ELR H5-IES-PT/500AC-x-IOL

Networkable motor starter (CONTACTRON)

Data sheet
107542_en_01

1 Description

The network-capable 3-phase hybrid motor starter with reversing function and current monitoring provides the following functions.

- Right contactor
- Left contactor
- Motor overload protection relay
- EMERGENCY STOP to performance level PLe
- Connection to IO-Link systems

The amount of cabling required is reduced to a minimum by the internal locking circuit and the load wiring.

The control commands for backward and forward running are received by an IO-Link communication interface.

Make sure you always use the latest documentation.
It can be downloaded from the product at phoenixcontact.net/products.

This document is valid for the products listed in the “Ordering data”.

2 Table of contents

3 Ordering data

Description	Type	Order No.	Pcs./Pkt.
Networkable hybrid motor starter for reversing 3~ AC motors up to 500 V AC and 3 A output current, with adjustable overload shutdown, emergency stop function up to SIL 3/PL e, and Push-in connection. Connection to IO-Link.	ELR H5-IES-PT/500AC-3-IOL	2908669	1
Networkable hybrid motor starter for reversing 3~ AC motors up to 500 V AC and 9 A output current, with adjustable overload shutdown, emergency stop function up to SIL 3/PL e, and Push-in connection. Connection to IO-Link.	ELR H5-IES-PT/500AC-9-IOL	2908670	1

Accessories	Type	Order No.	Pcs./Pkt.
3-phase loop bridge for 2 CONTACTRON modules, with push-in connection and 22.5 mm housing width, connecting cable: 3 m, with ferrules included.	BRIDGE-PT 2	2904490	1
3-phase loop bridge for 3 CONTACTRON modules, with push-in connection and 22.5 mm housing width, connecting cable: 3 m, with ferrules included.	BRIDGE-PT 3	2904491	1
3-phase loop bridge for 4 CONTACTRON modules, with push-in connection and 22.5 mm housing width, connecting cable: 3 m, with ferrules included.	BRIDGE-PT 4	2904492	1
3-phase loop bridge for 5 CONTACTRON modules, with push-in connection and 22.5 mm housing width, connecting cable: 3 m, with ferrules included.	BRIDGE-PT 5	2904493	1
3-phase loop bridge for 6 CONTACTRON modules, with push-in connection and 22.5 mm housing width, connecting cable: 3 m, with ferrules included.	BRIDGE-PT 6	2904494	1
3-phase loop bridge for 7 CONTACTRON modules, with push-in connection and 22.5 mm housing width, connecting cable: 3 m, with ferrules included.	BRIDGE-PT 7	2904495	1
3-phase loop bridge for 8 CONTACTRON modules, with push-in connection and 22.5 mm housing width, connecting cable: 3 m, with ferrules included.	BRIDGE-PT 8	2904496	1
3-phase loop bridge for 9 CONTACTRON modules, with push-in connection and 22.5 mm housing width, connecting cable: 3 m, with ferrules included.	BRIDGE-PT 9	2904497	1
3-phase loop bridge for 10 CONTACTRON modules, with push-in connection and 22.5 mm housing width, connecting cable: 3 m, with ferrules included.	BRIDGE-PT 10	2904498	1
The BRIDGE COVER covering hood is used to cover unused plugs on the CONTACTRON bridge that may subsequently be used to extend the system. The hood can be used with the screw and Push-in version of the bridge.	BRIDGE COVER	2906240	10
Modular power distribution board with CrossLink® interface, 125 A, 3-pos., touch-proof and protection against polarity reversal, width: 225 mm	EM-CPS-225	1002634	1

Accessories	Type	Order No.	Pcs./Pkt.
Modular power distribution board with CrossLink® interface, 125 A, 3-pos., touch-proof and protection against polarity reversal, width: 405 mm	EM-CPS-405	1002635	1
Connection module with integrated spring-loaded terminals for cables up to 16 mm², 3-pos.,	EM-CPS-TB3/63A	1002633	4
Device adapter with fuse holder for 16 A fuse (10x38/ Class CC), CrossLink® interface and fixed DIN rail	EM-CPS-DA-22,5F/16A	1002668	1

