V**PNC2 to printer connection**(RS232 port)  
(24 Way, D type, Female)cable not supplied  
with unit

25 Way, D type, Male

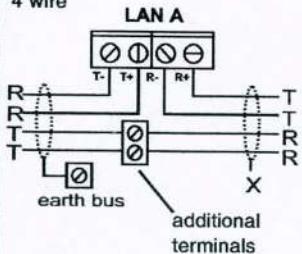
**Auxiliary Supply Output (24 Vdc)****Trend Lan (Lan A)**

polarity independent

2 wire

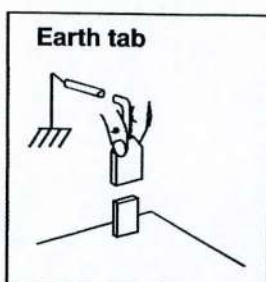


4 wire



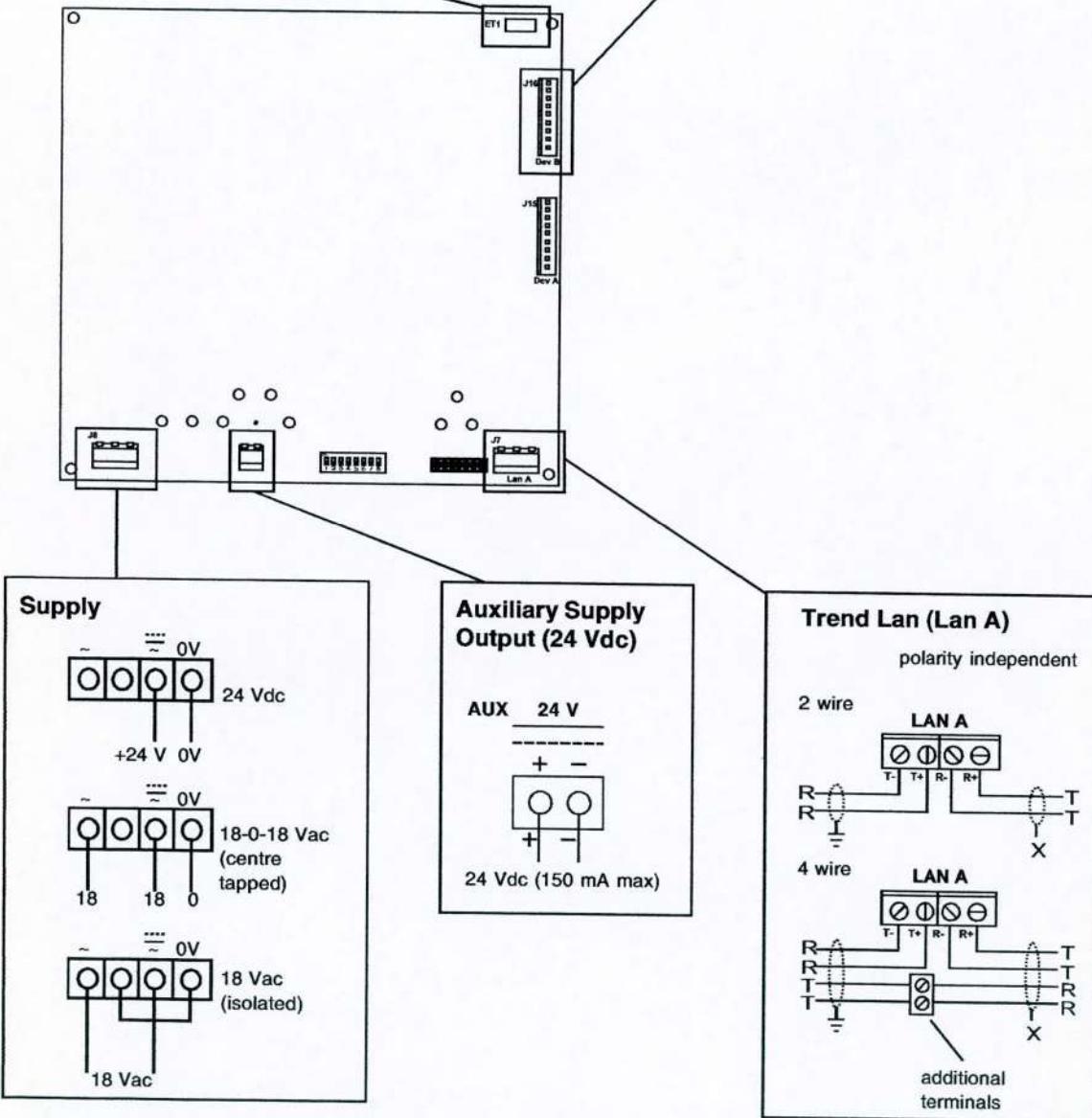
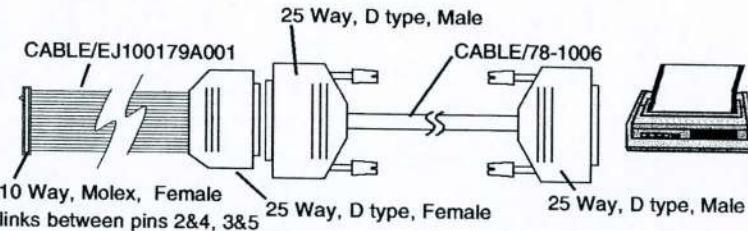
## CONNECTIONS

Board PNC2



**PNC2 to printer connection**  
(Dev B, J16)  
(10 Way, Molex, Male)

cables not supplied with unit

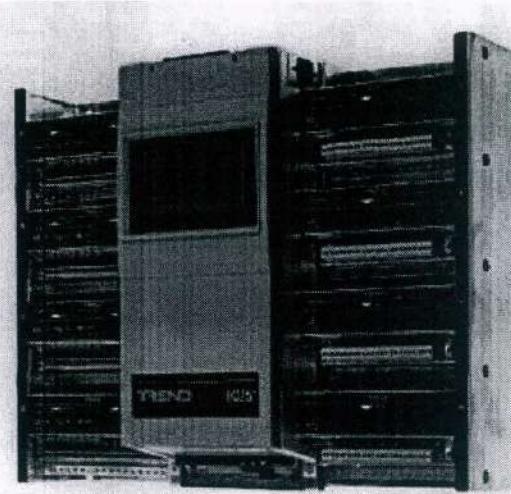


## DISPOSAL

COSHH ASSESSMENT FOR DISPOSAL OF NODE CONTROLLER: No parts affected

## RECYCLING

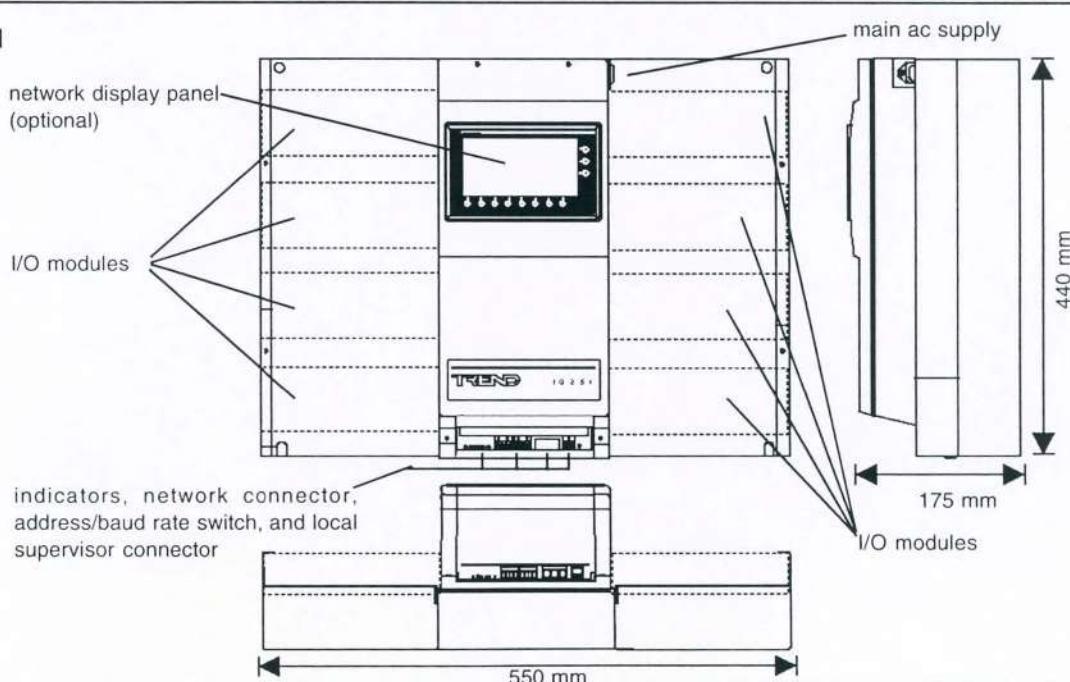
All plastic and metal parts are recyclable. The printed circuit board may be sent to any PCB recovery contractor to remove some of the components for any metals such as gold or silver.

**IQ251 CONTROLLER****Description**

The IQ251 is a large capacity controller designed for the control of all types of building plant. It can provide up to 128 I/O points by connecting 8 I/O modules in any combination. The range of I/O modules comprises an 8 analogue plus 8 digital input module, an 8 analogue output module, and an 8 digital output module. Trend accessory modules may be connected to the input/output channels to provide greater I/O flexibility. They enable the IQ251 to provide sufficient capability for more complex strategies. It can operate either as a stand alone device or as part of a Building Management System. An optional Network Display Panel can be fitted on the front cover, or remotely. It provides access to all IQ controllers on a single or multi-Lan system via a node controller integrated within the IQ251. The IQ251 also provides the ability to connect any Trend supervisor or Engineering Tool to the network without the need for a separate node controller.

**Features**

- 1 second cycle time.
- Optional integral Network Display Panel.
- Access to entire network via local supervisor connection.
- Facility for mounting an additional node controller.
- High capacity DDC with PID control loops.
- Stand alone or integrated system operation.
- Up to 8 input/output modules for optimum configuration.
- Range of enclosures.
- Up to 96 logs.
- Up to 1000 values per log.
- Compatible with IQ151+ data files.
- Flexible I/O combinations

**Physical**

## FUNCTIONALITY

The IQ251 Controller's functionality can be divided into two sections, the strategy, and the hardware.

### STRATEGY

The strategy processes inputs according to a set of instructions and then outputs signals which can be used to control plant.

**Communications:** When operating as part of a Building Management System the IQ251 will be connected to other devices via the Trend Network. This means that information within the IQ251 can be accessed using one of the Trend supervisor programs, or passed to other Trend IQ controllers using inter controller communications, enabling the sharing of information across the whole system.

**Configuration:** The IQ251 uses the standard IQ configuration mode which enables configuration via the network, or by direct connection. The 822+/Toolbox version 6 can be used to upload, and download IQF files.

**Modules:** The strategy consists of a number of individual functional blocks known as configuration modules. These blocks can be linked in various combinations to enable plant to be controlled appropriate to the buildings requirements. The table lists the different types of configuration modules and the number of each type available with IQ251. Full details of the modules are given in the IQ Configuration Manual. Differences between the modules covered in the manual and the IQ251's modules and additional nodes are described below.

*Note that the sequence cycle time is 1 second. This will enable the IQ251 to control faster processes, and respond more rapidly to alarm conditions than IQ1 series controllers.*

**The Engineer's Journal:** The Engineer's Journal enables information about changes to the strategy to be entered. Pressing 'J' while in configuration mode displays all the existing messages. A new message can be entered by typing the next number (e.g. if there are 3 messages, type 4,) and then the message.

**Address module:** The address module has two extra addresses for the NDP and Supervisor.

**sUpervisor port addr:** This should be set to the network address of the supervisor connected via the IQ251 supervisor port (this could also be an NDP). It can take the normal range of addresses on the network, as long as an address is not duplicated. If set to address zero the supervisor will only communicate with the local IQ251.

**ndp pOrt addr:** This should be set to the network address of the NDP connected via the IQ251 NDP port (this could also be a local supervisor). It can take the normal range of addresses on the network, as long as an address is not duplicated. If set to address zero the NDP will only communicate with the local IQ251.

**Sensor Types:** The IQ251 is inherently more accurate at thermistor temperature measurement as it measures both the reference voltage and the voltage developed across the thermistor and using a 0.1% bridge resistor then calculates the thermistor resistance. The IQ251 has five sensor types:

|   |        |   |                            |   |                           |
|---|--------|---|----------------------------|---|---------------------------|
| 0 | linear | 2 | linearise thermistor volts | 4 | linearise thermistor ohms |
| 1 | log    | 3 | linearise volts            |   |                           |

Type 0, linear, has been changed relative to the IQ151+ (or earlier controllers using ±5 V for linear voltage T and B parameters - IQ111, 131, 151) for linear voltage only in that T and B must be set to the values of the variable being sensed which give outputs of +10 V and -10 V respectively. This brings the IQ251 in line with all other current IQs (IQ7x, 9xe, 10x+, 111+, 131+).

Type 1, log, is the same as before.

The controller can use up to 3 different addresses. One address is for the controller, the 2nd and 3rd are optional, and are for the NDP, and locally connected supervisor. This means that both the NDP and supervisor have their own network addresses when connected to the network via the controller. The controller's address is set by a switch on the module, and the addresses for the display panel, and supervisor are software selectable.

Alternatively the ACE+ utility can be used to create a strategy data file which can then be downloaded to the controller.

| Module Type   | Number | Module Type    | Number |
|---------------|--------|----------------|--------|
| Sensor        | 96     | Critical alarm | 4      |
| Sensor type   | 12     | Alarm history  | 20     |
| Loop          | 32     | IC comms       | 16     |
| Function      | 240    | Digital Inputs | 96     |
| Logic         | 240    | Fast sequence  | 8      |
| Driver        | 64     | Zone           | 5      |
| Knob          | 60     | Schedule       | 32     |
| Switch        | 60     | Calendar       | 20     |
| Sensor log    | 96     | User password  | 6      |
| Sequence step | 560    | Sequence time  | 1 s    |

**I/O Card Summary:** The I/O Card Summary lists the type of I/O card connected to each I/O slot. Typing 'io' while in configuration mode displays this list.

There is no supply frequency option on the address page as the problem of mains pickup is dealt with differently.

The IQ251 will identify itself (e.g. to the 945 and the NDP) as an 'IQ2xx v1'. This is so that existing versions of these programs can operate with the IQ251.

If the IQ251 receives an identify message aimed at either the supervisor, or NDP port it will identify the attached device. If there is no device attached then it will identify the port as a CNC.

Type 2, linearise, is now 'linearise thermistor volts', and is reserved for thermistors only.

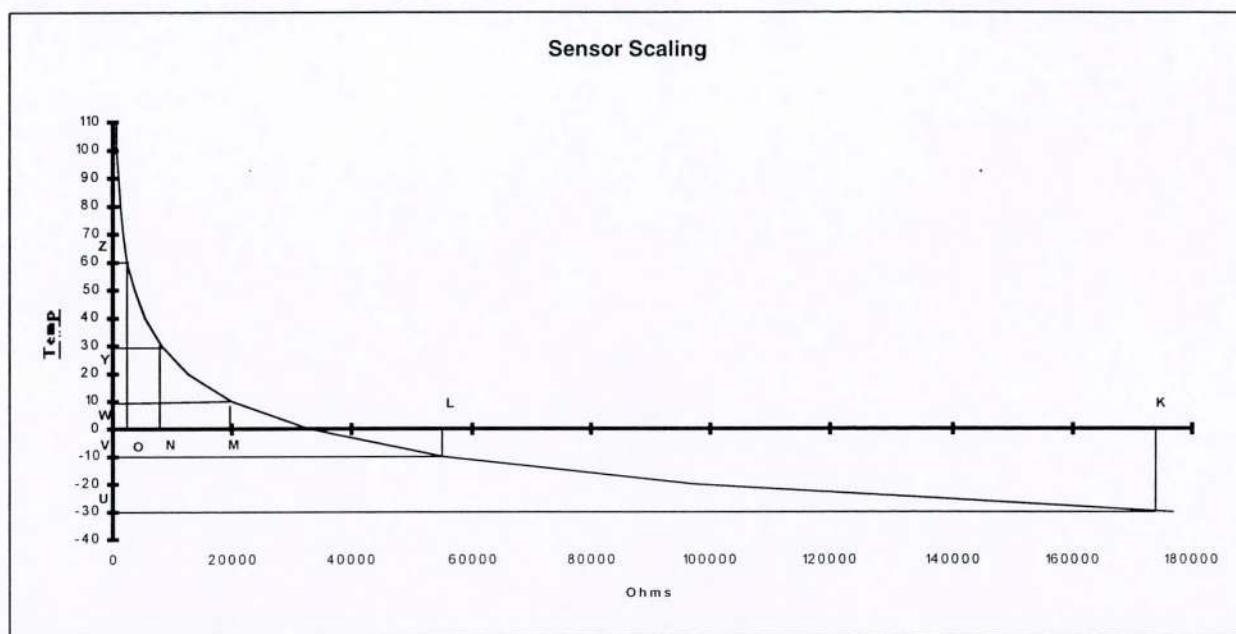
Type 3, linearise volts, is to be used for voltage or current signals which need to be linearised and is the same format as sensor type 2.

**STRATEGY** (Continued)

Type 4, linearise thermistor ohms, may be used instead of type 2. It presents a more logical method of defining the thermistor linearisation, requiring entry of ohms against temperature directly from the sensor characteristic. It also enables the linearisation points on the temperature scale to be individually chosen so that they can be closer together over a part of the characteristic where the gradient is changing rapidly, and further apart where the gradient changes only gradually. It appears in configuration mode as shown.

| Scaling 4 |      | linearise thermistor ohms |      |      |      |
|-----------|------|---------------------------|------|------|------|
|           |      | U                         | V    | W    | Y    |
| units     | 0.00 | 0.00                      | 0.00 | 0.00 | 0.00 |
| kohms     | 0.00 | 0.00                      | 0.00 | 0.00 | 0.00 |
| K         | L    | M                         | N    | O    |      |

The parameters U, V, W, Y, Z and K, L, M, N, O are obtained from a characteristic graph of the sensor. For example:



The graph shows the temperature characteristic for a Trend thermistor sensor. If the sensor is to be used for a temperature range -30 °C to +60 °C, then this defines two points U/K and Z/O. The other three points have now to be chosen:

The gradient changes most rapidly over the 'knee' of the characteristic therefore around this area the points should be closer together. The points are found by drawing four straight lines, approximating as closely as possible to the curve. Each of these lines should provide a best fit straight line approximation to that curve segment. The actual point values should be obtained from a table rather than a graph, for greater accuracy. The standard Trend table (see IQ Configuration manual) gives the following points for the -30 °C to +60 °C example.

|   | °C  | kΩ       |
|---|-----|----------|
| U | -30 | K 177.00 |
| V | -10 | L 55.34  |
| W | 10  | M 19.98  |
| Y | 30  | N 8.06   |
| Z | 60  | O 2.49   |

**Sensor Log:** The IQ251 has 96 logging channels. Each channel can sample a sensor value at a prescribed interval (period), and store up to 1000 values. After 1000 values have been recorded the oldest value is overwritten. This means that the last 1000 values are always available. Logging is performed at 10 different intervals (1s, 1m, 5m, 10m, 15m, 20m, 30m, 1h, 6h, and 24h). The interval can be specified from any of those listed in the table.

**Analogue array:** The IQ251's analogue array has been extended to 510 nodes (previously 255). The extra nodes are used as follows: The fixed allocations are set up in the firmware, whereas recommended allocations are set up by the user in configuration mode, see the Array Reference Card for a more detailed description.

**Table showing recommended sensor type 4 settings for standard temperature ranges of Trend thermistor sensors.**

|   |    | -10 °C to 110 °C | -10 °C to 40°C | -40 °C to 50°C | -10 °C to 70°C |
|---|----|------------------|----------------|----------------|----------------|
| U | °C | -10              | -10            | -40            | -10            |
| V |    | 2.5              | -5             | -28.5          | 0              |
| W |    | 16.5             | 4.5            | -14            | 12.5           |
| Y |    | 42               | 19             | 8.5            | 33             |
| Z |    | 110              | 40             | 50             | 70             |
| K | kΩ | 540.6            | 55.34          | 328.87         | 54.44          |
| L |    | 28               | 40.5           | 157.9          | 32.49          |
| M |    | 14.06            | 25.26          | 64.35          | 16.93          |
| N |    | 3.9              | 12.63          | 19.18          | 6.38           |
| O |    | 0.51             | 5.32           | 3.6            | 1.75           |

| Period | Duration         | Period | Duration          |
|--------|------------------|--------|-------------------|
| 1 s    | 16 m 40 s        | 20 m   | 13 days 21 h 20 m |
| 1 m    | 16 h 40 m        | 30 m   | 20 days 2 h       |
| 5 m    | 3 days 11 h 20 m | 1 h    | 41 days 16 h      |
| 10 m   | 6 days 22 h 40 m | 6 h    | 250 days          |
| 15 m   | 10 days 10 h     | 24 h   | 1000 days         |

| Nodes      | Used for                            |             |
|------------|-------------------------------------|-------------|
| 256 to 287 | Sensors 49 to 80 (real or internal) | Fixed       |
| 288 to 303 | Sensors 81 to 96 (real or internal) | Fixed       |
| 304 to 355 | Free                                | Recommended |
| 356 to 475 | Functions 121 to 240                | Recommended |
| 476 to 505 | Knobs 31 to 60                      | Fixed       |
| 506 to 510 | Free                                | Recommended |

**STRATEGY** (Continued)

**Digital array:** The IQ251's digital array has been extended to 1012 bytes (previously 506). The extra bytes are used as follows:

The fixed allocations are set up in the firmware, whereas recommended allocations are set up by the user in configuration mode, see the Array Reference Card for a more detailed description.

| Bytes      | Used for                   | Size/module | Bytes       | Used for    | Size/module                        |        |             |
|------------|----------------------------|-------------|-------------|-------------|------------------------------------|--------|-------------|
| 507 to 512 | Dig. in. 49 to 96          | 1 bit       | Fixed       | 821 to 868  | Sens. alarm ack status 49 to 96    | 1 byte | Fixed       |
| 513 to 518 | Dig. out. 49 to 96         | 1 bit       | Fixed       | 869 to 884  | Free                               |        | Recommended |
| 519 to 523 | Free                       |             | Recommended | 885 to 900  | Driv. alarm ack status 33 to 64    | ½ byte | Fixed       |
| 524 to 528 | Switches 21 to 60          | 1 bit       | Fixed       | 901 to 906  | Dig. in. ack status 49 to 96       | 1 bit  | Fixed       |
| 529 to 543 | Logic outputs 121 to 240   | 1 bit       | Recommended | 907 to 912  | Dig. in. required states 49 to 96  | 1 bit  | Fixed       |
| 544 to 546 | Free                       |             | Recommended | 913 to 960  | Sens. alarm enable status 49 to 96 | 1 byte | Fixed       |
| 547 to 801 | An. node alarms 256 to 510 | 1 byte      | Fixed       | 961 to 976  | Free                               |        | Recommended |
| 802        | Free                       |             | Recommended | 977 to 992  | Driv. alarm enable status 33 to 64 | ½ byte | Fixed       |
| 803 to 818 | Driv. alarms 33 to 64      | ½ byte      | Fixed       | 993 to 998  | Dig. in. enable status 49 to 96    | 1 bit  | Fixed       |
| 819 to 820 | Free                       |             | Recommended | 999 to 1012 | Free                               |        | Recommended |

**External Channels:** In configuration mode the IQ251 identifies the external channel numbers corresponding to the module number (in the case of sensors or digital inputs) or output channel number (in the case of drivers).

The sensor and digital input modules, and the output channels specified in the driver modules are related to the external channels as shown in the table:

| Sensor Module |                  | Digital Input Module |                  | Driver Module  |                  |
|---------------|------------------|----------------------|------------------|----------------|------------------|
| Sensor Number | External Channel | Dig. Input Number    | External Channel | Output Channel | External Channel |
| S1 to S8      | AA1 to AA8       | I1 to I8             | AD1 to AD8       | 1 to 8         | E1 to E8         |
| S9 to S16     | BA1 to BA8       | I9 to I16            | BD1 to BD8       | 9 to 16        | F1 to F8         |
| S17 to S24    | CA1 to CA8       | I17 to I24           | CD1 to CD8       | 17 to 24       | G1 to G8         |
| S25 to S32    | DA1 to DA8       | I25 to I32           | DD1 to DD8       | 25 to 32       | H1 to H8         |
| S33 to S48    | internal only    | I33 to I48           | internal only    | 33 to 48       | internal only    |
| S49 to S56    | EA1 to EA8       | I49 to I56           | ED1 to ED8       | 49 to 56       | A1 to A8         |
| S57 to S64    | FA1 to FA8       | I57 to I64           | FD1 to FD8       | 57 to 64       | B1 to B8         |
| S65 to S72    | GA1 to GA8       | I65 to I72           | GD1 to GD8       | 65 to 72       | C1 to C8         |
| S73 to S80    | HA1 to HA8       | I73 to I80           | HD1 to HD8       | 73 to 80       | D1 to D8         |
| S81 to S96    | internal only    | I81 to I96           | internal only    | 81 to 96       | internal only    |

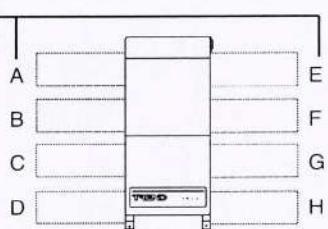
The external channels are referenced as follows:

module reference, analogue or digital (input only), channel number

- e.g. BA1 module **B**, Analogue input, channel 1  
 BD1 module **B**, Digital input, channel 1  
 F1 module **F**, output channel 1  
 A7 module **A**, output channel 7  
 GD8 module **G**, Digital input, channel 8

**Battery Status:** The IQ251 has a battery status checking circuit that checks the battery on power up and thereafter every midnight and sets byte 506 bit 0 if the voltage has falls below a threshold value. This bit being set indicates that the battery needs to be changed. It should be used within the strategy to generate an alarm (e.g. critical alarm). The battery should be changed after the first indication. The battery will have a typical life of 10 years at 20 °C. It is recommended that the battery is replaced every 5 years.

I/O module position references



**Time Resolution:** Loop and logic reschedule times have a resolution of 1 s, and driver's start delay, TP period, and RL drive time have increments of 1 s with a maximum of 32767 s.

**Large numbers:** As a result of certain calculations (e.g. divide by zero), an analogue value may be returned as 'infinity', and similarly, dividing infinity by infinity gives 'NaN' (not a number). Both these values are represented by alpha characters, but are treated by the strategy as very large numbers.

**HARDWARE**

**Enclosures:** If required the IQ251 can be fitted in a metal enclosure (ENCLS, or ENCLS/NDP) The enclosure provides additional environmental protection (IP55) for the unit.

**Connectors:** Two part connectors are used throughout to facilitate wiring. The power supply uses a standard IEC connector.

**Network:** The network terminals facilitate connection of 2 or 4 wire cables. The address and baud rate (19k2, 9k6, or 1k2) are selected by switches. The standard Trend node features are included (TX and RX, and LAN indicators, bypass relay, and network alarm generation). There is also the facility for connection of an NDP, and/or PC to the network via the controller without the need for an additional node controller. A location is also provided for an extra node controller, e.g. MNC, should this be required.

**Power:** 230 Vac 50/60 Hz.

**Display Panel:** The optional Network Display Panel can be mounted on the front cover, or remotely. It provides access to all IQ controllers on a single or multi-Lan system without the need for an additional node controller although it does have its own network address. Using icons, and softkeys it allows an operator to perform, under password protection, supervisory functions, such as setpoint adjustments, or to view logs and alarms from all controllers on the system. It can be powered from the IQ251.

**Supervisor:** A PC running a Trend Supervisor or Utility program can be connected to the network via the controller's supervisor port without the need for an additional node controller although it does have its own network address. When connected in this way the PC will have access to all devices on the network, and will function as if it were connected via its own node controller.

**HARDWARE (Continued)**

**Link Headers:** A range of link headers is available to enable the input channels to accept a wider range of inputs:

LKE/10mA: Provides 10 mA supply (e.g. for potentiometers)

LKE/5V: Provides 5V, 20 mA supply

LKE/15V: Provides 15V, 20 mA supply.

The link header is fitted by removing the links for the appropriate channel, and fitting the link header in their place.

**Auxiliary Supply:** There is a 24 Vdc auxiliary supply provided on the power supply board to power external relay modules, sensors, external NDP etc. It is thermally protected and can supply a maximum of 500 mA. This will normally be available, but if the IQ251 has a full complement of I/O modules with integral NDP, and an integral comms node fitted the amount of auxiliary power available for other purposes will have to be calculated. The internal IQ251 24 Vdc supply has 2100 mA available after deduction of current required for main board and network. This has to supply I/O modules, integral node, integral NDP, and the 24 Vdc auxiliary supply. These loads can be calculated as follows:

**Input module**

8 digital inputs @ 8 mA per channel

8 analogue inputs @ 20 mA per channel (thermistor and voltage inputs can be ignored)

Max total for whole I/O module =  $(8 \times 8) + (20 \times 8) = 224$  mA

**Output module**

8 analogue outputs @ 20 mA per channel

Max total for whole board =  $20 \times 8 = 160$  mA

8 digital outputs @ 24 mA per channel

Max total for whole I/O module =  $24 \times 8 = 192$  mA

Integral NDP= 100 mA

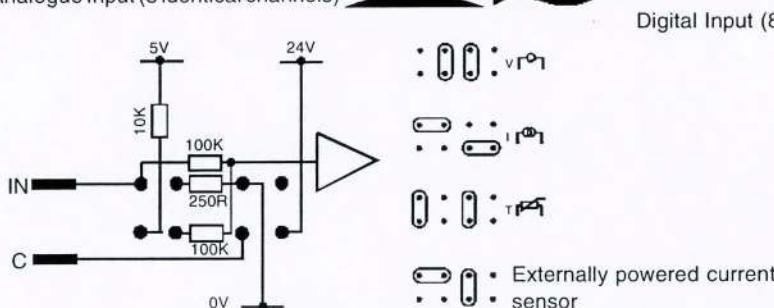
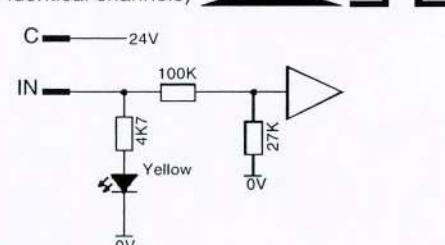
Integral Node (e.g. MNC) = 200mA.

For consumption of other nodes see the respective data sheet.

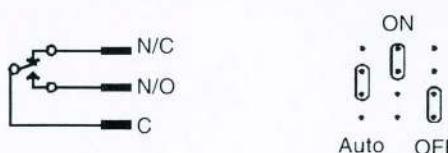
For example:

**I/O modules:** The IQ251 has a range of I/O modules which may be fitted in any combination in the 8 I/O slots. The range comprises an 8 analogue and 8 digital input module (EIN), an 8 analogue output module (EOA), and an 8 digital output module (EDO).

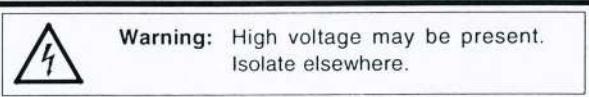
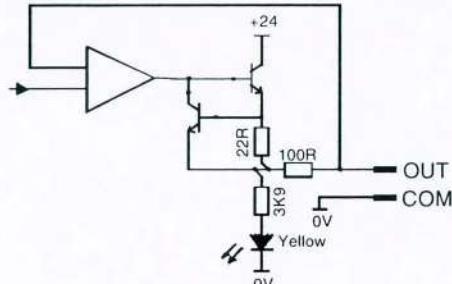
**Inputs:** The input channel combination is dependent on the number of input modules fitted. Each module provides 8 analogue, and 8 digital inputs.

**Analogue Input (8 identical channels)****Digital Input (8 identical channels)**

**Outputs:** The output channel combination is dependent on the output modules fitted. There are two different modules; one which provides 8 digital outputs, and another that provides 8 analogue voltage outputs. A Trend 2VID interface module can be used in conjunction with the analogue voltage output module to provide analogue current outputs.

**Digital Output (8 identical channels)**

Digital outputs have manual override facilities as indicated above.

**Analogue Voltage Output (8 identical channels)**

## COMPATIBILITY

|                          |                                                                                                                                   |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| <b>Supervisors:</b>      | 94x series, 921, NDP v2.3. Note NDP v2.2 or lower may have problems accessing long lists of sensors, digital inputs, and drivers. |
| <b>Utility software:</b> | 822+/Toolbox version 6, 841 Strategy Browser, 842 Change Tracker, 843 Lan Map, 845 Loop Tuner, ACE+.                              |

**Strategy files:** A standard uploaded strategy file (.IQF) can be downloaded to an IQ251 (see loop reschedule time below), but an .IQF file uploaded from an IQ251 has a different format to all IQ1 series controller files; it cannot be downloaded to them. If this is attempted, the controller will fail to send 'Load OK'.

**Loop reschedule time:** A strategy file uploaded by the 822+/Toolbox is designated an .IQF file. When this is downloaded to the IQ251, the IQ251 assumes that it has come from an IQ151+ and will change the loop reschedule time accordingly. It is entered in minutes on an IQ151, or 151+, whereas it is entered in seconds on all other controllers including the IQ251. It will automatically be converted to seconds (multiplied by 60) on download to an IQ251.

If the file being downloaded to the IQ251 has come from an IQ other than IQ2 series controllers, IQ151, or 151+ then (because of the way the IQ251 stores the reschedule time) the loop reschedule time will have to be divided by 3 and re-entered by the user.

**Sensor logs:** Although the IQ251 version has 1000 values per logging channel, some Trend display panel and supervisor/tool applications can only accept the first 96 values of logs using 1 minute, 15 minute, 1 hour, and 24 hour time intervals. This is shown in the table below.

|                                                     |                                                                          |
|-----------------------------------------------------|--------------------------------------------------------------------------|
| All 921, 822, 942, 943, NDP, and 945 pre-issue 2/0. | Access first 96 values of 1 minute, 15 minute, 1 hour and 24 hour logs‡. |
| 945 Issue 2/0.                                      | Access all values from all logs except 1 s.                              |
| NDP 2.3                                             | Access first 96 values from all logs.                                    |

‡Only the first 58 channels are available.

|                                           |                                                                                                               |
|-------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| <b>Controllers:</b>                       | It can communicate to other Trend IQ controllers using inter controller communications.                       |
| <b>Interface:</b>                         | It can be connected to Trend interface modules. Check interface module specification to ensure compatibility. |
| <b>Local Display:</b><br><b>Strategy:</b> | Network Display Panel.<br>All IQ151+ strategies with certain exceptions as described below.                   |

**Sensor types:** For sensor type 0, if the data file has been uploaded from an IQ151+ (or earlier controller using ±5 V for linear voltage T and B parameters) and if the sensor outputs a voltage signal, the T and B values will have to be multiplied by 2 and re-entered by the user.

For sensor type 2, parameters set up in IQ1 series controllers will operate correctly in a IQ251 for a thermistor, but if the sensor is current or voltage it will need to have the sensor type changed to 3. When the sensor type is changed, the other parameters (B, T, F, G etc) will stay the same and hence be correct.

**Analogue and Digital Arrays:** The extended arrays cannot be accessed by identifiers, only by labels, in IC Comms from IQ1 series controllers.

Not all Trend display panels, and supervisor/tool applications can set up or change logging channels for the new time bases. This is summarised in the table below.

|                                               |                                                                                                                                                                                                                                       |
|-----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All 921, 822, 942, 943, and 945 pre-issue 2/0 | Can edit existing channels, and set up new ones using 1 minute, 15 minute, 1 hour, and 24 hour time intervals unless any channel has been set up using 1 second, 5 minute, 10 minute, 20 minute, 30 minute, and 6 hour time interval. |
| 945 Issue 2.0                                 | Can edit existing channels, and set up new ones using all time intervals except 1s.                                                                                                                                                   |

## INSTALLATION

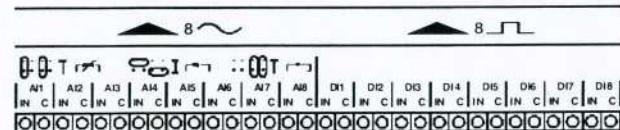
The IQ251 Controller is installed on a flat surface, a wall, or panel, using screws and washers. The procedure involves:

- |                                                                                                      |                                                                                                                                      |                                                                                                             |
|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| mounting the controller in position<br>routing the cables<br>fitting earthing bars<br>wiring the I/O | fitting input/output modules<br>setting the address and baud rate<br>positioning input/output links<br>connecting the input channels | connecting the output channels<br>connecting to network<br>connecting to the power supply<br>commissioning. |
|------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|

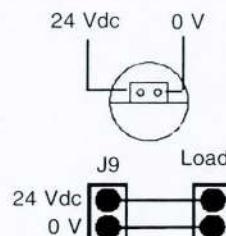
The installation procedure is covered in the IQ251 Installation Instructions (TG102316).

## CONNECTIONS

### Inputs (EIN module)

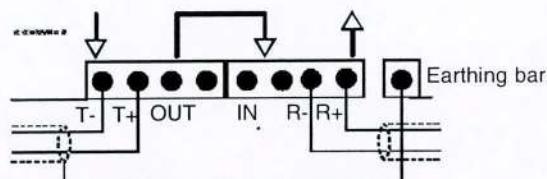
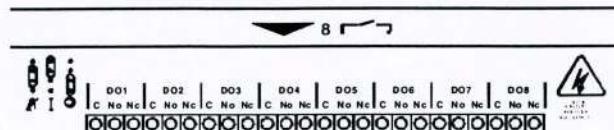


### 24 Vdc auxiliary supply

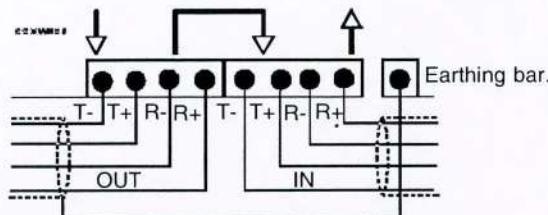


**CONNECTIONS** (Continued)**Outputs (EAO module)****Network**

Using two wire method

**Outputs (EDO module)**

Using four wire method

**FIELD MAINTENANCE**

The IQ251 Controller requires virtually no routine maintenance, however it is recommended that the lithium battery be replaced every 5 years, as explained in the Installation Instructions (TG102316).

**ORDER CODES**

IQ251/[Display]/[Node]/[I/O Modules]/230

| [Display] | [Node]                          | [I/O Modules]                                                 |
|-----------|---------------------------------|---------------------------------------------------------------|
| blank     | IQ251 with no display           | blank EIN 8 analogue + 8 digital inputs                       |
| ENDP      | IQ251 with NDP on front cover   | MNC Node including Trend MODEM EAO 8 analogue voltage outputs |
|           | ANC Node for proprietary MODEM  | EDO 8 digital outputs                                         |
|           | CNC Node for Trend network      |                                                               |
|           | PNC Node for remote printer     |                                                               |
|           | INC Node for Trend Internetwork | Only specify the modules required (Max 8 I/O modules)         |
|           | AND Node for ISDN               |                                                               |
|           | XN28 Node for PSDN              |                                                               |
|           | XNC Node for user configuration |                                                               |

e.g. IQ251MNC/4EIN/3EDO/230 Specifies an IQ251 with integral MNC, 4 input modules, and 3 digital output modules with 230Vac supply (220 to 240 V).

If required a kit for fitting an additional node in the IQ251 can be purchased.

KIT/[Node]/[IQ251]

| [Node]                          |
|---------------------------------|
| MNC Node including Trend MODEM  |
| ANC Node for proprietary MODEM  |
| CNC Node for Trend network      |
| PNC Node for remote printer     |
| INC Node for Trend Internetwork |
| AND Node for ISDN               |
| XN28 Node for PSDN              |
| XNC Node for user configuration |

Enclosures for the IQ251 can be ordered separately:

- ENCLS 600 mm x 600 mm x 210 mm IP55 enclosure for IQ251.  
 ENCLS/NDP 600 mm x 600 mm x 210 mm IP55 enclosure for IQ251 with NDP in front of enclosure.

KIT/ENDP/251 Kit for fitting an internal NDP to the IQ251.

## SPECIFICATIONS

### CONTROLLER

#### Electrical

|                             |                                                                                                                                      |
|-----------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| CPU                         | :68EC020 32 bit processor                                                                                                            |
| CPU speed                   | :16.67 MHz                                                                                                                           |
| Cycle time                  | :1 s                                                                                                                                 |
| Memory                      | :512 kbyte battery-backed SRAM, and 512 kbyte flash.                                                                                 |
| Supply voltage              | :230 Vac -15 + 10 %, 50 to 60 Hz                                                                                                     |
| Auxiliary supply            | :24Vdc, 500 mA dependent on configuration (see page 4 for further details).                                                          |
| Consumption                 | :100 VA max                                                                                                                          |
| Battery backup              | :Battery maintains time, and logged data with mains off for at least 5 years.                                                        |
| Battery                     | :Saft LM2450, 3 V, or equivalent                                                                                                     |
| Clock accuracy              | :30 s per month (typical).                                                                                                           |
| Network                     | :20 mA serial 2 wire current loop, opto isolated, polarity independent receiver.                                                     |
| Network display panel       | :Icon driven display panel with backlit display, for use on single or multi Lan systems. Can be mounted in front cover, or remotely. |
| Distance supervisor network | :15 m<br>:Dependent on cable type, see table below.                                                                                  |

| Cable       | 1k2 baud | 9k6 baud | 19k2 baud | No. of Wires |
|-------------|----------|----------|-----------|--------------|
| Belden 9182 | 1000 m   | 1000 m   | 700 m     | 2            |
| 9207        | 1000 m   | 1000 m   | 500 m     | 2            |
| 8761        | 1000 m   | 700 m    | 350 m     | 2            |
| 8723        | 1000 m   | 500 m    | 250 m     | 4            |

|                              |                                                                         |
|------------------------------|-------------------------------------------------------------------------|
| Baud rate network            | :Selectable by switch 1k2, 9k6, or 19k2.                                |
| NDP supervisor               | :9k6.                                                                   |
| Network addresses controller | :9k6.                                                                   |
| NDP                          | :Selectable by switch, 116 nodes addressable (1,4 to 119 excluding 10). |
| supervisor                   | :Software selectable, 116 nodes addressable (1,4 to 119 excluding 10)   |
| Input modules                | :Software selectable, 116 nodes addressable (1,4 to 119 excluding 10)   |
| Output modules               | :Up to 4 modules.                                                       |

#### Mechanical

|             |                                                                                            |
|-------------|--------------------------------------------------------------------------------------------|
| Dimensions  | :550 mm x 440 mm x 175 mm                                                                  |
| Material    |                                                                                            |
| Chassis     | :Zinc plated and passivated mild steel                                                     |
| I/O modules | :Extruded aluminium with alchrom finish.                                                   |
| Cover       | :Fire retardant moulded ABS.                                                               |
| Protection  | :IP20                                                                                      |
| Weight      | :14.5 kg (fully loaded)                                                                    |
| Connector   |                                                                                            |
| I/O modules | :2 part connector, 50 mm half pitch                                                        |
| power       | :IEC plug                                                                                  |
| network     | :2 part connector screw terminals for 0.5 to 2.5 mm <sup>2</sup> cross section area cable. |
| supervisor  | :RJ11 (FCC68), 6 pin, for Trend utility software connected via adaptor cable PART/10/1442. |
| NDP         | :3 pin in line to 9 way D type connector cable.                                            |

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#### Environmental

|                |                              |
|----------------|------------------------------|
| EMC            |                              |
| emissions      | :EN50081-1.                  |
| immunity       | :prEN50082-2.                |
| Safety         | :EN61010.                    |
| Ambient limits |                              |
| storage        | : -10 °C to 50 °C            |
| operating      | : 0 °C to 45 °C              |
| humidity       | : 0 to 95 %RH non-condensing |

#### Indicator Lamps

|     |                                                         |
|-----|---------------------------------------------------------|
| PWR | :ON when power supply is connected.                     |
| WD  | :ON if controller has a software fault.                 |
| I/O | :Flashing during normal operation.                      |
| LAN | :ON if network is operating.                            |
| TX  | :ON if current is flowing from the network transmitter. |
| RX  | :ON if current is entering the network receiver.        |

#### I/O MODULES

|                           |                                                                                                                                   |
|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------|
| Dimensions                | :72 mm x 202 mm x 43 mm                                                                                                           |
| Weight                    | :0.3 kg approx.                                                                                                                   |
| Connector                 |                                                                                                                                   |
| Main board inputs/Outputs | :2 part connector, 50 mm half pitch<br>:2 part connector screw terminals for 0.5 to 2.5 mm <sup>2</sup> cross section area cable. |

#### 8 analogue, 8 Digital Input Module (/EIN/)

|                 |                                                                                                                                                                                                                                                              |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Analogue inputs | :12 bit resolution (4096 steps). Minimum 60 dB series mode rejection at supply frequency. Linkable for analogue current (I), analogue voltage (V), or thermistor (T)<br>:0 to 10 V input resistance 200 kΩ, accuracy 50 mV equivalent to ±0.5% of span.<br>V |
| I               | :0 to 20 mA input resistance 250 Ω 0.1%, accuracy 0.5 % of span (i.e. 100 μA)                                                                                                                                                                                |
| T               | :Thermistor, bridge resistor 10 kΩ 0.1%, accuracy 0.5 % of span. Bridge supply 5V.                                                                                                                                                                           |
| Digital inputs  | :Internally, or self powered volt free contact. Wetting current 5 mA @ 24 Vdc, count rate 32 Hz max.                                                                                                                                                         |
| Status LED      | :One per digital input. ON if input is closed                                                                                                                                                                                                                |

#### 8 Analogue Output Module (/EAO/)

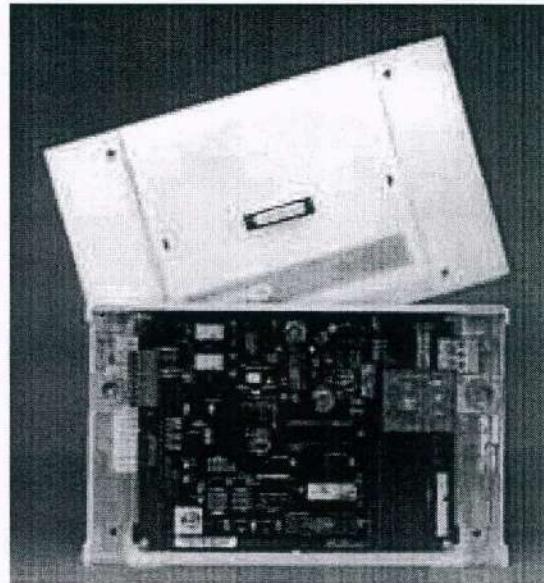
|                  |                                                                                                              |
|------------------|--------------------------------------------------------------------------------------------------------------|
| Analogue outputs | :8 bit resolution (256 steps). 0 to 10 V with 20 mA current limit, accuracy ±50mV equivalent to ±0.5 % span. |
| Status LED       | :1 per channel. Light intensity increases with output voltage.                                               |

#### 8 Digital Output Module (/EDO/)

|                 |                                                                                                    |
|-----------------|----------------------------------------------------------------------------------------------------|
| Digital outputs | :Single pole change over relay, contacts rated at 10 A resistive, 2 A inductive (28 Vdc, 240 Vac). |
| Status LED      | :1 per channel. ON when relay is energised.                                                        |
| Manual override | :Each channel is linkable for ON, OFF, or AUTO.                                                    |

# CNC Communications Node Controller

## COMMUNICATIONS NODE CONTROLLER



### Description

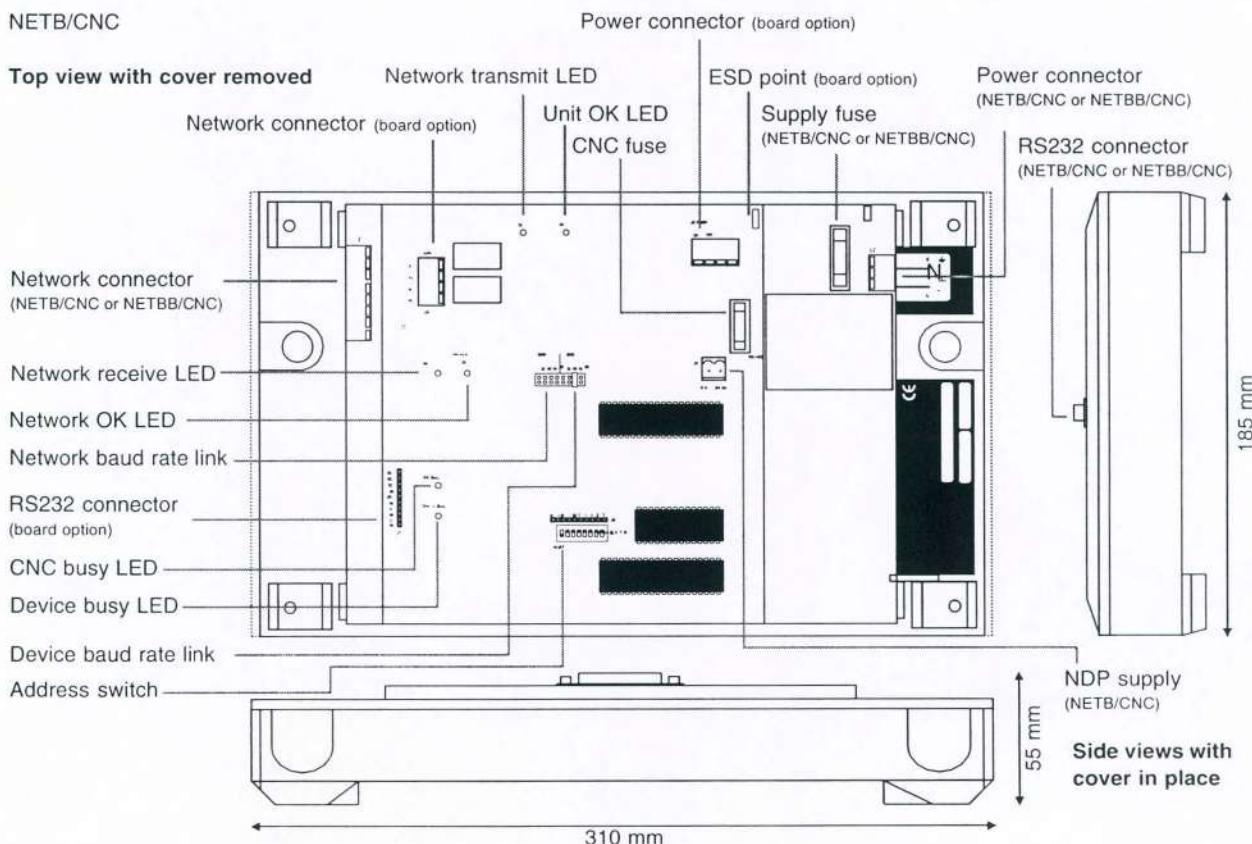
The Communications Node Controller (CNC) interfaces between Trend devices and the Trend network. It is available in a IP40 enclosure (with or without battery backup) or can be supplied without an enclosure for mounting inside Trend devices, e.g. an IQ controller.

### Features

- Automatic network test.
- 116 node addressable.
- Compatibly with earlier CNC networks and 1k2 baud operation.

### Physical

#### NETB/CNC



## FUNCTIONALITY

The CNC interfaces between a Trend device and the Trend network via an RS232 link, it also provides certain network maintenance operations. The CNC continually monitors the network, if it receives data that is addressed to a different node it passes it on around the network via its transmit port. It will transmit data to the device it is connecting to the network, via the device port, if data arrives at its receive port with the same address as its own. When data arrives from the device, via the device port, it transmits the data onto the network via the transmit port.

The CNC also help to maintain a high level of network integrity by performing continuous checking of network cables, and nodes. Alarm messages are generated whenever a problem occurs.

## HARDWARE

**Enclosures:** The CNC can be provided either in an enclosure or as a board for mounting in Trend devices.

There are two enclosure options one with battery backup (NETBB/CNC), and one without (NETB/CNC). The enclosures are made from Borg Warner Cycolac KGBE plastic, and provide IP40 protection for the board inside. The NETB/CNC option also provides the facility of 4 wire networking. The board option enables a CNC to be mounted inside certain Trend devices.

**Battery Backup (NETBB/CNC only):** In the event of a power failure the battery will provide power for the CNC for up to 5 minutes provided it is fully charged.

**Fusing:** The NETB/CNC, and NETBB/CNC options have a 50 mA fuse protecting the power supply, and a 500 mA fuse protecting the CNC. The board option has a 500 mA fuse.

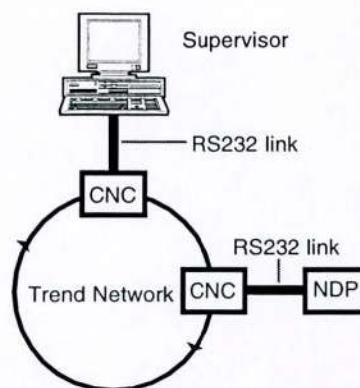
**Cable management:** The NETB/CNC, and NETBB/CNC have 6 cable entry holes, 2 in the top, 2 in the bottom, and 2 at the back.



**Connectors:** Two part connectors are used to facilitate wiring.

**Network bypass relay:** In order that the network continues to operate if the CNC fails, a node bypass relay is fitted to maintain network integrity in the event failure of the node's power supply, or failure of the node itself. The bypassing of a node will be recognised by the downstream node, and reported as a Lan changed alarm.

**Network:** The network connectors generally facilitate connection of 2 wire cables, except the NETB/CNC which also facilitates 4 wire connection. The address and baud rate are selected by switches.



**Power:** The NETB/CNC, and NETBB/CNC options require a 230 Vac power supply. The CNC board requires 24 Vdc for correct operation. It also accepts 18-0-18 Vac ±15 % (transformer centre tapped) 50 or 60 Hz 6 VA, or 18 Vac ±15 % (transformer isolated) 50 or 60 Hz 6 VA.

**Indicators:** The CNC has six LED indicators, however these are not visible during normal operation if mounted in a NETB, NETBB, or IQ controller.

|             |                                                                                                                                                                                                                                           |
|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TX          | When ON, the transmit network is connected correctly. The illumination may be disturbed by messages on the network. If OFF, the transmit connection to the next node maybe broken.                                                        |
| RX          | When ON, the receive network is connected correctly. The illumination may be disturbed by messages on the network. If OFF, the receive connection from the previous node maybe broken.                                                    |
| Network OK  | When ON, the network is operating correctly (i.e. the CNC is able to send and receive messages). When OFF, it indicates that a LAN broken, or fault condition exists. If it is flashing the address set on the address switch is invalid. |
| OK          | When ON, the CNC self check is correct. If OFF, a fault exists, and the network bypass relay will operate.                                                                                                                                |
| Device Busy | When ON, the device that the CNC is connecting to the network is unable to receive data. It will normally light for short periods due to messages on the network.                                                                         |
| CNC Busy    | When ON, the CNC is unable to receive data. It will normally light for short periods due to messages on the network.                                                                                                                      |

## INSTALLATION

The CNC installation involves the following procedure:

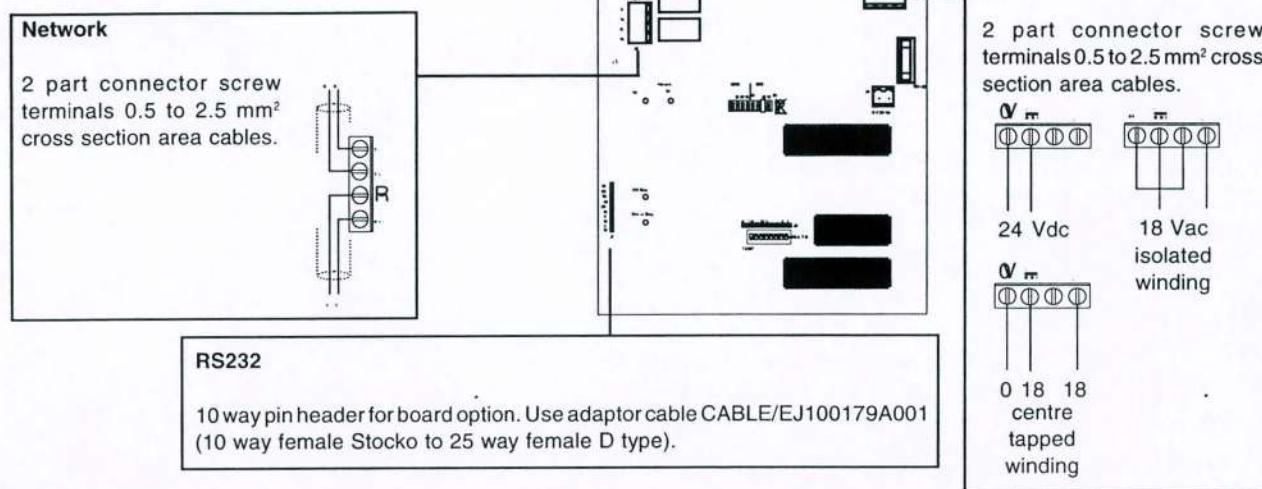
- Fix the unit in position
- Route cables
- Connect the network
- Set network address

- Set network baud rate
- Connect power supply
- Connect to device
- Test

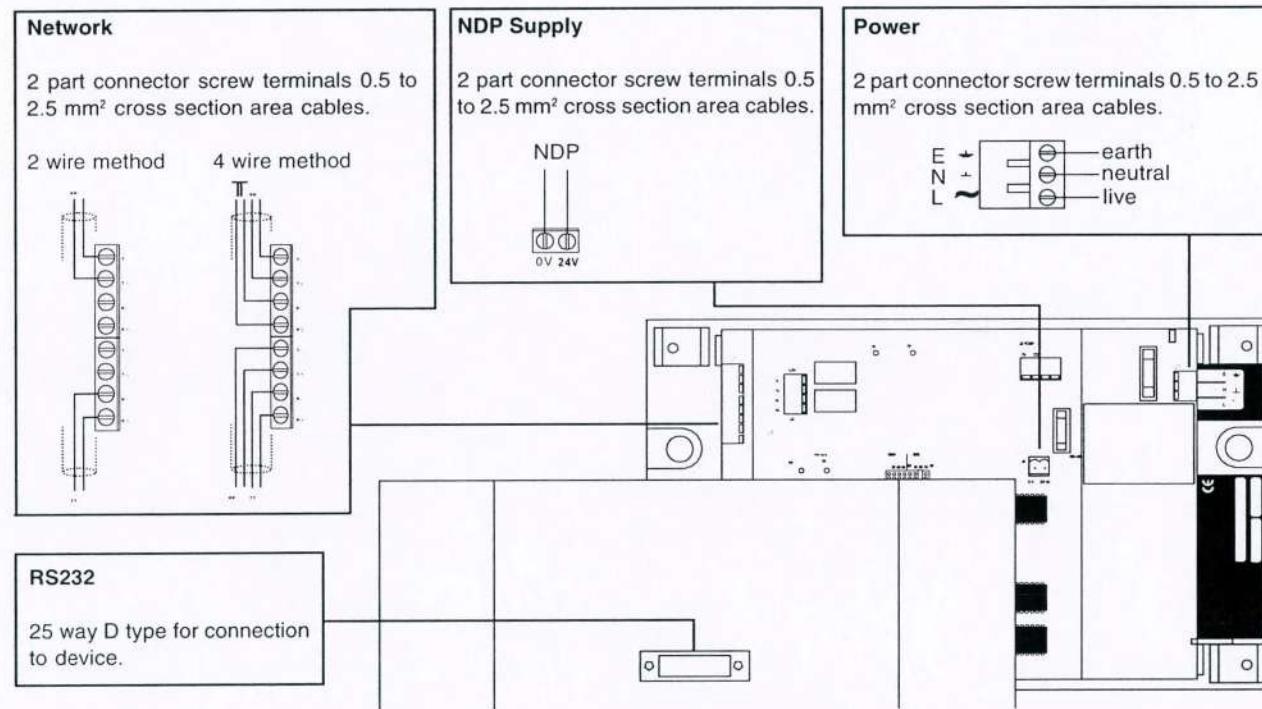
A full description of installing the NETB/CNC, or NETBB/CNC is provided in the NETB/CNC or NETBB/CNC Installation Instructions - Fixing, which provides information about mounting the unit in position (TG200004). Instructions for installing a CNC board only are provided in the CNC Installation Instructions - Fixing (TG200006) which provides information about mounting the unit in position. Information about commissioning, and maintaining the product is provided in the NETB/CNC or NETBB/CNC Installation Instructions - Configuring (TG200005) or CNC Installation Instructions - Configuring (TG200007).

