HE 5697 MFC

Multifunctional controller

Device description

(Translation of the original operating manual)

321859 | Version 1.4

HESCH
AUTOMATION PARTNER

Imprint

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Publisher:
HESCH Industrie Elektronik GmbH, Documentation Department

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1 Foreword

1.1 Information regarding the usage of this device description

Structure

Chapter 1	**Foreword** Information on chapter structure, document history, intended use and device safety
Chapter 2	**Safety information** Important safety information regarding the multifunctional controller
Chapter 3	**Device description** Description of the multifunctional controller, display and control elements, connection areas and technical specifications
Chapter 4	**Installation** Description of installation, dimensions and scope of delivery
Chapter 5	**Electrical commissioning** Connection of supply voltage and input/output signals
Chapter 6	**Software / Programming** Description for transferring the project to the multifunctional controller
Chapter 7	**Operation**
Chapter 8	**Controls**
Chapter 9	**Maintenance and service** Information regarding control operations and disposal
Chapter 10	**Technical appendix** Description of optional components

Target group

This device description is intended for qualified electricians that will install, wire, commission and put the HE 5697 MFC multifunctional controller into operation.

Document history

Date / version	Description
09/2014 / 1.0	First creation / Draft
05/2015 / 1.1	Assembly instructions updated; Chapter 6 (Software) updated; various corrections to content.
06/2015 / 1.2	Technical appendix I/O card: Converter resolution resolved.
09/2015 / 1.3	Chapter 3 (Relay outputs) Text supplement Control contactor; Chapter 10 (Counter input) Text corrected.
10/2019 / 1.4	Chapter 3 (configuration variations), chapter 10: Technical appendix (IO cards/ communication cards

1.2 Legal provisions

Manufacturer

HESCH Industrie-Elektronik GmbH, Boschstraße 8, D-31535 Neustadt, Germany

Intended use

- The HE 5697 MFC multifunctional controller is used for switching or continuous control with sequence control and electrical measured value recording.
- The multifunctional controller can be operated within the usage and ambient conditions stated in this manual without causing any safety risks.
- The manufacturer is not liable for improper usage and the resulting personnel injuries or damage; the risk lies entirely with the operator. Failure to comply with the above mentioned criteria regarding intended use may void the warranty – the manufacturer cannot be held liable for damage to the device in this case.

Personnel qualification

Only qualified electricians with the appropriate knowledge in the field of electrical engineering are allowed to conduct any work on the multifunctional controller.

Device safety

The device was built and tested in accordance with VDE 0411 / EN 61010-1 and has left the factory in an operationally safe condition. In order to maintain this condition and to ensure safe operation, the user has to follow the instructions and warnings contained in this manual, see chapter 2 "Safety information" *on page 8*.

2 Safety information

2.1 Symbols and basic safety information

This chapter contains important safety provisions and information. In order to protect against personnel injury and damage, it is necessary to carefully read this chapter before working with the device.

Used symbols

The following symbols are used in this device description. All safety information notes are structured in a uniform manner.

Warning of personnel injury!
The severity of the danger is indicated by the respective signal word, *see page 9*.

Warning of explosive atmosphere!

Warning of dangerous electrical voltage!

Warning of material damage due to electrostatic charging!

Warning of material damage!

Note!
Indicates possible malfunctions and provides information regarding optimal operating conditions.

Signal words

DANGER!
Indicates an immediate danger with *high* risk that will result in death or serious injury if not avoided.
WARNING!
Indicates a possible danger with *medium* risk that may result in death or serious injury if not avoided.
CAUTION!
Indicates a danger with *low* risk that might result in slight or moderate injury if not avoided.

Structure of warning notes

All warning notes in these operating instructions are structured in a uniform manner. The pictogram designates the type of danger.

SIGNAL WORD!
An informative text describes the danger and suggests how it can be avoided.

2.2 Safety during the individual phases of operation

The following safety information must be observed when installing the multifunctional controller and during operation.

Danger of electric shock!
Disconnect the power supply before working on the device. Install the electrical lines in accordance with the respectively applicable local regulations (VDE 0100 in Germany). Lay the measuring lines separately from the power lines. Produce a connection between the protective ground connection (in the respective device carrier) and a protective ground.

Danger of electric shock!
Any interruption of the protective ground in the device carrier may cause the device to become dangerous. Deliberate interruptions are not permissible. If it can be assumed that safe operation is no longer possible, then the device shall be put out of commission and be secured against unintended operation or re-activation.

Danger of electric shock!
Do not open the device under voltage! When opening the devices or removing covers and parts, live parts may become exposed. Connecting points may also be live!

Caution!
The device may not be put into operation when there is visible damage on the device.

Caution!
Observe the accident prevention regulations applicable to the system, such as BGV A 3 "Electrical Systems and Equipment" during installation, commissioning, maintenance and troubleshooting.

Caution!
Clean soiled contacts using oil-free compressed air or spirit and a lint-free cloth.

Material damage due to electrostatic charging!
Observe the safety measures according to DIN EN 61340-51/-3 in order to prevent electrostatic discharging!

Electrical connection!
Install the electrical lines in accordance with the respectively applicable local regulations (VDE 0100 in Germany). Lay the measuring lines separately from the power lines. Produce a connection between the protective ground connection (in the respective device carrier) and a protective ground.

Troubleshooting!
When beginning to troubleshoot, all possible sources of error regarding additional equipment or cables (measuring lines, wiring, slave devices) should be taken into consideration. If no error source can be found after examining these points, we recommend to send the device to the supplier.

Decommissioning!
Disconnect the power supply entirely if the device is to be decommissioned. Secure the device against inadvertent operation!
If the device is interconnected with other devices and/or equipment, the effects of the deactivation should be considered prior to disconnecting the device and the appropriate precautions should be taken beforehand.

The following provisions must be observed:

- Attach the cables to the connections and terminals correctly.
- It is only permitted to clean the housing with wet cleaning agents in order to avoid static charging.
- It is required to clean the device in order to prevent increased dust formation.

