ELR H5-I-xx/500AC-xx-IFS

Networkable motor starter (CONTACTRON)

Data sheet
106270_en_02

1 Description

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

- Forward running
- Reverse running
- Motor overload protection
- Link to the INTERFACE system via the DIN rail connector (TBUS)

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 a communication interface, an EM-xxx-GATEWAY-IFS.

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, output current: 0.6 A, adjustable overload shutdown, and Push-in connection, DIN rail connector provided.	ELR H5-I-PT/500AC-06-IFS	2905144	1
Networkable hybrid motor starter for reversing 3~ AC motors up to 500 V AC, output current: 3 A, adjustable overload shutdown, and Push-in connection, DIN rail connector provided.	ELR H5-I-PT/500AC-3-IFS	2905146	1
Networkable hybrid motor starter for reversing 3~ AC motors up to 500 V AC, output current: 9 A, adjustable overload shutdown, and Push-in connection, DIN rail connector provided.	ELR H5-I-PT/500AC-9-IFS	2905147	1
Networkable hybrid motor starter for reversing 3~ AC motors up to 500 V AC, output current: 0.6 A, adjustable overload shutdown, and screw connection, DIN rail connector provided.	ELR H5-I-SC/500AC-06-IFS	2905157	1
Networkable hybrid motor starter for reversing 3~ AC motors up to 500 V AC, output current: 3 A, adjustable overload shutdown, and screw connection, DIN rail connector provided.	ELR H5-I-SC/500AC-3-IFS	2905159	1
Networkable hybrid motor starter for reversing 3~ AC motors up to 500 V AC, output current: 9 A, adjustable overload shutdown, and screw connection, DIN rail connector provided.	ELR H5-I-SC/500AC-9-IFS	2905160	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

Accessories	Type	Order No.	Pcs./Pkt.
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
Gateway for the connection of up to 32 INTERFACE system devices to a higher-level controller via PROFIBUS DP. The INTERFACE system devices are connected to the Gateway via DIN rail connectors, the DIN rail connectors are provided.	EM-PB-GATEWAY-IFS	2297620	1
Gateway for the connection of up to 32 INTERFACE system devices to a higher-level controller via EtherNet/IP™. The INTERFACE system devices are connected to the Gateway via DIN rail connectors, the DIN rail connectors are provided.	EM-ETH-GATEWAY-IFS	2901988	1
Gateway for the connection of up to 32 INTERFACE system devices via PROFINET to a higher-level controller. The INTERFACE system devices are connected to the Gateway via DIN rail connectors, the DIN rail connectors are provided.	EM-PNET-GATEWAY-IFS	2904472	1
Gateway for the connection of up to 32 INTERFACE system devices to a higher-level controller via CANopen®. The INTERFACE system devices are connected to the Gateway via DIN rail connectors, the DIN rail connectors are provided.	EM-CAN-GATEWAY-IFS	2901504	1
Gateway for the connection of up to 32 INTERFACE system devices to a higher-level controller via Modbus/RS-232. The INTERFACE system devices are connected to the Gateway via DIN rail connectors, the DIN rail connectors are provided.	EM-RS232-GATEWAY-IFS	2901526	1
Gateway for the connection of up to 32 INTERFACE system devices to a higher-level controller via Modbus/RS-485. The INTERFACE system devices are connected to the Gateway via DIN rail connectors, the DIN rail connectors are provided.	EM-RS485-GATEWAY-IFS	2901527	1
Gateway for the connection of up to 32 INTERFACE system devices via Modbus/TCP to a higher-level controller. The INTERFACE system devices are connected to the Gateway via DIN rail connectors, the DIN rail connectors are provided.	EM-MODBUS-GATEWAY-IFS	2901528	1
Gateway for the connection of up to 32 INTERFACE system devices to a higher-level controller via DeviceNet™. The INTERFACE system devices are connected to the Gateway via DIN rail connectors, the DIN rail connectors are provided.	EM-DNET-GATEWAY-IFS	2901529	1

Accessories	Type	Order No.	Pcs./Pkt.
Plug component, Nominal current: 8 A, Nominal current (Ex): 8 A, Nominal voltage (Ex): 125 V, Number of positions: 5, Pitch: 3.81 mm, Articles with gold-plated contacts, bus connectors for connecting with electronic housings	ME 22,5 TBUS 1,5/ 5-ST-3,81 GN	2707437	50
DIN rail bus adapter for ME and ME-MAX, design width: 22.5 mm, 5 parallel positions, color: light gray (similar to RAL 7035) Component housing, Color: light gray	ME 22,5 TBUS ADAPTER KMGY	2201756	50
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
Plastic label, Card, white, unlabeled, can be labeled with: THERMOMARK PRIME, THERMOMARK CARD, Mounting type: Adhesive, Lettering field: 15 x 5 mm	US-EMLP (15X5)	0828790	10
Plastic label, Sheet, white, unlabeled, can be labeled with: BLUEMARK CLED, BLUEMARK LED, CMS-P1-PLOTTER, PLOTMARK, Mounting type: Adhesive, Lettering field: 15 x 5 mm	UC-EMLP (15X5)	0819301	10
3-phase loop bridge for 2 CONTACTRON modules, with screw connection and 22.5 mm housing width, connecting cable: 0.3 m, with ferrules.	BRIDGE- 2	2900746	1
3-phase loop bridge for 3 CONTACTRON modules, with screw connection and 22.5 mm housing width, connecting cable: 0.3 m, with ferrules.	BRIDGE- 3	2900747	1
3-phase loop bridge for 4 CONTACTRON modules, with screw connection and 22.5 mm housing width, connecting cable: 0.3 m, with ferrules.	BRIDGE- 4	2900748	1
3-phase loop bridge for 5 CONTACTRON modules, with screw connection and 22.5 mm housing width, connecting cable: 0.3 m, with ferrules.	BRIDGE- 5	2900749	1
3-phase loop bridge for 6 CONTACTRON modules, with screw connection and 22.5 mm housing width, connecting cable: 0.3 m, with ferrules.	BRIDGE- 6	2900750	1
3-phase loop bridge for 7 CONTACTRON modules, with screw connection and 22.5 mm housing width, connecting cable: 0.3 m, with ferrules.	BRIDGE- 7	2900751	1
3-phase loop bridge for 8 CONTACTRON modules, with screw connection and 22.5 mm housing width, connecting cable: 0.3 m, with ferrules.	BRIDGE- 8	2900752	1
3-phase loop bridge for 9 CONTACTRON modules, with screw connection and 22.5 mm housing width, connecting cable: 0.3 m, with ferrules.	BRIDGE- 9	2900753	1
3-phase loop bridge for 10 CONTACTRON modules, with screw connection and 22.5 mm housing width, connecting cable: 0.3 m, with ferrules.	BRIDGE-10	2900754	1
3-phase loop bridge for 2 CONTACTRON modules, with screw connection and 22.5 mm housing width, connecting cable: 3 m, with ferrules included.	BRIDGE- 2-3M	2901543	1