## CONNECTIONS

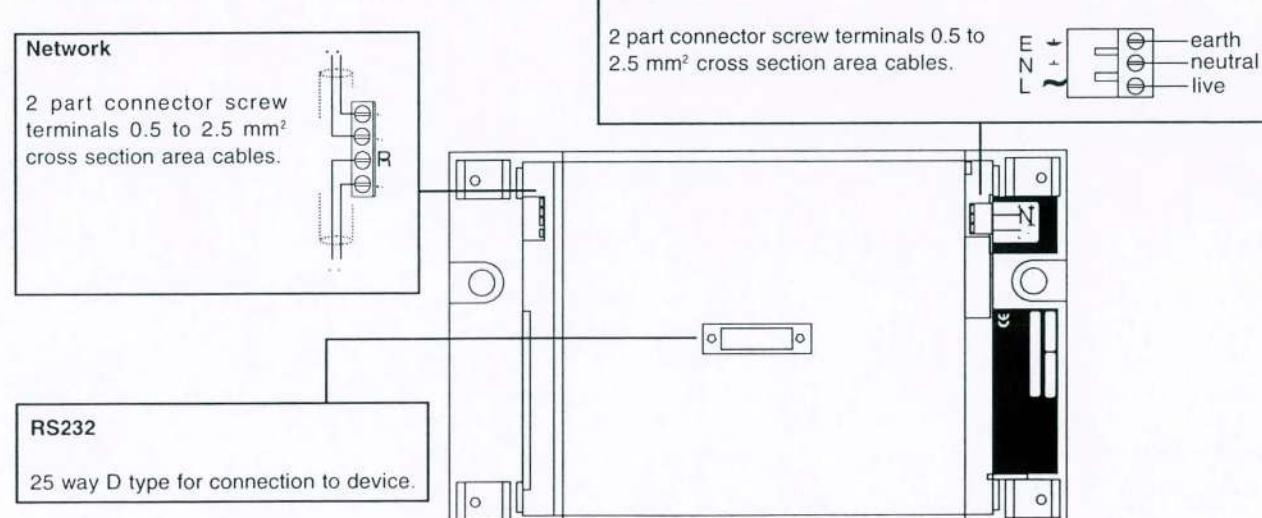
## Board



## NETB/CNC



## NETBB/CNC



## ORDER CODES

|                                                                                                     |                                                                                                                                                                                                 |                         |                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CNC                                                                                                 | Board only ( <i>Note: must purchase node fixing kit e.g. KIT/NODE/IQ25x, if the CNC is to be mounted inside a controller.</i> )                                                                 | <b>Node fixing kits</b> |                                                                                                                                                               |
| NETB/CNC/230                                                                                        | CNC in a NETB enclosure.                                                                                                                                                                        | KIT/NODE/IQ25x          | Fixings required to mount a CNC inside an IQ250 or IQ251 controller.                                                                                          |
| NETBB/CNC/230                                                                                       | CNC in a NETBB enclosure.                                                                                                                                                                       | KIT/NODE/24x            | Fixings required to mount a CNC inside an IQ241 controller.                                                                                                   |
| BUN/NDP/CNC                                                                                         | CNC, NDP, and leads for connection to an IQ controller ( <i>Note: must purchase node fixing kit e.g. KIT/NODE/IQ25x, if the CNC is to be mounted inside a controller or a NETB, or NETBB.</i> ) | KIT/CNC/[IQtype]        | Fixings required to mount a CNC inside the specified IQ type.                                                                                                 |
| CABLE/EJ100179A001 10 way female Stocko to 25 way female D type for connecting CNC board to device. |                                                                                                                                                                                                 |                         | Certain IQ controllers may be ordered with a CNC board already mounted inside; for details of these order codes, see the appropriate controller's data sheet. |

## SPECIFICATIONS

## Electrical

|                              |                                                                                                    |
|------------------------------|----------------------------------------------------------------------------------------------------|
| Supply Board                 | :24 Vdc ±15 % at 250 mA, or 18-0-18 Vac ±15 % (transformer centre tapped)                          |
|                              | 50 or 60 Hz 6 VA, or 18 Vac ±15 % (transformer isolated) 50 or 60 Hz 6VA. (board must be earthed). |
| NETB/ or NETBB/ Fusing Board | :230 Vac ±10%, 50 or 60 Hz, 6 VA.                                                                  |
| NETB/ or NETBB/              | :500 mA T type slow blow.                                                                          |
|                              | :50 mA T type slow blow protecting power supply, and 500 mA T type slow blow protecting CNC.       |
| NDP supply (NETB/ only)      | :24 Vdc at 40 mA.                                                                                  |
| Battery backup (NETBB/ only) |                                                                                                    |
| Hold up time                 | :5 minutes typical                                                                                 |
| Discharge cycles             | :15 minimum.                                                                                       |
| Charge time                  | :7 days maximum.                                                                                   |
| Network                      | :20 mA two wire current loop, opto-isolated polarity independent, receiver, bipolar transmitter    |
| RS232 Distance               | :EIA RS232                                                                                         |
| RS232 (device)               | :15m max.                                                                                          |
| Network                      | :Between units dependent on cable type (see table).                                                |

| Cable       | 1k2 baud | 4k8 baud | 9k6 baud | 19k2 baud | No. of Wires |
|-------------|----------|----------|----------|-----------|--------------|
| Belden 9182 | 1000 m   | 1000 m   | 1000 m   | 700 m     | 2            |
| 9207        | 1000 m   | 1000 m   | 1000 m   | 500 m     | 2            |
| 8761        | 1000 m   | 1000 m   | 700 m    | 350 m     | 2            |
| 8723        | 1000 m   | 1000 m   | 500 m    | 250 m     | 4            |

|                   |                                                                                                         |
|-------------------|---------------------------------------------------------------------------------------------------------|
| Baud rate Device  | :Selectable by links 1k2, 4k8, 9k6, 19k2 baud.                                                          |
| Network           | :Selectable by links 1k2, 4k8, 9k6, 19k2 baud.                                                          |
| Network addresses | :Selectable by board switches 116 nodes addressable (1 to 119, excluded addresses 2,3, and 10) per Lan. |

## Mechanical

|                         |                                                                                         |
|-------------------------|-----------------------------------------------------------------------------------------|
| Dimensions              |                                                                                         |
| Board                   | :175 x 160 x 35 mm (typical)                                                            |
| NETB/ or NETBB/         | :310 x 185 x 55 mm                                                                      |
| Enclosure Material      |                                                                                         |
| NETB/ or NETBB/         | :Borg Warner Cycloc KGEB or equivalent                                                  |
| Protection              |                                                                                         |
| NETB/ or NETBB/         | :IP40                                                                                   |
| Weight                  |                                                                                         |
| Board                   | :0.4 kg                                                                                 |
| NETB/ or NETBB/         | :1.5 kg                                                                                 |
| Connectors              |                                                                                         |
| Power                   | :2 part connector screw terminals 0.5 to 2.5 mm <sup>2</sup> cross section area cables. |
| Network                 | :2 part connector screw terminals 0.5 to 2.5 mm <sup>2</sup> cross section area cables. |
| RS232                   | :10 way pin header for board option, and 25 way D type for NETB/ or NETBB/.             |
| NDP supply (NETB/ only) | :2 part connector screw terminals 0.5 to 2.5 mm <sup>2</sup> cross section area cables. |

## Environmental

|                   |                             |
|-------------------|-----------------------------|
| EMC Emissions     | :EN50081-1                  |
| EMC immunity      | :EN50082-2                  |
| Electrical Safety | :EN61010                    |
| Ambient limits    |                             |
| Storage           | :-10 °C to 50 °C            |
| Operating         | :0 °C to 45 °C              |
| Humidity          | :0 to 95 %RH non-condensing |

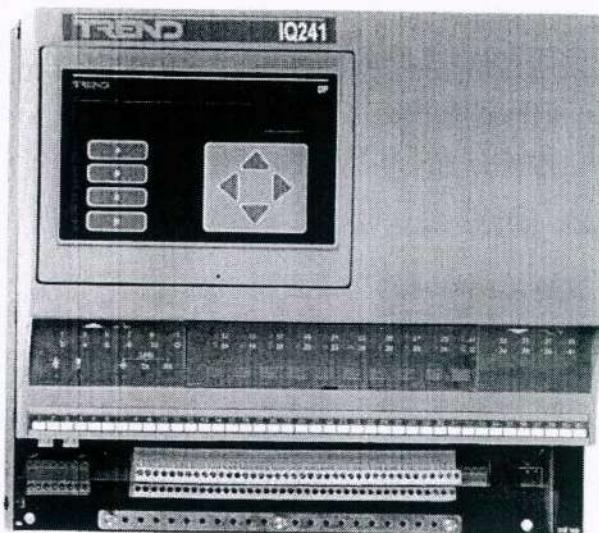
## Indicators

|             |                                                                                   |
|-------------|-----------------------------------------------------------------------------------|
| TX          | :ON if current is flowing from the network transmitter.                           |
| RX          | :ON if current is entering the network receiver.                                  |
| Network OK  | :ON if data can go round the network, flashes if a forbidden address is selected. |
| OK          | :ON if the self test is passed.                                                   |
| Device Busy | :ON if the device is not ready to receive data.                                   |
| CNC Busy    | :ON if the CNC has a message for the device.                                      |

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## IQ24x SERIES CONTROLLERS



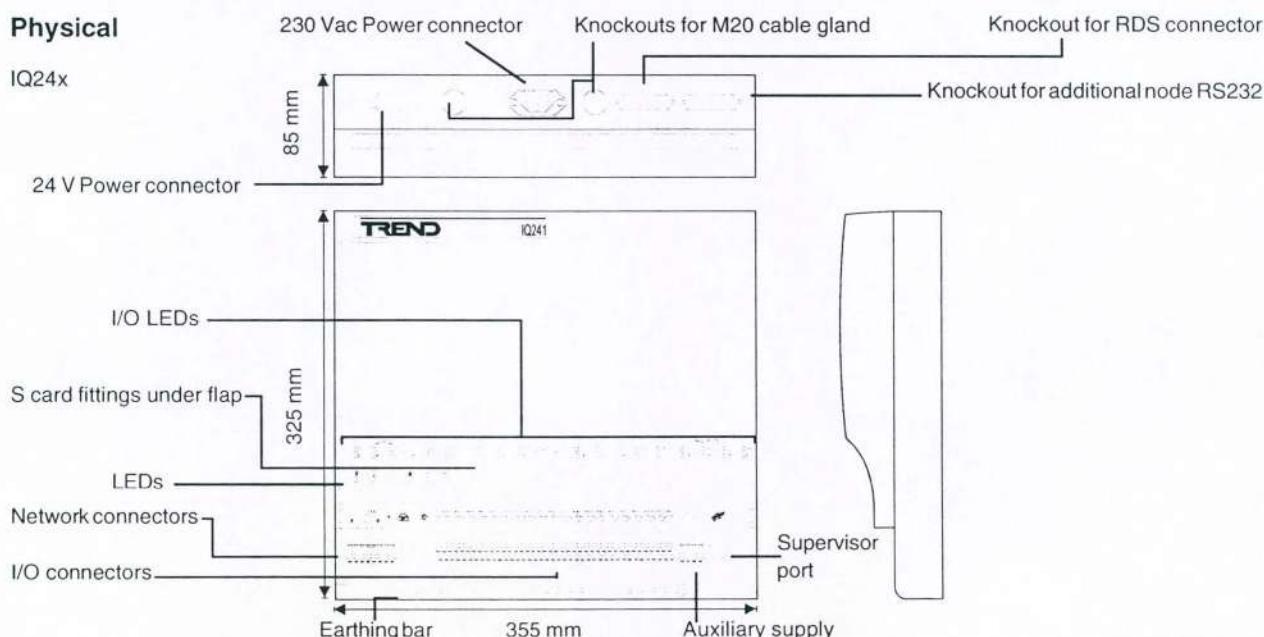
### Description

The IQ24x series controllers are of medium capacity designed for the control of all types of building plant. They can provide a minimum of 12 digital inputs, and 8 analogue voltage outputs. A further 20 I/O points can be made available by using up to 10 S cards, each providing 2 inputs or outputs of the same type (8 input only, 12 input or output). The IQ242 has 8 thermistor inputs pre-fitted via 4 S cards. S cards can provide analogue current, analogue voltage, thermistor, or digital inputs, or analogue voltage outputs giving the IQ24x sufficient capability for more complex strategies. It can operate either as a stand alone device or as part of a Building Management System. If required a Network Display Panel can be mounted on the front cover, or externally, using a node controller built into the IQ24x. A standard Display Panel can also be mounted on the front cover, or externally. The IQ24x also has the facility to connect any Trend supervisor or Engineering Tool to the network without a separate node controller.

### Features

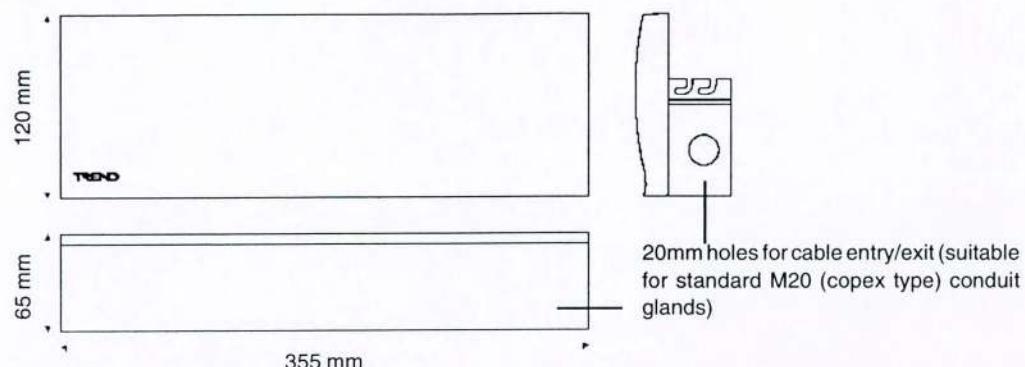
- 1 second cycle time.
- Optional integral/external Network Display Panel.
- Optional integral/external Display Panel.
- Access to entire network via local supervisor connection.
- Facility for mounting an additional node controller.
- High capacity DDC with PID control loops.
- Stand alone or integrated system operation.
- 12 digital inputs.
- 8 analogue voltage outputs.
- 10 slots for S cards (20 I/O points) (IQ242 has 4 cards pre-fitted)
- Optional cable management system.
- Optional relay extension system.

### Physical

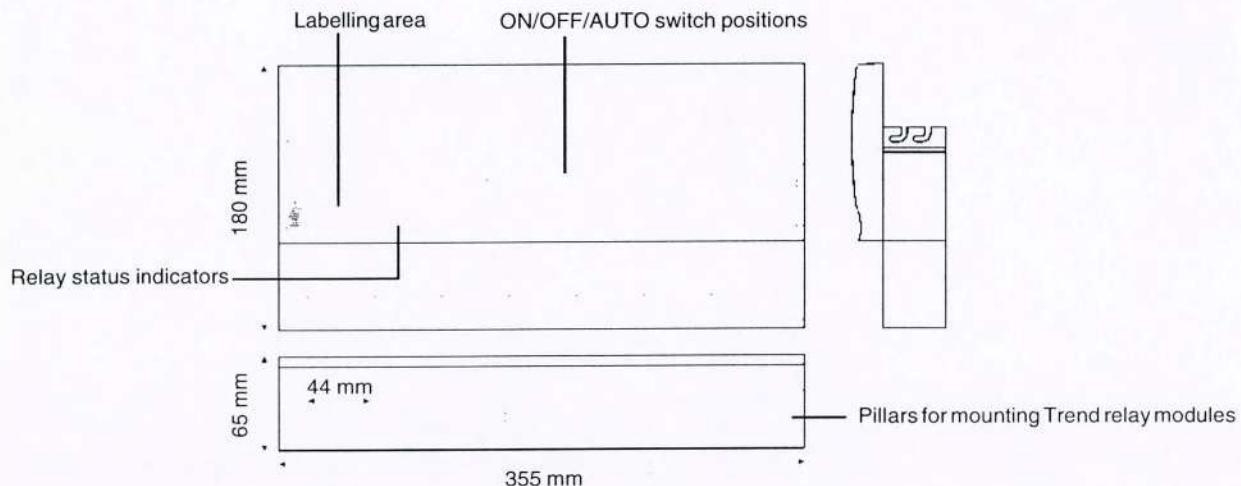


**PHYSICAL** (Continued)

## Cable Management System



## Relay Management System

**FUNCTIONALITY**

The IQ24x Controller's functionality can be divided into two sections, the strategy, and the hardware.

**STRATEGY**

The strategy processes inputs according to a set of instructions and then outputs signals which can be used to control plant.

**Communications:** When operating as part of a Building Management System, the IQ24x will be connected to other devices via the Trend Network. This means that information within the IQ24x can be accessed using one of the Trend supervisor programs, or passed to other Trend IQ controllers using inter-controller communications, enabling the sharing of information across the whole system.

When connected to the network the controller can use up to 3 different addresses. One address is for the controller itself, the second and third are optional, and are for the Network Display Panel, and locally connected supervisor. This means that both the Network Display Panel and supervisor have their own network addresses when connected to the network via the controller.

The controller's address is set by a switch on the module, and the addresses for the network display panel, and supervisor are software selectable.

**Configuration:** The IQ24x uses the standard IQ configuration mode which enables configuration via the network, or by direct connection. Alternatively the ACE+ utility can be used to create a strategy data file which can then be downloaded to the controller by the 822+/Toolbox. The 822+/Toolbox version 6 can be used to upload, and download IQF files for backup purposes.

**The Engineer's Journal:** This enables information about changes made to the strategy to be entered. Pressing 'J' while in configuration mode displays existing messages. A new message can be entered by entering the next number (e.g. if there are 3 messages, enter 4,) and then the message. There may be a maximum of 4 messages of up to 60 characters each.

**I/O Summary:** The I/O Summary lists all the I/O channels available including the S Cards that are fitted. Typing 'io' while in configuration mode on the top menu page displays this list.

**STRATEGY** (Continued)

**Modules:** The strategy consists of a number of individual functional blocks known as configuration modules. These blocks can be linked in various combinations to enable plant to be controlled appropriate to the building's requirements. The table lists the different types of configuration modules and the number of each type available with IQ24x. Full details of the modules are given in the IQ Configuration Manual. Differences between the modules covered in the manual and the IQ24x's modules are described below.

*Note that the sequence cycle time is 1 second. This will enable the IQ24x to control faster processes, and respond more rapidly to alarm conditions than IQ1x series controllers.*

| Module Type   | Number | Module Type    | Number |
|---------------|--------|----------------|--------|
| Sensor        | 48     | Critical Alarm | 4      |
| Sensor type   | 12     | Alarm History  | 20     |
| Loop          | 32     | IC Comms       | 16     |
| Function      | 160    | Digital Inputs | 48     |
| Logic         | 160    | Fast Sequence  | 8      |
| Driver        | 32     | Zone           | 5      |
| Knob          | 30     | Schedule       | 32     |
| Switch        | 20     | Calendar       | 20     |
| Sensor log    | 32     | User Password  | 6      |
| Sequence step | 400    | Sequence time  | 1 s    |

**Sensor Types:** The IQ24x is inherently more accurate at thermistor temperature measurement than Series 1 IQ controllers as it measures both the reference voltage and the voltage developed across the thermistor and using a 0.1% bridge resistor then calculates the thermistor resistance. The IQ24x has five sensor types:

|   |                            |   |                           |
|---|----------------------------|---|---------------------------|
| 0 | linear                     | 3 | linearise volts           |
| 1 | log                        | 4 | linearise thermistor ohms |
| 2 | linearise thermistor volts |   |                           |

Type 0, linear, has been changed relative to the IQ151+ (or earlier controllers using  $\pm 5$  V for linear voltage T and B parameters - IQ111, 131, 151) for linear voltage only in that T and B must be set to the values of the variable being sensed which give outputs of +10 V and -10 V respectively.

Type 1, log, is the same as before.

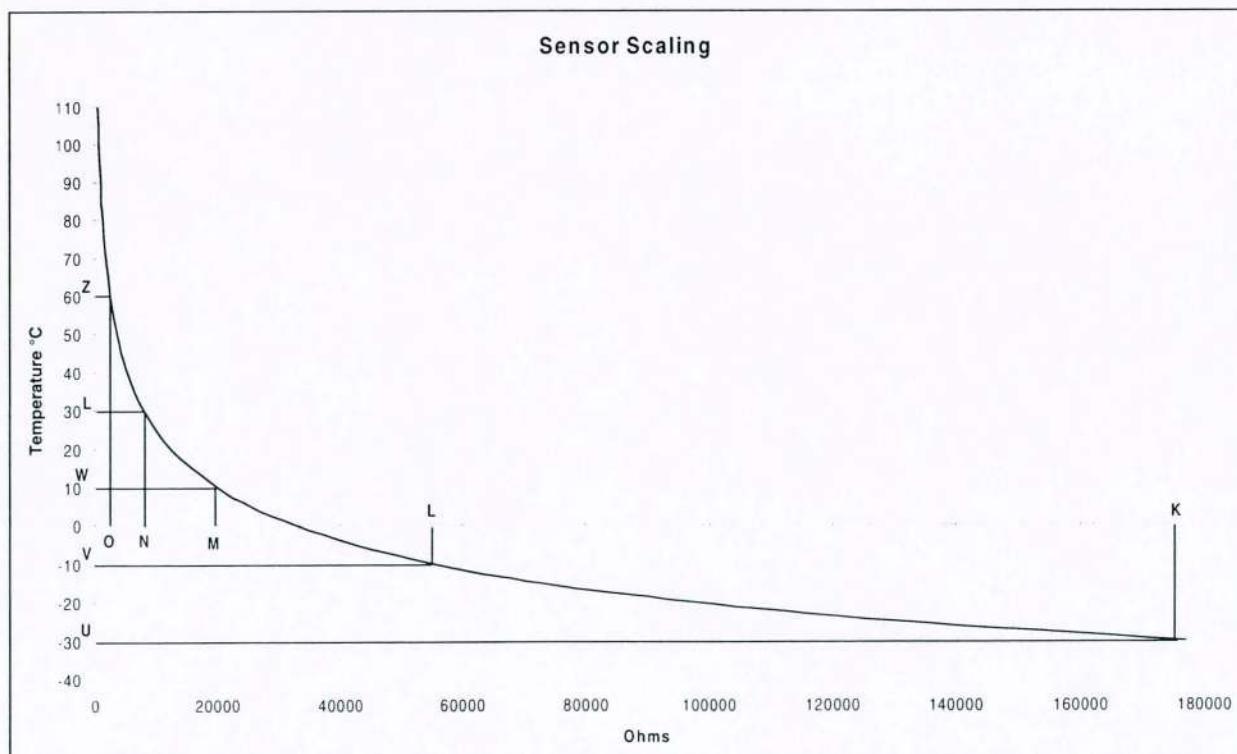
Type 2, linearise, is now 'linearise thermistorvolts', and is reserved for thermistors only.

Type 3, linearise volts, is to be used for voltage or current signals which need to be linearised and is the same format as sensor type 2.

Type 4, linearise thermistor ohms, may be used instead of type 2. It presents a logical method of defining the thermistor linearisation requiring entry of ohms against temperature directly from the sensor characteristic. It enables the linearisation points on the temperature scale to be individually chosen so that they can be closer together over a part of the characteristic where the gradient is changing rapidly, and further apart where the gradient changes only gradually. A sensor type 4 appears in configuration mode as shown.

| Scaling 4 linearise thermistor ohms |      |      |      |      |      |
|-------------------------------------|------|------|------|------|------|
|                                     | U    | V    | W    | Y    | Z    |
| units                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| kohms                               | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
|                                     | K    | L    | M    | N    | O    |

The parameters U, V, W, Y, Z and K, L, M, N, O are obtained from a characteristic graph of the sensor. For example:



**STRATEGY** (Continued)

The graph shows the temperature characteristic for a Trend thermistor sensor. If the sensor is to be used for a temperature range -30 °C to +60 °C, then this defines points U, K and Z, O. The other three points have now to be chosen:

The gradient changes most rapidly over the 'knee' of the characteristic therefore around this area the points should be closer together. The points are found by drawing four straight lines, approximating as closely as possible to the curve. Each of these lines should provide a best fit straight line approximation to that curve segment. The actual point values should be obtained from a table rather than a graph, for greater accuracy. The standard Trend table (see IQ Configuration manual) gives the following points for the -30 °C to +60 °C example.

|   | °C  | kW       |
|---|-----|----------|
| U | -30 | K 177.00 |
| V | -10 | L 55.34  |
| W | 10  | M 19.98  |
| Y | 30  | N 8.06   |
| Z | 60  | O 2.49   |

Table showing recommended sensor type 4 settings for standard temperature ranges of Trend thermistor sensors.

|   |     | -10 °C to 110 °C | -10 °C to 40°C | -40 °C to 50°C | -10 °C to 70°C |
|---|-----|------------------|----------------|----------------|----------------|
| U | °C  | -10              | -10            | -40            | -10            |
| V |     | 2.5              | -5             | -28.5          | 0              |
| W |     | 16.5             | 4.5            | -14            | 12.5           |
| Y |     | 42               | 19             | 8.5            | 33             |
| Z |     | 110              | 40             | 50             | 70             |
| K | k Ω | 54.06            | 55.34          | 328.87         | 54.44          |
| L |     | 28               | 40.5           | 157.9          | 32.49          |
| M |     | 14.06            | 25.26          | 64.35          | 16.93          |
| N |     | 3.9              | 12.63          | 19.18          | 6.38           |
| O |     | 0.51             | 5.32           | 3.6            | 1.75           |

**Address module:** The address module has two extra addresses for the NDP and Supervisor (3 in total).

**sUpervisorportaddr:** This should be set to the network address of the supervisor connected via the IQ24x supervisor port (this could also be an NDP). It can take the normal range of addresses on the network, as long as an address is not duplicated. If set to address zero the supervisor will only communicate with the local IQ24x.

**ndp pOrt addr:** This should be set to the network address of the NDP connected via the NDP port (this could also be a local supervisor). It can take the normal range of addresses on the network, as long as an address is not duplicated. If set to address zero the NDP will only communicate with the local IQ24x.

**Supply frequency option:** There is no supply frequency option on the address page as the problem of mains pick-up is dealt with automatically by the hardware.

**Serial number:** This is factory set to the serial number on the main board. It can be accessed with text comms using 'R(s)' (s must be lower case).

**Loader Issue:** This displays the issue and date of the download kernel that is in the controller. It can be accessed with text comms using 'R(c)' (c must be lower case).

**Identity:** The IQ24x will identify itself (e.g. to the 945 and the NDP) as an 'IQ2xx v1'. This is so that existing versions of these programs can operate with the IQ24x.

If the IQ24x receives an identify message aimed at either the supervisor, or NDP port it will identify the attached device. If there is no device attached then it will identify the port as a CNC.

**Battery Status:** The IQ24x has a battery status checking circuit which will check the battery on power up and thereafter at every midnight and generate a digital bit if the battery voltage has fallen below a threshold value. If the voltage has fallen below this value it will set byte 506 bit 0. This bit being set is an indication that the battery needs to be changed. It should be used within the strategy to generate an alarm (e.g. critical alarm). The battery should be changed after the first indication. The battery will have a typical life of 10 years at 20 °C. This will be derated as the temperature increases with a minimum guaranteed life of about 5 years. It is recommended that the battery is replaced every 5 years.

**Time Resolution:** The faster processor improves the time resolution on various modules. Loop and logic reschedule times now have a resolution of 1 s, and drivers start delay, TP period, and RL drive time have increments of 1 s with a maximum of 32767 s.

**Large numbers:** As a result of certain calculations (e.g. divide by zero), an analogue value may be returned as 'infinity', and similarly, dividing infinity by infinity gives 'NaN' (not a number). Both these values are represented by alpha characters; they never appear in analogue nodes but may appear in certain module parameters (e.g. OSS logs) where they are treated as very large numbers.

**Sensor Log:** The IQ24x has 32 logging channels. Each channel can sample a sensor value at a prescribed interval (period), and store up to 1000 values. After 1000 values have been recorded the oldest value is overwritten. This means that the last 1000 values are always available. Logging is performed at 10 different intervals (1s, 1m, 5m, 10m, 15m, 20m, 30m, 1h, 6h, and 24h). The interval can be specified from any of those listed in the table below.

| Period | Duration         | Period | Duration          |
|--------|------------------|--------|-------------------|
| 1 s    | 16 m 40 s        | 20 m   | 13 days 21 h 20 m |
| 1 m    | 16 h 40 m        | 30 m   | 20 days 20 h      |
| 5 m    | 3 days 11 h 20 m | 1 h    | 41 days 16 h      |
| 10 m   | 6 days 22 h 40 m | 6 h    | 250 days          |
| 15 m   | 10 days 10 h     | 24 h   | 1000 days         |

**I/O Channel reference:** The IQ24x has very flexible I/O which can be configured in a number of ways. The configuration input modules (sensors and digital inputs) and the output modules (drivers) are related to the external channels as shown in the table below. The external channel reference for these modules is displayed in configuration mode.

| Module type           | Module reference                      | External channel |
|-----------------------|---------------------------------------|------------------|
| Sensor-analogue input | S1 to S20                             | 13 to 32         |
| Sensor-digital input  | S1 to S32 (not normally used*)        | 1 to 32          |
| Digital input         | I1 to I32                             | 1 to 32          |
| Driver                | Driver channel 1 to driver channel 20 | 40 to 21         |

The table below specifies the possible modes for each channel.

| Module     | Input Modes                                                         |
|------------|---------------------------------------------------------------------|
| S1 to S20  | analogue input, digital input*, internal analogue, internal digital |
| S21 to S32 | digital input*, internal analogue, internal digital                 |
| S33 to S48 | internal analogue, internal digital                                 |
| I1 to I32  | digital input                                                       |
| I33 to I48 | internal digital                                                    |

Note that as sensors and digital inputs are supported separately on the display panel, and have separate labels, use of sensor modules in digital input mode is not normally required.

## HARDWARE

**Unit:** The IQ24x is supplied in a metal and plastic enclosure which provides IP40 protection for the unit. The controller can be fitted with an optional cable management system or relay extension system.

**Cable management system:** The cable management system comprises of a metal box with 17 off 20 mm metal knockouts (4 rear, 11 bottom, 1 each side). The knockouts can be removed to provide cable entry/exit holes suitable for grommets, or standard M20 (copex type) conduit glands. It fits immediately underneath the controller, or the relay extension system (if fitted) using a simple hooking method preventing accidental contact with the terminals.

**Relay extension system:** The relay extension system provides an easy way to mount Trend relay modules, it also IP40 protection to the relay modules inside. If required more than 1 relay extension system can be fitted. It fits immediately underneath the controller or other relay extension system using a simple hooking method. If the relay extension system is to be fitted the cable management system must also be fitted. The relay extension system consists of a metal tray with mounting pillars for Trend relay modules, and a fire retardant ABS cover, an insulating plate, a paper label for labelling of relays, and switches (if fitted), a sticky label to protect the relay label, 16 light pipes, and a bracket for mounting ON/OFF/AUTO switches. The relay modules clip onto the mounting pillars. The table below illustrates the possible combinations of relay modules that may be mounted using 1 relay extension system.

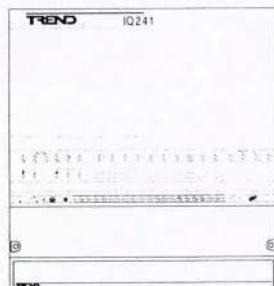
**ON/OFF/AUTO Switches:** Each relay mounted in the relay extension system can be equipped with an ON/OFF/AUTO switch using the ON/OFF/AUTO switch kit that fits onto the bracket supplied with the relay extension system. This kit consists 1 ON/OFF/AUTO switch with cable and connector.

The relays can be linked to the IQ's auxiliary power supply, and signal output using relay connector leads (CABLE/RMT/10, and CABLE/RMT/30). If required other relay extension systems can be mounted underneath the first to provide additional relay mounting space in which case longer relay connector leads are required.

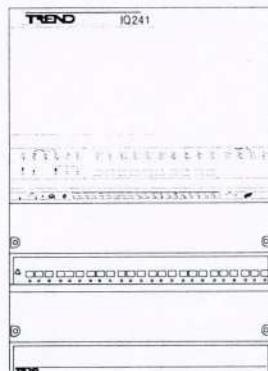
*Note that if the relay extension system is to be fitted the cable management system must also be fitted.*

| Max Number of Relay Module per relay extension system |     |     |
|-------------------------------------------------------|-----|-----|
| 2RM or 2SRM                                           | 3RM | 6RM |
| 8                                                     | 0   | 0   |
| 6                                                     | 1   | 0   |
| 5                                                     | 0   | 1   |
| 4                                                     | 2   | 0   |
| 3                                                     | 1   | 1   |
| 2                                                     | 0   | 2   |
| 0                                                     | 1   | 2   |
| 0                                                     | 4   | 0   |

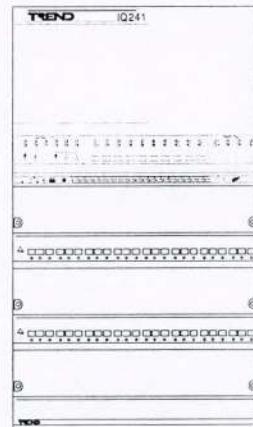
The diagrams below illustrates how up to 3 relay extension system and an cable management system can be fitted to an IQ24x



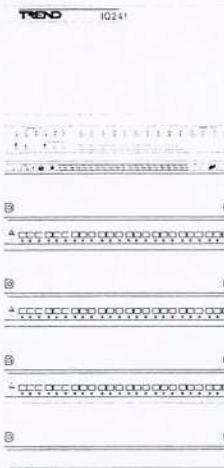
IQ24x  
Cable Management System



IQ24x  
Relay Extension System  
Cable Management System



IQ24x  
Relay Extension System  
Relay Extension System  
Cable Management System



IQ24x  
Relay Extension System  
Relay Extension System  
Relay Extension System  
Cable Management System

**Network:** The network terminals facilitate connection of 4 or 2 wire cables. The address and baud rate (19k2, 9k6, or 1k2) are selected by switches. The standard Trend node features are included (TX RX, and LAN indicators, bypass relay, and network alarm generation). There is also the facility for connection of a Network Display Panel, and/or supervisorto the network via the controller without the need for additional node controllers. A location is also provided for mounting an extra node controller, e.g. MNC, should this be required.

**Connectors:** Two part connectors are used throughout to facilitate wiring. The 230 Vac power supply uses a standard IEC connector.

**Power:** 230 Vac 50/60 Hz, 24 Vac, 24 V supply must be isolated.

**Fusing:** The controller has no fuses; protection is provided by means of a self resetting thermally protected transformer. The I/O modules are also individually protected against short circuits.

**Battery Backup:** Details about the strategy configuration, time and date, and logged data are stored in RAM. A plug-in lithium cell provides power to maintain the data in the event of power failure, or the controller being switched off.

**S Cards:** S Cards enable the IQ configuration of the controller to be set up according to user requirements. Each card provides 2 input/output channels of the same type. The range of S Cards provides analogue current, analogue voltage, thermistor, and digital inputs, or analogue voltage outputs. The IQ24x has space for 10 S Cards providing up to 20 additional I/O channels (8 input only, 12 input or output). The IQ242 has 8 thermistor inputs pre-fitted via 4 S cards.

**HARDWARE** (Continued)

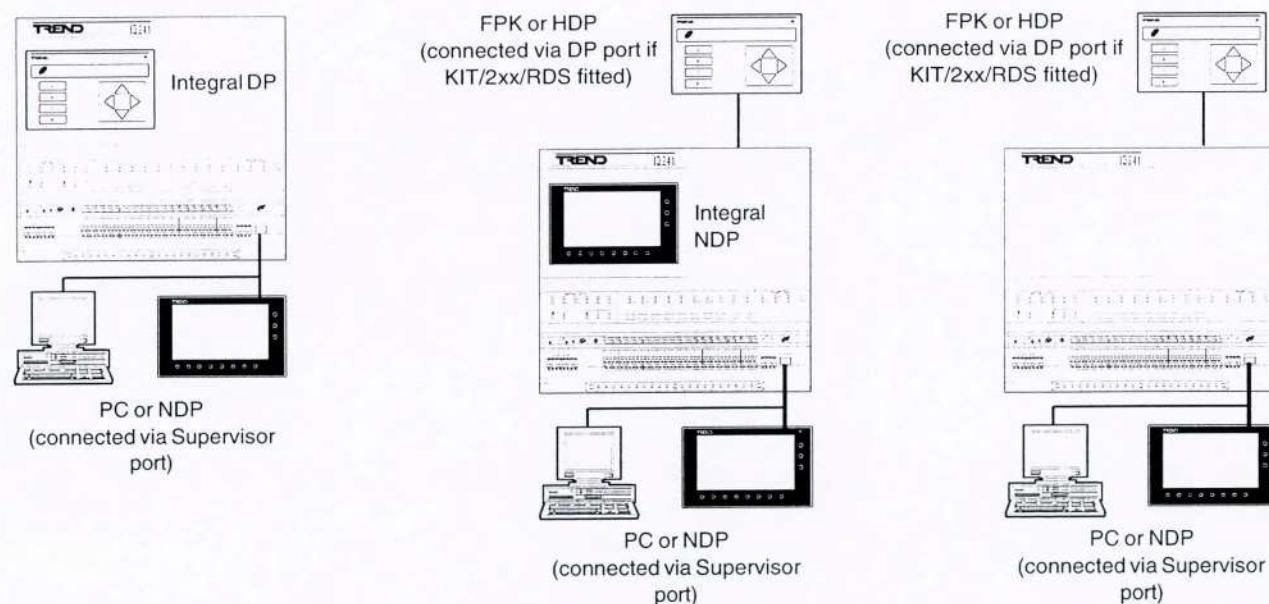
**Auxiliary Supplies:** The IQ24x has two types of auxiliary supplies which share 1000 mA. Both are thermally protected and can supply 24 Vdc at a maximum of 500 mA. The first is a single connector for relay modules, sensors external NDP, external DP etc.

**Displays:** The IQ24x can be fitted with 3 different types of display, a Display Panel, a Network Display Panel, and a PC.

**Display panel:** A display panel can be mounted externally, or in the front cover, to provide access to parameters within the controller. External connection of a display panel requires the KIT/2xx/RDS option to be fitted, this makes it possible to connect standard FPK, or HDP display panels. If mounted in the front cover, the KIT/2xx/RDS option is not required, because the display panel is an IQ2 display panel which does not require the Kit. If a display panel is fitted in the front cover it will not be possible to connect an external display panel or mount an internal Network Display Panel.

**PC:** A computer running a Trend Supervisor or Engineering Tool can be connected to the Trend network via the controller's supervisor port without the need for an additional node controller although it does have its own network address. When connected in this way the supervisor will have access to all devices on the network, and will function as if it were connected via its own node controller. If a supervisor/engineering tool is connected to the controller it is not possible to connect an external NDP.

The diagrams below illustrate the various combinations in which the display panels, network display panels and supervisor/engineering tools can be connected.



**Inputs/Outputs:** The IQ241 and IQ242 both have 12 digital inputs and 8 analogue voltage outputs, in addition the IQ242 has 8 thermistor inputs provided by 4 pre-fitted S cards. The maximum number of additional channels provided via S Cards (2 per S card) is 20 for IQ241 and 12 for IQ242.

| IQ24x | Inputs  |            |                            | Outputs          |                            | Max No. of additional S cards which can be fitted |
|-------|---------|------------|----------------------------|------------------|----------------------------|---------------------------------------------------|
|       | Digital | Thermistor | Additional S card channels | Analogue Voltage | Additional S card channels |                                                   |
| IQ241 | 12      | 0          | 20 (10 S cards)            | 8                | 12 (6 S cards)             | 10                                                |
| IQ242 | 12      | 8          | 12 (6 S cards)             | 8                | 12 (6 S cards)             | 6                                                 |

S cards ( 2 channels per card ) :Analogue current inputs  
Analogue voltage inputs  
Analogue thermistor inputs  
Digital inputs  
Analogue voltage outputs

**COMPATIBILITY**

**Supervisors:** 94x series, 921.  
**Utility software:** 822+/Toolbox version 6, 841 Strategy Browser, 842 Change Tracker, ACE+.  
**Controllers:** It can communicate to other Trend IQ controllers using inter controller communications.

**Strategy files:** A standard uploaded strategy file (.IQF) can be downloaded to an IQ24x (see loop reschedule time below), but an .IQF file uploaded from an IQ24x has a different format to all other controller files. It cannot be downloaded into IQ1 series controllers. If this is attempted, the controller will fail to send 'Load OK'. Because of the IQ24x's flexible I/O the I/O channel reference will be different as described earlier in this data sheet.

**Loop reschedule time:** The strategy file uploaded by the 822+/Toolbox is designated the .IQF file. If an IQxx.IQF is downloaded to the IQ24x, the loop reschedule and integral times are transferred as multiples of the cycle time so that for an IQ151 or IQ151+ they are divided by 15 and for other IQ1xx's they are divided by 5 (for IQ2xx the times are unchanged) e.g. if a file uploaded from an IQ131+ is downloaded to an IQ24x, then loop reschedule and integral times should be multiplied by 5.

**Sensor logs:** Although the IQ24x has 1000 values per logging channel, some Trend display panel and supervisor/tool applications can only accept the first 96 values of logs using 1 minute, 15 minute, 1 hour, and 24 hour time intervals. This is shown in the table below.

|                                                     |                                                                         |
|-----------------------------------------------------|-------------------------------------------------------------------------|
| All 921, 822, 942, 943, NDP, and pre 945 Issue 2.0. | Access first 96 values of 1 minute, 15 minute, 1 hour and 24 hour logs. |
| 945 Issue 2.0.                                      | Access all values from all logs except 1 s.                             |
| NDP 2.20.                                           | Access first 96 values from all logs.                                   |

**Interface:** It can be connected to Trend interface modules. Check interface module specification to ensure compatibility.  
**Local Display:** Network Display Panel, standard Display Panel.

**Sensor types:** For sensor type 0, if the data file has been uploaded from an IQ151+ (or earlier controller using ±5 V for linear voltage T and B parameters) and if the sensor outputs a voltage signal, the T and B values will have to be multiplied by 2 and re-entered by the user.

For sensor type 2, parameters set up in all other IQ controllers will operate correctly in a IQ24x for a thermistor, but if the sensor is current or voltage it will need to have the sensor type changed to 3. When the sensor type is changed, the other parameters (B, T, F, G etc) will stay the same and hence be correct.

Not all Trend display panels, and supervisor/tool applications can set up or change logging channels for the new time bases. This is summarised in the table below.

|                                                |                                                                                                                                                                                                                                       |
|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All 921, 822, 942, 943, and pre 945 Issue 2.0. | Can edit existing channels, and set up new ones using 1 minute, 15 minute, 1 hour, and 24 hour time intervals unless any channel has been set up using 1 second, 5 minute, 10 minute, 20 minute, 30 minute, and 6 hour time interval. |
| 945 Issue 2.0                                  | Can edit existing channels, and set up new ones using all time intervals except 1s.                                                                                                                                                   |

**INSTALLATION**

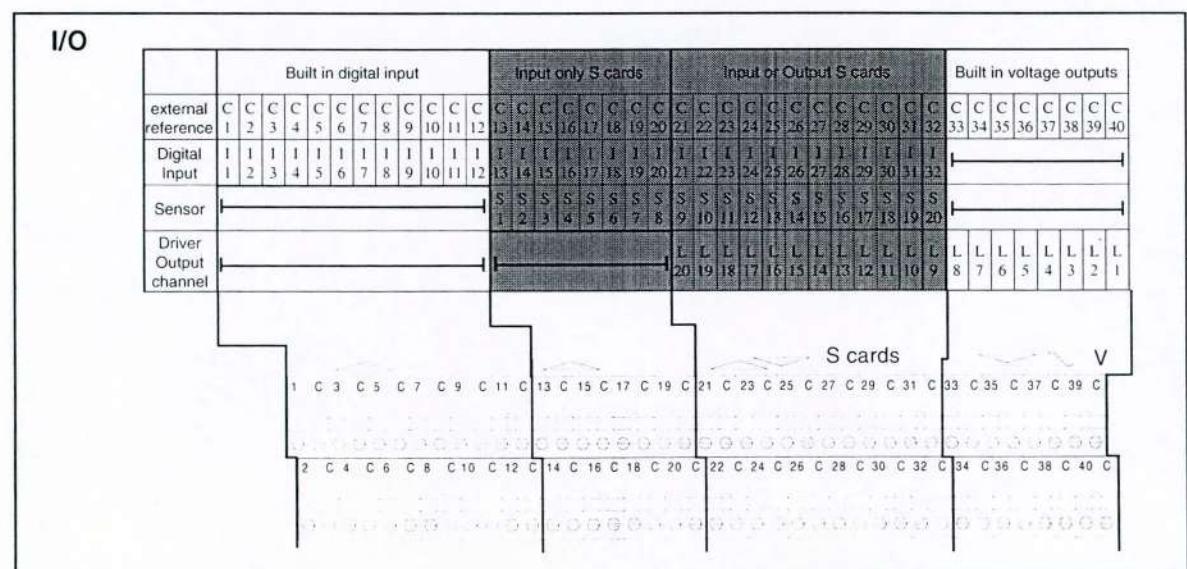
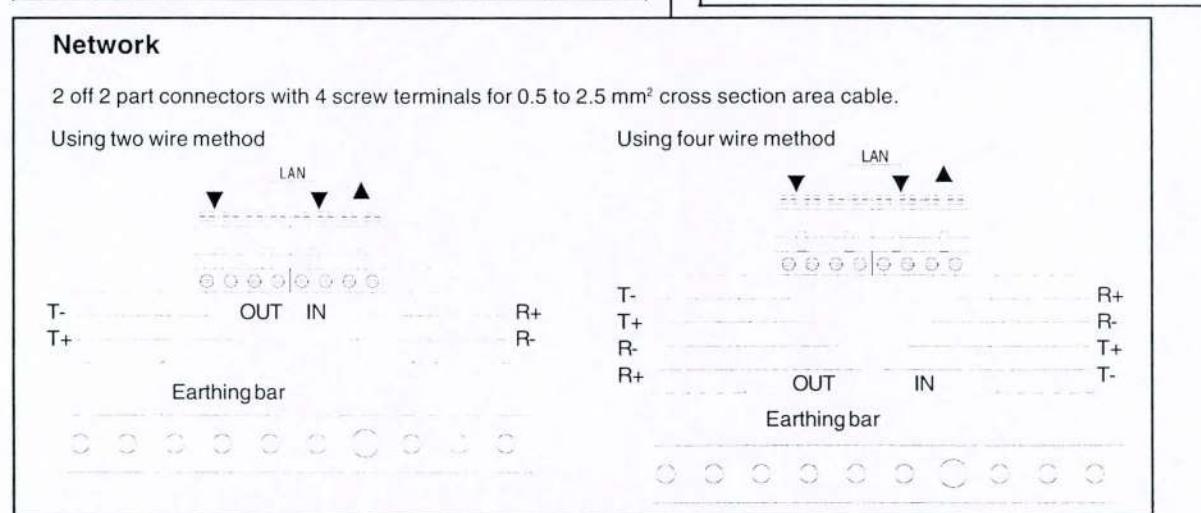
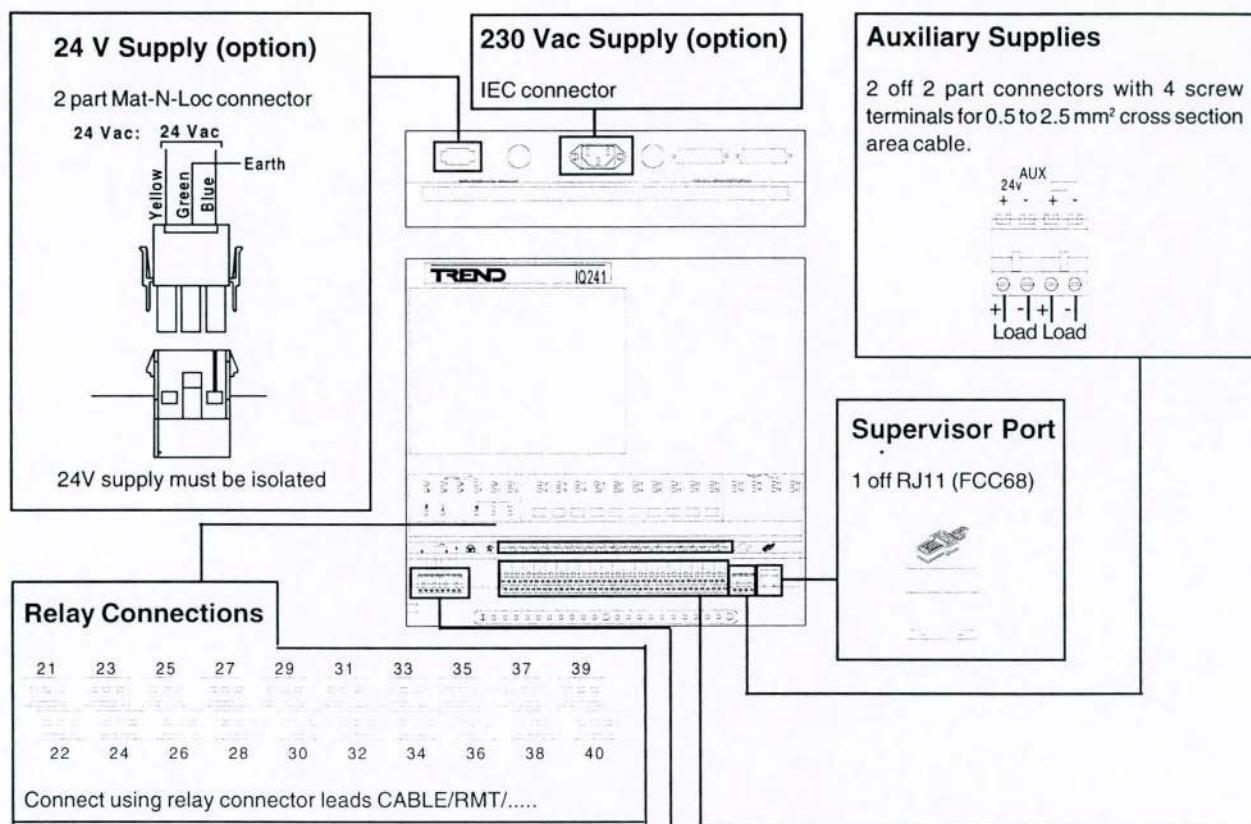
The IQ24x Controller must be installed on a flat surface such as, a wall, or panel, using screws and washers. The procedure involves:

mounting the controller in position  
 routing the cable to the controller  
 connecting the I/O  
 fitting the S cards  
 connecting the auxiliary supply

specifying network address and baud rate  
 connecting to network  
 Powering up  
 configuring the strategy

The installation procedure is covered in the IQ24x Installation Instructions (TG103012). More detailed connection information is shown on the next page.

## CONNECTIONS



## FIELD MAINTENANCE

The IQ24x Controller requires virtually no routine maintenance, however it is recommended that the lithium battery be replaced every 5 years, as explained in the Installation Instructions (TG103012).

## ORDER CODES

**IQ241/[Display]/[Node]/[PSU]** :12 digital inputs, 8 analogue voltage outputs, and 20 configurable channels

**IQ242/[Display]/[Node]/[PSU]** :12 digital inputs, 8 thermistor inputs, 8 analogue voltage outputs, and 12 configurable channels

| [Display] |                                | [Node] |                             | [PSU] |                      |
|-----------|--------------------------------|--------|-----------------------------|-------|----------------------|
| Blank     | No display.                    | blank  | No node                     | 230   | 230 Vac power supply |
| ENDP      | IQ241 with NDP in front cover. | MNC    | Node including Trend MODEM  | 24VAC | 24 Vac power supply  |
| DP        | IQ241 with DP in front cover.  | ANC    | Node for proprietary MODEM  | 24VDC | 24 Vdc power supply  |
|           |                                | CNC    | Node for Trend network      |       |                      |
|           |                                | PNC    | Node for remote printer     |       |                      |
|           |                                | INC    | Node for Trend Internetwork |       |                      |
|           |                                | AND    | Node for ISDN               |       |                      |
|           |                                | XN28   | Node for PSDN               |       |                      |
|           |                                | XNC    | Node for user configuration |       |                      |

e.g. IQ24x/ENDP/MNC/230

Specifies an unboxed IQ24x with integral NDP, integral MNC, and 230 Vac power supply.

S cards IQ241 (10 input cards max, 6 output cards max, 10 cards in total max). IQ242 (6 input cards max, 6 output cards max, 6 cards in total max).

- SCVO 2 Analogue voltage outputs S card.
- SCVI 2 Analogue voltage inputs S card.
- SCCI 2 Current inputs S card.
- SCTI 2 Thermistor inputs S card.
- SCDI 2 Digital inputs S card.

Cable management system

ENCLS/CMtray/241 1 cable management tray and cover (only 1 may be fitted to a single IQ24x).

Relay extension system

- ENCLS/RMtray/241 1 relay management tray, fixing bar, cover, insulating plate, 1 paper label, 1 sticky label, and 16 light pipes.
- CABLE/RMT/10 8 off 10 cm relay connection leads
- CABLE/RMT/30 8 off 30 cm relay connection leads
- 2RM/241 Double relay module for mounting in relay extension system
- 2SRM/241 2 single relay module on a single PCB for mounting in relay extension system
- 3RM/241 Triple relay module for mounting in relay extension system
- 6RM/241 Six relay module for mounting in relay extension system

*Note that if any ENCLS/RMtray/241 option is ordered the ENCLS/CMtray/241 option must also be ordered.*

ON/OFF/AUTO Switch Kit

HOA/241 1 ON/OFF/AUTO switch with cable and connector.

*Note that this option can only be fitted if the relay extension system is being used.*

Retro fit kits

- KIT/ENDP/IQ24x Kit to retrofit Network Display Panel in front cover
- KIT/DP2 Kit to retrofit 2-line Display Panel, HDP, FPK to front cover of IQ22x, 24x, 250
- KIT/2xx/RDS Kit to enable connection of FPK or HDP externally
- KIT/node/IQ24x Kit for fitting additional node

Enclosures

- ENCLS 600 mm x 600 mm x 210 mm IP55 enclosure
- ENCLS/FPK 600 mm x 600 mm x 210 mm IP55 enclosure with FPK on front.
- ENCLS/NDP 600 mm x 600 mm x 210 mm IP55 enclosure with NDP on front.

**SPECIFICATIONS****CONTROLLER****Electrical**

|                       |                                                                                                                                        |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| CPU                   | :68332 32 bit micro controller                                                                                                         |
| CPU speed             | :16.78 MHz                                                                                                                             |
| Cycle time            | :1 s                                                                                                                                   |
| Memory                | :256 kbyte battery backed SRAM, and 256 kbyte Flash.                                                                                   |
| Supply voltage /230   | :230 Vac +15 -10 %, 50 to 60 Hz                                                                                                        |
| /24VAC                | :24 Vac +15 -10 %, 50 to 60 Hz (24Vac supply must be isolated).                                                                        |
| Auxiliary supply      | :24 Vdc, 1000 mA dependent on configuration, see page 5 for further details.                                                           |
| Consumption           | :60 VA max                                                                                                                             |
| Battery backup        | :Battery maintains time, and logged data with mains off for at least 5 years.                                                          |
| Battery               | :Saft LM2450, 3 V, or equivalent                                                                                                       |
| Clock accuracy        | :30 s per month (typical).                                                                                                             |
| Network               | :20 mA serial 2 wire current loop, opto isolated, polarity independent receiver.                                                       |
| Network display panel | :Icon driven display panel with backlit display, for use on single or multi Lan systems. Can be mounted in front cover, or externally. |
| Display panel         | :2x40 character display, with 4 programmable softkeys. Can be mounted in front cover, or externally via display panel connector        |
| Distance              |                                                                                                                                        |
| Supervisor            | :15 m                                                                                                                                  |
| Network               | :Dependent on cable type, see table below.                                                                                             |
| Baud rate             |                                                                                                                                        |

| Cable       | 1k2 baud | 9k6 baud | 19k2 baud | No. of Wires |
|-------------|----------|----------|-----------|--------------|
| Belden 9182 | 1000 m   | 1000 m   | 700 m     | 2            |
| 9207        | 1000 m   | 1000 m   | 500 m     | 2            |
| 8761        | 1000 m   | 700 m    | 350 m     | 2            |
| 8723        | 1000 m   | 500 m    | 250 m     | 4            |

|                   |                                                                         |
|-------------------|-------------------------------------------------------------------------|
| Network           | :Selectable by switch 1k2, 9k6, or 19k2.                                |
| NDP               | :9k6.                                                                   |
| Supervisor        | :9k6.                                                                   |
| Network addresses |                                                                         |
| Controller        | :Selectable by switch, 116 nodes addressable (1,4 to 119 excluding 10). |
| Supervisor port   | :Software selectable, 116 nodes addressable (1,4 to 119 excluding 10).  |
| NDP port          | :Software selectable, 116 nodes addressable (1,4 to 119 excluding 10).  |

|                   |                                                                                                                                                                                                                                 |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I/O               |                                                                                                                                                                                                                                 |
| Channels 1 to 12  | 12 digital inputs. Internally, or self powered volt free contact. Wetting current 4 mA @ 24 Vdc, count rate 32 Hz max. 1 Status LED per channel. ON if input is closed.                                                         |
| Channels 13 to 20 | IQ241: 8 universal inputs, 4 slots to fit Trend analogue voltage input, current input, thermistor input, or digital input S cards.<br>IQ242: 8 thermistor inputs (via 4 slots pre-fitted with S cards).                         |
| Channels 21 to 32 | 12 universal I/O, 6 slots to fit Trend analogue voltage input, current input, thermistor input, digital input, or analogue voltage output S cards.                                                                              |
| Channels 33 to 40 | 8 analogue voltage outputs. 8 bit resolution (256 steps). 0 to 10 V with 20mA current limit, accuracy $\pm 100\text{mV}$ equivalent to $\pm 1\%$ span. 1 Status LED per channel. Light intensity increases with output voltage. |

**Mechanical**

|                       |                                                                                                   |
|-----------------------|---------------------------------------------------------------------------------------------------|
| Dimensions            | :325 mm x 355 mm x 85 mm                                                                          |
| Material              |                                                                                                   |
| Chassis               | :Steel                                                                                            |
| Cover                 | :Fire retardant ABS                                                                               |
| Protection            | :IP40                                                                                             |
| Weight                | :5.6 kg                                                                                           |
| Connectors            |                                                                                                   |
| /230                  | :IEC plug                                                                                         |
| /24                   | :Mat-N-Loc                                                                                        |
| Network               | :2 part connector with 4 screw terminals for 0.5 to 2.5 mm <sup>2</sup> cross section area cable. |
| I/O                   | :2 part connector with 2 screw terminals for 0.5 to 2.5 mm <sup>2</sup> cross section area cable. |
| Supervisor            | :RJ11 (FCC68), for Trend utility software connected via adaptor cable PART/10/1442.               |
| Display panel         | 25 way D type if fitted.                                                                          |
| Relay                 | :2 part 3 pin in line connector for power.                                                        |
| Relay connector leads | :100 mm, or 300 mm long with 2 part 3 pin in line connectors.                                     |

**Environmental**

|                |                             |
|----------------|-----------------------------|
| EMC            |                             |
| Emissions      | :EN50081-1.                 |
| Immunity       | :EN50082-2.                 |
| Safety         | :EN61010.                   |
| Ambient limits |                             |
| storage        | :-10 °C to 50 °C            |
| operating      | :0 °C to 45 °C              |
| humidity       | :0 to 90 %RH non-condensing |

**Indicator Lamps**

|     |                                                         |
|-----|---------------------------------------------------------|
| PWR | :ON when power supply is connected.                     |
| WD  | :ON if controller has a software fault.                 |
| LAN | :ON if network is operating.                            |
| TX  | :ON if current is flowing from the network transmitter. |
| RX  | :ON if current is entering the network receiver.        |

**SPECIFICATIONS** (Continued)**S CARDS**

Dimensions :32 mm x 45 mm x 10 mm

**Analogue voltage input card**

Analogue voltage inputs: 2 channels per card, 12 bit resolution (4096 steps). Minimum 60 dB series mode rejection at supply frequency. 0 to 10 V, input resistance 200 k $\Omega$ , accuracy 50 mV equivalent to  $\pm 0.5\%$  of span.