3 Device description

3.1 Overview

3.1.1 Front side

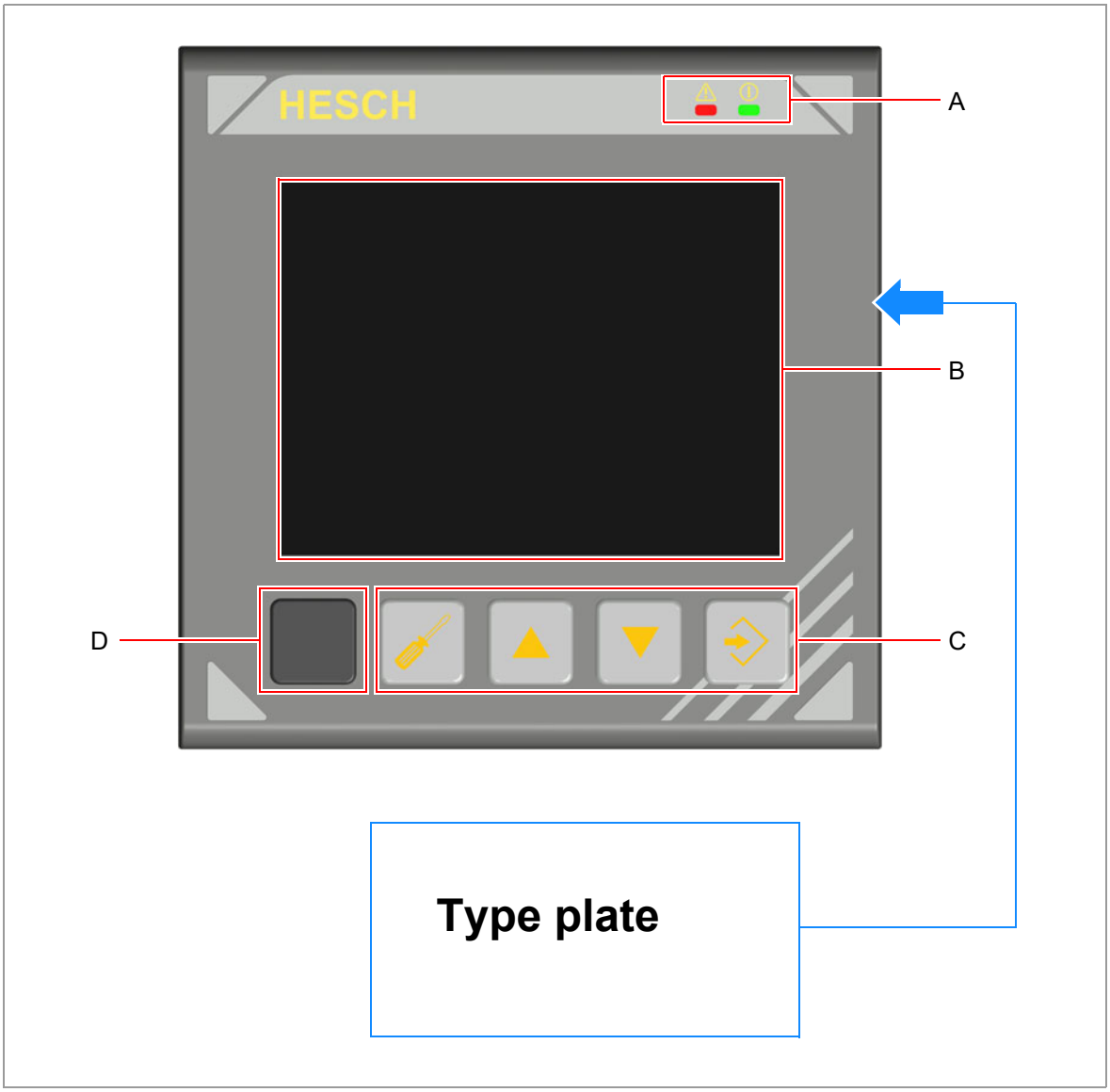


Fig. 3.1: Overview of front side

A. Display elements
B. Resistive touch screen
C. Control elements
D. Mini-USB front interface (galvanically isolated)

3.1.2 Rear side

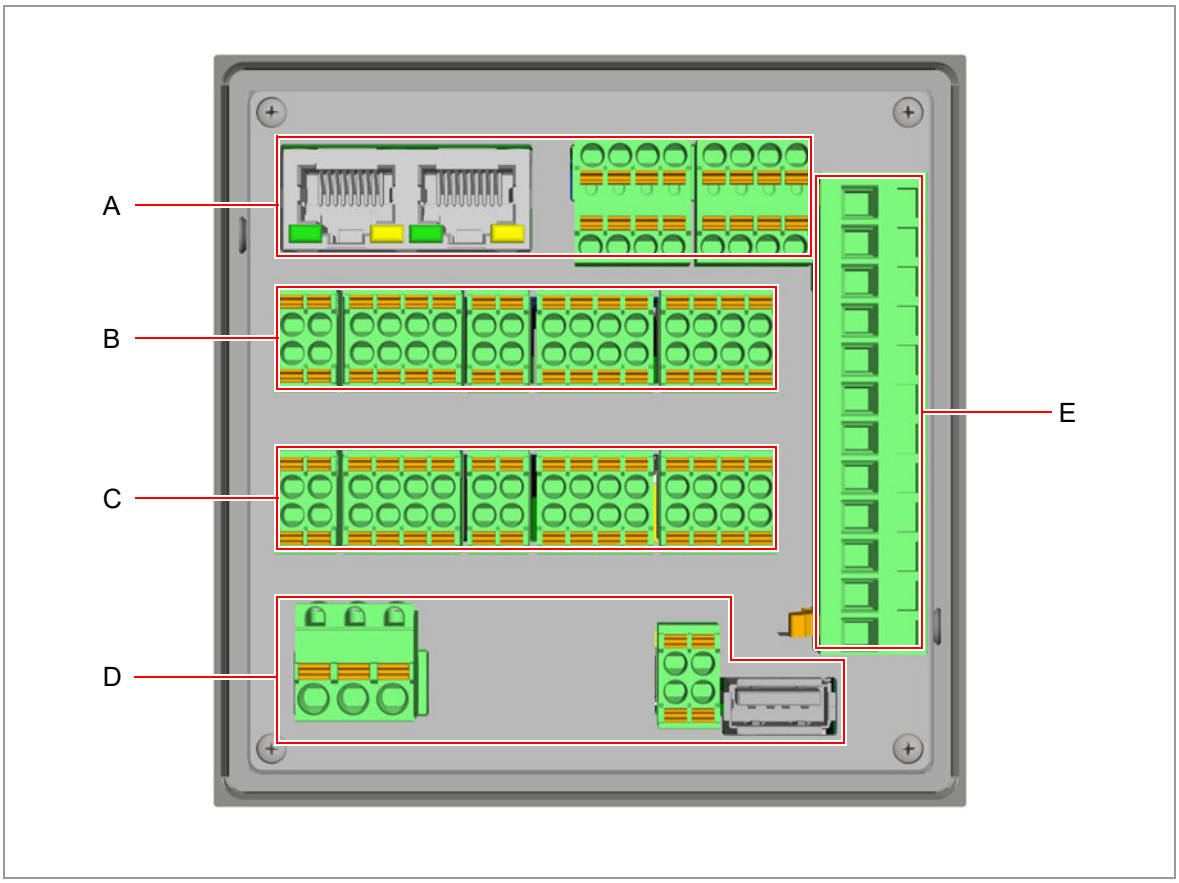


Fig. 3.2: Overview of the rear side when fully equipped (connection area)

A. Slot C (optional and variable), *see page 19*.

B. Slot B (optional and variable), *see page 18*.

C. Slot A (optional and variable), *see page 17*.

D. Power supply slot, *see page 16*.

E. Relay outputs, *see page 21*.

3.2 Display and control elements

Symbols	Meaning
	Freely assignable display element, see chapter 6 "Software / Programming" *on page 28*.
	• Power on (if no program is started) • After starting the program, the function of the LED is determined by the started program. • Freely assignable display element, see chapter 6 "Software / Programming" *on page 28*.
	Freely assignable control element, see chapter 6 "Software / Programming" *on page 28*.
	Freely assignable control element, see chapter 6 "Software / Programming" *on page 28*.
	Freely assignable control element, see chapter 6 "Software / Programming" *on page 28*.
	Freely assignable control element, see chapter 6 "Software / Programming" *on page 28*.
	Resistive touch screen Resolution 320 × 240 pixels QVGA

3.3 Technical data

Technical data	
Intended use:	The multifunctional controller is used for switching or continuous control with sequence control and electrical measured value recording
Supply voltage:	100 to 240 V AC / 24 V DC
Transducer supply:	18 V DC / 45 mA
Power consumption:	Max. 350 mA (24 V DC)
Display:	Resistive touch screen; 3.5"; resolution 320 × 240 pixels QVGA
LEDs:	2 freely programmable LEDs for status indications
Buttons:	4 freely assignable buttons
Outputs:	See connection areas, *on page 16* et seq.
Inputs:	See connection areas, *on page 16* et seq.
Relay:	See connection areas, *on page 16* et seq.
Interfaces:	Rear side: 1 × USB 2.0 host, connector type A Front side: 1 × Mini-USB 2.0 Device, connector type B (galvanically isolated)
CPU:	Cortex A8, 600 MHz
Boot time:	approx. 17 s
Real-time clock:	Power failure buffered
Storage:	• Mass storage 1 × Micro SD card (4 GByte) • DDR2 64 MByte • Flash 128 MByte • MRAM 128 kByte
Housing:	• Panel mounting apparatus • Protection Class: IP 65 on front side IP 20 on rest of housing • Dimensions (W × H × D): 98 mm × 98 mm × 115 mm (without connector) 98 mm × 98 mm × 130 mm (with connector)
Installation:	• Panel mounting • Panel cut-out: 92 mm × 92 mm (+0.8 mm tolerance)

Ambient conditions	
Climatic	
Storage	-20 °C to +70 °C
Transport	-20 °C to +70 °C
Operation	0 °C to +55 °C
Relative humidity	Relative humidity 95%, no condensation allowed
Air and creepage distances	
Contamination Class	2

Ambient conditions	
Over voltage category	II
Maximum altitude	2000 m
Category a	
Rated voltage:	230 V
Test voltage:	3000 VAC, 1 min
Category b	
Rated voltage:	50 V
Test voltage:	520 VAC, 1 min

Subject to technical changes.

3.4 Connection areas

3.4.1 Power supply slot

The power supply slot always has the following connections:

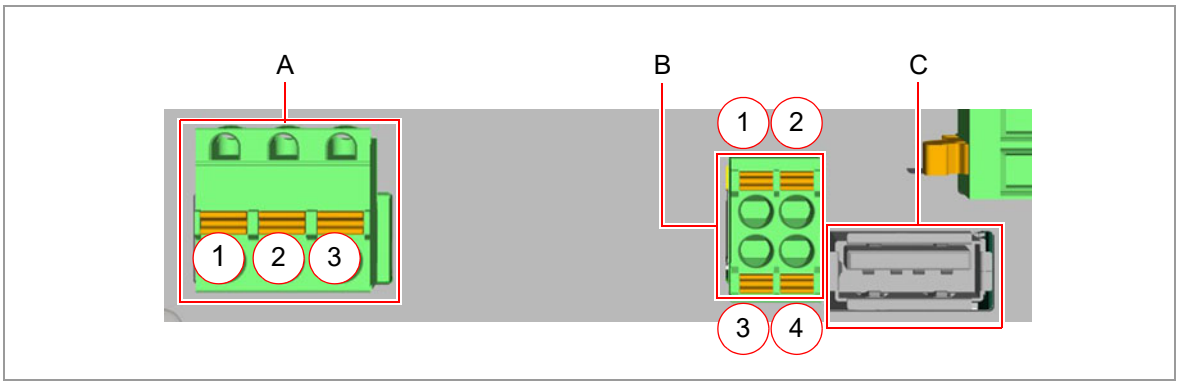


Fig. 3.3: Power supply slot

A. Power supply
Connection type: 3-pole basic housing; grid dimension 5

B. Transducer supply
Connection type: 4-pole basic housing DMC 1.5; grid dimension 3.5

C. USB interface (USB 2.0 host, connector type A)

	Signal	Current no.
Power supply	L	1
	N	2
	FE	3

	Signal	Current no.
Transducer supply:	$+U_{AV}$	1
		3
	$-U_{AV}$	2
		4

3.4.2 Slot A – Configuration (option)

Slot A is variable and can take the following connections:

I/O card

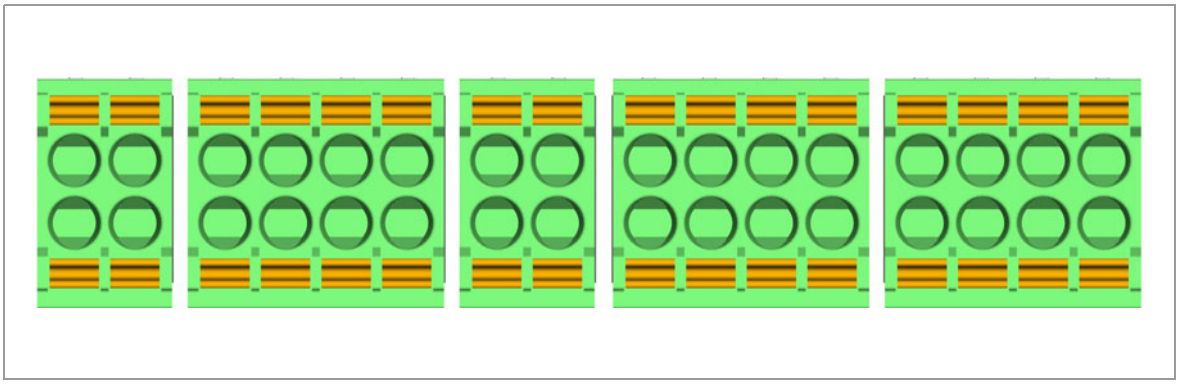


Fig. 3.4: Slot A: I/O card

For information on the I/O card see chapter 10.1 "I/O cards" *on page 33*.

