

Data sheet

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MULTICAL® 603**The future-proof heat and cooling meter with full flexibility**

- Fully programmable data logger with minute loggers
- 2 second integration interval
- 16 years battery lifetime at a reading interval down to 10 seconds
- Possibility of built-in M-Bus
- 2 communication modules
- 7 or 8 digit display resolution
- User-friendly interface with 3 push buttons
- Possibility of backlit display
- Auto Detect of ULTRAFLOW®



MID

CE[M17]0200

EN 1434

DK-BEK 1178 - 06/11/2014



EN 1434



80000002

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Description

MULTICAL® 603 is an all-round calculator, suitable as heat meter, cooling meter or combined heat/cooling meter together with 1 or 2 flow sensors and 2 or 3 temperature sensors. The meter is intended for energy measurement in almost all types of thermal installations where water is used as the energy-conveying medium.

MULTICAL® 603 can, in addition to heat and cooling measurement, be used for leakage monitoring, permanent performance monitoring, as power and flow limiter with valve control as well as for energy measurement in both open and closed systems.

According to EN 1434 and MID, MULTICAL® 603 can be designated as a "calculator" with separate type approval and verification, and it can be delivered either as a separate calculator or as a complete meter, with mounted temperature sensors and flow sensor according to customer requirements.

MULTICAL® 603 has 2 flow sensor inputs that can be used for both electronic and mechanical flow sensors. The pulse figure can be programmed from 0.001 to 300 pulses/liter, and the calculator can be programmed to all nominal flow sensor sizes from 0.6 to 15,000 m³/h. The calculator can be delivered with both galvanically connected and separated flow sensor inputs.

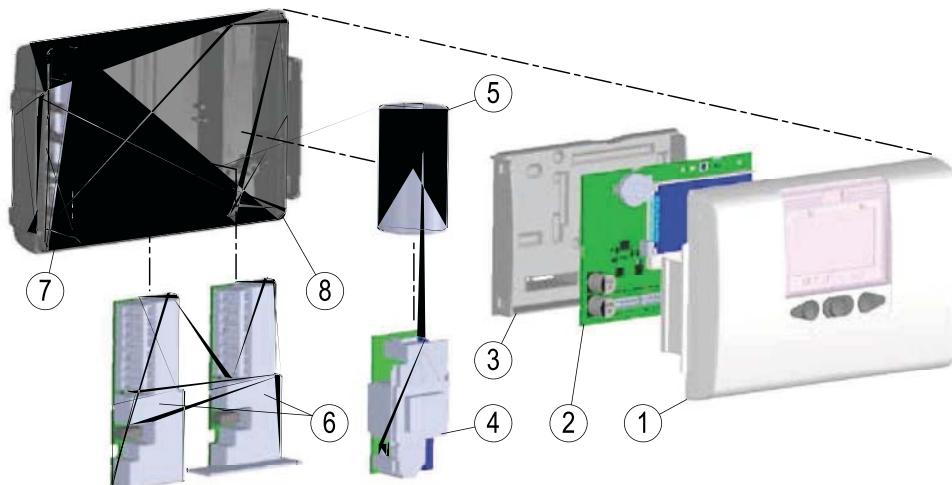
The accumulated heat energy and/or cooling energy can be displayed in kWh, MWh, GJ or Gcal, all in the form of seven or eight significant digits plus measuring unit. The display

has been specially designed with a view to obtaining long lifetime and sharp contrast in a wide temperature range. Furthermore, MULTICAL® 603 can be delivered in a variant with backlit display (type 603-F).

MULTICAL® 603 is powered by an internal D-cell lithium battery with a lifespan of up to 16 years or a 2xAA lithium packet with a lifespan of up to 9 years. Alternatively, the meter can be mains supplied, either by 24 VAC or 230 VAC. In designing MULTICAL® 603, great importance has been attached to flexibility through programmable functions and plug-in modules in order to secure optimum use in a wide range of applications. The meter has been configured from the factory and is ready for use. It can, however, be changed/reconfigured after installation via the front keys of the meter, READy or METERTOOL HCW.

Auto Detect enables the exchange of ULTRAFLOW® X4 on MULTICAL® 603 without the need for reconfiguration (change of the CCC code). MULTICAL® 603 can automatically adjust the pulse figure and q_p to match the connected ULTRAFLOW® X4 via Auto Detect. Auto Detect is active with CCC code 8xx and is initiated when the calculator top and base are separated and reassembled.

Mechanical construction



- | | |
|---|--|
| 1 Calculator top with front keys and laser engraving | 5 ... or a battery can be mounted |
| 2 PCB with microcontroller, display, etc. | 6 1 or 2 communication modules |
| 3 Verification cover [may only be opened at an authorised laboratory] | 7 Connection of temperature sensors and flow sensors |
| 4 Either a power supply module can be mounted... | 8 Calculator base |

Mechanical data

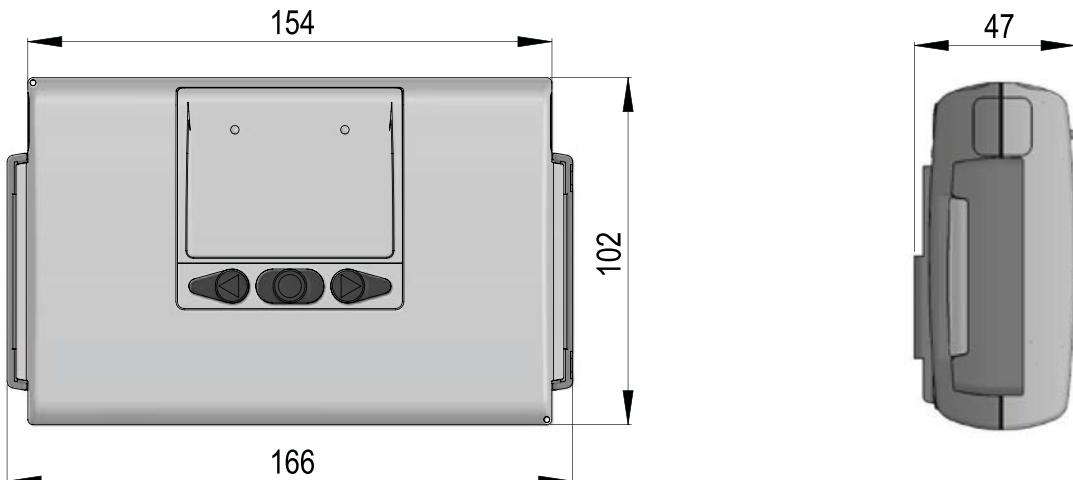
Environmental class	Complies with EN 1434 class A and C [MID class E1 and E2]
Ambient temperature	5...55 °C non-condensing, closed location [installation indoors]
Protection class	Calculator: IP65 according to EN/IEC 60529
Medium temperatures ULTRAFLOW®	2...130 °C At medium temperatures below ambient temperature or above 90 °C in the flow sensor, we recommend that the calculator is wall-mounted.
Medium in ULTRAFLOW®	Water [district heating water as described in CEN TR 16911 and AGFW FW510]
Storage temperature	-25...60 °C [drained flow sensor]
Connection cable	Ø3.5...6 mm
Supply cable	Ø5...8 mm

Materials

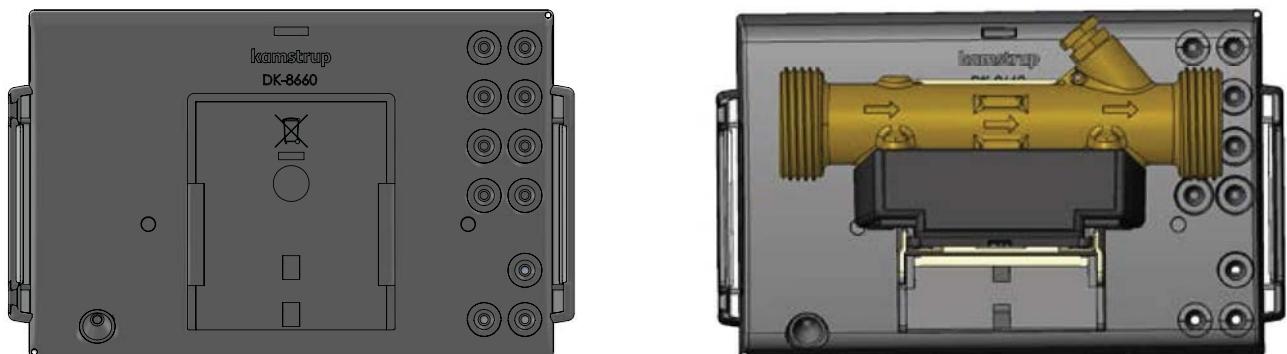
Calculator case	Thermoplastic, PC 10 % GF with TPE [thermoplastic elastomer]
- Top and base	ABS
- Verification cover	Silicone cable with inner Teflon insulation
Cables	

Dimensioned sketches

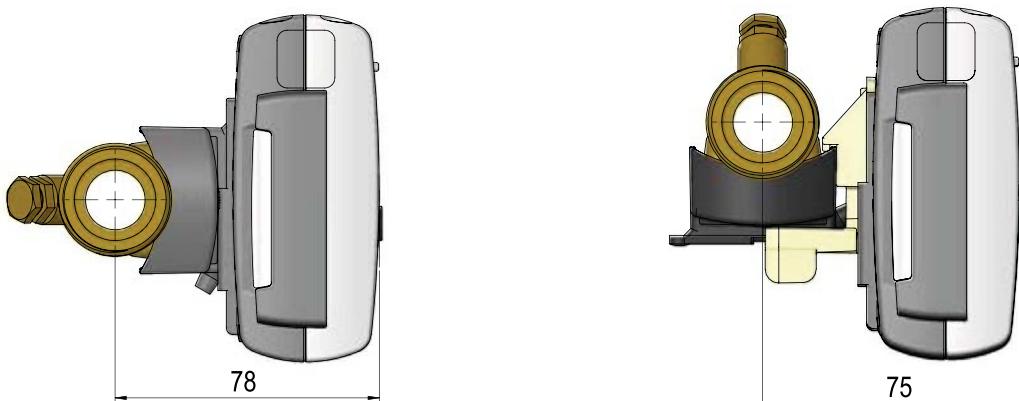
All measurements in [mm].



Mechanical measurements for MULTICAL® 603 calculator



Calculator base separate and mounted on ULTRAFLOW®



MULTICAL® 603 mounted on ULTRAFLOW® with G¾ threaded connection

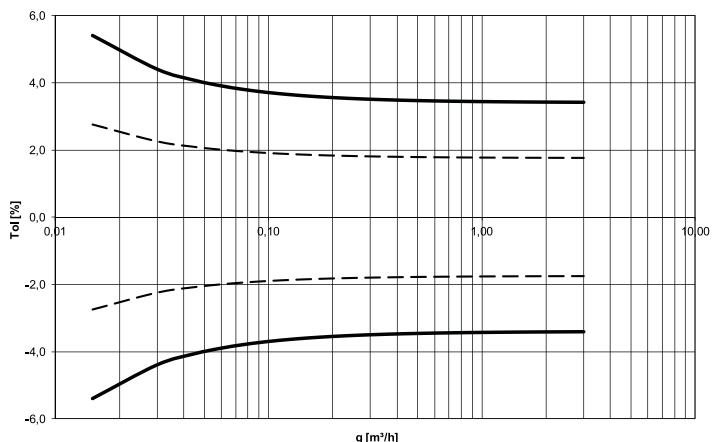
Measurement accuracy

Heat meter components	MPE according to EN 1434-1	Typical accuracy
MULTICAL® 603	$E_c = \pm [0.5 + \Delta\Theta \text{ min}/\Delta\Theta] \%$	$E_c = \pm [0.15 + 2/\Delta\Theta] \%$
Sensor pair	$E_t = \pm [0.5 + 3 \Delta\Theta \text{ min}/\Delta\Theta] \%$	$E_t = \pm [0.4 + 4/\Delta\Theta] \%$
ULTRAFLOW®	$E_f = \pm [2 + 0.02 q_p/q]$, but not above $\pm 5 \%$	$E_f = \pm [1 + 0.01 q_p/q] \%$

MULTICAL® 603 and ULTRAFLOW® $q_p 1.5 \text{ m}^3/\text{h}$ @ $\Delta\Theta 30\text{K}$

Total typical accuracy of MULTICAL® 603, sensor pair and ULTRAFLOW® compared to EN 1434-1.