4 Technical data

Device supply	
Rated control circuit supply voltage U_S	24 V DC
Control supply voltage range	19.2 V DC ... 30 V DC
Rated control supply current I_S	65 mA
Protective circuit	Surge protection Reverse polarity protection Parallel polarity protection diode
Enable input	
Rated actuating voltage U_C	24 V DC
Rated actuating current I_C	7 mA
Switching threshold	9.6 V (“0” signal) 19.2 V (“1” signal)
Switching level	< 5 V DC (For EMERGENCY STOP)
Typical turn-off time	< 30 ms
AC output	
Rated operating voltage U_e	500 V AC (50/60 Hz)
Operating voltage range	42 V AC ... 550 V AC
Load current range see to derating	180 mA ... 3 A / 1.5 A ... 9 A
Trigger characteristic in acc. with IEC 60947-4-2	Class 10 / Class 10A
Cooling time	20 min. (for auto reset)
Rated operating current I_e AC-51	3 A / 9 A
Rated operating current I_e AC-53a	3 A / 7 A
Leakage current	0 mA / 0 mA
Protective circuit	Surge protection Varistor
Status and diagnostics indicators	
Status display	Yellow LED
Indication	Red LED
Operating voltage display	Green LED
IO-Link	
Specification	V1.1.1
Reverse polarity protection	Yes
Transmission speed	230.4 kbps (COM3)
Cycle Time	30 ms
Amount of process data	8 Byte (Input data) 2 Byte (Output data)
IO-Link ports	1 COMBICON 3-conductor
Current consumption	typ. 65 mA ±15 % (24 V DC) max. 150 mA

General data	
Mounting position	vertical (horizontal DIN rail, motor output below)
Mounting	alignable, for spacing see derating
Operating mode	100% operating factor
Degree of protection	IP20
Power dissipation min./max.	0.88 W / 4.1 W ; 0.88 W / 7 W
Dimensions W/H/D	22.5 mm / 99 mm / 114.5 mm

Connection data	
Connection name	**Control circuits**
Connection method	Push-in connection
Conductor cross section, solid	0.2 mm² ... 2.5 mm²
Conductor cross section, flexible	0.2 mm² ... 2.5 mm²
Conductor cross section [AWG]	24 ... 14
Stripping length	10 mm
Connection name	**Load circuit**
Connection method	Push-in connection
Conductor cross section, solid	0.2 mm² ... 2.5 mm²
Conductor cross section, flexible	0.2 mm² ... 2.5 mm²
Conductor cross section [AWG]	24 ... 14
Stripping length	10 mm

Ambient conditions	
Ambient temperature (operation)	-5 °C ... 55 °C (observe derating)
Ambient temperature (storage/transport)	-40 °C ... 80 °C

Standards/regulations	
Standards	IEC 60947-1 EN 60947-4-2 IEC 61508 ISO 13849

Insulation characteristics	
Rated insulation voltage	550 V
Rated surge voltage / insulation	6 kV
Insulation characteristics between the control input and control supply voltage, and auxiliary circuit to the main circuit	Safe isolation (IEC 60947-1)
Isolation characteristics between the control input and control supply voltage to auxiliary circuit	Safe isolation (IEC 60947-1) in the auxiliary circuit ≤ 300 V AC Safe isolation (EN 50178) in the auxiliary circuit ≤ 300 V AC
Degree of pollution	2

Conformance/Approvals	
UL, USA/Canada	NLDX.E228652 NRNT.E172140
Safety Integrity Level according to IEC 61508	≤ 3 (Safe shutdown)
Category acc. to EN ISO 13849	≤ 3 (Safe shutdown)
Performance level according to ISO 13849	e (Safe shutdown)

5 Safety regulations and installation notes

- When working on the device, observe the national safety and accident prevention regulations.
- Disregarding these safety regulations may result in death, serious personal injury or damage to equipment.
- This device may only be commissioned, installed, modified or upgraded by an electrically skilled person.
- Disconnect the power to the module.
- For emergency stop applications, the machine must be prevented from restarting automatically by a higher-level control system.
- During operation, parts of electrical switching devices carry hazardous voltages.
- Protective covers must not be removed when operating electrical switching devices.
- Keep the product documentation in a safe place.
- The device is an associated item of equipment. Do not install the device in potentially explosive areas. When installing and operating associated equipment, the applicable safety directives must be observed.
- If you use the "Automatic RESET" operating mode, the drive is switched on again after the cooling time has ended if a control signal is still present. The cooling time is 20 minutes.
- Do not subject the device to mechanical and/or thermal loads that exceed the specified limits.
- To protect the device against mechanical or electrical damage, install it in a suitable housing with appropriate degree of protection as per IEC 60529.
- Where dust is present, the device must be installed in suitable housing (IP64 minimum) according to EN 60079-14.
- Install the device according to the instructions in the installation instructions. Access to circuits within the device is not permitted.
- Do not repair the device yourself; replace it with an equivalent device. Repairs may only be performed by the manufacturer. The manufacturer is not liable for damage resulting from noncompliance.
- The device performs a diagnosis of the functions when the drive is switched on or has been switched off. In addition, an authorized electrician or a skilled worker who is well acquainted with the relevant standards can conduct the "Motor protection" safety function test. For this test, the drive must be operated with forward or reverse running, and the current flow in a conductor must be interrupted (e.g. by removing the fuse in the L1 or L3 phase). The hybrid motor starter then switches off the drive within 1.5 to 2 s. The LEDs for backward and forward running go off, the DIAG LED is activated, and the confirmation can be retrieved via the bus.
- Secure the device during safety-related applications with an access protection.
- Only use power supply units with safe isolation with SELV / PELV voltage in accordance with EN 50178/ VDE 0160(SELV / PELV). This prevents short circuits between primary and secondary sides.
- Observe the minimum permissible load current in safety-related applications:
  ELR H5-.../500AC-3: ≥ 180 mA
  ELR H5-.../500AC-9: ≥ 1.5 A