3.4.3 Slot B – Configuration (option)

Slot B is variable and can take the following connections:

I/O card

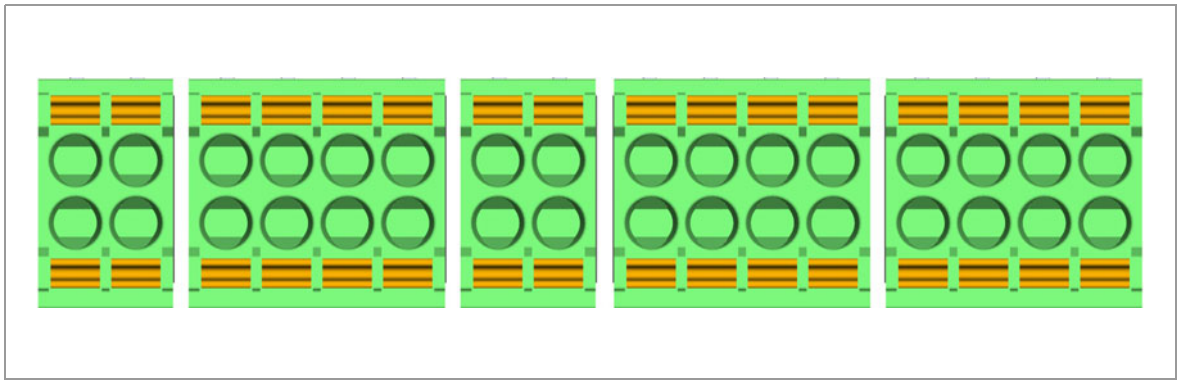


Fig. 3.5: Slot B: I/O card

For information on the I/O card see chapter 10.1 "I/O cards" *on page 33*.

3.4.4 Slot C: Communication card – Configuration (option)

Slot C is variable and can take the following connections.

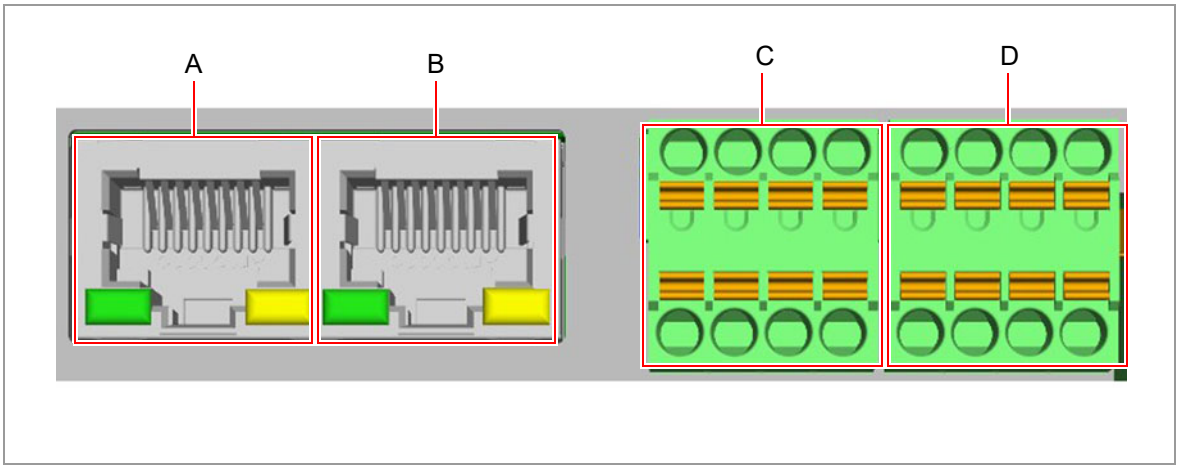


Fig. 3.6: Slot C (example)

A. Possible connections:
10/100 BaseT
Profinet CC-A
Modbus TCP (Slave)
Ethernet (LAN)

B. Possible connections:
10/100 BaseT
Profinet CC-A
Modbus TCP (Slave)
Ethernet (LAN)

C. Possible connections:
RS-485

D. Possible connections:
RS-485
CAN

Configuration variations

1. Profinet + Modbus, *see page 48*
   - 1 × Profinet CC-A
   - 1 × Modbus TCP (Slave) / 1 × Ethernet (LAN)
   - 1 × RS-485 (Modbus RTU Master)
   - 1 × RS-485 (HPR-Bus Master)

2. Profinet + CAN configuration
   - 1 × Profinet CC-A
   - 1 × Modbus TCP (Slave)
   - 1 × RS-485 (Modbus RTU Master)
   - 1 × CAN
3. Ethernet + Modbus configuration
   - 1 × Ethernet (LAN)
   - 1 × RS-485 (Modbus RTU Master)
   - 1 × RS-485 (Modbus RTU Slave)
4. Ethernet + CAN configuration
   - 1 × Ethernet (LAN)
   - 1 × CAN
   - 1 × RS-485 (Modbus RTU Master)
5. EtherCAT Slave + Modbus configuration
   - 1 × EtherCAT
   - 1 × Ethernet (LAN)
   - 1 × RS-485 (Modbus RTU Master)
6. EtherCAT Slave + CAN configuration
   - 1 × EtherCAT
   - 1 × Ethernet (LAN)
   - 1 × CAN
7. Profibus DP Slave + Modbus (Communication card)
   - 1 × Profibus DP Slave
   - 1 × Ethernet (LAN)
   - 1 × RS-485 (Modbus RTU Master)
8. Profibus DP Slave + CAN configuration (Communication card)
   - 1 × Profibus DP Slave
   - 1 × Ethernet (LAN)
   - 1 × CAN

3.4.5 Relay outputs

The connection area always has 12 relay contacts.

Connection type: PCB direct plug connector to accommodate a 12-pin basic housing; grid dimension 5

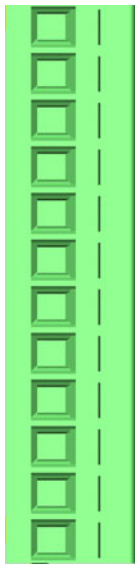
	Signal	Current no.	
Relay output 4	Working contact	1	
	NO contact	2	
	NC contact	3	
Relay output 3	Working contact	4	
	NO contact	5	
	NC contact	6	
Relay output 2	Working contact	7	
	NO contact	8	
	NC contact	9	
Relay output 1	Working contact	10	
	NO contact	11	
	NC contact	12	

Fig. 3.7: Relay outputs

If a control contactor is connected to a relay output, an RC protective circuit corresponding to the specifications of the contactor manufacturer is required in order to avoid high voltage peaks!

Varistor protective circuits are not recommended.

3.4.6 Connecting external I/Os (optional)

External I/Os can be connected to the multifunctional controller via the optional communication card in slot C.