Accessories	Type	Order No.	Pcs./Pkt.
3-phase loop bridge for 3 CONTACTRON modules, with screw connection and 22.5 mm housing width, connecting cable: 3 m, with ferrules included.	BRIDGE- 3-3M	2901656	1
3-phase loop bridge for 4 CONTACTRON modules, with screw connection and 22.5 mm housing width, connecting cable: 3 m, with ferrules included.	BRIDGE- 4-3M	2901659	1
3-phase loop bridge for 5 CONTACTRON modules, with screw connection and 22.5 mm housing width, connecting cable: 3 m, with ferrules included.	BRIDGE- 5-3M	2901545	1
3-phase loop bridge for 6 CONTACTRON modules, with screw connection and 22.5 mm housing width, connecting cable: 3 m, with ferrules included.	BRIDGE- 6-3M	2901697	1
3-phase loop bridge for 7 CONTACTRON modules, with screw connection and 22.5 mm housing width, connecting cable: 3 m, with ferrules included.	BRIDGE- 7-3M	2901698	1
3-phase loop bridge for 8 CONTACTRON modules, with screw connection and 22.5 mm housing width, connecting cable: 3 m, with ferrules included.	BRIDGE- 8-3M	2901700	1
3-phase loop bridge for 9 CONTACTRON modules, with screw connection and 22.5 mm housing width, connecting cable: 3 m, with ferrules included.	BRIDGE- 9-3M	2901701	1
3-phase loop bridge for 10 CONTACTRON modules, with screw connection and 22.5 mm housing width, connecting cable: 3 m, with ferrules included.	BRIDGE-10-3M	2901702	1
3-phase loop bridge for 2 modules from the CONTACTRON family with screw connection and 22.5 mm housing width, 1 m long connecting cable, without ferrules.	BRIDGE- 2-1M	2901542	1
3-phase loop bridge for 3 modules from the CONTACTRON family with screw connection and 22.5 mm housing width, 1 m long connecting cable, without ferrules.	BRIDGE- 3-1M	2901655	1
3-phase loop bridge for 4 modules from the CONTACTRON family with screw connection and 22.5 mm housing width, 1 m long connecting cable, without ferrules.	BRIDGE- 4-1M	2901658	1
3-phase loop bridge for 5 modules from the CONTACTRON family with screw connection and 22.5 mm housing width, 1 m long connecting cable, without ferrules.	BRIDGE- 5-1M	2901544	1
3-phase loop bridge for 6 modules in the CONTACTRON family with 1 m long connecting cable without ferrules, 22.5 mm housing width.	BRIDGE- 6-1M	2901649	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	60 mA
Protective circuit	Surge protection Reverse polarity protection Parallel polarity protection diode
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	75 mA ... 600 mA / 180 mA ... 3 A / 1.5 A ... 9 A
Trigger characteristic in acc. with IEC 60947-4-2	Class 10 / Class 10 / Class 10A
Cooling time	20 min. (for auto reset)
Rated operating current I_e AC-51	0.6 A / 3 A / 9 A
Rated operating current I_e AC-53a	0.6 A / 3 A / 7 A
Leakage current	0 mA / 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
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 / 2.5 W ; 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	Push-in connection	Screw connection
Connection name	**Control circuits**	**Control circuits**
Conductor cross section, solid	0.2 mm² ... 2.5 mm²	0.2 mm² ... 2.5 mm²
Conductor cross section, flexible	0.2 mm² ... 2.5 mm²	0.2 mm² ... 2.5 mm²
Conductor cross section [AWG]	24 ... 14	24 ... 14
Tightening torque		0.5 Nm ... 0.6 Nm (5-7 lbs-in)
Connection name	**Load circuit**	**Load circuit**
Conductor cross section, solid	0.2 mm² ... 2.5 mm²	0.2 mm² ... 2.5 mm²
Conductor cross section, flexible	0.2 mm² ... 2.5 mm²	0.2 mm² ... 2.5 mm²
Conductor cross section [AWG]	24 ... 14	24 ... 14
Tightening torque		0.5 Nm ... 0.6 Nm (5-7 lbs-in)
Stripping length	10 mm	8 mm

Ambient conditions	
Ambient temperature (operation)	-5 °C ... 60 °C (observe derating)
Ambient temperature (storage/transport)	-40 °C ... 80 °C

Standards/regulations	
Standards	IEC 60947-1 EN 60947-4-2

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

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.
- Startup, mounting, modifications, and upgrades should only be carried out by a skilled electrical engineer!
- Disconnect the power to the module.
- During operation, parts of electrical switching devices carry hazardous voltages.
- During operation, the protective covers must not be removed from the electric switchgear.
- 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.
- The equipment must not be exposed to mechanical or thermal influences that exceed the limits as described in the operating instructions. If required, the device should be installed in an appropriate housing with a suitable degree of protection (e. g. IP54) according to IEC 60529/EN 60529 to provide protection against mechanical and electrical damage.
- Install the device according to the instructions in the installation instructions. Access to circuits within the device is not permitted.
- The operating equipment cannot be repaired by the user and must be replaced by an equivalent device. Repairs may only be carried out by the manufacturer.
- 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 load current:
  ELR H5-.../500AC-06: ≥ 75 mA
  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	0,6 A (480 V AC) / 3 A (480 V AC) / 7,6 A (480 V AC)