**Analogue Current input card**

Analogue current inputs :2 channels per card, 12 bit resolution (4096 steps). Minimum 60 dB series mode rejection at supply frequency. 0 to 20 mA, input resistance 250  $\Omega$  0.1%, accuracy 0.5 % of span (i.e. 100  $\mu$ A).

**Analogue Thermistor input card**

Analogue Thermistor inputs :2 channels per card, 12 bit resolution (4096 steps). Minimum 60 dB series mode rejection at supply frequency. Thermistor, bridge resistor 10 k $\Omega$  0.1%, accuracy 0.5 % of span. Bridge supply 5 V.

**Digital input card**

Digital inputs :2 channels per card. 1 Status LED per channel. ON if contact closed.

**Analogue voltage output card**

Analogue voltage outputs 2 channels per card, 8 bit resolution (256 steps). 0 to 10 V with 20 mA current limit, accuracy  $\pm 100$  mV equivalent to  $\pm 1\%$  span. 1 Status LED per channel. Light intensity increases with output voltage.

**RELAY EXTENSION SYSTEM**

Dimensions :120 mm x 355 mm 85 mm (including cover)

|                  |                                      |
|------------------|--------------------------------------|
| Material         | :Steel                               |
| tray             | :Fire retardant ABS                  |
| cover            | :Plastic                             |
| insulating plate | IP40 (when fitted to IQ24x)          |
| Protection       | 0.4 kg                               |
| Weight           | :40 mm, 3mm diameter perspex piping. |
| Light pipes      |                                      |

**CABLE MANAGEMENT SYSTEM**

Dimensions :60 mm x 355 mm 85 mm (including cover)

|            |                             |
|------------|-----------------------------|
| Material   | :Steel                      |
| tray       | :Fire retardant ABS         |
| cover      | IP40 (when fitted to IQ24x) |
| Protection | 0.3 kg                      |
| Weight     |                             |

**SWITCH KIT**

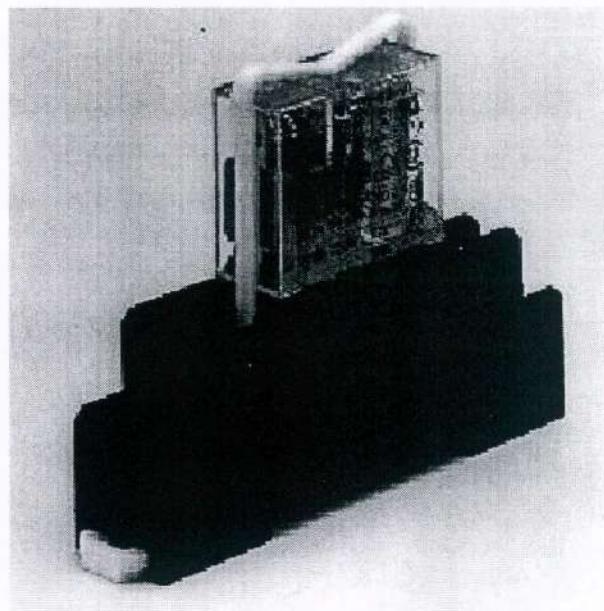
Switch :1 off SPDT switches for ON/OFF/AUTO control of relays.

Caradon Trend Limited reserves the right to revise this publication from time to time and make changes to the content hereof without obligation to notify any person of such revisions or changes.



# SRMI, SRMV, SRMAC Single Relay Module

## SINGLE RELAY MODULE



### Description

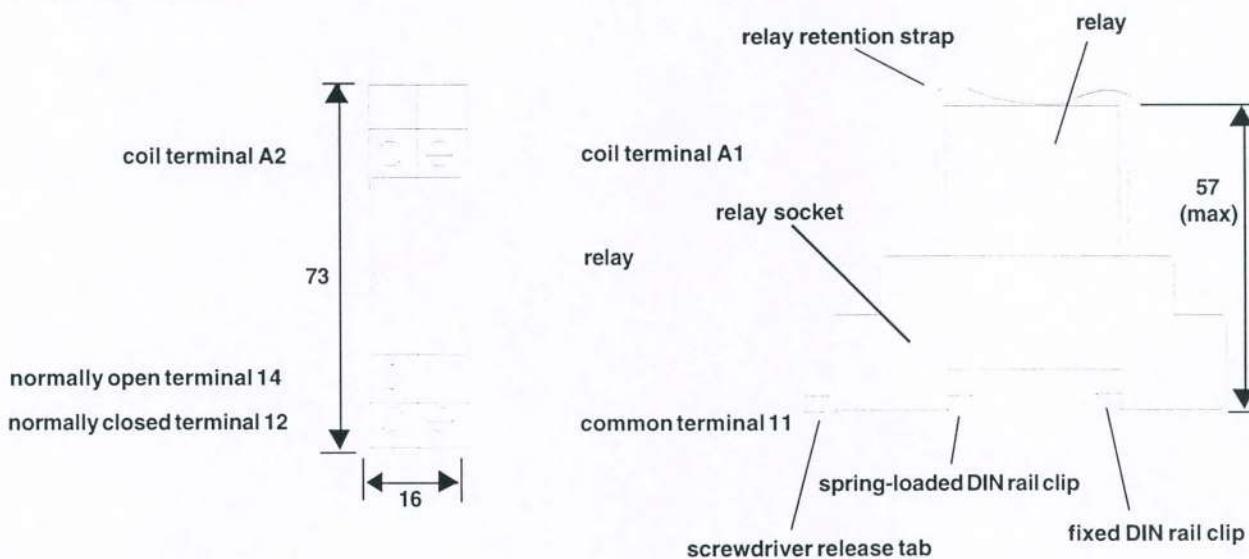
The Single Relay Module enables a controller output signal to drive a single changeover relay. This allows plant of up to 5A at 240 Vac resistive to be switched via the relay contacts. The module may either be mounted on a DIN rail or on a flat surface. There are three versions: the SRMV accepts a 0-10 V signal, the SRMI accepts a 4-20 mA signal, and the SRMAC accepts a 24 Vac signal (e.g. IQ7x triac output).

### Features

- SRMI, SRMV convert an analogue output signal to a 5A relay output
- SRMAC converts an IQ7x triac output signal to a 5A relay output
- can drive up to 5A at 240 Vac resistive, 2A at 240 Vac inductive
- can be mounted on a DIN rail or any flat surface

### Physical

all dimensions are in mm



## INSTALLATION

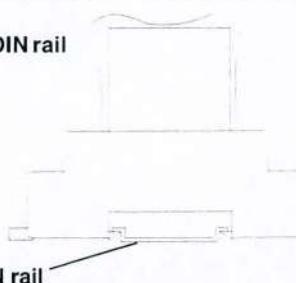
### MECHANICAL

The module is supplied with the relay plugged into the screw terminal socket, and held by the retaining strap. The module can be mounted either by clipping onto a standard DIN rail, or by screwing onto a flat surface.

#### (1) To mount on a DIN rail.

Slip the fixed clip over one side of the rail, and press the other edge onto the rail so that the spring loaded clip locates under the rail.

**module clipped onto DIN rail**

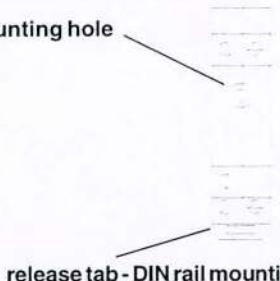


The module will fit onto a standard 35 mm top hat profile DIN rail (DIN 46277-3, EN 50 022, BS 5584:1978).

#### (2) To screw onto a flat surface

Remove relay (see below). Screw onto the surface using a single M3 screw. Replace relay.

**mounting hole**



**release tab - DIN rail mounting**

## REMOVAL

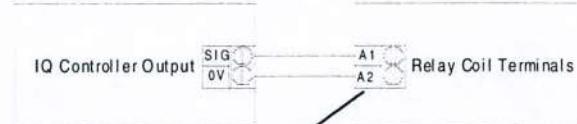
### Removal of the Module from the DIN Rail

- (1) Switch off power to the coil and the contacts.
- (2) Disconnect the terminals.
- (3) Unclip the module by pressing the release tab using a screwdriver.

### ELECTRICAL

The screw terminals incorporate self lifting cable clamps and can accommodate two 1.5 mm<sup>2</sup> wires.

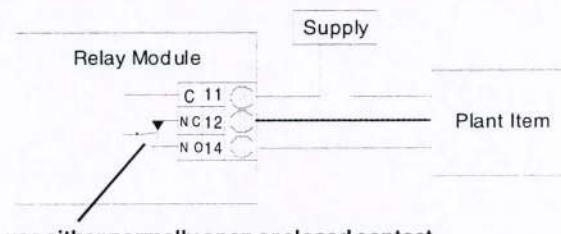
- (1) Connect the IQ controller output to the module coil terminals as shown below.



**the coil polarity is unimportant**

Note that for the SRMV (voltage version), the IQ output should be set up for voltage output (V), whereas for the SRMI (current version), the IQ output should be set up for current (I).

- (2) Connect the relay output to the plant item that is to be controlled as shown below.



#### NOTE: IQ COMPATIBILITY

SRMI cannot be used on IQ 111+ or IQ131+. SRMV can be used on IQ111+, IQ131+ and any other controller set to analogue voltage output except channel 5 on IQ93, 103, 93+. SRMAC can be used on IQ7x triac outputs.

## ORDER CODES

MOD/SRMI 4-20 mA current driven relay (rated voltage 32.5V)  
MOD/SRMV 0-10 V voltage driven relay (rated voltage 12 V)  
MOD/SRMAC 0-24 Vac voltage driven relay (rated voltage 24Vac)

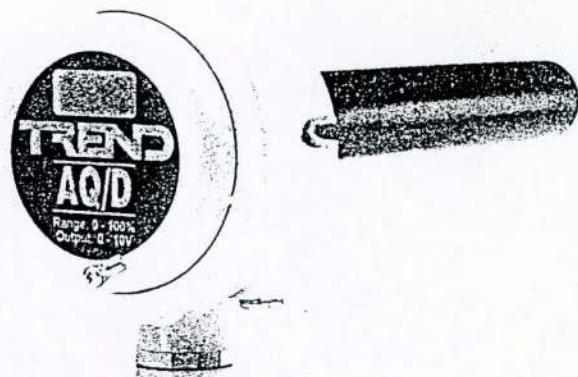
## SPECIFICATIONS

|                       |                                                                                                     |
|-----------------------|-----------------------------------------------------------------------------------------------------|
| Dimensions            | :73 mm x 16 mm x 52 mm (57 max)                                                                     |
| Operating temperature | :-40 to +70 °C (SRMI, SRMV)<br>-40 to +40 °C (SRMAC)                                                |
| Mounting              | :Module consists of relay in socket.<br>Socket can be mounted on a flat surface or onto a DIN rail. |
| Coil operation        | :SRMI: 32.5 V (20.5 V switching point approx), coil resistance =1150 Ω approx.                      |

|                        |                                                                                                           |
|------------------------|-----------------------------------------------------------------------------------------------------------|
| Coil operation (cont.) | :SRMV: 12 V (8 V switching point approx), coil resistance =660 Ω approx. Current at 10 V =16 mA (approx). |
| Contacts               | :SRMAC: 24Vac (19.2 V switching point approx), coil resistance =290 Ω approx.                             |
| Rated Voltage          | :250 Vac                                                                                                  |
| Rated Current          | :5 A @ 250 Vac resistive or 30 Vdc<br>:2 A @ 250 Vac inductive (Cos Ø =0.14)                              |
| Terminals              | :screw with self lifting cable clamps, can accommodate two 1.5 mm <sup>2</sup> wires                      |

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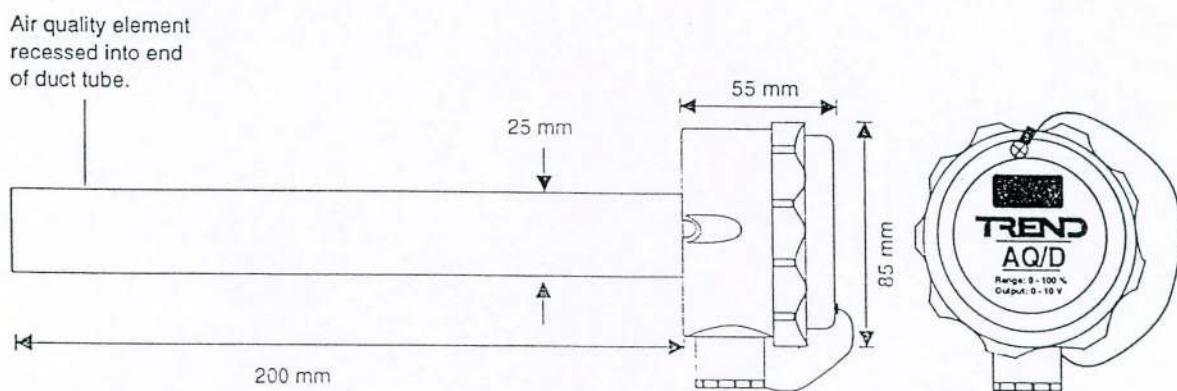


**AQ/D**  
**Duct Air Quality Sensor****DUCT AIR QUALITY SENSOR****Description**

Duct mounting air quality sensor for air measurement applications. Heated sensor element is sensitive to a wide range of gases and is capable of measuring the total level of impurity. Enables ventilation rates to be controlled according to occupancy, saving energy without compromising air quality. Sensor response closely tracks CO<sub>2</sub> levels in occupied spaces. IP67 housing with M20 cable entry.

**Features**

- Senses mix of gases to monitor air quality.
- Response closely tracks CO<sub>2</sub> levels in occupied spaces.
- Precalibrated for ease of commissioning.
- Long term reliability.
- 0 to 10 Vdc output, 24 Vdc/ac supply.
- IP67 housing.
- M20 cable entry.

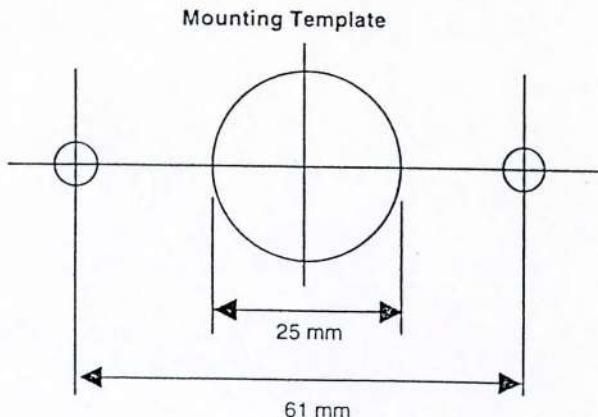
**Physical**

## INSTALLATION

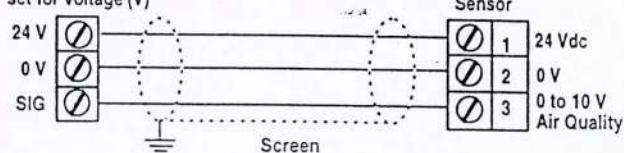
- (1) Choose an accessible location where sensor element will lie in the airstream to be measured.
- (2) Drill 2 pilot holes on 61 mm centres in duct side to take No. 6 self-tapping screws (see template opposite).
- (3) Drill a 25 mm diameter clearance hole centrally between the 2 screw holes.
- (4) Insert sensor tube into duct and fix sensor head with No. 6 screws. Cable entry should be at the bottom.

When initially powered up an initial stabilisation period of 2 to 3 minutes should be allowed before checking functionality, as when cold the sensor output is above 10 V. After this, a burn-in period of 2 to 3 days is required before a stable and repeatable output can be ensured. On-site adjustment is not normally necessary and should not be attempted until after the burn-in period. The sensor may become warm. This is normal and does not imply malfunction. (For further information see Trend Tips SEN13).

- (5) Remove cap by unscrewing retaining ring.
- (6) Insert cable through cable gland and connect signal wires to terminals as shown. Replace cap.



IQ Input Channel  
set for voltage (V)

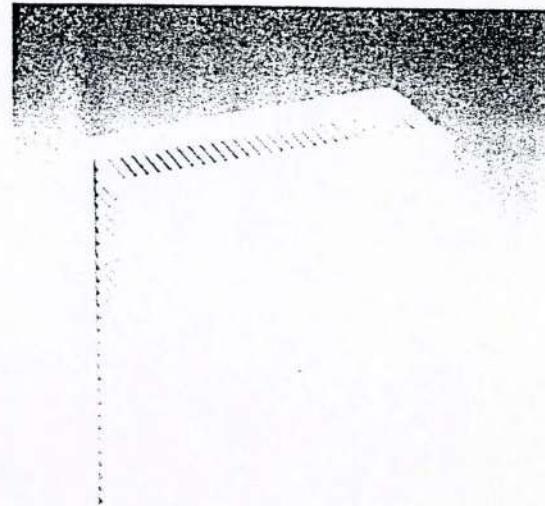


## SPECIFICATIONS

|                                                                                                                                          |                                                                                                                     |                  |                                                                                                                                                                                                                                                                                                                |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
|------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--------------------------------|----------------|-------|-----|-----|-------|---|---|-------|----|-----|--------|-----|------|
| Product Description                                                                                                                      | :Duct Air Quality Sensor                                                                                            | Operating limits | :Designed for controlled environments (18 to 24 °C). Below this range as temperature falls output voltage increases.                                                                                                                                                                                           |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
| Product code                                                                                                                             | :AQ/D                                                                                                               |                  |                                                                                                                                                                                                                                                                                                                |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
| Air Quality element                                                                                                                      | :Ceramic tube coated with a tin dioxide with centrally mounted heating element and flameproof stainless steel mesh. |                  |                                                                                                                                                                                                                                                                                                                |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
| Accuracy                                                                                                                                 | :International standards yet to be agreed                                                                           |                  |                                                                                                                                                                                                                                                                                                                |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
| Repeatability                                                                                                                            | :±2 %                                                                                                               |                  |                                                                                                                                                                                                                                                                                                                |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
| Hysteresis                                                                                                                               | :Negligible                                                                                                         |                  |                                                                                                                                                                                                                                                                                                                |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
| Sensitivity                                                                                                                              | :Dependent on gas mix                                                                                               |                  |                                                                                                                                                                                                                                                                                                                |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
| Long term stability                                                                                                                      | :Negligible drift                                                                                                   |                  |                                                                                                                                                                                                                                                                                                                |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
| Power supply                                                                                                                             | :15 to 32 Vdc/ac                                                                                                    |                  |                                                                                                                                                                                                                                                                                                                |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
| Note: When used with a 24 Vac supply the output signal will be approximately 10 % higher than the signal when used with a 24 Vdc supply. |                                                                                                                     |                  |                                                                                                                                                                                                                                                                                                                |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
| Consumption                                                                                                                              | :135 to 140 mA                                                                                                      |                  |                                                                                                                                                                                                                                                                                                                |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
| Output                                                                                                                                   | :0 to 10 Vdc<br>(0 V = good quality, 10 V = bad quality)                                                            |                  |                                                                                                                                                                                                                                                                                                                |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
|                                                                                                                                          |                                                                                                                     | Environmental    |                                                                                                                                                                                                                                                                                                                |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
|                                                                                                                                          |                                                                                                                     | protection       | :IP67                                                                                                                                                                                                                                                                                                          |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
|                                                                                                                                          |                                                                                                                     | Ambient limits   | : -10 to 50 °C, 0 to 90 %RH non-condensing                                                                                                                                                                                                                                                                     |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
|                                                                                                                                          |                                                                                                                     | Dimensions       |                                                                                                                                                                                                                                                                                                                |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
|                                                                                                                                          |                                                                                                                     | Duct tube        | :200 mm long<br>25 mm diameter                                                                                                                                                                                                                                                                                 |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
|                                                                                                                                          |                                                                                                                     | Fixing centres   | 61 mm                                                                                                                                                                                                                                                                                                          |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
|                                                                                                                                          |                                                                                                                     | Head             | 85 mm diameter<br>55 mm deep                                                                                                                                                                                                                                                                                   |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
|                                                                                                                                          |                                                                                                                     | Cable entry      | :M20                                                                                                                                                                                                                                                                                                           |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
|                                                                                                                                          |                                                                                                                     | Materials        | :Impact resistant ABS                                                                                                                                                                                                                                                                                          |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
|                                                                                                                                          |                                                                                                                     | Connections      | :1 part screw terminals for 0.5 to 2.5 mm² cross section area cable                                                                                                                                                                                                                                            |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
|                                                                                                                                          |                                                                                                                     | IQ scaling       |                                                                                                                                                                                                                                                                                                                |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
|                                                                                                                                          |                                                                                                                     |                  | <table border="1"><tr> <td></td><td>IQ151+, IQ151,<br/>IQ131, IQ111</td><td>All other IQ's</td></tr> <tr> <td>Upper</td><td>100</td><td>100</td></tr> <tr> <td>Lower</td><td>0</td><td>0</td></tr> <tr> <td>Range</td><td>50</td><td>100</td></tr> <tr> <td>Brange</td><td>-50</td><td>-100</td></tr> </table> |  | IQ151+, IQ151,<br>IQ131, IQ111 | All other IQ's | Upper | 100 | 100 | Lower | 0 | 0 | Range | 50 | 100 | Brange | -50 | -100 |
|                                                                                                                                          | IQ151+, IQ151,<br>IQ131, IQ111                                                                                      | All other IQ's   |                                                                                                                                                                                                                                                                                                                |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
| Upper                                                                                                                                    | 100                                                                                                                 | 100              |                                                                                                                                                                                                                                                                                                                |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
| Lower                                                                                                                                    | 0                                                                                                                   | 0                |                                                                                                                                                                                                                                                                                                                |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
| Range                                                                                                                                    | 50                                                                                                                  | 100              |                                                                                                                                                                                                                                                                                                                |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |
| Brange                                                                                                                                   | -50                                                                                                                 | -100             |                                                                                                                                                                                                                                                                                                                |  |                                |                |       |     |     |       |   |   |       |    |     |        |     |      |

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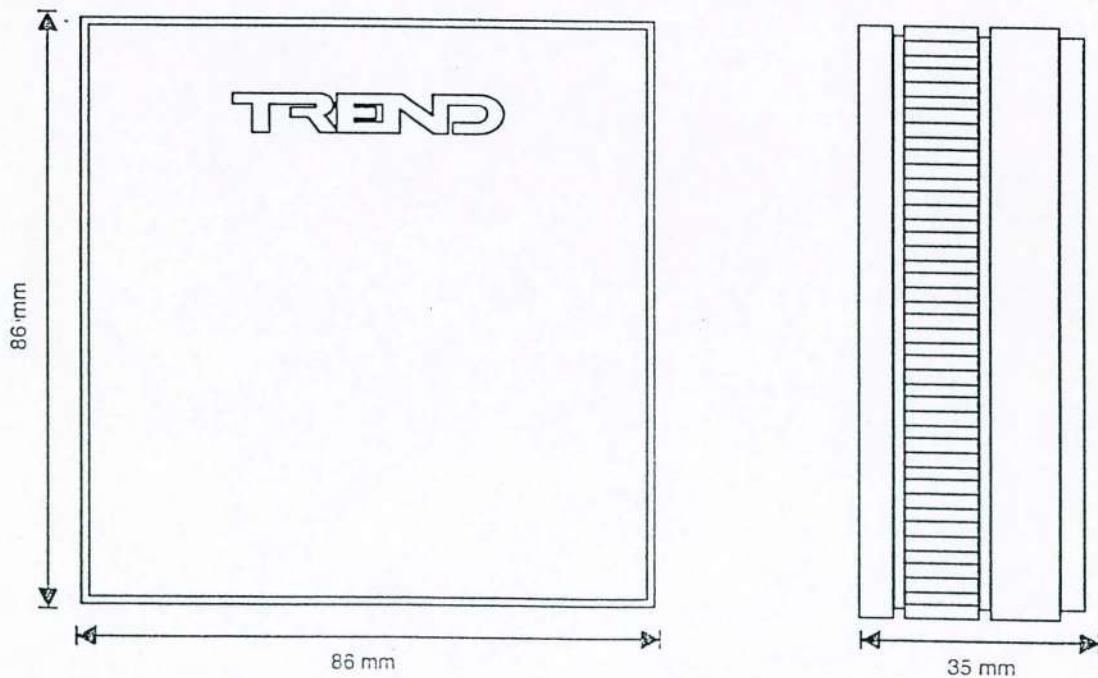


**AQ/S**  
**Air Quality Sensor****AIR QUALITY SENSOR****Description**

Wall mounted air quality sensor for air measurement applications. Heated sensor element is sensitive to a wide range of gases and is capable of measuring the total level of impurity. Enables ventilation rates to be controlled according to occupancy, saving energy without compromising air quality. Sensor response closely tracks CO<sub>2</sub> levels in occupied spaces.

**Features**

- Senses mix of gases to monitor air quality.
- Response closely tracks CO<sub>2</sub> levels in occupied spaces.
- Precalibrated for ease of commissioning.
- Long term reliability.
- 0 to 10 Vdc output, 24 Vdc/ac supply.
- 2 part connectors for ease of installation.
- Standard Trend room sensor housing.

**Physical**

## INSTALLATION

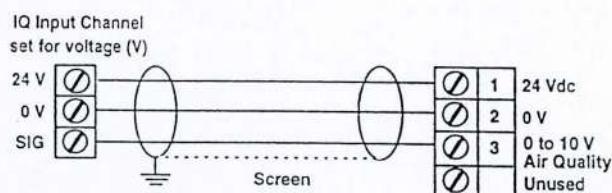
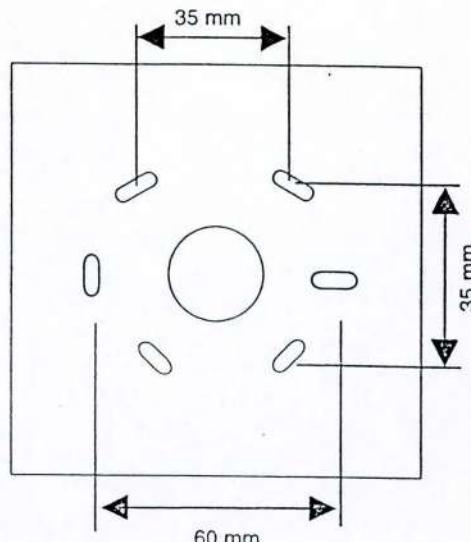
Choose an accessible location for the sensor where there is good air movement (avoid corners) to give a representative air quality reading. Also avoid locating the sensor where it will be subject to radiated heat.

- (1) Remove the knockout section from the backplate.
- (2) Fix the backplate to the wall using a minimum of 4 screws with washers using the holes provided.
- (3) Remove the terminal blocks from the sensor and wire them as shown below.
- (4) Plug the terminal blocks back into the sensor.
- (5) Clip the sensor onto the backplate making sure that the cables are routed through the cable exit.

Note: When initially powered up an initial stabilisation period of 2 to 3 minutes should be allowed before checking functionality, as when cold the sensor output is above 10 V. After this, a burn-in period of 2 to 3 days is required before a stable and repeatable output can be ensured. On-site adjustment is not normally necessary and should not be attempted until after the burn-in period. The sensor may become warm. This is normal and does not imply malfunction (for further information see Trend Tips SEN 13).

- (6) The cable connections should be as shown in the diagram right.

Note: Do not earth the screen at the sensor end.



## SPECIFICATIONS

|                     |                                                                                                                      |                        |                                                                                           |
|---------------------|----------------------------------------------------------------------------------------------------------------------|------------------------|-------------------------------------------------------------------------------------------|
| Product Description | :Air Quality Sensor                                                                                                  | Consumption            | :135 to 140 mA                                                                            |
| Product code        | :AQ/S                                                                                                                | Output                 | :0 to 10 V<br>(0 V = good quality, 10 V = bad quality)                                    |
| Air Quality element | :Ceramic tube coated with a tin dioxide with centrally mounted heating element and flameproof stainless steel mesh.  | Ambient limits         | :-10 to 40 °C, 0 to 90 %RH non-condensing                                                 |
| Accuracy            | :International standards yet to be agreed                                                                            | Enclosure material     | :Borg Warner Cycolac KJBE or equivalent                                                   |
| Repeatability       | :±2 %                                                                                                                | UL flammability rating | :94 V-0                                                                                   |
| Hysteresis          | :Negligible                                                                                                          | Dimensions             | :86 mm x 86 mm x 35 mm                                                                    |
| Sensitivity         | :Dependent on gas mix                                                                                                | Connections            | :2 part connector screw terminals for 0.5 to 2.5 mm <sup>2</sup> cross section area cable |
| Long term stability | :Negligible drift                                                                                                    | IQ scaling             |                                                                                           |
| Operating limits    | :Designed for controlled environments (18 to 24 °C). Below this range as temperature falls output voltage increases. |                        |                                                                                           |
| Power supply        | :15 to 32 Vdc/ac                                                                                                     |                        |                                                                                           |

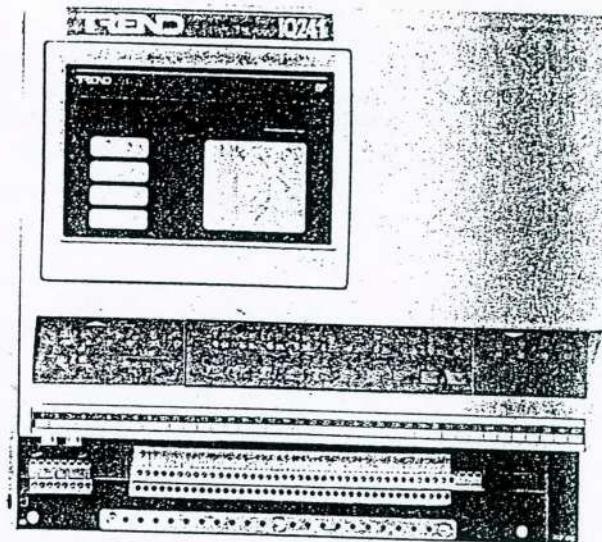
|        | IQ151+, IQ151,<br>IQ131, IQ111 | All other IQ's |
|--------|--------------------------------|----------------|
| Upper  | 100                            | 100            |
| Lower  | 0                              | 0              |
| Range  | 50                             | 100            |
| Brange | -50                            | -100           |

Note: When used with a 24 Vac supply the output signal will be approximately 10 % higher than the signal when used with a 24 Vdc supply.

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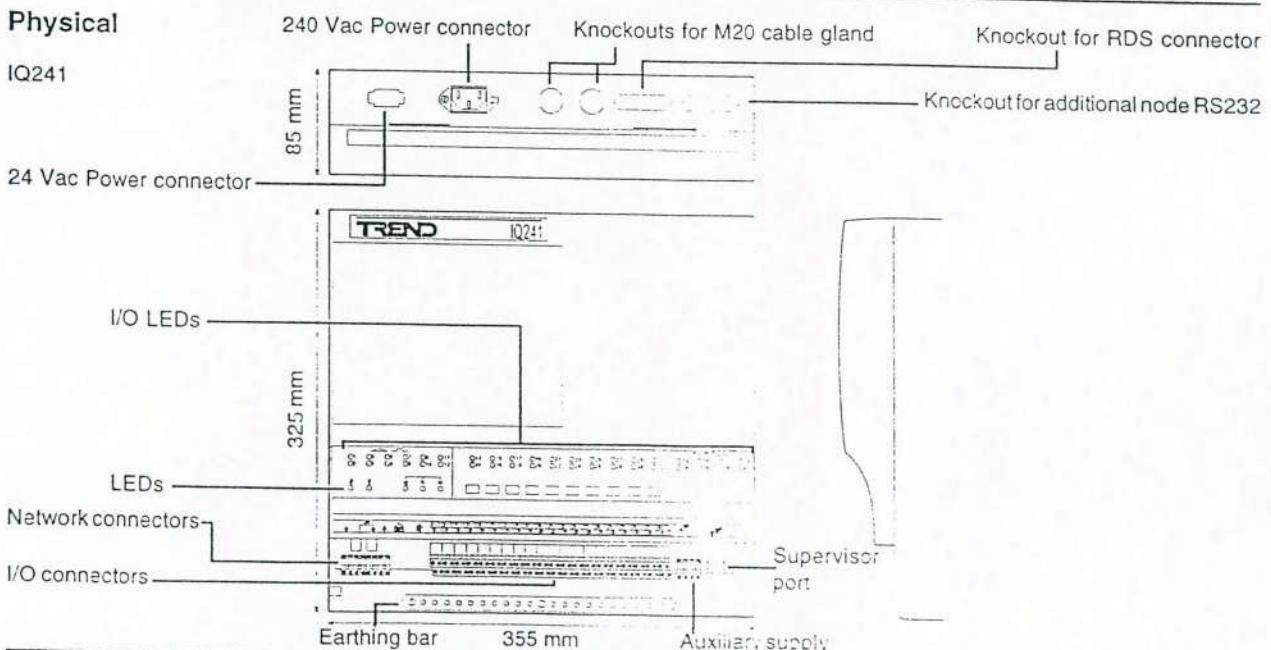
Caradon Trend Limited, P.O. Box 34 Horsham Sussex RH12 2YF England Telephone: 0403 211888 Fax: 0403 241608.

**IQ241 CONTROLLER****Description**

The IQ241 is a medium capacity controller designed for the control of all types of building plant. It can provide a minimum of 12 digital inputs, and 8 analogue voltage outputs. A further 20 I/O points can be made available by using up to 10 S cards, each providing 2 inputs or outputs of the same type (8 input only, 12 input or output). The range of S cards provides analogue voltage, thermistor, or digital inputs, or analogue voltage outputs. This enables the IQ241 to provide sufficient capability for more complex strategies. It can operate either as a stand alone device or as part of a Building Management System. If required a Network Display Panel can be mounted on the front cover, or externally, using a node controller built into the IQ241. A standard Display Panel can also be mounted on the front cover, or externally. Additionally the IQ241 provides the ability to connect any Trend supervisor or Engineering Tool to the network without a separate node controller.

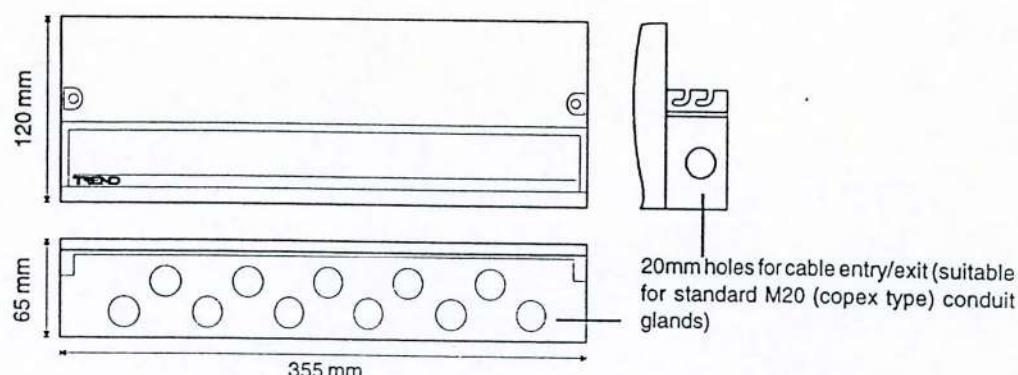
**Features**

- 1 second cycle time.
- Optional integral/external Network Display Panel.
- Optional integral/external Display Panel.
- Access to entire network via local supervisor connection.
- Facility for mounting an additional node controller.
- High capacity DDC with PID control loops.
- Stand alone or integrated system operation.
- 12 digital inputs.
- 8 analogue voltage outputs.
- 10 slots for S cards (20 I/O points)
- Optional cable management system.
- Optional relay extension system.

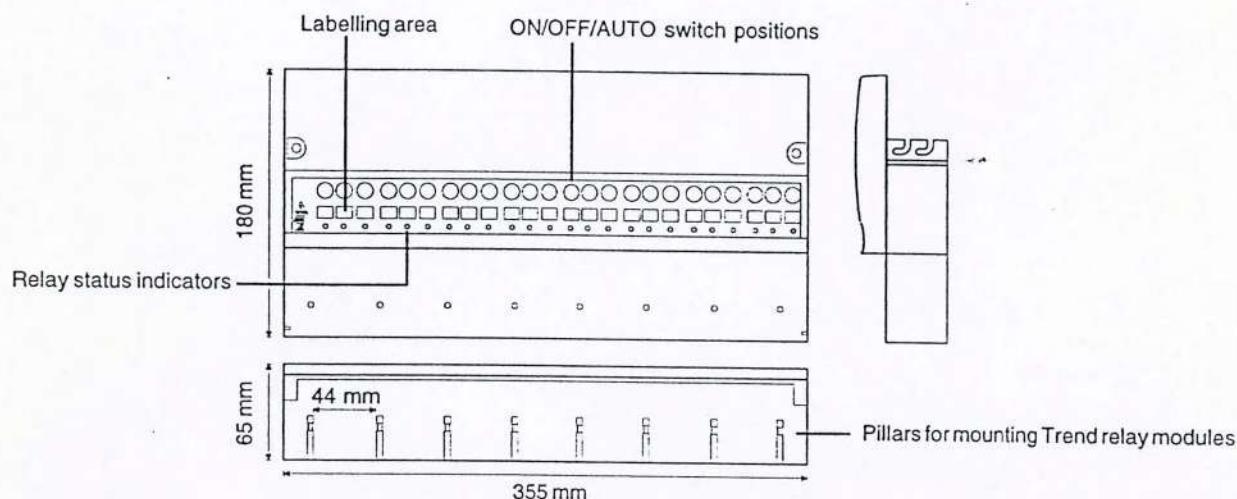
**Physical**

## PHYSICAL (Continued)

### Cable Management System



### Relay Management System



## FUNCTIONALITY

The IQ241 Controller's functionality can be divided into two sections, the strategy, and the hardware.

### STRATEGY

The strategy processes inputs according to a set of instructions and then outputs signals which can be used to control plant.

**Communications:** When operating as part of a Building Management System, the IQ241 will be connected to other devices via the Trend Network. This means that information within the IQ241 can be accessed using one of the Trend supervisor programs, or passed to other Trend IQ controllers using inter-controller communications, enabling the sharing of information across the whole system.

When connected to the network the controller can use up to 3 different addresses. One address is for the controller itself, the second and third are optional, and are for the Network Display Panel, and locally connected supervisor. This means that both the Network Display Panel and supervisor have their own network addresses when connected to the network via the controller.

The controller's address is set by a switch on the module, and the addresses for the network display panel, and supervisor are software selectable.

**Configuration:** The IQ241 uses the standard IQ configuration mode which enables configuration via the network, or by direct connection. Alternatively the ACE+ utility can be used to create a strategy data file which can then be downloaded to the controller by the 822+/Toolbox. The 822+/Toolbox version 6 can be used to upload, and download IQF files for backup purposes.

**The Engineer's Journal:** This enables information about changes made to the strategy to be entered. Pressing 'J' while in configuration mode displays existing messages. A new message can be entered by entering the next number (e.g. if there are 3 messages, enter 4,) and then the message.

**I/O Summary:** The I/O Summary lists all the I/O channels available including the S Cards that are fitted. Typing 'io' while in configuration mode on the top menu page displays this list.

## STRATEGY (Continued)

**Modules:** The strategy consists of a number of individual functional blocks known as configuration modules. These blocks can be linked in various combinations to enable plant to be controlled appropriate to the building's requirements. The table lists the different types of configuration modules and the number of each type available with IQ241. Full details of the modules are given in the IQ Configuration Manual. Differences between the modules covered in the manual and the IQ241's modules are described below.

Note that the sequence cycle time is 1 second. This will enable the IQ241 to control faster processes, and respond more rapidly to alarm conditions than IQ1x series controllers.

| Module Type   | Number | Module Type    | Number |
|---------------|--------|----------------|--------|
| Sensor        | 48     | Critical Alarm | 4      |
| Sensor type   | 12     | Alarm History  | 20     |
| Loop          | 32     | IC Comms       | 16     |
| Function      | 160    | Digital Inputs | 48     |
| Logic         | 160    | Fast Sequence  | 8      |
| Driver        | 32     | Zone           | 5      |
| Knob          | 30     | Schedule       | 32     |
| Switch        | 20     | Calendar       | 20     |
| Sensor log    | 32     | User Password  | 6      |
| Sequence step | 400    | Sequence time  | 1 s    |

**Sensor Types:** The IQ241 is inherently more accurate at thermistor temperature measurement than Series 1 IQ controllers as it measures both the reference voltage and the voltage developed across the thermistor and using a 0.1% bridge resistor then calculates the thermistor resistance. The IQ241 has five sensor types:

|   |                            |   |                           |
|---|----------------------------|---|---------------------------|
| 0 | linear                     | 3 | linearise volts           |
| 1 | log                        | 4 | linearise thermistor ohms |
| 2 | linearise thermistor volts |   |                           |

Type 0, linear, has been changed relative to the IQ151+ (or earlier controllers using ±5V for linear voltage T and B parameters - IQ111, 131, 151) for linear voltage only in that T and B must be set to the values of the variable being sensed which give outputs of +10 V and -10 V respectively.

Type 1, log, is the same as before.

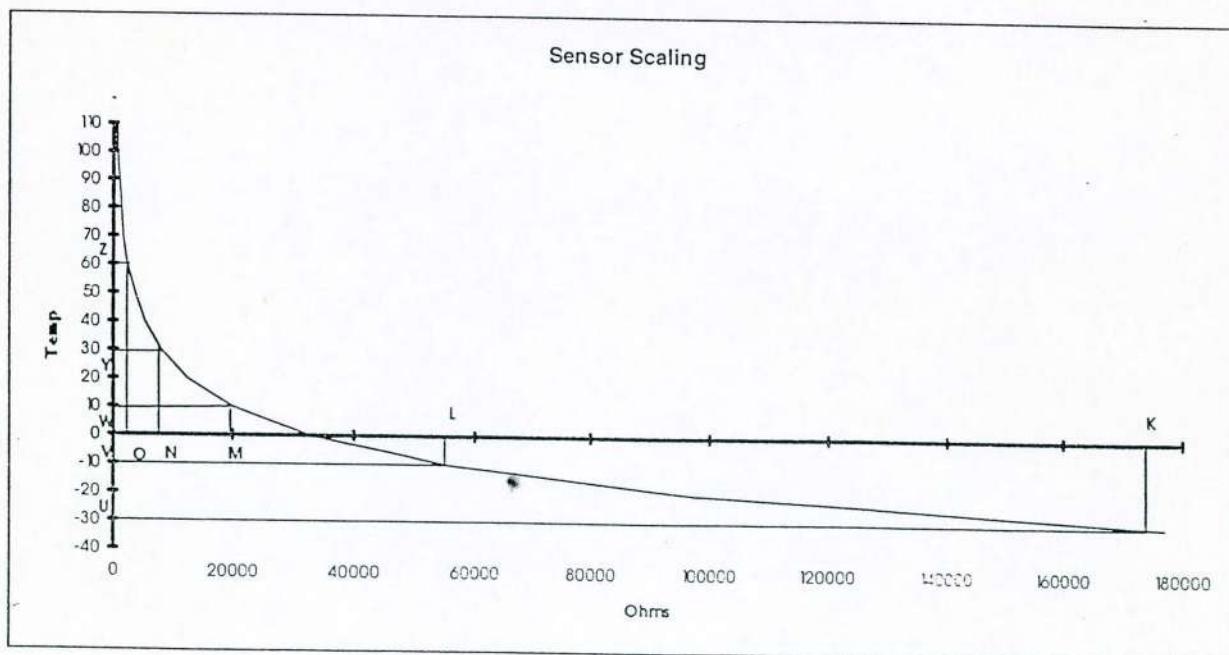
Type 2, linearise, is now 'linearise thermistor volts', and is reserved for thermistors only.

Type 3, linearise volts, is to be used for voltage or current signals which need to be linearised and is the same format as sensor type 2.

Type 4, linearise thermistor ohms, may be used instead of type 2. It presents a logical method of defining the thermistor linearisation requiring entry of ohms against temperature directly from the sensor characteristic. It enables the linearisation points on the temperature scale to be individually chosen so that they can be closer together over a part of the characteristic where the gradient is changing rapidly, and further apart where the gradient changes only gradually. A sensor type 4 appears in configuration mode as shown.

| Scaling 4 linearise thermistor ohms |      |      |      |      |
|-------------------------------------|------|------|------|------|
| U                                   | V    | W    | Y    | Z    |
| units 0.00                          | 0.00 | 0.00 | 0.00 | 0.00 |
| kohms 0.00                          | 0.00 | 0.00 | 0.00 | 0.00 |
| K L M N O                           |      |      |      |      |

The parameters U, V, W, Y, Z and K, L, M, N, O are obtained from a characteristic graph of the sensor. For example:



## STRATEGY (Continued)

The graph shows the temperature characteristic for a Trend thermistor sensor. If the sensor is to be used for a temperature range -30 °C to +60 °C, then this defines points U, K and Z, O. The other three points have now to be chosen:

The gradient changes most rapidly over the 'knee' of the characteristic therefore around this area the points should be closer together. The points are found by drawing four straight lines, approximating as closely as possible to the curve. Each of these lines should provide a best fit straight line approximation to that curve segment. The actual point values should be obtained from a table rather than a graph, for greater accuracy. The standard Trend table (see IQ Configuration manual) gives the following points for the -30 °C to +60 °C example.

|   | °C  | kΩ       |
|---|-----|----------|
| U | -30 | K 177.00 |
| V | -10 | L 55.34  |
| W | 10  | M 19.98  |
| Y | 30  | N 8.06   |
| Z | 60  | O 2.49   |

Table showing recommended sensor type 4 settings for standard temperature ranges of Trend thermistor sensors.

|   |    | -10 °C to 110 °C | -10 °C to 40°C | -40 °C to 50°C | -10 °C to 70°C |
|---|----|------------------|----------------|----------------|----------------|
| U | °C | -10              | -10            | -40            | -10            |
| V |    | 2.5              | -5             | -28.5          | 0              |
| W |    | 16.5             | 4.5            | -14            | 12.5           |
| Y |    | 42               | 19             | 8.5            | 33             |
| Z |    | 110              | 40             | 50             | 70             |
| K | kΩ | 540.6            | 55.34          | 328.87         | 54.44          |
| L |    | 28               | 40.5           | 157.9          | 32.49          |
| M |    | 14.06            | 25.26          | 64.35          | 16.93          |
| N |    | 3.9              | 12.63          | 19.18          | 6.38           |
| O |    | 0.51             | 5.32           | 3.6            | 1.75           |

**Address module:** The address module has two extra addresses for the NDP and Supervisor (3 in total).

**sUervisor port addr:** This should be set to the network address of the supervisor connected via the IQ241 supervisor port (this could also be an NDP). It can take the normal range of addresses on the network, as long as an address is not duplicated. If set to address zero the supervisor will only communicate with the local IQ241.

**ndp pOrt addr:** This should be set to the network address of the NDP connected via the NDP port (this could also be a local supervisor). It can take the normal range of addresses on the network, as long as an address is not duplicated. If set to address zero the NDP will only communicate with the local IQ241.

**Supply frequency option:** There is no supply frequency option on the address page as the problem of mains pick-up is dealt with automatically by the hardware.

**Serial number:** This is factory set to the serial number on the main board. It can be accessed with text comms using 's' (must be lower case).

**Loader Issue:** This displays the issue and date of the download kernel that is in the controller. It can be accessed with text comms using 'c' (must be lower case).

**Identity:** The IQ241 will identify itself (e.g. to the 945 and the NDP) as an 'IQ2xx v1'. This is so that existing versions of these programs can operate with the IQ241.

If the IQ241 receives an identify message aimed at either the supervisor, or NDP port it will identify the attached device. If there is no device attached then it will identify the port as a CNC.

**Battery Status:** The IQ241 has a battery status checking circuit which will check the battery on power up and thereafter at every midnight and generate a digital bit if the battery voltage has fallen below a threshold value. If the voltage has fallen below this value it will set byte 506 bit 0. This bit being set is an indication that the battery needs to be changed. It should be used within the strategy to generate an alarm (e.g. critical alarm). The battery should be changed after the first indication. The battery will have a typical life of 10 years at 20 °C. This will be derated as the temperature increases with a minimum guaranteed life of about 5 years. It is recommended that the battery is replaced every 5 years.

**Time Resolution:** The faster processor improves the time resolution on various modules. Loop and logic reschedule times now have a resolution of 1 s, and drivers start delay, TP period, and RL drive time have increments of 1 s with a maximum of 32767 s.

**Large numbers:** As a result of certain calculations (e.g. divide by zero), an analogue value may be returned as 'infinity', and similarly, dividing infinity by infinity gives 'NaN' (not a number). Both these values are represented by alpha characters, but are treated by the strategy as very large numbers, e.g. if output via a driver they will cause it to drive to maximum output.

**Sensor Log:** The IQ241 has 32 logging channels. Each channel can sample a sensor value at a prescribed interval (period), and store up to 1000 values. After 1000 values have been recorded the oldest value is overwritten. This means that the last 1000 values are always available. Logging is performed at 10 different intervals (1s, 1 m, 5 m, 10 m, 15 m, 20 m, 30 m, 1 h, 6 h, and 24 h). The interval can be specified from any of those listed in the table below.

| Period | Duration         | Period | Duration          |
|--------|------------------|--------|-------------------|
| 1 s    | 16 m 40 s        | 20 m   | 13 days 21 h 20 m |
| 1 m    | 16 h 40 m        | 30 m   | 20 days 20 h      |
| 5 m    | 3 days 11 h 20 m | 1 h    | 41 days 16 h      |
| 10 m   | 6 days 22 h 40 m | 6 h    | 250 days          |
| 15 m   | 10 days 10 h     | 24 h   | 1000 days         |

**I/O Channel reference:** The IQ241 has very flexible I/O which can be configured in a number of ways. The configuration input modules (sensors and digital inputs) and the output modules (drivers) are related to the external channels as shown in the table below. The external channel reference for these modules is displayed in configuration mode.

| Module type           | Module reference                      | External channel |
|-----------------------|---------------------------------------|------------------|
| Sensor-analogue input | S1 to S20                             | 13 to 32         |
| Sensor-digital input  | S1 to S32 (not normally used*)        | 1 to 32          |
| Digital input         | I1 to I32                             | 1 to 32          |
| Driver                | Driver channel 1 to driver channel 20 | 40 to 21         |

The table below specifies the possible modes for each channel.

| Module     | Input Modes                                                         |
|------------|---------------------------------------------------------------------|
| S1 to S20  | analogue input, digital input*, internal analogue, internal digital |
| S21 to S32 | digital input*, internal analogue, internal digital                 |
| S33 to S48 | internal analogue, internal digital                                 |
| I1 to I32  | digital input                                                       |
| I33 to I48 | internal digital                                                    |

\*Note that as sensors and digital inputs are supported separately on the display panel, and have separate labels, use of sensor modules in digital input mode is not normally required.

## HARDWARE

**Unit:** The IQ241 is supplied in a metal and plastic enclosure which provides IP40 protection for the unit. The controller can be fitted with an optional cable management system or relay extension system.

**Cable management system:** The cable management system comprises of a metal box with 17 off 20 mm metal knockouts (4 rear, 11 bottom, 1 each side). The knockouts can be removed to provide cable entry/exit holes suitable for grommets, or standard M20 (copex type) conduit glands. It fits immediately underneath the controller, or the relay extension system (if fitted) using a simple hooking method preventing accidental contact with the terminals.

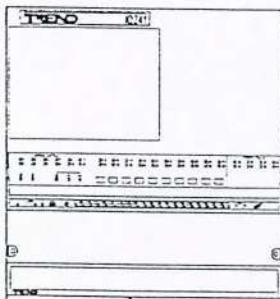
**Relay extension system:** The relay extension system provides an easy way to mount Trend relay modules, it also IP40 protection to the relay modules inside. If required more than 1 relay extension system can be fitted. It fits immediately underneath the controller or other relay extension system using a simple hooking method. If the relay extension system is to be fitted the cable management system must also be fitted. The relay extension system consists of a metal tray with mounting pillars for Trend relay modules, and a fire retardant ABS cover, an insulating plate, a paper label for labelling of relays, and switches (if fitted), a sticky label to protect the relay label; 16 light pipes, and a bracket for mounting ON/OFF/AUTO switches. The relay modules clip onto the mounting pillars. The table below illustrates the possible combinations of relay modules that may be mounted using 1 relay extension system.

**ON/OFF/AUTO Switches:** Each relay mounted in the relay extension system can be equipped with an ON/OFF/AUTO switch using the ON/OFF/AUTO switch kit that fits onto the bracket supplied with the relay extension system. This kit consists 1 ON/OFF/AUTO switch with cable and connector.

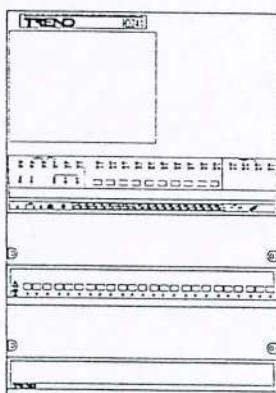
The relays can be linked to the IQ's auxiliary power supply, and signal output using relay connector leads (CABLE/RMT/20, and CABLE/RMT/50). If required other relay extension systems can be mounted underneath the first to provide additional relay mounting space in which case longer relay connector leads are required. Note that if the relay extension system is to be fitted the cable management system must also be fitted.

| Max Number of Relay Module per relay extension system |     |     |
|-------------------------------------------------------|-----|-----|
| 2RM or 2SRM                                           | 3RM | 6RM |
| 8                                                     | 0   | 0   |
| 6                                                     | 1   | 0   |
| 5                                                     | 0   | 1   |
| 4                                                     | 2   | 0   |
| 3                                                     | 1   | 1   |
| 2                                                     | 0   | 2   |
| 0                                                     | 1   | 2   |
| 0                                                     | 4   | 0   |

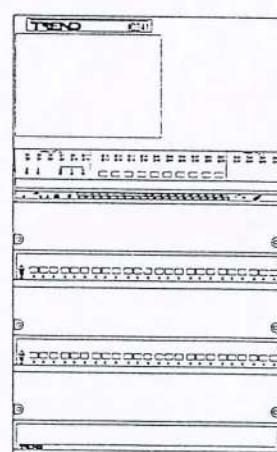
The diagrams below illustrates how up to 3 relay extension system and an cable management system can be fitted to an IQ241



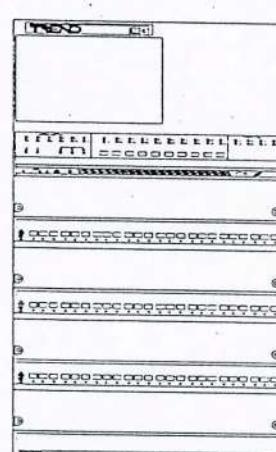
IQ241  
Cable Management System



IQ241  
Relay Extension System  
Cable Management System



IQ241  
Relay Extension System  
Relay Extension System  
Cable Management System



IQ241  
Relay Extension System  
Relay Extension System  
Relay Extension System  
Cable Management System

**Network:** The network terminals facilitate connection of 4 or 2 wire cables. The address and baud rate (19k2, 9k6, or 1k2) are selected by switches. The standard Trend node features are included (TX RX, and LAN indicators, bypass relay, and network alarm generation). There is also the facility for connection of a Network Display Panel, and/or supervisor to the network via the controller without the need for additional node controllers. A location is also provided for mounting an extra node controller, e.g. MNC, should this be required.

**Connectors:** Two part connectors are used throughout to facilitate wiring. The 230 Vac power supply uses a standard IEC connector.

**Power:** 230 Vac 50/60 Hz, or 24 Vac

**Fusing:** The controller has no fuses; protection is provided by means of a self resetting thermally protected transformer. The I/O modules are also individually protected against short circuits.

**Battery Backup:** Details about the strategy configuration, time and date, and logged data are stored in RAM. A plug-in lithium cell provides power to maintain the data in the event of power failure, or the controller being switched off.

**S Cards:** S Cards enable the IQ configuration of the controller to be set up according to user requirements. Each card provides 2 input/output channels of the same type. The range of S Cards provide analogue voltage, thermistor, and digital inputs, or analogue voltage outputs. The IQ241 has space for 10 S Cards providing up to 20 additional I/O channels (8 input only, 12 input or output).

## HARDWARE (Continued)

**Auxiliary Supplies:** The IQ241 has two types of auxiliary supplies which share 1000 mA. Both are thermally protected and can supply 24 Vdc at a maximum of 500 mA. The first is a single connector for relay modules, sensors external NDP, external DP etc.

**Displays:** The IQ241 can be fitted with 3 different types of display, a Display Panel, a Network Display Panel, and a PC.

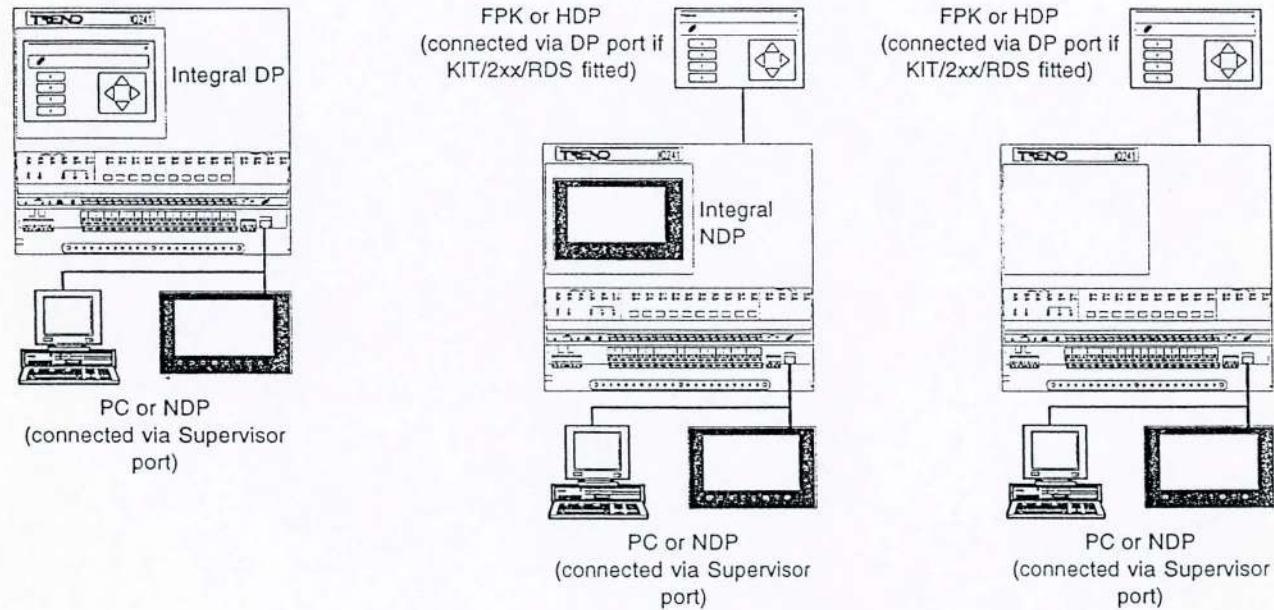
**Display panel:** A display panel can be mounted externally, or in the front cover, to provide access to parameters within the controller. External connection of a display panel requires the KIT/2xx/RDS option to be fitted, this makes it possible to connect standard FPK, or HDP display panels. If mounted in the front cover, the KIT/2xx/RDS option is not required, because the display panel is an IQ2 display panel which does not require the Kit. If a display panel is fitted in the front cover it will not be possible to connect an external display panel or mount an internal Network Display Panel.