Area of application

- This is a product for environment A (industry). The device can cause unwanted radio interference if used in Class B environments (household). In this case, the user may be obligated to take the necessary precautionary measures.

5.1 UL note

WARNING: Risk of electric shock and fire

The opening of the branch-circuit protective device may be an indication that a fault current has been interrupted.

To reduce the risk of fire or electric shock, current-carrying parts and the other componentsof the controller should be examined and replaced if damaged.

Failure to follow instructions can result in death, serious injury, or equipment damage.

NOTE

For use with a "low voltage, limited energy, isolated power supply" use copper cables approved to at least 75 °C.

The device is designed for use with a "low voltage, limited energy, isolated power supply".

SCCR (single and group installation)	
Suitable for use on a circuit with a maximum of 5 kA rms symmetrical amperes and ≤ 480 V, with 20 A fuses rated RK5 (coordination type 1).	
Suitable for use on a circuit with a maximum of 100 kA rms symmetrical amperes and ≤ 480 V, with 30 A fuses rated J or rated CC (coordination type 1).	
FLA	3 A (480 V AC), 7.6 A (480 V AC)

6 Operating and indication elements

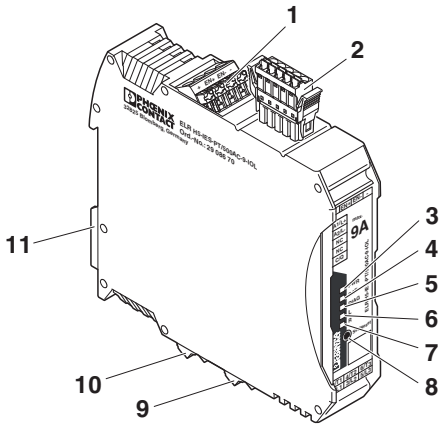

Figure 1 Operating and indication elements

1 Enable: Safety-related input
2 Connection for IO-Link supply and communication
3 LED green PWR: Device status
4 LED green DAT: IO-Link communication
5 LED red/yellow DIAG: Device or process error
6 LED yellow L: Reverse running
7 LED yellow R: Forward running
8 Reset button
9 3-phase output voltage
10 3-phase input voltage
11 Metal lock for fixing to DIN rail

7 Connection notes

WARNING: Danger to life by electric shock!

Never perform work on the device when voltage is present.

7.1 Mains connection and line protection

- When connecting the 3-phase network, it is essential to observe the terminal identification.
- The following specifications apply for the fuses used.

16 A gG 50 kA / 500 V	Coordination type 1
30 A CCMR30 50 kA / 500 V	Coordination type 1
FAZ-B16/3 2.5 kA / 400 V	Coordination type 1
PKM0-4 50 kA / 415 V	Coordination type 1
PKM0-6,3 15 kA / 415 V	Coordination type 1

- The control supply voltage and control voltage inputs must be operated with power supply modules according to IEC 61131-2 (max. 5 % residual ripple).
- In order to avoid inductive or capacitive coupling of noise emissions where long control wires are used, we recommend the use of shielded conductors.

NOTE: Electrical safety

Only connect conductors with the same conductor cross section to a terminal point.

7.2 Assembly

The IO-Link connection is implemented via a 5-pos. connector.

Connect the cables to the connector (2) on the hybrid motor starter.

7.3 IO-Link connection

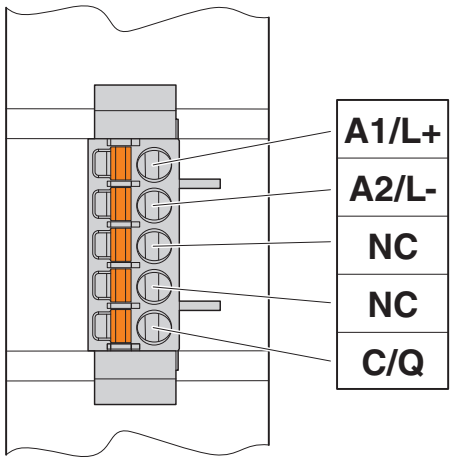

Figure 2 IO-Link connector

The 24 V power supply and IO-Link communication C/Q are implemented via the 5-pos. IO-Link connection.