6 Operating and indication elements

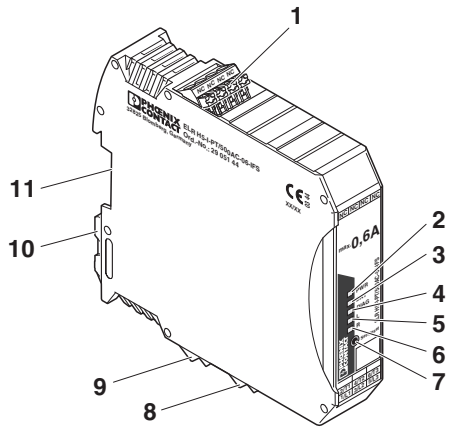

Figure 1 Operating and indication elements

1 Terminal block with no function
2 LED green PWR: Device status
3 LED green DAT: Bus communication
4 LED red/yellow DIAG: Device or process error
5 LED yellow L: Reverse running
6 LED yellow R: Forward running
7 Reset button
8 3-phase output voltage
9 3-phase input voltage
10 Metal lock for fixing to DIN rail
11 Connection option for DIN rail connector

7 Connection notes

WARNING: Danger to life by electric shock!

Never carry out work 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

Screw connection:

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

Push-in connection:

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

7.2 Assembly

The TBUS DIN rail connector makes the INTERFACE system communication and/or power supply of individual INTERFACE system devices possible.

NOTE

The use of the TBUS DIN rail connector for the supply of modules is only possible with 24 V DC devices.

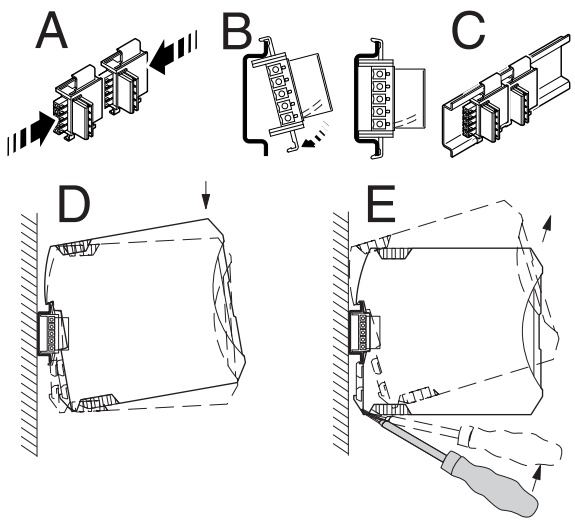

Figure 2 Assembly

Connect the required number of TBUS DIN rail connectors (Order No. 2707437) together.

When placing the gateway onto the DIN rail, make sure that it is aligned correctly with the TBUS.

Power is supplied on the gateway or a power terminal. Observe the permissible current carrying capacity.

7.3 Connecting cables

Push-in connection:

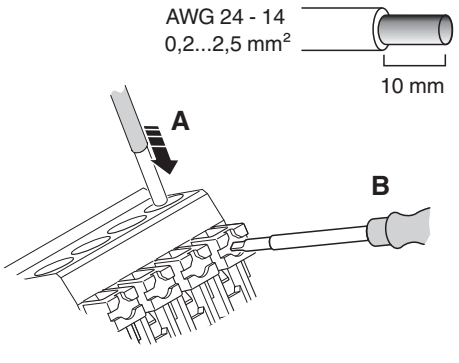

Figure 3 Push-in connection

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.

Screw connection:

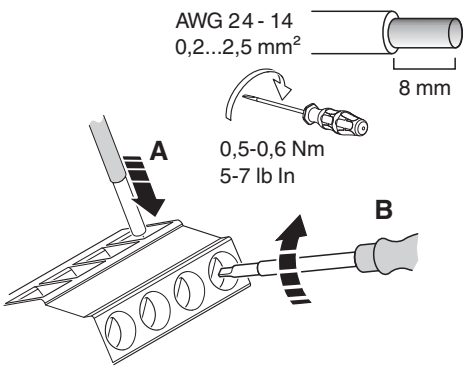

Figure 4 Screw connection

- Strip off each individual wire to 8 mm.
- Insert the wire into the corresponding connection terminal block.
- Use a screwdriver to tighten the screw in the opening above the connection terminal block.

7.4 Block diagram

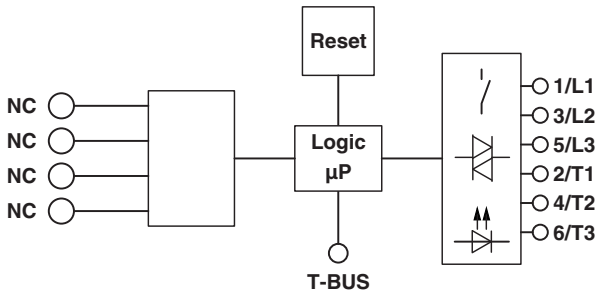

Figure 5 Block diagram

7.5 Setting and displaying the interface system address

For further information, please refer to the product documentation for the EM-xxx-GATEWAY-IFS modules at phoenixcontact.net/products.

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	Bus 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
No bus	Device is not integrated into a bus.	E / B	A	X	X	X	Ne
Data traffic	Device is integrated into bus; cyclic or acyclic communication occurs.	E / B	E	X	X	X	Ne
Parameterization	Parameterization of device occurs	E	B	X	X	X	Ne
Drive switched on	Reverse running (L)	E	E	A	E	A	Ne
	Forward running (R)	E	E	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 restoring the system state: Checksum error. The thermal memory of the motor protection function is set to the maximum value. The error must be manually acknowledged.				Message via bus or DTM		
	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.						
	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
Configuration errors	It is determined during installation of the device that the configuration is faulty. Load the correct configuration.	E / B	X	B_{ye}	A	A	Nm

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.

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 or the DTM.

8.3 Parameterization - Nominal current setting

- Parameterize the device for the nominal current that matches the connected motor during startup, via either the bus or a DTM.

See also the “Process data > Nominal motor current setting” section.

- Check the current value with the LEDs.

When setting the nominal current, the PWR LED flashes green. The other LEDs (DAT, DIAG, L, R) light up in a specific combination depending on the current setting value.