**PC:** A computer running a Trend Supervisor or Engineering Tool can be connected to the Trend network via the controller's supervisor port without the need for an additional node controller although it does have its own network address. When connected in this way the supervisor will have access to all devices on the network, and will function as if it were connected via its own node controller. If a supervisor/engineering tool is connected to the controller it is not possible to connect an external NDP

The second consists of 20 connectors for relay modules etc connected to channels 21 to 40. The 1000 mA will normally be available, but if the IQ241 has an integral NDP and an additional communications node fitted, only 900 mA will be available to be shared between the two supplies.

**Network Display Panel:** A Network Display panel can be mounted externally or in the front cover to provide access to parameters within all IQ controllers on a single or multi-Lan system. Using icons, and softkeys it allows an operator to perform, under password protection, supervisory functions, such as setpoint adjustments, or to view logs and alarms from all controllers on the system. It can be powered from the IQ241. Connection is via the internal NDP port (when mounted in front cover), or the supervisor port (when mounted externally). If mounted in the front cover, it is not possible to mount an internal Display Panel, and if the supervisor port is used to connect the NDP it is not possible to connect a Supervisor/Engineering Tool.

The diagrams below illustrate the various combinations in which the display panels, network display panels and supervisor/engineering tools can be connected.



**Inputs:** The input channel combination is dependent on the S cards fitted. The 241 has 12 on board digital inputs, and can accept up to 10 input type S cards each of which provides 2 input channels.

**Outputs:** The output channel combination is dependent on the S cards fitted. The 241 has 8 on board analogue voltage outputs and can accept up to 6 output type S cards each of which provides 2 output channels

## COMPATIBILITY

|                          |                                                                                         |                       |                                                                                                               |
|--------------------------|-----------------------------------------------------------------------------------------|-----------------------|---------------------------------------------------------------------------------------------------------------|
| <b>Supervisors:</b>      | 94x series, 921.                                                                        | <b>Interface:</b>     | It can be connected to Trend interface modules. Check interface module specification to ensure compatibility. |
| <b>Utility software:</b> | 822+/Toolbox version 6, 841 Strategy Browser, 842 Change Tracker, ACE+.                 | <b>Local Display:</b> | Network Display Panel, standard Display Panel.                                                                |
| <b>Controllers:</b>      | It can communicate to other Trend IQ controllers using inter controller communications. |                       |                                                                                                               |

## COMPATIBILITY (Continued)

**Strategy files:** A standard uploaded strategy file (.IQF) can be downloaded to an IQ241 (see loop reschedule time below), but an .IQF file uploaded from an IQ241 has a different format to all other controller files. It cannot be downloaded into IQ1 series controllers. If this is attempted, the controller will fail to send 'Load OK'. Because of the IQ241's flexible I/O the I/O channel reference will be different as described earlier in this data sheet.

**Loop reschedule time:** The strategy file uploaded by the 822+/Toolbox is designated the .IQF file. When this is downloaded to the IQ241, the IQ241 assumes that it has come from an IQ131+ and will change the loop reschedule time accordingly.

If the file being downloaded to the IQ241 has come from an IQ151, or 151+ then (because of the way the IQ241 stores the reschedule time) the loop reschedule time will have to be multiplied by 3 and re-entered by the user.

**Sensor logs:** Although the IQ241 has 1000 values per logging channel, some Trend display panel and supervisor/tool applications can only accept the first 96 values of logs using 1 minute, 15 minute, 1 hour, and 24 hour time intervals. This is shown in the table below.

|                                                     |                                                                          |
|-----------------------------------------------------|--------------------------------------------------------------------------|
| All 921, 822, 942, 943, NDP, and pre 945 Issue 2.0. | Access first 96 values of 1 minute, 15 minute, 1 hour and 24 hour logs‡. |
| 945 Issue 2.0.                                      | Access all values from all logs except 1 s.                              |
| NDP 2.20.                                           | Access first 96 values from all logs.                                    |

‡ Only the first 58 channels can be accessed

**Sensor types:** For sensor type 0, if the data file has been uploaded from an IQ151+ (or earlier controller using ±5 V for linear voltage T and B parameters) and if the sensor outputs a voltage signal, the T and B values will have to be multiplied by 2 and re-entered by the user.

For sensor type 2, parameters set up in all other IQ controllers will operate correctly in a IQ241 for a thermistor, but if the sensor is current or voltage it will need to have the sensor type changed to 3. When the sensor type is changed, the other parameters (B, T, F, G etc) will stay the same and hence be correct.

Not all Trend display panels, and supervisor/tool applications can set up or change logging channels for the new time bases. This is summarised in the table below.

|                                                |                                                                                                                                                                                                                                       |
|------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All 921, 822, 942, 943, and pre 945 Issue 2.0. | Can edit existing channels, and set up new ones using 1 minute, 15 minute, 1 hour, and 24 hour time intervals unless any channel has been set up using 1 second, 5 minute, 10 minute, 20 minute, 30 minute, and 6 hour time interval. |
| 945 Issue 2.0                                  | Can edit existing channels, and set up new ones using all time intervals except 1s.                                                                                                                                                   |

## INSTALLATION

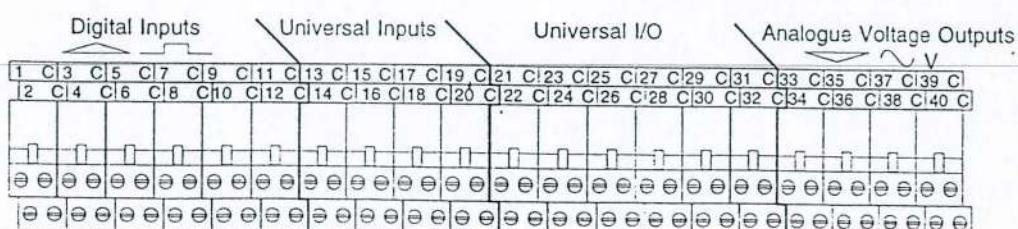
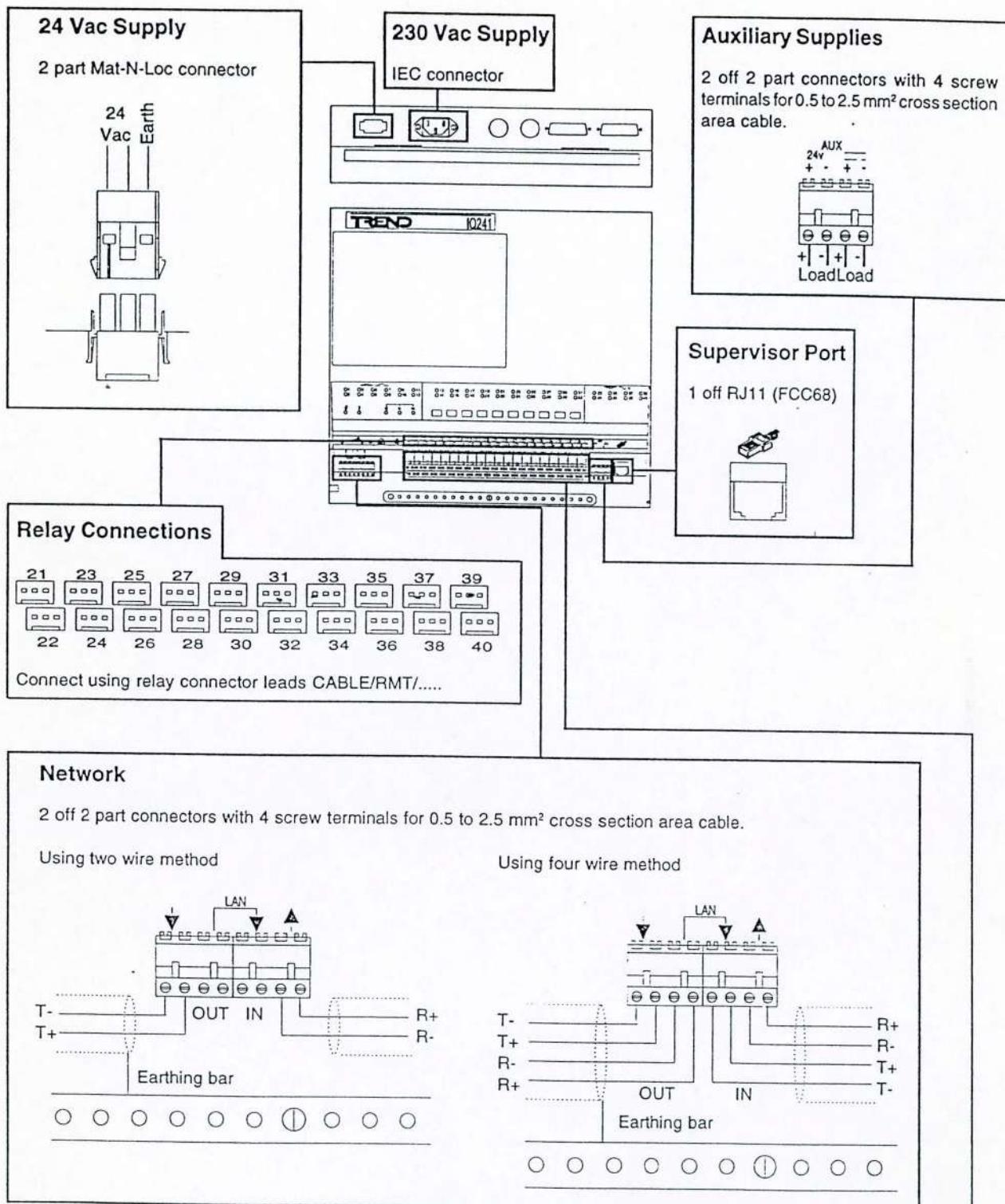
The IQ241 Controller is installed on a flat surface, a wall, or panel, using screws and washers. The procedure involves:

- mounting the controller in position
- routing the cable to the controller
- connect the I/O
- fit the S cards
- connect the auxiliary supply

- specify network address and baud rate
- connect to network
- Power up
- configure the strategy

The installation procedure is covered in the IQ241 Installation Instructions (TG103012). More detailed connection information is shown on the next page.

## CONNECTIONS



## FIELD MAINTENANCE

The IQ241 Controller requires virtually no routine maintenance, however it is recommended that the lithium battery be replaced every 5 years, as explained in the Installation Instructions (TG103012).

## ORDER CODES

IQ241/[Display]/[Node]/[PSU]

| [Display] |                                | [Node] |                             | [PSU] |                      |
|-----------|--------------------------------|--------|-----------------------------|-------|----------------------|
| Blank     | No display.                    | blank  | No node                     | 230   | 230 Vac power supply |
| ENDP      | IQ241 with NDP in front cover. | MNC    | Node including Trend MODEM  | 24    | 24 Vac power suply   |
| DP        | IQ241 with DP in front cover.  | ANC    | Node for proprietary MODEM  |       |                      |
|           |                                | CNC    | Node for Trend network      |       |                      |
|           |                                | PNC    | Node for remote printer     |       |                      |
|           |                                | INC    | Node for Trend Internetwork |       |                      |
|           |                                | AND    | Node for ISDN               |       |                      |
|           |                                | XN28   | Node for PSDN               |       |                      |
|           |                                | XNC    | Node for user configuration |       |                      |

e.g. IQ241/ENDP/MNC/230

Specifies an unboxed IQ241 with integral NDP, integral MNC, and 230 Vac power supply.

## S cards

- SCVO 1 Analogue voltage output S cards (provides 2 analogue voltage output per card).
- SCVI 1 Analogue voltage input S cards (provides 2 analogue voltage inputs per card).
- SCCI 1 Current input S cards (provides 2 current inputs per card).
- SCTI 1 Thermistor input S cards (provides 2 thermistor inputs per card).
- SCDI 1 Digital input S cards (provides 2 digital inputs per card).

## Cable management system

ENCLS/CMtray/241 1 cable management tray and cover (only 1 may be fitted to a single IQ241).

## Relay extension system

- |                  |                                                                                                                  |
|------------------|------------------------------------------------------------------------------------------------------------------|
| ENCLS/RMtray/241 | 1 relay management tray, fixing bar, cover, insulating plate, 1 paper label, 1 sticky label, and 16 light pipes. |
| CABLE/RMT/20     | 8 off 20 cm relay connection leads                                                                               |
| CABLE/RMT/50     | 8 off 50 cm relay connection leads                                                                               |
| 2RM/241          | Double relay module for mounting in relay extension system                                                       |
| 2SRM/241         | 2 single relay module on a single PCB for mounting in relay extension system                                     |
| 3RM/241          | Triple relay module for mounting in relay extension system                                                       |
| 6RM/241          | Six relay module for mounting in relay extension system                                                          |

*Note that if any ENCLS/RMtray/241 option is ordered the ENCLS/CMtray/241 option must also be ordered.*

## ON/OFF/AUTO Switch Kit

HOA/241 1 ON/OFF/AUTO switch with cable and connector.

*Note that this option can only be fitted if the relay extension system is being used.*

## Retro fit kits

- |              |                                                      |
|--------------|------------------------------------------------------|
| KIT/ENDP/241 | Kit to retrofit Network Display Panel in front cover |
| KIT/DP2      | Kit to retrofit Display Panel in front cover         |
| KIT/2xx/RDS  | Kit to enable connection of FPK or HDP               |
| KIT/[Node]   | Kit for fitting additional node                      |

| [Node] |                             |
|--------|-----------------------------|
| MNC    | Node including Trend MODEM  |
| ANC    | Node for proprietary MODEM  |
| CNC    | Node for Trend network      |
| PNC    | Node for remote printer     |
| INC    | Node for Trend Internetwork |
| AND    | Node for ISDN               |
| XN28   | Node for PSDN               |
| XNC    | Node for user configuration |

## Enclosures

- |           |                                                            |
|-----------|------------------------------------------------------------|
| ENCLS     | 600 mm x 600 mm x 210 mm IP55 enclosure                    |
| ENCLS/FPK | 600 mm x 600 mm x 210 mm IP55 enclosure with FPK on front. |
| ENCLS/NDP | 600 mm x 600 mm x 210 mm IP55 enclosure with NDP on front. |

**SPECIFICATIONS****CONTROLLER****Electrical**

|                       |                                                                                                                                        |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| CPU                   | :68332 32 bit micro controller                                                                                                         |
| CPU speed             | :16.78 MHz                                                                                                                             |
| Cycle time            | :1 s                                                                                                                                   |
| Memory                | :256 kbyte battery backed SRAM, and 256 kbyte Flash.                                                                                   |
| Supply voltage /230   | :230 Vac +15 -10 %, 50 to 60 Hz                                                                                                        |
| /24                   | :24 Vac +15 -10 %, 50 to 60 Hz                                                                                                         |
| Auxiliary supply      | :24 Vdc, 1000 mA dependent on configuration, see page 5 for further details.                                                           |
| Consumption           | :60 VA max                                                                                                                             |
| Battery backup        | :Battery maintains time, and logged data with mains off for at least 5 years.                                                          |
| Battery               | :Saft LM2450, 3 V, or equivalent                                                                                                       |
| Clock accuracy        | :30 s per month (typical).                                                                                                             |
| Network               | :20 mA serial 2 wire current loop, opto isolated, polarity independent receiver.                                                       |
| Network display panel | :Icon driven display panel with backlit display, for use on single or multi Lan systems. Can be mounted in front cover, or externally. |
| Display panel         | :2x40 character display, with 4 programmable softkeys. Can be mounted in front cover, or externally via display panel connector        |
| Distance              |                                                                                                                                        |
| Supervisor            | :15 m                                                                                                                                  |
| Network               | :Dependent on cable type, see table below.                                                                                             |

| Cable       | 1k2 baud | 9k6 baud | 19k2 baud | No. of Wires |
|-------------|----------|----------|-----------|--------------|
| Belden 9182 | 1000 m   | 1000 m   | 700 m     | 2            |
|             | 9207     | 1000 m   | 1000 m    | 2            |
|             | 8761     | 1000 m   | 700 m     | 2            |
|             | 8723     | 1000 m   | 500 m     | 4            |

|                   |                                                                         |
|-------------------|-------------------------------------------------------------------------|
| Baud rate         |                                                                         |
| Network           | :Selectable by switch 1k2, 9k6, or 19k2.                                |
| NDP               | :9k6.                                                                   |
| Supervisor        | :9k6.                                                                   |
| Network addresses |                                                                         |
| Controller        | :Selectable by switch, 116 nodes addressable (1,4 to 119 excluding 10). |
| Supervisor port   | :Software selectable, 116 nodes addressable (1,4 to 119 excluding 10).  |
| NDP port          | :Software selectable, 116 nodes addressable (1,4 to 119 excluding 10).  |

|     |                   |                                                                                                                                                                                                                                  |
|-----|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I/O | Channels 1 to 12  | 12 digital inputs. Internally, or self powered volt free contact. Wetting current 4 mA @ 24 Vdc, count rate 32 Hz max. 1 Status LED per channel. ON if input is closed.                                                          |
|     | Channels 13 to 20 | 8 universal inputs, 4 slots to fit Trend analogue voltage input, current input, thermistor input, or digital input S cards.                                                                                                      |
|     | Channels 21 to 32 | 12 universal I/O, 6 slots to fit Trend analogue voltage input, current input, thermistor input, digital input, or analogue voltage output S cards.                                                                               |
|     | Channels 33 to 40 | 8 analogue voltage outputs. 8 bit resolution (256 steps). 0 to 10 V with 20mA current limit, accuracy $\pm 50\text{mV}$ equivalent to $\pm 0.5\%$ span. 1 Status LED per channel. Light intensity increases with output voltage. |

**Mechanical**

|                       |                                                                                                   |
|-----------------------|---------------------------------------------------------------------------------------------------|
| Dimensions            | :325 mm x 355 mm x 85 mm                                                                          |
| Material              |                                                                                                   |
| Chassis               | :Steel                                                                                            |
| Cover                 | :Fire retardant ABS                                                                               |
| Protection            | :IP40                                                                                             |
| Weight                | :5.6 kg                                                                                           |
| Connectors            |                                                                                                   |
| /230                  | :IEC plug                                                                                         |
| /24                   | :Mat-N-Loc                                                                                        |
| Network               | :2 part connector with 4 screw terminals for 0.5 to 2.5 mm <sup>2</sup> cross section area cable. |
| I/O                   | :2 part connector with 2 screw terminals for 0.5 to 2.5 mm <sup>2</sup> cross section area cable. |
| Supervisor            | :RJ11 (FCC68), for Trend utility software connected via adaptor cable PART/10/1442.               |
| Display panel         | 25 way D type if fitted.                                                                          |
| Relay                 | :2 part 3 pin in line connector for power.                                                        |
| Relay connector leads | :100 mm, or 300 mm long with 2 part 3 pin in line connectors.                                     |

**Environmental**

|                |                             |
|----------------|-----------------------------|
| EMC            |                             |
| Emissions      | :EN50081-1.                 |
| Immunity       | :EN50082-2.                 |
| Safety         | :EN61010.                   |
| Ambient limits |                             |
| storage        | :-10 °C to 50 °C            |
| operating      | :0 °C to 45 °C              |
| humidity       | :0 to 95 %RH non-condensing |

**Indicator Lamps**

|     |                                                         |
|-----|---------------------------------------------------------|
| PWR | :ON when power supply is connected.                     |
| WD  | :ON if controller has a software fault.                 |
| LAN | :ON if network is operating.                            |
| TX  | :ON if current is flowing from the network transmitter. |
| RX  | :ON if current is entering the network receiver.        |

**SPECIFICATIONS** (Continued)**S CARDS**

Dimensions :32 mm x 45 mm x 10 mm

**Analogue voltage input card**

Analogue voltage inputs :2 channels per card, 12 bit resolution (4096 steps). Minimum 60 dB series mode rejection at supply frequency. 0 to 10 V, input resistance 200 kΩ, accuracy 50 mV equivalent to ±0.5% of span.

**Current input card**

Current inputs :2 channels per card, 12 bit resolution (4096 steps). Minimum 60 dB series mode rejection at supply frequency. 0 to 20 mA, input resistance 250 Ω 0.1%, accuracy 0.5 % of span (i.e. 100 µA).

**Thermistor input card**

Thermistor inputs :2 channels per card, 12 bit resolution (4096 steps). Minimum 60 dB series mode rejection at supply frequency. Thermistor, bridge resistor 10 kΩ 0.1%, accuracy 0.5 % of span. Bridge supply 5 V.

**Digital input card**

Digital inputs :2 channels per card. 1 Status LED per channel. ON if contact closed.

**Analogue voltage output card**

Analogue voltage outputs 2 channels per card, 8 bit resolution (256 steps). 0 to 10 V with 20 mA current limit, accuracy ±50 mV equivalent to ±0.5 % span. 1 Status LED per channel. Light intensity increases with output voltage.

**RELAY EXTENSION SYSTEM**

Dimensions :120 mm x 355 mm 85 mm (including cover)

Material tray :Steel  
cover :Fire retardant ABS  
insulating plate :Plastic  
Protection IP40 (when fitted to IQ241)  
Weight 0.4 kg  
Light pipes :40 mm, 3mm diameter perspex piping.

**CABLE MANAGEMENT SYSTEM**

Dimensions :60 mm x 355 mm 85 mm (including cover)

Material tray :Steel  
cover :Fire retardant ABS  
Protection IP40 (when fitted to IQ241)  
Weight 0.3 kg

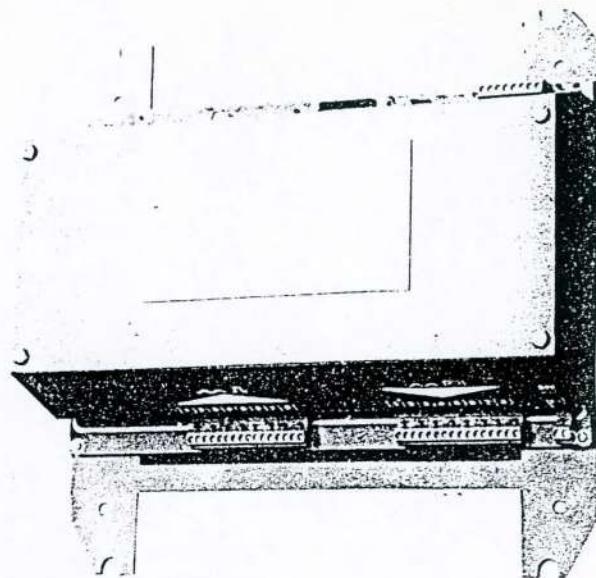
**SWITCH KIT**

Switch :1 off SPDT switches for ON/OFF/AUTO control of relays.

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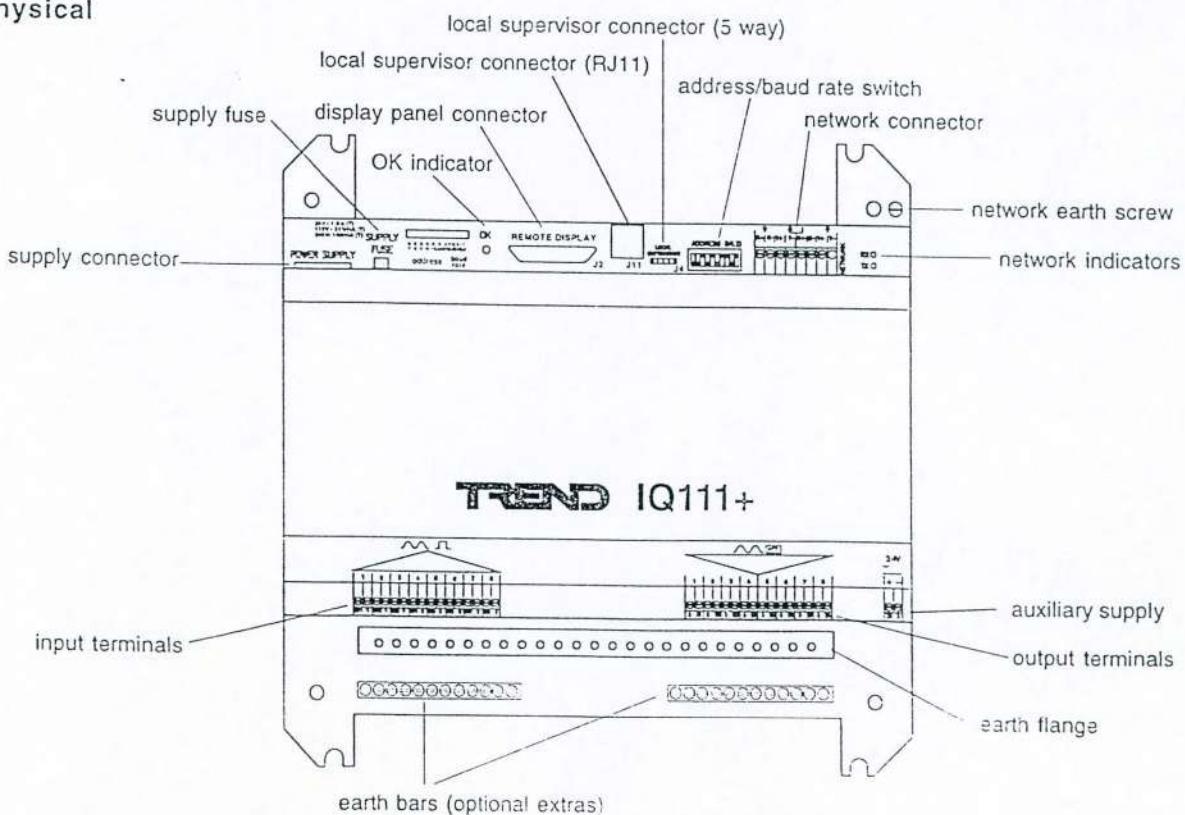
Caradon Trend Limited. P.O. Box 34 Horsham Sussex RH12 2YF England Tel:+44 (0)1403 211888 Fax:+44 (0)1403 241608 email:info@trend.caradon.co.uk

**IQ111+ CONTROLLER****Description**

The IQ111+ Controller is a medium sized controller in the Trend range with 8 universal inputs and 8 analogue outputs. It provides DDC with PID loops and is supplied in a range of options (stand alone, system, display panel, modem, and enclosures).

**Features**

- Full DDC control with PID control loops.
- Stand alone or integrated system operation.
- Communicates with a local supervisor.
- 8 input points
- 8 output points

**Physical**

## INSTALLATION

### MECHANICAL (dimensions in mm)

Site locations for the controller should provide safe access for maintenance and a suitable operating environment.

- (1) Fix the controller to a permanent structure using four screws or lugs as shown below.

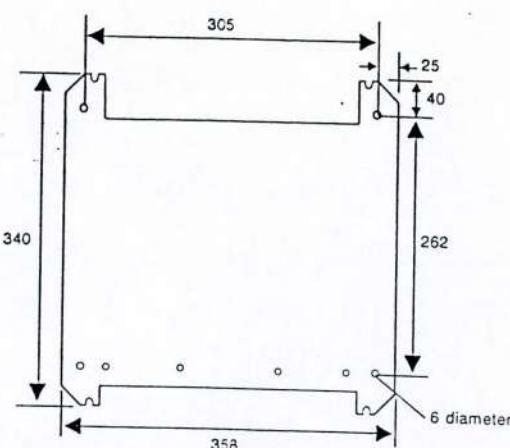
*Notes:* Do not cover, allow air circulation.  
Do not operate outside the ambient temperature range (0 to 45 °C).

*Do not operate in a humidity outside the range 0 to 90 %RH non-condensing.*

*Protect from direct contact with steam or water.*

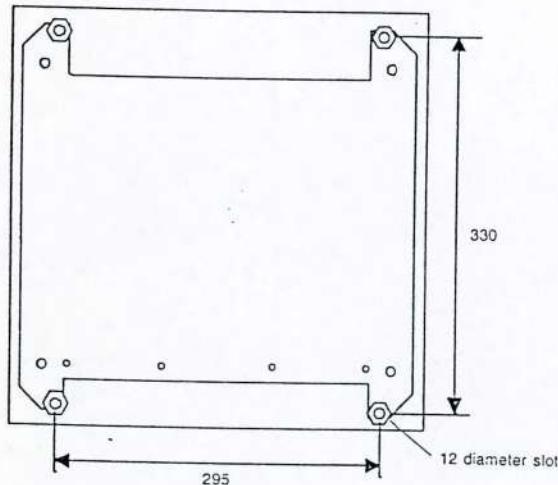
If an optional communications node controller is fitted in the IQ111+, refer to the appropriate data sheet for installation and commissioning details. Connection details are shown in the maintenance section of this data sheet.

### IQ111+/UNB/:chassis only version



Mount using four screws in 6 mm diameter holes.

### IQ111+/BOX/:boxed version



Supplied in 380 mm x 380 mm x 210 mm cabinet, the boxed version IQ is mounted on the four cabinet studs via the four 12 mm slots using nuts and washers. The standard cabinet is fitted with a gland plate in the base with a 60 mm x 300 mm cable entry area.

### ELECTRICAL

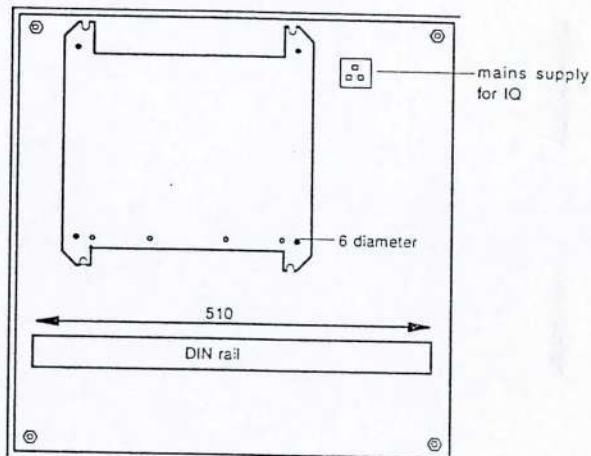
#### Network Connection

- (3) Make the necessary network connections as indicated in the diagram, connecting T+ and T- to R+ and R- of other device and vice versa.

If the adjacent devices have four terminal network connections, connect as described in the Network Engineering Manual.

The choice of network cable should be made according to distance and baud rate as shown in the table.

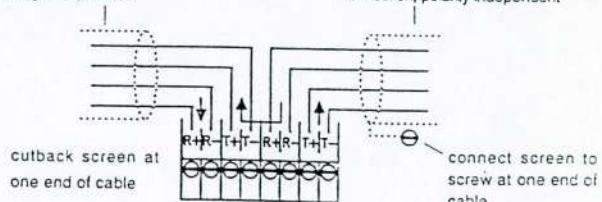
### IQ111+/LB/:large box version



The large box version is supplied as shown in a 600 mm x 600 mm x 210 mm cabinet. The cabinet is fitted with a backplate and the IQ is mounted on the backplate using 4 screws in the 6 mm diameter holes. The DIN rail is fitted below the controller and may be used for mounting interface modules. The large box is fitted with a gland plate in the base with a 120 mm x 510 mm cable entry area.

connect to IN connector of previous device if it has an eight terminal network connection, polarity independent

connect to OUT connector of next device if it has an eight terminal network connection, polarity independent

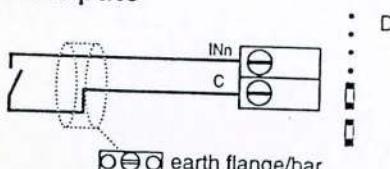
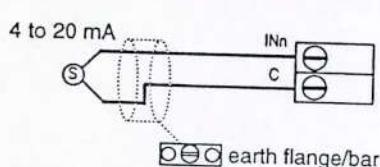
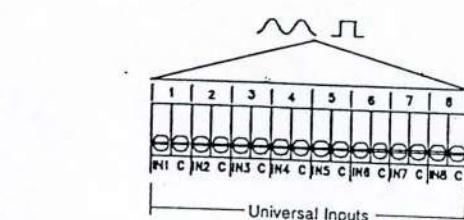
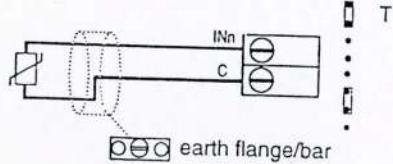
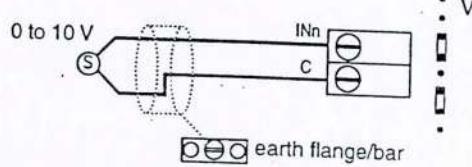
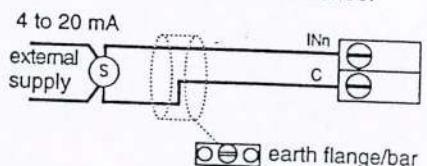


| Cable       | 1k2 baud    | 9k6 baud    | 19k2 baud  |
|-------------|-------------|-------------|------------|
| Belden 9182 | 1000 metres | 1000 metres | 700 metres |
| Belden 9207 | 1000 metres | 1000 metres | 500 metres |
| Belden 8761 | 1000 metres | 700 metres  | 350 metres |
| Belden 8723 | 1000 metres | 500 metres  | 250 metres |

**INSTALLATION** (continued)**INPUT CONNECTIONS**

- (4) Make the necessary input connections.

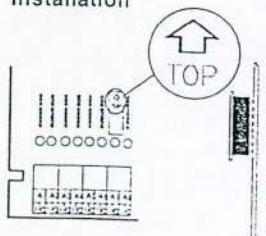
The input linking must be established before power is applied (see commissioning). All inputs should use screened cable to reduce nuisance readings, especially with thermistors. Cable screens are screwed to the earth flange, or connected to the earth bars. The two earth bars are optional extras and each have ten 4.2 mm diameter terminals. On the earth flange the screen is terminated in a crimped eyelet and attached to the flange by a No. 8 self tap screw. Other types of inputs may be catered for by using the Input Isolation Module or the 4 DIX (input multiplexor) or 4SIM (ac inputs). For details see the appropriate data sheets.

**Digital Inputs****Analogue Inputs****Current Source Sensor (e.g. Trend)****Thermistor****Voltage Output Sensor****Externally Powered Current Sensor**

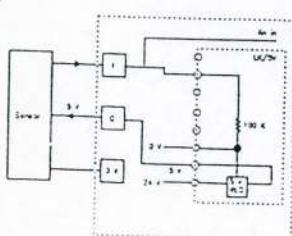
**WARNING:** The 24 V instrument supply will destroy the precision  $250 \Omega$  scaling resistor if it is connected directly to an input set for 20 mA (e.g. if linked for I and connected as a digital input). Power off the IQ111+ before wiring or unwiring a current sensor.

**Link Headers**

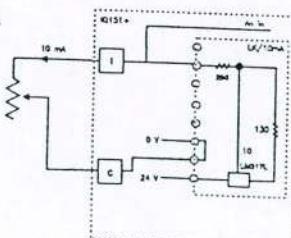
Additional types of inputs may be catered for by link headers. These link headers LK/5, LK/15V and LK/10mA are the only link headers that may be used on IQ111+'s. For more details on all link headers see the Link Header Data Sheet, 91-0905.

**Installation**

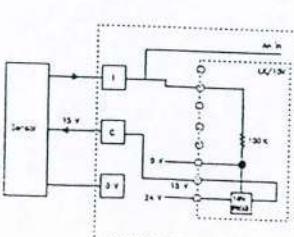
The links should be removed, and the link header boards should be fitted to the linking pins of the input board with the components on the underside, and the arrow pointing upwards.

**LK/5V**

This link header provides a regulated 5 V supply at 20 mA maximum to an analogue input device.

**LK/10mA**

This link header provides a regulated 10 mA through the analogue input device. If the input device is  $100 \Omega$  to  $1 k\Omega$  potentiometer, the analogue input will measure 1 to 10 V.

**LK/15V**

This link header provides a regulated 15 V supply at 20 mA maximum to an analogue input device.

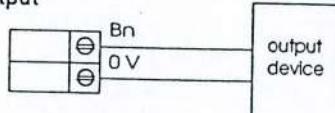
## INSTALLATION (continued)

### OUTPUT CONNECTIONS

- (5) Make the necessary output connections see below.

The output may use screened cable to reduce spurious pick-up, although this is not mandatory. The cable screen should be connected to the earthing flange or bar (optional extra).

#### Ordinary Output



### POWER CONNECTION

- (5) Connect the controller to the supply using the cable provided.

#### 110, 220, 240 Vac versions

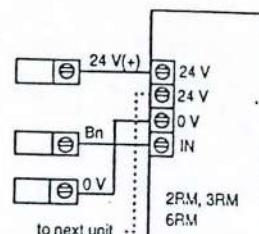
- Connect Line (~), Neutral (N), and Earth (L) via IEC connector

The earth line (L) is internally connected to the chassis.

**WARNING: This equipment must be earthed.**

*Note: The 0 V signal line is internally connected to the chassis in all versions.*

#### Output using Relay Module



*Note that the output supplies 0 to 10 Vdc. If a single relay is required, use SRMV.*

#### 24 Vac version

- Connect 24 Vac (~), Common (N), and Earth (L) via 2 part screw terminals.

24 Vac supply must be isolated. The chassis terminal must be earthed.

#### 24 Vdc version

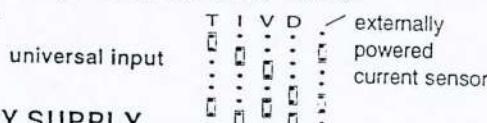
- Connect +24 Vdc (marked ~), 0 Vdc (N), and Earth (L) via 2 part screw terminals.

## COMMISSIONING

### INPUT LINKING

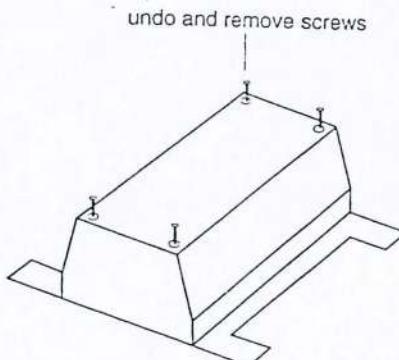
- (1) Set the input linking.

Remove the cover by undoing the 4 screws. The input link is located behind each analogue or universal input terminal group. If the link is omitted an open circuit input will result in random values being read by the controller sensor module.



### AUXILIARY SUPPLY

The auxiliary 24 Vdc supply is available to supply node controllers or interface modules (e.g. 2RM, 3RM, 6RM, MNC).



It has a maximum current of 200 mA (fused at 250 mA for safety). This is available in addition to fully powering the input channels.

### POWER UP

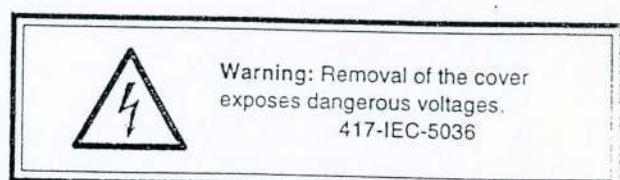
- (2) Ensure cover is fitted and power up the controller.

On power up the OK indicator will light. If it does not, check the power supply and fuse.

If the fault is corrected, the indicators will light after a few seconds and the network bypass relay will be heard to operate. If this does not happen the unit is faulty.

### DIGITAL INPUTS

- (3) To monitor the digital inputs remove the cover by removing the 4 screws on the top of the controller that hold the cover and lifting it off.
- (4) The state of the digital inputs can be monitored by the indicators. If a digital input contact is closed, its indicator will illuminate.

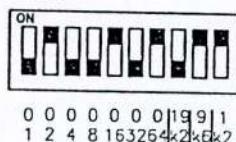


## COMMISSIONING (continued)

### NETWORK

Necessary only for those controllers networked to other devices.

- (4) Set the address switch to a unique valid address (that is in the range 1, 4 to 119 excluding address 10).



The address is formed by summing the values of all poles which are down. The illustration shows  $1+4+8+32$  which equals 45.

- (5) Set up the baud rate so that all nodes on the local network are at the same baud rate. The illustration shows 19 k2 baud.

On power up the TX and RX indicators will light indicating network current flow. If TX is off then the cable to the following controller may be faulty (open circuit). If RX is off then the cable from the previous controller may be faulty (open or short circuit). Check the leads and connections.

TX

RX

To check the controller alone, wire T+ and T- to R+ and R- and confirm the TX and RX indicators light. No indicators lit, and correct power applied indicates a faulty unit.

The 822+/Toolbox program may be used for more extensive network diagnosis by identifying the nodes responding on the network (map function). Network alarms will indicate if there is a broken network. A commissioning and fault finding procedure is described in the Network Engineering Manual.

### STRATEGY

The controller may be supplied preconfigured with an application strategy or it may be supplied without a strategy, in which case it will need to be configured by the user. Details of configuration are given in the IQ Configuration Reference Manual.

The strategy can be configured over the network or via the local supervisor connector using a PC running 822+/Toolbox utility. The PC can be connected either to the 5 way in-line local supervisor connector via a 9F to 25M cable (PART/58/0750) plus a 25F to 5 way in-line (PART/78/1172), or to the RJ11 connector via the 9F to RJ11 cable (PART/10/1442).

Once the strategy is configured, check that it functions correctly by exercising the inputs (e.g. warming a sensor) and checking that the correct response is given by the outputs (i.e. check plant operation).

The value of the reference voltage is used by the IQ for voltage and current (i.e. Linear) sensor scaling and may be calibrated on the configuration "addRes" page (reference Voltage). This is factory preset but may be recalibrated if an input inaccuracy is suspected or after changing the battery or firmware. The recalibration is performed by removing the cable on input channel 1, selecting thermistor (T) linking, and measuring the voltage between the IN1 terminal and the C terminal. The link is then returned to the required position. The reference voltage should be set to this value. Only reference voltages between 4.8 V and 5.2 V will be accepted.

The sensor module will need to be set to the correct sensor type scaling for the particular type of sensor being used. The table relates the sensor type to its configuration parameters.

The parameters T and B in sensor type module should be set to the value of the variable being sensed which produces the sensor output level shown e.g. for a 4 to 20 mA linear sensor, T should be set to the sensed variable value which produces a sensor output of +20mA.

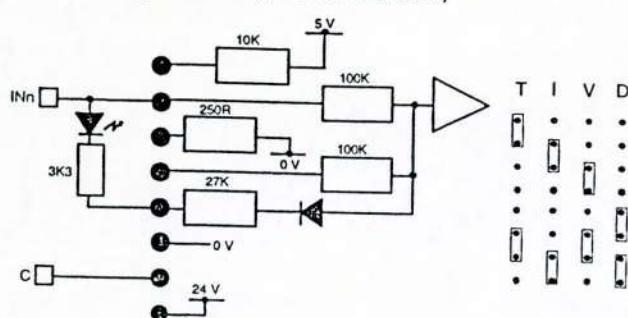
| Sensor type                     | Sensor type Scaling | Range                                          |        |
|---------------------------------|---------------------|------------------------------------------------|--------|
|                                 |                     | T                                              | B      |
| Thermistor                      | Linearise           | See sensor data sheet for 10 V reference table |        |
| 4 to 20 mA                      | Linear              | 20 mA                                          | -20 mA |
| 4 to 20 mA (externally powered) | Linear              | 20 mA                                          | -20 mA |
| 0 to 10 V                       | Linear              | 10 V                                           | -10 V  |

### CONFIGURATION MODULES

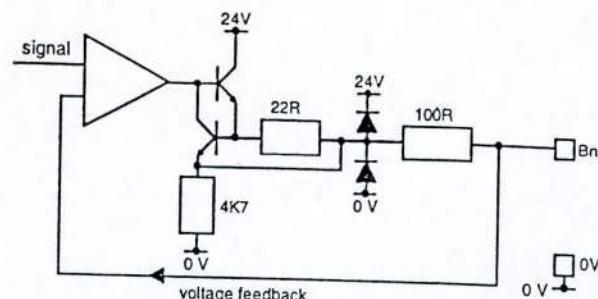
|               |     |                     |        |
|---------------|-----|---------------------|--------|
| Sensor        | 32  | Critical alarm      | 4      |
| Sensor type   | 8   | Alarm history       | 20     |
| Loop          | 16  | I/C communications  | 16     |
| Function      | 64  | Digital inputs      | 32     |
| Logic         | 64  | Fast sequence       | 8      |
| Driver        | 12  | Zone                | 5      |
| Knob          | 30  | Schedule            | 8      |
| Switch        | 20  | Calendar            | 20     |
| Sensor log    | 20  | User password       | 6      |
| Sequence step | 148 | Sequence cycle time | 5 secs |

## INPUT/OUTPUT CIRCUITS

#### **Universal Input circuit (8 identical circuits)**

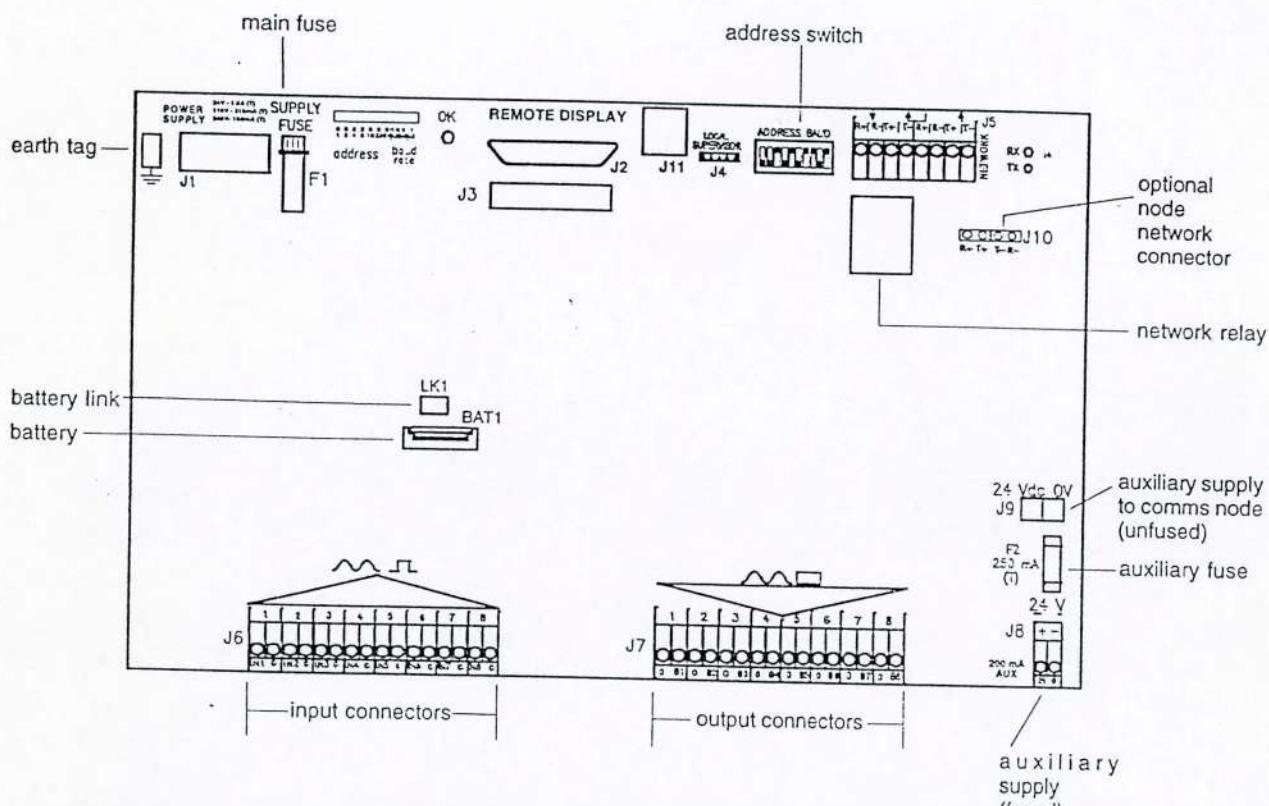


#### **Output Circuit (8 identical circuits)**



## FIELD MAINTENANCE

MAIN BOARD



**Warning: Removal of the cover  
exposes dangerous voltages.**  
417-IEC-5036



**Warning: Static Sensitive devices.**  
417-IEC-5134

#### CHANGING THE FUSE

There are two fuses, the main supply fuse, and the auxiliary fuse. Their ratings are as follows:

|           | PSU version          | Fuse      |
|-----------|----------------------|-----------|
| Main fuse | 24 Vac or 24 Vdc     | 1.6 A     |
|           | 110 to 120 Vac (110) | 315 mA(T) |
|           | 220 to 240 Vac (230) | 160 mA(T) |

Auxiliary Fuse = 250 mA(T)

All fuses 5 x 20 mm

#### To replace a fuse:

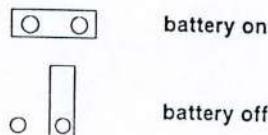
- (1) Power down the unit.
  - (2) For auxiliary fuse only, remove main cover.

- (3) Replace fuse with one of correct rating.
  - (4) Replace main cover.
  - (5) Power up unit and check operation.

## FIELD MAINTENANCE (continued)

### BATTERY LINK

The IQ111+ is normally supplied with the battery link fitted in the ON position. In this position the controller memory and internal clock are kept supplied in the event of supply failure. If this link is removed and pushed back onto one pin, all memory contents (application strategy) are lost and the clock will lose its time synchronisation if the supply fails. If users are designing their own strategies they may wish to move the link to the OFF position to prolong battery shelf life. The normal battery life with no power fail is 14 years.



To move the battery link:

- (1) Power off the controller, unplug the supply cable, and remove the cover.
- (2) Be aware of static precautions and locate the battery link and move it.

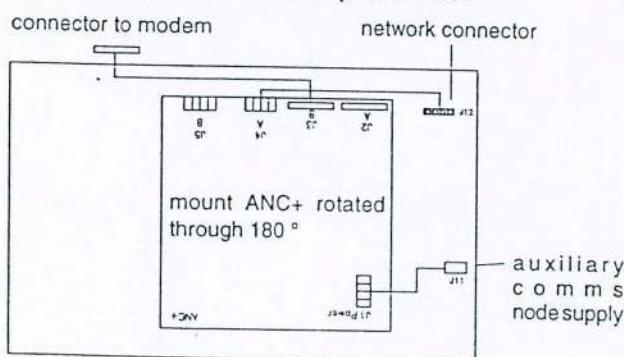
If the battery link has been restored to the ON position, the controller will need reconfiguring and the clock will need to be synchronised.

### OPTIONAL NODE CONTROLLERS

The optional node controllers are fitted onto four standoffs mounted on the IQ111+ board. They should be connected and set up as described in the node controller data sheet. Examples of installed ANC+ and MNC+ are shown below.

The network connection normally has links fitted (R+ to T+, T- to R-), these have to be removed before connecting the node controller network cable (part no. 50-2781). Note that if the IQ is autodialled (ANC+ or MNC+) and stand alone, the external network connectors must be linked as shown.

#### Internal cabling for IQ111+ with optional ANC+



### BATTERY REPLACEMENT

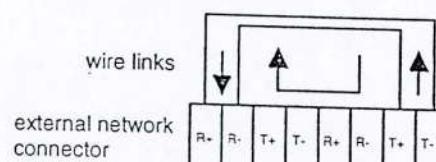
If the battery has run-down due to a period of power failure, it will need to be replaced. The battery is a non-rechargeable lithium plug in cell size 2450 with a nominal voltage of 3.0 V and a capacity of 500 mAh.

To replace the battery:

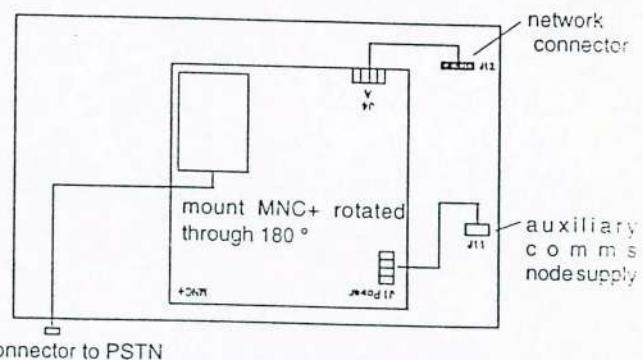
- (1) Take a strategy backup (see 822+/Toolbox User manual).
- (2) Power off the controller, disconnect the supply cable and remove the cover.
- (3) Be aware of static precautions, locate the battery and lift it from its holder.
- (4) Replace the battery, ensuring correct polarity.
- (5) Download strategy (see 822+/Toolbox User Manual). This may be done from a local supervisor or over the network. Access via the network may need a Personal Identification Number obtainable from Trend Technical Support.

**WARNING:** The lithium battery must not be recharged, disassembled, burnt or short circuited. Misuse may cause explosion or fire. Dispose of carefully. Refer to Health and Safety Executive Guidance Note GS43.

Links to be fitted if autodialled and stand alone.



#### Internal cabling for IQ111+ with optional MNC+

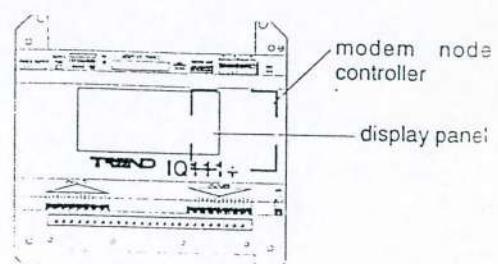


### PRODUCT CODES

IQ111+/[Enclosure]/[DP]/[Node controller]/[PSU]

e.g. IQ111+/UNB/DP/MNC/230

| [Enclosure]  | [DP]                              | [Node controller] | [PSU]               |
|--------------|-----------------------------------|-------------------|---------------------|
| BOX box      | blank, no display panel           | CNC               | 230: 220 to 240 Vac |
| LB large box | DP integral display panel         | PNC               | 110: 110 to 120 Vac |
| UNB no box   | FPK front panel display panel kit | INC               | 24Vac: 24 Vac       |
|              | HDP hand held display panel       | MNC               | 24Vdc: 24 Vdc       |
|              | FP front panel display panel      | ANC               |                     |



PART/15/3003: Earth bar option (up to two may be fitted on IQ111+)

## SPECIFICATIONS

### Absolute Maximum Ratings (see below for details)

Ambient limits -10 to 50 °C (storage)  
 Electrical supply, Nominal voltage -15 % + 10 %  
 Battery life, 2 years minimum (full shut down)

### Electrical

|                                  |                                                                                                                                                                                                  |                                    |                                                                                                                                                                                    |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Wiring                           | :2 part connector screw terminals for 0.5 to 2.5 mm <sup>2</sup> cross section area cable.                                                                                                       | Outputs<br>(channels 1-8)          | :Analogue, 8 bit resolution (256 steps). 0 to 10 Vdc with 20 mA current limit accuracy 3 %. Can be extended to drive loads digitally by using external Trend interface modules.    |
| Supply                           | :Nominal voltage -15 to +10 %, 47 to 63 Hz                                                                                                                                                       |                                    | :gold plated screw terminals, 8 bit with oversampling equivalent to 11 bit (2048 steps) linkable for analogue current (I), analogue voltage (V) or thermistor (T), or digital (D). |
| Voltage                          | :220 to 240 Vac (230), 110 to 120 Vac (110), 24 Vac, 24 Vdc                                                                                                                                      | Universal Inputs<br>(channels 1-8) | :0 to 10 V, input resistance 200 kΩ, 1 %, accuracy 300 mV                                                                                                                          |
| Power consumption                | :35 VA max                                                                                                                                                                                       |                                    | :0 to 20 mA input resistance 250 Ω, 0.1 %, accuracy 400 μA                                                                                                                         |
| Supply Connector                 |                                                                                                                                                                                                  |                                    | :Thermistor, bridge resistor 10 kΩ, 0.1 %, accuracy 2 % span                                                                                                                       |
| 110, 230                         |                                                                                                                                                                                                  |                                    | :Bridge supply 5 V, 0.5 % internal reference                                                                                                                                       |
| 24 Vac, 24 Vdc                   |                                                                                                                                                                                                  |                                    | :50 Vdc max. by volt free contacts                                                                                                                                                 |
| Battery backup                   | :IEC plug                                                                                                                                                                                        | :V                                 | :upper threshold 13 V                                                                                                                                                              |
|                                  | :2 part screw connector 2.5 to 2.5 mm <sup>2</sup> cable                                                                                                                                         | :I                                 | :lower threshold 9 V                                                                                                                                                               |
|                                  | :Non-rechargeable plug in lithium cell size 2450, 3.0V nominal 500 mAh. Maintains data memory and time clock with mains off for two years minimum (at 25 °C). Nominal shelf life 14 years.       | :T                                 | :count rate 30 Hz max.                                                                                                                                                             |
| Clock accuracy                   | :15 secs per month                                                                                                                                                                               |                                    |                                                                                                                                                                                    |
| Auxiliary supply                 | :24 Vdc ±5 % + supply tolerance, 200 mA maximum to supply output accessory loads (e.g. MNC+, relay modules) fused at 250 mA. This supply is in addition to the full complement of input loading. | :D                                 |                                                                                                                                                                                    |
| Auxiliary Comms                  | :24 Vdc ±5 % + supply tolerance. Available inside the IQ for auxiliary communications node (e.g. MNC+). Limited by main fuse.                                                                    |                                    |                                                                                                                                                                                    |
| Node Supply                      |                                                                                                                                                                                                  |                                    |                                                                                                                                                                                    |
| Network transmission             | :20 mA 2 wire current loop, opto-isolated polarity independent receiver. Normally wired using a four wire cable to facilitate return path wiring.                                                | Mechanical                         |                                                                                                                                                                                    |
| Network distance                 | :Between units dependent on cable type (see table on page 2).                                                                                                                                    | Dimensions                         | :Unboxed (UNB) 358 mm x 340 mm x 80 mm typical                                                                                                                                     |
| Baud rate                        | :Selectable by board switches 1k2, 9k6, or 19k2.                                                                                                                                                 | Material                           | :Mild steel, plated and coated                                                                                                                                                     |
| Address                          | :Selectable by board switches, 116 nodes addressable per Lan (1, 4 to 119 excluding address 10).                                                                                                 | Enclosure dimensions               | :Boxed (BOX) 380 mm x 380 mm x 210 mm typical                                                                                                                                      |
| Supervisor transmission          | :EIA RS232                                                                                                                                                                                       | Weight                             | :Large box (LB) 600 mm x 600 mm x 210 mm typical                                                                                                                                   |
| Supervisor distance              | :15 m between IQ111+ and local supervisor                                                                                                                                                        | Boxed weight                       | :5 kg (approx)                                                                                                                                                                     |
| Supervisor baud rate             | :9k6 baud                                                                                                                                                                                        | Protection                         | :Box 16 kg (approx)                                                                                                                                                                |
| Supervisor connector             | :5 way pin header (polarity independent), 0.1 " pitch, adapter cables needed; 9F to 25M (PART/58/0750) plus 25F to 5way in-line (PART/78/1172).                                                  |                                    | :Large box 33 kg (approx)                                                                                                                                                          |
| Display panel                    | :RJ11, adapter cable needed; 9F to RJ11 (PART/10/1442).                                                                                                                                          |                                    | :IP55 (enclosure)                                                                                                                                                                  |
| DP connector                     | :optional, integral (DP), or if in a box on the front panel (FP), or external, hand held (HDP) or for cabinet panel (FPK).                                                                       | Environmental                      |                                                                                                                                                                                    |
| DP cable                         | :25 way D type socket for external DP                                                                                                                                                            | EMC emissions                      | :EN55022 Class A, FCC part 15 Class A                                                                                                                                              |
|                                  | :Trend cable PART/58/0935 (1m supplied with HDP) or PART/58/0836 (3m supplied with FPK)                                                                                                          | EMC susceptibility                 | :IEC 801-2, IEC 801-4                                                                                                                                                              |
| Distance IQ111+ to Display panel | :3 m max.                                                                                                                                                                                        | Ambient limits                     | : -10 to 50 °C (storage), 0 to 45 °C (operating)<br>0 to 90 %RH non-condensing                                                                                                     |
|                                  |                                                                                                                                                                                                  | Indicators                         |                                                                                                                                                                                    |
|                                  |                                                                                                                                                                                                  | TX                                 | :ON if current is flowing from the network transmitter                                                                                                                             |
|                                  |                                                                                                                                                                                                  | RX                                 | :ON if current is entering the network receiver.                                                                                                                                   |
|                                  |                                                                                                                                                                                                  | OK                                 | :ON if the processor healthy and network relay energised                                                                                                                           |
|                                  |                                                                                                                                                                                                  | Digital Inputs                     | :ON if digital input is on                                                                                                                                                         |

Caradon Trend Limited reserves the right to revise this publication from time to time and make changes to the content hereof without obligation to notify any person of such revisions or changes.