— Ec+Et+Ef (EN) - - - Ec+Et+Ef (Typ)



Approved meter data

Approvals	DK-0200-MI004-0XX, heat meter according to MID 2014/32 EU and EN 1434:2015 TS 27.02 0XX, cooling meter according to DK-BEK 1178 and EN 1434:2015
EU directives	Measuring Instrument Directive, Low Voltage Directive, Electromagnetic Compatibility Directive, Radio Equipment Directive, RoHS directive
Heat meter approval	DK-0200-MI004-040
- Temperature range	θ : 2 °C...180 °C
- Differential area	$\Delta\Theta$: 3 K...178 K
Cooling meter and cooling/heat meter	TS 27.02 012
- Temperature range	θ : 2 °C...180 °C
- Differential area	$\Delta\Theta$: 3 K...178 K
Medium temperature, ULTRAFLOW®	θq : 2 °C...130 °C
Temperature sensor connection	Type 603-A Pt100 – EN 60751, 2-wire connection Type 603-B Pt100 – EN 60751, 4-wire connection Type 603-C/E/F Pt500 – EN 60751, 2-wire connection Type 603-D/G Pt500 – EN 60751, 4-wire connection
EN 1434 designation	Environmental class A and C
MID designation	Mechanical environment: Class M1 and M2 Electromagnetic environment: Class E1 and E2 Non-condensing environment, closed location (indoors), 5...55 °C

Electrical data

Calculator data

Typical accuracy	Calculator: $E_c \pm [0.15 + 2/\Delta\Theta] \%$ Sensor pair: $E_t \pm [0.4 + 4/\Delta\Theta] \%$
Display	LCD – 7 or 8 digits, digit height 8.2 mm
Resolutions	999,9999 - 9999,999 - 99999,99 - 999999,9 - 9999999 9999,9999 - 99999,999 - 999999,99 - 9999999,9 - 99999999
Energy units	MWh – kWh – GJ – Gcal
Data logger (EEPROM)	Programmable – all registers can be selected
- Logger contents	Programmable – from 1 minute to 1 year
- Logging interval	Programmable – standard: 20 years, 36 months, 460 days, 1400 hours (RR code = 10)
- Logging depth	
Info logger (EEPROM)	250 info codes (last 50 are shown in the display)
Clock/calender (with backup battery)	Clock, calendar, leap year compensation, target date
Daylight saving time/wintertime (DST)	Programmable
Time accuracy	This function can be disabled so that "technical normal time" is used
Without external adjustment: Less than 15 min./year	
With external adjustment every 48 hours: Less than 7 s from legal time	
Data communication	KMP protocol with CRC16 used for optical communication as well as for modules
Power in temperature sensors	< 10 µW RMS

Power supply

Battery

	3.65 VDC, D-cell lithium	3.65 VDC, 2xA cell lithium
Wall-mounted	16 years @ $t_{BAT} < 30^\circ\text{C}$	9 years @ $t_{BAT} < 30^\circ\text{C}$
Mounted on flow sensor	14 years @ $t_{BAT} < 40^\circ\text{C}$	7 years @ $t_{BAT} < 40^\circ\text{C}$

Note: Depends on the meter and module configuration

Mains supply

Insulation voltage	230 VAC +15/-30 %, 50/60 Hz
Power consumption	24 VAC ±50 %, 50/60 Hz
Backup supply	3.75 kV
EMC data	< 1 W

Electrical data

Temperature measurement	t1 Inlet	t2 Outlet	t3 Inlet	t4 Outlet	$\Delta\Theta$ [t1-t2] Heat measure- ment	$\Delta\Theta$ [t2-t1] Cooling measure- ment	t5 Preset for A1 and A2			
Measuring range 603-A, 2-wire, Pt100 603-B, 4-wire, Pt100 603-C/E/F, 2-wire, Pt500 603-D/G, 4-wire, Pt500	0.00...185.00 °C [t1 and t2: Approved for 2.00...180.00 °C]									
Offset adjustment	± 0.99 K joint zero point adjustment for t1, t2 and t3 Note: The offset adjustment is only active on measured temperatures. If, for example, t3 has been selected for a preset value, the offset adjustment will not influence the preset value.									
Max cable lengths (max ø6 mm cable)	Pt100, 2-wire		Pt100, 4-wire		Pt500, 2-wire		Pt500, 4-wire			
	2 x 0.25 mm ² : 2.5 m 2 x 0.50 mm ² : 5 m 2 x 1.00 mm ² : 10 m		4 x 0.25 mm ² : 100 m		2 x 0.25 mm ² : 10 m		4 x 0.25 mm ² : 100 m			
Flow measurement V1/V2	ULTRAFLOW® V1: 9-10-11 V2: 9-69-11	Reed contacts V1: 10-11 V2: 69-11	FET contacts V1: 10-11 V2: 69-11	24 V active pulses V1: 10B-11B						
CCC-code	1xx-2xx-4xx-5xx-8xx	0xx	9xx	2xx and 9xx						
EN 1434 pulse class	IC	IB	IB	(IA)						
Pulse input	680 kΩ pull-up to 3.6 V	680 kΩ pull-up to 3.6 V	680 kΩ pull-up to 3.6 V	12 mA at 24 V						
Pulse ON	< 0.4 V in > 0.5 ms	< 0.4 V in > 300 ms	< 0.4 V in > 30 ms	< 4 V in > 3 ms						
Pulse OFF	> 2.5 V in > 10 ms	> 2.5 V in > 100 ms	> 2.5 V in > 100 ms	> 12 V in > 10 ms						
Pulse frequency	< 128 Hz	< 1 Hz	< 8 Hz	< 128 Hz						
Integration frequency	< 1 Hz	< 1 Hz	< 1 Hz	< 1 Hz						
Electrical isolation	No	No	No	2 kV						
Max cable length	10 m	10 m	10 m	100 m						
Max cable length with Cable Extender Box, Type 66-99-036	30 m	30 m	30 m	-						
Pulse inputs In-A/In-B	Electronic switch			Reed-switch						
Pulse input	680 kΩ pull-up to 3.6 V			680 kΩ pull-up to 3.6 V						
Pulse ON	< 0.4 V in > 30 ms			< 0.4 V in > 500 ms						
Pulse OFF	> 2.5 V in > 30 ms			> 2.5 V in > 500 ms						
Pulse frequency	< 3 Hz			< 1 Hz						
Electrical isolation	No			No						
Max cable length	25 m			25 m						
Requirements to external contact	Leakage current at function open < 1 µA									
Pulse outputs Out-C/Out-D	Type HC-003-21		Type HC-003-11		Type HC-003-11					
Pulse output type	Before YYYY-MM-DD			After YYYY-MM-DD						
Type	Open collector (OB)			Opto FET						
External voltage	5...30 VDC			5...48 VDC/AC						
Current	1...10 mA			1...50 mA						
Residual stress	$U_{CE} \approx 1$ V at 10 mA			$R_{ON} \leq 40 \Omega$						
Electrical isolation	2 kV			2 kV						
Max cable length	25 m			25 m						

Product variants

The required product variant is selected via the meter's type number, whereas the meter configuration is selected via the meter's configuration number. Further configuration parameters can be selected at submission of order. The meter has been configured from the factory and is ready for use. It can, however, be changed/reconfigured after installation via the front keys of the meter, READy or METERTOOL HCW.

MULTICAL® 603 type number				Statistical data Written on the meter's front	Dynamic data Appearing from display							
				Type 603-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Calculator type												
Pt100 2-wire	t1-t2	V1	M-Bus		A							
Pt100 4-wire	t1-t2	V1	M-Bus		B							
Pt500 2-wire	t1-t2	V1	M-Bus		C							
Pt500 4-wire	t1-t2	V1	M-Bus		D							
Pt500 2-wire	t1-t2-t3	V1-V2			E							
Pt500 2-wire	t1-t2-t3	V1-V2	Backlit display		F							
Pt500 4-wire	t1-t2	V1 [24 V active pulses]	M-Bus		G							
Meter type												
Heat meter		MID module B				1						
Heat meter		MID module B+D				2						
Heat/cooling meter		MID module B+D & TS 27.02		$\Theta_{HC} = OFF$		3						
Heat meter		National approval				4						
Cooling meter		TS 27.02+BEK1178				5						
Heat/cooling meter		MID module B+D & TS 27.02		$\Theta_{HC} = ON$		6						
Volume meter						7						
Energy meter						9						
Country code												
Determined by Kamstrup upon receipt of order								XX				
Flow sensor connection type												
Delivered with one ULTRAFLOW®						1						
Delivered with two identical ULTRAFLOW®						2						
Prepared for one ULTRAFLOW®						7						
Prepared for two identical ULTRAFLOW®						8						
Prepared for flow sensor with fast and bounce-free electronic pulses						C						
Prepared for flow sensor with slow and bounce-free electronic pulses						J						
Prepared for flow sensor with slow pulses with bounce						L						
Prepared for flow sensor with 24 V active pulses						P						

Product variants

MULTICAL® 603 type number	Type 603-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-	<input type="checkbox"/>	Dynamic data Appearing from display							
Temperature sensor set														
No temperature sensors														00
PT500 temperature sensor pair														
Short direct sensor pair	27.5 mm		1.5 m											11
Short direct sensor pair	27.5 mm		3.0 m											12
Short direct pair [3 pairs]	27.5 mm		1.5 m											15
Short direct pair [3 pairs]	27.5 mm		3.0 m											16
Short direct sensor pair	38.0 mm		1.5 m											21
Short direct sensor pair	38.0 mm		3.0 m											22
Pocket sensor pair	Ø5.8 mm		1.5 m											31
Pocket sensor pair	Ø5.8 mm		3.0 m											32
Pocket sensor pair	Ø5.8 mm		5.0 m											33
Pocket sensor pair	Ø5.8 mm		10.0 m											34
Pocket sensor pair [3 pairs]	Ø5.8 mm		1.5 m											35
Pocket sensor pair [3 pairs]	Ø5.8 mm		3.0 m											36
Pocket sensor pair [3 pairs]	Ø5.8 mm		5.0 m											37
Pocket sensor pair [3 pairs]	Ø5.8 mm		10.0 m											38
Pt100 temperature sensor pair														
Short direct sensor pair	27.5 mm		2.0 m											J1
Short direct sensor pair	38.0 mm		2.0 m											J2
Supply														
No supply														0
Battery, 1 x D-cell														2
230 VAC high-power SMPS														3
24 VAC/VDC high-power SMPS														4
230 VAC power supply														7
24 VAC power supply														8
Battery, 2 x A-cells														9
Communication module (2 module slots)														
No module													00	00
Data + 2 pulse inputs (In-A, In-B)													10	10
Data + 2 pulse outputs (Out-C, Out-D) + pulse transmitter (V1+V2)													11	11
M-Bus, configurable + 2 pulse inputs (In-A, In-B)													20	20
M-Bus, configurable + 2 pulse outputs (Out-C, Out-D)													21	21
M-Bus, configurable with Thermal Disconnect													22	22
Wireless M-Bus, EU, configurable, 868 MHz + 2 pulse inputs (In-A, In-B)													30	30
Wireless M-Bus, EU, configurable, 868 MHz + 2 pulse outputs (Out-C, Out-D)													31	31
Analog output module 2x 0/4...20 mA													40	40
LON FT-X3 + 2 pulse inputs (In-A, In-B)													60	60
BACnet MS/TP (RS-485) + 2 pulse inputs (In-A, In-B)													66	66
Modbus RTU (RS-485) + 2 pulse inputs (In-A, In-B)													67	67

Meter configuration

The required product variant is selected via the meter's type number, whereas the meter configuration is selected via the meter's configuration number (shown below). The below overview shows the standard configurations. Contact Kamstrup A/S for information about further configuration possibilities.

	A	-	B	-	CCC	-	DDD	-	EE	-	FF	-	GG	-	L	-	M	-	N	-	PP	-	RR	-	T	-	VVVV
Flow sensor position																											
Inlet																											
Outlet																											
Measuring unit																											
GJ																											
kWh																											
MWh																											
Gcal																											
Auto Detect CCC codes (UF x4)																											
Normal resolution [7 digits]																											
High resolution [8 digits]																											
Static CCC codes																											
Reed contact [7 digits]																											
Electronic, fast pulses [7 digits]																											
Electronic, fast pulses [8 digits]																											
Kamstrup, UF X4 [7 digits]																											
Kamstrup, UF X4 [8 digits]																											
Electronic, slow pulses [7 digits]																											
Display																											
Heat meter [standard]																											
Heat/cooling meter [standard]																											
Cooling meter [standard]																											
Tariffs																											
No active tariff																											
Power tariff																											
Flow tariff																											
t1-t2 tariff																											
Inlet tariff																											
Outlet tariff																											
Time-controlled tariff																											
Heat/cooling volume tariff																											
PQ tariff																											
Pulse inputs In-A/In-B																											
10 m³/h, 10 l/imp, pre-counter 1 [standard]																											
Integration mode																											
Adaptive mode [2-64 s]																											
Normal mode [32 s]																											
Fast mode [8 s]																											
Mains mode [2 s]																											
Adaptive mode [2-64 s]																											
Normal mode [32 s]																											
Fast mode [8 s]																											
Mains mode [2 s]																											
Leakage limits (V1/V2)																											
OFF																											
1.0 % of q _p + 20 % of q																											
1.0 % of q _p + 10 % of q																											
0.5 % of q _p + 20 % of q																											
0.5 % of q _p + 10 % of q																											
Cold water leakage limits (In-A/In-B)																											
OFF																											
30 min. without pulses																											
One hour without pulses																											
Two hours without pulses																											

Meter configuration

	A - B - CCC - DDD - EE - FF - GG - L - M - N - PP - RR - T - VVV
Pulse outputs Out-C/Out-D	
Out-C: V1/1, Out-D: V2/1	3.9 ms
Out-C: V1/1	3.9 ms
Out-C: V1/4	22 ms
E1 and V1 or E3 and V1	10 ms
E1 and V1 or E3 and V1	32 ms
E1 and V1 or E3 and V1	100 ms [0.1 s]
Controlled output based on data commands	
	80
	82
	83
	94
	95
	96
	99
Data logger profile	
Standard data logger profile	10
Encryption level	
Common key	2
Individual key	3
Customer label	
Serial number	0000

Information code types in display

Display digit								Description
1	2	3	4	5	6	7	8	
Info	t1	t2	t3	V1	V2	In-A	In-B	
1								No voltage supply *
2								Low battery level
9								External alarm (e.g. via KMP)
	1							t1 Above measuring range or switched off
		1						t2 Above measuring range or switched off
			1					t3 Above measuring range or switched off
				2				t1 Below measuring range or short-circuited
					2			t2 Below measuring range or short-circuited
						2		t3 Below measuring range or short-circuited
				9	9			t1-t2 Invalid temperature difference
						1		V1 Communication error
							1	V2 Communication error
							2	V1 Wrong pulse figure
							2	V2 Wrong pulse figure
						3		V1 Air
							3	V2 Air
						4		V1 Wrong flow direction
							4	V2 Wrong flow direction
						6		V1 Increased flow [flow1 > q _s , for more than 1 hour]
							6	V2 Increased flow [flow2 > q _s , for more than 1 hour]
						7		V1/V2 Burst, water loss [flow1 > flow2]
							7	V1/V2 Burst, water penetration [flow1 < flow2]
						8		V1/V2 Leakage, water loss [M1 > M2]
							8	V1/V2 Leakage, water penetration [M1 < M2]
							7	In-A2 Leakage in the system
							8	In-A1 Leakage in the system
							9	In-A1/A2 External alarm
							7	In-B2 Leakage in the system **
							8	In-B1 Leakage in the system **
							9	In-B1/B2 External alarm

Note: Info codes are configurable. Therefore, it is not certain that all the parameters are available in a given MULTICAL® 603.