Bit				Nominal current [mA]		
3	2	1	0			
DAT	DIAG	L	R	0.6 A	3 A	9 A
0	0	0	0	75	180	1500
0	0	0	1	110	300	2000
0	0	1	0	145	440	2500
0	0	1	1	180	600	3000
0	1	0	0	215	680	3500
0	1	0	1	250	880	4000
0	1	1	0	285	1000	4500
0	1	1	1	320	1100	5000
1	0	0	0	355	1200	5500
1	0	0	1	390	1500	6000
1	0	1	0	425	1600	6500
1	0	1	1	460	1900	7000
1	1	0	0	495	2100	7500
1	1	0	1	530	2400	8000
1	1	1	0	565	2700	8500
1	1	1	1	600	3000	9000

- Press the reset button to store the current value.
- If you do not press the reset button, the current value stored in the device does not change.

NOTE

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

9 Application examples

9.1 Connection examples

The example shows a reversing starter with motor protection and EM-...-GATEWAY-IFS connection via the TBUS.

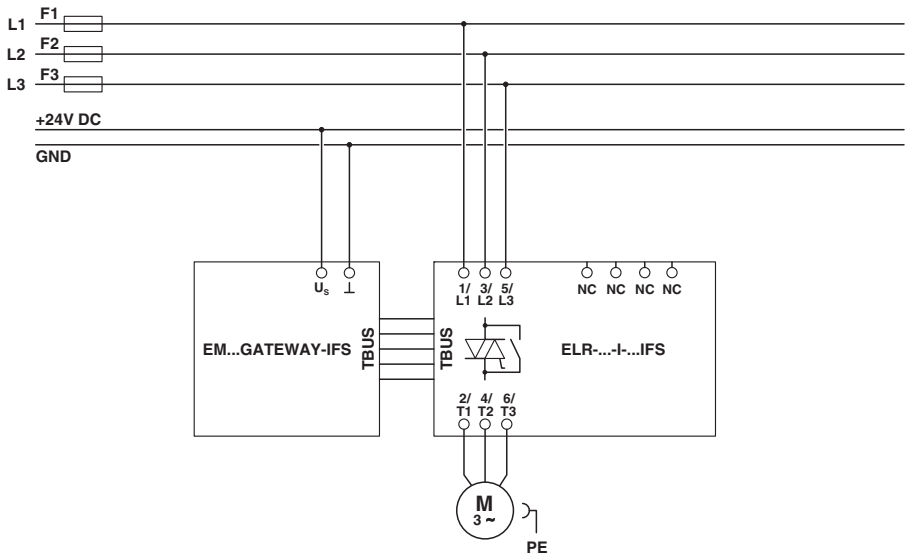

Figure 6 Example application

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 Configuration

You can either configure the module via the controller used or via the S-PORT on the connected EM-xx-GATEWAY-IFS using the CONTACTRON-DTM-IFS software.

This section describes the CONTACTRON-DTM-IFS software.

A quick start guide can be downloaded for the product at phoenixcontact.net/products.

10.1 Overview

The overview dialog box displays all the operating data and status messages that provide initial information. This overview provides a quick and comprehensive summary of the system state.

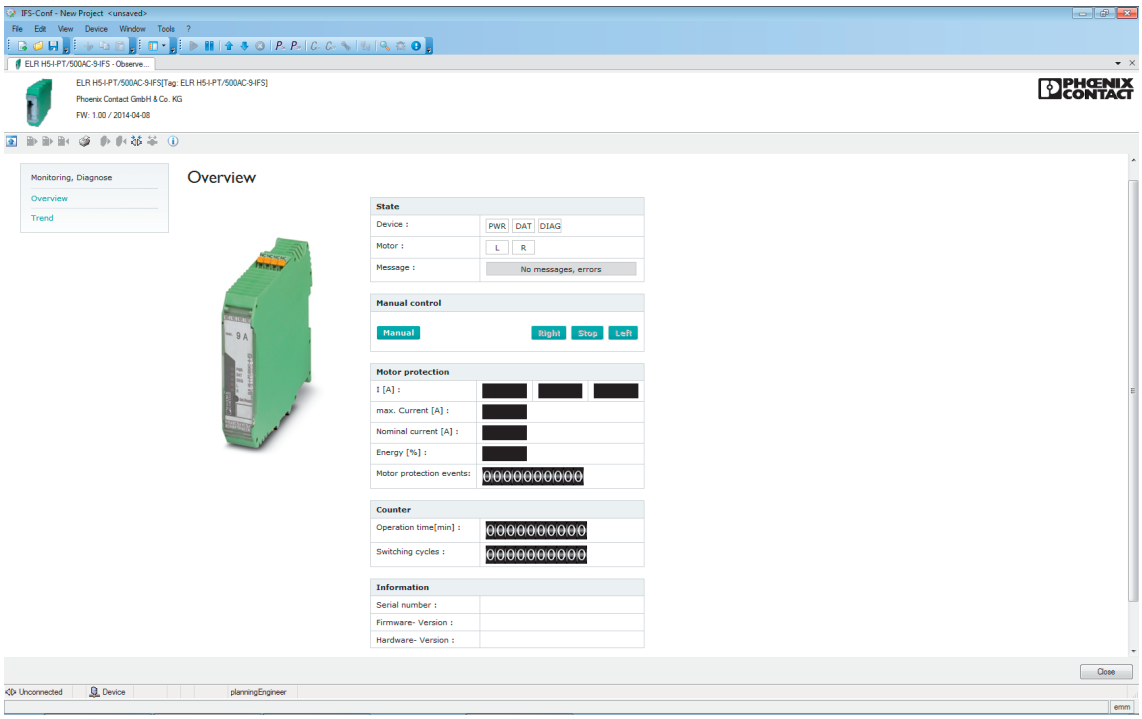

Figure 7 Overview dialog box

Area	Value	Description
Status	**PWR**	Device status
	DAT	Bus communication
	DIAG	Device or process error
	EN	Status enable input
	L	Reverse running
	R	Forward running
Manual control	Manual	Manual control
	Right	Manual control, forward running
	Stop	Manual control stop
	Left	Manual control, reverse running
Motor protection	I [A]	Display of the current of the three phases
	max. current [A]	Display of the currently highest motor current of the three phases
	Nominal current [A]	Display of the set nominal motor current
	Power [%]	Display of the thermal replica of the motor
	Motor protection events	Display of the number of motor protection trips
Counter	Operating time [min]	Display of operating times
	Cycles	Display of cycles
Information	Serial number	Display of the serial number of the module used
	Firmware version	Display of the firmware version of the module in use
	Hardware version	Display of the hardware version of the module used

10.2 Trend

The trend dialog box displays the current flow of the motor.