REF.JHW/S98057I2/jhw

13 February 2000

Benchmark  
Wool House Garden  
Carlton Gardens  
St. James's  
London  
SW1 5AD

For the attention of Mr. B. O'Leary

Dear Sirs,

**RE: 5-7 Carlton Gardens**

As requested by Mr. M. Barford, of Mace Ltd, please find attached one copy of the network schematic, drawing no. S98057-FCUNW-01 for the Seachange Fan Coil Unit Controls for the above project.

A schedule of the Fan Coil Unit Numbers relating to the Seachange Address Nos. is enclosed.

Also enclosed is a copy of the individual Fan Coil Unit wiring diagram, drawing no. S98057-220, together with Seachange data Sheets for the Fan Coil Unit Controllers, Zone Controllers, Power Supplies, and Actuator Controllers.

Yours faithfully,

**For and on behalf of Synchronised Systems**

  
**J. H. Wetherell**

Technical Director

c.c. Mr. M. Barford – Mace Limited

**SYNCHRONISED SYSTEMS**

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# SeaChange

Data Sheet

Z2

## Temp + RH Zone Controller

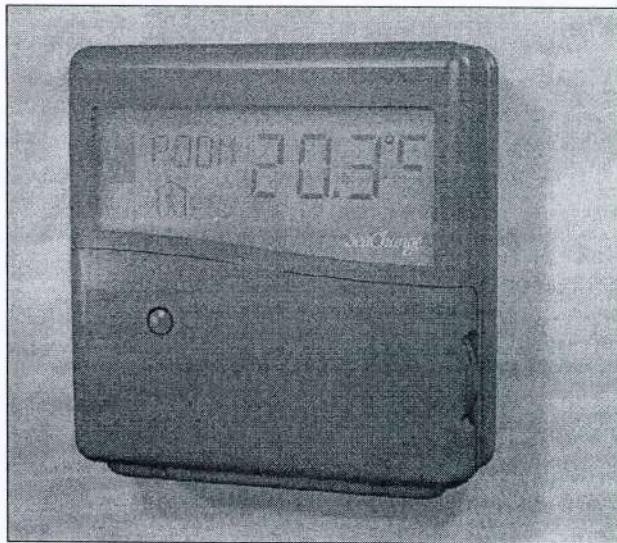
### Main Features

Controls Space Temperature only during Occupancy

Controls Humidity during Non-Occupancy periods for Protection of Building Fabric and Contents

Used to set Required Temperatures and Occupation Times

Operates with Sontay Relative Humidity & Temperature Transmitter



### Detailed Features

#### User Settings

The Zone Controller allows the User to set Occupation Times and the Temperature during the occupation period. The Occupation Status is shown on the LCD Display on the front of the device.

#### Occupation Time Schedule

The Occupation Times for the Zone are set using the Push Buttons found behind the front cover. Occupation times for each of the seven days of the week can be independently set with two periods per day. There are special settings for Today's or Tomorrow's times which are volatile, i.e. they only affect the one day set and do not alter the standard week times.

The Holiday feature sets the number of days the Holiday, starting the next day.

#### Override

The override button is used to change the occupation status as shown on the LCD. If the 'man' is in the house, the zone is in 'Occupation' and is out of occupation when the 'man' is outside the house. Pressing the Override button will change the unit from Occupied to Non-Occupied until the next occupied period. Outside the occupied period, Override will give a timed Extension. The Extension time is set by the configuration parameter XHRS and is preset to one hour.

#### Required Temperature

The required temperature during occupation can be set by the User from the adjustment Knob on the Zone Controller. Moving the Knob by one 'click' changes the display to show Required Temperature. Further rotation of the Knob will alter the required temperature. The Default Required Temperature is preset to 20 Deg C and can be configured by the OCSP parameter. The Range of User Adjustment is preset

to +/- 5 Deg C (i.e.. 15 to 25 Deg C) and can be configured by the SPRG parameter about a midpoint SPMD.

*Any User changes made to the Required Temperature will revert to the default setpoint the following day.*

To stop too large a change being made, the Required Temperature can only be adjusted by 2 Deg C at a time. After a few minutes further change can be made repeating until a set maximum is reached.

#### Occupied Setpoint (OCSP)

The occupied setpoint is the temperature to which the control will be returned at the start of each occupancy period and can be set within the range (10 - 25.5 Deg.C)

#### Relative Humidity Fabric Protection

Outside the Occupation Time Period, the module controls the Relative Humidity of the space by varying the required temperature. This works because for air of a given moisture content, the Relative Humidity will decrease if the temperature is increased. So the control mechanism is to vary the non-occupied temperature setpoint to maintain the Relative Humidity at or below the RH setpoint. The RH Setpoint is factory set to 50%RH and is configured by the SPRH parameter.

In this control mode, the Relative Humidity control can vary the temperature setpoint between the Non-Occupied Temperature setpoint (factory preset to 10 Deg C by the NOSP parameter) and the default occupied temperature setpoint defined above.

#### User Displays

The Zone Controller can display Room Temperature, Required Temperature, Outside Air Temperature, % Relative Humidity and % Demand using the Select Button and Knob to select the desired display.

# Features

Z2

## Temperature Indicator

Shows whether the room temperature is at the required temperature.

**Green** when at the required temperature.

**Red** when colder than required.

**Yellow** when hotter than required.

## Status Lamp

Zone is in Occupancy when indicator is lit.

Indicator Flashes when controller is in configuration mode.

## Select

Press button and turn knob to view user displays from other controllers e.g., Outside Air Temperature, Boiler Flow Temperature and local Relative Humidity. Selected parameter can be left as the controller display.

## Override

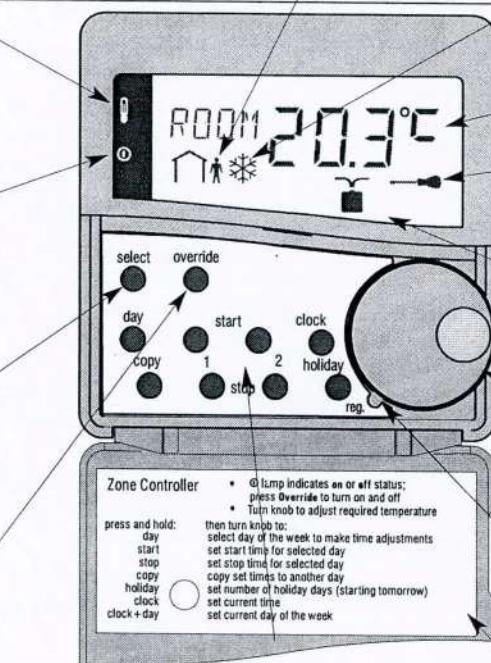
Press button to change Occupation status. Button also accessible with flap closed. Outside Occupation period *Override* starts a one hour occupation period.

Within Occupation period *Override* puts zone into non-occupation until next scheduled start.

## Occupancy Indicator

Figure inside house shows zone is in occupation and outside when not in occupation.

During Optimum Start the figure jumps in and out of the house, and shows as On/Off during Optimum Stop



## Time control

Time settings for two periods per day 7days per week.. Today and tomorrow settings allow adjustment for those days only. Holiday feature allows up to 90 days of holiday to be set. Holiday becomes effective the day after setting is made.

## Frost Indicator

Shows that the system is running in Fabric Protection mode.

## Main Display

Indicates selected Temperature and Time on large clear LCD.

## Screwdriver Symbol

Indicates controller is in configuration mode.

## Connection Symbol

Indicates that the controller has not been registered with other system devices and still needs to be commissioned.

## Rotary Knob

is used to make all adjustments to times and temperatures.

## Registration Button

is used during the commissioning process to build logical links between controllers.

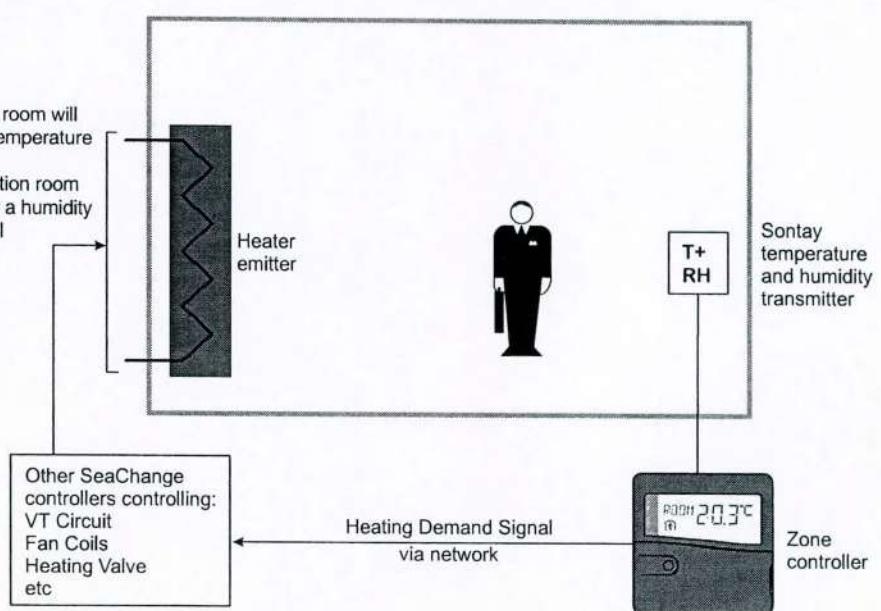
## User Instructions

are provided on the inside of the hinged flap.

# Typical Application

## Fabric protection of room and contents using RH Fabric Protection

During occupation, room will be controlled to a temperature setpoint.  
During non-occupation room will be controlled to a humidity setpoint with overall temperature limits.



## Accessing Configuration Parameters

Z2

Configuration Parameters are used to adjust settings from their factory defaults; Monitoring Parameters show the current operation of the controller (such as temperature readings) during the Commissioning process.

Configuration parameters may be viewed and adjusted by using this Zone Controller, another connected to the network, or by connecting the

SeaChange Doorway Supervisor. When adjusting this controller, place into Configuration Mode, hold the select button and rotate the Knob anticlockwise to view the Configuration Parameters.

Having selected a Configuration Parameter to Adjust, Press the Override button and change the value using the Knob.

## Configuration Parameters

| Label | Doorway Code | Description                                                                           | Units | Default Value | Range      |
|-------|--------------|---------------------------------------------------------------------------------------|-------|---------------|------------|
| OPST  | C1           | Optimum Start Time                                                                    | Hours | 0             | 0 to 24    |
| OPOK  | C2           | Optimum Start complete                                                                | Hours | 0             | 0 to 24    |
| MXWU  | C3           | Maximum Optimum Warm Up Time                                                          | Hours | 6             | 1 to 24    |
| MXCD  | C4           | Maximum Optimum Cool Down Time                                                        | Hours | 2             | 0 to 4     |
| OPT   | C5           | Optimum ON Constant                                                                   |       | 100           | 0 to 100   |
| OPOF  | C6           | Optimum OFF Constant                                                                  |       | 100           | 0 to 100   |
| SPRH  | C7           | Humidity default setpoint                                                             | %RH   | 50            | 0 to 100   |
| SCAL  | C8           | Calibrate temperature sensor value                                                    | Deg C | 0             | -5 to 5    |
| SPMD  | C9           | Midpoint of setpoint adjustment range                                                 | Deg C | 20            | 10 to 25.5 |
| SPRG  | C10          | Range of setpoint adjustment about midpoint                                           | Deg C | 5             | 0 to 10    |
| SBDB  | C12          | Additional deadband used in Optimum off                                               | Deg C | 2             | 0 to 10    |
| MNOP  | C13          | Minimum output invoked if within 1 deg C of setpoint, used to keep VT circuit running | %     | 5             | 0 to 10    |
| XHRS  | C14          | Extension hours when override pressed outside occupation alarm mode                   | hrs   | 1             | 0 to 8     |
| HTSC  | C15          | Heat Source, points to module providing heat to zone.                                 | -     | 0             | -1 to 100  |

## Monitoring Parameters

| Label | Doorway Code | Description                          | Units | Default Value | Range    |
|-------|--------------|--------------------------------------|-------|---------------|----------|
| ROOM  | S1 (C50)     | Current Room Temperature             | Deg C | -             | 5 to 30  |
| REQD  | S2 (C51)     | Controller Current Setpoint          | Deg C | -             | 5 to 30  |
| DMND  | S3 (C52)     | Controller Current Output            | %     | -             | +/-100   |
| HTOP  | S4 (C53)     | Heating Output (to Actuator modules) | %     | -             | 0 to 100 |
| RHUM  | S5 (C55)     | Current room relative humidity       | %     | 50            | 0 to 100 |
| OCSP  | K1 (C60)     | Occupancy temperature Setpoint       | Deg C | 20            | 10 to 30 |
| NOSP  | K2 (C61)     | Non-Occupancy Setpoint               | Deg C | 10            | 5 to 30  |

## Optimiser Parameters

### Optimum Start (OPST)

The heating (or cooling) plant start time is calculated from the zone room and outside temperatures. Over a period of days the controller calculates the heating loss constant (OPT) monitoring the room temperature fall against the outside temperature. This is used to set the plant 'On' time so that the selected occupation temperature can be reached at the occupancy start time. The current preheat time can be checked via the Zone controller in configuration mode or via Doorway ( OPST). The maximum preheat time can be changed if needed using MXWU preset to 6 hours.

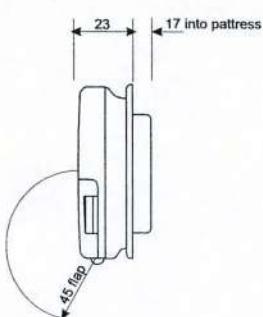
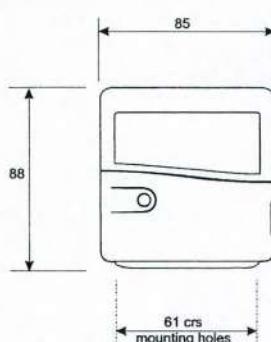
### Optimum Stop

If Optimum stop is invoked, the space temperature as measured by the Zone Controller is allowed to fall beneath the setpoint by a limited amount prior to the end of occupancy. The limit is set by adjusting the control deadband (SBDB factory set at 2 deg.C). This characteristic is self adaptive like the optimum start feature (OPOF). Optimum Stop can be disabled by setting maximum optimum stop time, MXCD (factory set at 2 hours) to zero.

# Specification

Z2

## Dimensions



all dimensions in mm

## Electrical

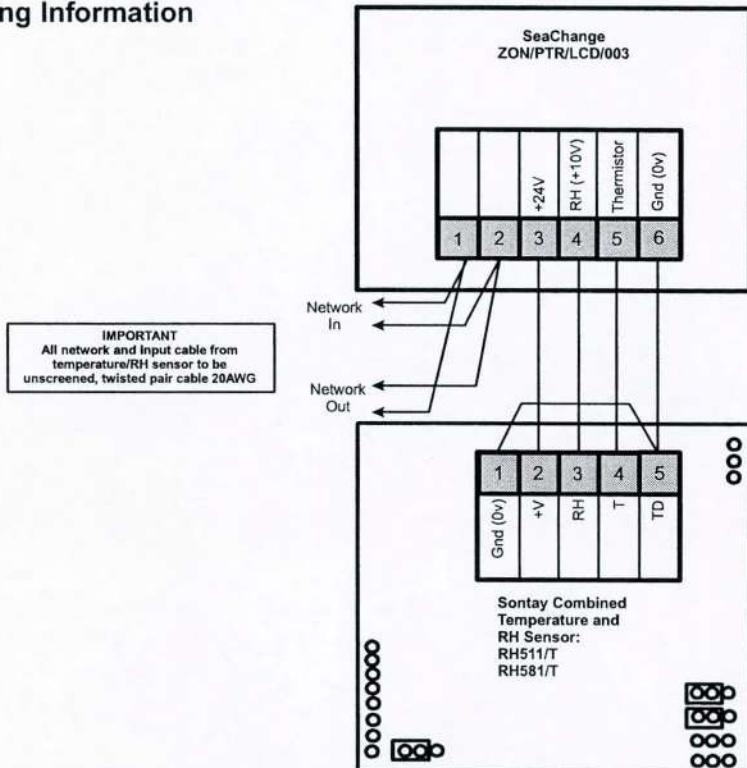
|         |                                  |
|---------|----------------------------------|
| Inputs  | 2 x remote sensors (Sontay T+H)  |
| Outputs | None                             |
| Network | Polarity independent connections |
|         | Network load 10mA                |

## Physical

|                |                                 |
|----------------|---------------------------------|
| Weight         | 0.25 kg                         |
| Cover Material | PC/ABS alloy Self extinguishing |

Conformant product

## Wiring Information



## Options and Product Codes

**ZON / PTR / LCD / 003**

Configured for use with Sontay Space Mounting  
Relative Humidity & Temperature Transmitter

**RH + Temp Transmitter**

Available from Sontay Ltd.

Product Codes:

RH511 / T = 10k 3A1 Overall accuracy +/- 3%RH  
RH581 / T = 10k 3A1 Overall accuracy +/- 2%RH

# Seachange

8 Horsted Square  
Bell Lane Business Park  
Uckfield East Sussex TN22 1QQ

phone 01825 769812  
fax 01825 769813  
e-mail sales@seachange.co.uk  
http:// www.seachange.co.uk

# SeaChange

Consumer Module Data Sheet F1

## Fan Coil Controller - 3 Relay Outputs

### Main Features

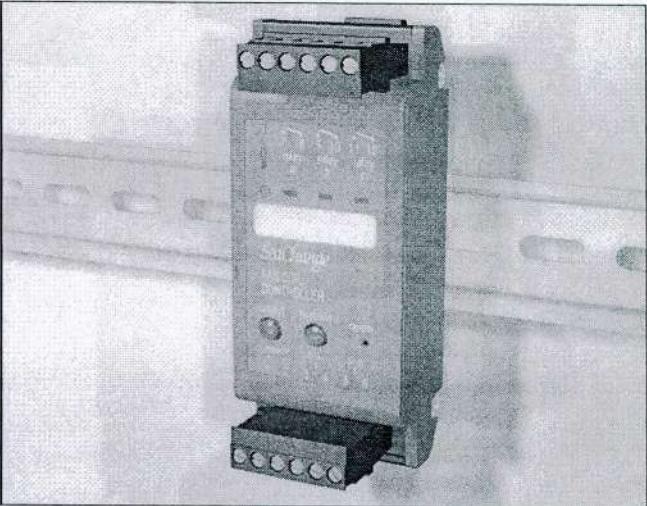
#### 2 Pipe Fan Coils:

- Heating Only + Fan Enable
- Cooling Only + Fan Enable

#### 4 Pipe Fan Coils:

- Airside Damper + Fan Enable
- Thermal Valves + Fan Enable

Works in conjunction with other SeaChange Controllers via "Plug-and-Play"



### Detailed Features

#### General

2 pipe fan coil controller (type / 001, / 002) for heating only or cooling only applications with fan enable.

4 pipe fan coil controller (type / 003) for fan coils utilising an airside damper with fan enable.

4 pipe fan coil controller (type / 004) for use with thermal valves including fan enable, an external 24V AC supply is required.

These types can be inter-mixed with other styles as required.

#### Operation

A SeaChange Zone Controller is used to set the operating times and temperatures for its group of fan coils and to provide an override push button to extend operation outside normal hours. One Zone Controller has the flexibility to control from 1 to 200 fan coil units at any one time on a single network.

This makes the SeaChange system equally suited to controlling numerous fan coils in a single open plan office zone as it is to providing effective one to one unit zone control for cellular office or hotel bedroom applications.

Because it is modular and incorporates plug and play engineering, a SeaChange fan coil control system can be easily and inexpensively adapted to cope with additional zones or fan coils changed to work in different zones as offices "churn" over time.

#### Temperature Control

Temperature control is normally based on the fan coil unit's return air temperature. If a supply air sensor is fitted, off coil temperature can be reset within limits as a cascaded control system.

The Second Input can be alternately employed for reset control. A remote setpoint and local override unit can be applied so that the temperature can be adjusted and the unit turned On/Off locally. Other fan coil controllers can then be controlled as slaves. Diagrams showing these connections are shown on page 3.

Demand from the fan coils for hot and/or cold water is co-ordinated so that the main plant chillers or boilers and distribution plant run only on demand from the Zone Controller.

**Temperature Indicator**  
indicates how far the controlled temperature is from setpoint.  
Green = close to setpoint.  
Amber = above setpoint.  
Red = below setpoint.

**Status Lamp**  
indicates that the Controller is receiving demand signals from other controllers if lit steadily, also indicates that controller is in Configuration Mode (slow flashing) or Maintenance Mode (rapid flashing).

**Select**  
is used during commissioning to allow a Zone Controller to display the Engineering Parameters of this controller. Also used to set stroke time for Heating and Cooling Valves (see Commissioning Guide for details).

**Terminals**  
are all of two-part construction to facilitate wiring connections.

**Connections**  
for network. Twisted pair, unscreened cable is required.

**Relay Output Connectors**  
for connection to the controlled devices.

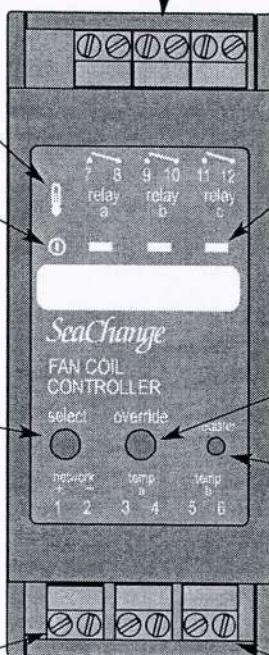
**Latches**  
for retaining controller to DIN rail may be released using a screwdriver.

**Relay status lamps**  
indicate when the output relays are energised

**Override**  
is used to change from Normal to Maintenance mode; Maintenance mode will allow the plant to run without demand signals from the Zone Controllers, which is useful for plant maintenance purposes. (see Detailed Features in this Data Sheet for further information).

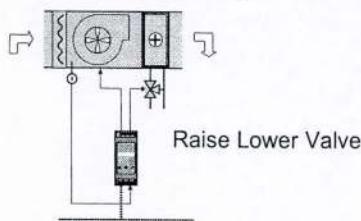
**Registration Button**  
is used during the commissioning process to build logical links between controllers

**Connections**  
for return/space or optional supply temperature sensors. Twisted pair, unscreened cable is required.



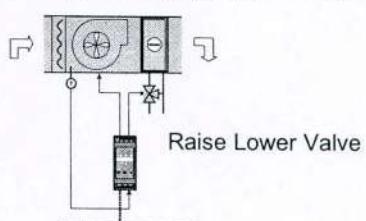
## Typical Applications

### 2 - Pipe Fan Coil - Heating Only + Fan Enable



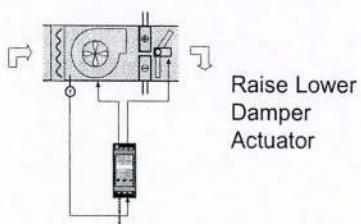
Uses Driver Type / 001

### 2 - Pipe Fan Coil - Cooling Only + Fan Enable



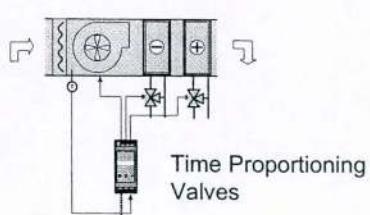
Uses Driver Type / 002

### 4 - Pipe Fan Coil - Airside Damper + Fan Enable



Uses Driver Type / 003

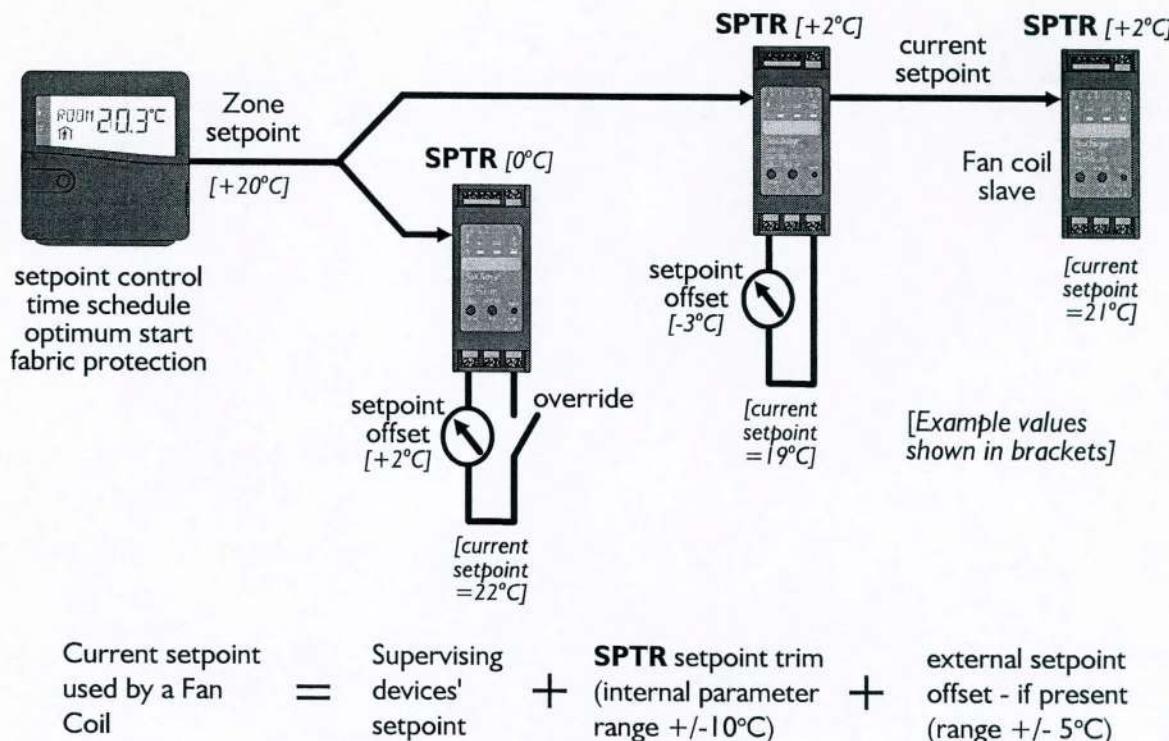
### 4 - Pipe Fan Coil - Thermal Valves + Fan Enable



Uses Driver Type / 004

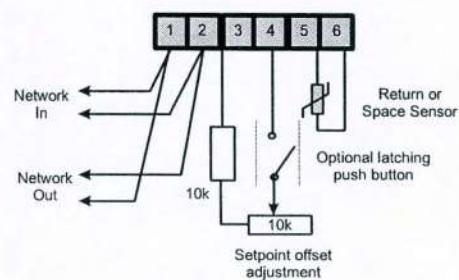
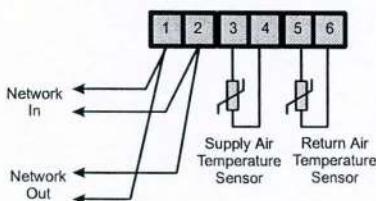
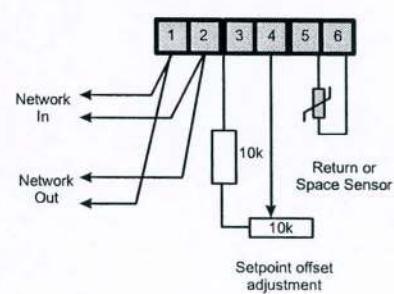
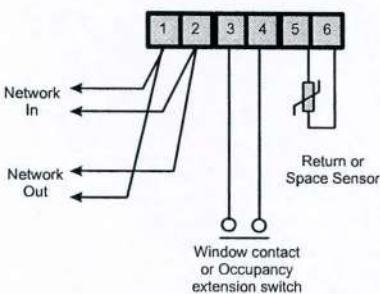
## Master / Slave Operation

F1



## External Input Options

F1



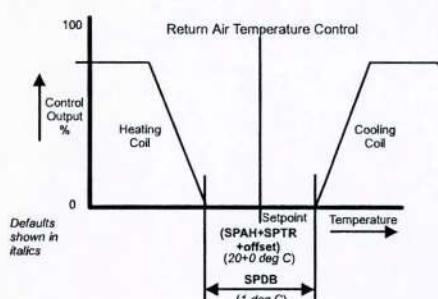
## Temperature Control

### Return Air Control

A Return Air (or Space) Temperature sensor must be fitted. The FCU Controller will control Return Air temperature to a fixed setpoint set using Configuration parameter **SPFC**, or an adjustable setpoint, using a Zone Controller (see **Registration**, later). A deadband may be set (using the **SPDB** parameter) which will prevent cycling between heating and cooling and reduce energy usage.

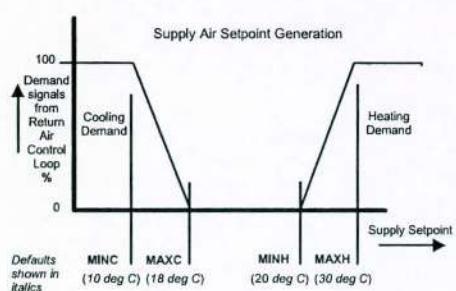
### Return Air Control with Supply Air Limits

Supply and Return Air (or Space) temperature sensors must be fitted. Instead of directly acting on the control valves / damper etc. the Return Air Control Loop will produce internal demand signals that will adjust the Supply Air Temperature setpoint of the Supply Air Control Loop (this is called *Cascade Control*). Limits to the Maximum and Minimum Supply Setpoints can be set on **MAXH**, **MINH**, **MAXC** and **MINC** (see diagram).



### Supply Air Control from a Zone Controller or another Fan Coil Controller

If a Supply Air Temperature Sensor only is fitted, the Supply Air Setpoint will be derived from the Heating and Cooling Demand signals from a Zone Controller, or another Fan Coil Controller acting as a "master" in an open-plan area. The setpoint will be calculated according to the settings on **MAXH**, **MINH**, **MAXC** and **MINC** (see diagram).



### Slave Control

With no Sensor fitted, the Fan Coil Controller will adjust its heating and cooling outputs to the valves etc. on the basis of the demand signals received from the Zone Controller or "Master" Fan Coil Controller, i.e. if the Zone Controller is demanding 50% Heat, the heating valve will be driven to 50% open. (This is called *Open-Loop Control*).

## Setpoint Supervision and Local Setpoint Adjustment

A Zone Controller may be used to determine the Setpoint for one or many Fan Coil Controllers. This is called **Setpoint Supervision**, (typically 20 Deg C).

A Fan Coil Controller may have a **Local Setpoint Adjuster** which is a simple wall-mounted potentiometer wired directly into the Fan Coil Controller's input terminals; adjusting this will adjust the **offset** value (limited to +/-5 Deg.C). The **offset** value and a value set on the internal parameter **S PTR** are added (or subtracted if the value is negative) to the setpoint set on **SPFC** to produce the operating setpoint for the controller. Note that using a simple potentiometer means that some of the energy saving benefits given by the Zone Controller (e.g. resetting the setpoint to a default value at the start of each occupancy period) are not possible.

A Fan Coil Controller can also be used to provide **Setpoint Supervision** for a group of "Slave" Fan Coils; this would be used when an Open-Plan area is fed by several Fan Coils, and only one Local Setpoint Adjuster is required. The Local Setpoint Adjuster is wired to one of the Fan Coil Controllers, which then becomes the "Master" of the group. It will send its setpoint set on **SPFC** plus the **offset** applied by the Setpoint Adjuster plus any value set on **S PTR** to all of the "Slave" Fan Coils registered to it (see Master/Slave diagram) which will then use the resultant value as their own **SPFC** value. Individual trims to this setpoint can be set up in each "Slave" using its **S PTR** parameter, if desired.

## Occupancy Times and Local Override

Occupation times for one, or many Fan Coil Controllers (up to 200) are set at a Zone Controller. The Occupancy Times may be overridden by the Override pushbutton on the Zone Controller in the usual way, giving configurable timed extension to occupancy (see Zone Controller Data Sheet).

Additionally, a local switch may be used in order to put the Fan Coil Controller into an Occupied State; this can either be used exclusively to control occupancy (e.g. a Meeting Room) or it can be used in conjunction with a Zone Controller to provide an extension to occupancy. In either case, the Controller requires a maintained contact closure (latching switch) in order to give an Occupied State; if a timed extension is desired, an external timed latching contact must be used. The parameter **INMD** is used to determine whether the external signal is to be used exclusively, or as an OR function with a Zone Controller's Occupation Times.

## Window Contact, General Alarm or Monitoring

A Volt-free window contact may be wired into the Controller's input terminals and used to disable the Fan Coil if the Window is opened, preventing energy wastage. This function could also be applied to other inputs which would require the Fan Coil to shut down, e.g. Condensate Tray Full signal from a level switch. Alarms to the supervisor can be enabled or disabled using the **ALRM** parameter; the **ALST** parameter is used to set the contact sense. I.e. whether an opening or closing contact will generate an alarm.

The Input may be alternatively used for general monitoring, either with or without alarm generation (e.g. filter blocked)

The correct mode of operation is determined by the **INMD** parameter.

## Registration

*Registration* is the simple process by which logical connections are made between Controllers in a SeaChange system; it is done during commissioning and involves pressing buttons on the Controllers in a specific sequence.

For further details of the registration process, see our 'Commissioning Guide' publication.

## Address Allocation and System Housekeeping

Like all SeaChange Controllers, the Fan Coil Controllers must be registered with other modules in order to create a working system; one or more of the following registration procedures must be followed. During each of these procedures, the address of each Controller is allocated by the module that contains *System Housekeeping*. This could be a SeaChange Boiler Controller or a AHU Controller (for up to 100 Zone + FCU Controllers) or a Floor Controller (for up to 200 Zone + FCU Controllers). It is essential, therefore, that any SeaChange System contains one module with System Housekeeping; for more details, see Boiler, AHU or Floor Controller Data Sheets.

## Occupancy Control, only from Zone Controller

The **SPTY** parameter in the FCU Controller must be set to 0, the Zone Controller is then put into Configuration Mode and the FCU Controller is registered to it. When the Zone Controller enters its occupancy mode, the FCU Controller's registered to it will be enabled and will control to their occupied setpoints.

## Occupancy Control + Setpoint Supervision from Zone Controller

The **SPTY** parameter in the FCU Controller must be set to 1, the Zone Controller is then put into Configuration Mode and the FCU Controller is registered to it. When the Zone Controller enters its occupancy mode, the FCU Controller's registered to it will be enabled and will control to the setpoint in the Zone Controller.

## Occupancy Control + Setpoint Supervision from a 'Master' Fan Coil Controller

The 'Master' Fan Coil Controller must be operating in **SPTY** 0 or 1 with its own return air sensor. 'Slaves' may have local sensors, but do not need them (see Setpoint Supervision and Local adjustment). The 'Slave' FCU Controller **SPTY** parameter must be set to 2 then the 'Master' FCU Controller is put into Configuration Mode registering the 'Slave' FCU Controller to it.

Occupancy of the 'Slaves' will now be taken from the 'Master'; any setpoint change made at the 'Master' (whether from a Local Setpoint adjuster, or Setpoint Supervision change from a Zone Controller) will be reflected at the 'Slaves'.

## Demand Collation - Heat and Cool Sources

Heating and Cooling demand signals from the Fan Coil Controllers are automatically collated and are fed back to a provider of heat (or 'cool') - for instance, the Boiler Controller or a CT Pumpset. This is done by putting the Heat (or Cool) source into Configuration Mode and registering the FCU Controller to it.

For systems where the main plant is not controlled by SeaChange, the Floor Controller may be used to collate Heating and Cooling demand signals and present them as a series of volt-free contacts which can be used as inputs to the Legacy System in order to enable heating and/or cooling as appropriate. The Floor Controller is put into Configuration Mode and the FCU Controllers are registered to it.

For further details of the Floor Controller, see appropriate Data Sheet.

## Alarm Handling

The FCU Controller may be set to ignore alarm conditions, report them to a SeaChange Doorway Supervisor (either locally connected to the system, or via an autodialling modem), or to both report alarms and take some control action. The **ALRM** parameter is used to select the desired Alarm Mode, whilst **ALST** is used to set the sense (ie. whether a closing or opening contact generates an alarm).

The FCU Controller generates an alarm if the sensor fails and also if the external alarm input is used.

The FCU Controller may be set to respond to the **STOP** System Stop Alarm which is generated by a Boiler Controller; this can be used to shut down the entire control system, or parts of it, if a particularly critical event occurs.

| Configuration Parameters |              |                                                                                                                                                                                                                                                      |         |               |              |  |
|--------------------------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------------|--------------|--|
| Label                    | Doorway Code | Description                                                                                                                                                                                                                                          | Units   | Default Value | Range        |  |
| SPFC                     | C1           | Occupied Return temperature Setpoint                                                                                                                                                                                                                 | Deg C   | 20            | 10 to 35     |  |
| SPDB                     | C2           | Setpoint Deadband                                                                                                                                                                                                                                    | Deg C   | 1.0           | 0 to 10      |  |
| SPTR                     | C3           | Setpoint Trim                                                                                                                                                                                                                                        | Deg C   | 0             | -10 to +10   |  |
| SPTY                     | C4           | Setpoint type<br>0: Local from C1, occupancy controlled from 1 or more Zone Controllers<br>1: Setpoint (and occupancy) supervised from master Zone Controller<br>2: Room control from remote Zone Controller FCU Supply controlled from Heat%, Cool% | -       | 1             | 0 to 2       |  |
| INMD                     | C5           | Input mode for terminals 'temp a'<br>0: Supply temperature<br>1: Time clock AND window contact (short = occupied)<br>2: Time Clock OR internal clock<br>3: External Occupation signal only<br>4: Alarm Input                                         | -       | 0             | 0 to 4       |  |
| MAXH                     | C6           | Supply maximum heating setpoint                                                                                                                                                                                                                      | Deg C   | 30            | 0 to 90      |  |
| MINH                     | C7           | Supply minimum heating setpoint                                                                                                                                                                                                                      | Deg C   | 20            | 0 to 90      |  |
| MAXC                     | C8           | Supply maximum cooling setpoint                                                                                                                                                                                                                      | Deg C   | 18            | 2 to 30      |  |
| MINC                     | C9           | Supply minimum cooling setpoint                                                                                                                                                                                                                      | Deg C   | 10            | 2 to 30      |  |
| MIND                     | C10          | Supply minimum demand, used for switching between heating and cooling                                                                                                                                                                                | -       | 4             | 0.0 to 10.0  |  |
| OCCO                     | C11          | When set, controller will only run during the Occupied Period                                                                                                                                                                                        | -       | 0             | 0 to 1       |  |
| HPRD                     | C12          | Heating valve period or minimum time                                                                                                                                                                                                                 | Secs/10 | 6             | 1 to 60      |  |
| HDLY                     | C13          | Heating interlock delay. Negative value delays fan (or pump)<br>On after heating starts, positive value causes run-on of fan after heating shuts down                                                                                                | Minutes | 0             | -30 to +30   |  |
| CPRD                     | C14          | Cooling Valve period or minimum On time                                                                                                                                                                                                              | Sec/10  | 6             | 1 to 60      |  |
| CDLY                     | C15          | Cooling Interlock delay. Negative value delays fan (or pump)<br>On after cooling starts, positive value causes run-on of fan after cooling shuts down                                                                                                | Minutes | 0             | -30 to +30   |  |
| FPRD                     | C16          | Fan Period, minimum time to change fan speed steps                                                                                                                                                                                                   | Secs/10 | 12            | 1 to 60      |  |
| FRPT                     | C17          | Frost Protection<br>0 = No Action,<br>1 = Open Heating Valve to 50%<br>2 = Open Heating Valve to 50% and run fan (pump)                                                                                                                              | -       | 0             | 0 to 2       |  |
| MANL                     | C18          | Manual Level from Doorway                                                                                                                                                                                                                            | -       | 0             | -100 to +100 |  |
| HTSC                     | C19          | Heat Source                                                                                                                                                                                                                                          | -       | 0             | -1 to 100    |  |
| CLCS                     | C20          | Cool Source                                                                                                                                                                                                                                          | -       | 0             | -1 to 100    |  |
| MXCT                     | C21          | Maximum CT Setpoint when AHU demanding 100% heating                                                                                                                                                                                                  | Deg C   | 70            | 20 to 100    |  |
| MNCT                     | C22          | Minimum CT Setpoint                                                                                                                                                                                                                                  | Deg C   | 50            | 20 to 100    |  |
| ALRM                     | C23          | Alarm Mode<br>0: Ignore alarms<br>1: Alarms reported no other action<br>2: Control output set to zero on alarm<br>3: STOP alarm recognised control set to zero                                                                                       | -       | 1             | 0 to 3       |  |
| ALST                     | C24          | Not used in this application                                                                                                                                                                                                                         |         |               |              |  |

## Pre Commissioning Checks

### Power Up

On initial power up of the module there will be delay of between 10 to 60 seconds before the temperature LED lights. This delay has been incorporated so that when many fan coils are controlled on the same circuit their power requirements will be spread over this period. Once start up has been initiated, the valve outputs sequence to close the valves before control is initiated and until that process is completed (HPRD + CPRD) the manual override as described will be in-effective.

### Setting the Stroke Time for Actuators.

If the Select button is held pressed for a few seconds the status lamp will flash and the 'B' relay will energise to close the valve. When the valve is noted as closed and the Select button pressed again, the 'A' relay will

energise causing the valve to open and start the timing cycle. When the valve reaches full stroke open, the Select button is pressed to record the Stroke Time and return the controller to the automatic mode. (For controllers with TP heating and cooling a similar process times both the heating and cooling valves). The times can also be checked and adjusted using the (H or C)PRD parameter (recorded in tens of seconds).

# Monitoring Parameters

F1

| Label | Doorway Code | Description                                | Units | Default Value | Range          |
|-------|--------------|--------------------------------------------|-------|---------------|----------------|
| INPA  | C30          | Input A status                             | -     | -             | 0 to 1         |
| OCCD  | C31          | Occupied                                   | -     | -             | 0 to 1         |
| COOL  | C34          | Cooling Status                             | -     | -             | 0 to 1         |
| RLYA  | C35          | Relay 'A' Status                           | -     | -             | 0 to 1         |
| RLYB  | C36          | Relay 'B' Status                           | -     | -             | 0 to 1         |
| RLYC  | C37          | Relay 'C' Status                           | -     | -             | 0 to 1         |
| AUTO  | C38          | Automatic/Manual Status                    | -     | -             | 0 to 1         |
| OVRD  | C39          | Override                                   | -     | -             | 0 to 1         |
| SERV  | W7           | Service Pin Message (to Doorway)           | -     | -             | -              |
| CGST  | C45          | Configuration Mode Status                  | -     | -             | 0 to 1         |
| SPLA  | S1 C50       | Supply Air Temperature                     | Deg C | -             | -              |
| RTNA  | S2 C51       | Return Air Temperature                     | Deg C | -             | -              |
| HCOP  | S3 C52       | Heat Cool Output Valves                    | %     | -             | 0 to 100       |
| SPSL  | C53          | Current Supply Setpoint                    | Deg C | -             | -              |
| SPRT  | C54          | Current Return Setpoint                    | Deg C | -             | -              |
| HDM   | C55          | Heat Demand from Room Loop                 | %     | -             | 0 to 100       |
| CDMD  | C56          | Cool Demand from Room Loop                 | %     | -             | 0 to 100       |
| SPOC  | K1 C60       | Occupation Setpoint                        | Deg C | 20            | 5.0 to 35.0    |
| SPNO  | K2 C61       | Non-Occupation Setpoint                    | Deg C | 10            | 5.0 to 20.0    |
| SPSV  | K3 C62       | Supervised Setpoint from Master Controller | Deg C | -             | 0 to 35.0      |
| SPTR  | K4 C63       | Setpoint Trim                              | Deg C | 0             | -10.0 to +10.0 |

## Accessing Configuration and Monitoring Parameters

Generally, Configuration Parameters are used to adjust settings from their factory defaults; Monitoring Parameters are used to monitor internal readings (such as temperature readings) during the Commissioning process.

The Parameters may be viewed, and in the case of Configuration Parameters, adjusted by one of two methods; either by using a Zone Controller connected to the network, or by using the SeaChange Doorway Supervisor.

### Using the Zone Controller:

- The Zone Controller must be connected to the network and *registered* (see Commissioning Guide for further details).
- Put the Zone Controller into Configuration Mode by depressing Select and Override buttons for 10 seconds, until the CNFG legend appears on the display.
- Press Select button momentarily on the target device (in this case, the selected Fan Coil Controller).
- Hold down Select button on the Zone Controller, and rotate the rotary knob:  
clockwise to view Monitoring Parameters  
anticlock to view Configuration Parameters

- When desired Configuration Parameter appears, release Select, hold down Override and turn knob to adjust the parameter (some Monitoring Parameters cannot be adjusted).

### Using SeaChange Doorway:

Data Points may be added to a Doorway page to access/adjust any Configuration or Monitoring Parameter. Graphs of the Input Parameters and Heat/Cool output are also available. The code used to

access an FCU Controller is **Zn**, where *n* is the Fan Coil Zone number. The code for each parameter is shown in the adjacent tables.

Further details of how to set up Doorway pages may be found in the SeaChange Doorway Manual, or in the online help facility supplied with SeaChange Doorway. The PC running SeaChange Doorway can be connected locally via a Serial Adaptor Module, or remotely using standard High-Speed Modems. In this manner all parameters can be monitored and adjusted remotely.

## Manual Override

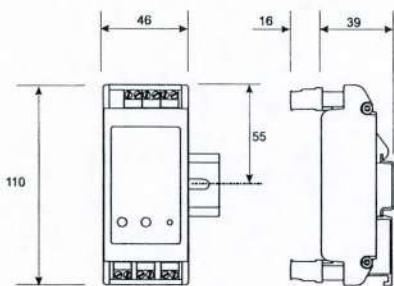
Allows the outputs to be exercised during commissioning and maintenance activities. Holding the Manual Override button pressed until the Status Lamp flashes green will cause the controller to be switched from automatic to manual control and the Fan will run. Subsequent pressings of the manual override button will cause:

| Press | Temp Lamp | Relay Output                          |
|-------|-----------|---------------------------------------|
| 1     | Red       | Htg Valve Open                        |
| 2     | Yellow    | Htg Close, Clg Open                   |
| 3     | Green     | Clg Close and returns to Auto Control |

As this feature does not time out, care should be exercised to ensure the module is returned to the automatic mode on completion of the commissioning or maintenance activities.

Override can also be achieved via Doorway when AUTO can be set to manual mode and MANL used to set the output condition.

## Dimensions



all dimensions in mm

## Electrical

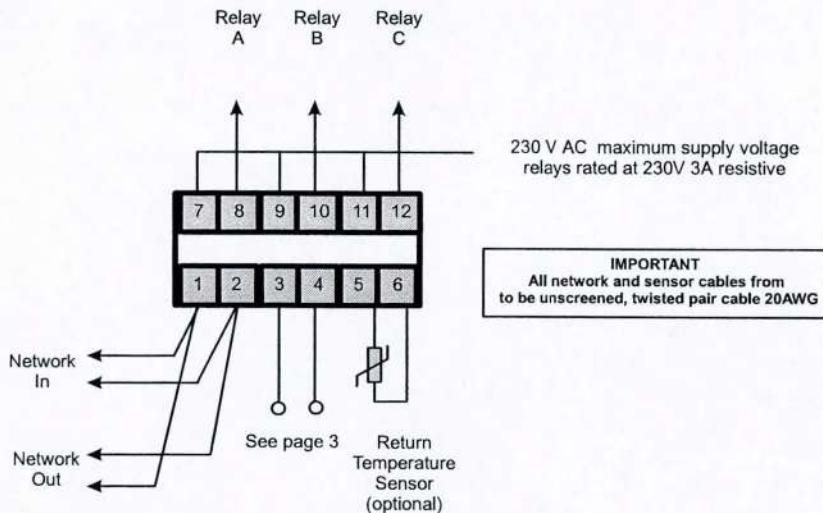
|             |                                                          |
|-------------|----------------------------------------------------------|
| Inputs      | 2 Thermistor or 1 Thermistor and VFC or potentiometer.   |
| Outputs     | 3 Relay Outputs N/O contacts<br>3 A 230 V resistive Load |
| Consumption | 22 mA from network                                       |

## Physical

|                |                                                  |
|----------------|--------------------------------------------------|
| Weight         | 0.15 kg                                          |
| Cover Material | PC/ABS alloy Self extinguishing to UL 94 V0/1.60 |
| Base Material  | Polyamide 6.6 Self extinguishing to UL 94 VO     |
| Colour         | Dark Grey to Pantone 425                         |

CE Conformant product

## Wiring Information



## Options and Product Codes

3R Fan Coil Controller

FCU / DIN / 3R / [driver option]

## Relay output driver options

| Option | Relay A        | Relay B        | Relay C |
|--------|----------------|----------------|---------|
| /001   | Valve Open     | Valve Close    | Fan     |
| /002   | Valve Open     | Valve Close    | Fan     |
| /003   | Damper Heating | Damper Cooling | Fan     |
| /004   | Heating Valve  | Cooling Valve  | Fan     |

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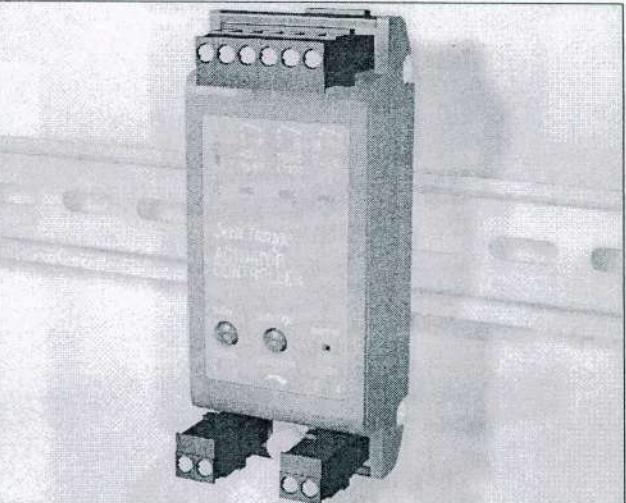
## Actuator Controller - DIN rail mounting

### Main Features

Controls Zone Valves and Pump or Packaged Heating Plant

Works with or without Local Temperature Feedback

Heating, Cooling or Heat/Cool operation



### Detailed Features

#### Temperature Feedback

Actuator Controllers will work with or without local temperature feedback.

If no temperature sensor is fitted, the Actuator Controller will interpret demand signals from a Zone Controller as a proportional output signal (e.g.. a Valve Position). This is called *Open-Loop* control.

If a temperature sensor is fitted, the Actuator Controller will automatically convert the demand signal into a setpoint (e.g.. Desired Supply Air Temperature) and control at the actuator becomes *Closed-Loop* and the overall control scheme becomes *Cascade Control*, with the output from the Zone Controller's control loop forming the setpoint for the Actuator Controller.

#### Setting Timing Characteristics of output Channels

It is possible to set stroke time (for Raise/Lower type Actuators) and the minimum time (for Time Proportion type Actuators) using pushbuttons.

##### Raise/Lower Types - Setting Stroke Time

Hold down select button. Temperature indicator will flash red and status indicator will flash at one second intervals. Release select button; relay B will energise to close valve. When valve is closed depress select button. Temperature indicator will flash green and relay A will energise to open valve. The

controller is now measuring the stroke time. When the valve is open depress select button. Flashing will stop and stroke time set within the Actuator Driver and stored in non-volatile memory. This time will be retained until the procedure is repeated.

##### TP Types - Setting Minimum Time On/Off

Hold down select button. Temperature indicator will flash green at one second intervals and relay A will energise. Release select button. When minimum time on/off has elapsed, depress select button. Flashing will stop and this time will be set within the Actuator Driver and stored in non-volatile memory. This time will be retained until the procedure is repeated. Note that the full TP period will be 10 times this value.

#### Power-up behaviour and recalibration - for Raise/Lower type

On power-up, the valve will be over-driven closed for 120% of the valve travel time. This overdriving is repeated every time the actuator is driven to 0 or 100%. If the actuator has not been driven to either end during a 12 hour period, the actuator will overdrive fully closed.

## Features

**Temperature indicator**  
indicates how far away from setpoint the temperature is.  
Green = close to setpoint  
Amber = above setpoint  
Red = below setpoint

**Connections**  
for Actuator / plant connection.

**Latches**  
for retaining controller to DIN rail may be released using a screwdriver.

**Status lamp**  
indicates a heating demand if lit, also indicates that controller is in configuration mode if flashing.

**Relay Status Lamps**  
indicate the current status of the three output relays.

**Select**  
is used during commissioning to set timing characteristics of the output channels (for example, stroke time of an actuator) and also to allow a Zone Controller to display the Engineering Parameters of this controller.

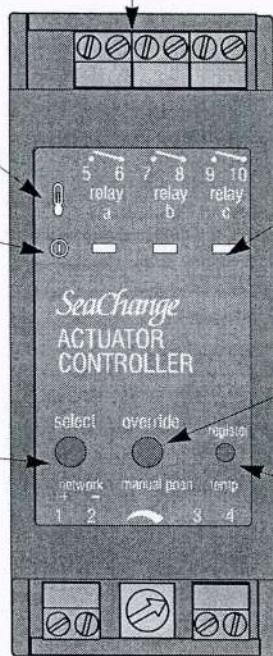
**Override**  
is used to change from Normal to Maintenance mode; this will allow the valve actuator to be manually positioned using the Rotary Knob.

**Terminals**  
are all of two-part construction to facilitate wiring connections.

**Registration Button**  
is used during the commissioning process to build logical links between controllers.

**Connections**  
for Network.

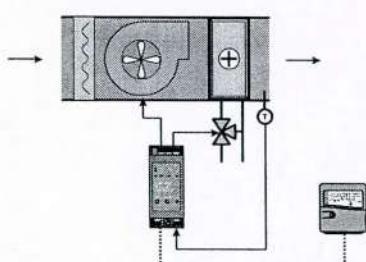
**Connections**  
for optional Heating Medium Temperature Sensor.



**Rotary Knob**  
is used to make manual adjustments to the outputs e.g.. to manually position the valve.

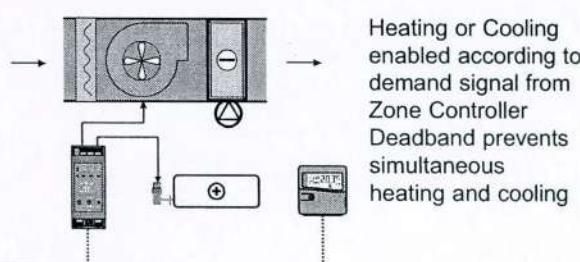
## Typical Applications

### Heating or Cooling Terminal



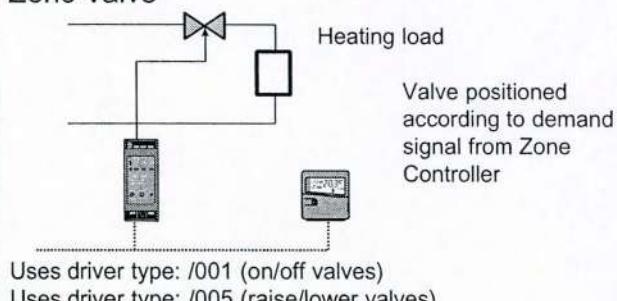
Uses driver type: /006 or /007

### Wet Heating with DX Cooling

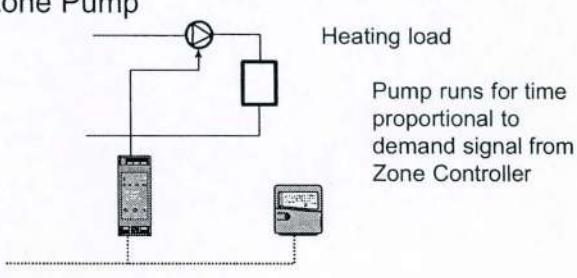


Uses driver type: /013

### Zone Valve



### Zone Pump



## Configuration Parameters

| Label | Doorway Code | Description                                                                                                                                                                                                                                                                                                         | Units | Default Value | Range   |
|-------|--------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|---------------|---------|
| SACT  | C1           | for future use                                                                                                                                                                                                                                                                                                      |       |               |         |
| SPMX  | C2           | Maximum occupied setpoint for closed loop operation                                                                                                                                                                                                                                                                 | Deg C | 80            | 0 - 100 |
| SPMN  | C3           | Minimum occupied setpoint for closed loop operation                                                                                                                                                                                                                                                                 | Deg C | 10            | 0 - 100 |
| SPNO  | C4           | Non-occupied setpoint for closed loop operation                                                                                                                                                                                                                                                                     | Deg C | 10            | 0 - 100 |
| MIND  | C5           | Minimum demand to select occupied                                                                                                                                                                                                                                                                                   | %     | 0             | 0 - 2   |
| CLSL  | C6           | Cool selector<br>0: Heating only<br>1: Cooling only<br>2: Heating & Cooling                                                                                                                                                                                                                                         | -     | 0             | 0 - 2   |
| PERD  | C7           | Stroke time of valve (on raise/lower)                                                                                                                                                                                                                                                                               | Sec   | 6             | 1 - 240 |
| INLK  | C8           | Minimum on/off time (on time proportional)<br>Interlink Used when relay C required to start fan<br>0: no action<br>Type 008 - sequenced outputs for DX cooling or elec heating<br>1: relay C OSS } Fan runs before battery is enabled<br>2: relay C OCC } and runs on after battery is shut down to dissipate heat. |       |               |         |
| MANL  | C9           | Manual level<br>Value of control output (e.g. valve position) when controller is switched into manual mode using C38/C39                                                                                                                                                                                            |       |               |         |

## Monitoring Parameters

| Label | Doorway Code | Description                                    | Units  | Default Value | Range   |
|-------|--------------|------------------------------------------------|--------|---------------|---------|
| WMUP  | I1 (C30)     | Warm up                                        | On/Off | -             | On/Off  |
| OCC   | I2 (C31)     | occupied, some demand signal is being received | On/Off | -             | On/Off  |
| COOL  | I5 (C34)     | Control in cooling                             | On/Off | -             | On/Off  |
| RLYA  | I6 (C35)     | relay A status                                 | On/Off | -             | On/Off  |
| RLYB  | I7 (C36)     | relay B status                                 | On/Off | -             | On/Off  |
| RLYC  | I8 (C37)     | relay C status                                 | On/Off | -             | On/Off  |
| AUTO  | W1 (C38)     | Automatic, control mode                        | On/Off | -             | On/Off  |
| OVRD  | W2 (C39)     | Override                                       | On/Off | -             | On/Off  |
| TEMP  | S1 (C50)     | Sensor temperature                             | Deg C  | -             | -       |
| REQD  | S2 (C51)     | Required temperature setpoint                  | Deg C  | -             | -       |
| DMND  | S3 (C52)     | Heating/Cooling demand                         | %      | -             | +/-100  |
| HTOP  | S4 (C53)     | Heating output to actuator                     | %      | -             | 0 - 100 |
| CLOP  | S5 (C54)     | Cooling output to actuator                     | %      | -             | 0 - 100 |
| SPMX  | K1 (C60)     | Maximum occupied setpoint                      | Deg C  | 80            | 0 - 100 |
| SPMN  | K2 (C62)     | Minimum occupied setpoint                      | Deg C  | 10            | 0 - 100 |

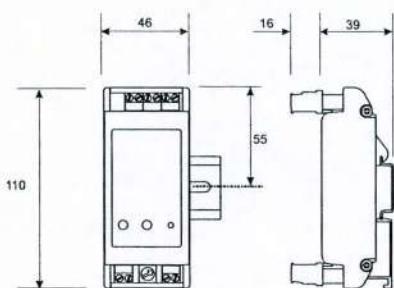
### Accessing Configuration and Monitoring Parameters

Configuration Parameters are used to adjust settings from their factory defaults; Monitoring Parameters are used to monitor internal readings (such as temperature readings) during the Commissioning process.