* This parameter of the info code does not appear from the current info code as it is only active when the meter is without supply.

** The info code for leakage at pulse input B must be actively selected.

Accessories

Article number Description

HC-993-02	Battery module with one D-cell
HC-993-03	230 VAC high-power supply module
HC-993-04	24 VAC/VDC high-power supply module
HC-993-07	230 VAC supply module
HC-993-08	24 VAC supply module
HC-993-09	Battery module with 2 A-cells
3026-207	Wall bracket
3026-858	Angle fitting ULTRAFLOW® (q_p 0.6...2.5)
6699-035	USB module configuration cable
6699-099	Infrared optical reading head w/USB plug
6699-724	METERTOOL HCW
6699-725	LogView HCW
6699-810	Holder for optical readout head for MULTICAL® 302/403/603

Calibration units

Article number Description

6699-xxx	2-wire Pt100, Heat/Cooling (used with METERTOOL HCW)
6699-xxx	2-wire Pt500, Heat/Cooling (used with METERTOOL HCW)
6699-xxx	4-wire Pt100, Heat/Cooling (used with METERTOOL HCW)
6699-xxx	4-wire Pt500, Heat/Cooling (used with METERTOOL HCW)

Sensor nipples and pockets

Article number Description

6556-491	R½ nipple for Pt500 short direct sensor
6556-492	R¾ nipple for Pt500 short direct sensor
6557-324	R½ x 65 mm sensor pocket, ø5.8 mm
6557-327	R½ x 90 mm sensor pocket, ø5.8 mm
6557-314	R½ x 140 mm sensor pocket, ø5.8 mm
6561-330	11 mm adapter for 38 mm short direct sensor

Ball valves

Article number Description

6556-474	½" ball valve with M10 connection for short direct temperature sensor with flat gasket
6556-475	¾" ball valve with M10 connection for short direct temperature sensor with flat gasket
6556-476	1" ball valve with M10 connection for short direct temperature sensor with flat gasket
6556-526	1¼" ball valve with M10 connection for short direct temperature sensor with flat gasket
6556-527	1½" ball valve with M10 connection for short direct temperature sensor with flat gasket

Contact Kamstrup A/S for information about further accessories.

Kamstrup A/S

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Data sheet

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TemperatureSensor 63**2-wire temperature sensors for use
with heat and cooling meters**

- Delivered as a set of two paired temperature sensors
- Easy installation and exchange
- Quick response to temperature changes
- High water resistance (IP68)
- Support of temperature offset adjustment



MID 2014/32/EU

M22 0200

EN 1434

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EN 1434

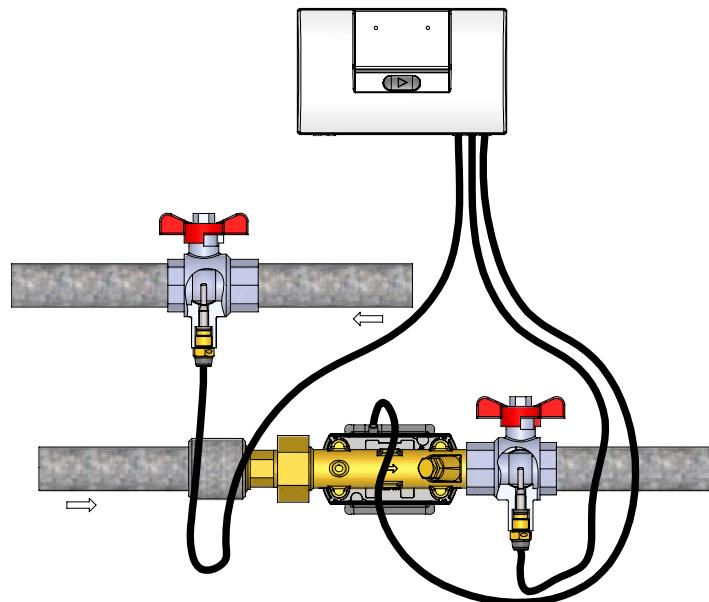
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Application

Kamstrup TemperatureSensor 63 consists of two paired temperature sensors and is used together with electronic energy meters for measuring the inlet and outlet temperatures. The temperature sensors have built-in platinum resistors of which the electric resistance changes according to the temperature. A measurement of the resistance value thus provides an analogue expression of the temperature.

Kamstrup TemperatureSensor 63 has a very broad selection of temperature sensor types and thus fits most heat or cooling installations. Kamstrup TemperatureSensor 63 is approved for IP68 and is thus especially suited to be used for both heat and cooling measurements.



Approval and verification

MID approval DK-0200-MI004-046

Temperature range $0: 2 \dots 150 \text{ }^{\circ}\text{C}$
Temperature difference $\Delta\Theta: 3 \dots 140 \text{ K}$

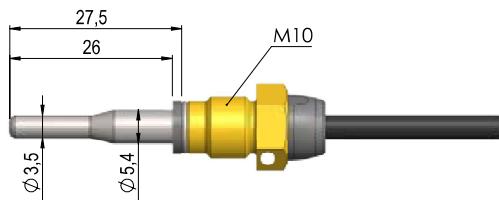
Danish cooling approval TS 27.02 017

Temperature range $0: 2 \dots 150 \text{ }^{\circ}\text{C}$
Temperature difference $\Delta\Theta: 3 \dots 140 \text{ K}$

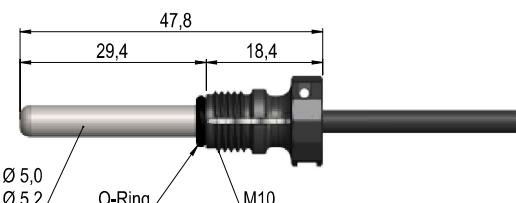
Pairing and verification according to EN1434-5:2015.

Temperature sensors

Direct short temperature sensor

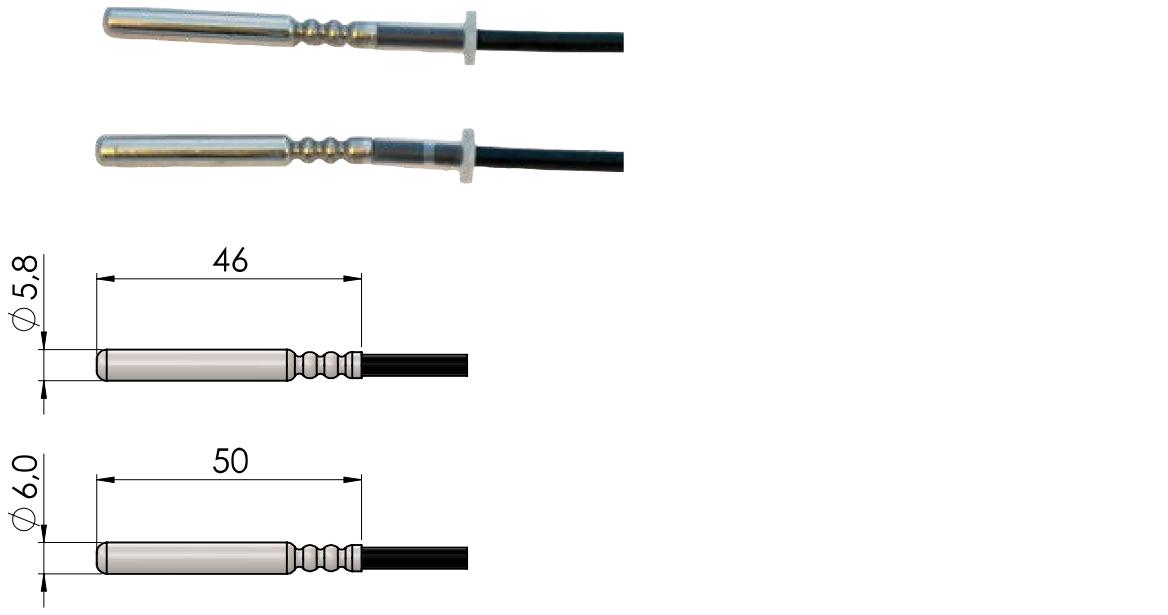


ø5.0 mm / ø5.2 mm temperature sensors



Temperature sensors

ø5.8 mm / ø6.0 mm temperature sensors



Technical data

	Direct short temperature sensor	ø5.0 mm temperature sensor/ ø5.2 mm temperature sensor	ø5.8 mm temperature sensor/ ø6.0 mm temperature sensor
Component		Pt500 according to EN60751	
Time constant $\tau_{0.5}$	2 s	3 s	4 s
Minimum submersion depth	15 mm	17 mm	18 mm
Sensor pipe material		AISI 316L W-no. 1.4404	
Silicone cable		2 x 0.22 mm ²	
Cable lengths	1.5 m, 3 m		1.5 m, 3 m, 5 m, 10 m

Identification of diameter of pocket sensors

$\varnothing 5.8\text{ mm}$



$\varnothing 6.0\text{ mm}$

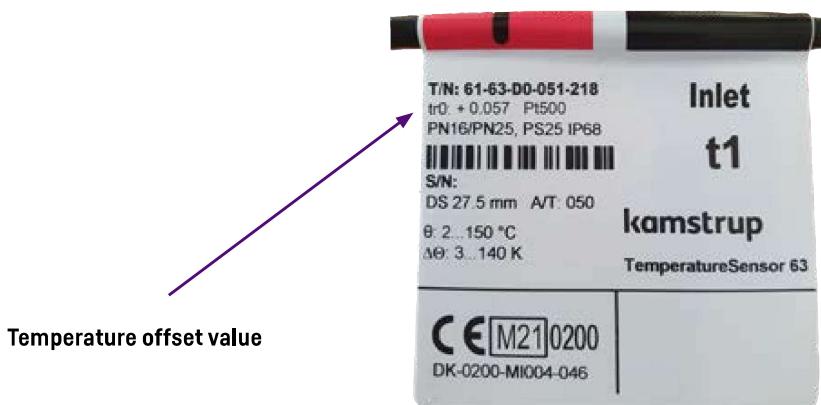


Temperature sensor application area

Ambient temperature	-10 °C...70 °C
Storage and transport temperatures	-25 °C...70 °C
Medium	District heating water
Medium temperature	0...150 °C, for a short period 160 °C
Humidity	< 98 % rF condensing
IP class	IP 68
Approved mechanical classes	M1, M2
Approved pressure stages for direct short temperature sensor	PN16, PN25, PS25
Approved pressure stages for direct short ø5.0 mm/ø5.2 mm temperature sensor with composite union nut	PN16, PN25, PS25

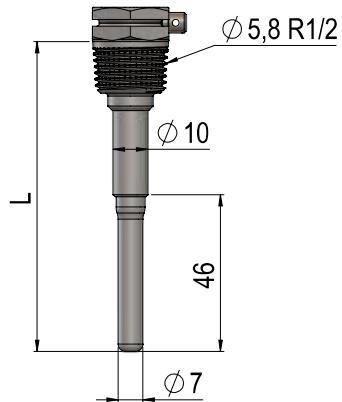
Optimise the accuracy of inlet and outlet temperatures through offset adjustment

The heat/cooling meters MULTICAL® 303, MULTICAL® 403, MULTICAL® 603 and MULTICAL® 803 have an offset adjustment function that enables the adjustment of the inlet and outlet temperatures by up to ± 0.99 K. The offset adjustment value is determined in connection with the factory calibration of Kamstrup TemperatureSensor 63, and when this value is embedded in the meter, the deviation of the inlet and outlet temperatures will typically be less than ± 0.1 K. As both the inlet and outlet temperatures are adjusted with the same value, the offset adjustment does not influence the calculation of the consumed energy.