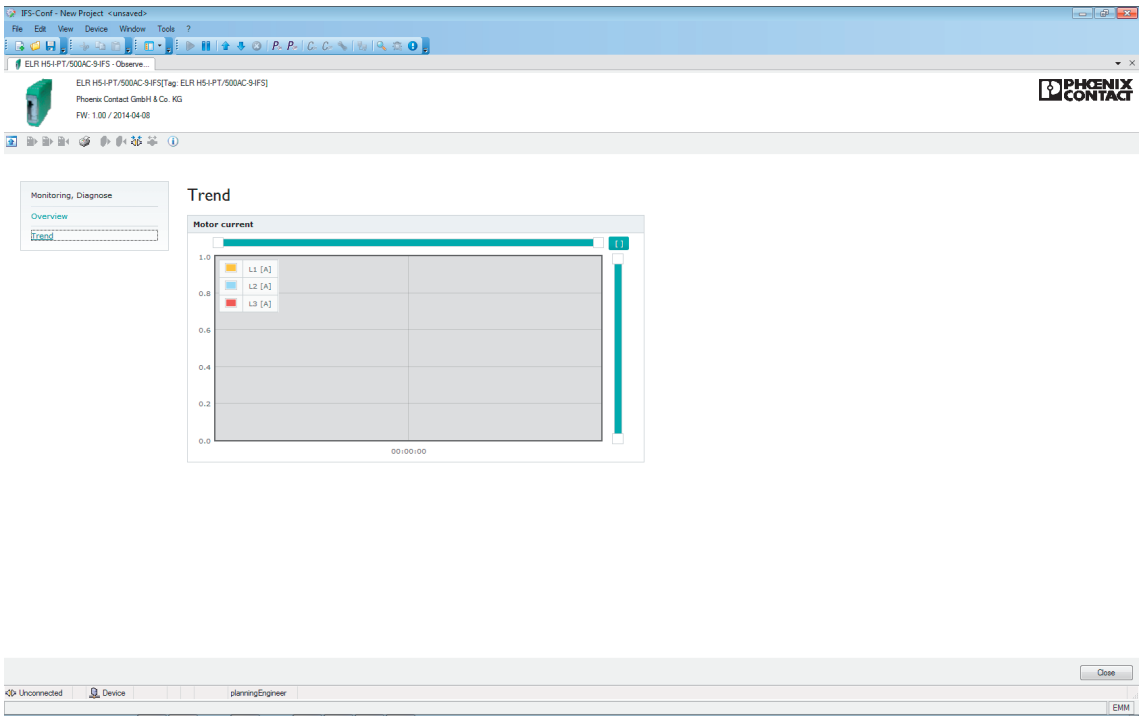

Figure 8 Trend dialog box

Area	Value	Description
Trend	Motor current	Current current flow of the three phases

10.3 Configuration

You can make the settings for the configuration in the configuration dialog box and confirm them with “OK”.

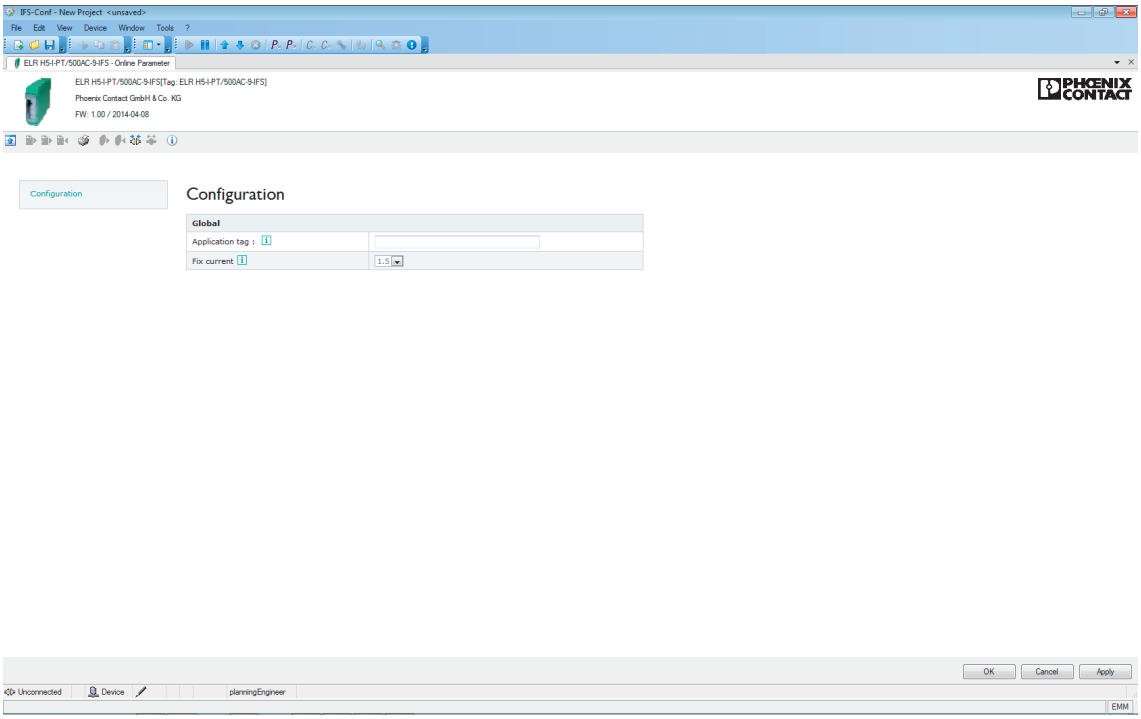

Figure 9 Configuration

Area	Value	Description
General	AKZ	System ID, max. 32 characters
	Nominal motor current	Nominal motor current setting - you must confirm the value on the device by pressing the reset button

A window appears containing an overview of your configuration.