Connection possibilities:

- Ethernet / RS-485
  - Can also be used outside the control cabinet
  - Connection of several nodes possible

- HPR-Bus
  - Only use over short distances
  - Maximum connection of a node

- CAN-Bus
  - Usage outside the control cabinet possible
  - Connection of several nodes possible

4 Installation

4.1 Dimensions

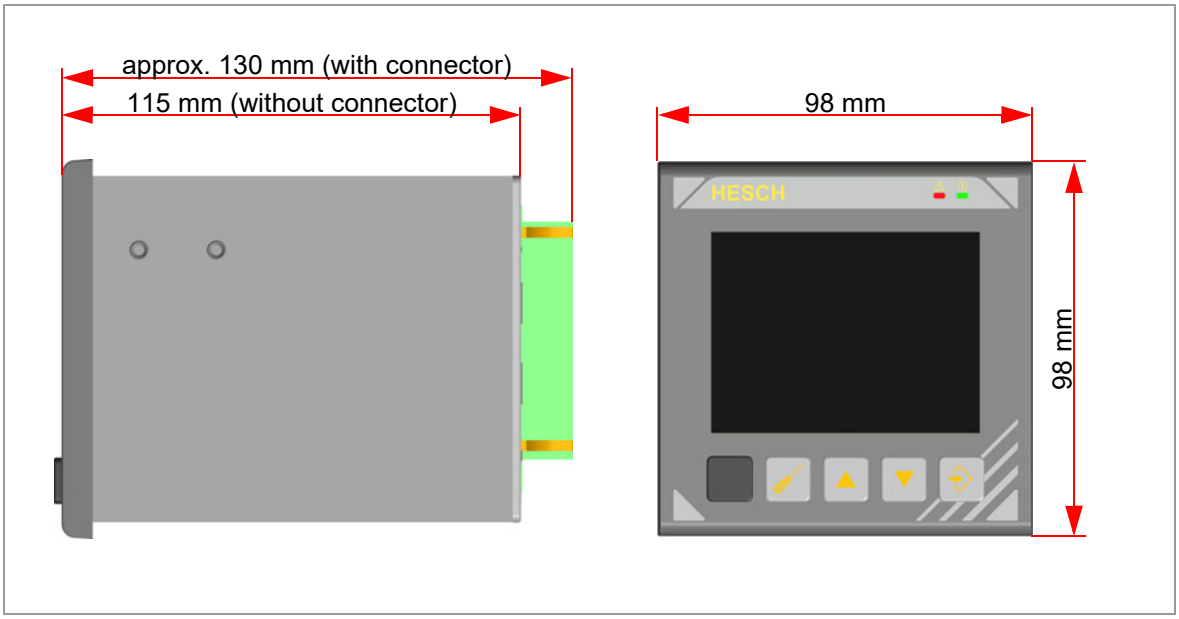


Fig. 4.1: Dimensions

4.2 Scope of delivery

- HE 5697 MFC
- Installation manual
- Fixing clamps
- Connectors

Note!
After receiving the delivery, check it for completeness and obvious defects. In case of a complaint, immediately contact your local HESCH representative.

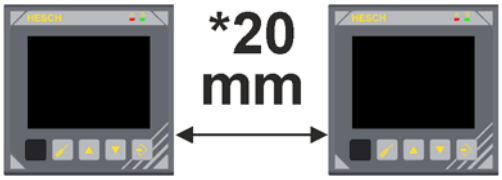
4.3 Installation

Note!
During installation it must be ensured that
- the distance to the next device or wall is at least 20 mm.
- sufficient space is required between the rear of the device and the wall for the supply line and the interface cables.

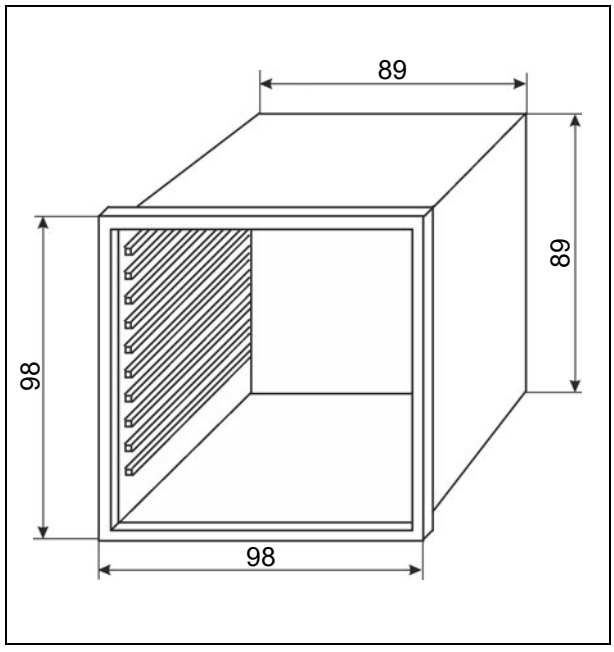
Note!
The ambient temperature at the installation position may not exceed the permissible temperature for rated use listed in the Technical data section. The special provisions should be observed, see chapter 2.2 "Safety during the individual phases of operation" *on page 10*.

The HE 5697 MFC is intended for installation in a control cabinet door or control panel.

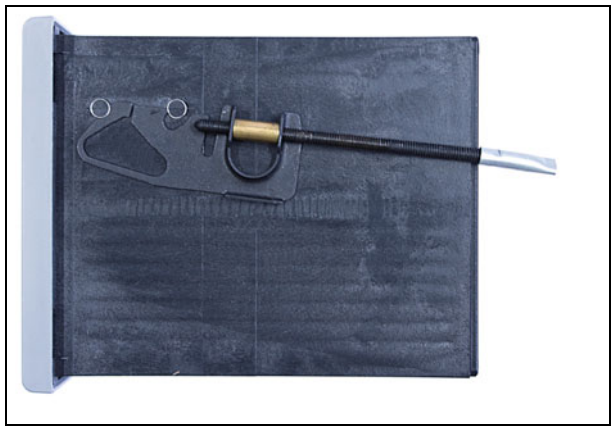
*Ensure a minimum distance of 20 mm from device front to device front.



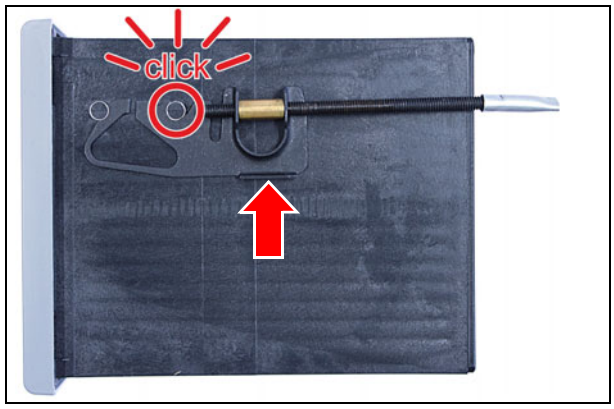
1. Cut a cut-out (92 × 92 mm +0.8 mm tolerance) in the control cabinet door or control panel.
2. Push the HE 5697 MFC horizontally from the front into the cut-out.



3. Clamp the fixing clamps on the right and left side of the housing into the brackets.



4. Press both fixing clamps upwards until they engage.



5. Tighten the fixing clamps evenly with a slotted screwdriver.

5 Electrical commissioning

Mind the following points prior to turning on the device:

- Firmly connect the cables to the terminals. The supply voltage must match the specifications on the type plate.
- The device may only be operated in its installed state.
- The temperature limitations specified for use of the device have to be observed before and during operation.
- The protective ground connection in the appropriate device carrier has to be conductively connected to the protective ground

5.1 Safety information

Danger of electric shock!
Only perform the electrical installation in a dead-voltage state.

Material damage due to electrostatic charging!
Observe the safety measures according to DIN EN 61340-51/-3 in order to prevent electrostatic discharging!

Note!
Only qualified specialists may work on the electronics.

5.2 Supply voltage

Fig. 5.1: Supply voltage

1. Read the supply voltage value off the type plate (there are devices with 100 to 240 V AC and 24 V DC mains voltage).
2. Connect conductors.
3. The multifunctional controller starts when the supply voltage is applied. Boot time: approx. 17 seconds.

6 Software / Programming

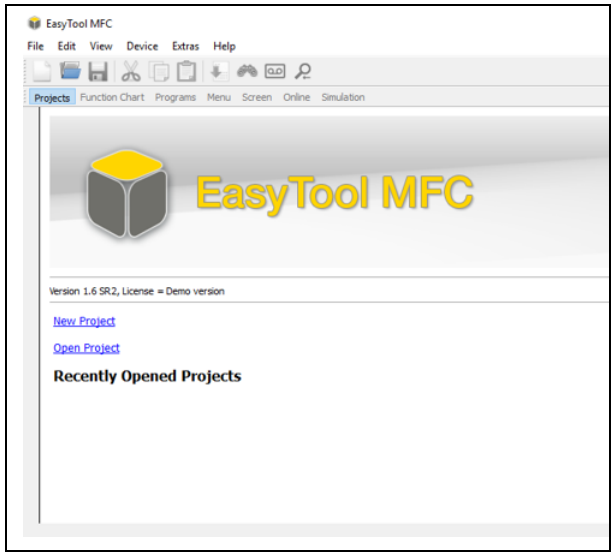
6.1 Software

Information about the PC software "EasyTool MFC" can be found in the document "EasyTool MFC Quick Guide".

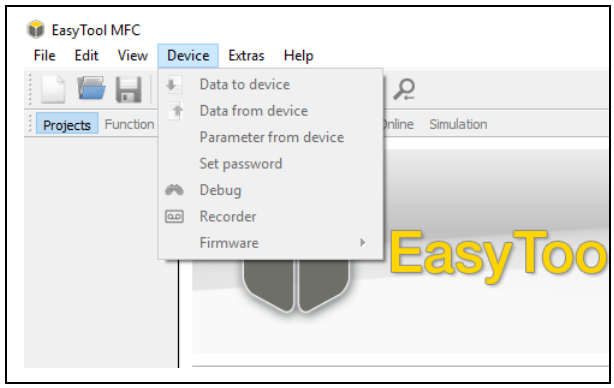
6.2 Load program

To load a program into the multifunctional controller, it is necessary to use the PC software "EasyTool MFC".