Two connection points are not used.

7.4 Connecting cables

Push-in connection:

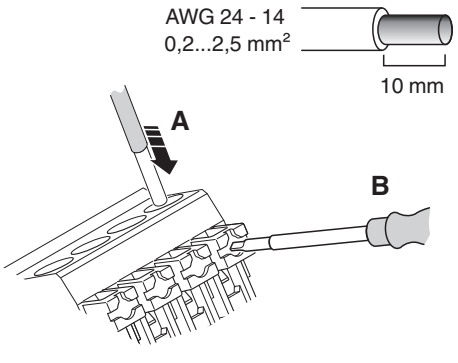

Figure 3 Push-in connection

Insert solid or stranded conductors with ferrules directly in the clamping space (A). Reliable contact can be made with stranded conductors without ferrules by opening the spring beforehand using the pushbutton (B). Press the pushbutton (B) also to release the conductor.

7.5 Block diagram

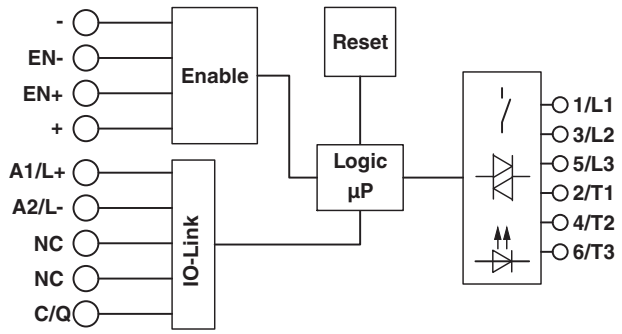

Figure 4 Block diagram

7.6 Enable input

In order make the motor connected to the device operational, you must issue the release to the device via the Enable input.

As soon as a valid signal is applied to the Enable input (terminals EN+ and EN-), the device receives control commands via the bus connection.

With non-safety-related applications, you can also issue the release by bridging terminals (EN-) and (-) and terminals (EN+) and (+).

Voltage interruptions (blanking) ≤ 3 ms or voltage pulse (unblanking) ≤ 4 ms are filtered.

8 Function

8.1 Status and diagnostics indicators

The device visualizes the operating statuses with a total of five LEDs.

LED PWR	Green	Device status
LED DAT	Green	IO-Link communication
LED DIAG	Red/yellow	Device or process error
LED L	Yellow	Reverse running
LED R	Yellow	Forward running

After applying the control supply voltage, all LEDs light up once as an LED test.

8.2 Diagnostic function

Various diagnostic functions enable the hybrid motor starter to detect many internal errors and also external errors (I/O errors).

If an error is detected, the device is switched to the safe shutdown state.

You cannot acknowledge internal errors. They are stored in the device. Afterwards the device cannot be started up again.

In case of external errors, an error acknowledgment is required to exit the safe shutdown state.

Explanation: A = LED switched off, Aut = automatic, B = LED flashes, B_r = LED flashes red, B_{ye} = LED flashes yellow, E = LED shines continuously, E_{ye} = LED shines yellow, E_r = LED shines red, Man = manual, Ne = not required, Nm = not possible, X = arbitrary state

Status	Description	PWR	DAT	DIAG	L	R	Acknowledgment
OFF	Supply voltage not present	A	A	A	A	A	Ne
Ready to operate, enable = 0	Supply voltage present, release has not been issued	B	X	X	X	X	Ne
Ready to operate, enable = 1	Supply voltage present, release has been issued	E	X	X	X	X	Ne
No bus	Device is not integrated into IO-Link	E / B	A	X	X	X	Ne
Data traffic	Device is integrated into IO-Link, cyclic or acyclic communication occurs.	E / B	B	X	X	X	Ne
Drive switched on	Reverse running (L)	E	B	A	E	A	Ne
	Forward running (R)	E	B	A	A	E	Ne
Internal error	Internal device error - **device replacement required**	B	B	E_r	B	B	Nm
External error in controller or I/O devices (maintenance requirement)	**Motor protection function**: The motor current is higher than the motor nominal current specification: Cooling time elapsing (20 minutes)						
	Error during reverse running	E	X	B_{ye}	E	A	Aut
	Error during forward running	E	X	B_{ye}	A	E	Aut
	A manual reset is possible (after approx. 2 min)						
	Error during reverse running	E	X	B_{ye}	B	A	Man
	Error during forward running	E	X	B_{ye}	A	B	Man
	Error when restoring the system state: Manual acknowledgment possible after 2 min.				Message via bus		
	Symmetry: The two motor currents deviate from each other by more than 33 %.	E	X	B_{ye}	A	A	Man
	Blocking: The max. measurable motor current is exceeded for more than 2 s. (analogous to motor protection function).						
	Error during reverse running	E	X	B_{ye}	E	A	Man
	Error during forward running	E	X	B_{ye}	A	E	Man
No current flow with control	No current is measured when power amplifier activated						
	During reverse running	E	X	A	B	A	Ne
	During forward running	E	X	A	A	B	Ne