Pockets for ø5.8 mm temperature sensors

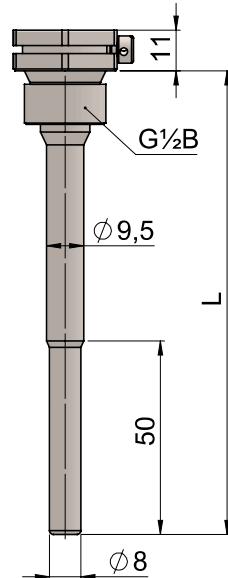


Technical data

Installation lengths	65 mm, 90 mm, 140 mm
Thread	Conical thread R½
Material	AISI 304 / W.-no. 1.4301
Time constant $\tau_{0.5}$	Max 8 s
Type number in approval	65 mm pocket: 6557-340 90 mm pocket: 6557-341 140 mm pocket: 6557-342
Pressure stage	PN16/PN25, PS25
Maximum flow velocity	3 m/s
Maximum application temperature	150 °C
Approved mechanical classes	M1, M2



Pockets for ø5.8 mm / ø6.0 mm temperature sensors



Technical data

Installation lengths L	65 mm, 85 mm, 120 mm, 210 mm
Thread	Straight thread G½B
Gasket	Copper gasket [included in bag with 2 pockets]
Material	AISI 316L / W.-no. 1.4404
Time constant $\tau_{0.5}$	Max 10 s with ø6.0 mm temperature sensor Max 14 s med ø5.8 mm temperature sensor
Type number in approval	65 mm pocket: 6557-355 85 mm pocket: 6557-343 120 mm pocket: 6557-344 210 mm pocket: 6557-345
Pressure stage	PN16/PN25, PS25
Maximum flow velocity	3 m/s
Maximum application temperature	150 °C
Approved mechanical classes	M1, M2



Reinforced pockets for ø5.8 mm / ø6.0 mm temperature sensors



Technical data

Installation lengths	120 mm, 210 mm
Thread	Conical thread R½ or straight thread G½B
Gasket for pockets with straight threads G½B	Copper gasket (included in bag with 2 pockets)
Material	AISI 316L / W.-No. 1.4404
Time constant $\tau_{0.5}$	Max 12 s with ø6.0 mm temperature sensor Max 16 s med ø5.8 mm temperature sensor
Type number in approval	120 mm pockets with R½ thread: 6557-350 210 mm pockets with R½ thread: 6557-351 120 mm pockets with G½B thread: 6557-352 210 mm pockets with G½B thread: 6557-353
Pressure stage	PN16/PN25/PN40, PS40
Maximum flow velocity	10 m/s
Maximum application temperature	180 °C
Approved mechanical classes	M1, M2

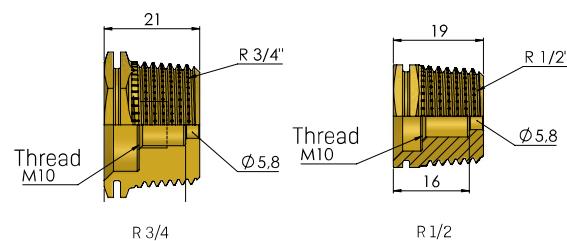
Accessories

Nipples

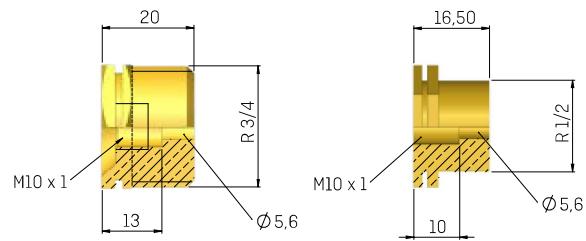
Technical data

Connection	R $\frac{1}{2}$ or R $\frac{3}{4}$
Material	MS 58 Bb
Nipples may be used in both PN16 and PN25 installations.	

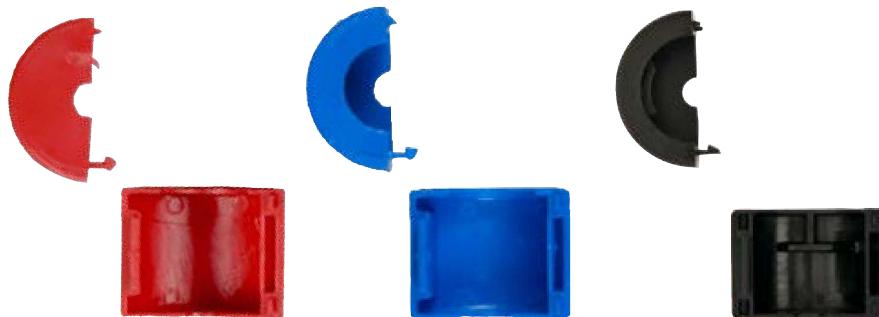
Nipples with increased submersion depth



Nipples suited for use with sealing caps



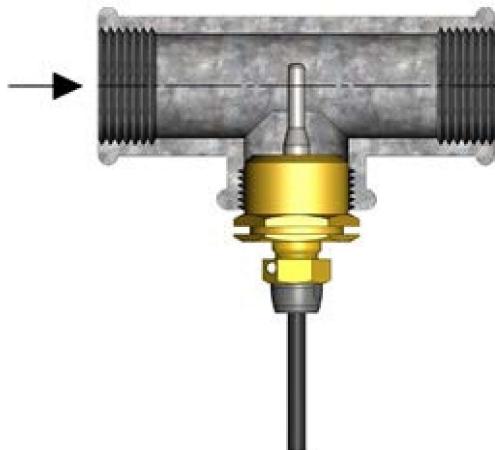
Sealing caps



Mounting examples

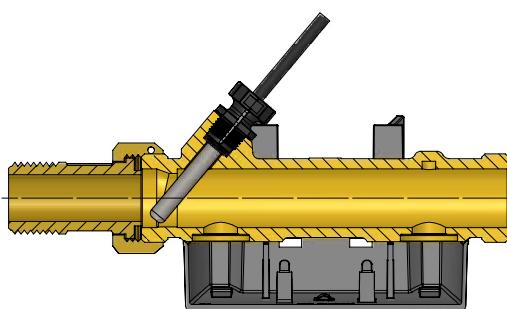
Example 1

Direct short temperature sensor mounted in T-piece using a nipple



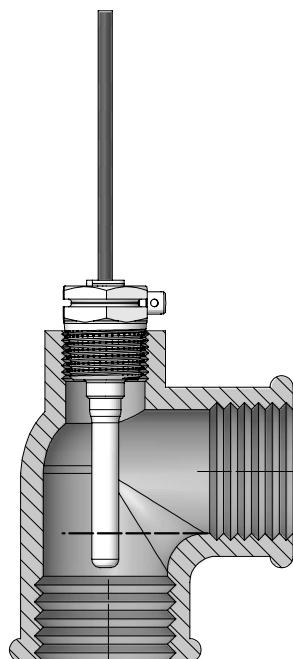
Example 2

$\varnothing 5.2$ mm temperature sensor mounted in MULTICAL® 303

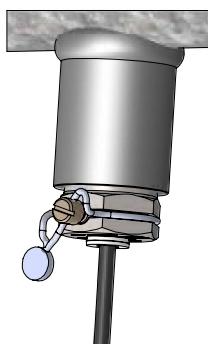
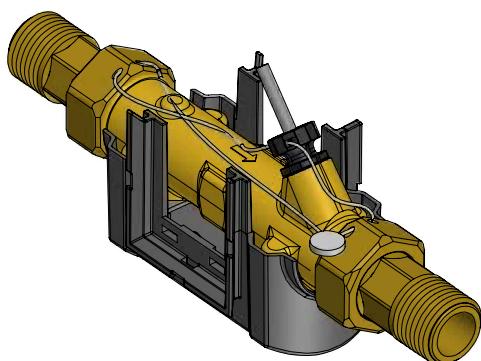
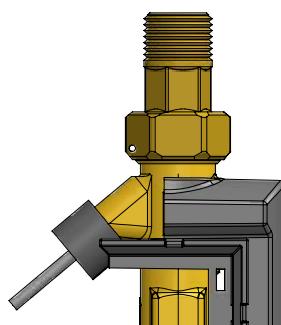
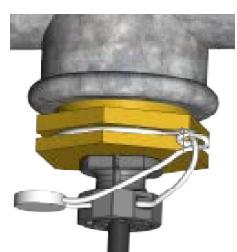
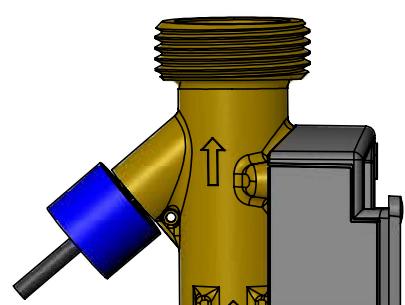
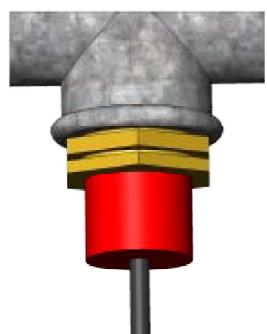
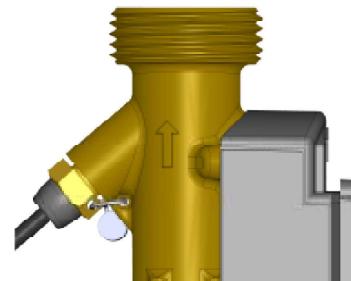
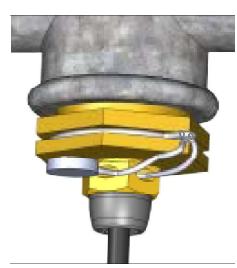


Example 3

$\varnothing 5.8$ mm pocket sensor mounted in 90 degree angle using pocket, type number 6557-340



Sealing examples



Ordering

Temperature sensor set

Order no.*	Description
61-63-D0-051-XXX	Pt500 direct short temperature sensor set [2 pcs] with 1.5 m cable
61-63-D0-052-XXX	Pt500 direct short temperature sensor set [2 pcs] with 3 m cable
61-63-D0-061-XXX	Pt500 Ø5.0 mm direct short temperature sensor set [2 pcs] with 1.5 m cable
61-63-D0-062-XXX	Pt500 Ø5.0 mm direct short temperature sensor set [2 pcs] with 3 m cable
61-63-D0-071-XXX	Pt500 Ø5.2 mm direct short temperature sensor set [2 pcs] with 1.5 m cable
61-63-D0-072-XXX	Pt500 Ø5.2 mm direct short temperature sensor set [2 pcs] with 3 m cable
61-63-D0-073-XXX	Pt500 Ø5.2 mm direct short temperature sensor set [2 pcs] with 5 m cable
61-63-D0-081-XXX	Pt500 Ø5.8 mm pocket sensor set [2 pcs] with 1.5 m cable
61-63-D0-082-XXX	Pt500 Ø5.8 mm pocket sensor set [2 pcs] with 3 m cable
61-63-D0-083-XXX	Pt500 Ø5.8 mm pocket sensor set [2 pcs] with 5 m cable
61-63-D0-084-XXX	Pt500 Ø5.8 mm pocket sensor set [2 pcs] with 10 m cable
61-63-D0-091-XXX	Pt500 Ø6.0 mm pocket sensor set [2 pcs] with 1.5 m cable
61-63-D0-092-XXX	Pt500 Ø6.0 mm pocket sensor set [2 pcs] with 3 m cable
61-63-D0-093-XXX	Pt500 Ø6.0 mm pocket sensor set [2 pcs] with 5 m cable
61-63-D0-094-XXX	Pt500 Ø6.0 mm pocket sensor set [2 pcs] with 10 m cable

* The order number may vary due to local approvals

Ordering

Pockets for pocket sensors

Order number	Description
6557-440	Bag with 2 pcs of ø5.8 mm pockets with R½ thread, length 65 mm
6557-441	Bag with 2 pcs of ø5.8 mm pockets with R½ thread, length 90 mm
6557-442	Bag with 2 pcs of ø5.8 mm pockets with R½ thread, length 140 mm
6557-455	Bag with 2 pcs of ø5.8 mm/ø6.0 mm pockets with G½B thread, length 65 mm
6557-443	Bag with 2 pcs of ø5.8 mm/ø6.0 mm pockets with G½B thread, length 85 mm
6557-444	Bag with 2 pcs of ø5.8 mm/ø6.0 mm pockets with G½B thread, length 120 mm
6557-445	Bag with 2 pcs of ø5.8 mm/ø6.0 mm pockets with G½B thread, length 210 mm
6557-450	Bag with 2 pcs of ø5.8 mm/ø6.0 mm reinforced pockets with R½ thread, length 120 mm
6557-451	Bag with 2 pcs of ø5.8 mm/ø6.0 mm reinforced pockets with R½ thread, length 210 mm
6557-452	Bag with 2 pcs of ø5.8 mm/ø6.0 mm reinforced pockets with G½B thread, length 120 mm
6557-453	Bag with 2 pcs of ø5.8 mm/ø6.0 mm reinforced pockets with G½B thread, length 210 mm

Ordering

Accessories

Order number	Description
6556-546	R½ distance nipple for direct short temperature sensor, increased submersion depth
6556-547	R¾ distance nipple for direct short temperature sensor, increased submersion depth
6556-492	R¾ distance nipple for direct short temperature sensor, suited for use with sealing cap
6556-491	R¾ distance nipple for direct short temperature sensor, suited for use with sealing cap
2210-233	Fibre gasket for direct short temperature sensor
3026-517	Sealing cap, red, for direct short temperature sensor
3026-518	Sealing cap, blue, for direct short temperature sensor
3026-1034	Sealing cap, black, for ø5.0 mm / ø5.2 mm direct temperature sensors

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User Manual



ELECTROMAGNETIC FLOW METER

VIR Series Data Sheet

The documentation is only complete when used in combination with the relevant documentation for the signal converter.

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1. GENERAL INFORMATION

This manual will assist you in installing, using and maintaining Electromagnetic Flow meter. It is your responsibility to make sure that all operators have access to adequate instructions about safe operating and maintenance procedure.



For your safety, review the major warnings and cautions below before operating your equipment.

- Use only fluids that are compatible with the housing material and wetted components of your Electromagnetic Flow Meter.
- When handling hazardous liquids, always exercise appropriate safety precautions.
- When measuring flammable liquids, observe precautions against fire or explosion.
- When working in hazardous environments, always exercise appropriate safety precautions.
- Handle the sensor carefully. Even small scratches or nicks can affect the accuracy.
- For best results, calibrate the meter at least once a year.
- Do not purge the flow meter with compressed air.
- During removal of Electromagnetic flow meter liquid may spill over. Please follow manufacturer's safety precautions for clean up

1.1 Product Description

Electrocmagnetic flow meters are intended for fluid measurement in most industries including water, wastewater, food and beverage, pharmaceutical and chemical.

There are two basic components of Virtec electromagnetic flow meter: 1) The Detector, which includes the flow tube, isolating liner and measuring electrodes. 2) The Converter, which is the electronic device responsible for signal processing, flow calculation, display and output signals

The materials of construction of the wetted parts (liner and electrodes) should be appropriate fo the specifications on the intended type of service. Review of the compatibilities consistent with the specifications is recommended.

Cur's electromagnetic flow meters are factory tested and calibrated. A calibration certificate is included in the shipment of each meter.