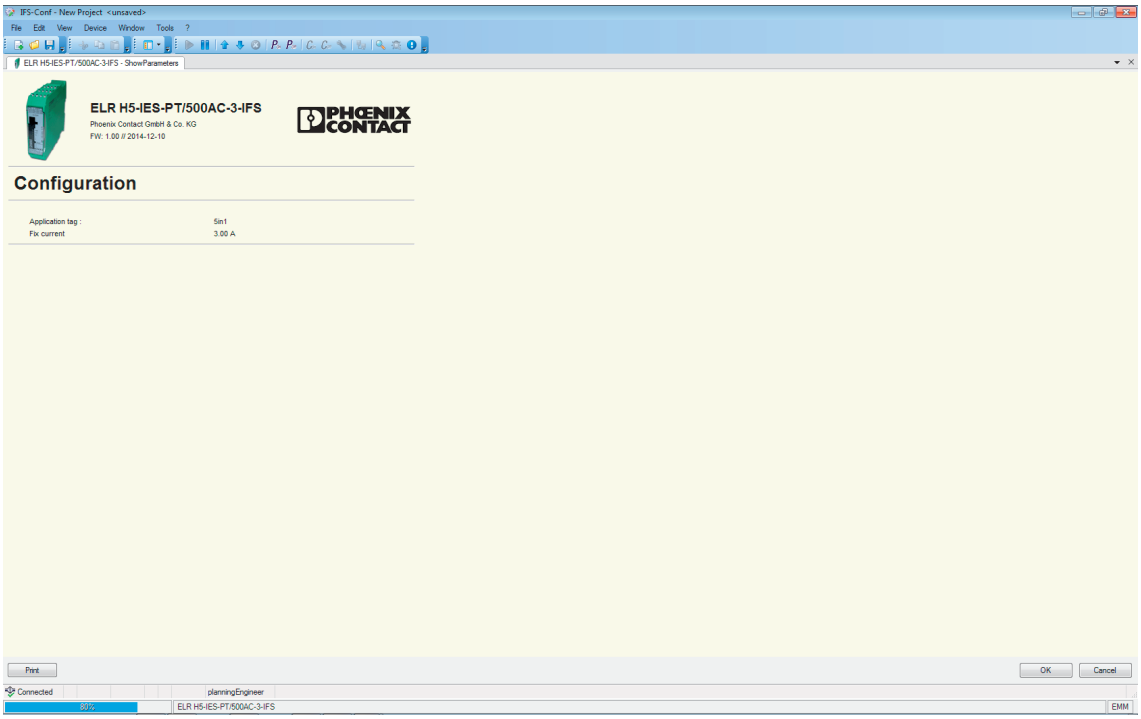

Figure 10 Configuration

Confirm this configuration with “OK” and the data will be transferred to the device.

The data from the device is applied by pressing the reset button.

If the supply voltage is interrupted before the reset button is pressed, the device restarts at the same point on the next startup and waits for confirmation.

“Cancel” makes the configuration in the device invalid and the device enters the “Invalid configuration” error state.

A voltage reset must be performed in order to remove this error state.

11 Process data

In addition to the cyclical input and output bytes, acyclic objects can also be read out/written via the electronic hybrid motor starter.

11.1 Firmware Version 1.0

The following process data is available as of firmware Version 1.0.

11.1.1 Device state

PDC	Bit	Description	Value
DEVICE_STATE	0	Device in controllable state	0: device can be controlled
			1: device cannot be controlled (motor protection has been tripped or an internal error has occurred)
	1	Right direction of rotation is activated	0: no device control for forward running
			1: device control for forward running
	2	Left direction of rotation is activated	0: no device control for reverse running
			1: device control for reverse running
	6 ... 3	Reserved	
	7	Internal device error	0: device has no internal error
			1: device is in an internal device error state
	15 ... 8	Reserved	

11.1.2 Set nominal motor current

PDC	Bit	Description	Value
FIX_CURRENT	0...3	Query set nominal motor current	0000: smallest value overload trip
			1111: largest value overload trip

11.1.3 Largest phase current [%]

PDC	Bit	Description	Value
CURRENT_MAX_PERC	7 ... 0	Current largest current of the three phases as a percentage, in relation to the set nominal current	0...255 %

11.1.4 Thermal load

PDC	Bit	Description	Value
THERMAL_LOAD	7 ... 0	Current load of the motor model as a percentage (max. 255 %)	0...255 %

11.1.5 Largest phase current [A]

PDC	Bit	Description	Value
CURRENT_MAX_AMP	15 ... 0	Current largest current of the three phases in amps	Current value in 10 mA, e.g.: 1267 = 12.67 A

11.1.6 Phase current L1 [%]

PDC	Bit	Description	Value
CURRENT_L1	7 ... 0	Current current of phase L1 as a percentage, in relation to the set nominal motor current	0...255 %

11.1.7 Phase current L2 [%]

PDC	Bit	Description	Value
CURRENT_L2	7 ... 0	Current current of phase L2 as a percentage, in relation to the set nominal motor current	0...255 %

11.1.8 Phase current L3 [%]

PDC	Bit	Description	Value
CURRENT_L3	7 ... 0	Current current of phase L3 as a percentage, in relation to the set nominal motor current	0...255 %

11.1.9 Channel status

PDC	Bit	Description	Value
CHN_STATE_HI	14 ... 0	Reserved	
	15	Current channel status high word, reset status	0: channel status reset is not possible
			1: Channel status reset is possible
CHN_STATE_LO	0	Overload pre-warning	0: no overload pre-warning (thermal load < 105%)
			1: Overload advance warning (thermal load > 105%)
	1	Overload	0: no overload (thermal load < 115%)
			1: overload (thermal load > 115%)
	2	Blocking	0: no blocking
			1: blocking
	3	Phase imbalance ≥33% and < 67%	0: phase imbalance < 33%
			1: phase imbalance ≥ 33% and < 67%
	4	Phase imbalance ≥67%	0: phase imbalance ≥67%
			1: phase imbalance ≥67%
	5	Phase failure	0: all phases present
			1: Phase failure
	6	Mains power failure	0: all phases present
			1: Failure of all three phases
	15 ... 7	Reserved	