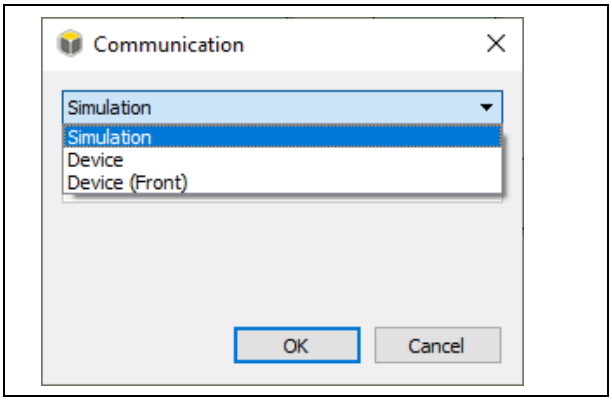
1. Connect the computer with the PC software "EasyTool MFC" to the multifunctional controller via a USB interface or via Ethernet (if an appropriate communication card is installed).
   Ensure that the USB dongle (license key) is inserted in a USB interface of the computer.
2. Start the EasyTool MFC PC software.
3. Load the project.



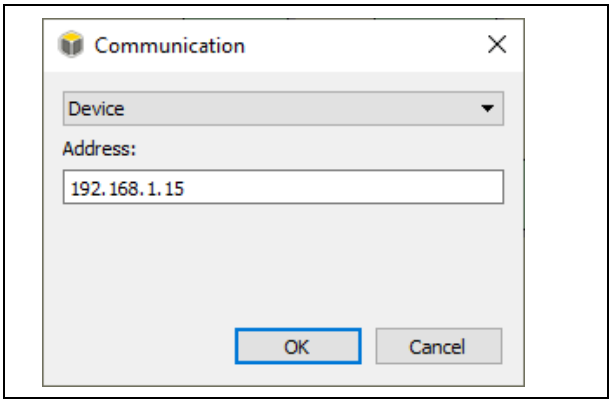
4. In the menu bar under "Device", select "Data to device".



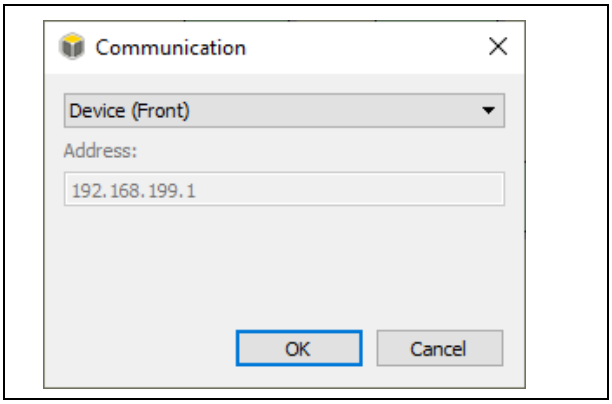
5. In the drop-down menu, select the interface via which the computer is connected to the multifunctional controller.



- If the computer is connected via an Ethernet port on the back of the multifunctional controller, select the "Device" interface, enter the IP address and confirm with "OK".



- If the computer is connected via the USB port on the front side of the multifunctional controller, select the "Device (front)" interface and confirm with "OK".



If the data transfer was successful, the window is closed.
The multifunctional controller will restart automatically.

7 Operation

Operation is started by applying the supply voltage. The boot time of the multifunctional controller is approx. 17 seconds.

8 Controls

The multifunctional controller is operated via the touch screen and the four buttons on the front of the device.

All functions are freely programmable and can therefore not be described here.

The description of the controls must be made by the creator of the respective program.

9 Maintenance and service

9.1 Maintenance, repair

Material damage!
Abrasive cleaners or aggressive solvents will damage the touch screen.

- Only clean the touch screen with a soft damp cloth. Use a screen cleaning agent or water with detergent.
- Do not apply cleaning agent directly to the touch screen, but to the cloth.
- Only perform cleaning when the device is switched off.

The device has to be cleaned regularly in order to avoid increased dust formation on the device and to ensure the functionality of the touch screen.

9.2 Disposal

Recycle metals and plastics. Electrical and electronic components should be collected separately and be disposed of accordingly. Properly dispose of printed circuit boards.

9.3 Service

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Germany
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10 Technical appendix

10.1 I/O cards

10.1.1 I/O card type 1

10.1.1.1 Analogue inputs

The I/O card is equipped with two completely independent analogue universal inputs.

One input is equipped with two channels.

Converter resolution:	24 Bit
Cycle time:	50 ms
Galvanic isolation:	corresponding to category a, *see page 16*

10.1.1.2 Universal input

Channel 1 is used to process signals from RTD sensors, thermocouples, resistors, voltage sources up to 1000 mV and current sources up to 20 mA.

The input type is selected via a parameter.

RTD measurement

Input type:	Resistance	
Connection type:	3-conductor	
Measuring ranges:	Pt100/1000	-200 to 850°C
	Ni100/1000	-60 to 300°C
	KTY 11-6	-50 to 125°C
Measuring current:	Pt100/Ni100	I < 0.5 mA
	Pt1000/Ni1000	I < 50 µA
	KTY 11-6	I < 50 µA
Accuracy:	≤1K	
Temperature drift:	≤0.08% / 10K	
Measuring circuit monitoring:	Short circuit, interruption	

Thermocouple measurement

Input type:	Voltage
Connection type:	2-conductor
Input resistance:	>10 MΩ

Thermocouple

	Measuring range	Accuracy	Resolution
L	-200 to 900°C	≤2 K	0.05 K
J	-210 to 1200°C	≤2 K	0.05 K
K	-270 to 1370°C	≤2 K	0.08 K
N	-196 to 1299°C	≤2 K	0.08 K
S	-50 to 1760°C	≤2 K	0.07 K
R	-50 to 1760°C	≤2 K	0.07 K
T	-270 to 400°C	≤2 K	0.02 K
E	-270 to 1000°C	≤2 K	0.04 K
B	25 to 1820°C	≤3 K	0.1 K
W	0 to 2299°C	≤3 K	0.1 K

Temperature drift:	≤0.08% / 10 K
Measuring circuit monitoring:	Interruption
Cold junction compensation:	integrated; additional error <2 K

Resistance measurement

Input type:	Resistance
Connection type:	2-conductor
Measuring ranges:	0 to 20 kΩ
Detection range:	Measuring range + 10%
Measuring current:	tbd. mA
Accuracy:	≤0.1%
Temperature drift:	≤0.08% / 10 K
Measuring circuit monitoring:	Overflow detection range

Current measurement

Input type:	Current
Connection type:	2-conductor
Measuring ranges:	0 to 20 mA
Detection range:	Measuring range +/- 10%
Input impedance:	max. 50 Ω
Accuracy:	≤0.1%
Temperature drift:	≤0.08% / 10 K
Measuring circuit monitoring:	Detection range - underflow/overflow

10.1.1.3 Standard signal input

Channel 2 is used for processing current and voltage signals.

The input is implemented as a differential input.

The input type is selected via a parameter.

Current measurement

Input type:	Current
Connection type:	2-conductor
Measuring ranges:	0 to 20 mA
Detection range:	Measuring range +/- 10%
Input impedance:	max. 50 Ω
Accuracy:	≤0.1%
Temperature drift:	≤0.08% / 10 K
Measuring circuit monitoring:	Detection range - underflow/overflow

Voltage measurement

Input type:	Voltage
Connection type:	2-conductor
Measuring ranges:	0 to 10 V
Detection range:	Measuring range +/- 10%
Input impedance:	type 1.2 MΩ
Accuracy:	≤0.1%
Temperature drift:	≤0.08% / 10 K
Measuring circuit monitoring:	Detection range - underflow/overflow

10.1.1.4 Analogue outputs

The I/O card is equipped with two analogue outputs.

These provide one voltage and one current output.

Converter resolution:	12 Bit
Linearity:	<0.1%
Accuracy:	<0.2%
Temperature drift:	≤0.1% / 10K
Cycle time:	50 ms
Galvanic isolation:	corresponding to category a, *see page 16*

Voltage output

Dynamic range:	0 to +11 V
Output load:	RL ≥ 1 kΩ

Current output

Dynamic range:	0 to +22 mA
Output burden:	max. 500 Ω

10.1.1.5 Digital inputs/outputs

The I/O card is equipped with six inputs/outputs. Use as input or output is programmable. The supply of the inputs/outputs must be fed in externally.

Supply voltage:	24 VDC +/- 20%
Galvanic isolation:	corresponding to category b, *see page 16*

Counter input

Two digital inputs can be used as counter inputs, for this purpose the input is galvanically decoupled via an optocoupler and passed on to analogue input 1. Here the signal evaluation and further processing to an "analogue signal" takes place.

Cut-off frequency:	10 kHz
Output signal:	Impulses / time unit

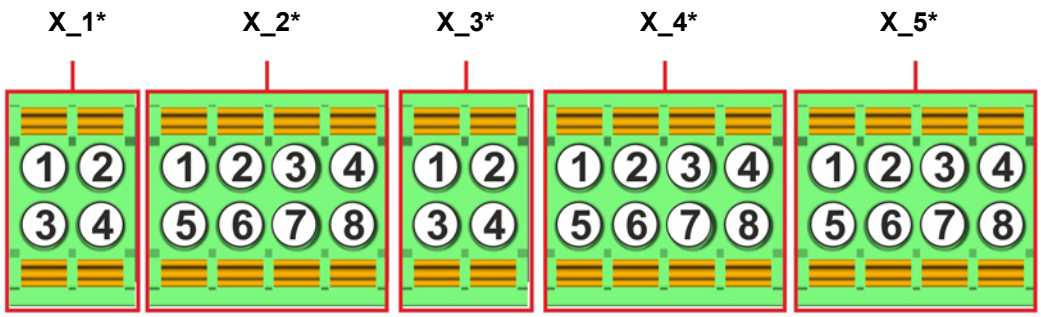
10.1.1.6 General technical data

Supply voltage:	takes place via the system bus
Power consumption:	I < 1 A @ 5 V
	I < 50 mA @ 3.3 V

10.1.1.7 Ambient conditions

See chapter 3.3 "Technical data" *on page 15*.