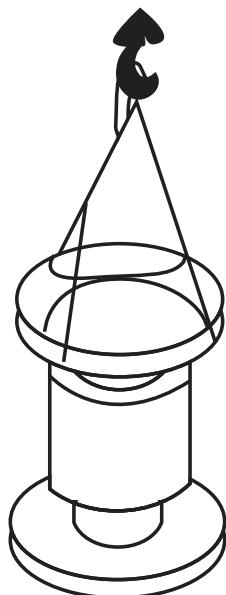
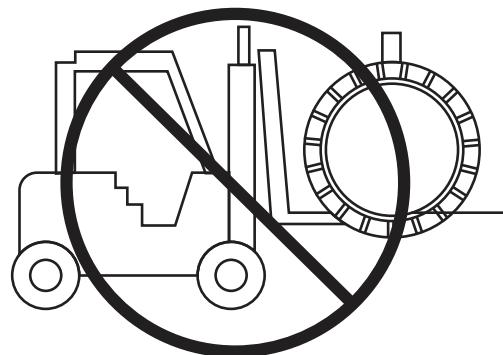
1.2 Unpacking and Inspection

Upon receipt, examine your meter for visible damage. The meter is a precision measuring instrument and to be handled carefully. Remove the protective plugs and caps for a thorough inspection. If any items are damaged or missing, contact us immediately.

Make sure the flow meter model meets your specific needs. For your future reference, it might be useful to record this information on nameplate in the manual in case it becomes unreadable on the meter.

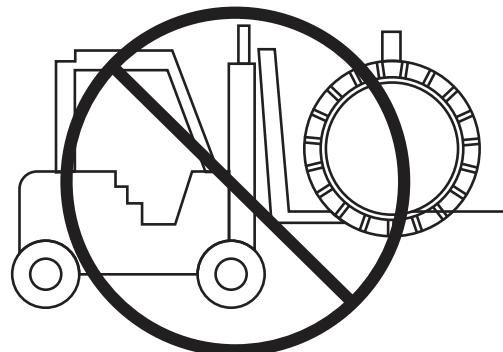
Transportation and Handling

Do not lift the detector from the Converter housing, the junction box or the connecting cable. Use lifting lugs for larger sizes is recommended. Very large meter sizes are packed and crated with the meter laying on its side for shipping safety and stability reasons. In order to lift the meter in vertical position, it's recommended to use a sling rigged method as shown below.



Warning: NEVER introduce the forklift, chains, wire slings or any other sharp object inside the flow tube for lifting or handling purpose. This could permanently damage the isolating liner and could render the meter inoperative.

If using a forklift, do not lift the detector from its body between the flanges. The housing could be accidentally dented and permanent damage could be caused to the internal coil assemblies.



2. TECHNICAL DATA

Measuring System

Measuring Principle	Faraday's Law
Application range	Application range
Measured Value	
Primary measured value	Flow velocity
Secondary measured value	Volume flow

Design

Features	Fully welded maintenance-free sensor
	Flange version with full bore flow tube
	Standard as well as higher pressure ratings
	Large diameter range from DN25 to DN 3000 with rugged liners approved for drinking water
	Industry specific insertion lengths
Modular Construction	The measurement system consists of a flow sensor and a signal converter. It is available as compact and as remote version.
Compact Version	With 511B converter: 110–240V AC Power
	With 521B converter: 18–36V DC Power
	With W800L/W800W: Battery Power
Remote Version	In wall mount version with 211B converter (110–240V AC) or 221B converter (18–36V DC)
	With W800F converter: Battery Power
Measurement Range	0.3...+10 m/s

Measuring System

Reference Conditions	Flow conditions similar to EN 29104
	Medium: Water
	Electrical conductivity: $\geq 20 \mu\text{s}/\text{cm}$
	Temperature: +10...+50°C (+50°F... +120°F)
	Inlet section: $\geq 5\text{DN}$
	Operating pressure: Min 1 bar(14.5 psig)
Flow Meter Accuracy	Standard: $\pm 0.5\%$ of rate
	Optional: $\pm 0.2\%$ of rate

Operating Conditions

Temperature	
Process Temperature	Hard rubber liner: -5°C...+60°C or 90°C
	Polypropylene liner: -5°C..+90°C
	PTFE liner: -5°C...+120°C; PFA: 180°C
Ambient Temperature (all versions)	Standard (with aluminum converter housing)
	-20°C...+60°C (Protect electronics against self-heating with ambient temperatures above 55
Storage Temperature	-20°C...+70°C
Pressure	
EN 1092-1	DN2200...DN3000: PN2.5
	DN1200...DN2000: PN 6
	DN200...DN1000: PN10
	DN65...DN150: PN 16
	DN10...DN50: PN 40
	Other pressures on request
Pressure Drop	Negligible

Fluid	
Physical condition	Conductive liquids
Electrical conductivity	220µs/cm
Permissible gas content (volume)	≤5%
Permissible solid content (volume)	≤ 30%

Installation Conditions

Installation	Take care that flow sensor is always fully filled
	For detailed information see chapter "Cautions for Installation"
Flow Direction	Forward and reverse
	Arrow on flow sensor indicates positive flow direction
Inlet Run	5 DN
Outlet Run	2 DN

Installation Conditions

Sensor Housing	Sheet steel, Polyurethane coated Other materials on request
Measuring Tube	Austenitic stainless steel
Flanges	Carbon steel; Polyurethane coated Other materials on request
Liner	Standard DN10 to DN40: PTFE DN50 to DN300: PTFE or Hard Rubber DN300 to DN2200 Hard Rubber or PTFE Option
Connection Box (only remote versions)	Standard: Polyurethane coated die-cast aluminum
Measuring Electrodes	Standard: Stainless steel 316L Option: Hastelloy C, Titanium, Tantalum Other materials on request
Grounding Rings	Standard: Stainless steel
Grounding Electrodes (option)	Same material as measuring electrodes

Installation Conditions

Flange	
EN 1092-1	DN40 to DN300 IN PN6...40
	Other sizes or pressure ratings on request

Materials

Model	Diameter		Flow Rate (m³/h)		
			V=0.3m/s	V=6m/s	V=10m/s
"Type No."	(mm)	(Inch)	(Min)	(Calibrated)	(Max)
65-EM-1-VIR-800	6	1/4"	0.0306	0.611	1.018
65-EM-2-VIR-800	10	3/8"	0.0849	1.696	2.827
65-EM-3-VIR-800	15	1/2"	0.1909	3.817	6.362
65-EM-4-VIR-800	20	3/4"	0.3393	6.786	11.31
65-EM-5-VIR-800	25	1"	0.5301	10.60	17.67
65-EM-6-VIR-800	32	1-1/4"	0.8686	17.37	28.95
65-EM-7-VIR-800	40	1-1/2"	1.357	27.14	45.24
65-EM-8-VIR-800	50	2"	2.121	42.14	70.69
65-EM-9-VIR-800	65	2-1/2"	3.584	71.68	119.5
65-EM-10-VIR-800	80	3"	5.429	108.6	181.0
65-EM-11-VIR-800	100	4"	8.482	169.6	282.7
65-EM-VIR-800	125	5"	13.25	265.1	441.8
65-EM-A-VIR-800	150	6"	19.09	381.7	636.2
65-EM-8-VIR-800	200	8"	33.93	678.6	1131
65-EM-C-VIR-800	250	10"	53.01	1060	1767
65-EM-D-VIR-800	300	12"	76.34	1527	2545
65-EM-E-VIR-800	350	14"	103.9	2078	3465
65-EM-F-VIR-800	400	16"	135.7	2714	4524
65-EM-G-VIR-800	450	18"	171.8	3435	5726
65-EM-H-VIR-800	500	20"	212.1	4241	7069
65-EM-I-VIR-800	600	24"	305.4	6107	10179
65-EM-J-VIR-800	700	28"	415.6	8310	13850
65-EM-K-VIR-800	800	32"	542.9	10860	18100
65-EM-L-VIR-800	900	36"	662.8	13740	22900
65-EM-M-VIR-800	1000	40"	848.2	16962	28270

3. MODEL AND SELECTION

3.1 Flange Type

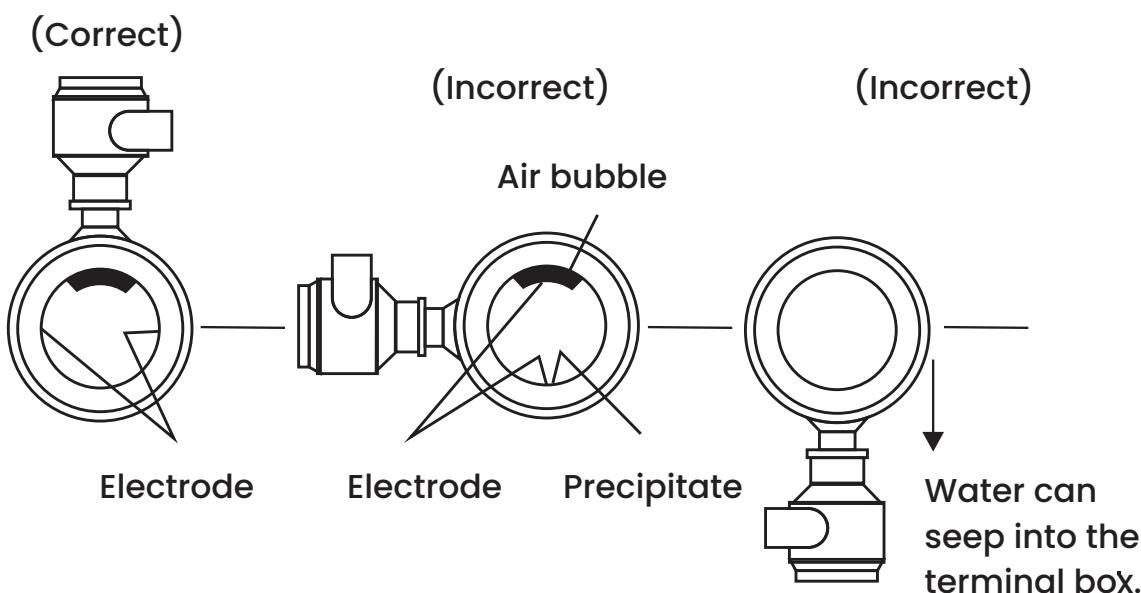


VIR Series

4. CAUTIONS FOR INSTALLATION

4.1 Mounting Orientation

- If the electrodes are vertical to the ground, air bubbles near the top or precipitates at the bottom may cause measurement error. Ensure that the terminal box is mounted above the piping to prevent water from entering them.



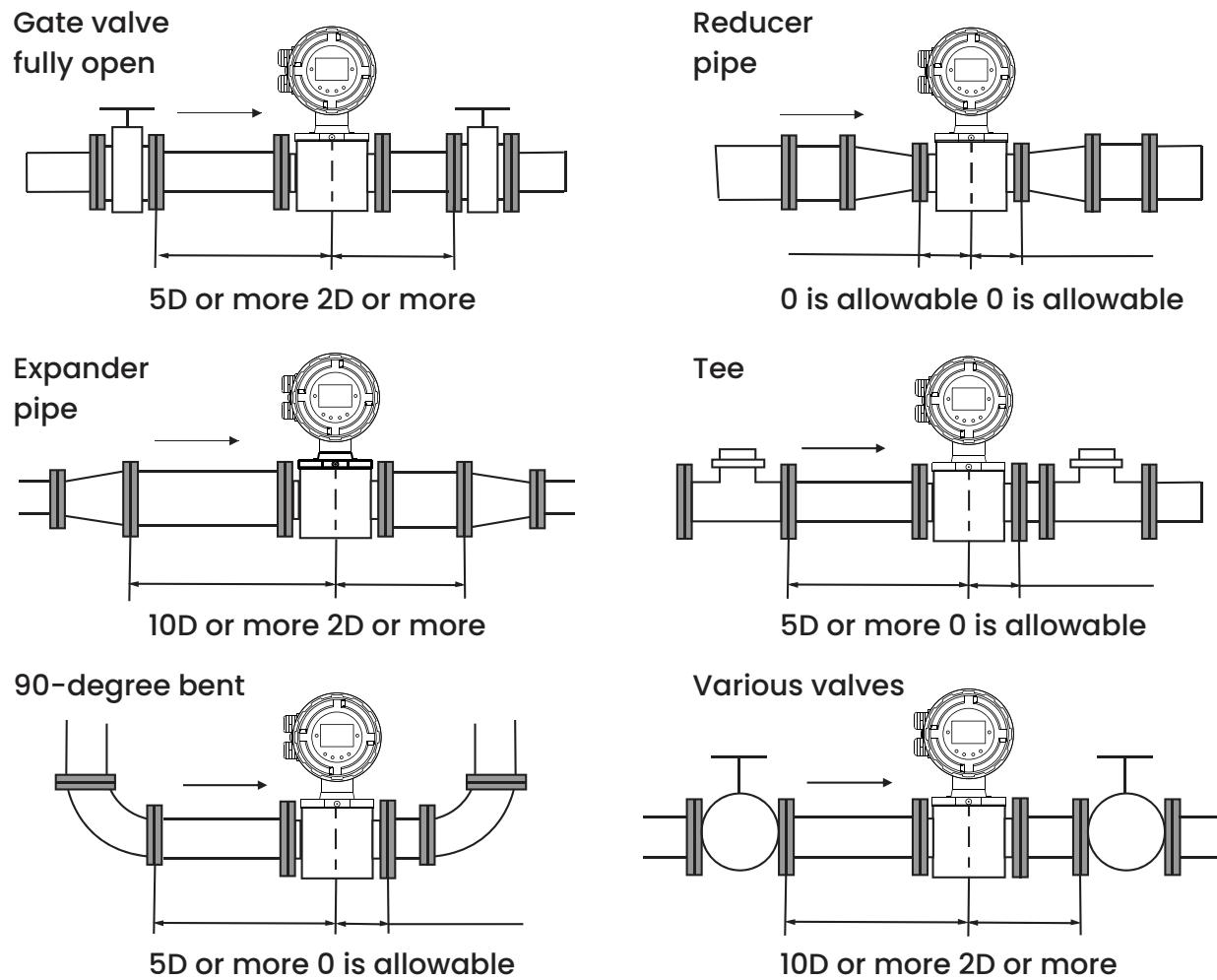
- Avoid all pipe locations where the flow is pulsating, such as in the outlet side of piston or diaphragm pumps.
- Avoid locations near equipment producing electrical interference such as electric motors, transformers, variable frequency, etc.
- Install the meter with enough room for future access for maintenance purposes.
- The magnetic meter isolating liner, whether it is PTFE or Rubber, is not intended to be used as gasket material. Standard gaskets (not provided) should be installed to ensure a proper hydraulic seal. When installing the gaskets, make sure they are properly centered to avoid flow restriction or turbulence. Do not use graphite or any electrically conductive sealing compound to hold the gaskets in place during installation. This could affect the reading accuracy of the measuring signal.