Error acknowledgment

The following options are available for error acknowledgment.

Manual (reset button)

Press the reset button on the front of the device.

When pressing the reset button for more than 2 s (approximately), the device returns to the error state.

Manual (remote acknowledgment via the bus)

You can perform the manual reset via the bus.

See also the “Cyclic output data” section.

Automatic (parameterization via the bus)

If you parameterize this function, the device automatically acknowledges motor protection trippings after 20 minutes.

Feedback

As soon as the device detects an error or signals a message, you can retrieve this information via the bus.

8.3 Parameterization - Nominal current setting

You can set the nominal current via a cyclic or acyclic service.

When you set the nominal current via an acyclic service, you have to confirm the current value via the Set/Reset button.

To do this you have to check the current value via the LEDs.

Bit				Nominal current [mA]	
3	2	1	0		
DAT	DIAG	L	R	3 A	9 A
0	0	0	0	180	1500
0	0	0	1	300	2000
0	0	1	0	440	2500
0	0	1	1	600	3000
0	1	0	0	680	3500
0	1	0	1	880	4000
0	1	1	0	1000	4500
0	1	1	1	1100	5000
1	0	0	0	1200	5500
1	0	0	1	1500	6000
1	0	1	0	1600	6500
1	0	1	1	1900	7000
1	1	0	0	2100	7500
1	1	0	1	2400	8000
1	1	1	0	2700	8500
1	1	1	1	3000	9000

If you do not press the Set/Reset button, the current value stored in the device does not change.

Subsequently, you can also change the nominal current via a cyclic service.

However, this must be smaller than the current value that you have acyclically parameterized.

You do not have to confirm this change via the Set/Reset button.

NOTE

Lock monitoring is activated from a motor current of 56 A.

9 Application examples

9.1 Emergency stop/safety door monitoring

The hybrid motor starter can be integrated in an emergency stop chain or in applications where safety shutdown is a normal operating state, e.g., for safety door or two-hand applications.