The Parameters may be viewed, and in the case of Configuration Parameters, adjusted by one of two methods; either by using a Zone Controller connected to the network, or by using the SeaChange Doorway Supervisor. See Boiler Controller Data Sheet for further details.

# Specification

## Dimensions



all dimensions in mm

## Electrical

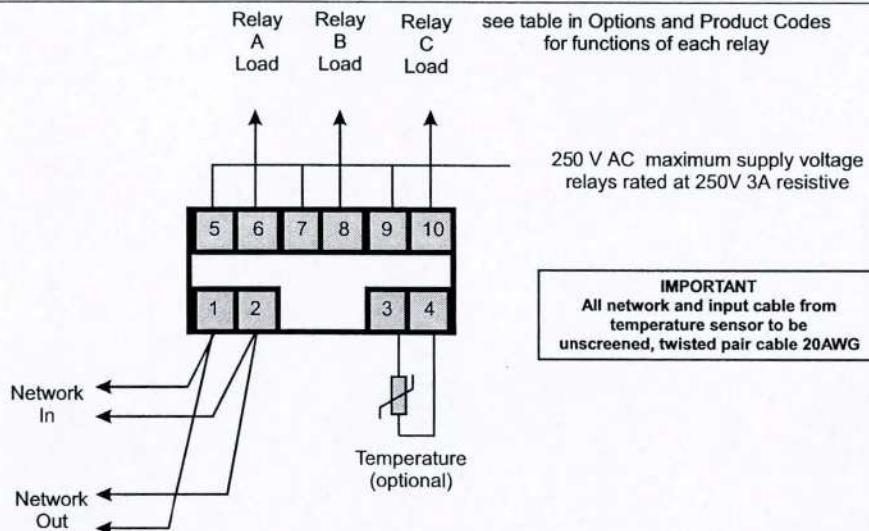
|             |                                   |
|-------------|-----------------------------------|
| Inputs      | 1 Thermistor                      |
| Outputs     | 3 Relay Outputs N/O contacts      |
| Consumption | 3 A 250 V resistive Load<br>22 mA |

## Physical

|                |                                                  |
|----------------|--------------------------------------------------|
| Weight         | 0.25 kg                                          |
| Cover Material | PC/ABS alloy Self extinguishing to UL 94 VO/1.60 |
| Base Material  | Polyamide 6.6 Self extinguishing to UL 94 VO     |
| Colour         | Dark Grey to Pantone 425                         |

Conformant product

## Wiring Information



## Options and Product Codes

Actuator Controller

ACT / DIN / [output type] / [driver option]

Output type  
**/RLY/** 3 x Relay outputs

| Relay output driver options |                                                 |                        |                      |
|-----------------------------|-------------------------------------------------|------------------------|----------------------|
| Option                      | Relay A                                         | Relay B                | Relay C              |
| /001                        | Time Proportional Heat or Cool                  | Occupation Switch      | Not used             |
| /002                        | Time Proportional Heat or Cool                  | Optimum Start Switch   | Not used             |
| /005                        | Valve Open                                      | Valve Close            | Not used             |
| /006                        | Valve Open                                      | Valve Close            | Occupation Switch    |
| /007                        | Valve Open                                      | Valve Close            | Optimum Start Switch |
| /008                        | Sequence 2 relays at 33% and 66% of demand      |                        | Not used             |
| /009                        | Sequence 3 relays at 25%, 50% and 75% of demand |                        |                      |
| /013                        | Time Proportional Heat                          | Time Proportional Cool | Not used             |
| /014                        | Time Proportional Heat                          | Time Proportional Cool | Occ. Switch          |
| /015                        | Time Proportional Heat                          | Time Proportional Cool | Opt. St. Switch      |

# SeaChange

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http:// www.seachange.co.uk

# SeaChange

## Main Features

Provides 0.5A Power Supply for SeaChange link powered networks

Power Sharing feature - multiple PSUs on one network segment

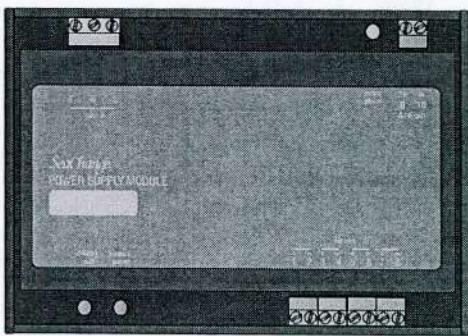
Fault Protection and Indication

240Vac & 110Vac Versions

## Data Sheet

P1

## Power Supply Unit



## Detailed Features

**Network Terminator:** Each network segment must have one and only one PSU/ - /TER with termination circuit. Any additional PSU's on this segment must be of the PSU/ - /NOT type

**Network Fault Indicator:** Shows that a network imbalance exists between each leg of the network, probably caused by a short (or partial short) to earth; colour of LED shows which leg of network has short present. LED showing red indicates a fault on the +ve leg, whilst a green lamp indicates a fault on the -ve leg

**Network Power OK Indicator:** Shows green if network is healthy; if showing red, indicates a polarity conflict with another PSU on the network segment

**Mains Power Indicator:** Shows green if mains power is present, and Auxilliary is healthy. If a short circuit exists on the Auxilliary circuit, the lamp will be off.

### Network Short Circuit + Reverse Polarity Protection

**Protection:** The Power Supply unit is protected against Reverse Polarity (with respect to another PSU on the same network segment) and also against short circuits on the network. The Power Supply will automatically recover after a fault is cleared.

### Auxilliary Power or Internal Fault Protection:

The Power Supply Unit is protected against short circuits on the Auxilliary output and internal faults by a thermal fuse. If the fault is external, it must be cleared and then mains power removed from the unit for a few minutes to allow the thermal fuse to reset.

**Calculations for Power Requirements:** The total loads from the various SeaChange modules should be

added together to calculate the total network load per segment as shown on the individual module datasheets. It is also good practice (but optional) to allow some spare capacity for future addition of modules which will be dependent upon future designs for the building. As additional PSU's can be easily added later; 10% spare capacity is recommended. Network consumption for each module is shown in the specification section of the appropriate data sheet.

The PSU will cause an insertion loss equal to that of 1 LPT Transceiver, this means that the PSU must be counted in any calculations for numbers of controllers per network segment (64 maximum).

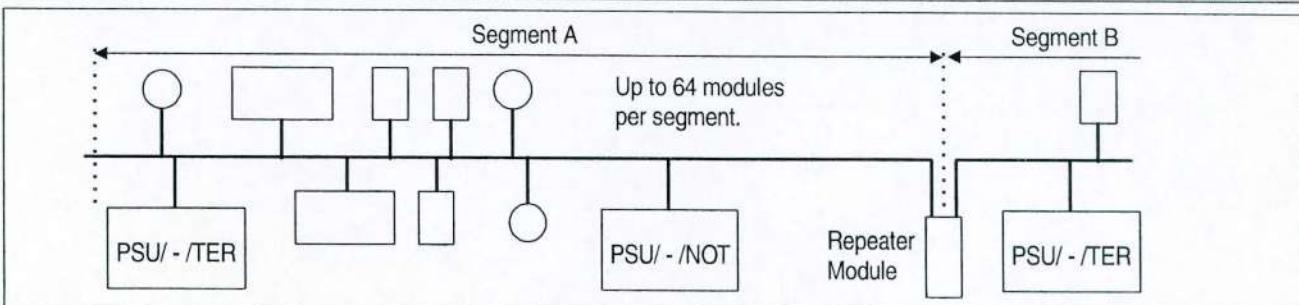
A 24V AC auxilliary supply is available for use with a SeaChange Boiler or AHU controller. Only 1 controller may be powered from this auxilliary supply; if other modules requiring auxilliary power are present on the system a separate 24V AC transformer must be used.

### Example:

| Device    | Load (mA) | Qty          | Total |
|-----------|-----------|--------------|-------|
| PSU       | 7         | 1            | 7     |
| BLR       | 13        | 1            | 13    |
| CAS + PCO | 22        | 4            | 88    |
| VTC       | 22        | 2            | 44    |
| AHU*      | 13        | 3            | 39    |
| PRE + DAM | 22        | 6            | 132   |
| ZON       | 10        | 3            | 30    |
|           |           | Total        | 353   |
|           |           | Spare 10%    | 35    |
|           |           | Total Design | 388   |

(Confirmed as single PSU @ 1 x 500mA)

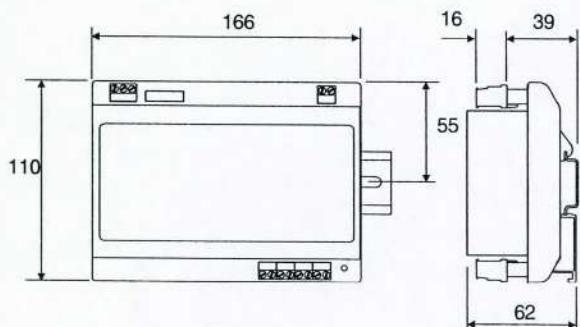
\* Note: AHU will require 24V AC auxilliary supply from a transformer.



# Specification

P1

## Dimensions



all dimensions in mm

## Electrical

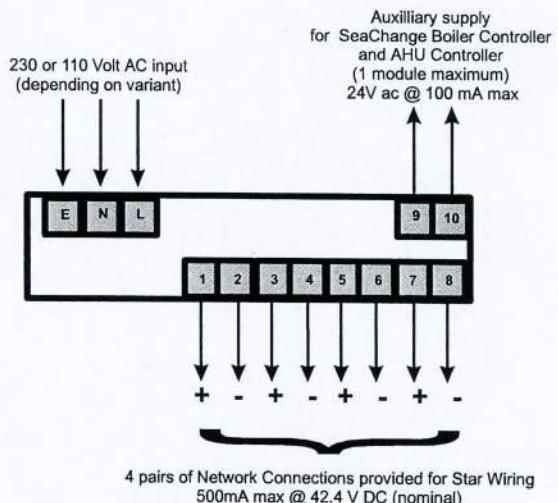
|               |                           |
|---------------|---------------------------|
| Input         | 110/240 Vac 50/60Hz 35 VA |
| Outputs       |                           |
| Network       | 500mA max @ 43Vdc         |
| Aux power out | 100mA @ 24 V AC           |

## Physical

|                |                                              |
|----------------|----------------------------------------------|
| Weight         | 1.5 KG                                       |
| Cover Material | Steel                                        |
| Base Material  | Polyamide 6.6 Self extinguishing to UL 94 VO |
| Colour         | Dark Grey to Pantone 425                     |

Conformant product

## Wiring Information



## Options and Product Codes for Power Supply Units

**PSU / DIN / 500S / [ input voltage ] / [ network termination ]**

### Input Voltage Options:

- / 230 / 230 Volt AC Supply Voltage
- / 110 / 110 Volt AC Supply Voltage

### Network Termination Options:

- / TER with Network Terminator
- / NOT no Network Terminator

e.g. PSU / DIN / 500S / 230 / TER

is a 500mA power supply with power sharing capability, 230 Volt AC supply voltage, with network termination (only one per network segment)

PSU / DIN / 500S / 110 / NOT

is a 500mA power supply with power sharing capability, 110 Volt AC supply voltage, with no network termination (for second and subsequent power supplies on a segment).

# SeaChange

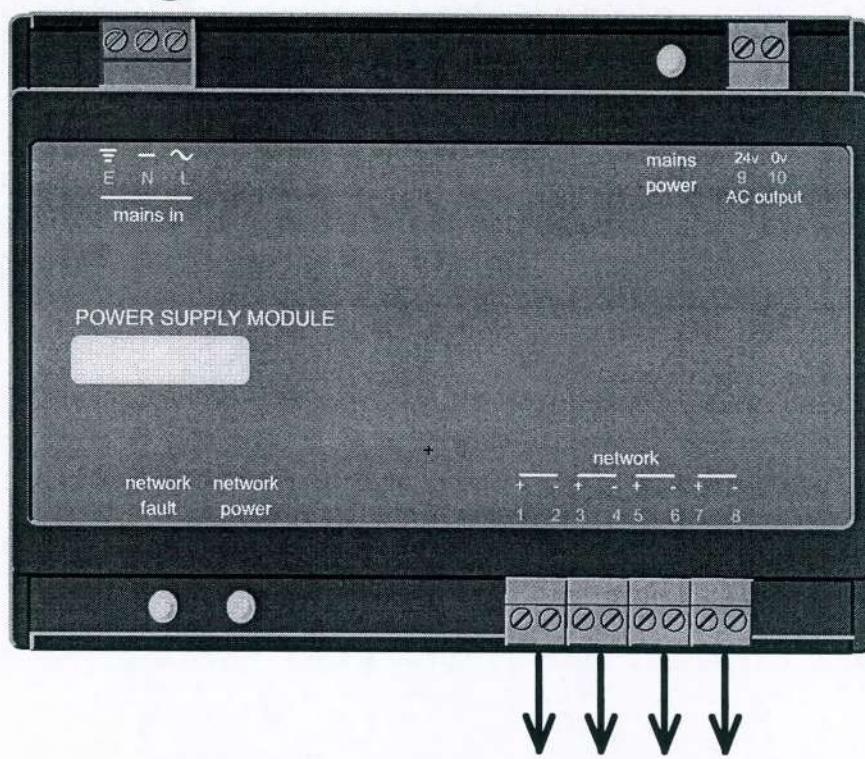
8 Horsted Square  
Bell Lane Business Park  
Uckfield East Sussex TN22 1QQ

phone 01825 769812  
fax 01825 769813  
e-mail sales@seachange.co.uk  
http:// www.seachange.co.uk

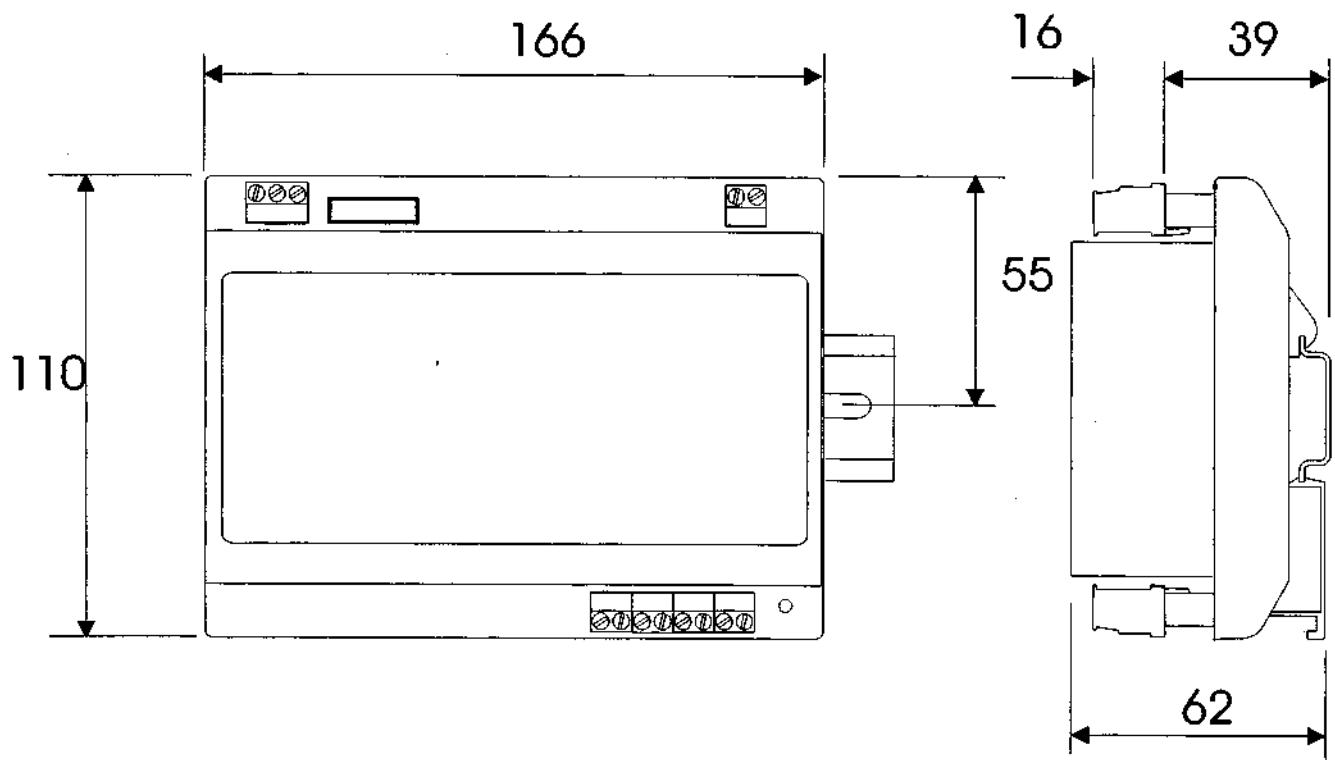
230V 50Hz

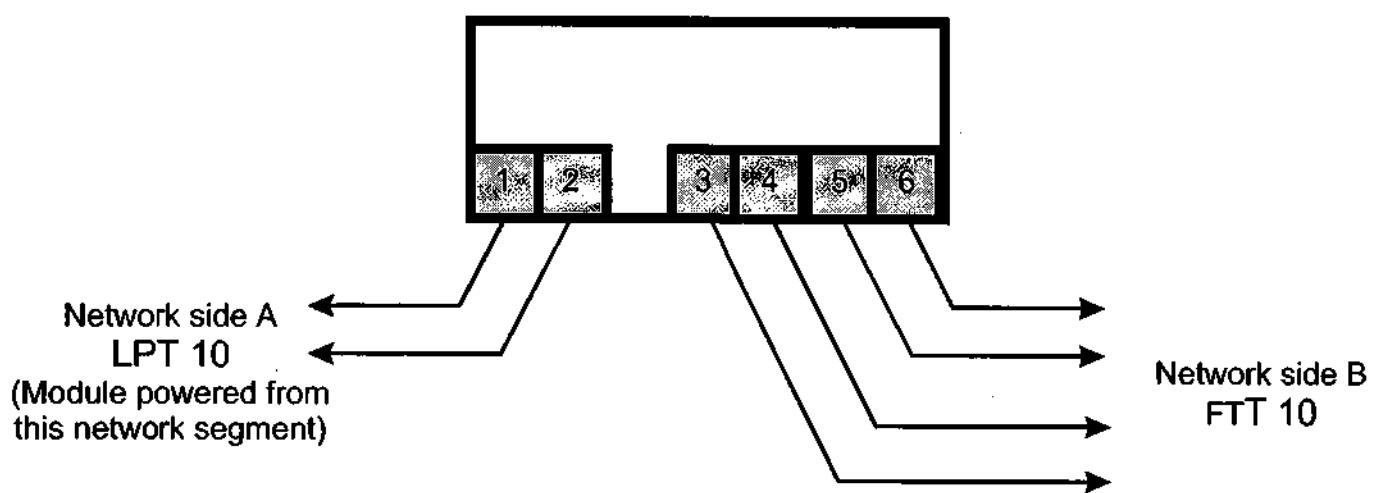


24Vac Max 100mA  
Auxiliary power



42.4Vdc @ 500mA Network power  
4 pairs Network terminations for spur connection





# SeaChange

## Zone Controller

### Main Features

- Controls Space Temperature in a Zone
- Optimum Start and Stop Control
- User Interface for any type of plant
- Engineering Display for Commissioning

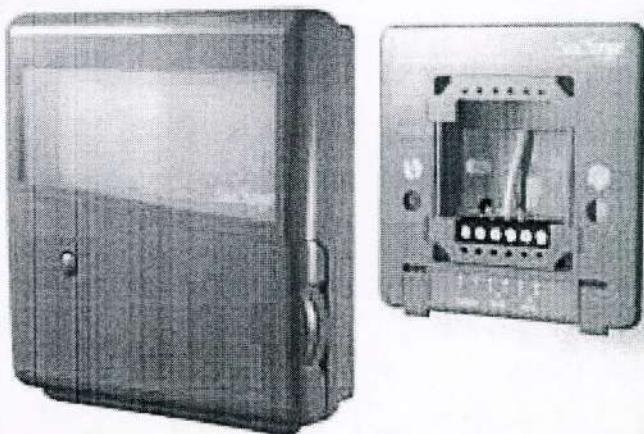


### General Features

- Large Clear Display shows System Status and Current Settings
- Settings easily made using Dedicated Push Buttons and Rotary Adjustment Knob
- 2 Time Periods per Day: 7 Days per Week
- Special settings for Today and Tomorrow
- Holiday Period Feature
- Can be used to remotely display values from another module
- Can use temperature values from other modules for control
- Can be used to supervise the operation of other plant
- Condensation control for Chilled Ceilings
- Fabric Protection using temperature or Relative Humidity
- Can be used to display Alarms from the system
- External inputs for remote sensors or Occupancy Override signals

### Master / Slave operation

- Both Zone Controllers and Slave Zone Controllers are available.
- Slave Zone controllers take all of their time settings from a (master) Zone Controller, and hence do not have the relevant time control buttons.
- Users may still adjust their temperature setpoints and use the Override & Time Extension features.
- Slave Zone Controllers perform their own Optimum Start function independent of the master Zone Controller.
- Up to 100 Slaves can be associated with one Zone Controller.



**Occupancy Indicator**

Figure inside house shows zones is in occupation and outside when not in occupation.

During Optimum Start the figure jumps in and out of the house, during Optimum Stop, the figure flashes ON and OFF inside the house

**Temperature Indicator**

Shows whether the room temperature is at the required temperature.

**Green** when at the required temperature.

**Red** when colder than required.

**Yellow** when hotter than required.

**Status Lamp**

Zone is in Occupancy when indicator is lit.  
Indicator Flashes when controller is in configuration mode.

**Select**

Press button and turn knob to view user displays from other controllers e.g.. Outside Air Temperature, Boiler Flow Temperature

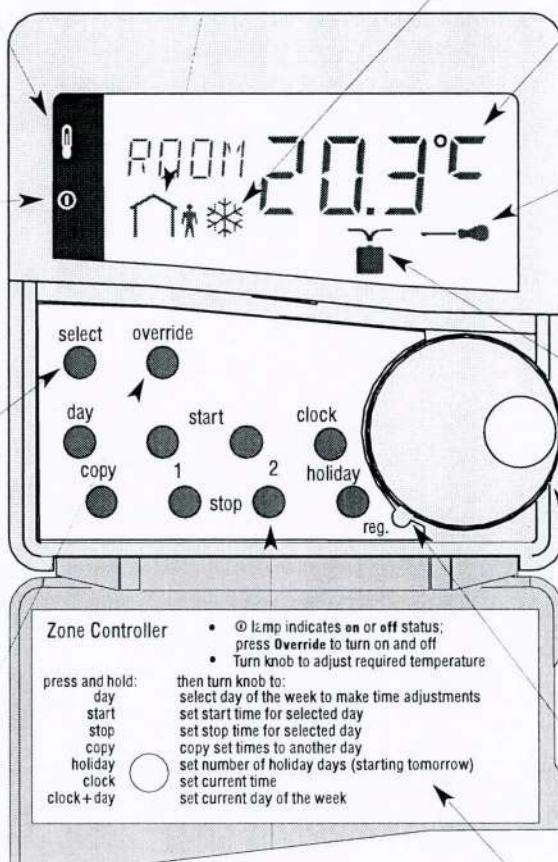
**Override**

Press button to change Occupation status.

Button also accessible with flap closed.

Outside Occupation period *Override* starts a one hour occupation period.

Within Occupation period *Override* puts zone into non-occupation until next scheduled start.

**Time control**

Time settings for two periods per day 7days per week.. Today and tomorrow settings allow adjustment for those days only. Holiday feature allows up to 90 days of holiday to be set. Holiday becomes effective the day after setting is made.

**Frost Indicator**

Shows that the system is running in frost or fabric protection mode.

**Main Display**

Indicates selected Temperature and Time on large clear LCD.

**Screwdriver Symbol**

**Flashing:** Alarm current in system

**Steady:** Indicates controller is in configuration mode.

**Suitcase Symbol**

**Flashing:** indicates Holiday mode is set, but not active

**Steady, with Seagull symbol flashing:** indicates Holiday mode active

**Rotary Knob**

is used to make all adjustments to times and temperatures.

**Registration Button**

is used during the commissioning process to build logical links between controllers.

**User Instructions**

are provided on the inside of the hinged flap.

## User Display Options

The Zone Controller can be used to display certain other parameters in the system which can be particularly useful to installers and maintenance staff.

### Viewing User Displays:

To view user display parameters

- press and hold select button
- rotate Knob clockwise to show parameters.

Preset (factory default) parameters are:

|                           |         |
|---------------------------|---------|
| 1 Room Temperature        | ROOM    |
| 2 Required Temperature    | REQD    |
| 3 Outside Temperature     | OUTS    |
| 4 Boiler flow temperature | FLOW    |
| 5 Zone Control Demand     | DEMD    |
| 6 Time & Day              | MON-SUN |

### Release button:

Display will continue to show parameter selected

To return the display to Room Temperature

- press & hold select button
- rotate Knob anti-clockwise to beginning of list to show ROOM
- release button

### Changing User Displays

It is possible to reconfigure two of the user display parameters - Nos 3 & 4 - to read other system parameters than those preset. This can be used to display temperatures from other modules e.g. POOL temperature or DHW temperature.

- put zone into configuration mode and select required parameter on target module
- by pressing & holding select + override buttons until status display flashes
- press select on target module
- press & hold select on Zone Controller
- rotate Knob until Required Temperature value shown
- release select button
- press start 1 & start 2 buttons together to change user display 3 (preset to Outside Temperature) a tick symbol will appear in the display.
- press stop 1 & stop 2 buttons together to change user display 4 (preset to Boiler flowtemp) a tick symbol will appear in the display.
- return Zone to normal mode - press select and override together.

Note only temperature variables should be selected for these user displays.

### To Reset User Displays to Factory Defaults:

- put Zone into config mode
- push pair of buttons used to set particular variable i.e.
- start 1 - start 2 for user display 3
- stop 1 - stop 2 for user display 4
- copy & holiday for Room Temperature Process

Variable

- display will temporarily show RSET to show variable has been reset
- exit from config mode

### Confirming the Source of a User Display which is already set up

To confirm where a user display is coming from, put the Zone Controller into config. mode, select suspected target module, turn knob clockwise with select button depressed to locate suspected value, if tick displayed this is the displayed user value. If no tick displayed then value can be updated by pressing the appropriate buttons together (see Changing User Displays).

### Remote PV (Process Variable)

The Zone Controller normally uses the Room Temperature either measured by its internal temperature sensor or a remote sensor wired into its terminals as the Process Variable that the Zone will control.

It is possible to use a temperature measurement being made by another module in the system as a Remote Process Variable in place of the Room Temperature. The Zone Controller accesses this information from the other module over the communications network.

The Zone Controller will then display the new value and 4-character label (e.g. POOL from a Pool Controller or HW T from a DHW Controller) in place of the ROOM temperature.

### To set Remote Process Variable

- press and hold select + override buttons on Zone until status lamp flashes (Zone in Config Mode)
- press select on target module
- press and hold select on Zone Controller
- rotate Knob clockwise until target temperature value shown
- release select button
- press copy & holiday buttons together. A tick symbol will appear in the display
- Unit will now display and work to new process variable.

Note this variable must be a measured temperature parameter. Do not try to use a remote setpoint as a Process Variable by this process.

Be careful if using the Zone Controller to perform the control of the temperature, because the Zone Controller Fuzzy Logic constants are set assuming a slow moving Room temperature and may not cope well with a fast changing temperature.

Alternatively, this feature may simply be used to remotely display an appropriate value (if, for instance the Zone Controller is being used to set Return Air Setpoint in an AHU Controller using Setpoint

Supervision, then the measured temperature **RTNA** from that module should be displayed on the Zone).

In this case, the **HTSC** and **CLSC** parameters in the Zone Controller should be set to zero, to disable spurious Energy Demand signals to other modules (because the control is being done by the AHU module, not the Zone).

See also *Temperature Sensors and Occupancy Inputs* for details of Networked Temperature Sensors.

## Temperature Control

### Optimum Start (OPST)

The Occupation Time periods define the times that the building or zone will be to temperature and suitable for occupation.

The Controller will bring on the heating services or HVAC system for a boost period before the beginning of the occupation period to bring the building to the required temperature. The boost period is varied depending on both the zone temperature and the outside temperature in order to bring the zone just up to the required temperature by the beginning of the occupation period. This feature is known as optimum start. By changing the boost time, energy is saved as the plant does not run longer than actual conditions require, the Zone Controller adapts the parameters in its optimum start algorithm so it learns the characteristics of the building and of the services plant.

The Zone learns different characteristics for heating and cooling modes because the plant will have different characteristics in each mode.

Two Parameters can be adjusted to affect Optimum Start; **MXOS** is used to limit the length of the boost period. With undersized plant, it may not be possible to reach the Occupied Setpoint on very cold days without an excessively long boost period, so the length of the boost period may need to be limited. The **OPTE** parameter may be used to allow the Optimum Start algorithm to aim for a setpoint lower than the Occupied Setpoint; this is useful where a step change in heat gain occurs at Occupancy Start, due to lots of people entering the space (e.g. schools) or equipment being turned on. The use of the **OPTE** parameter can prevent temperature overshoot under these conditions.

During the Optimum Start period the figure on the display jumps in and out of the house.

### Optimum Stop

The services for a zone can often be turned off before the end of occupation without the temperature falling outside acceptable conditions. The optimum stop control algorithm calculates how long before the end of occupation the services can be switched off based on zone temperature, outside temperature and its learned characteristics of the building.

The maximum optimum off period is preset to 2 hours configurable by **MXOF**. Setting the parameter of 0 disables the optimum off function which is the preset. Note that the optimum off function turns off the heating or cooling only. Fresh air and ventilation plant would continue to run until the normal end of the occupation period. The target temperature for optimum off can be offset from the Required Temperature by setting the configuration parameter **SBDB** - preset to 0°C.

During the Optimum Stop period the figure on the display flashes ON and OFF inside the house.

### Required Temperature

The Zone Controller normally displays the Room temperature.

To View and Change the Required Temperature:

- rotate the adjustment knob by one click; the display

shows Required Temperature (REQD). After a few seconds the display reverts to Room Temperature (ROOM) displayed.

The Required Temperature is preset to 20°C; to change the Required Temperature rotate the knob more than one click. Clockwise to increase, anti-clockwise to decrease.

## Intelligent Setpoint

The Zone Controller has a number of functions that limit the adjustments that the user can make to the temperature in order to ensure comfort and energy efficient operation are maintained.

### Setpoint Adjustment Limit

Changes that can be made to the Required Temperature using the knob are limited to 2degC at a time (the adjustment limit) to prevent users unthinkingly making large adjustments that would impair the energy efficiency of the system. After a few minutes the Required Temperature can be altered further. The adjustment limit is a configuration parameter **SPAS** which is preset to 2°C

### Adjustment Range

The total Adjustment Range of the Required Temperature is limited to prevent it being set to unacceptable conditions. The Adjustment Range is preset to 5°C about the range midpoint temperature which is preset to 20°C. The Adjustment Range and Midpoint can be set by configuration parameters, **SPRG & SPMD**.

### Required Temperature Reversion

At the beginning of each day the Required Temperature reverts to its Default value so that any changes made the previous day are lost and the control returns to an energy efficient default. The Default temperature can be configured to be anywhere within the Adjustment Range and is preset to 20°C (configuration parameter **SPOC**). The Required Temperature Reversion feature can be disabled by setting the configuration parameter **SPDF** to zero.

## Heat - Cool Control

The Zone Controller has the ability to control cooling as well as heating and can work through separate plant and actuator controllers for both heating and cooling.

It is normal to set a dead band between the heating and cooling functions to allow the temperature to float between the two modes which will improve energy efficiency. The dead band is configured by the **SPDB** parameter. It is preset to 0 which disables the cooling control loop. Setting between 1 to 10°C enables cooling control and sets the cooling dead band.

## Fabric Protection - using Temperature

During the occupation period the Zone controls to the Required Temperature. Outside the occupation period, the zone will bring on the services if the temperature falls to the Fabric Protection Temperature in order to avoid condensation forming.

Once the Fabric Protection algorithm has been initiated it will bring the temperature up by the Fabric Rise Temperature in order to avoid the plant cycling ON and OFF. The Zone remains in this mode until the temperature has risen by the amount specified by the parameter **FRSE** at which point the Zone Controller reverts to non-occupied setpoint as before. If a stable temperature is required during non-Occupancy (e.g. night setback for a nursing home) then FRSE can be left set to the factory default setting of zero.

The Fabric protection temperature is a configuration parameter **SPNC** and is preset to 10°C.

When the Zone is running the plant in Fabric Protection mode a snowflake symbol appears on the display.

## Fabric Protection - using Relative Humidity

If a Networked T+RH sensor is registered to the Zone Controller, the Humidity value may be used for Fabric Protection; the Zone Controller can be made to bring on the heating to prevent RH levels rising above a predetermined level.

The desired maximum RH level is set on parameter **SPRH** (Rh setpoint); setting a non-zero value will enable RH Fabric Protection.

If the RH is below the RH setpoint, the Zone will control to its normal non-occupied setpoint (set on **SPNC**) as for temperature-based Fabric Protection. As the RH in the space rises, the Zone Controller will increase its current setpoint (which can be read on Monitoring Parameter **REQD**) at a maximum rate of 0.1 degC per minute according to an integrating control action. As this temperature setpoint exceeds the current temperature in the space, so the heating will be enabled, raising the temperature and thus reducing the Relative Humidity. The temperature setpoint is limited to the normal Occupied setpoint for the zone (set on **SPOC**) thus providing a high limit for space temperature.

## Frost Protection

The Zone Controller is made aware of the Frost protection status of the Boiler Controller. If the Zone Controller alarms are enabled (**ALRM** set greater than zero) then the Zone will receive frost (**FRST**) alarms from the Boiler. If the Boiler is in Frost protect this is communicated to the zones which will display the frost symbol and open any registered actuators to 50% and start any optimum start/stop switched loads. The Zone remains in non-occupied (man out of the house) to distinguish this mode from *Fabric Protection*.

## Occupancy Control

### Time Schedules

The user can set the times that the Zone is to be used - called occupation periods - by setting the time schedule. This allows 2 occupation periods per day and different settings for each day of the week.

Preset times are:

one occupation period: 0830 to 1700 Mon - Fri

no occupation: Saturday & Sunday

### System Clock

All Zones share a common system clock function so on multi zone systems it is only necessary to set the clock and day on one zone - all the other zones will receive and use the updated time and day.

The Real Time Clock (RTC) is located in the System Housekeeping Module and this module broadcasts the time information over the network every minute and this is received and used by all modules that require this information. If the Zone Module fails to receive the time update - (for instance if the System Housekeeping Module is disconnected or is in configuration mode when it will not communicate) then the zone will automatically switch to use its internal software based clock until the time signals are restored. The Zone Controller alerts the user by bringing an **X** symbol in the lower part of the display when it is running on its software clock.

### Setting the System Clock

To Set Current Time:

- Press and hold clock button
- Rotate Knob until correct time shows on display
- Release Button

To Set Current Day:

- Press and hold day & clock buttons together
- Rotate Knob until correct day shows in display
- Release Buttons

### Setting the 7 Day Time Schedule

Select the Day to be changed:

- press & hold day button
- rotate Knob to select day
- release button

View and adjust time periods:

- press and hold Start 1 butt
- Display shows current start time for period one
- rotate Knob until display shows required start time
- release button
- Set Stop 1 for end of period 1 in same way
- Set second time period using Start 2 and Stop 2 in same way (if required).

To skip an Occupation Period:

The controller will skip an occupation period if the start and stop times are set the same. The default times are to skip the second occupation Monday to Friday preset to 24:00 and both periods Saturday & Sunday preset to 00:10.

**Copy Feature**

Having set the occupation periods for one day they can be copied to other days of the week using the copy facility.

- select the day to be copied from using the day button
- press and hold the copy button
- rotate Knob until last day in copy sequence shows in display
- release button

The occupation times have been copied, from the initial day to all the days, including the final day in the sequence. The copy process can go both forward (Mon to Fri) and back (Fri to Mon) depending on which way the knob turned.

The variable display shows both the initial day and the final day in the sequence as day number 1 - 7, Monday is day 1 and Sunday day 7, so copy from Monday to Friday and the variable display will show 01:05

**Today & Tomorrow**

The time periods for today and tomorrow can be set to be different from the normal 7 day time periods but they are *volatile* and the system will revert to the normal 7 day time periods when they are over. This is useful for unusual events (e.g. late working, or early starts) which are not repeated every week.

To set times for today and tomorrow:

- select day
- press and hold day button
- for TODAY rotate Knob Anti clockwise until display shows TDAY (for Today) which is before MON
- for TOMORROW rotate Knob clockwise until display shows TMRW (for Tomorrow) which is after SUN
- press start and stop buttons to display current time periods
- press and hold start and stop buttons and rotate knob to set special times
- release button

**Override**

Occupation Status is shown on the display During an occupied period, the figure is in the house, outside occupation the figure is outside.

The user can Override the Occupation Status using the Override Button that appears through the flap on the front of the controller.

The way the Override works changes depending on the periods of the day when override is used.

If used before the beginning of either Occupation period in the day, then the zone will be Occupied until the end of that Occupation period. If Override is used when the zone is Occupied, then the unit will switch to non Occupied until the start of the next time period. If Override is used after the end of the Occupation periods then there will be a timed extension to the Occupation period. This extension period is preset to 1 hour but may be changed by using configuration parameter XHRS.

**Holiday**

The Zone Controller can be set to Holiday Mode which is the number of days holiday period starting from the following day. Occupation periods can be set for holiday (for cleaners etc.); the preset value is for no occupation period.

To set Holiday Occupation period :

- press and hold day button
- rotate knob clockwise until HOLS displayed - This is after SUN & TMRW
- release day button
- press and hold start 1 button
- rotate knob to show required start time
- release button
- repeat for Stop 1 & period 2

To set Holiday Mode :

- press and hold holiday button
- display shows number of days holiday starting from tomorrow
- rotate knob to display required number of holidays, 14 for 2 weeks etc.
- release button

When Holiday Mode has been set (but is not active, i.e on the last working day) the display will indicate this by showing a flashing "Suitcase" symbol. When Holiday Mode is active, the display will show steady "Suitcase" and flashing "Seagull" symbols.

**Registration**

The Zone Controller can be used in several different ways, for Controlling the Zone temperature directly, for supervising other controllers in various ways, or for demanding services from other controllers. Some of these features are mutually exclusive, whilst some can co-exist at the same time.

The various forms of Logical Links between this Zone Controller and other Controllers are made by the process of *Registration*; a brief description of the process is given below. For a full description, see our CD ROM.

**Address Allocation**

Before any Registration Links can be made, the Zone Controller must be allocated an address by the System Housekeeping Module. The Register button is pressed; the Zone should display its address; "ZONE1", "ZONE2" etc.

**Submodules**

The Zone Controller may have up to 8 Submodules (e.g. Actuator Controllers, Pump Changeover Modules) registered to it. The Zone is put into Configuration Mode and the Submodule is registered to it. This sets up the Submodule's address (which will be of the form ZnAm, where n is the Zone's address, and m is the Submodule's address).

The registration process also makes *Control Demand* links between Zone and its Submodules, so that they will respond to Occupancy and Heating/Cooling demand signals from the Zone as appropriate.

## Networked Sensors

The Zone Controller may have a Networked Sensor registered to it; either a Condensation sensor, a Networked Temperature sensor, or a Networked Temperature + Relative Humidity sensor. Only one sensor may be registered to a Zone. The Zone is put into Configuration Mode and the Sensor is registered to it.

## Demand Links

These links are Many-to One links made from this Zone (and perhaps many others) to a Module that is providing a service to the Zone (provision of Fresh Air, Energy or Domestic Hot Water services). They can each exist with any other links simultaneously.

### Occupancy Demand

The Occupation state of the Zone can be passed to an AHU or DHW Controller using *Occupancy Demand* linking; this is for plant which provides a service for many zones (e.g. Fresh Air plant). The Target Module is put into Configuration Mode, and the Zone register to it. This sets up the Occupancy Destination parameter **OCDS** to "point" the Zone's Occupancy Demand at the target, which will then run when the Zone (or any other Zone thus registered) is in Occupancy. Occupancy Demand linking can be used in conjunction with any other links at the same time.

### Energy Demand

The Zone Controller can send its Energy Demands for Heating and Cooling to another Module (a *Distributor Module*, like a Secondary Circuit Controller or *Provider Module* like a Boiler Controller) if that Module is responsible for providing energy to the Zone. The Distributor/Provider Module is put into Configuration Mode, and the Zone is registered to it. This sets up the **HTSC** and **CLSC** parameters in the Zone to "point" the Energy Demands at the appropriate Modules. Energy Demand linking can be used in conjunction with any other links at the same time.

## Supervision Links

These links are One-to Many links made from this Zone to one or many other Modules. The Zone Controller will supervise the behaviour of these other modules in some way; either their Setpoint, Occupancy Status (i.e whether they are On or Off) or their Time Schedules (so that they can still perform their own Optimum Start and Fabric Protection). The Zone Controller can only have one of the 3 types of link with any given Module, but it may have links of each type with several different Modules concurrently (e.g. it can supervise the Setpoint in an AHU Controller, and send Occupancy Times to a Slave Zone Controller at the same time)..

### Setpoint Supervision:

The Zone Controller can be used to transmit its Setpoint to another Module (e.g. an AHU Controller) or to many other Controllers (e.g. Fan Coils). Parameters in the Supervised Modules will need to be set (typically their **SPTY** parameter -see appropriate Data Sheets for details).

The **SLVM** parameter in the Zone must be set to 2 or 3 (a setting of 3 will allow the Zone to also send

Occupancy Times to a different Controller). The Zone Controller is put into Configuration Mode, and the target Controller(s) are registered to it. This Setpoint Master-Slave link will be confirmed by "SLVE" (for Zones, Fan Coils etc.) or "SAHU" appearing in the Zone's display.

AHU Controllers thus supervised would normally run to the Zone's setpoint during Occupancy, and will turn off during Non-Occupancy. If it is desired to run the AHU during Non-Occupancy (i.e for 24 hours) but at a different setpoint, the parameter **NOSV** may be used ; if set to a non-zero value, this will keep the AHU running at the desired setpoint.

### Occupancy Supervision:

The Zone Controller can be used to transmit its Occupancy Status to many other Controllers (e.g. Fan Coils). This mode of linking can be used instead of Setpoint Supervision to drive Fan Coils on and off, but leave them controlling to their own setpoints. The Zone Controller will be responsible for Optimum Start and Fabric Protection.

Parameters in the Supervised Modules will need to be set (typically their **SPTY** parameter -see appropriate Data Sheets for details).

The **SLVM** parameter in the Zone must be set to 2 or 3 (a setting of 3 will allow the Zone to also send Occupancy Times to a different Controller). The Zone Controller is put into Configuration Mode, and the target Controller(s) are registered to it. This Setpoint Master-Slave link will be confirmed by "SLVE" (for Zones, Fan Coils etc.) or "SAHU" appearing in the Zone's display.

### Time Schedule Supervision:

The Zone Controller can be used to transmit its Occupancy Time Schedules to many other Controllers (e.g. Slave Zone Controllers). This mode of linking can be used instead of Setpoint Supervision to set Occupancy Times but leave them controlling to their own setpoints, and performing independent Optimum Start and Fabric Protection for their parts of the building.

Parameters in the Supervised Modules will need to be set (typically their **SPTY** parameter -see appropriate Data Sheets for details).

The **SLVM** parameter in the Zone must be set to 1 or 3 (a setting of 3 will allow the Zone to also send Setpoints to a different Controller). The Zone Controller is put into Configuration Mode, and the target Controller(s) are registered to it. This Setpoint Master-Slave link will be confirmed by "SLVE" (for Zones, Fan Coils etc.) or "SAHU" appearing in the Zone's display.

## ● Temperature, RH and Occupancy Inputs

### Conventional Thermistor Sensors

The Zone Controller (type /001) is fitted with its own internal temperature sensor which is used as the measured temperature to be controlled.

The unit can be connected to a remote temperature sensor which is a conventional, low cost thermistor type for applications where it is inappropriate to locate the Zone Controller in the area to be controlled because it may be tampered with. The Zone Controller is preset to switch control to the remote sensor if one is fitted but the sensor action parameter **SACT** can be set so the controller uses the higher, lower or average value of the two sensors. If one sensor fails the control will continue on the other sensor alone. A Sensor fail alarm can be sent.

A version (/003) of the Zone Controller is available without an Internal Temperature sensor but with the ability to use 2 remote sensors. This is useful to provide freedom of location of sensors and to allow two measurement points in a larger space.

Because they are standard 10K ohm thermistors, 4 can be wired in series/parallel configuration to provide electrical averaging of 4 sensors. Thus up to 8 sensors can be wired to a Zone Controller.

### Intelligent Networked Sensors - Temperature

A SeaChange Intelligent Networked Temperature Sensor (which has its own Microprocessor and derives its power from the network) may be registered (as a Submodule) to the Zone Controller. The Zone will display **SEN1** when the device is registered. This type of sensor has the advantage that it may be located anywhere on the network, and so may provide installation benefits because an additional cable may not need to be run between the Zone and the sensor. The parameter **SACT** must be adjusted accordingly to make the Zone Controller use the Networked Sensor value as its Process Variable in place of its own thermistor. Control will revert to the local thermistor if the Networked Sensor reading is invalid. Unlike the feature *Remote Process Variable*, (described under *User Display Options*) where the Process variable is obtained from another Controller Module, here the value is coming from a Sensor Submodule, so the Zone Display will still read "ROOM".

### - Temperature + Humidity

A SeaChange Intelligent Networked T + Rh sensor connected somewhere on the network may be registered (as a Submodule) to the Zone Controller. The Zone will display **SEN1** when the device is registered. The parameter **SACT** must be adjusted accordingly to make the Zone Controller use the Networked Sensor Temperature value as its Process Variable in place of its own thermistor. Control will revert to the local thermistor if the Networked Sensor

reading is invalid.

The Relative Humidity may be used for Monitoring only, or it may be used for enhanced Fabric Protection using Rh control - see *Fabric Protection*.

### Sensor Calibration

The sensor calibration can be trimmed using the **SCAL** parameter. This provides a fixed offset to the temperature measurement and applies to the resultant temperature - after selection of remote, average, etc. functions using **SACT** parameter. Sensor calibration is preset to 0°C.

## Switch Inputs

### Remote Occupation Status Input

A Volt-Free Contact (VFC) may be wired to the external input connections to provide external control over the Occupation Status of the controller.

### Occupancy/Non-Occupancy Switching

The remote temperature input connections can be configured by **SACT** to be a remote input to provide occupation override. This uses a contact closure (volt free contact) to drive the zone into the occupancy state if it currently is not occupied but will not alter the occupancy state if the time schedule etc., has already put the zone into occupancy. This feature can be used to drive a zone into occupancy using an input from a simple switch, another item of plant, or a Presence Detector or Card Access Controller. Note that any timed on period should be part of the presence detector function, the Zone Controller will revert to Non-occupied directly the signal is removed.

### Occupancy/Standy Mode Switching

The remote temperature input connections can be configured by **SACT** to be a remote input to provide Occupation/ Standby Mode switching. This uses a contact closure (volt free contact) to drive the zone into the occupancy state if it is currently outside of its Occupation Times. If the Zone is in its normal Occupancy period, with the external contact open circuit, it will be running in *Standby Mode* (i.e with a wide deadband set on parameter **SBDB**).

When the external contact closes, the Zone will be driven into its normal Occupation Mode (with a normal close deadband set on **SPDB**). This feature can be used to drive a zone into occupancy using an input from a simple switch, another item of plant, or a Presence Detector or Card Access Controller. Note that any timed on period should be part of the presence detector function, the Zone Controller will revert to Non-occupied directly the signal is removed.

## Condensation Control

The Zone Controller can control condensation in Static Cooling (Chilled Ceiling and Chilled Beam) installations, where condensation can form on the cold surfaces of the ceiling if the ceiling temperature is allowed to fall below the dewpoint of the surrounding air. This phenomenon is sometimes referred to as "Office Rain".

A SeaChange Intelligent Networked Condensation Sensor must be registered to the Zone Controller (the sensor can be connected anywhere on the network). Upon registration, the Zone Controller will display "SEN1".

If the Condensation Sensor reports a condensing condition, the Zone Controller will progressively ramp down its Cooling Control demand signal, and hence start to close down any registered Actuator Submodules, which would be controlling the Cooling Valve on the Chilled Ceiling. An alarm can also be generated; see *Alarm Handling and Display*.

As the condensing condition clears, the Zone Controller will resume normal control; thus a simple form of local Dewpoint Control has been created. The Controller will allow the Chilled Ceiling to run as cold as possible whilst preventing condensation, which will ensure that the maximum possible cooling output is derived from the ceiling.

If the Condensation Sensor fails to respond or becomes disconnected during a condensing event, the Zone Controller will recover normal operation within 7 minutes, until the sensor is re-connected.

## Alarm Handling and Display

The Zone Controller can generate alarms, and can also respond to alarms sent by other Controllers. If it receives an alarm, it can be set to take some control action, display the alarm, or both.

### Alarm Generation

The Zone Controller can generate 3 different alarms, which can be reported at Doorway Supervisor, or on the display of this Zone Controller (see below).

**SENF** alarm is generated when the sensor reading is outside of the allowable range

**RPVF** alarm is generated if the Controller is set to use a Remote Process Variable from another controller in place of its own sensors, and the Variable is not being received across the network

**CNDF** alarm is generated when a Condensation sensor registered to this Zone has detected condensation.

### Alarm Control Action

The Zone Controller can be set to react to alarms in different ways; the **ALRM** parameter can be set to ignore alarms, to report alarms but take no Control Action, or to shut down its Control Demand output (and hence any registered Submodules' outputs, e.g. Actuator Controllers) - either because of an internal alarm, or because a System **STOP** alarm has been received.

### Alarm Displays

The Zone Controller can be set to display alarms if required. The setting can make the Zone display only its own alarms, or alarms from any other Controller on the network.

The parameter **AMON** when set to a non zero value enables the Alarm Monitoring feature. The controller stores the first 10 Controllers which report alarms and the display flashes "**HELP**" and the current number of Controllers which have reported alarms, alternating with the normal display (usually ROOM and the temperature value). If the Alarm is generated by the Zone controller itself then the display will show the Alarm label instead of HELP.

Pressing override acknowledges the alarm and the display reverts to normal except that the screwdriver symbol continues to flash until the alarms clear.

This feature has been developed to provide simple alarm indication on small systems so that the occupants can alert their maintenance company that there is a fault. Alternatively it can be used to show sensor fail or condensation imminent for just the zone affected.

# Configuration Parameters

| Label                 | Doorway Code | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Units | Default Value | Range       |
|-----------------------|--------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|---------------|-------------|
| SACT                  | C1           | Sensor Action; sets pre-processing for temperature input and selects external input modes.<br>0: use local sensor unless remote hardwired sensor connected (see use of nviRemoteTemp for Open systems)<br>1: average of valid sensor values<br>2: maximum of valid sensor values<br>3: minimum of valid sensor values<br>4: use remote sensor as Occupation input , VFC shorted is occupied<br>5: use networked temperature (nviRemoteTemp) if valid, else remote hardwired if valid, else local<br>6: use remote sensor as Occupancy / standby input, VFC shorted is occupied with close control. open circuit is standby or non-occupied according to zone occupancy pattern | -     | 0             | 0 to 6      |
| SCAL                  | C2           | Calibrate sensor value                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Deg C | 0             | -5.0 to 5.0 |
| SPMD                  | C3           | Midpoint of absolute setpoint adjustment range                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Deg C | 20.0          | 5 to 95     |
| SPRG                  | C4           | Range of absolute setpoint adjustment about midpoint                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Deg C | 5             | 0 to 10     |
| SPDB                  | C5           | Setpoint deadband between heating and cooling setpoints. If zero disables cooling                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Deg C | 0             | 0 to 10     |
| SBDB                  | C6           | Additional deadband used in Standby Mode and Optimum off                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Deg C | 2.0           | 0 to 10     |
| SLVM<br>(master only) | C7           | Slave Mode; (only in Master Zones)<br>1: send Occupation times to Slave Zones<br>2: send Setpoint to Slave Zones<br>3: send both Times and setpoint to Slaves                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | -     | 1             | 1 to 3      |
| SPTY<br>(slave only)  | C7           | Setpoint Type; (only in Slave Zones)<br>0: use local setpoint<br>1: use remote setpoint, disable local OSS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | -     | 1             | 0 to 1      |
| MNOP                  | C8           | Minimum output invoked if within 1C of setpoint, used to keep VT circuit running (alternative to using MIND = 0 in VT Controller)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | %     | 0             | 0 to 10     |
| XHRS                  | C9           | Extension hours when override pressed outside occupation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | hours | 1             | 0 to 8.0    |
| DEGF                  | C10          | Selects displays in degrees Fahrenheit when set to 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | -     | 0             | 0 to 1      |
| FRSE                  | C11          | Fabric/Frost rise; added to SPNO to form termination temperature for heating run if temperature dips below SPNO value during non-occupation                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Deg C | 0             | 0 to 10.0   |
| SPAJ                  | C12          | Setpoint Adjust;<br>range of instantaneous setpoint adjustment using knob                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Deg C | 2.0           | 0 to 10.0   |
| SPDF                  | C13          | Setpoint Default;<br>If set to 1 setpoint changes with the knob update the default setpoint (i.e. the setpoint will not revert to a default during the next occupancy period)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Deg C | 0             | 0 to 1      |
| ALRM                  | C14          | Alarm mode;<br>0: ignore alarms<br>1: report alarms<br>2: report alarms, shut down all outputs (i.e. Submodules) on alarm<br>3: report alarms, shut down all outputs (i.e. Submodules) on STOP alarm or sensor fail alarm                                                                                                                                                                                                                                                                                                                                                                                                                                                      | -     | 1             | 0 to 3      |
| ALST                  | C15          | not used                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | -     | -             | -           |
| AMON                  | C16          | displays that alarms are present on the Zone Display                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | -     | 0             | 0 to 3      |
|                       |              | 0: disables alarm monitoring<br>1: only monitors own alarms<br>2: only monitors alarms from own domain<br>3: monitors all alarms                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |       | 0             | 0 to 1      |
| HTSC                  | C17          | Heat Source; points Energy Demand to source of Heating energy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | -     | 1             | 0 to 8255   |
| CLSC                  | C18          | Cool Source; points Energy Demand to source of Cooling energy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | -     | 0             | 0 to 8255   |
| OCDS                  | C19          | Occupation Destination;<br>points Occupancy Demand at another controller                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | -     | 0             | 0 to 8255   |
| HTCT                  | C20          | Setpoint selector;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | -     | 0             | 0 to 100    |
|                       | C21          | 0: send Heating Demand signal as % (for VT Circuit Control)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |       |               |             |
|                       | C22          | 1- 100: send this value as CT setpoint (for CT Circuit Control)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |       |               |             |
| CLCT                  | C23          | reserved for future use                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | -     | 0             | 0 to 20     |
| ISS3                  | C24          | Set to force single domain operation (should only be needed when using issue 3 Floor Controllers)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | %     | 0             | 0 to 1      |
|                       |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | hrs   | -             |             |

# Monitoring Parameters

Z1

| Label                                          | Doorway Code | Description                                                          | Units  | Default Value | Range     |
|------------------------------------------------|--------------|----------------------------------------------------------------------|--------|---------------|-----------|
| FRST                                           | I1 (C30)     | Frost or Fabric protection in operation                              | On/Off | -             | On/Off    |
| OCC                                            | I2 (C31)     | Occupied                                                             | On/Off | -             | On/Off    |
| OSRT                                           | I3 (C32)     | Optimum Start in operation                                           | On/Off | -             | On/Off    |
| OOFF                                           | I4 (C33)     | Optimum Off in operation                                             | On/Off | -             | On/Off    |
| COOL                                           | I5 (C34)     | Controller in cooling mode                                           | On/Off | -             | On/Off    |
| COND                                           | I6 (C35)     | Condensation detected                                                | On/Off | -             | On/Off    |
| XOCC                                           | I8 (C37)     | External Occupation signal                                           | On/Off | -             | On/Off    |
| AUTO                                           | W1 (C38)     | Controller in automatic control                                      | On/Off | -             | On/Off    |
| OVRD                                           | W2 (C39)     | Override W1 and W2 used together with Doorway Auto/manual dialog box | On/Off | -             | On/Off    |
| CGST                                           | W8 (C45)     | Configuration mode                                                   | On/Off | -             | On/Off    |
| ROOM                                           | S1 (C50)     | Controller measured temperature                                      | Deg C  | -             | 5 to 30.0 |
| DMND                                           | S2 (C51)     | Controller output                                                    | %      | -             | -100 /100 |
| REQD                                           | S3 (C52)     | Controller current setpoint                                          | Deg C  | 5 to 30.0     |           |
| HTOP                                           | S4 (C53)     | Heating output                                                       | %      | 0 to 100      |           |
| CLOP                                           | S5 (C54)     | Cooling output                                                       | %      | 0 to 100      |           |
| RHUM                                           |              | Relative Humidity (only valid if networked TRH sensor registered)    | % RH   | 0 to 100      |           |
| OPST                                           |              | last Optimum Start time                                              | hours  | 0 to 24.0     |           |
| OPOK                                           |              | last Optimum Start complete (OK)                                     | hours  | 0 to 24.0     |           |
| <b>Knobs : these are adjustable parameters</b> |              |                                                                      |        |               |           |
| SPOC                                           | K1 (C60)     | Occupied setpoint                                                    | Deg C  | 20            | 10 to 30  |
| SPNO                                           | K2 (C61)     | Non-occupied setpoint                                                | Deg C  | 10            | 5 to 30   |
| SPSV                                           | K3 (C62)     | Supervised setpoint, from master controller                          | Deg C  | 0             | 0 to 30   |
| SPRH                                           | K4.. (C63)   | Humidity protection setpoint                                         | % RH   | 0             | 0 to 95   |
| MXOS                                           | K5 (C64)     | Maximum Optimum Start time (hours)                                   | hours  | 6             | 1 to 24.0 |
| MXOF                                           | K6 (C65)     | Maximum Optimum Stop time (hours)                                    | hours  | 2             | 0 to 4.0  |
| NOSV                                           | K7 (C66)     | Non Occupied Supervised setpoint                                     | Deg C  | 0             | 0 to 30.0 |

## Accessing Configuration and Monitoring Parameters

Configuration Parameters are used to adjust settings from their factory defaults; Monitoring Parameters are mostly used to monitor internal readings (such as temperature readings) during the Commissioning process.

This Module's Parameters may be viewed, and in the case of some parameters, adjusted by one of two methods; Either by using the Zone Controller's own buttons and display, or by using the SeaChange Doorway Supervisor. The Zone Controller may also be used to view parameters in any other Module on the network.

### Using the Zone Controller:

- The Zone Controller must be connected to the network and *registered* (see Commissioning Guide for further details).
- Put the Zone Controller into Configuration Mode by depressing Select and Override buttons for 10 seconds, until the CNFG legend appears on the display.
- To view Parameters in this Zone Controller, miss out this step and go to step d). To view Parameters in another Controller, press Select button on the target device (in this case, the Boiler Controller).
- Hold down Select button on the Zone Controller, and rotate the rotary knob:

clockwise to view Monitoring Parameters  
anticlock to view Configuration Parameters

e) When desired Configuration Parameter appears, release Select, hold down Override and turn knob to adjust the parameter (note; some Monitoring Parameters cannot be adjusted).

Note: Once you have selected another controller to view, you can select another controller (by pressing its Select Button), but you cannot "deselect" all other controllers in order to return to viewing the Zone's own parameters. In order to do this, exit from Configuration Mode (press Select and Override briefly) then start again at step a) above.

### Using SeaChange Doorway:

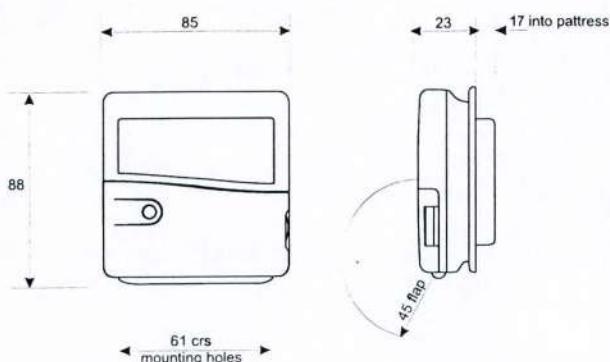
Data Points may be added to a Doorway page to access/adjust any Configuration or Monitoring Parameter. Graphs of certain Parameters are also available. The code used to access a Boiler Controller is **Zn**, where *n* is the Zone's address number. The code for each parameter is shown in the adjacent tables.