10.1.1.8 Electrical connections



* The second digit of the terminal designation depends on the insertion position of the I/O card (slot A = A; slot B = B)

Fig. 10.1: I/O card electrical connections

Interface X_1

Connection type: 4-pole basic housing DMC 1.5; grid dimension 3.5

Analogue output 1	Signal	Current no.
Voltage output	-	1
	+	2
Current output	-	3
	+	4

Interface X_2

Connection type: 8-pole basic housing DMC 1.5; grid dimension 3.5

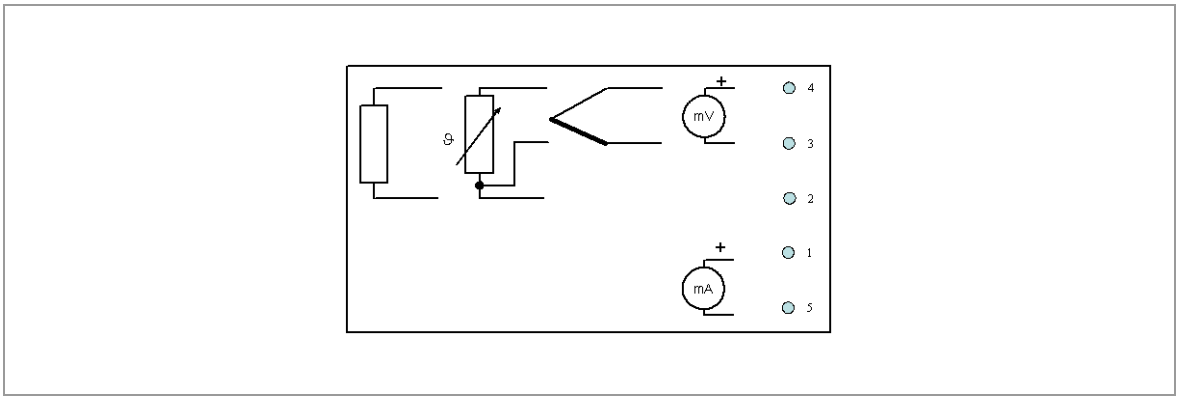


Fig. 10.2: Analogue input 1 universal input

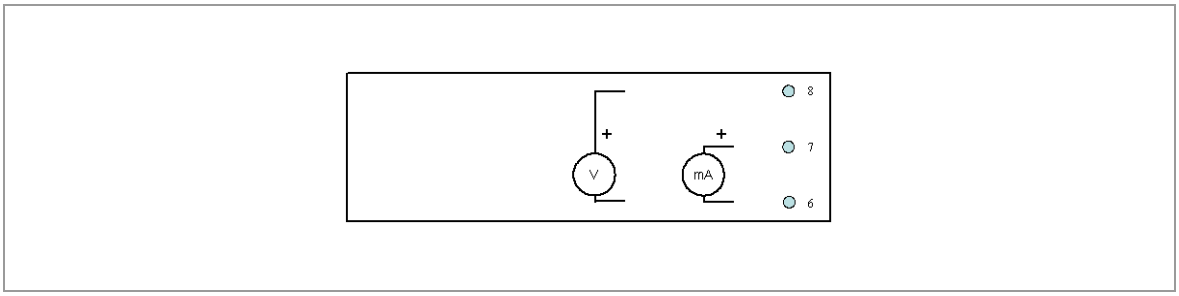


Fig. 10.3: Analogue input 1 standard signal input

Interface X_3

Connection type: 4-pole basic housing DMC 1.5; grid dimension 3.5

Analogue output 2	Signal	Current no.
Voltage output	-	1
	+	2
Current output	-	3
	+	4

Interface X_4

Connection type: 8-pole basic housing DMC 1.5; grid dimension 3.5

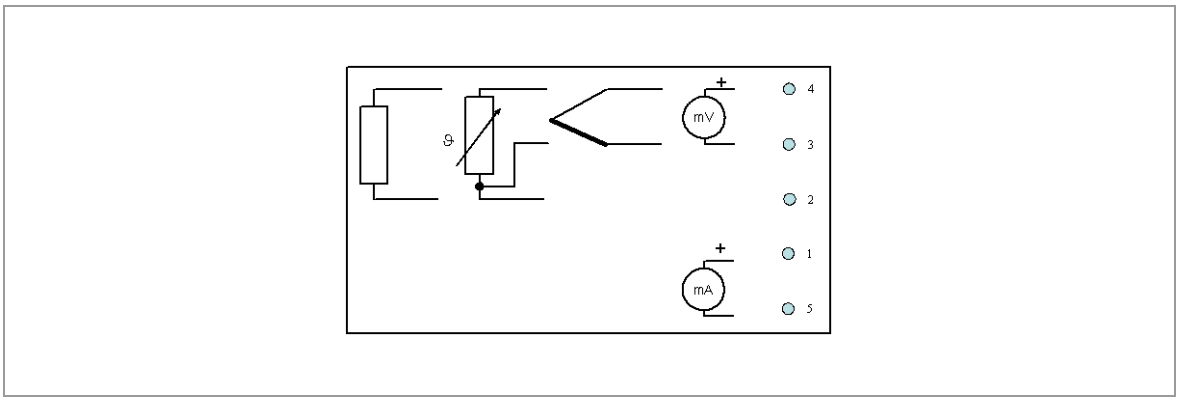


Fig. 10.4: Analogue input 2 universal input

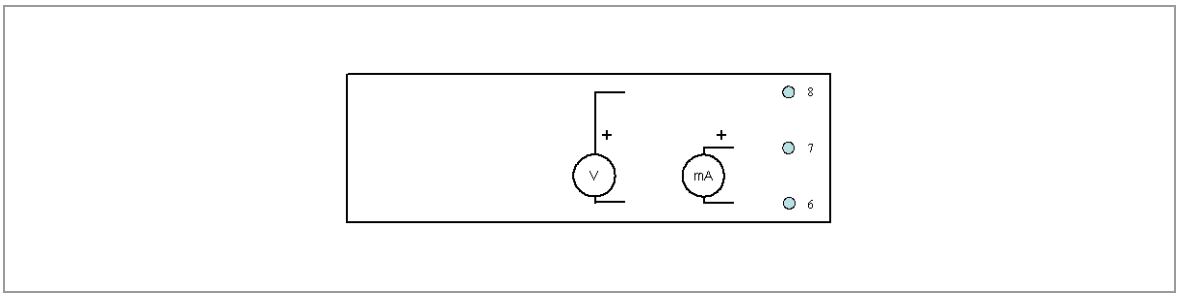


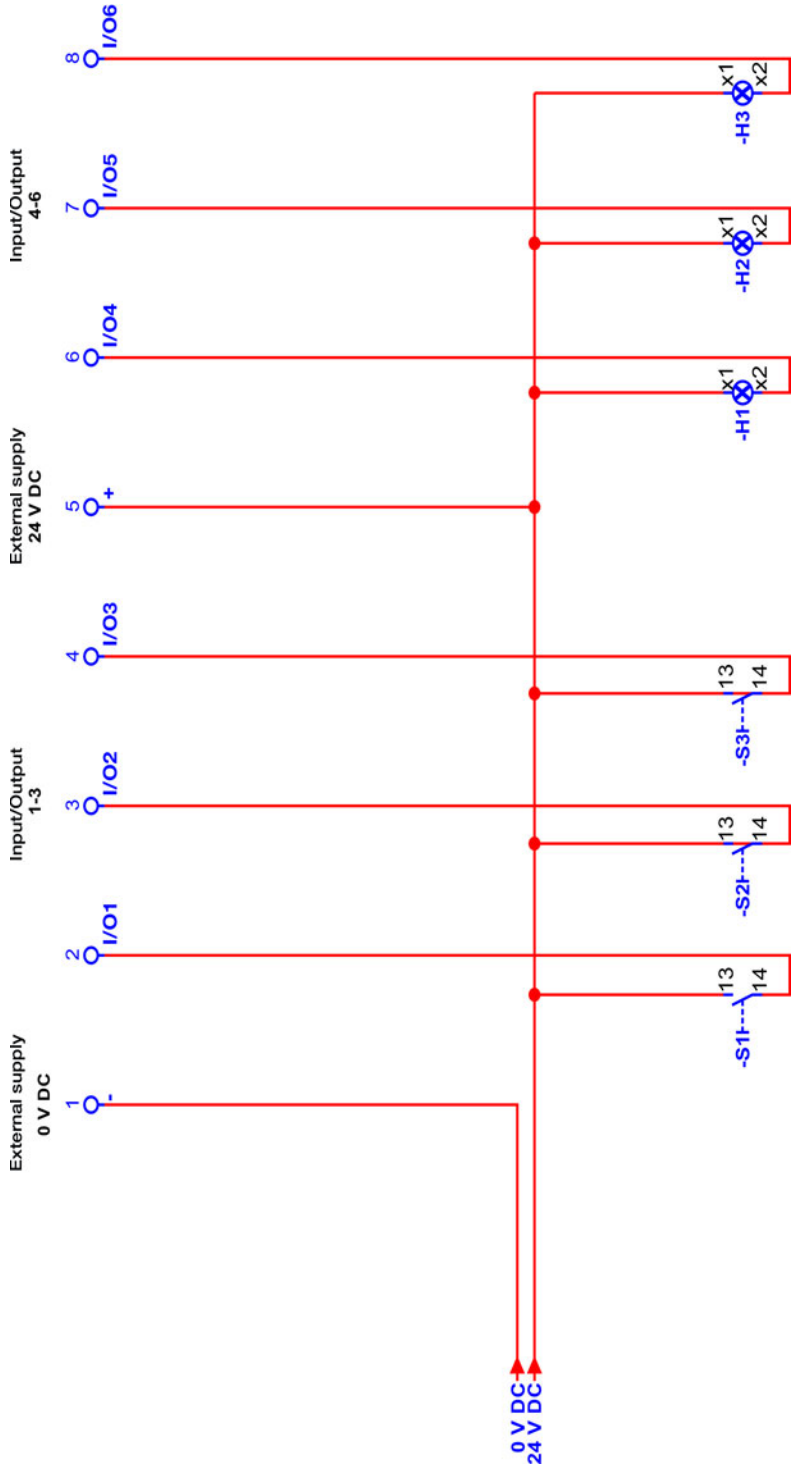
Fig. 10.5: Analogue input 2 standard signal input