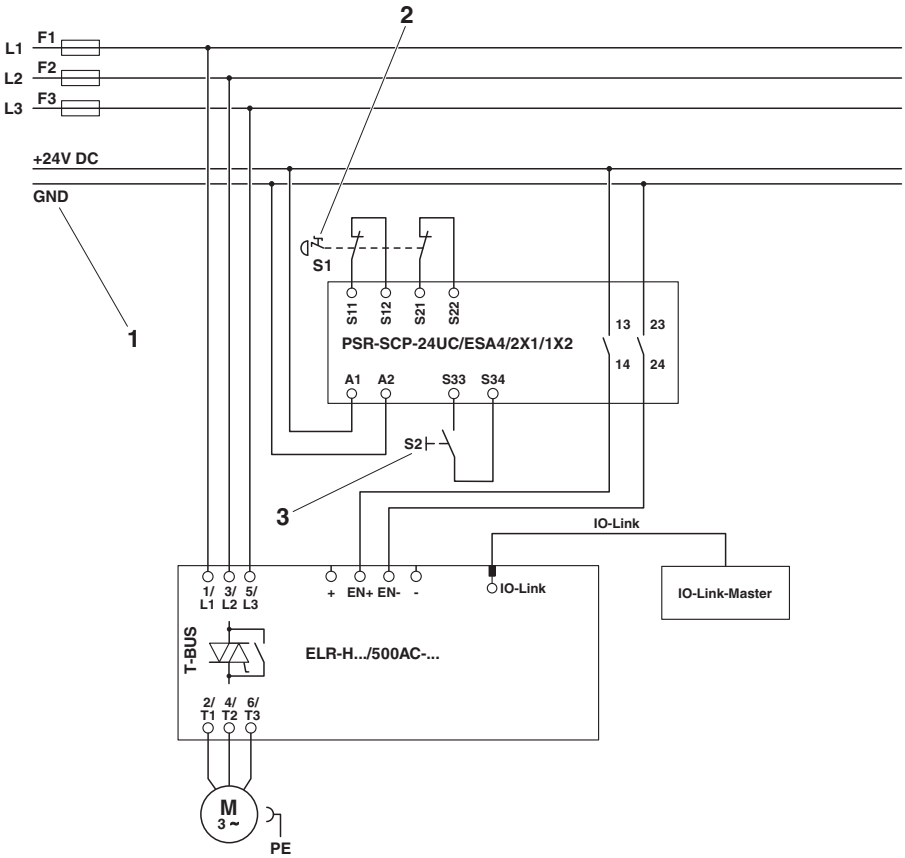

Figure 5 Emergency stop

1 Supply 1

2 Emergency stop

3 Reset button

The enable inputs are switched off via a safety relay as soon as the emergency stop button is actuated.

If shutdown is performed, e.g., from a “safe controller” with semiconductor outputs, the residual voltage must be < 5 V DC.

Voltage interruptions (blanking) ≤ 3 ms or voltage pulse (unblanking) ≤ 4 ms are filtered.

9.2 Motor protection

All safety-related functions are implemented by the hybrid motor starter without external influences. Special circuit technology is not required.

If the motor currents deviate by more than 33 %, the motor shuts down within 2 minutes.

If the motor currents deviate by more than≥ 67 %, (e.g., phase failure), the motor shuts down within 2 seconds.

The deviation can be calculated using the following formulas.

Value (I_{max}) > I_{nom} ⇒ (I_{max} - I_{min})/I_{max}

Value (I_{max}) < I_{nom} ⇒ (I_{max} - I_{min})/I_{nom}

In the event of high clock rates, the motor protection function may trip due to the increased switch-on currents

9.3 Motor with brake

If a motor with brake (connection in the motor terminal board) is connected, the 400 V AC brake must be linked to the 2/T1 and 6/T3 terminals. A 230 V AC brake must be connected to the 4/T2 terminals and the star point of the motor.

NOTE

Increase motor current monitoring to the nominal brake current. This should be set accordingly on the hybrid motor starter.

9.4 Auxiliary relay connection

Auxiliary relay (e. g. PLC RSC 230UC/21, order no.: 2966207) for activating external brakes or acknowledgements, e. g. to the PLC, must be connected to the 4T2 and N connections of the system.

10 Cyclic data

The device uses six input bytes and two output bytes.

The IO-Link telegrams are structured so that the higher value bytes are shown first.

10.1 IN process data

Byte 0 (IO-Link diagnostic bits/ELR status)

Bit	Description	Value
Bit 0	Error detection	0: device can be controlled
		1: device cannot be controlled (motor protection has been tripped or an internal error has occurred)
Bit 1	Forward rotation	0: forward running not activated and/or motor start
		1: motor in forward running and/or motor start
Bit 2	Reverse rotation	0: reverse running not activated
		1: motor in reverse running
Bit 3	Enable signal	0: the external enable signal is not available (low)
		1: the external enable signal is available (high)
Bit 4	Diagnostics	0: diagnostics not present
		1: diagnostics present
Bit 5	Device OK	1: device is OK (activated and current flow available)
Bit 6	Overload pre-warning	0: thermal model ≤ 105%
		1: thermal model > 105%
Bit 7	Not used	Not used

Byte 1 (differentiated trip indicator/set nominal current)

Bit	Description	Value
Bit 0 ... bit 3	Set nominal current (0...15)	0000: smallest value overload trip
		...
		1111: largest value overload trip
Bit 4 ... bit 6	Differentiated trip indicator	000: not used
		001: trip indicator overload
		010: mains failure
		011: phase asymmetry
		100: phase failure
		101: trip indicator emergency tripping
		110: not used
		111: not used
Bit 7	Overload acknowledgment necessary	0: overload was acknowledged/there is no overload
		1: overload acknowledgement

Byte 2 (maximum motor current [%])

Bit	Description	Value
Bit 0 ... bit 7	Maximum current of the three phases	255% (maximum) 2.5 x

Byte 3 (thermal model)

Bit	Description	Value
Bit 0 ... bit 7	Model of the thermal load (trip at 115%)	255% (maximum) 2.5 x

Byte 4 (device type)

Bit	Description	Value
Bit 0 ... bit 3	Device type	0000: ELR H5-IES-PT/500AC-3-IOL
		0001: ELR H5-IES-PT/500AC-9-IOL
		0010: ELR H3-IES-PT/500AC-3-IOL
		0011: ELR H3-IES-PT/500AC-9-IOL
		0100: not used
		0101: not used
		0110: not used
		0111: not used
		1000: not used
		1001: not used
		1010: not used
		1011: not used
		1100: not used
		1101: not used
		1110: not used
		1111: not used
Bit 4	Not used	Not used
Bit 5	Not used	Not used
Bit 6	Not used	Not used
Bit 7	Not used	Not used