Warning: Precaution for direct sunshine and rain when the meter is installed outside.

4.2 Required Lengths Of Straight Runs

For optimum accuracy performance, it is required to provide sufficient inlet and outlet straight pipe runs. An equivalent to 3D of straight pipe is required on the inlet side, and 2D on the outlet side. There are no special requirements for standard concentric pipe reducers. See diagram1 for required straight runs when there is altering device.



Special Notice

When the meter contains removable coverplates, leave the coverplate installed unless accessory mx 3.17 cm pecify removal. Don't remove the coverplates when the meter is powered, or al shock and explosion hazard can be caused.

4.3 Grounding

In this section the term "grounding" will be defined as: the arrangement of process wetted materials (piping, ground rings, ground electrodes), cabling (ground straps, ground wires), and connections to stable references (often, but not always earth ground) required to achieve satisfactory operation of a magnetic flowmeter. As such, it applies to the instrumentation aspect of grounding, rather than to "safety grounding".

Proper installation and grounding of magnetic flowmeter is important for accurate, reliable measurement performance. Stray AC or DC currents through the fluid or instrument can produce noise signals that may in turn interfere with the relatively low flow signals generated in today's modern pulsed DC magmeter.

Manufacturers provide a variety of elements (ground straps, ground electrodes, ground rings and directions for the standard grounding of the magmeter.

Applications exist in which the user can not or should not make use of the traditional grounding connection to adjacent piping or to earth ground. These flow measurement applications are frequently encountered in electrolytic processes. In this case, the fluid passing through the magmeter flow tube may be at a potential significantly higher or lower than earth ground, and a connection to earth ground may be detrimental to the performance and even the reliability of the magmeter. These applications are typically compounded by the use of non-conductive or lined pipe and may feature acid or caustic flows which may necessitate the use of expensive wetted electrodes and grounding materials such as titanium, platinum, or tantalum.

4.4 Connections

Use a gasket between the meter flange and mating flange. Determine the material of the gasket based on the operating conditions and type of fluid.

Note: *Do not over tighten the flange bolts. This may cause the gasket to be compressed into the flow stream and may decrease the accuracy of the meter.*

4.5 VIR-800 Series Dimension Details

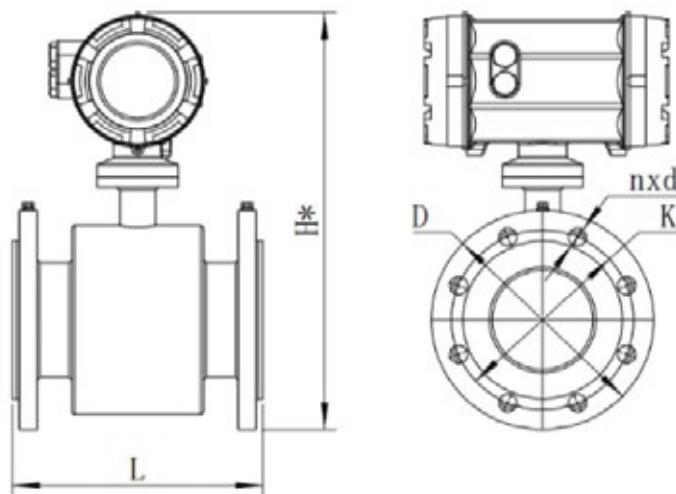


Table 1 : Dimensions (DIN PN16, Unit: mm)

DIA (mm)	L (mm)	D (mm)	K (mm)	H (mm)	H* (mm)	n*d (mm)
10	200	90	60	300	215	4*Φ14
15	200	95	65	310	225	4*Φ14
20	200	105	75	315	230	4*Φ14
25	200	115	85	325	240	4*Φ14
32	200	140	100	340	255	4*Φ18
40	200	150	110	345	260	4*Φ18
50	200	165	125	365	275	4*Φ18
65	200	185	145	375	290	8*Φ18
80	200	200	160	390	305	8*Φ18
100	250	220	180	410	325	8*Φ18
125	250	250	210	440	355	8*Φ18
150	300	285	240	465	380	8*Φ22
200	350	340	295	525	440	12 *Φ22
250	450	405	355	590	505	12 *Φ26
300	500	460	410	635	550	12 *Φ26
350	550	520	470	690	605	16 *Φ26
400	600	580	525	750	670	16 *Φ30
450	600	640	585	800	715	20*Φ30
500	600	715	650	865	780	20*Φ33
600	600	840	770	980	895	20*Φ36
700	700	910	840	1065	980	24*Φ36
800	800	1025	950	1175	1090	24*Φ39
900	900	1125	1050	1275	1190	28*Φ39
1000	1000	1255	1170	1390	1305	28*Φ42

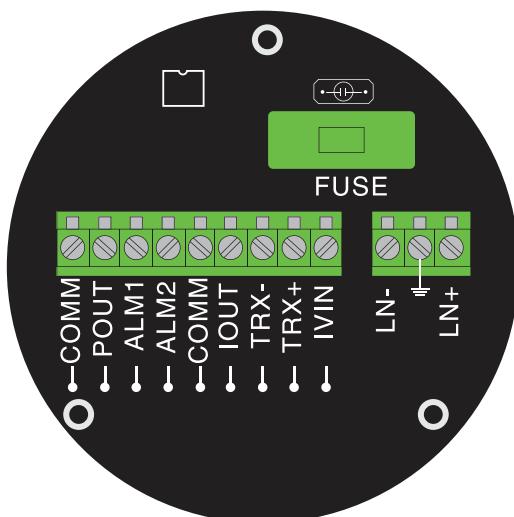
5. ELECTRICAL WIRING



Warning: Electrical Hazard Disconnect power before beginning electrical wiring.

5.1 Terminal Configuration Diagram

5.1.1 Compact Converter (110-240V AC; 18-24V DC)



Dimension Detail Tterminal Configuration

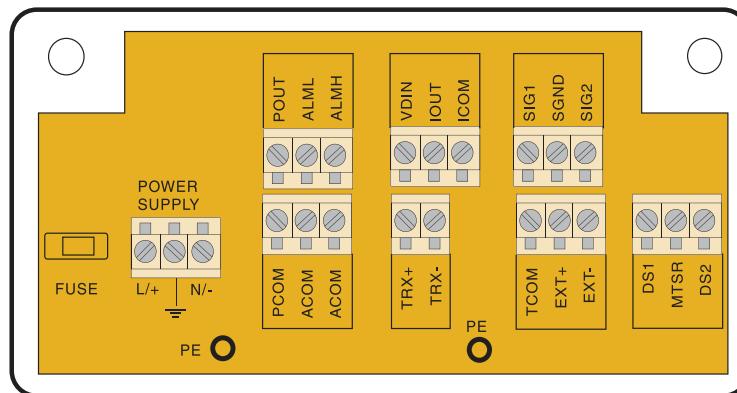
Terminal Wiring For Compact Converter

POUT	Frequency(Pulse) Output for Bi-directional Flow
ALM1	Alarm Output for Upper Limit
ALM2	Alarm Output for Low Limit
COMM	Frequency, Pulse and Current Common (GND)
COMM	Frequency, Pulse and Current Common (GND)
IOUT	Current Output of Flow Rate
IVIN	24V DC Power Supply for 2-wire 4-20mA Output
TRX+	+Communication RS485(+)
TRX-	-Communication RS485(-)
LN+	L: Live Wire of 110-240V AC; +24V DC power supply
LN-	N: Naught Wire of 110-240V AC; -24V DC power supply

Note: Don't connect 110 240V AC Power on 521B converter which is DC Power Supply Type.

5.1.2 Remote Converter (110-240 ac; 1824VDC)

Terminal Configuration



Terminal Wiring for Remote Converter

Pulse Output	POUT	Frequency(Pulse) Output for Bi-directional Flow
	PCOM	Pulse Output Ground
Alarm Output	ALMH	Alarm Output for Upper Limit
	ACOM	Alarm Output Ground
Alarm Output	ALML	Alarm Output for Low Limit
	ACOM	Alarm Output Ground
RS485 (Function Optional)	TRX+	Communication RS485+
	TRX-	Communication RS485-
Analog Current Output	VDIN	24VDC Power Supply for 2-wire 4-20mA Output
	IOUT	Analog Current Output
	ICOM	Analog Current Output Ground
Power Supply	L/+	L: Live Wire of 110-240Vac; +: 24V DC +
	N/-	N: Naught Wire of 110-240VAC; - : 24V DC-
Signal from Sensor	SIG1	Signal 1
	SGND	Signal Ground
	SIG2	Signal 2
	TCOM	Reserved
	EXT+	Exciting Current+
	EXT-	Exciting Current-
	DS1	Shielded Exciting1
	MTSR	Reserved
	DS2	Shielded Exciting2

6. Description of Outputs

6.1 Digital Frequency Outputs

Frequency Output Range	1 to 5000 Hz
Output Electric isolate	Photoelectric Isolate > 1000V
Frequency Output Capacity	Field-effect transistors Output Maximum Voltage: 36V DC Maximum Current: 250 mA

6.2 Digital Pulse Outputs

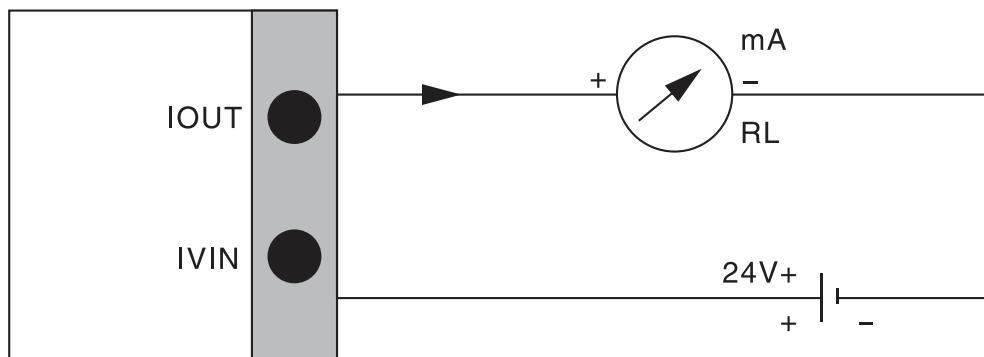
Pulse Output Range	1 to 100 Pulse/s
Pulse Output Value	0.001-1,000m3/cp; 0.001-1.000 Liter/cp
Pulse Output Capacity	Field-effect transistors Output Maximum Voltage: 36V DC Maximum Current: 250mA

6.3 Alarm Outputs

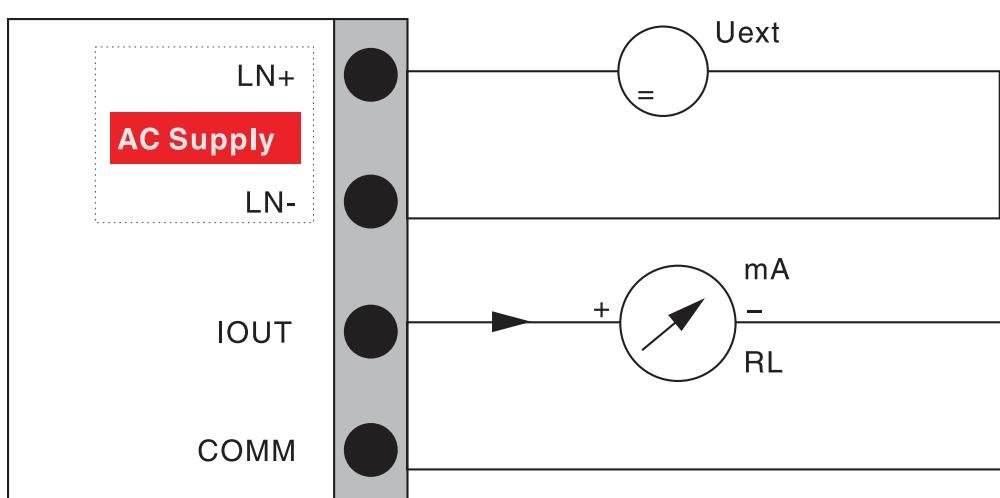
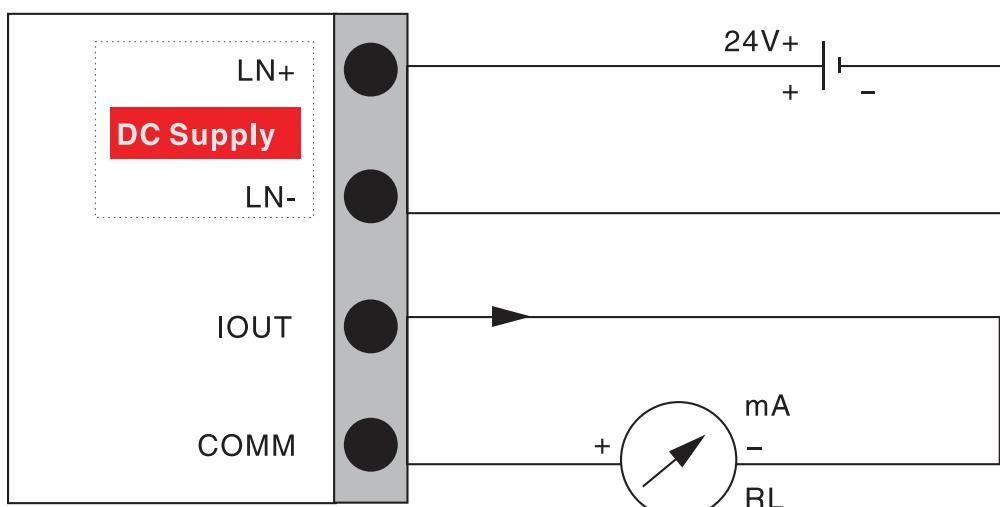
Alarm Output Junction	ALMH: Upper Limit; ALML: Lower Limit
Alarm Output Capacity	Field-effect transistors Output Maximum Voltage: 36V DC Maximum Current: 250 mA