Interface X_5 digital inputs/outputs

Connection type: 8-pole basic housing DMC 1.5; grid dimension 3.5

	Signal	Current no.
Input/output supply	+ 24 V external	5
	0 V external	1
Inputs/outputs	Input/Output 1	2
	Input/Output 2	3
	Input/Output 3	4
	Input/Output 4	6
	Input/Output 5	7
	Input/Output 6	8

10.1.1.9 Connection example



10.1.2 I/O card type 2

10.1.2.1 Analogue inputs

The I/O card is equipped with two completely independent analogue universal inputs:

One input is equipped with two channels.

Converter resolution:	24 Bit
Cycle time:	50 ms
Galvanic isolation:	corresponding to category a, *see page 16*

10.1.2.2 Universal input

Channel 1 is used to process signals from RTD sensors, thermocouples, resistors, voltage sources up to 1000 mV and current sources up to 20 mA.

The input type is selected via a parameter.

RTD measurement

Input type:	Resistance	
Connection type:	3-conductor	
Measuring ranges:	Pt100/1000	-200 to 850°C
	Ni100/1000	-60 to 300°C
	KTY 11-6	-50 to 125°C
Measuring current:	Pt100/Ni100	I < 0.5 mA
	Pt1000/Ni1000	I < 50 µA
	KTY 11-6	I < 50 µA
Accuracy:	≤1K	
Temperature drift:	≤0.08% / 10K	
Measuring circuit monitoring:	Short circuit, interruption	

Thermocouple measurement

Input type:	Voltage
Connection type:	2-conductor
Input resistance:	>10 MΩ

Thermocouple

	Measuring range	Accuracy	Resolution
L	-200 to 900°C	≤2 K	0.05 K
J	-210 to 1200°C	≤2 K	0.05 K
K	-270 to 1370°C	≤2 K	0.08 K
N	-196 to 1299°C	≤2 K	0.08 K
S	-50 to 1760°C	≤2 K	0.07 K
R	-50 to 1760°C	≤2 K	0.07 K
T	-270 to 400°C	≤2 K	0.02 K
E	-270 to 1000°C	≤2 K	0.04 K
B	25 to 1820°C	≤3 K	0.1 K
W	0 to 2299°C	≤3 K	0.1 K

Temperature drift: ≤0.08% / 10 K

Measuring circuit monitoring: Interruption

Cold junction compensation: integrated, additional error < 2K

Resistance measurement

Input type: Resistance

Connection type: 2-conductor

Measuring range: 0 to 20 kΩ

Detection range: Measuring range + 10%

Measuring current: tbd. mA

Accuracy: ≤0.1%

Temperature drift: ≤0.08% / 10 K

Measuring circuit monitoring: Overflow detection range

Current measurement

Input type:	Current
Connection type:	2-conductor
Measuring ranges:	0 to 20 mA
Detection range:	Measuring range +/- 10%
Input impedance:	max. 50 Ω
Accuracy:	≤0.1%
Temperature drift:	≤0.08% / 10 K
Measuring circuit monitoring:	Detection range - underflow / overflow

10.1.2.3 mV-input

Channel 2 is used to process high-impedance voltage sources.

The input is a differential input.

Voltage measurement

Input type:	Voltage
Connection type:	2-conductor
Measuring range:	-200 to 1800 mV
Detection range:	Measuring range +/- 10%
Input impedance:	max. 150 MΩ
Accuracy:	≤0.1%
Temperaturdrift:	≤0.08% / 10 K
Measuring circuit monitoring:	Detection range - underflow / overflow

10.1.2.4 Analogue outputs

The I/O card is equipped with two analogue outputs.

These provide one voltage and one current output.

Converter resolution:	12 Bit
Linearity:	<0.1%
Accuracy:	<0.2%
Temperature drift:	≤0.1% / 10K
Cycle time:	50 ms
Galvanic isolation:	corresponding to category a, *see page 16*

Voltage output

Dynamic range:	0 to +11 V
Output load:	RL ≥ 1 kΩ

Current output

Dynamic range:	0 to +22 mA
Output burden:	max. 500 Ω

10.1.2.5 Digital inputs / outputs

The I/O card is equipped with six inputs/outputs. Use as input or output is programmable. The supply of the inputs/outputs must be fed in externally.

Supply voltage:	24 VDC +/- 20%
Galvanic isolation:	corresponding to category b, *see page 16*
Output type:	open Collector
Load:	max. 100 mA / output

Counter input

Two digital inputs can be used as counter inputs, for this purpose the input is galvanically decoupled via an optocoupler and passed on to analogue input 1. Here the signal evaluation and further processing to an "analogue signal" takes place.

Cut-off frequency:	10 kHz
Output signal:	Impulses / time unit

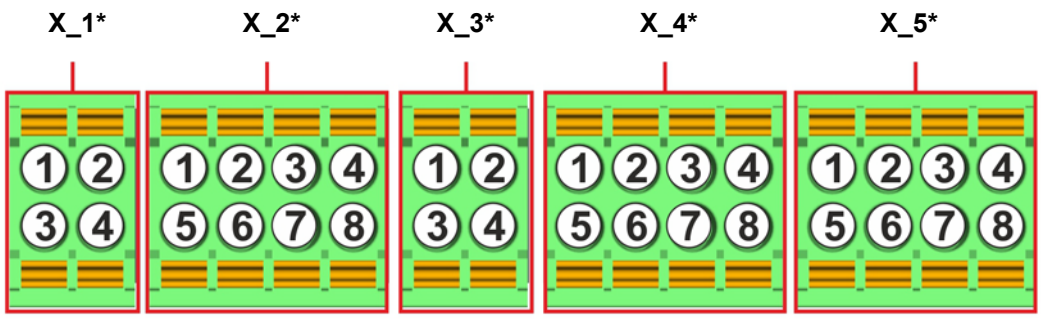
10.1.2.6 General technical data

Supply voltage:	takes place via the system bus
Power consumption:	I < 1 A @ 5 V
	I < 50 mA @ 3.3 V

10.1.2.7 Ambient conditions

See chapter 3.3 "Technical data" *on page 15*.

10.1.2.8 Electrical connections



* The second digit of the terminal designation depends on the insertion position of the I/O card (slot A = A; slot B = B)

Fig. 10.6: I/O card electrical connections

Interface X_1

Connection type: 4-pole basic housing DMC 1.5; grid dimension 3.5

Analogue output 1	Signal	Current no.
Voltage output	-	1
	+	2
Current output	-	3
	+	4