Byte 5 (low byte) and 6 (high byte) as 16-bit data word (maximum current value [A])

Bit	Description	Value
Bit 0 ... bit 7	Maximum current which occurs in the three phases	Current value in 10 mA, e.g.: 1267 = 12.67 A
Bit 0 ... bit 7		

10.2 OUT process data

Byte 0 (motor control)

Bit	Description	Value
Bit 0	Motor start/forward running start	0: no device control for forward running (terminal R) or motor start (terminal ON)
		1: device control for forward running (terminal R) or motor start (terminal ON)
Bit 1	Reverse running start	0: no device control for reverse running (terminal L)
		1: device control for reverse running (terminal L)
Bit 2	Manual reset	0: no reset
		1: overload reset through rising edge of this command
Bit 3	Automatic reset	0: no reset
		1: overload reset through continuous signal of this command
Bit 4	Not used	Not used
Bit 5	Reverse running start	Rising edge starts the reverse running
Bit 6	Stop	Rising edge stops the motor
Bit 7	Forward running start	Rising edge starts the forward running

Byte 1 (nominal current setting 2)

The nominal current setting “Nominal current 2” must be below the “Nominal current 1” value which is parameterized acyclically (see also Section 11 “Acyclic data”).

You do not have to confirm “Nominal current 2” via the Set/Reset button on the device.

Bit	Description	Value
Bit 0 ... bit 3	Nominal current setting (0...15)	0000: smallest value overload trip
		...
		1111: largest value overload trip
Bit 1	Not used	Not used
Bit 2	Not used	Not used
Bit 3	Not used	Not used
Bit 4	Not used	Not used
Bit 5	Not used	Not used
Bit 6	Not used	Not used
Bit 7	Nominal current setting enable	1: apply the new values

11 Acyclic data

There are three acyclic input bytes and two acyclic output bytes.

11.1 Input process data (16 bits)

Index	Type		Description	Value
16	String		Vendor Name	Phoenix Contact
17	String		VendorText	www.phoenixcontact.com
18	String		ProductName	e. g. ELR H5-IES-PT/500AC-3-IOL
19	String		ProductId	e. g. 2908669
20	String		ProductText	IO-Link/hybrid motor starter
21	String		Serial number	Stored in the production process.
22	String		HW_Revision	e.g., 1.00
23	String		FW_Revision	e.g., 1.00
24	String		AKZ	Hybrid motor starter
41	Byte 0 ... 74		Not used	Not used
68	Byte 0	Bit 0 ... bit 7	Motor current L1 [%]	255% (maximum) 2.5 x
	Byte 1	Bit 0 ... bit 7	Motor current L2 [%]	255% (maximum) 2.5 x
	Byte 2	Bit 0 ... bit 7	Motor current L3 [%]	255% (maximum) 2.5 x

11.2 Output process data (16 bits)

You can parameterize two nominal currents using acyclic services.

“Nominal current 1” must always be confirmed via the Set/Reset button on the device.

If you do not do this, the device will not apply the parameterized value.

“Nominal current 2” must have a lower value than “Nominal current 1”. Only “Nominal current 1” is stored in the device.

When the device is restarted, “Nominal current 2” is set to the same value as “Nominal current 1”.

Index	Type		Description	Value
24	String		AKZ	Hybrid motor starter
40	Byte 0 ... 74	Not used		
66	Byte 0	Bit 0 ... bit 3	Nominal current 1 setting (1 ... 15)	0000: smallest value overload trip
				...
				1111: largest value overload trip
		Bit 4 ... bit 7	Not used	Not used
67	Byte 0	Bit 0 ... bit 3	Nominal current 2 setting (1 ... 15)	0000: smallest value overload trip
				...
				1111: largest value overload trip
		Bit 4 ... bit 7	Not used	Not used

12 Safety functions

System conditions	
Database for failure rates	SN 29500
System type (consisting of subsystems)	Type B
Standard used	IEC 61508
Beta factor	1 %
MTTF [years] (mean time to failure at ambient temperature of 40°C)	34

12.1 Safe shutdown

HFT (hardware fault tolerance)	1
Ambient temperature	40 °C
$MTTF_D$ [years] - mean time to dangerous failure	164
Shutdown time [ms]	200
λsu [FIT] - safe, undetectable	1311
λdd [FIT] - dangerous, detectable	694
λdu [FIT] - dangerous, undetectable	0.1
SFF [%] - safe failure fraction	99
DC [%] - diagnostic coverage	99
PFH_D [FIT] probability of a dangerous failure per hour	0.1
PFD_{avg} (6 months/36 months) Average Probability of Failure on Demand	$0{:}5 * 10^{-6}$ / $2{:}9 * 10^{-6}$
Safety level according to	IEC/CEI 61508-1: up to SIL 3
	ISO 13849-1: up to category 3 PL e

Additional safety data is available on request.