6.4 Connection Diagrams Of Outputs

6.4.1 Current Outputs (on special request)

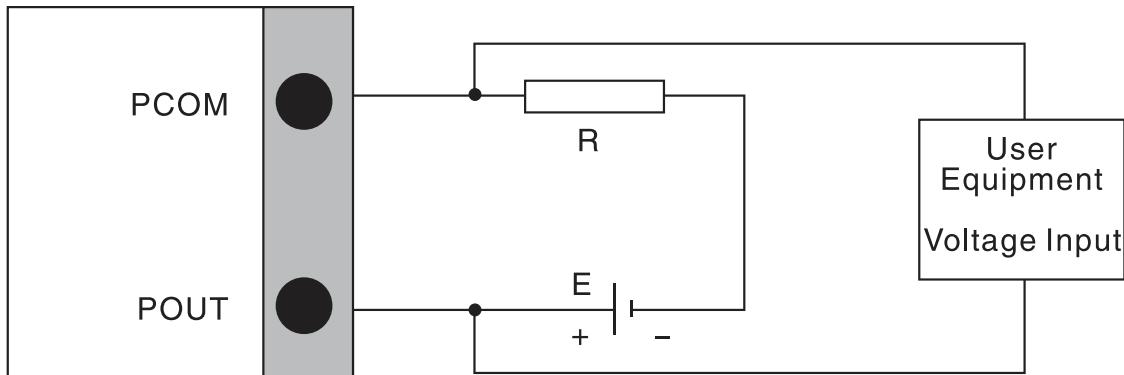


Current Outputs-Two Wire Connection

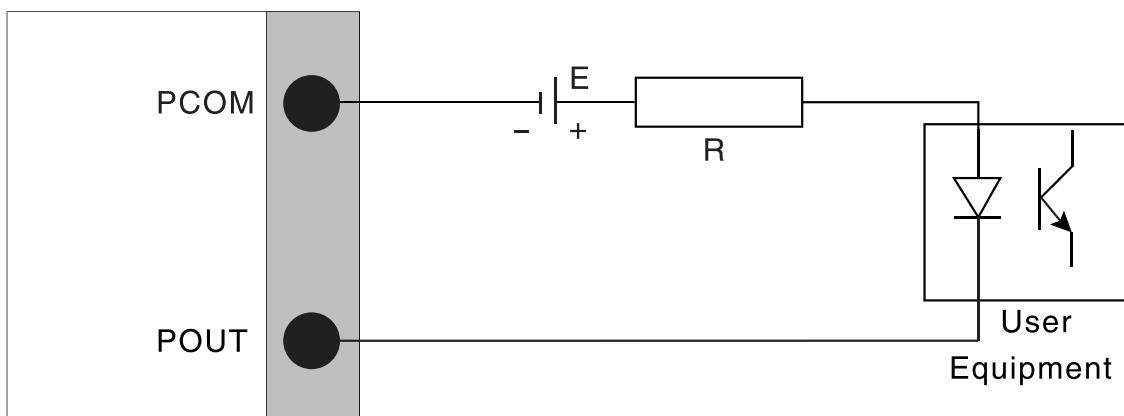


Current Outputs-Four Wire Connection(Isolated)

6.4.2 Digital Voltage Outputs

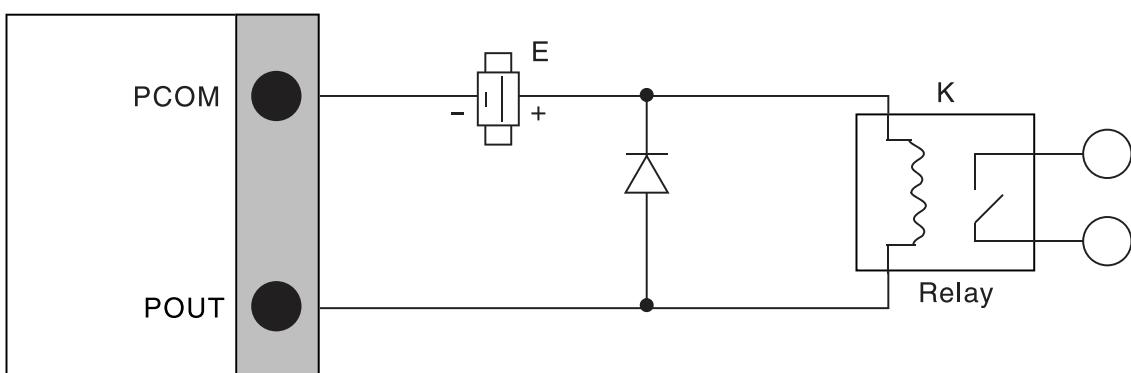


6.4.3 Digital Outputs To Photoelectricity Coupling



Generally, photoelectricity coupling current is about 10mA. When $E/R=10mA$, $E=5-24V$

6.4.4 Digital Outputs To Relay



Digital Output To Relay

Generally, E (Voltage) of the relay is 12V or 24V; D is extended diode, most middle relays have this diode inside. If not, user should connect one outside.

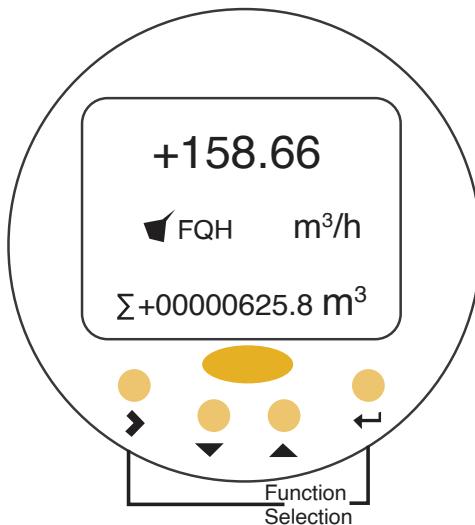
Table of digital output parameter: POUT

Parameter	Test Condition	Min	Typical	Max	Unit
Voltage	IC = 100mA	3	24	36	V
Current	Vol=1,4V	0	300	350	mA
Frequency	IC = 100mA Vcc=24V	0	5000	7500	Hz
High Voltage	IC = 100mA	Vcc	Vcc	Vcc	V
Low Voltage	IC = 100mA	0,9	1,0	1,4	V

7. OPERATION AND SETUP

7.1 Display and Keys

7.1.1 Compact Type



	Flow Rate
	Alarm Symbol and Message: FQH; FQL; FGP; SYS
	Flow Rate Unit
	Flow Velocity; Percentage; Positive, Negative or Net Total (Switchable)
	Keys (See table below for function and representation in text)
	Infrared Sensor (not present in all signal converter versions)

7.2 Function Selection Menu

At measuring mode, press  +  will lead to function selection menu including three sub-menu.

Key (Measuring mode)	Function Selection	Description
 + 	(1) Parameters Set	Choose this menu and one page with password protect can be displayed. Input the correct password and press  +  to enter the parameters set.
	(2) Cir Total Rec	Choose this menu and one page with password protect can be displayed. Input the correct password and press  +  to perform the total flow reset, <i>Note: factory default password is "10000"; change this password when get the flowmeter to avoid unintended reset on total flow</i>
	(3) Fact Modif Rec	Track the modification record on factor

7.3 Parameters Set

Press  +  it leads to function selection menu and the first menu is "Parameters Set", press  to confirm the enter "Parameters Set". Input the password, and press  +  There are total 54 menus in "Parameters Set" and users can access and modify these menus depending on the input password grade. See table in next page for more information on password grade.

Table, Description of Password Grade

Password Grade	Password	Login Privileges	Menu Access
Grade 1	00521	Read Only	Menu 1 to 54
Grade 2	03210	Read and Edit	Read: Menu 1 to 54 Edit: Menu 1 to 24
Grade 3	06108	Read and Edit	Read: Menu 1 to 54 Edit: Menu 1 to 25
Grade 4	07206	Read and Edit	Read: Menu 1 to 54 Edit: Menu 1 to 38
Grade 5	Please consult your local representative	Read and Edit	Read: Menu 1 to 54 Edit: Menu 1 to 52

Menu	Parameter Name	Setting Method	Grades	Range
M1	Language	Select Parameter	2	English
M2	Comm Addres	Input Value	2	0-99
M3	Baud Rate	Select Parameter	2	600-14400
M4	Snsr Size	Select Parameter	2	3-3000
M5	Flow Unit	Select Parameter	2	L/h, L/m, L/s, m³/h, m³/m, m³/s
M6	Flow Range	Input Value	2	0-99999
M7	Flow Rspns	Select Parameter	2	1-50
M8	Flow Direct	Select Parameter	2	Plus/Reverse
M9	Flow Zero\input	Input Value	2	0-9999
M10	Flow Cutoff	Input Value	2	0-599,99%
M11	Cutoff Ena	Select Parameter	2	Enable/Disable
M12	Total Unit	Select Parameter	2	0,001m²-1m², 0,001L-1L
M13	SegmaN Ena	Select Parameter	2	Enable/Disable
M14	Analog Type	Select Parameter	2	0-10mA/4-20mA
M15	Pulse type	Select Parameter	2	Freque / Pulse
M16	Pulse Fact	Select Parameter	2	0.001m-1m², 0.001L-1L
M17	Freque Max	Select Parameter	2	1-5999HZ
M18	Mtsnsr Ena	Select Parameter	2	Enable/Disable
M19	Mtsnsr Trip	Input Value	2	59999%
M20	Alm Hi Ena	Select Parameter	2	Enable/Disable
M21	Alm Hi Val	Input Value	2	000.0-599.99%
M22	Alm Lo Ena	Select Parameter	2	Enable/Disable
M23	Alm Lo Val	Input Value	2	000.0-599.99%
M24	Sys Alm Ena	Select Parameter	2	Enable/Disable
M25	Clr Sum Key	Input Value	3	0-99999
M26	Snsr Code 1	User set	4	Finished Y M
M27	Snsr Code 2	User set	4	Product Number

Menu	Parameter Name	Setting Method	Grades	Range
M28	Field Type	Select Parameter	4	Type 1,2,3
M29	Sensor Fact	Input Value	4	0.0000-5.9999
M30	Line Crc Ena	Select Parameter	4	Enable/Disable
M31	Lineary CRC 1	User Set	4	Set Velocity
M32	Lineary Fact 1	User Set	4	0.0000-1.9999
M33	Lineary CRC 2	User Set	4	Set Velocity
M34	Lineary Fact 2	User Set	4	0.0000-1.9999
M35	Lineary CRC 3	User Set	4	Set Velocity
M36	Lineary Fact 3	User Set	4	0.0000-1.9999
M37	Lineary CRC 4	User Set	4	Set Velocity
M38	Lineary Fact 4	User Set	4	0.0000-1.9999
M39	FwdTotal Lo	Correctable	5	00000-99999
M40	FwdTotal Hi	Correctable	5	00000-9999
M41	RevTotal Lo	Correctable	5	00000-99999
M42	Rev Total Hi	Correctable	5	00000-9999
M43	PisntLmtEna	Select Parameter	5	Enable/Disable
M44	PisntLmtVal	Select Parameter	5	0.010-0.800m/s
M45	Pisnt Delay	Select Parameter	5	400-2500ms
M46	PassWord 1	User Correct	5	00000-99999
M47	PassWord 2	User Correct	5	00000-99999
M48	PassWord 3	User Correct	5	00000-99999
M49	PassWord 4	User Correct	5	00000-99999
M50	Analog Zero	Input Value	5	0.0000-1.9999
M51	Anig Range	Input Value	5	0.0000-3.9999
M52	Meter Fact	Input Value	5	0.0000-5.9999
M53	MeterCode 1	Factory Set	6	Production Date:Y/M
M54	MeterCode 2	Factory Set	6	Product Serial No

7.2 Function Selection Menu

No.	Function	Settings/Descriptions
language		
M1	Language	English/Chinese Language selection depends on the device version.
RS485 Communication.		
M2	Comm Address	Value: Integer 01 to 99 Device Address for RS485 (Not Present in all converter)
M3	Baud Rate	Selectable: 600, 1200, 2400, 4800, 9600, 19200
Sensor Diameter		
M4	Sensor Size	Select the sensor size (See the nameplate)
Flow Parameter: Unit, Range, Response Time, Direction, Zero Calibration, Small Flow Cutoff		
M5	Flow Unit	Selectable: L / h (liter/hour), L/m(liter/minute), L/s(liter/second)m³/h (cubic meter/hour), m³/m(cubic meter/min), m³/s(cubic meter/second)
M6	Flow Range	Value: 0-99999 (This parameter represents the Max, Flow Rate of flowmeter)
		Change this value will affect other parameter (M10) and current output value.
M7	Flow Rspns	Damping time/Time constant, default value: 3 second
		Set large value can enhance the stability of flow display and output digital, which is suitable for accumulative total from pulse output; the small value means fast respond rate, which is suitable for production control.
M8	Flow Direct	Selectable:Plus/Reverse
		Define polarity of flow direction. Plus/Forwards(according to the arrow on the measuring sensor) or Reverse/Backwards(in the opposite direction to the arrow)
M9	Flow Zero	Zero Calibration
		First row small words: FS-new zero calibration value Second row-large words: zero point correction value To ensure the flowmeter's accuracy, FS should be 0. Change the value at second row to make sure FS is 0, Note: ONLY perform "Flow Zero when the pipe is full filled static fluid.
M10	Flow Cutoff	Sets output value of all outputs to "0": (Low flow cutoff)
		For example: Flow Cutoff value = 20% Then the Min. Flow te = 20 deg of Max. Flow rate (the value in M6) Note: this function is ONLY effective if M11 (SegmaN Ena) is Enable.
M11	Cutoff Ena	Selectable: Enable/Disable The switch on M10(Flow Cutoff)
M12	Total Unit	Selectable: 0,001m², 0,1m ^ 3 0,1m ^ 3 1m ^ 2 0,001L, 0,01L, 0,1L, 1L 9Digits, this parameter can control the resolution for accumulative flow.