Further details of how to set up Doorway pages may be found in the SeaChange Doorway Manual, or in the online help facility supplied with SeaChange Doorway

The PC running SeaChange Doorway can be connected locally via a Serial Adaptor Module, or remotely using standard High-Speed Modems; all Parameters can thus be monitored and adjusted remotely.

# Specification

## Dimensions



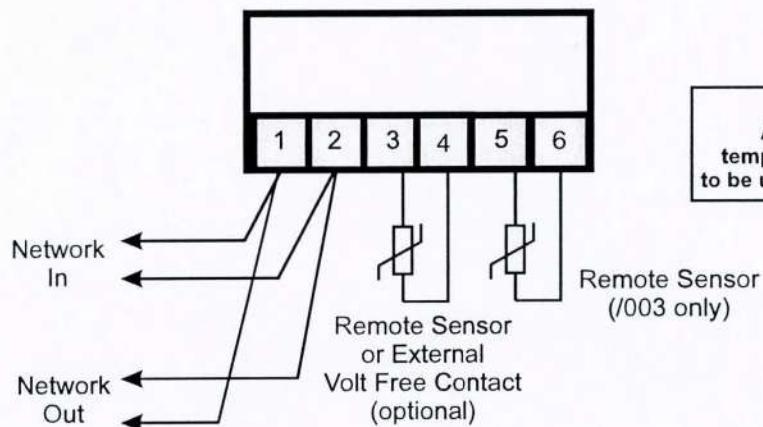
all dimensions in mm

## Electrical

|                 |                                                                                              |
|-----------------|----------------------------------------------------------------------------------------------|
| Inputs          | 1 x remote sensor or VFC (type /001)<br>2 x remote sensors or 1 sensor and 1 VFC (type /003) |
| Outputs         | None                                                                                         |
| Consumption     | 11mA from network                                                                            |
| <b>Physical</b> |                                                                                              |
| Weight          | 0.25 kg                                                                                      |
| Cover Material  | PC/ABS alloy Self extinguishing to UL 94 V0/1.60                                             |
| Base Material   | Polyamide 6.6 Self extinguishing to UL 94 VO                                                 |

Conformant product

## Wiring Information



**IMPORTANT**  
All network and input cable from  
temperature sensor or Volt Free Contact  
to be unscreened, twisted pair cable 20AWG

## Options and Product Codes

### ZON / PTR / LCD / 001

Zone Controller with internal sensor, with facility for wiring optional external thermistor sensor or Volt-Free contact for external occupancy control

### ZON / PTR / LCD / 003

Zone Controller with no internal sensor, facility for wiring 1 or 2 remote sensors or 1 sensor and 1 Volt-Free contact for external occupancy control

phone 01825 769812  
fax 01825 769813  
e-mail sales@seachange.co.uk  
[http:// www.seachange.co.uk](http://www.seachange.co.uk)

8 Horsted Square  
Bell Lane Business Park  
Uckfield East Sussex TN22 1QQ

# SeaChange

Data Sheet

Z2

## Temp + RH Zone Controller

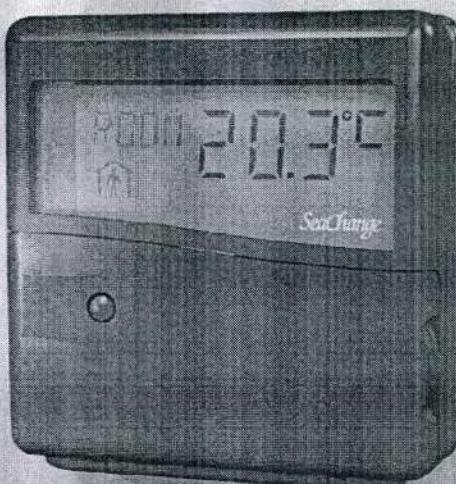
### Main Features

Controls Space Temperature only during Occupancy

Controls Humidity during Non-Occupancy periods for Protection of Building Fabric and Contents

Used to set Required Temperatures and Occupation Times

Operates with Sontay Relative Humidity & Temperature Transmitter



### Detailed Features

#### User Settings

The Zone Controller allows the User to set Occupation Times and the Temperature during the occupation period. The Occupation Status is shown on the LCD Display on the front of the device.

#### Occupation Time Schedule

The Occupation Times for the Zone are set using the Push Buttons found behind the front cover. Occupation times for each of the seven days of the week can be independently set with two periods per day. There are special settings for Today's or Tomorrow's times which are volatile, i.e. they only affect the one day set and do not alter the standard week times. The Holiday feature sets the number of days the Holiday, starting the next day.

#### Override

The override button is used to change the occupation status as shown on the LCD. If the 'man' is in the house, the zone is in 'Occupation' and is out of occupation when the 'man' is outside the house. Pressing the Override button will change the unit from Occupied to Non-Occupied until the next occupied period. Outside the occupied period, Override will give a timed Extension. The Extension time is set by the configuration parameter XHRS and is preset to one hour.

#### Required Temperature

The required temperature during occupation can be set by the User from the adjustment Knob on the Zone Controller. Moving the Knob by one 'click' changes the display to show Required Temperature. Further rotation of the Knob will alter the required temperature. The Default Required Temperature is preset to 20 Deg C and can be configured by the OCSP parameter. The Range of User Adjustment is preset

to +/- 5 Deg C (i.e.. 15 to 25 Deg C) and can be configured by the SPRG parameter about a midpoint SPMD.

*Any User changes made to the Required Temperature will revert to the default setpoint the following day.*

To stop too large a change being made, the Required Temperature can only be adjusted by 2 Deg C at a time. After a few minutes further change can be made repeating until a set maximum is reached.

#### Occupied Setpoint (OCSP)

The occupied setpoint is the temperature to which the control will be returned at the start of each occupancy period and can be set within the range (10 - 25.5 Deg.C)

#### Relative Humidity Fabric Protection

Outside the Occupation Time Period, the module controls the Relative Humidity of the space by varying the required temperature. This works because for air of a given moisture content, the Relative Humidity will decrease if the temperature is increased. So the control mechanism is to vary the non-occupied temperature setpoint to maintain the Relative Humidity at or below the RH setpoint. The RH Setpoint is factory set to 50%RH and is configured by the SPRH parameter.

In this control mode, the Relative Humidity control can vary the temperature setpoint between the Non-Occupied Temperature setpoint (factory preset to 10 Deg C by the NOSP parameter) and the default occupied temperature setpoint defined above.

#### User Displays

The Zone Controller can display Room Temperature, Required Temperature, Outside Air Temperature, % Relative Humidity and % Demand using the Select Button and Knob to select the desired display.

# Features

Z2

## Temperature Indicator

Shows whether the room temperature is at the required temperature.

**Green** when at the required temperature.

**Red** when colder than required.

**Yellow** when hotter than required.

## Status Lamp

Zone is in Occupancy when indicator is lit.

Indicator Flashes when controller is in configuration mode.

## Select

Press button and turn knob to view user displays from other controllers e.g.. Outside Air Temperature, Boiler Flow Temperature and local Relative Humidity. Selected parameter can be left as the controller display.

## Override

Press button to change Occupation status. Button also accessible with flap closed. Outside Occupation period

*Override* starts a one hour occupation period.

Within Occupation period *Override* puts zone into non-occupation until next scheduled start.

## Occupancy Indicator

Figure inside house shows zone is in occupation and outside when not in occupation.

During Optimum Start the figure jumps in and out of the house, and shows as On/Off during Optimum Stop

## Frost Indicator

Shows that the system is running in Fabric Protection mode.

## Main Display

Indicates selected Temperature and Time on large clear LCD.

## Screwdriver Symbol

Indicates controller is in configuration mode.

## Connection Symbol

Indicates that the controller has not been registered with other system devices and still needs to be commissioned.

## Rotary Knob

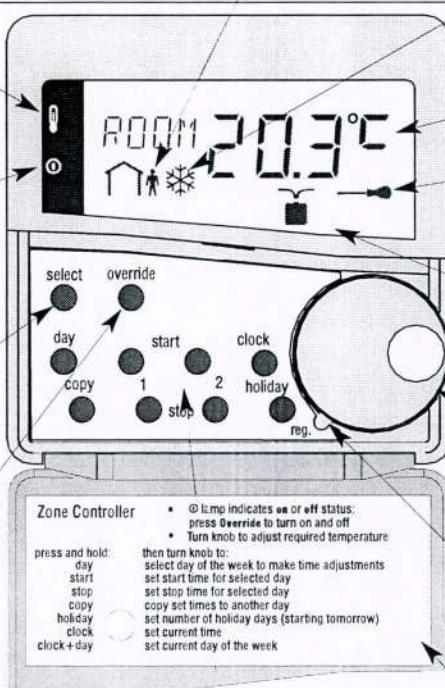
is used to make all adjustments to times and temperatures.

## Registration Button

is used during the commissioning process to build logical links between controllers.

## User Instructions

are provided on the inside of the hinged flap.



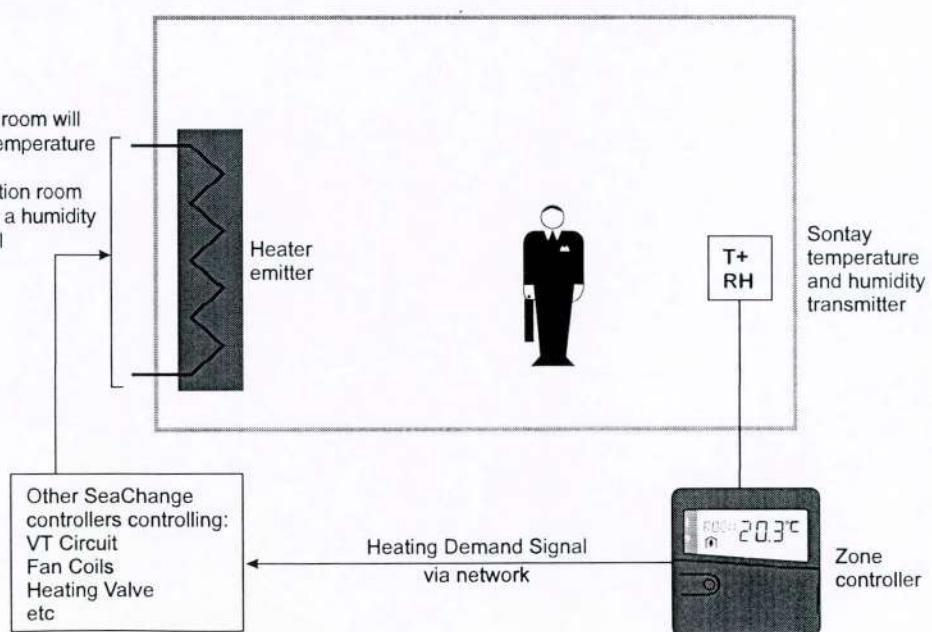
## Time control

Time settings for two periods per day 7days per week.. Today and tomorrow settings allow adjustment for those days only. Holiday feature allows up to 90 days of holiday to be set. Holiday becomes effective the day after setting is made.

# Typical Application

## Fabric protection of room and contents using RH Fabric Protection

During occupation, room will be controlled to a temperature setpoint.  
During non-occupation room will be controlled to a humidity setpoint with overall temperature limits.



## Accessing Configuration Parameters

Z2

Configuration Parameters are used to adjust settings from their factory defaults; Monitoring Parameters show the current operation of the controller (such as temperature readings) during the Commissioning process.

Configuration parameters may be viewed and adjusted by using this Zone Controller, another connected to the network, or by connecting the

SeaChange Doorway Supervisor. When adjusting this controller, place into Configuration Mode, hold the select button and rotate the Knob anticlockwise to view the Configuration Parameters.

Having selected a Configuration Parameter to Adjust, Press the Override button and change the value using the Knob.

## Configuration Parameters

| Label | Doorway Code | Description                                                                           | Units | Default Value | Range       |
|-------|--------------|---------------------------------------------------------------------------------------|-------|---------------|-------------|
| OPST  | C1           | Optimum Start Time                                                                    | Hours | 0             | 0 to 24     |
| OPOK  | C2           | Optimum Start complete                                                                | Hours | 0             | 0 to 24     |
| MXWU  | C3           | Maximum Optimum Warm Up Time                                                          | Hours | 6             | 1 to 24     |
| MXCD  | C4           | Maximum Optimum Cool Down Time                                                        | Hours | 2             | 0 to 4      |
| OPT   | C5           | Optimum ON Constant                                                                   |       | 100           | 0 to 100    |
| OPOF  | C6           | Optimum OFF Constant                                                                  |       | 100           | 0 to 100    |
| SPRH  | C7           | Humidity default setpoint                                                             | %RH   | 50            | 0 to 100    |
| SCAL  | C8           | Calibrate temperature sensor value                                                    | Deg C | 0             | -5 to 5     |
| SPMD  | C9           | Midpoint of setpoint adjustment range                                                 | Deg C | 20            | 10 to 25.5  |
| SPRG  | C10          | Range of setpoint adjustment about midpoint                                           | Deg C | 5             | 0 to 10     |
| SBDB  | C12          | Additional deadband used in Optimum off                                               | Deg C | 2             | 0 to 10     |
| MNOP  | C13          | Minimum output invoked if within 1 deg C of setpoint, used to keep VT circuit running | %     | 5             | 0 to 10     |
| XHRS  | C14          | Extension hours when override pressed outside occupation alarm mode                   | hrs   | 1             | 0 to 8      |
| HTSC  | C15          | Heat Source, points to module providing heat to zone.                                 |       | -             | 0 -1 to 100 |

## Monitoring Parameters

| Label | Doorway Code | Description                          | Units | Default Value | Range    |
|-------|--------------|--------------------------------------|-------|---------------|----------|
| ROOM  | S1 (C50)     | Current Room Temperature             | Deg C | -             | 5 to 30  |
| REQD  | S2 (C51)     | Controller Current Setpoint          | Deg C | -             | 5 to 30  |
| DMND  | S3 (C52)     | Controller Current Output            | %     | -             | +/-100   |
| HTOP  | S4 (C53)     | Heating Output (to Actuator modules) | %     | -             | 0 to 100 |
| RHUM  | S5 (C55)     | Current room relative humidity       | %     | 50            | 0 to 100 |
| OCSP  | K1 (C60)     | Occupancy temperature Setpoint       | Deg C | 20            | 10 to 30 |
| NOSP  | K2 (C61)     | Non-Occupancy Setpoint               | Deg C | 10            | 5 to 30  |

## Optimiser Parameters

### Optimum Start (OPST)

The heating (or cooling) plant start time is calculated from the zone room and outside temperatures. Over a period of days the controller calculates the heating loss constant (OPT) monitoring the room temperature fall against the outside temperature. This is used to set the plant 'On' time so that the selected occupation temperature can be reached at the occupancy start time. The current preheat time can be checked via the Zone controller in configuration mode or via Doorway ( OPST). The maximum preheat time can be changed if needed using MXWU preset to 6 hours.

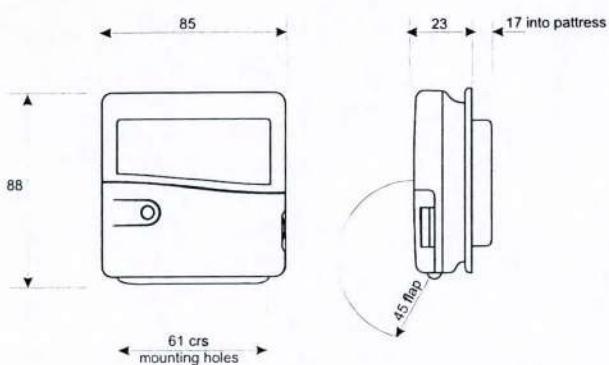
### Optimum Stop

If Optimum stop is invoked, the space temperature as measured by the Zone Controller is allowed to fall beneath the setpoint by a limited amount prior to the end of occupancy. The limit is set by adjusting the control deadband (SBDB factory set at 2 deg.C). This characteristic is self adaptive like the optimum start feature (OPOF). Optimum Stop can be disabled by setting maximum optimum stop time, MXCD (factory set at 2 hours) to zero.

# Specification

Z2

## Dimensions



all dimensions in mm

## Electrical

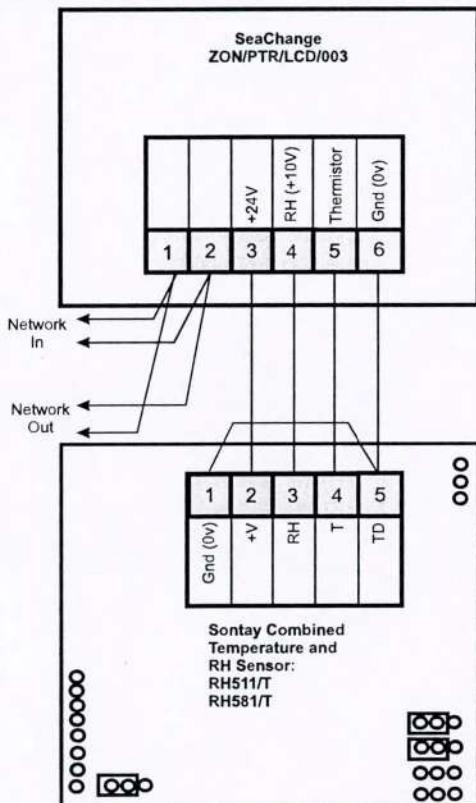
|         |                                                       |
|---------|-------------------------------------------------------|
| Inputs  | 2 x remote sensors (Sontay T+H)                       |
| Outputs | None                                                  |
| Network | Polarity independent connections<br>Network load 10mA |

## Physical

|                |                                 |
|----------------|---------------------------------|
| Weight         | 0.25 kg                         |
| Cover Material | PC/ABS alloy Self extinguishing |

CE Conformant product

## Wiring Information



## Options and Product Codes

**ZON / PTR / LCD / 003**

Configured for use with Sontay Space Mounting Relative Humidity & Temperature Transmitter

**RH + Temp Transmitter**

Available from Sontay Ltd.

Product Codes:

RH511 / T = 10k 3A1 Overall accuracy +/- 3%RH  
RH581 / T = 10k 3A1 Overall accuracy +/- 2%RH

● *SeaChange*

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## Fan Coil Controller - 3 Relay Outputs

### Main Features

2 Pipe Fan Coils:

- Heating Only + Fan Enable
- Cooling Only + Fan Enable

4 Pipe Fan Coils:

- Airside Damper + Fan Enable
- Thermal Valves + Fan Enable

Works in conjunction with other SeaChange Controllers via "Plug-and-Play"



### Detailed Features

#### General

2 pipe fan coil controller (type / 001, / 002) for heating only or cooling only applications with fan enable.

4 pipe fan coil controller (type / 003) for fan coils utilising an airside damper with fan enable.

4 pipe fan coil controller (type / 004) for use with thermal valves including fan enable, an external 24V AC supply is required.

These types can be inter-mixed with other styles as required.

#### Operation

A SeaChange Zone Controller is used to set the operating times and temperatures for its group of fan coils and to provide an override push button to extend operation outside normal hours. One Zone Controller has the flexibility to control from 1 to 200 fan coil units at any one time on a single network.

This makes the SeaChange system equally suited to controlling numerous fan coils in a single open plan office zone as it is to providing effective one to one unit zone control for cellular office or hotel bedroom applications.

Because it is modular and incorporates plug and play engineering, a SeaChange fan coil control system can be easily and inexpensively adapted to cope with additional zones or fan coils changed to work in different zones as offices "churn" over time.

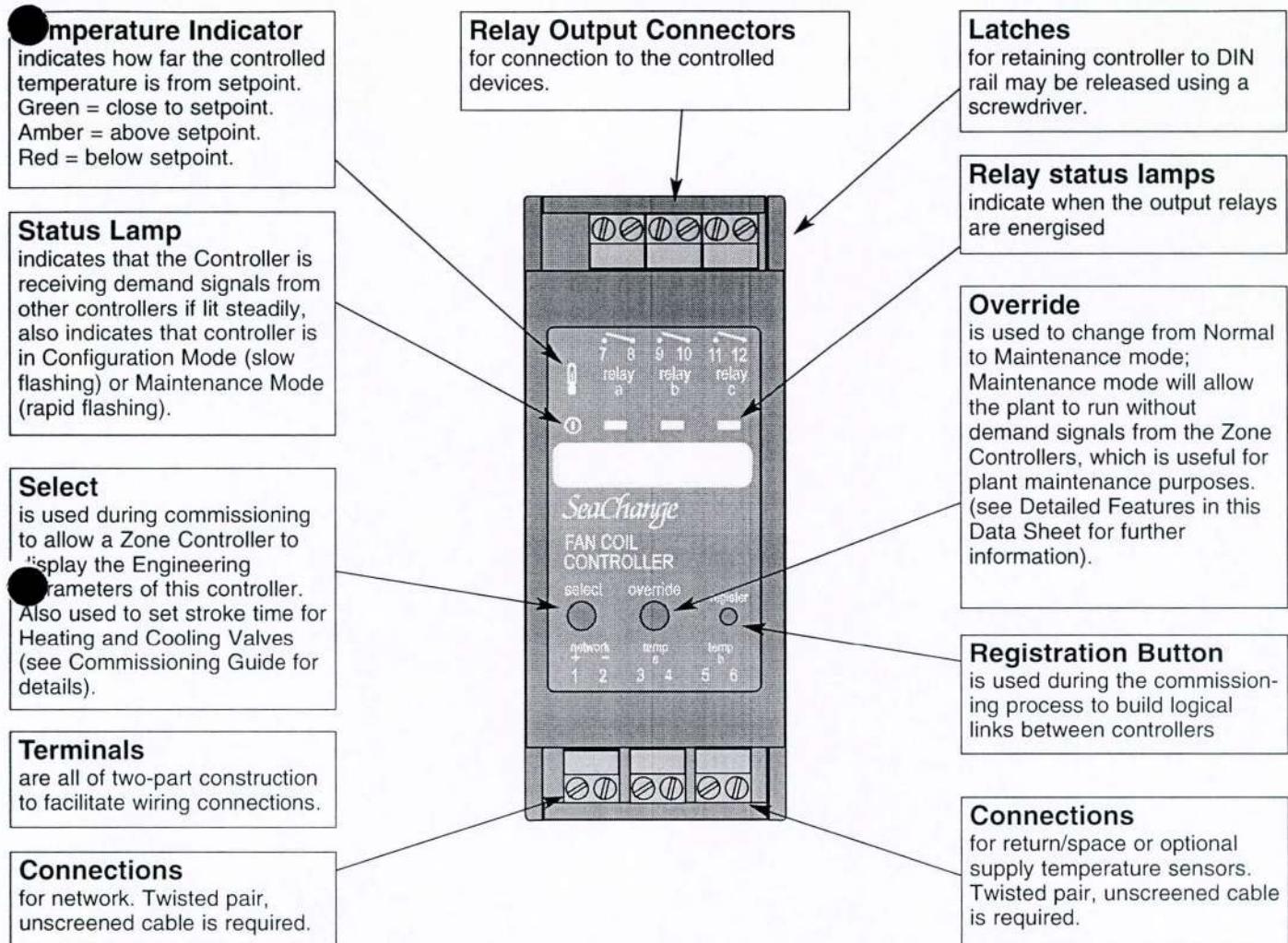
#### Temperature Control

Temperature control is normally based on the fan coil unit's return air temperature. If a supply air sensor is fitted, off coil temperature can be reset within limits as a cascaded control system.

The Second Input can be alternately employed for reset control. A remote setpoint and local override unit can be applied so that the temperature can be adjusted and the unit turned On/Off locally. Other fan coil controllers can then be controlled as slaves. Diagrams showing these connections are shown on page 3.

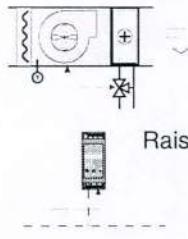
Demand from the fan coils for hot and/or cold water is co-ordinated so that the main plant chillers or boilers and distribution plant run only on demand from the Zone Controller.

# Features



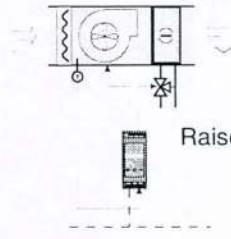
## Typical Applications

### 2 - Pipe Fan Coil - Heating Only + Fan Enable



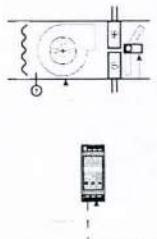
Uses Driver Type / 001

### 2 - Pipe Fan Coil - Cooling Only + Fan Enable



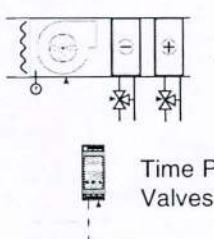
Uses Driver Type / 002

### 4 - Pipe Fan Coil - Airside Damper + Fan Enable



Uses Driver Type / 003

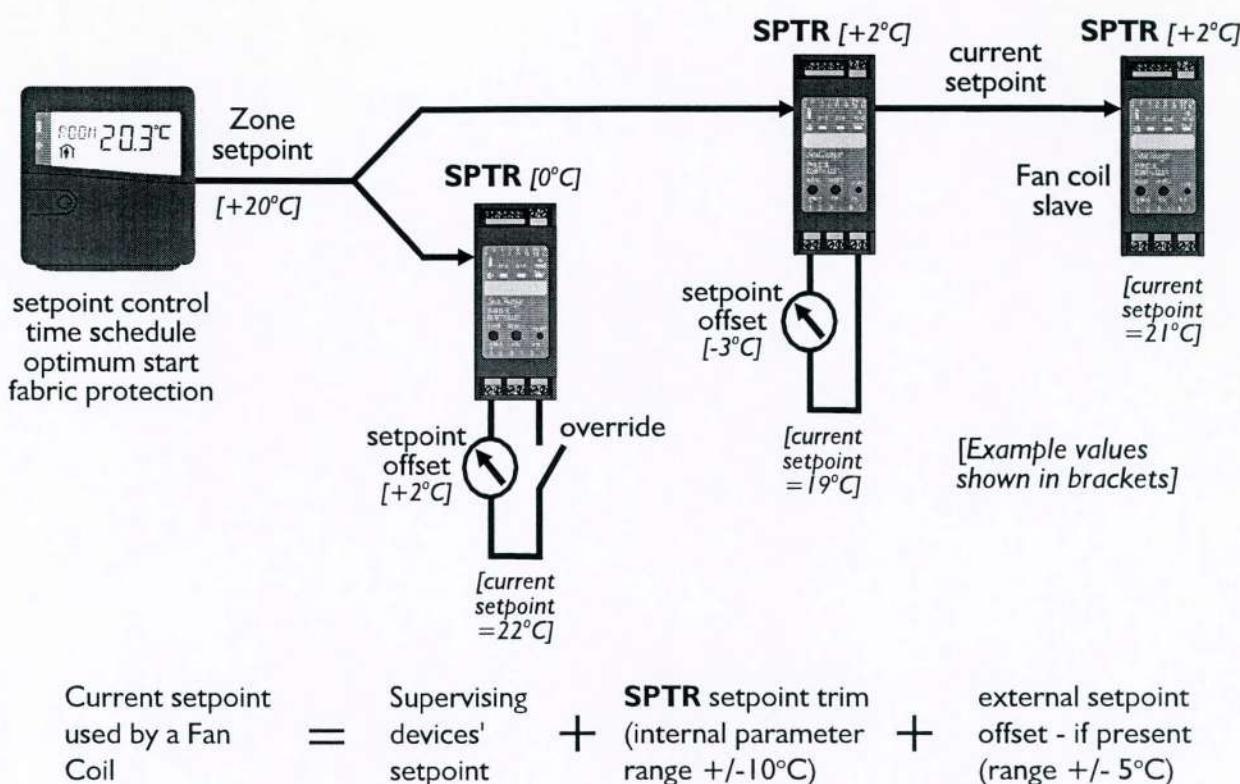
### 4 - Pipe Fan Coil - Thermal Valves + Fan Enable



Uses Driver Type / 004

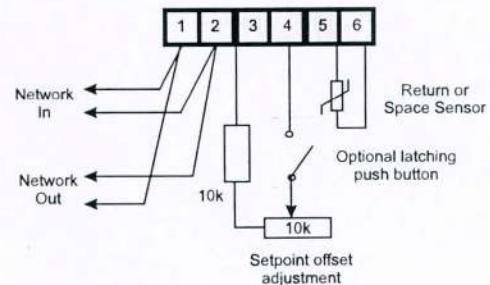
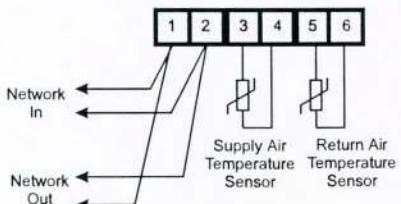
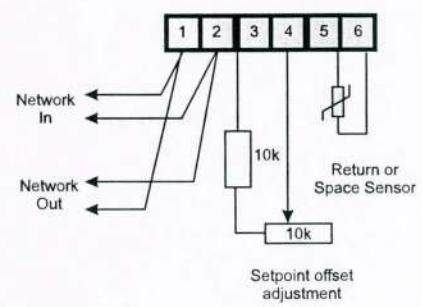
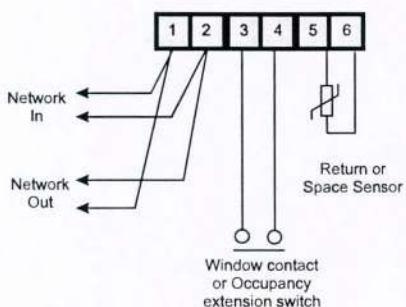
# Master / Slave Operation

F1



# External Input Options

F1



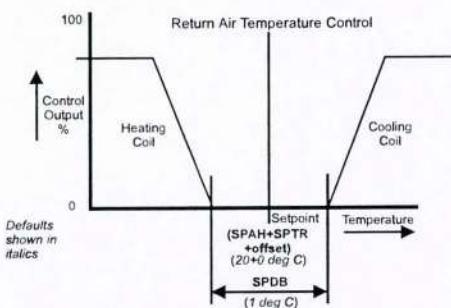
## Temperature Control

### Return Air Control

A Return Air (or Space) Temperature sensor must be fitted. The FCU Controller will control Return Air temperature to a fixed setpoint set using Configuration parameter **SPFC**, or an adjustable setpoint, using a Zone Controller (see **Registration**, later). A deadband may be set (using the **SPDB** parameter) which will prevent cycling between heating and cooling and reduce energy usage.

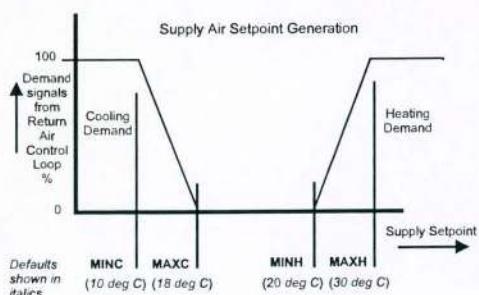
### Return Air Control with Supply Air Limits

Supply and Return Air (or Space) temperature sensors must be fitted. Instead of directly acting on the control valves / damper etc. the Return Air Control Loop will produce internal demand signals that will adjust the Supply Air Temperature setpoint of the Supply Air Control Loop (this is called *Cascade Control*). Limits to the Maximum and Minimum Supply Setpoints can be set on **MAXH**, **MINH**, **MAXC** and **MINC** (see diagram).



### Supply Air Control from a Zone Controller or another Fan Coil Controller

If a Supply Air Temperature Sensor only is fitted, the Supply Air Setpoint will be derived from the Heating and Cooling Demand signals from a Zone Controller, or another Fan Coil Controller acting as a "master" in an open-plan area. The setpoint will be calculated according to the settings on **MAXH**, **MINH**, **MAXC** and **MINC** (see diagram).



### Slave Control

With no Sensor fitted, the Fan Coil Controller will adjust its heating and cooling outputs to the valves etc. on the basis of the demand signals received from the Zone Controller or "Master" Fan Coil Controller, i.e. if the Zone Controller is demanding 50% Heat, the heating valve will be driven to 50% open. (This is called *Open-Loop Control*).

## Setpoint Supervision and Local Setpoint Adjustment

A Zone Controller may be used to determine the Setpoint for one or many Fan Coil Controllers. This is called **Setpoint Supervision**, (typically 20 Deg C).

A Fan Coil Controller may have a **Local Setpoint Adjuster** which is a simple wall-mounted potentiometer wired directly into the Fan Coil Controller's input terminals; adjusting this will adjust the **offset** value (limited to +/- 5 Deg.C). The **offset** value and a value set on the internal parameter **S PTR** are added (or subtracted if the value is negative) to the setpoint set on **SPFC** to produce the operating setpoint for the controller. Note that using a simple potentiometer means that some of the energy saving benefits given by the Zone Controller (e.g. resetting the setpoint to a default value at the start of each occupancy period) are not possible.

A Fan Coil Controller can also be used to provide **Setpoint Supervision** for a group of "Slave" Fan Coils; this would be used when an Open-Plan area is fed by several Fan Coils, and only one Local Setpoint Adjuster is required. The Local Setpoint Adjuster is wired to one of the Fan Coil Controllers, which then becomes the "Master" of the group. It will send its setpoint set on **SPFC** plus the **offset** applied by the Setpoint Adjuster plus any value set on **S PTR** to all of the "Slave" Fan Coils registered to it (see Master/Slave diagram) which will then use the resultant value as their own **SPFC** value. Individual trims to this setpoint can be set up in each "Slave" using its **S PTR** parameter, if desired.

## Occupancy Times and Local Override

Occupation times for one, or many Fan Coil Controllers (up to 200) are set at a Zone Controller. The Occupancy Times may be overridden by the Override pushbutton on the Zone Controller in the usual way, giving configurable timed extension to occupancy (see Zone Controller Data Sheet).

Additionally, a local switch may be used in order to put the Fan Coil Controller into an Occupied State; this can either be used exclusively to control occupancy (e.g. a Meeting Room) or it can be used in conjunction with a Zone Controller to provide an extension to occupancy. In either case, the Controller requires a maintained contact closure (latching switch) in order to give an Occupied State; if a timed extension is desired, an external timed latching contact must be used. The parameter **INMD** is used to determine whether the external signal is to be used exclusively, or as an OR function with a Zone Controller's Occupation Times.

## Window Contact, General Alarm or Monitoring

A Volt-free window contact may be wired into the Controller's input terminals and used to disable the Fan Coil if the Window is opened, preventing energy wastage. This function could also be applied to other inputs which would require the Fan Coil to shut down, e.g. Condensate Tray Full signal from a level switch. Alarms to the supervisor can be enabled or disabled using the **ALRM** parameter; the **ALST** parameter is used to set the contact sense. I.e. whether an opening or closing contact will generate an alarm.

The Input may be alternatively used for general monitoring, either with or without alarm generation (e.g. filter blocked)

The correct mode of operation is determined by the **INMD** parameter.

## Registration

*Registration* is the simple process by which logical connections are made between Controllers in a SeaChange system; it is done during commissioning and involves pressing buttons on the Controllers in a specific sequence.

For further details of the registration process, see our 'Commissioning Guide' publication.

## Address Allocation and System Housekeeping

Like all SeaChange Controllers, the Fan Coil Controllers must be registered with other modules in order to create a working system; one or more of the following registration procedures must be followed. During each of these procedures, the address of each Controller is allocated by the module that contains *System Housekeeping*. This could be a SeaChange Boiler Controller or a AHU Controller (for up to 100 Zone + FCU Controllers) or a Floor Controller (for up to 200 Zone + FCU Controllers). It is essential, therefore, that any SeaChange System contains one module with System Housekeeping; for more details, see Boiler, AHU or Floor Controller Data Sheets.

## Occupancy Control, only from Zone Controller

The **SPTY** parameter in the FCU Controller must be set to 0, the Zone Controller is then put into Configuration Mode and the FCU Controller is registered to it. When the Zone Controller enters its occupancy mode, the FCU Controller's registered to it will be enabled and will control to their occupied setpoints.

## Occupancy Control + Setpoint Supervision from Zone Controller

The **SPTY** parameter in the FCU Controller must be set to 1, the Zone Controller is then put into Configuration Mode and the FCU Controller is registered to it. When the Zone Controller enters its occupancy mode, the FCU Controller's registered to it will be enabled and will control to the setpoint in the Zone Controller.

## Occupancy Control + Setpoint Supervision from a 'Master' Fan Coil Controller

The 'Master' Fan Coil Controller must be operating in **SPTY** 0 or 1 with its own return air sensor. 'Slaves' may have local sensors, but do not need them (see Setpoint Supervision and Local adjustment). The 'Slave' FCU Controller **SPTY** parameter must be set to 2 then the 'Master' FCU Controller is put into Configuration Mode registering the 'Slave' FCU Controller to it.

Occupancy of the 'Slaves' will now be taken from the 'Master'; any setpoint change made at the 'Master' (whether from a Local Setpoint adjuster, or Setpoint Supervision change from a Zone Controller) will be reflected at the 'Slaves'.

## Demand Collation - Heat and Cool Sources

Heating and Cooling demand signals from the Fan Coil Controllers are automatically collated and are fed back to a provider of heat (or 'cool') - for instance, the Boiler Controller or a CT Pumpset. This is done by putting the Heat (or Cool) source into Configuration Mode and registering the FCU Controller to it.

For systems where the main plant is not controlled by SeaChange, the Floor Controller may be used to collate Heating and Cooling demand signals and present them as a series of volt-free contacts which can be used as inputs to the Legacy System in order to enable heating and/or cooling as appropriate. The Floor Controller is put into Configuration Mode and the FCU Controllers are registered to it.

For further details of the Floor Controller, see appropriate Data Sheet.

## Alarm Handling

The FCU Controller may be set to ignore alarm conditions, report them to a SeaChange Doorway Supervisor (either locally connected to the system, or via an autodialling modem), or to both report alarms and take some control action. The **ALRM** parameter is used to select the desired Alarm Mode, whilst **ALST** is used to set the sense (ie. whether a closing or opening contact generates an alarm).

The FCU Controller generates an alarm if the sensor fails and also if the external alarm input is used.

The FCU Controller may be set to respond to the **STOP** System Stop Alarm which is generated by a Boiler Controller; this can be used to shut down the entire control system, or parts of it, if a particularly critical event occurs.

# Configuration Parameters

| <b>Label</b> | <b>Doorway Code</b> | <b>Description</b>                                                                                                                                                                                                                                   | <b>Units</b> | <b>Default Value</b> | <b>Range</b> |
|--------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------------------|--------------|
| SPFC         | C1                  | Occupied Return temperature Setpoint                                                                                                                                                                                                                 | Deg C        | 20                   | 10 to 35     |
| SPDB         | C2                  | Setpoint Deadband                                                                                                                                                                                                                                    | Deg C        | 1.0                  | 0 to 10      |
| SPTR         | C3                  | Setpoint Trim                                                                                                                                                                                                                                        | Deg C        | 0                    | -10 to +10   |
| SPTY         | C4                  | Setpoint type<br>0: Local from C1, occupancy controlled from 1 or more Zone Controllers<br>1: Setpoint (and occupancy) supervised from master Zone Controller<br>2: Room control from remote Zone Controller FCU Supply controlled from Heat%, Cool% | -            | 1                    | 0 to 2       |
| INMD         | C5                  | Input mode for terminals 'temp a'<br>0: Supply temperature<br>1: Time clock AND window contact (short = occupied)<br>2: Time Clock OR internal clock<br>3: External Occupation signal only<br>4: Alarm Input                                         | -            | 0                    | 0 to 4       |
| MAXH         | C6                  | Supply maximum heating setpoint                                                                                                                                                                                                                      | Deg C        | 30                   | 0 to 90      |
| MINH         | C7                  | Supply minimum heating setpoint                                                                                                                                                                                                                      | Deg C        | 20                   | 0 to 90      |
| MAXC         | C8                  | Supply maximum cooling setpoint                                                                                                                                                                                                                      | Deg C        | 18                   | 2 to 30      |
| MINC         | C9                  | Supply minimum cooling setpoint                                                                                                                                                                                                                      | Deg C        | 10                   | 2 to 30      |
| MIND         | C10                 | Supply minimum demand, used for switching between heating and cooling                                                                                                                                                                                | -            | 4                    | 0.0 to 10.0  |
| CCO          | C11                 | When set, controller will only run during the Occupied Period                                                                                                                                                                                        | -            | 0                    | 0 to 1       |
| HPRD         | C12                 | Heating valve period or minimum time                                                                                                                                                                                                                 | Secs/10      | 6                    | 1 to 60      |
| HDLY         | C13                 | Heating interlock delay. Negative value delays fan (or pump) On after heating starts, positive value causes run-on of fan after heating shuts down                                                                                                   | Minutes      | 0                    | -30 to + 30  |
| CPRD         | C14                 | Cooling Valve period or minimum On time                                                                                                                                                                                                              | Sec/10       | 6                    | 1 to 60      |
| CDLY         | C15                 | Cooling Interlock delay. Negative value delays fan (or pump) On after cooling starts, positive value causes run-on of fan after cooling shuts down                                                                                                   | Minutes      | 0                    | -30 to +30   |
| FPRD         | C16                 | Fan Period, minimum time to change fan speed steps                                                                                                                                                                                                   | Secs/10      | 12                   | 1 to 60      |
| FRPT         | C17                 | Frost Protection<br>0 = No Action,<br>1 = Open Heating Valve to 50%<br>2 = Open Heating Valve to 50% and run fan (pump)                                                                                                                              | -            | 0                    | 0 to 2       |
| MANL         | C18                 | Manual Level from Doorway                                                                                                                                                                                                                            | -            | 0                    | -100 to +100 |
| HTSC         | C19                 | Heat Source                                                                                                                                                                                                                                          | -            | 0                    | -1 to 100    |
| CLCS         | C20                 | Cool Source                                                                                                                                                                                                                                          | -            | 0                    | -1 to 100    |
| MXCT         | C21                 | Maximum CT Setpoint when AHU demanding 100% heating                                                                                                                                                                                                  | Deg C        | 70                   | 20 to 100    |
| MNCT         | C22                 | Minimum CT Setpoint                                                                                                                                                                                                                                  | Deg C        | 50                   | 20 to 100    |
| ALRM         | C23                 | Alarm Mode<br>0: Ignore alarms<br>1: Alarms reported no other action<br>2: Control output set to zero on alarm<br>3: STOP alarm recognised control set to zero                                                                                       | -            | 1                    | 0 to 3       |
| ALST         | C24                 | Not used in this application                                                                                                                                                                                                                         |              |                      |              |

## Pre Commissioning Checks

### Power Up

On initial power up of the module there will be delay of between 10 to 60 seconds before the temperature LED lights. This delay has been incorporated so that when many fan coils are controlled on the same circuit their power requirements will be spread over this period. Once start up has been initiated, the valve outputs sequence to close the valves before control is initiated and until that process is completed (HPRD + CPRD) the manual override as described will be in-effective.

### Setting the Stroke Time for Actuators.

If the Select button is held pressed for a few seconds the status lamp will flash and the 'B' relay will energise to close the valve. When the valve is noted as closed and the Select button pressed again, the 'A' relay will

energise causing the valve to open and start the timing cycle. When the valve reaches full stroke open, the Select button is pressed to record the Stroke Time and return the controller to the automatic mode. (For controllers with TP heating and cooling a similar process times both the heating and cooling valves). The times can also be checked and adjusted using the (H or C)PRD parameter (recorded in tens of seconds).

# Monitoring Parameters

F1

| Label | Doorway Code | Description                                | Units | Default Value | Range          |
|-------|--------------|--------------------------------------------|-------|---------------|----------------|
| INPA  | C30          | Input A status                             | -     | -             | 0 to 1         |
| OCCD  | C31          | Occupied                                   | -     | -             | 0 to 1         |
| COOL  | C34          | Cooling Status                             | -     | -             | 0 to 1         |
| RLYA  | C35          | Relay 'A' Status                           | -     | -             | 0 to 1         |
| RLYB  | C36          | Relay 'B' Status                           | -     | -             | 0 to 1         |
| RLYC  | C37          | Relay 'C' Status                           | -     | -             | 0 to 1         |
| AUTO  | C38          | Automatic/Manual Status                    | -     | -             | 0 to 1         |
| OVRD  | C39          | Override                                   | -     | -             | 0 to 1         |
| SERV  | W7           | Service Pin Message (to Doorway)           | -     | -             | -              |
| CGST  | C45          | Configuration Mode Status                  | -     | -             | 0 to 1         |
| SPLA  | S1 C50       | Supply Air Temperature                     | Deg C | -             | -              |
| RTNA  | S2 C51       | Return Air Temperature                     | Deg C | -             | -              |
| HCOP  | S3 C52       | Heat Cool Output Valves                    | %     | -             | 0 to 100       |
| SPSL  | C53          | Current Supply Setpoint                    | Deg C | -             | -              |
| SPRT  | C54          | Current Return Setpoint                    | Deg C | -             | -              |
| HDMD  | C55          | Heat Demand from Room Loop                 | %     | -             | 0 to 100       |
| CDMD  | C56          | Cool Demand from Room Loop                 | %     | -             | 0 to 100       |
| SPOC  | K1 C60       | Occupation Setpoint                        | Deg C | 20            | 5.0 to 35.0    |
| SPNO  | K2 C61       | Non-Occupation Setpoint                    | Deg C | 10            | 5.0 to 20.0    |
| SPSV  | K3 C62       | Supervised Setpoint from Master Controller | Deg C | -             | 0 to 35.0      |
| SPTR  | K4 C63       | Setpoint Trim                              | Deg C | 0             | -10.0 to +10.0 |

## Accessing Configuration and Monitoring Parameters

Generally, Configuration Parameters are used to adjust settings from their factory defaults; Monitoring Parameters are used to monitor internal readings (such as temperature readings) during the Commissioning process.

The Parameters may be viewed, and in the case of Configuration Parameters, adjusted by one of two methods; either by using a Zone Controller connected to the network, or by using the SeaChange Doorway Supervisor.

### Using the Zone Controller:

- a) The Zone Controller must be connected to the network and *registered* (see Commissioning Guide for further details).
- b) Put the Zone Controller into Configuration Mode by depressing Select and Override buttons for 10 seconds, until the CNFG legend appears on the display.
- c) Press Select button momentarily on the target device (in this case, the selected Fan Coil Controller).
- d) Hold down Select button on the Zone Controller, and rotate the rotary knob:

clockwise to view Monitoring Parameters  
anticlock to view Configuration Parameters

- e) When desired Configuration Parameter appears, release Select, hold down Override and turn knob to adjust the parameter (some Monitoring Parameters cannot be adjusted).

### Using SeaChange Doorway:

Data Points may be added to a Doorway page to access/adjust any Configuration or Monitoring Parameter. Graphs of the Input Parameters and Heat/Cool output are also available. The code used to

access an FCU Controller is **Zn**, where *n* is the Fan Coil Zone number. The code for each parameter is shown in the adjacent tables.

Further details of how to set up Doorway pages may be found in the SeaChange Doorway Manual, or in the online help facility supplied with SeaChange Doorway. The PC running SeaChange Doorway can be connected locally via a Serial Adaptor Module, or remotely using standard High-Speed Modems. In this manner all parameters can be monitored and adjusted remotely.

## Manual Override

Allows the outputs to be exercised during commissioning and maintenance activities. Holding the Manual Override button pressed until the Status Lamp flashes green will cause the controller to be switched from automatic to manual control and the Fan will run. Subsequent pressings of the manual override button will cause:

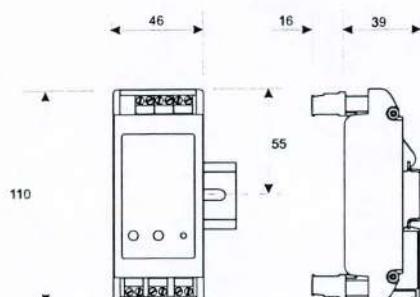
| Press | Temp Lamp | Relay Output                          |
|-------|-----------|---------------------------------------|
| 1     | Red       | Htg Valve Open                        |
| 2     | Yellow    | Htg Close, Clg Open                   |
| 3     | Green     | Clg Close and returns to Auto Control |

As this feature does not time out, care should be exercised to ensure the module is returned to the automatic mode on completion of the commissioning or maintenance activities.

Override can also be achieved via Doorway when AUTO can be set to manual mode and MANL used to set the output condition.

# Specification

## Dimensions



all dimensions in mm

## Electrical

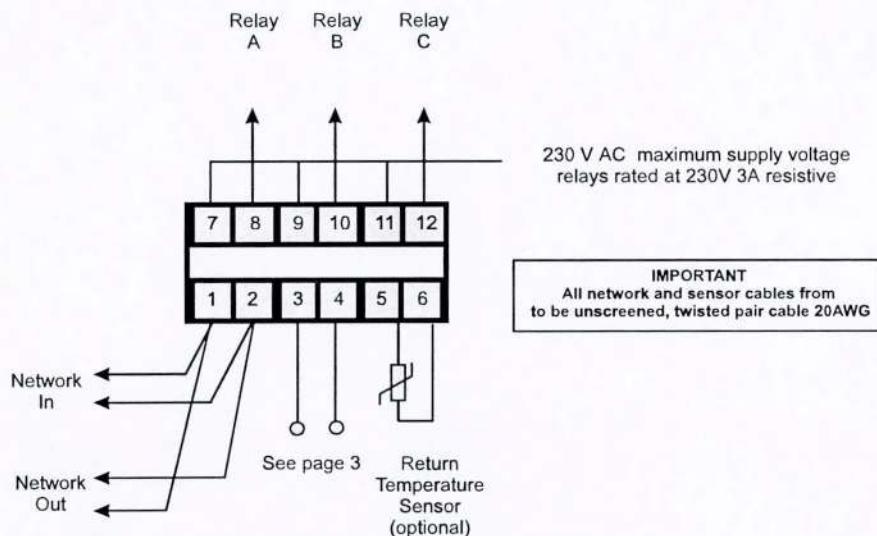
|             |                                                          |
|-------------|----------------------------------------------------------|
| Inputs      | 2 Thermistor or 1 Thermistor and VFC or potentiometer.   |
| Outputs     | 3 Relay Outputs N/O contacts<br>3 A 230 V resistive Load |
| Consumption | 22 mA from network                                       |

## Physical

|                |                                                  |
|----------------|--------------------------------------------------|
| Weight         | 0.15 kg                                          |
| Cover Material | PC/ABS alloy Self extinguishing to UL 94 VO/1.60 |
| Base Material  | Polyamide 6.6 Self extinguishing to UL 94 VO     |
| Colour         | Dark Grey to Pantone 425                         |

Conformant product

## Wiring Information



## Options and Product Codes

3R Fan Coil Controller

FCU / DIN / 3R / [driver option]

### Relay output driver options

| Option | Relay A        | Relay B        | Relay C |
|--------|----------------|----------------|---------|
| /001   | Valve Open     | Valve Close    | Fan     |
| /002   | Valve Open     | Valve Close    | Fan     |
| /003   | Damper Heating | Damper Cooling | Fan     |
| /004   | Heating Valve  | Cooling Valve  | Fan     |

# Seachange

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## Fan Coil Controller - 3 Relay Outputs

### Main Features

2 Pipe Fan Coils:

- Heating Only + Fan Enable
- Cooling Only + Fan Enable

4 Pipe Fan Coils:

- Airside Damper + Fan Enable
- Thermal Valves + Fan Enable

Works in conjunction with other SeaChange Controllers via "Plug-and-Play"



### Detailed Features

#### General

2 pipe fan coil controller (type / 001, / 002) for heating only or cooling only applications with fan enable.

4 pipe fan coil controller (type / 003) for fan coils utilising an airside damper with fan enable.

4 pipe fan coil controller (type / 004) for use with thermal valves including fan enable, an external 24V AC supply is required.

These types can be inter-mixed with other styles as required.

#### Operation

A SeaChange Zone Controller is used to set the operating times and temperatures for its group of fan coils and to provide an override push button to extend operation outside normal hours. One Zone Controller has the flexibility to control from 1 to 200 fan coil units at any one time on a single network.

This makes the SeaChange system equally suited to controlling numerous fan coils in a single open plan office zone as it is to providing effective one to one unit zone control for cellular office or hotel bedroom applications.

Because it is modular and incorporates plug and play engineering, a SeaChange fan coil control system can be easily and inexpensively adapted to cope with additional zones or fan coils changed to work in different zones as offices "churn" over time.

#### Temperature Control

Temperature control is normally based on the fan coil unit's return air temperature. If a supply air sensor is fitted, off coil temperature can be reset within limits as a cascaded control system.

The Second Input can be alternately employed for reset control. A remote setpoint and local override unit can be applied so that the temperature can be adjusted and the unit turned On/Off locally. Other fan coil controllers can then be controlled as slaves. Diagrams showing these connections are shown on page 3.

Demand from the fan coils for hot and/or cold water is co-ordinated so that the main plant chillers or boilers and distribution plant run only on demand from the Zone Controller.

**Temperature Indicator**  
indicates how far the controlled temperature is from setpoint.  
Green = close to setpoint.  
Amber = above setpoint.  
Red = below setpoint.

**Relay Output Connectors**  
for connection to the controlled devices.

**Latches**  
for retaining controller to DIN rail may be released using a screwdriver.

**Status Lamp**  
indicates that the Controller is receiving demand signals from other controllers if lit steadily, also indicates that controller is in Configuration Mode (slow flashing) or Maintenance Mode (rapid flashing).

**Relay status lamps**  
indicate when the output relays are energised

**Select**  
is used during commissioning to allow a Zone Controller to display the Engineering parameters of this controller. Also used to set stroke time for Heating and Cooling Valves (see Commissioning Guide for details).

**Override**  
is used to change from Normal to Maintenance mode; Maintenance mode will allow the plant to run without demand signals from the Zone Controllers, which is useful for plant maintenance purposes. (see Detailed Features in this Data Sheet for further information).

**Terminals**  
are all of two-part construction to facilitate wiring connections.

**Registration Button**  
is used during the commissioning process to build logical links between controllers

**Connections**  
for network. Twisted pair, unscreened cable is required.

**Connections**  
for return/space or optional supply temperature sensors. Twisted pair, unscreened cable is required.



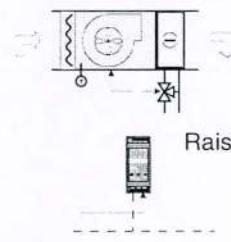
## Typical Applications

2 - Pipe Fan Coil - Heating Only + Fan Enable



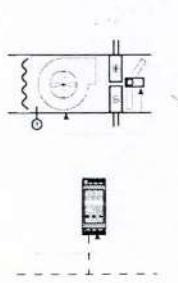
Uses Driver Type / 001

2 - Pipe Fan Coil - Cooling Only + Fan Enable



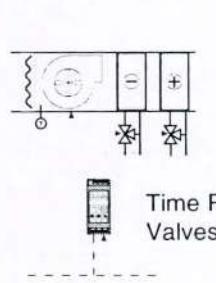
Uses Driver Type / 002

4 - Pipe Fan Coil - Airside Damper + Fan Enable



Uses Driver Type / 003

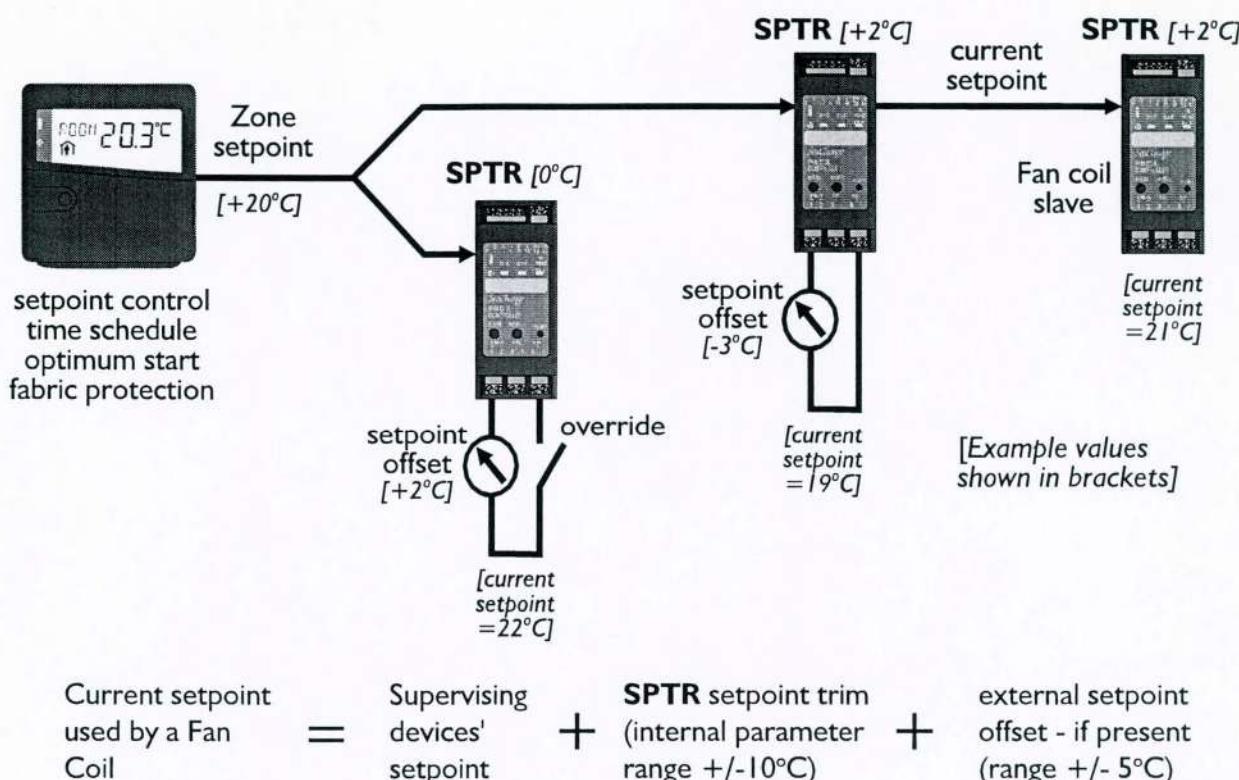
4 - Pipe Fan Coil - Thermal Valves + Fan Enable



Uses Driver Type / 004

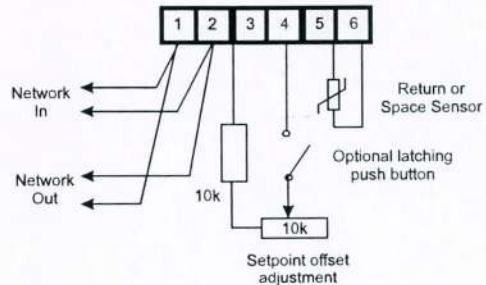
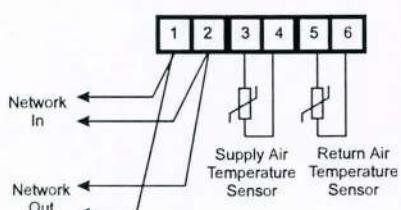
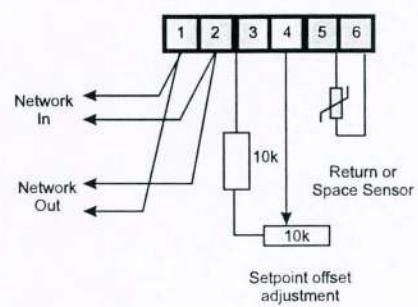
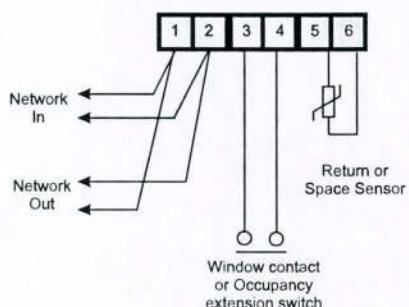
# Master / Slave Operation

F1



# External Input Options

F1



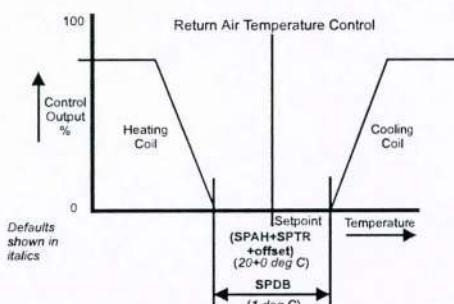
## Temperature Control

### Return Air Control

A Return Air (or Space) Temperature sensor must be fitted. The FCU Controller will control Return Air temperature to a fixed setpoint set using Configuration parameter **SPFC**, or an adjustable setpoint, using a Zone Controller (see **Registration**, later). A deadband may be set (using the **SPDB** parameter) which will prevent cycling between heating and cooling and reduce energy usage.