Interface X_2

Connection type: 8-pole basic housing DMC 1.5; grid dimension 3.5

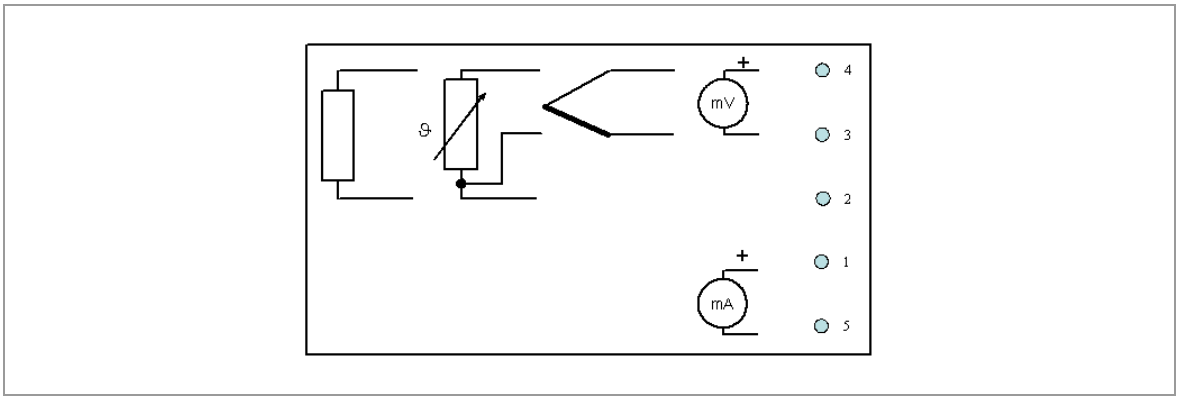


Fig. 10.7: Analogue input 1 universal input

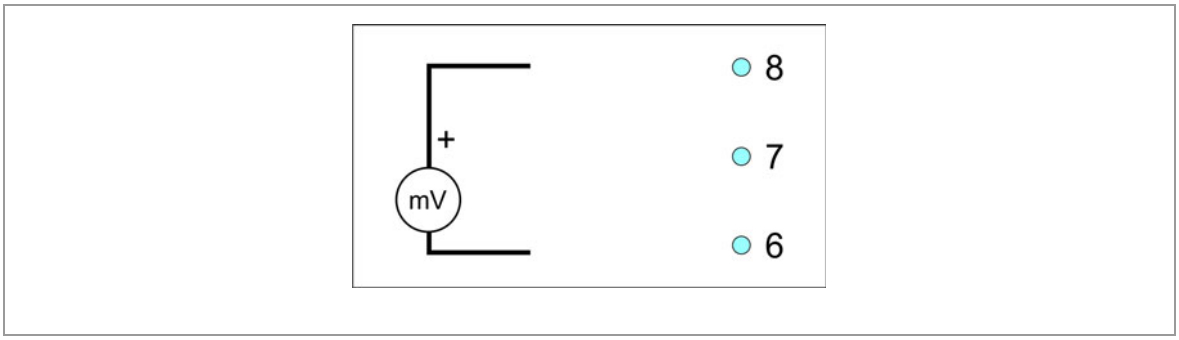


Fig. 10.8: Analogue input 1 mV input

Interface X_3

Connection type: 4-pole basic housing DMC 1.5; grid dimension 3.5

Analogue output 2	Signal	Current no.
Voltage output	-	1
	+	2
Current output	-	3
	+	4

Interface X_4

Connection type: 8-pole basic housing DMC 1.5; grid dimension 3.5

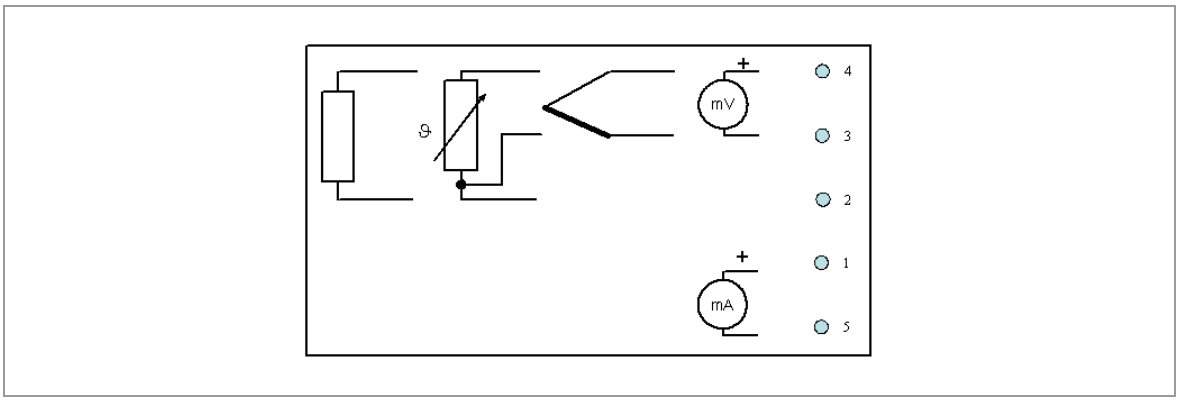


Fig. 10.9: Analogue input 2 universal input

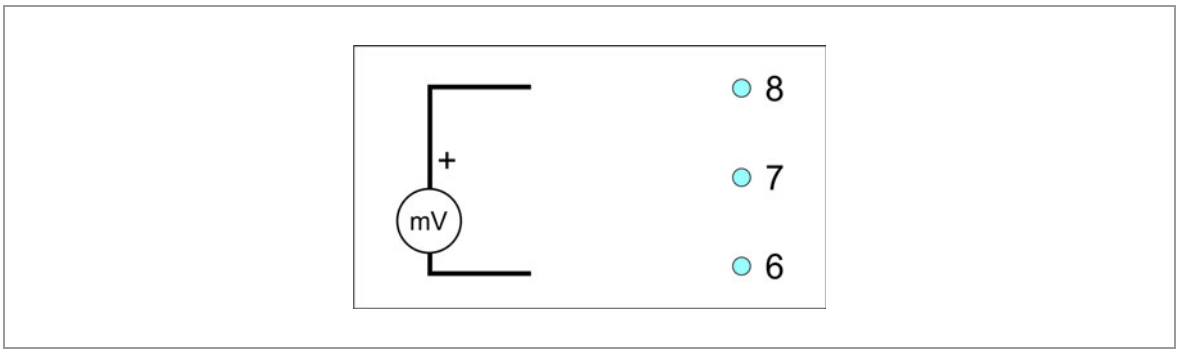


Fig. 10.10: Analogue input 2 mV input

Interface X_5 Digital inputs/outputs

Connection type: 8-pole basic housing DMC 1.5; grid dimension 3.5

	Signal	Current no.
Input/Output supply	+ 24 V external	5
	0 V extern	1
Inputs/Outputs	Inputs/Outputs 1	2
	Inputs/Outputs 2	3
	Inputs/Outputs 3	4
	Inputs/Outputs 4	6
	Inputs/Outputs 5	7
	Inputs/Outputs 6	8

10.2 Communication cards

10.2.1 2 × Ethernet, 2 × RS-485

10.2.1.1 Ethernet interfaces

This communication card is equipped with 2 Ethernet ports 10/100BaseT (compliant with IEEE 802.3). Each Ethernet port supports:

- 10/100 MBit/s
- Auto negotiation
- Auto MDIX
- Display of link / data status via LED:
  - Link = LED lights up continuously
  - Data = LED flashes

10.2.1.2 RS-485 interfaces

This communication card is equipped with 2 RS-485 ports.

The RS-485 ports are specified as follows:

Galvanic isolation:	corresponding to category b, *see page 16*
Data rate:	max. 500 kBaud
RS-485 driver:	max. 32 unit loads

10.2.1.3 General technical data

Supply voltage:	takes place via the system bus
Power consumption:	I < 0.5 A @ 5 V
	I < 0.1 A @ 3.3 V

10.2.1.4 Ambient conditions

See chapter 3.3 "Technical data" *on page 15*.

10.2.1.5 Electrical connections

Ethernet ports XC1 and XC2:

- RJ-45
- Recommended connection cable: Better than Cat5

RS-485 ports

Interface	XC3	
Connection type	Basic housing MC 1.5; grid dimension 3.5	
Assembly	**Signal**	**Current no.**
RS-485 Port 1	FE (shield connection)	1
	GND	2
	B	3
	A	4

Interface	XC4	
Connection type	Basic housing MC 1.5; grid dimension 3.5	
Assembly	**Signal**	**Current no.**
RS-485 Port 2	FE (shield connection)	1
	GND	2
	B	3
	A	4

10.2.2 1 x Ethernet, 1 X RS-485, 1 x Profibus

10.2.2.1 Profibus interfaces

XC1:

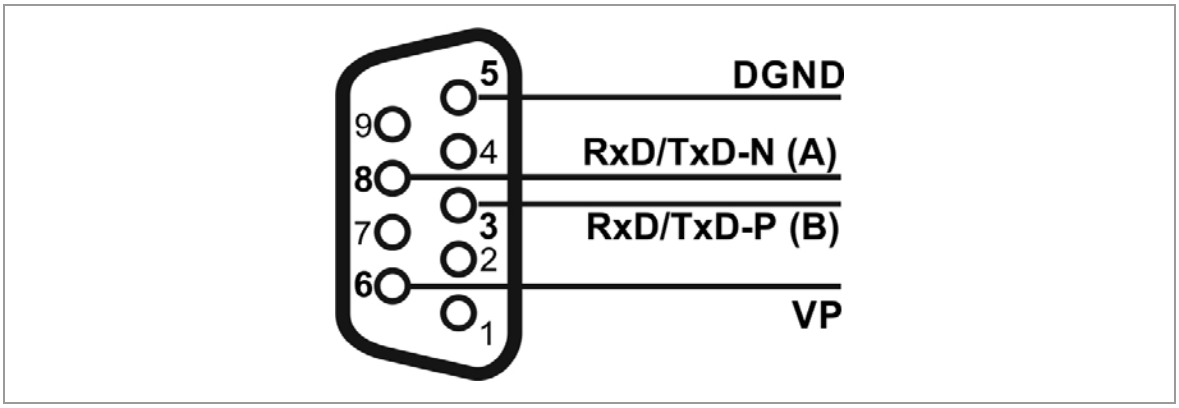


Fig. 10.11: Profibus interface

10.2.2.2 Ethernet interface

XC3:

This communication card is equipped with an Ethernet port 10/100BaseT (compliant with IEEE 802.3). The Ethernet port supports:

- 10/100 MBit/s
- Auto-Negotiation
- Auto-MDIX
- Display of link / data status via LED:
  - Link = LED lights up continuously
  - Data = LED flashes

10.2.2.3 RS-485 interface

Interface	**XC4**	
Connection type	Basic housing MC 1.5; grid dimension 3.5	
Assembly	**Signal**	**Current no.**
RS-485	FE (shield connection)	1
	GND	2
	B	3
	A	4

Notes

Notes