No.	Function	Settings/Descriptions
Outputs :		
M13	SegmaN Ena	The switch to control outputs of reverse Flow: current or pulse output.
		The output function is ONLY effective for reverse flow if M13 is Enable. For example, M13 = "Disable", then there is still no output even though there is reverse flow rate in pipe. Note: this switch can't control output of Plus Flow Rate.
M14	Analog Type	Selectable: 4-20mA/0-10mA
		Select the correct current output mode base on user's application.
M15	Pulse Type	Selectable: Freque (Frequency)/Pulse Freque: Frequency Output Pulse: Scaled Pulse Output
M16	Pulse Fact	Selectable: 0,001L, 0,01L, 0,1L, 1L; 0,001 m³, 0,01 m³, 0,1 m³, 1 m²
		The scaled pulse output value for each pulse, ONLY effective if M15 is selected as "Pulse. For example, M16="0.1L", it means each pulse is 0.1L Max. Pulse Output: 100 Pulses/Second.
M17	Freque Max	Value: 1-5000Hz Max. Frequency is corresponding to M6 (Flow range).
Alarms :		
M18	Mtsnsr Ena	Selectable: Enable/Disable Empty Pipe Detect is ONLY valid if M18 (Mtsnsr Ena) = Enable.
M19	Mtsnsr Trip	First row: measured conductivity value (V1) Second row: the value (V2) which can trigger the Empty Pipe Alarm, Generally, set V2 as three to five times of V1, Flow indication, pulse output and current output "=0" when pipe empty Note: perform this parameter set when the pipe is full filled with fluid.
M20	Alm Hi Ena	Selectable: Enable/Disable Upper Flow Limit Alarm is ONLY valid if M20 (Alm Hi ENa) = Enable
M21	Alm Hi Val	Value: 0%-199,9% (The value to trigger the Upper Flow Limit Alarm)
		Upper Flow Limit Alarm is ONLY triggered when M20= Enable and Flow rate > M21*M6
M22	Alm Lo Ena	Selectable. Enable/Disable Low Flow Limit Alarm is ONLY valid if M22 (Alm Lo Ena) = Enable
M23	Alm Lo Val	Value: 0% 199,9% (The value to trigger the Low Flow Limit Alarm)
		Low Flow Limit Alarm is ONLY triggered
M24	Sys Alm Ena	When M22- Enable and Flow rate < M10 M6
		Selectable: Enable/Disable System Exciting Alarm is ONLY valid if M24 = Enable

No.	Function	Settings/Descriptions
Reset Totaliser Password :		
M25	Clr Sum Key	The password is used to reset the totalizer. Note: please set M25 "Clr Sum Key" first, and use this password to perform reset according to Section 3.29 (Page 51)
Sensor:		
M26	Snsr Code1	User can set sensor production date in M26 to track whether the Sensor Factor is correct
M27	Snsr Code2	Sensor Serial Number
M28	Field Type	Selectable: 1/16; 1/20; 1/25 Three types of Exciting frequency. Usually use 1/16 for small size sensor, and others two for large size sensor.
M29	Sensor Fact	Input Measuring Sensor Constant: GK User can get this factor from the calibration certificate.
Linearity Correction :		
M30	Line Crc Ena	Selectable: Enable/Disable This parameter is used to control the linearity correction function. Enable: use the linearity correction; Disable: linearity correction is not used even M31 to M38 are set.
M31	Lineary CRC 1	Correction Point 1: the velocity of point 1
M32	Lineary Fact 1	Linearity Fact 1: the correction factor for point 1
M33	Lineary CRC2	Correction Point 2: the velocity of point 2
M34	Lineary Fact 2	Linearity Fact 2: the correction factor for point 2
M35	Lineary CRC3	Correction Point 3: the velocity of point 3
M36	Lineary Fact 3	Linearity Fact 3: the correction factor for point 3
M37	Lineary CRC4	Correction Point 4: the velocity of point 4
M38	Lineary Fact4	Linearity Fact 4: the correction factor for point 4
Set Value for Total Flow: For flowmeter maintenance or replacement, maybe the previous total flow should be set, And change M39 to M42 can accomplish this function,		
M39	Fwd Total Lo	Set Value: 00000-99999 Low Bbyte of Positive Total Flow

No.	Function	Settings/Descriptions
M40	Fwd Total Hi	Set Value: 0000-9999
		High Byte of Positive Total Flow
M41	RevTotal Lo	Set Value: 00000-99999
		Low Byte of Negative Total Flow
M42	Rev Total Hi	Set Value: 0000-9999
		High Byte of Negative Total Flow
Peak Suppression Function:		
M43	PisntLmtEna	The switch for Peak Suppression Enable: Peak Suppression ON; Disable: Peak Suppression OFF. For paper pulp, slurry and other serosity, "Peak Interference" can occur when the solid grain scrubs or strikes the electrodes, Peak suppression arithmetic can restrain this interference via the setting of M43, M44 and M45.
M44	PisntLmtVal	This parameter determines the change rate of Peak Interference, based on the percent of flow velocity; ten grades: 0.010m/s (Grade 1), 0.020m/s, 0.030m/s, 0.050m/s, 0.080m/s, 0.100m/s, 0.200m/s, 0.300m/s, 0.500m/s, 0.800m/s (Grade 10) The sensitivity of Peak Suppression is highest for Grade 1.
M45	Pisnt Delay	This parameter can determine the width of time to restrain Peak Interference and the unit is ms.
		If the duration of one signal is less than the value in M45, this signal can be determined as Peak Interference and will be suppressed; otherwise it will be determined as normal signal.
Password Management:		
M46	PassWord 1	M46 to M49 can be changed using Grade 5 Password to enter parameter setting.
M47	PassWord 2	
M48	PassWord 3	
M49	PassWord 4	
Factory Use ONLY: Zero point calibration or Full scale calibration		
M50	Analog Zero	Zero Point Calibration for current output to make sure the Zero point is 0 mA/4 mA
M51	Anlg Range	Full scale calibration for current output to make sure the Full Scale is 10mA or 20mA.
M52	Meter Fact	Factory Use ONLY
M53	MeterCode 1	Converter Production Date
M54	MeterCode 2	Converter Serial Number

8. INFRARED INTERFACE

Note: the infrared interface is optional with extra charge. Infrared interface can read and write writing all parameters with IR interface (option) without opening the front cover.

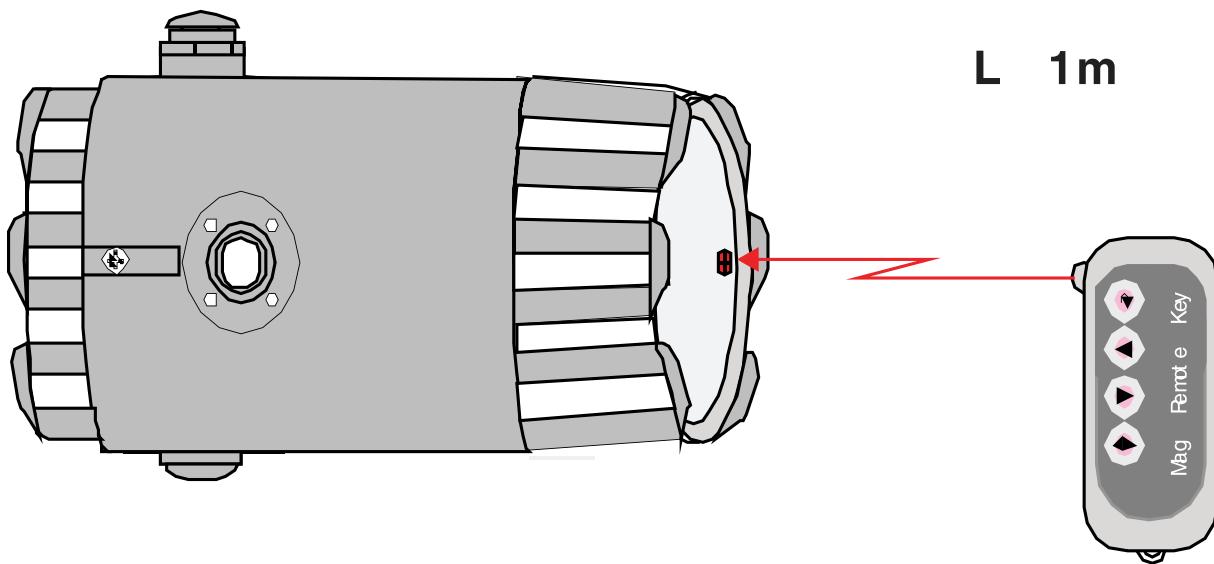


Fig 4 1 Infrared Interface for operating converter without opening the front cover

9. ALARM INFORMATION

Converters have self-diagnose function. This information displays at the left of LCD. The explanations of Alarm are as below:

FQH: Upper Flow Limit Alarm

FQL: Low Flow Limit Alarm

FGP: Empty Pipe Alarm

SYS: System Excitation Alarm

10. TROUBLESHOOTING

Symptom	Probable Cause	Solution
Measurement is not accurate	1. Parameter wrong	Check the parameters (Transmitter, K-factor and size)
	2. Pipe is not fully filled	Check if meter is fully filled
Flow rate indication is unstable	1. Grounding issue	(1) Make sure meter is properly grounded to a good earth grounding (2) Please use grounding ring when the pipe is not conductive, such as PVC or other plastic pipe
	2. Air	Make sure fluid does not contain air bubbles
	3. Converter location outside	Make sure converter is not too close to sources of electrical interference
No Display	1. No power	Apply correct power
	2. Incorrect power	Check power supply
	3. Wiring connections	Check power input/output connections
	4. Fuse blown	Replace fuse
	5. Contrast of LCD is too low	Increase the contrast
Empty Pipe Alarm	1. Fluid is not full filled the pipe	Increase the flow rate
	2. Electrode was polluted	Clean the electrode if voltage of DS1 and DS2 > 1V
	3. Fluid's conductivity is too small	If connect three terminals SIG 1, SIG 2, SGND and the alarm disappears, which means the fluid's conductivity is small. Replace other kind of flowmeter

8. INFRARED INTERFACE

We hereby provides a limited warranty against defects in materials and workmanship. This product includes a 1-year warranty. The warranty period shall begin on the date of the original new equipment purchase. Warrantor's obligation hereunder shall be limited to repairing defective workmanship or replacing or repairing any defective parts.

In the event purchaser believes the product is defective, the product must be returned to us, transportation prepaid by Purchaser, within the appropriate warranty period relative to the product. If our's inspection determines the workmanship or materials are defective and the required maintenance has been performed and, has been properly installed and operated, the product will be either repaired or replaced, at our's sole determination, free of additional charge, and the goods will be returned, transportation paid by us, using a transportation method selected by us.

Prior to returning the product to us, Purchaser must obtain a Returned Material Authorization (RMA) Number from our's Customer Service Department within 10 days after discovery a purported breach of warranty, but not later than the warranty period; otherwise, such claims shall be deemed waived.

If our's inspection reveals the product to be free of defects in material and workmanship or such inspection reveals the goods were improperly used, improperly installed, and/or improperly selected for service intended, we will notify the purchaser in writing and will deliver the goods back to Purchaser upon receipt of Purchaser's written instructions and agreement to pay the cost of transportation. If Purchaser does not respond within thirty (30) days after notice from us, the goods will be disposed of in our's discretion.

We do not warrant the product to meet the requirements of any safety code or other jurisdiction, and Purchaser assumes all risk and liability whatsoever resulting from the use thereof, whether used singly or in combination with other machines or apparatus.

This warranty shall not apply to any our product or parts thereof, which have been repaired outside our's factory or altered in any way, or have been subject to misuse, negligence, or accident, or have not been operated in accordance with our's printed instructions or have been operated under conditions more severe than, or otherwise exceeding, those set in the specifications.

FOR NON-WARRANTY repairs or calibrations, consult us for current repair/ calibration charges. Have the following information available BEFORE contacting us:

1. P.O. number to cover the COST of the repair/calibration,
2. Model and serial number of the product.
3. Repair instructions and/or specific problems relative to the product.



Setting Trends

Virtec is one of the global leaders providing Heat & Flow management solutions in HVAC & Water applications. The solutions are based on two measuring technologies, Ultrasonic & Electromagnetic principle. Our high-end services and cutting-edge product solutions in this field have made us the leading providers of technologically advanced Heat and Flow measuring instruments.

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