11.1.10 Counter overload trips

PDC	Bit	Description	Value
TRIP_CNT_LO	15 ... 0	Counter for overload trips low word (32-bit)	0000: smallest value overload trip
			1111: largest value overload trip
TRIP_CNT_HI	31 ... 16	Counter for overload trips high word (32-bit)	0000: smallest value overload trip
			1111: largest value overload trip

11.1.11 Operating cycle counters

PDC	Bit	Description	Value
SWITCH_CNT_LO	15 ... 0	Operating cycle counter low word (32-bit)	0000: smallest value operating cycle counter
			1111: largest value operating cycle counter
SWITCH_CNT_HI	31 ... 16	Operating cycle counter high word (32-bit)	0000: smallest value operating cycle counter
			1111: largest value operating cycle counter

11.1.12 Emergency tripping counter

PDC	Bit	Description	Value
BLOCK_CNT_LO	15 ... 0	Counter for emergency tripping low word (32-bit)	0000: smallest value emergency tripping
			1111: largest value emergency tripping
BLOCK_CNT_HI	31 ... 16	Emergency tripping counter high word (32-bit)	0000: smallest value emergency tripping
			1111: largest value emergency tripping

11.1.13 Motor control and reset (level-triggered)

PDC	Bit	Description	Value
CONTROL_SWITCH	0	Forward running (level-triggered/ switch)	0: forward running stop
			1: forward running start
	1	Reverse running (level-triggered/ switch)	0: reverse running stop
			1: reverse running start
	2	Manual reset	0: no function
			1: manual reset
	3	Automatic reset	0: no function
			1: automatic reset
	15 ... 4	Reserved	

11.1.14 Nominal motor current setting

See also the “Parameterization: nominal current setting” section.

PDC	Bit	Description	Value
SET_FIX_CURRENT	3 ... 0	Nominal motor current setting	0000: smallest nominal current setting
			1111: largest nominal current setting
	14 ... 4	Reserved	
	15	Identification for valid nominal current setting	0: no valid nominal current setting
			1: valid nominal current setting

11.1.15 Motor control and reset (edge-triggered)

PDC	Bit	Description	Value
CONTROL_BUTTON	0	Reverse running (edge-controlled/ button)	0: no reverse running start
			1: reverse running start
	1	Stop (edge-controlled/button)	0: no stop
			1: stop
	2	Forward running (edge-controlled/ button)	0: no forward running start
			1: forward running start
	3	Automatic reset	0: no automatic reset
			1: automatic reset
	5 ... 4	Reserved	
	6	Manual reset	0: no function
			1: manual reset
	15 ... 7	Reserved	

11.2 Firmware Version 1.1

The following process data is available as of firmware Version 1.1.

11.2.1 Extended device state

PDC	Bit	Description	Value
DEVICE_STATE_ALL	0	Device in controllable state	0: device can be controlled
			1: device cannot be controlled (motor protection has been tripped or an internal error has occurred)
	1	Right direction of rotation is activated	0: no device control for forward running
			1: device control for forward running
	2	Left direction of rotation is activated	0: no device control for reverse running
			1: device control for reverse running
	4 ... 3	Reserved	
	5	Internal device error	0: device has no internal error
			1: device is in an internal device error state
	6	Acknowledgment for nominal current 1 expected	0: nominal current 1 acknowledged
			1: acknowledgment for nominal current 1 expected
	7	Internal device error	0: device has no internal error
			1: device is in an internal device error state
	8	Reserved	
	9	Overload pre-warning	0: no overload pre-warning (thermal load < 105%)
			1: Overload advance warning (thermal load > 105%)
	10	Overload	0: no overload (thermal load < 115%)
			1: overload (thermal load > 115%)
	11	Blocking	0: no blocking
			1: blocking
	12	Phase imbalance ≥33% and < 67%	0: phase imbalance < 33%
			1: phase imbalance ≥ 33% and < 67%
	13	Phase imbalance ≥67%	0: phase imbalance ≥67%
			1: phase imbalance ≥67%
	14	Phase failure	0: all phases present
			1: Phase failure
	15	Mains power failure	0: all phases present
			1: Failure of all three phases

11.2.2 Extended motor control (level-triggered) with reset and nominal current setting

PDC	Bit	Description	Value
CTRL_SWITCH_ALL	0	Forward running (level-triggered/ switch)	0: forward running stop
			1: forward running start
	1	Reverse running (level-triggered/ switch)	0: reverse running stop
			1: reverse running start
	2	Manual reset	0: no function
			1: manual reset
	3	Automatic reset	0: no automatic reset
			1: automatic reset
	7 ... 4	Reserved	
	11 ... 8	Nominal motor current setting	0000: smallest nominal current setting
			1111: largest nominal current setting
	14 ... 12	Reserved	
	15	Identification for valid nominal current setting	0: no valid nominal current setting
			1: valid nominal current setting

11.2.3 Extended motor control (edge-controlled) with reset and nominal current setting

PDC	Bit	Description	Value
CTRL_BUTTON_ALL	0	Reverse running (edge-controlled/ button)	0: no reverse running start
			1: reverse running start
	1	Stop (edge-controlled/button)	0: no stop
			1: stop
	2	Forward running (edge-controlled/ button)	0: no forward running start
			1: forward running start
	3	Automatic reset	0: no automatic reset
			1: automatic reset
	5 ... 4	Reserved	
	6	Manual reset	0: no function
			1: manual reset
	7	Reserved	
	11 ... 8	Nominal motor current setting	0000: smallest nominal current setting
			1111: largest nominal current setting
	14 ... 12	Reserved	
	15	Identification for valid nominal current setting	0: no valid nominal current setting
			1: valid nominal current setting