13 Trigger characteristic

3 A modules

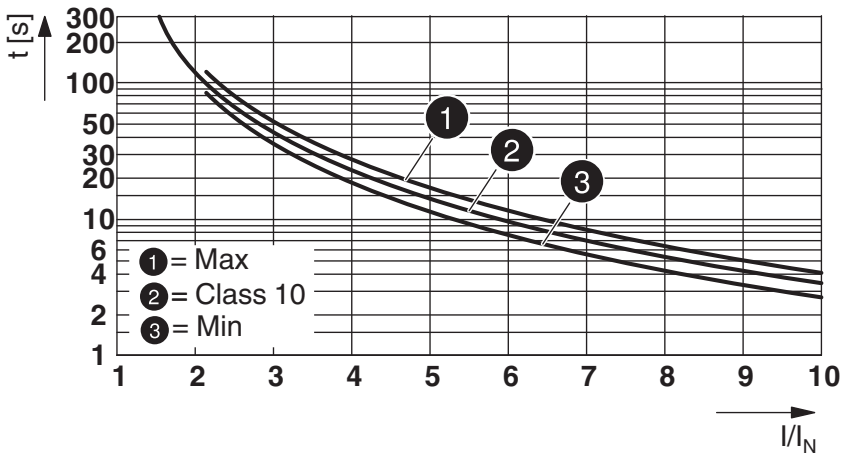

Figure 6 Trigger characteristic

t [s] Release time in seconds

I/I_N Overcurrent factor: the ratio between the actual current and the parameterized nominal current

9 A modules

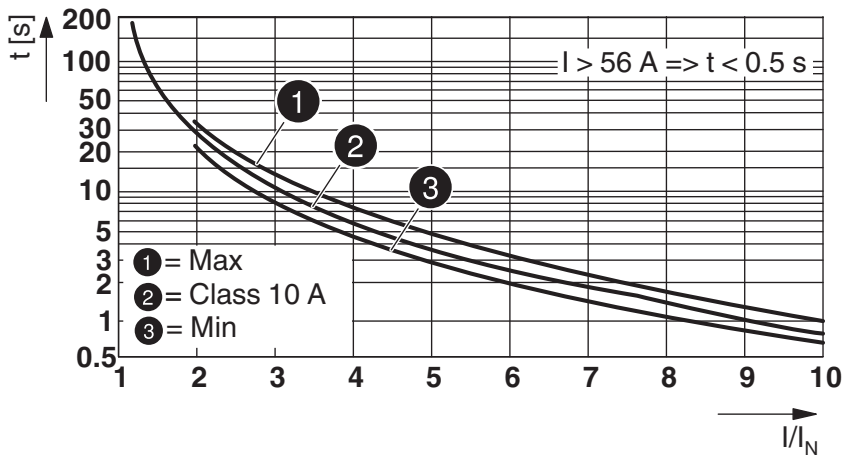

Figure 7 Trigger characteristic

t [s] Release time in seconds

I/I_N Overcurrent factor: the ratio between the actual current and the parameterized nominal current

14 Derating at 100% operating time

Additional data is available on request.

Ambient temperature [°C]	24	40	45	50	55
Max load current [A], aligned with 20 mm spacing	9	9	9	6.8	6.1
Max load current [A], aligned without spacing	5.2	5.2	3	-	-

The adjustment factors described here refer to hybrid motor starters with a maximum load current of 9 A. You can determine the maximum permissible rated current of the motor using the load current, the overcurrent factor (see data sheet of the relevant motor), and the derating table.

Derating table										
Overcurrent factor I_A/I_N	1	2	3	4	5	6	7	8	9	10
Adjustment factor K	1	1	1	1	1	1	0.88	0.77	0.69	0.62

Overcurrent factor 1 Utilization category AC-51
Overcurrent factor 8 Utilization category AC-53a

Example 1	
Motor with overcurrent factor I_A/I_N (from motor data sheet)	8
Adjustment factor K	0.77
Max. permissible load current I_L at 40°C, aligned (from derating table)	9 A
Max. permissible rated current I_N of the motor	6.9 A

Example 2	
Motor with overcurrent factor I_A/I_N (from motor data sheet)	5
Adjustment factor K	1
Max. permissible load current I_L at 45°C, aligned (from derating table)	3 A
Max. permissible rated current I_N of the motor	3 A