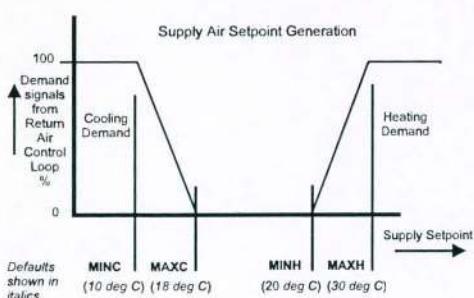
### Return Air Control with Supply Air Limits

Supply and Return Air (or Space) temperature sensors must be fitted. Instead of directly acting on the control valves / damper etc. the Return Air Control Loop will produce internal demand signals that will adjust the Supply Air Temperature setpoint of the Supply Air Control Loop (this is called *Cascade Control*). Limits to Maximum and Minimum Supply Setpoints can be set on **MAXH**, **MINH**, **MAXC** and **MINC** (see diagram).



### Supply Air Control from a Zone Controller or another Fan Coil Controller

If a Supply Air Temperature Sensor only is fitted, the Supply Air Setpoint will be derived from the Heating and Cooling Demand signals from a Zone Controller, or another Fan Coil Controller acting as a "master" in an open-plan area. The setpoint will be calculated according to the settings on **MAXH**, **MINH**, **MAXC** and **MINC** (see diagram).



### Slave Control

With no Sensor fitted, the Fan Coil Controller will adjust its heating and cooling outputs to the valves etc. on the basis of the demand signals received from the Zone Controller or "Master" Fan Coil Controller, i.e. if the Zone Controller is demanding 50% Heat, the heating valve will be driven to 50% open. (This is called *Open-Loop Control*).

## Setpoint Supervision and Local Setpoint Adjustment

A Zone Controller may be used to determine the Setpoint for one or many Fan Coil Controllers. This is called **Setpoint Supervision**, (typically 20 Deg C).

A Fan Coil Controller may have a **Local Setpoint Adjuster** which is a simple wall-mounted potentiometer wired directly into the Fan Coil Controller's input terminals; adjusting this will adjust the **offset** value (limited to +/-5 Deg.C). The **offset** value and a value set on the internal parameter **SPTR** are added (or subtracted if the value is negative) to the setpoint set on **SPFC** to produce the operating setpoint for the controller. Note that using a simple potentiometer means that some of the energy saving benefits given by the Zone Controller (e.g. resetting the setpoint to a default value at the start of each occupancy period) are not possible.

A Fan Coil Controller can also be used to provide **Setpoint Supervision** for a group of "Slave" Fan Coils; this would be used when an Open-Plan area is fed by several Fan Coils, and only one Local Setpoint Adjuster is required. The Local Setpoint Adjuster is wired to one of the Fan Coil Controllers, which then becomes the "Master" of the group. It will send its setpoint set on **SPFC** plus the **offset** applied by the Setpoint Adjuster plus any value set on **SPTR** to all of the "Slave" Fan Coils registered to it (see Master/Slave diagram) which will then use the resultant value as their own **SPFC** value. Individual trims to this setpoint can be set up in each "Slave" using its **SPTR** parameter, if desired.

## Occupancy Times and Local Override

Occupation times for one, or many Fan Coil Controllers (up to 200) are set at a Zone Controller. The Occupancy Times may be overridden by the Override pushbutton on the Zone Controller in the usual way, giving configurable timed extension to occupancy (see Zone Controller Data Sheet).

Additionally, a local switch may be used in order to put the Fan Coil Controller into an Occupied State; this can either be used exclusively to control occupancy (e.g. a Meeting Room) or it can be used in conjunction with a Zone Controller to provide an extension to occupancy. In either case, the Controller requires a maintained contact closure (latching switch) in order to give an Occupied State; if a timed extension is desired, an external timed latching contact must be used. The parameter **INMD** is used to determine whether the external signal is to be used exclusively, or as an OR function with a Zone Controller's Occupation Times.

## Window Contact, General Alarm or Monitoring

A Volt-free window contact may be wired into the Controller's input terminals and used to disable the Fan Coil if the Window is opened, preventing energy wastage. This function could also be applied to other inputs which would require the Fan Coil to shut down, e.g. Condensate Tray Full signal from a level switch. Alarms to the supervisor can be enabled or disabled using the **ALRM** parameter; the **ALST** parameter is used to set the contact sense. I.e. whether an opening or closing contact will generate an alarm.

The Input may be alternatively used for general monitoring, either with or without alarm generation (e.g. filter blocked)

The correct mode of operation is determined by the **INMD** parameter.

## Registration

*Registration* is the simple process by which logical connections are made between Controllers in a SeaChange system; it is done during commissioning and involves pressing buttons on the Controllers in a specific sequence.

For further details of the registration process, see our 'Commissioning Guide' publication.

### Address Allocation and System Housekeeping

Like all SeaChange Controllers, the Fan Coil Controllers must be registered with other modules in order to create a working system; one or more of the following registration procedures must be followed. During each of these procedures, the address of each Controller is allocated by the module that contains *System Housekeeping*. This could be a SeaChange Boiler Controller or a AHU Controller (for up to 100 Zone + FCU Controllers) or a Floor Controller (for up to 200 Zone + FCU Controllers). It is essential, therefore, that any SeaChange System contains one module with System Housekeeping; for more details, see Boiler, AHU or Floor Controller Data Sheets.

### Occupancy Control, only from Zone Controller

The **SPTY** parameter in the FCU Controller must be set to 0, the Zone Controller is then put into Configuration Mode and the FCU Controller is registered to it. When the Zone Controller enters its occupancy mode, the FCU Controller's registered to it will be enabled and will control to their occupied setpoints.

### Occupancy Control + Setpoint Supervision from Zone Controller

The **SPTY** parameter in the FCU Controller must be set to 1, the Zone Controller is then put into Configuration Mode and the FCU Controller is registered to it. When the Zone Controller enters its occupancy mode, the FCU Controller's registered to it will be enabled and will control to the setpoint in the Zone Controller.

### Occupancy Control + Setpoint Supervision from a 'Master' Fan Coil Controller

The 'Master' Fan Coil Controller must be operating in **SPTY** 0 or 1 with its own return air sensor. 'Slaves' may have local sensors, but do not need them (see Setpoint Supervision and Local adjustment). The 'Slave' FCU Controller **SPTY** parameter must be set to 2 then the 'Master' FCU Controller is put into Configuration Mode registering the 'Slave' FCU Controller to it.

Occupancy of the 'Slaves' will now be taken from the 'Master'; any setpoint change made at the 'Master' (whether from a Local Setpoint adjuster, or Setpoint Supervision change from a Zone Controller) will be reflected at the 'Slaves'.

### Demand Collation - Heat and Cool Sources

Heating and Cooling demand signals from the Fan Coil Controllers are automatically collated and are fed back to a provider of heat (or 'cool') - for instance, the Boiler Controller or a CT Pumpset. This is done by putting the Heat (or Cool) source into Configuration Mode and registering the FCU Controller to it.

For systems where the main plant is not controlled by SeaChange, the Floor Controller may be used to collate Heating and Cooling demand signals and present them as a series of volt-free contacts which can be used as inputs to the Legacy System in order to enable heating and/or cooling as appropriate. The Floor Controller is put into Configuration Mode and the FCU Controllers are registered to it.

For further details of the Floor Controller, see appropriate Data Sheet.

### Alarm Handling

The FCU Controller may be set to ignore alarm conditions, report them to a SeaChange Doorway Supervisor (either locally connected to the system, or via an autodialling modem), or to both report alarms and take some control action. The **ALRM** parameter is used to select the desired Alarm Mode, whilst **ALST** is used to set the sense (ie. whether a closing or opening contact generates an alarm).

The FCU Controller generates an alarm if the sensor fails and also if the external alarm input is used.

The FCU Controller may be set to respond to the **STOP** System Stop Alarm which is generated by a Boiler Controller; this can be used to shut down the entire control system, or parts of it, if a particularly critical event occurs.

# Configuration Parameters

| Label | Doorway Code | Description                                                                                                                                                                                                                                          | Units   | Default Value | Range        |
|-------|--------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------------|--------------|
| SPFC  | C1           | Occupied Return temperature Setpoint                                                                                                                                                                                                                 | Deg C   | 20            | 10 to 35     |
| SPDB  | C2           | Setpoint Deadband                                                                                                                                                                                                                                    | Deg C   | 1.0           | 0 to 10      |
| SPTR  | C3           | Setpoint Trim                                                                                                                                                                                                                                        | Deg C   | 0             | -10 to +10   |
| SPTY  | C4           | Setpoint type<br>0: Local from C1, occupancy controlled from 1 or more Zone Controllers<br>1: Setpoint (and occupancy) supervised from master Zone Controller<br>2: Room control from remote Zone Controller FCU Supply controlled from Heat%, Cool% | -       | 1             | 0 to 2       |
| INMD  | C5           | Input mode for terminals 'temp a'<br>0: Supply temperature<br>1: Time clock AND window contact (short = occupied)<br>2: Time Clock OR internal clock<br>3: External Occupation signal only<br>4: Alarm Input                                         | -       | 0             | 0 to 4       |
| MAXH  | C6           | Supply maximum heating setpoint                                                                                                                                                                                                                      | Deg C   | 30            | 0 to 90      |
| MINH  | C7           | Supply minimum heating setpoint                                                                                                                                                                                                                      | Deg C   | 20            | 0 to 90      |
| MAXC  | C8           | Supply maximum cooling setpoint                                                                                                                                                                                                                      | Deg C   | 18            | 2 to 30      |
| MINC  | C9           | Supply minimum cooling setpoint                                                                                                                                                                                                                      | Deg C   | 10            | 2 to 30      |
| MIND  | C10          | Supply minimum demand, used for switching between heating and cooling                                                                                                                                                                                | -       | 4             | 0.0 to 10.0  |
| CCO   | C11          | When set, controller will only run during the Occupied Period                                                                                                                                                                                        | -       | 0             | 0 to 1       |
| HPRD  | C12          | Heating valve period or minimum time                                                                                                                                                                                                                 | Secs/10 | 6             | 1 to 60      |
| HDLY  | C13          | Heating interlock delay. Negative value delays fan (or pump) On after heating starts, positive value causes run-on of fan after heating shuts down                                                                                                   | Minutes | 0             | -30 to +30   |
| CPRD  | C14          | Cooling Valve period or minimum On time                                                                                                                                                                                                              | Sec/10  | 6             | 1 to 60      |
| CDLY  | C15          | Cooling Interlock delay. Negative value delays fan (or pump) On after cooling starts, positive value causes run-on of fan after cooling shuts down                                                                                                   | Minutes | 0             | -30 to +30   |
| FPRD  | C16          | Fan Period, minimum time to change fan speed steps                                                                                                                                                                                                   | Secs/10 | 12            | 1 to 60      |
| FRPT  | C17          | Frost Protection<br>0 = No Action,<br>1 = Open Heating Valve to 50%<br>2 = Open Heating Valve to 50% and run fan (pump)                                                                                                                              | -       | 0             | 0 to 2       |
| MANL  | C18          | Manual Level from Doorway                                                                                                                                                                                                                            | -       | 0             | -100 to +100 |
| HTSC  | C19          | Heat Source                                                                                                                                                                                                                                          | -       | 0             | -1 to 100    |
| CLCS  | C20          | Cool Source                                                                                                                                                                                                                                          | -       | 0             | -1 to 100    |
| MXCT  | C21          | Maximum CT Setpoint when AHU demanding 100% heating                                                                                                                                                                                                  | Deg C   | 70            | 20 to 100    |
| MNCT  | C22          | Minimum CT Setpoint                                                                                                                                                                                                                                  | Deg C   | 50            | 20 to 100    |
| ALRM  | C23          | Alarm Mode<br>0: Ignore alarms<br>1: Alarms reported no other action<br>2: Control output set to zero on alarm<br>3: STOP alarm recognised control set to zero                                                                                       | -       | 1             | 0 to 3       |
| ALST  | C24          | Not used in this application                                                                                                                                                                                                                         |         |               |              |

## Pre Commissioning Checks

### Power Up

On initial power up of the module there will be delay of between 10 to 60 seconds before the temperature LED lights. This delay has been incorporated so that when many fan coils are controlled on the same circuit their power requirements will be spread over this period. Once start up has been initiated, the valve outputs sequence to close the valves before control is initiated and until that process is completed (HPRD + CPRD) the manual override as described will be in-effective.

### Setting the Stroke Time for Actuators.

If the Select button is held pressed for a few seconds status lamp will flash and the 'B' relay will energise to close the valve. When the valve is noted as closed and the Select button pressed again, the 'A' relay will

energise causing the valve to open and start the timing cycle. When the valve reaches full stroke open, the Select button is pressed to record the Stroke Time and return the controller to the automatic mode. (For controllers with TP heating and cooling a similar process times both the heating and cooling valves). The times can also be checked and adjusted using the (H or C)PRD parameter (recorded in tens of seconds).

# Monitoring Parameters

F1

| Label | Doorway Code | Description                                | Units | Default Value | Range          |
|-------|--------------|--------------------------------------------|-------|---------------|----------------|
| INPA  | C30          | Input A status                             | -     | -             | 0 to 1         |
| OCCD  | C31          | Occupied                                   | -     | -             | 0 to 1         |
| COOL  | C34          | Cooling Status                             | -     | -             | 0 to 1         |
| RLYA  | C35          | Relay 'A' Status                           | -     | -             | 0 to 1         |
| RLYB  | C36          | Relay 'B' Status                           | -     | -             | 0 to 1         |
| RLYC  | C37          | Relay 'C' Status                           | -     | -             | 0 to 1         |
| AUTO  | C38          | Automatic/Manual Status                    | -     | -             | 0 to 1         |
| OVRD  | C39          | Override                                   | -     | -             | 0 to 1         |
| SERV  | W7           | Service Pin Message (to Doorway)           | -     | -             | -              |
| CGST  | C45          | Configuration Mode Status                  | -     | -             | 0 to 1         |
| SPLA  | S1 C50       | Supply Air Temperature                     | Deg C | -             | -              |
| RTNA  | S2 C51       | Return Air Temperature                     | Deg C | -             | -              |
| HCOP  | S3 C52       | Heat Cool Output Valves                    | %     | -             | 0 to 100       |
| SPSL  | C53          | Current Supply Setpoint                    | Deg C | -             | -              |
| SPRT  | C54          | Current Return Setpoint                    | Deg C | -             | -              |
| HDMD  | C55          | Heat Demand from Room Loop                 | %     | -             | 0 to 100       |
| CDMD  | C56          | Cool Demand from Room Loop                 | %     | -             | 0 to 100       |
| SPOC  | K1 C60       | Occupation Setpoint                        | Deg C | 20            | 5.0 to 35.0    |
| SPNO  | K2 C61       | Non-Occupation Setpoint                    | Deg C | 10            | 5.0 to 20.0    |
| SPSV  | K3 C62       | Supervised Setpoint from Master Controller | Deg C | -             | 0 to 35.0      |
| SPTR  | K4 C63       | Setpoint Trim                              | Deg C | 0             | -10.0 to +10.0 |

## Accessing Configuration and Monitoring Parameters

Generally, Configuration Parameters are used to adjust settings from their factory defaults; Monitoring Parameters are used to monitor internal readings (such as temperature readings) during the Commissioning process.

The Parameters may be viewed, and in the case of Configuration Parameters, adjusted by one of two methods; either by using a Zone Controller connected to the network, or by using the SeaChange Doorway Supervisor.

### Using the Zone Controller:

- The Zone Controller must be connected to the network and *registered* (see Commissioning Guide for further details).
- Put the Zone Controller into Configuration Mode by depressing Select and Override buttons for 10 seconds, until the CNFG legend appears on the display.
- Press Select button momentarily on the target device (in this case, the selected Fan Coil Controller).
- Hold down Select button on the Zone Controller, and rotate the rotary knob:

clockwise to view Monitoring Parameters  
anticlock to view Configuration Parameters

- When desired Configuration Parameter appears, release Select, hold down Override and turn knob to adjust the parameter (some Monitoring Parameters cannot be adjusted).

### Using SeaChange Doorway:

Data Points may be added to a Doorway page to access/adjust any Configuration or Monitoring Parameter. Graphs of the Input Parameters and Heat/Cool output are also available. The code used to

access an FCU Controller is **Zn**, where *n* is the Fan Coil Zone number. The code for each parameter is shown in the adjacent tables.

Further details of how to set up Doorway pages may be found in the SeaChange Doorway Manual, or in the online help facility supplied with SeaChange Doorway. The PC running SeaChange Doorway can be connected locally via a Serial Adaptor Module, or remotely using standard High-Speed Modems. In this manner all parameters can be monitored and adjusted remotely.

## Manual Override

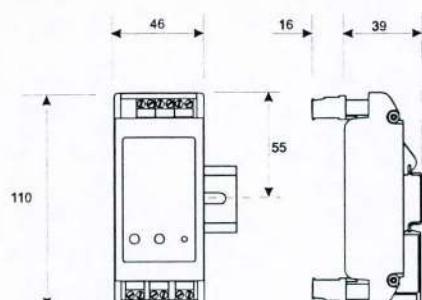
Allows the outputs to be exercised during commissioning and maintenance activities. Holding the Manual Override button pressed until the Status Lamp flashes green will cause the controller to be switched from automatic to manual control and the Fan will run. Subsequent pressings of the manual override button will cause:

| Press | Temp Lamp | Relay Output                          |
|-------|-----------|---------------------------------------|
| 1     | Red       | Htg Valve Open                        |
| 2     | Yellow    | Htg Close, Clg Open                   |
| 3     | Green     | Clg Close and returns to Auto Control |

As this feature does not time out, care should be exercised to ensure the module is returned to the automatic mode on completion of the commissioning or maintenance activities.

Override can also be achieved via Doorway when AUTO can be set to manual mode and MANL used to set the output condition.

## Dimensions



all dimensions in mm

## Electrical

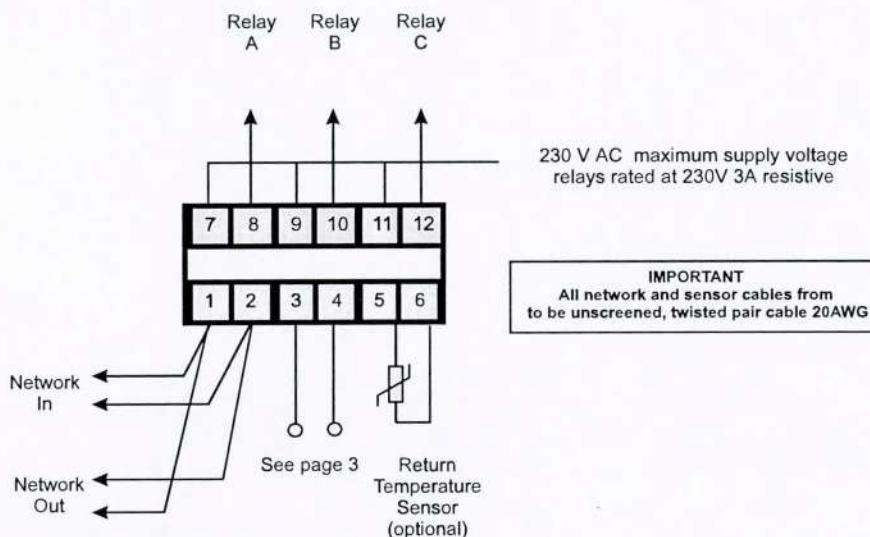
|             |                                                          |
|-------------|----------------------------------------------------------|
| Inputs      | 2 Thermistor or 1 Thermistor and VFC or potentiometer.   |
| Outputs     | 3 Relay Outputs N/O contacts<br>3 A 230 V resistive Load |
| Consumption | 22 mA from network                                       |

## Physical

|                |                                                  |
|----------------|--------------------------------------------------|
| Weight         | 0.15 kg                                          |
| Cover Material | PC/ABS alloy Self extinguishing to UL 94 V0/1.60 |
| Base Material  | Polyamide 6.6 Self extinguishing to UL 94 VO     |
| Colour         | Dark Grey to Pantone 425                         |

Conformant product

## Wiring Information



## Options and Product Codes

3R Fan Coil Controller

FCU / DIN / 3R / [driver option]

## Relay output driver options

| Option | Relay A        | Relay B        | Relay C |
|--------|----------------|----------------|---------|
| /001   | Valve Open     | Valve Close    | Fan     |
| /002   | Valve Open     | Valve Close    | Fan     |
| /003   | Damper Heating | Damper Cooling | Fan     |
| /004   | Heating Valve  | Cooling Valve  | Fan     |

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# **Doorway**

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*BMS software at PC software prices !*

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## Introduction

Thank you for purchasing *Doorway*, and we hope that you find it easy to use. It is assumed that you are reasonably familiar with Microsoft Windows and the principles of your Building Management System (BMS) product. *Doorway* works with BMS products from Trend Control Systems Ltd and SeaChange Controls Ltd, as well as the rapidly growing range of *LonWorks®* compatible devices.

*Doorway* is designed for Microsoft Windows 3.1x, Windows 95 and Windows NT 3.51 and 4 which protects your investment both now and in the future. *Doorway* is designed to add value to your investment in BMS technology.

Pictorial displays of plant with live information superimposed enables better diagnosis of plant conditions than character based lists. Pictures can be created using almost any Windows design package, including Visio, Corel Draw, Micrografx Designer and Microsoft Office Powerpoint. Visio users should try our custom templates which we supply on *Doorway* master disk 2. The file VISIO.BAT will expand these into your system root directory, then you can move them to your Visio templates directory

*Doorway* includes some BMS engineering tools, and our sensible low cost multi-user licence policy makes having multiple users practical.

*Doorway* supports modern high speed modems, including specification V34 (33,600 baud), which can give full speed access to a site's BMS. An interface is also included for the competitor DOS driver SANC.EXE which was used with certain legacy V23 (1200 baud) modems. The interface is for Windows 3.1x and Windows 95, not Windows NT.

Modems to specification V22, V32 and V34 use North American Phase Shift modulation which cannot communicate with the earlier European V23 (1200 baud) specification which uses Frequency Shift modulation. Some modern modems include the V23 specification, but usually only the 1200/75 baud 'Prestel' variant. Few modems now offer the V23 1200/1200 half-duplex mode used in the 'MNC' product designed by the writer in the 1980's.

*Doorway* can utilise the considerable investment users have made in IT networking technology and route BMS data to any PC across the user site(s), even many miles apart. This eliminates the speed penalty, capital and maintenance costs of modems and dial-up telephone lines. Data and alarms from all remote sites can appear on the same page if required. By contrast with modems and dial-up telephone lines simultaneous display is not possible, and alarms from remote sites are blocked when the modem is on line to another site.

Doorway Systems has a policy of regularly enhancing the features of the *Doorway* software in response to user suggestions, and updates are available free from our two Internet Web sites. Choose the site which gives you fastest access.

<http://www.doorways.demon.co.uk>

<http://ourworld.compuserve.com/homepages/doorway>

Comprehensive instructions are provided in the **Help** facility, and are therefore available on screen at all times. We believe this is the best way of providing you with up to date information in our continuously evolving product. All Help topics may of course be printed at any time.

To access the Help facility when running *Doorway* choose **Contents** from the **Help** menu. You may then jump from help topic to topic by clicking on the underlined keywords in the help screen. All the pages may be browsed using the **next >>** and **previous <<** buttons, or searched using the **Search** button. The powerful "in context" help feature is activated either by pressing the **F1** key on the keyboard while attempting a task, or clicking the **?** or **Help** button which is shown on many screens. *Doorway* tries to show the most appropriate help page for each task.

Now to get started, please follow the installation instructions in the next section.

### Installing Doorway onto your PC

*Doorway* is designed for Microsoft Windows 3.1x, Windows 95 and Windows NT 3.51 and 4.

The software is shipped on high quality branded floppy disks. The software is copy protected, and you cannot create working copies of disk 2 of the supplied disk set. This protection enables us to keep the software price low.

A single-user licence of *Doorway* provides 1 installation token, which releases the full features of *Doorway*. You may also install additional copies of *Doorway* on other PCs, but they will only work in a demonstration mode, and the Setup program will tell you that the installation is incomplete. You may move the licence token between machines at any time quite easily.

The licence token when installed consists of encrypted files in a standard MS-DOS 'hidden' system directory on your hard drive in the *Doorway* directory. Do not move or alter any of these files since this will permanently invalidate the licence token. It is very unlikely that a user could accidentally change these files. Licences are keyed by serial number to the original master disk 2.

The licence token is compatible with MS-DOS 6's **DoubleSpace** and **Defrag** utilities. Backup of the data from *Doorway* installations is straightforward, some can even fit on a single floppy disk. However it is necessary to deinstall the licence token before using the **BACKUP/RESTORE** on the *Doorway* directory or creating **DOUBLESPACE/ DRIVESPACE** drives. Reinstall the licence after the operation is complete, using *Doorway*'s **SETUP** program, choose option '**Re-install licence**'.

*Doorway* is compatible with IT Networks, so you can locate page files on a central file server to ensure all users use the same data set. Multi-user licence holders may if desired install the complete *Doorway* program on a file server. The licence protection is compatible with most Windows networking products. *Doorway* can then be made available at any PC on the site connected to the IT network. See your IT network administrator about setting up suitable IT 'access rights'. The *Doorway IT Gateway* enables routing of communications from remote PC's to the PC with the BMS hardware connection, eg CNC or SLT.

**First time installation:**

- 1) *Windows 3.1x* users should ensure that free conventional (DOS) memory is more than 500K bytes using the DOS MEM command. If not then you must temporarily disable some drivers in CONFIG.SYS to release workspace for the licence installation.  
*Windows 95* users with real mode drivers should check as for *Windows 3.1x* above.  
*Windows NT 3.51* and *4.0* installation is as below.
- 2) If in Windows already it is recommended to Exit and then restart Windows to ensure memory is clean. Ensure no other application is running.
- 3) Insert Disk 1 into Drive A
- 2) From Windows Program Manager choose File, then Run...  
or from Windows Start Bar choose Run...
- 5) Type A:\SETUP and click OK.

When the Doorway Setup screen appears, select option 1 - Complete Program, and press the *Setup* button. You may install a *Doorway* multi user licence onto a suitable shared drive or FileServer using the *Network* Setup option which installs all files in the same directory.

**To recover licence back to floppy disk:**

You can only recover a licence to its originally supplied disk set.

- 1) Insert Disk 1 into Drive A
- 2) From Windows Program Manager choose File, then Run...  
or from Windows Start Bar choose Run...
- 3) Type A:\SETUP and click OK.

When the Doorway Setup screen appears, select option 7 - De-Install Licence.

**To reinstall licence:**

- 1) Insert Disk 1 into Drive A
- 2) From Windows Program Manager choose File, then Run...  
or from Windows Start Bar choose Run...
- 3) Type A:\SETUP and click OK.

When the Doorway Setup screen appears, select option 6 - Re-Install Licence.

**Your master floppy disks are valuable, do not lose them!**

## **Starting Doorway**

To start the program double click on the *Doorway* icon in Windows Program Manager or select from the Windows Start Bar in the normal way. If the *Doorway* program is already running a second copy will not start. A *Loading, please wait...* message will be followed by the main screen and the program licence screen. The licence screen will disappear after a few seconds, or may be closed sooner by mouse clicking on its close button.

Notice that for your convenience *Doorway* always starts with its screen full size, and starts by trying to load a file called AUTO.DAT. This will initially be the *Doorway* advertising picture until you create your own page and saving as the file AUTO.DAT. You may alternatively change the starting file by adding the desired file name to the command line properties in the normal Windows way. If the desired file is in a different directory set the application working directory in the normal way.

When the program is running you can experiment with the supplied sample pages, jumping from page to page by clicking (once) on the grey buttons, which we shall refer to as *Jump Buttons*. *Doorway* follows Microsoft's user interface recommendations where *selections* are by single mouse click, and double mouse clicks are used for short cuts. For example *selecting an item* then *clicking* the OK button can be replaced by a double click selection.

## **Tutorial**

A short on screen tutorial is available which does not require connection to a BMS. The tutorial is started from the Help menu and presents many of *Doorway*'s features.

The tutorial makes extensive use of *Doorway*'s text capabilities. Text can be superimposed to a page very quickly, and even large coloured areas can be created as an outline for text or BMS data. Many of the sample pages do not actually use a picture.

## **Getting Data from the Building Management System**

To get some data from your Building Management System (BMS) you must plug a suitable RS232 cable from the PC into the BMS hardware connection, see your BMS instructions for further details about this. Use the menu **Tools Communications** to select a communications port and baud rate, usually COM1 and 9600 baud. We recommend using 19200 baud where possible for best performance. Your changes are implemented immediately by Windows. Notice that there are several other options on this screen, which can be explored later.

If all is correct then some data may appear from a controller on the sample pages, which are all addressed to controller 20. *Lan error* simply means that address 20 is not present on your BMS network.

*Doorway* keeps your chosen settings for communications etc. in a file called DOORWAY.INI. When you make selections in *Doorway* this INI file is automatically updated to remember your preferences.

*Doorway* does not require hardware flow control and only the three connections TxData, RxData and Ground are used, which means that almost all RS232 cables will work, including most 9 to 25 way RS232 PC adaptor cables from computer peripheral suppliers.

Direct connection to a controller's local port is possible for plant room convenience. Note that most controllers use a speed of 9600 baud at their local port, and require the 'Direct Connect' communications option to be selected.

## **Sample Pages**

All the supplied sample files have names starting with SAMPLE so it is suggested that you use different filenames for your own pages. The original installation AUTO.DAT is identical to SAMPLE00.DAT with picture file SAMPLE00.WMF, so you may safely change AUTO.DAT yet still be able to revert to the original at a later time if required.

The sample pages are installed by the Setup program. These illustrate some of the features available in *Doorway*. Where data is called from the BMS, address 20 is used. Please note that the sample pictures are deliberately quite simple. This not only reduces master floppy disk requirements, but emphasises that simple pictures which are quick to build are low cost but can be just as useful to the busy building services engineer.

*Doorway* can display very much more detailed pictures, including *scanned* photographs, showing up to the full Windows capability of 16.7 million colours. The complexity and detail of page pictures is probably limited only by your time and imagination.

## **Building your own pages**

Building a *Doorway* page is quite straightforward. You will need to start with a new blank page. Then you will choose a background colour if white is not appropriate. You will then add a picture or diagram as a backdrop if you wish, although this will have to be prepared using a separate drawing or painting package. You will then place Data Points on the page to show BMS data from controllers. You will add Jump Buttons to set jumps to other pages. You may give your page a title for the caption bar at the top of the screen and finally you will Save the Page to disk. In the following sections we will go through these stages in more detail.

### **Create a new page**

Choose the menu **File New** to give a new blank page.

### **Choose a background colour**

Select the menu **Edit Change Background Colour** to show the colour chart. *Doorway* can handle all of Windows' potential 16.7 million colours, sometimes referred to as '24 Bit' or 'TrueColor'. Your PC may offer you only 16 of these, but many other colours are created by 'dithering' colours together. The colour chart gives you some choice, and even lets you set custom colours as well. Experiment to see which colours look suitable. Incidentally many PC's now can show 256 colours by selecting a suitable display driver in Windows Setup, check your system documentation, or just try it out, but remember which display driver worked before starting!

### **Choose a filename**

Each page will be stored on disk and will need an unique filename. Now is a suitable time to choose the filename so that you can Save the page regularly as you build it, otherwise in case of a power failure you would lose your work. Choose menu **File Save As** and fill in the file save box in the normal way. This file is the DAT file which contains instructions about the layout and contents of the page. The picture will be in a separate file, see below.

### **Choose a picture**

There are three ways of getting a drawing or picture into *Doorway*. Use the Windows clipboard with Copy and Paste, load an existing suitable format picture file, or use OLE to get seamless interfacing with your chosen drawing package. *Doorway Systems* recommends *Visio*, *Corel Draw* and *Microsoft Office Powerpoint* which all work well. Some *Visio* templates are included on *Doorway* master disk 2.

Select menu **Edit Paste Picture** to paste a picture from the clipboard onto the *Doorway* page. If WMF and BMP formats are both present on the clipboard you will be given the choice. Normally choose the WMF format which automatically resizes to fit the page. Some pictures, for example photographs may not stretch well, and BMP is better. WMF are usually faster to redraw unless they are extremely complex. BMP draw at the same speed regardless of complexity. Experiment to see which works best on your PC.

Selecting menu **Edit Load Picture File** will show the choose picture file box. A file choice button will show the file selector for WMF and BMP files, and several other formats.

Windows MetaFile format (WMF) contain the instructions Windows uses to draw vector or 'shape' pictures. The Windows BitMap format (BMP) consists of the data for every individual part of a picture, this is required in very highly detailed pictures such as photographs. Incidentally all applications have to convert internally to WMF or BMP to pass the picture to the Windows screen driver.

Select menu **Edit Insert New OLE Picture**, and from the list choose a suitable OLE application. Create your drawing in the OLE application. Use the OLE application menu **Update** from time to time to see how it looks in *Doorway* without closing the OLE application. Then the OLE application menu **Exit** when complete to insert the picture into the *Doorway* page.

Now use *Doorway* menu **File Save** to save the page and picture to disk. If you chose an existing picture file from disk then that filename is stored in the DAT file. If you Pasted in a picture from the clipboard then you are asked for a picture filename. Notice that *Doorway* suggests the same name as your DAT filename with the extension WMF, BMP or OLE as appropriate. You may of course choose another filename if desired. OLE picture files must use the extension OLE so that *Doorway* will recall the original application for further editing.

Advanced users should note that BMP pictures in dynamic images automatically resize with the page, and can be used with good effect to stretch backdrop photographs.

### Adding Data Points

To show data from a BMS controller you need to place Data Points on the page. You can have up to 100 Data Points on each page.

Select menu **Edit Edit Mode** which first resizes the *Doorway* display, and then shows a yellow status bar at the bottom of the screen, and a colour palette at the right hand side. Select menu **Edit Add Data Point** which places a Data Point at the top left corner of the screen labelled *Data Point 1*. The yellow status box shows \$Data Point 1 from address 1. You can now edit the command to collect data from a controller using the manufacturers syntax.

Example: To get the value and units of sensor 1 enter *SI(V,%)*. Set the controller address in the OS box and network in the Lan box, a blank is accepted as Lan 0. Click the Enter button to action your changes, and the Data Point on the page should after a second or so show the data from the controller.

You can move the Data Point to the desired place by holding the CTRL key down and then dragging the item with the mouse.

All sorts of special effects are possible with Data Points. The style button takes you to the grey style status bar where you may choose from the full Windows range of fonts, sizes, ink and paper colours, outline boxing and transparent background effects. Advanced users may like to try *Doorway*'s Dynamic Image feature, where multi-state and animated images may be placed on the screen, further details in the Help file.

Digital data points have two conditions, which as a default is On and Off. Optional fields after the BMS data request controls the text and appearance of the two conditions.

example: **I1(\$,\$)/Fault!!/Normal/-12/11/** and assume the label is *Boiler*

As the digital input status changes the data point text changes between **Boiler Fault** on a Red background and **Boiler Normal** on an Aqua background. The negative value means that the Red background will flash at about  $\frac{1}{2}$  Hz between Red and the paper colour of the Data Point, which should be in a contrasting colour, such as white. The **!!** as the last characters in the text make the datapoint sound the selected alarm sounds periodically when that condition is active. Of course the use of all these special effects is optional.

Click the mouse on the ? button in the yellow edit box or press the help key F1 when editing a point, the Help display will open at the appropriate page.

### Adding Jump Buttons

To jump from page to page you use Jump Buttons. You have up to 60 Jump Buttons on each page.

Select menu **Edit Add Jump Button** which places a Jump Button at the top left corner of the screen labelled Button 1. It then shows a blue status bar at the bottom of the screen. You can now change the button label to your choice, notice that the button sizes itself to fit the label. You can add spaces to your text to achieve the size you like. Buttons containing no text at all still show as a very small square box. The file name which the button will jump to is entered in the other box. The file selector permits selection of DAT, PIC, UPG, ZON TGD, MAP and DWC files for showing or other action on the *Doorway* page.

Jump Buttons can also do other things such as start another application, e.g. the word processor WINWORD.EXE or even show a file in its application e.g. EXPENSES.XLS which would start the Microsoft EXCEL spreadsheet and load the file EXPENSES.XLS into it.

A number other actions are also available from a Jump Button e.g. \*RETURN which causes a jump to the previous picture. Other commands include \*ALARMS, \*CHANGE, \*CHART, \*CLICK, \*COMMS, \*DIAL, \*GENERIC, \*LIST, \*LOGBOOK, \*PLOT, \*REFRESH, \*SEND, \*SNAPSHOT, \*921, \*DIAL etc. For details on the latest range and syntax of \* commands open Doorway Help and search for *\* Commands* or *Jump Button Syntax*.

Click the mouse on the ? button in the blue edit box or press the help key F1 when editing a Jump Button, the Help display will open at the appropriate page.

### Changing editing modes

You can change from editing Data Points (yellow status line) to Jump Buttons (blue status line) by selecting the desired item by mouse clicking. The status line updates to show the properties of the item selected.

## Mouse and Keyboard shortcuts

Many of *Doorway's* features may be operated from the keyboard without using a mouse. While this is useful when using some portable PCs in the plant room, it is also often convenient for the experienced user editing *Doorway* pages even on a desktop PC.

To bring up the status line for a Data Point or Jump Button, hold down the Shift key and mouse click the item.

For Jump Buttons using the keyboard only press the TAB key to move between Jump Buttons. Press the Space bar to 'click' the Jump Button. To enter edit mode, hold Shift and press Space.

For Data Points using the keyboard only press Home, Page Up, Page Down and End keys to move between Data Points. The mouse pointer will move to indicate which Data Point is selected. Press the Insert key to "click" on a Data Point. To bring up the status line, hold Shift and press Insert.

To close the edit status bar using the keyboard press the ESC key.

The right mouse button is used to obtain properties of an item. When the right mouse button is clicked on the *Doorway* Page it shows a History list of the last few pages displayed. During page editing the right mouse button on a Data Point or Jump Button shows a menu with *Properties*, *Cut*, *Copy*, *Paste*, *Duplicate* and *Help* and other items when appropriate.

The Engineering mode is available from menu **Tools Engineering**. Users may find it convenient to use the familiar keyboard sequence CTRL O to get to the Engineering screen, and then CTRL O again to start controller configuration. Use CTRL M to select another controller from the Map. When complete use keys ALT F4 to return to the *Doorway* Page. Other CTRL key shortcuts are indicated on the menus, e.g. CTRL S for a list of Sensors.

### Change the picture title

The title on the caption bar at the top of the screen may be changed from the initial *Doorway* to something more informative by selecting menu **Edit Change Title** and typing in your choice. After using menu **File Convert from PIC format** to convert from the legacy PIC format pages are automatically titled *Doorway - filename.DAT*. Titles may be then changed as required.

### Save the page to disk

If you have not saved the file already then choose menu **File Save As** and fill in the file save box in the normal way. This file is the DAT file which contains instructions about the layout and contents of the page. If the file has already been given a name then choose menu **File Save** to save under the existing name. Note that any associated picture file is not saved again unless it has been changed. The DAT file contains the directory path and filename of any picture.

## **Doorway IT Networking**

Many users now have an IT network connecting their PC's to strategically located file servers. *Doorway* can use this network so that the BMS supervisor PC does not have to be connected physically to the BMS hardware connection. *Doorway* can still use RS232 ports COM1-4 in the usual way for stand alone application.

The *Doorway IT Gateway* software is a separate program (DOORNET.EXE) which is run on the PC connected to the BMS hardware. *Doorway* is then run at the distant PC and from menu **Tools-Communications** select the port NET1, instead of the normal COM1. All messages are now sent over the IT network, are picked up by the *Doorway IT Gateway* and sent to the BMS network. Replies and alarms are similarly routed back to the PC. Note that BMS alarms are received and archived by all PCs running *Doorway* connected to this NET port.

More than one PC workstation can simultaneously use the *Doorway IT Gateway*, although a practical limit at present of four users is suggested due to BMS congestion. All these users use the same NET port as the *Doorway IT Gateway*. Three additional *Doorway IT Gateways* may be connected to three more BMS hardware connections if desired using ports NET2 to NET4 on additional PC's. The PC's running the additional Gateways may be located anywhere physically convenient for the BMS and IT networks. *Doorway* can also run on the PC with the *Doorway IT Gateway* and operates in the normal way, sharing the BMS hardware connection with all other users connected to this NET port.

### **Doorway IT Gateway network requirements**

*Doorway IT Gateway* requires the NetBIOS services from the IT Network. The NetBIOS software interface standard was initially developed by IBM, and is an industry standard. NETBIOS services are available on all the Microsoft Windows supported protocols including TCP/IP, IPX/SPX and NETBUEI.

Microsoft Windows for Workgroups 3.11, Windows 95 and Windows NT includes complete networking support. Users of the *Doorway IT Gateway* are recommended to upgrade from Windows 3.1.

If using Windows 3.1 is essential then the way to check for NetBIOS services is to run Microsoft MSD.EXE. The Network option in MSD shows whether the NetBIOS services are present. See your IT network administrator for the addition of NetBIOS services to *Novell Netware* and *Banyan Vines*. The *Novell Netware* supplement is NETBIOS.EXE which is rather slow and the data will not pass through routers, and so upgrading Windows is strongly recommended.

Users who have several network protocols in use should note that *Doorway* communicates using the default or first (LANA 0) protocol only. You will need to ensure that all PC's running *Doorway* are set up with the same default protocol.

## IT Network capacity

*Doorway* transfers only a few hundred bytes each second on page change, relaxing back to a typical 100 bytes per second on page idle. Compared with the 1,000,000 bytes a second (10Mbps) or more Ethernet hardware capacity this is a negligible traffic load.

## Connecting *Doorway* to the IT Network

Use menu **Tools-Communications** to see the networking options. NET1-4 provide four channels over your IT Network. Select NET1 and choose OK. If NetBIOS services are available the LAN adapter registers *Doorway* with your network.

You may start the *Doorway IT Gateway* either before or after starting *Doorway*. Only one gateway may run on the network for each NET number. With 4 network channels available up to four BMS hardware connections can provide independent gateways into the BMS. We suggest about four simultaneous users per BMS hardware connection otherwise response becomes slow. If users 'park' on a non communicating page then this eases congestion for others. If all users show the same page and all data is being requested from just one BMS controller, the controller can get overloaded. To ease congestion choose the Tools Communications menu in *Doorway* and increase the *Communications Idle Time* from the standard 1.2 seconds, say to 1.5 seconds, repeat this on all users installations, and recheck. The idle time does not affect initial data collection, only the subsequent background refresh.

## Network LogIn and passwords.

The LogIn process to your network actually controls access to files on the fileserver(s). *Doorway*'s network communication is known as *peer to peer* which does not involve the file server. As a user does not need to LogIn to the file server for *Doorway* communications it is suggested that passwords in controllers and *Doorway* are used

For simplicity *Doorway IT Gateway* version 1.0 in May 1995 and the cosmetically changed version 1.1 were pre-set to use NET1 and COM1. In July 1996 *Doorway IT Gateway* version 1.1a was released with *Doorway* version 3.2. The product now allows NET1 to NET4, COM1 to COM4, and RS232 speeds of 1200, 4800, 9600 and 19200 baud. The settings are retained in DOORWAY.INI. Internal changes mean that you must upgrade both applications together on installations using IT networking.

## Single User - Multi User Site licences

The *Doorway* single user licence is intended for one user at a time. The *Doorway* multi-user site licence provides multiple tokens for conventional installations for several simultaneous users. Users with IT networks may find it convenient to place all the *Doorway* data files on the file server so that all users have the same pages, and a Setup option is provided for this.

A single user licence could enable multiple users if the licence token is installed to a file server, and several users simultaneously run from the single *Doorway* licence and program files. At present *Doorway* makes no checks on this situation, although it may in the future. We require users to upgrade to the modestly priced multi user license when this situation occurs.

## **Licence Agreement**

### **1 Definitions**

This is a legal agreement between you, the purchaser, and the authors, A D and J D Chamier. *Doorway*, "the Software" remains the property of the authors at all times.

### **2 Grant of Licence**

The authors grant you the right to use one copy of the enclosed software program on a single computer. The program is in "use" on a computer when it is loaded into temporary memory (i.e. RAM) or installed into permanent memory (e.g. hard disk, CD-ROM, or other storage device) of that computer. A multi user licence copy may be installed on up to the number of computers notified to the purchaser by the authors.

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You may not rent or lease the software, but you may transfer your rights under this Licence Agreement on a permanent basis provided you transfer all copies of the software and all written materials, and the recipient agrees to the terms of this Agreement. Any transfer must include the most recent update and all prior versions of the software.

### **6 Term**

The licence granted under this agreement is effective from the date on which the software is received by you. You may terminate this licence at any time upon one month's written notice to the authors. The authors may terminate this licence at any time without compensation if you fail to comply with any of the terms of this agreement. Within one month after the date of any termination, of the licence granted under this agreement, you will furnish the authors with a certificate certifying that through your best efforts, and to the best of your knowledge, the original and all copies, in whole or in part, in any form, of the software have been returned to the authors or destroyed.

### **7 Limitations of Warranty**

Apart from any statutory obligations, because of the diversity of hardware, software, and conditions under which the software may be used, the authors cannot make any warranties either express or implied with respect to the software, its quality, performance, merchantability or fitness for any particular use. The software is licensed "as is" and with all faults. In no event will the authors be liable for direct, indirect, incidental or consequential damage resulting from any defect in the software even if the authors have or had been advised.

### **8 Governing Law**

This agreement constitutes the entire agreement between the parties and supersedes any prior agreements. This agreement may only be changed by mutual written consent. This agreement shall be construed, interpreted, and governed by the laws of England.

## Doorway Software Release Notes

Doorway Systems has an open systems policy. We publish details about every software release since product launch in May 1993.

The software industry practice is moving strongly to on-line documentation, for cost and support reasons. The Windows Help system is always available and any topic can be printed if required. The Windows *Hypertext* links enables movement to related topics with a mouse click. From Doorway version 4 in December 1996 the software release notes have been moved to the Doorway Help system.

In Doorway's main screen you can choose Help from the menu bar or press function key F1. Pressing key F1 is recommended because it will always open the relevant help topic for the current screen. Many screens in Doorway also have a button labelled *Help* or with just a ? symbol to open the relevant help topic. Doorway's Help text is comprehensively indexed so just press the *Search* button to locate a topic. To locate the software release note press the *Contents* button, then in the Contents page click on the text *Software Releases*.

The Doorway Help data is updated regularly, and updates are available free from our Internet Web sites. The sites are identical, so use the one which gives you the fastest service:-

<http://www.doorways.demon.co.uk>  
<http://ourworld.compuserve.com/homepages/doorway>

# **Doorway**

## *BMS Software Data Sheet*

£400 single user, £800 for 4 user, £1200 for 8 user license + VAT

### **Features**

- For use with Trend Control Systems Ltd, SeaChange Ltd. & LonWorks® compatible products.
- Show controller data positioned on diagrams and pictures in an easy to understand way.
- Easy to operate with mouse with full context sensitive *Help*.
- May be operated using *Keyboard only*, for portable PCs without mouse.
- *Direct Connect* to controller feature allows use of portable PCs in the plantroom.
- Data can be *Copied* and *Pasted* into other Windows applications.
  
- Full range of *Windows fonts* and *colours* available, with an *Autoscaling resizable display*.
- Real time dynamic editing of pages, set parameters in status bar, move items with mouse.
- Use images from most Windows applications including AutoCAD® with *OLE* or *Copy* and *Paste*.
- Each page can have:
  - up to 60 *Jump-Buttons* per page to go to other pictures, or perform a system action.
  - up to 100 *Data-Points* per page for BMS controller data.
  - multi state and animated *Dynamic Images* respond to BMS digital and analog values.
- Text only pages can be built without pictures.
- Built in *Text Pages* (921 style) allow immediate use without creating pictures.
- Competitor *PIC* and *UPG* formats may be displayed without modification.
- Utility to convert *PIC* and *UPG* formats to Microsoft format in seconds.
  
- Easy adjustment of controller *Knobs* and *Switches*, also *Hand-Off-Auto* facility.
  
- *Lists* allow the quick display of BMS Sensors, Inputs, Drivers, Knobs, Switches, Alarm arrays, Plot channels, Functions, Logics, Loops, Sequence table, Critical Alarms and IC communications.
  
- *Graphs* - Up to eight traces in various styles including 3-dimensional and statistics.
  - Graphs may be printed in full colour to supported printers.
  - Competitor TGD plotting files may be used.
  - Real time *Charting* of almost any BMS parameter.
- All received alarms are *Archived*:
  - Monthly Alarm Archive - optional printing feature, only prints when desired.
  - Multi-media sound support for incoming alarm signal, requires sound card.
  - 4 channel alarm retransmission.
- Automatic page and graph *Snapshots* archived in Microsoft Access database format.
- Digital input *Counter Rollover* feature resolves controller counter overflow problem.
- Full program *Security*:
  - Up to 20 users, no problem if two users unknowingly choose the same password.
  - Each user has their own access level, controller PIN and adjustable password time-out.
- *Synchronise all Clocks* on BMS network to the PC clock.
- *Time Zones* can be viewed, changed and archived to disk.
- Support for modern *High speed modems* and MNC/ANC modem. Win 3.1 & 95 SANC interface.
- *Engineering* allows the configuration of controllers:
  - Including *Upload/Download* of IQF data files. Print, Copy & Paste configuration data.
  - Text communications feature. Create system address *MAP*, including over modems
- *E-Mail Chat* allows messaging with other users over the BMS network.
- *DDE* for data exchange with other applications, including LonWorks® using DDE Server.
- *Doorway IT Gateway* allows multiple remote users access to the BMS via a single RS232 port.
- *1 Year Event Calendar* for actions such as time zone download. *Year 2000* compliant.

*Doorway has been in commercial use since May 1993, with over 900 software licenses shipped.*

# Doorway Hardware Requirements

- **BMS requirements:**

- For a single controller:

- A suitable RS232 cable from PC to controller.

- For multiple controllers with BMS network:

- A Communications Node Controller on network.

- A suitable RS232 cable from PC to node.

- Note: Controllers must be fitted with firmware version 4.5 or later.*

- **Minimum PC specification:**

- Personal Computer using a 386 or higher processor.

- Microsoft Windows 3.1 or later.

- 4 MB of RAM.

- 3.5" high density disk drive.

- 10 MB of available hard disk space.

- Any colour or monochrome screen supported by Windows.

- **Suggested PC purchase specification:** (UK price from £800 in March 1998)

- Pentium II processor running at 266 MHz

- Windows 95 or Windows NT 4 Workstation

- 32 MB of RAM + 4 GB hard disk drive

- 16 million colour (TrueColor) graphics card in 1024\*768 pixel mode

- 17 inch colour monitor

- **Windows versions:**

- Windows 3.1 or Workgroups 3.11 or Windows 95 or Windows NT 3.51 or NT 4.0.

- **IT Network Fileservers**

- Pages load as fast from a files server as from a local hard drive, which can simplify support.

- Doorway works with any networking software compatible with Windows. (e.g. NT or Novell).

- **IT Networking (Ethernet or Token Ring hardware)**

- The Doorway IT Gateway enhances the return on capital investment in BMS and IT Network E-mail and Group working services. IT Gateways runs on PC's with BMS hardware connections. This can allow access from Doorway on PC's anywhere on the IT Network. There can be several simultaneous users per BMS connection, each user receiving their own data from the BMS in the normal way. Data throughput limitations in the BMS hardware means a sensible limit is six simultaneous users. The required industry standard NetBIOS network service is available for most protocols including TCP/IP, IPX/SPX and NETBEUI.

- **Screen resolutions:**

- VGA used to be the general screen resolution. Users with suitable monitors can take advantage of the higher screen resolutions such as 800\*600, 1024\*768, 1280\*1024, 1600 by 1200 etc with the associated Windows driver. Doorway's global Edit-Change Scaling feature makes font control easy when changing monitor size.

- **Colours:**

- Doorway can show the full Windows 16 million colours (24bit True Color) with suitable graphics hardware, which can give superb results, and is particularly effective with photographs.

- **Available from your regular BMS specialist or directly from:**

- Doorway Systems, 7 Chanctonbury Way, Crawley, West Sussex, RH11 8TE

- Telephone: Office: 0973-223643

- E-Mail: doorway@compuserve.com

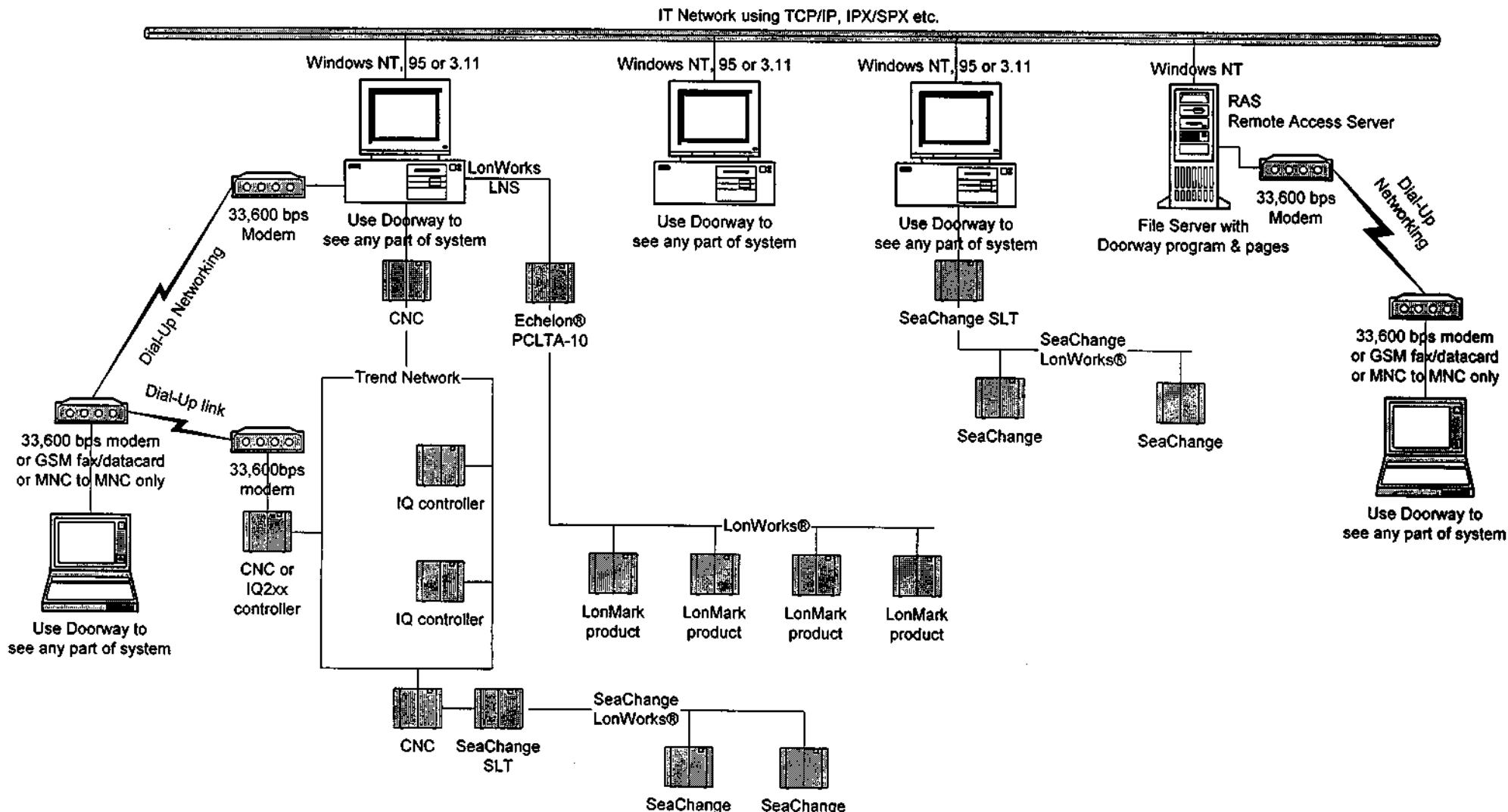
- Web site <http://www.doorways.demon.co.uk>



## **Doorway - BMS Supervisor**

Control and Monitoring for today and tomorrow

iss 4  
January 1998



## **Doorway networks today with tomorrow**

# **Doorway**

## *and the Company IT Network*

- The Doorway Systems and Trend Control Systems Ltd compatible **BMS Local Area Network** is well proven. The Lan allows peer to peer communications by controllers as well as permitting multiple PC Supervisors (man-machine interface's). Each Supervisor PC's RS232 port is connected to an adjacent BMS Lan hardware node (CNC). The BMS Lan cable has to be routed to every PC which wishes to access the BMS. Screened twisted pair cable lengths of up to 500 metres between nodes permit data rates up to 19,200 baud (bits/sec) by using the robust 20mA current loop signalling method. Remote sites have been linked in the past using proprietary BMS autodial modems such as *MNC* using the obsolete V23 signalling standard which is 1200 baud half duplex (one way at a time).
- **The Company IT Network** is a key business resource, enabling E-mail and group working products such as Notes, Exchange and GroupWise. Users can also access central resources such as file servers, or perhaps expensive items such as colour laser printers or A0 plotters for CAD drawings. The deployment, management and maintenance of a company wide IT network is managed by trained IT staff. IT networks use industry standard multi-sourced components using Ethernet or Token Ring hardware, and provide data at 10 million bits/sec (or more) to the PC. By contrast the 19,200 bit/sec capacity of the BMS Lan is modest.
- **Doorway** can allow authorised users to access the BMS from potentially anywhere on the company wide IT Network. A single RS232 connection to the BMS hardware is made at a convenient PC which runs the **Doorway IT Gateway** software. The gateway can also handle messages simultaneously from several remote users, data throughput limitations in the BMS hardware means a sensible limit is six simultaneous users.
- The **IT Network Service** used by the **Doorway IT Gateway** is the industry standard **NetBIOS** network service which is included with Microsoft Windows-for-Workgroups 3.11, Windows 95 and Windows NT for TCP/IP, IPX/SPX and NETBEUI protocols. Other network protocols have **NetBIOS** support provided by the vendor.
- **IT Network Security** is maintained by all existing network security mechanisms. In addition there is no mechanism within the Doorway software to transmit any messages other than BMS message packets encapsulated within industry standard **NetBIOS** datagrams. **NetBIOS** datagrams are also used by other network services, and are monitored and managed by the same network administrative software used for configuring IT network fileservers, bridges and routers. The IT network data traffic generated per **Doorway** Supervisor will average a modest 100 bytes per second when a page requesting BMS data is displayed.
- **Windows versions for IT Networking:**  
Windows-for-Workgroups 3.11 or Windows 95 or Windows NT contain software support by Microsoft, and are strongly recommended. For networking with Windows 3.1 suitable **NetBIOS** drivers have to be supplied by the network software vendor.
- **IT Network Fileserver:**  
Doorway may be installed on a file server, which can simplify support. Pages can load as fast from a fileservr as from a local hard drive.
- **Doorway Software Updates** are currently available free of charge from the Internet:  
<http://www.door.sys.demon.co.uk>
- **Available from your regular BMS specialist or directly from:**  
Doorway Systems, 7 Chanctonbury Way, Crawley, West Sussex, RH11 8TE  
Telephone: 0973-223643  
E-Mail: doorway@compuserve.com