12 Trigger characteristic

0.6 A and 3 A modules

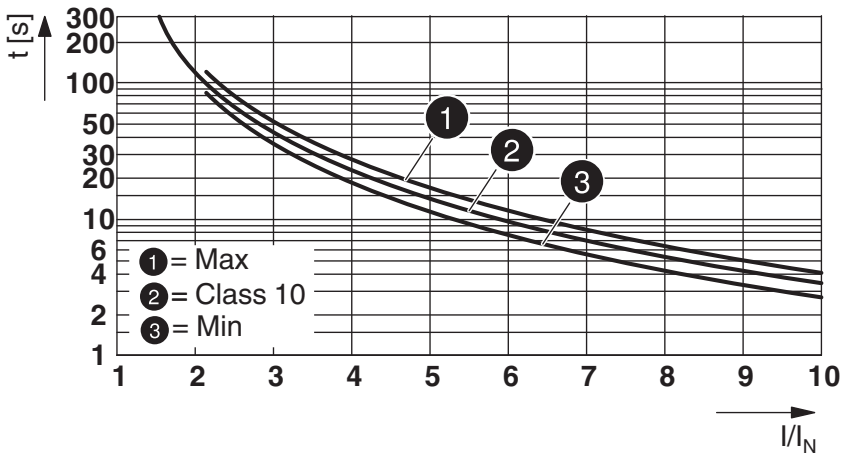

Figure 11 Trigger characteristic

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

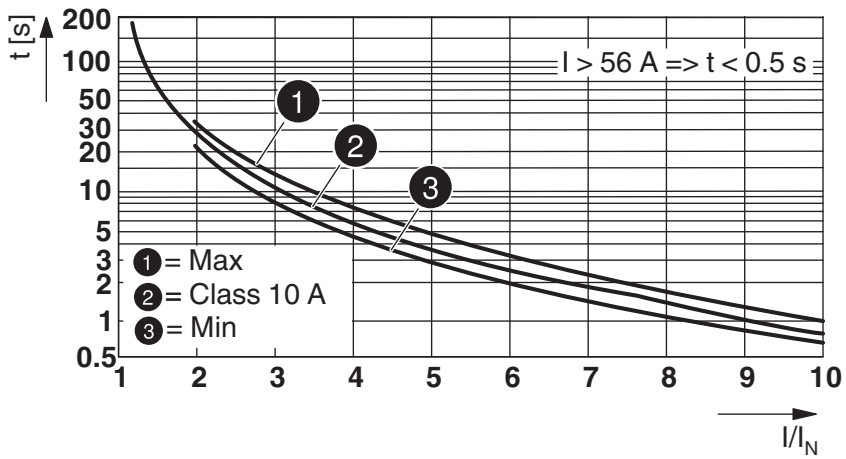

Figure 12 Trigger characteristic

t [s] Release time in seconds

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

13 Derating at 100% operating time

Additional data is available on request.

Ambient temperature [°C]	24	40	45	50	55	60
Max load current [A], aligned with 20 mm spacing	9	9	9	7.6	7.6	6.5
Max load current [A], aligned without spacing	6.5	6.5	6.1	5.2	4,6	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

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 45°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 55°C, aligned (from derating table)	4.6 A
Max. permissible rated current I_N of the motor	4.6 A

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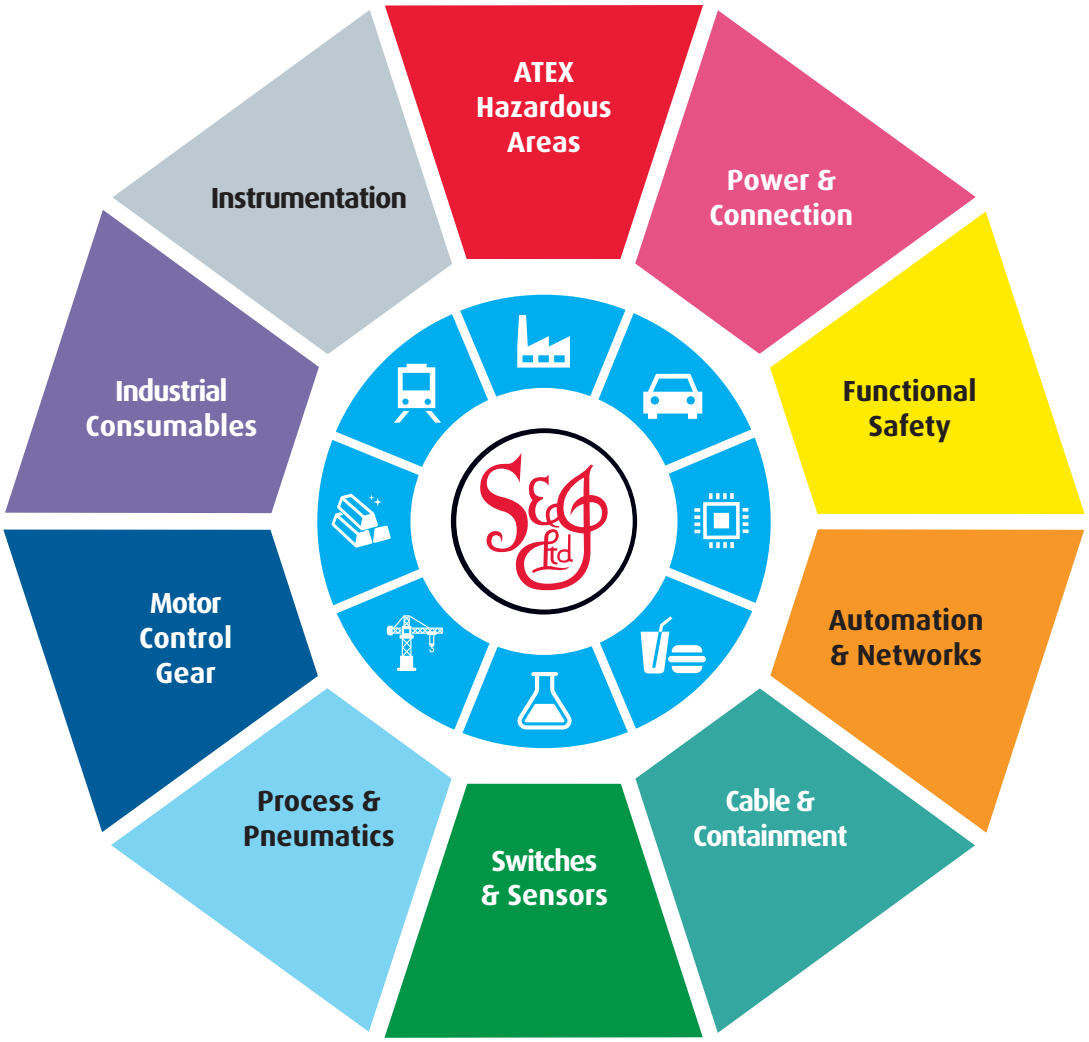

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