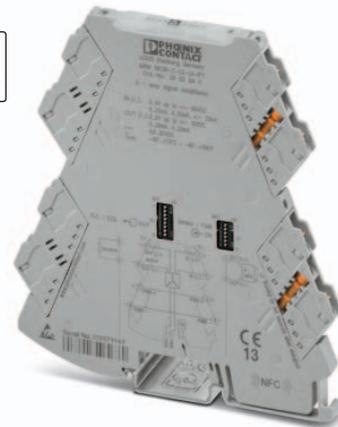


MINI MCR-2-UI-UI(-PT)(-C)



3-way signal conditioner

Data sheet
106006_en_02

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1 Description

The 3-way signal conditioner with pluggable connection technology and calibrated measuring range changeover can be configured using DIP switches and is used for the electrical isolation, conditioning, amplification, and filtering of unipolar and bipolar standard and normalized signals.

On the input side, the standard analog signals 0 - 20 mA, 4 - 20 mA, 0 - 10 V, 0 - 5 V, 1 - 5 V, or -10 - 10 V and the signals 2 - 10 V, 0 - 20 V, 4 - 20 V, 0 - 24 V, 4.8 - 24 V, 6 - 30 V, 0 - 30 V, -5 - 5 V, -20 - 20 V, -24 - 24 V, -30 - 30 V, and -20 - 20 mA are available.

On the output side, 0 - 20 mA, 4 - 20 mA, 0 - 10 V, 2...10 V, 0 - 5 V, 1 - 5 V, -10 - 10 V, and -5 - 5 V are available.

There is no need for adjustment following a measuring range changeover.

Features

- Configurable 3-way signal conditioner with plug-in connection technology
- Input and output signal range and cut-off frequencies configurable via DIP switches
- Calibrated measuring range switch-over
- Approval for Ex-zone 2 (nA)
- Screw or push-in connection available
- Can be supplied configured or unconfigured
- Reinforced insulation according to IEC 61010-1
- Supply voltage range 9.6 ... 30 V DC



WARNING: Correct usage in potentially explosive areas

The module is a category 3 item of electrical equipment. It is absolutely vital to follow the instructions provided here during installation and observe the information in the "Safety regulations and installation notes".



This device offers the option of NFC communication.

You can use the MINI Analog Pro Smartphone app to call-up DIP switch setting help and comprehensive module information via the NFC interface of your Smartphone.

The MINI Analog Pro Smartphone app is available to you free.



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".

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3 Ordering data

Description	Type	Order No.	Pcs./Pkt.
3-way signal conditioner with plug-in connection technology and calibrated measuring range changeover for the electrical isolation of unipolar and bipolar analog signals. Input/output configurable via DIP switch. Screw connection technology, standard configuration.	MINI MCR-2-UI-UI	2902037	1
3-way signal conditioner with plug-in connection technology and calibrated measuring range changeover, for the electrical isolation of unipolar and bipolar analog signals. Input/output configurable via DIP switch. push-in connection technology, standard configuration.	MINI MCR-2-UI-UI-PT	2902040	1
3-way signal conditioner with plug-in connection technology and calibrated measuring range changeover for the electrical isolation of unipolar and bipolar analog signals. Input/output configurable via DIP switch. Screw connection technology, order configuration.	MINI MCR-2-UI-UI-C	2902036	1
3-way signal conditioner with plug-in connection technology and calibrated measuring range changeover for the electrical isolation of unipolar and bipolar analog signals. Input/output configurable via DIP switch. push-in connection technology, order configuration.	MINI MCR-2-UI-UI-PT-C	2902039	1
Accessories	Type	Order No.	Pcs./Pkt.
DIN rail connector for DIN rail mounting. Universal for TBUS housing. Gold-plated contacts, 5-pos. Plug component, Number of positions: 5, Pitch: 3.81 mm	ME 6,2 TBUS-2 1,5/5-ST-3,81 GN	2869728	10
Power terminal with plug-in connection technology for delivering the supply voltage to the DIN rail connector. Monitoring of the supply voltages in combination with the fault monitoring module. Screw connection technology	MINI MCR-2-PTB	2902066	1
Power terminal with plug-in connection technology for delivering the supply voltage to the DIN rail connector. Monitoring of the supply voltages in combination with the fault monitoring module. Push-in connection technology	MINI MCR-2-PTB-PT	2902067	1
Fault monitoring module with plug-in connection technology for evaluating and reporting group errors from the FM system and for monitoring the supply voltages. Error reporting via N/O contact. Screw connection technology, standard configuration	MINI MCR-2-FM-RC	2904504	1
Fault monitoring module with plug-in connection technology for evaluating and reporting group errors from the FM system and for monitoring the supply voltages. Error reporting via N/O contact. Push-in connection technology, standard configuration	MINI MCR-2-FM-RC-PT	2904508	1
Primary-switched MINI POWER supply for DIN rail mounting, input: 1-phase, output: 24 V DC/1.5 A	MINI-SYS-PS-100-240AC/24DC/1.5	2866983	1
Marker for end clamp, Sheet, white, unlabeled, can be labeled with: THERMOMARK CARD, BLUEMARK CLED, BLUEMARK LED, TOPMARK LASER, Mounting type: snapped into marker carrier, Lettering field: 30 x 5 mm	UCT-EM (30X5)	0801505	10
Marker for end clamp, can be ordered: by sheet, white, labeled according to customer specifications, Mounting type: snapped into marker carrier, Lettering field: 30 x 5 mm	UCT-EM (30X5) CUS	0801589	1
Marker for end clamp, Sheet, yellow, unlabeled, can be labeled with: THERMOMARK CARD, BLUEMARK CLED, BLUEMARK LED, TOPMARK LASER, Mounting type: snapped into marker carrier, Lettering field: 30 x 5 mm	UCT-EM (30X5) YE	0830340	10
Marker for end clamp, can be ordered: by sheet, yellow, labeled according to customer specifications, Mounting type: snapped into marker carrier, Lettering field: 30 x 5 mm	UCT-EM (30X5) YE CUS	0830348	1
Plastic label, Sheet, white, unlabeled, can be labeled with: BLUEMARK CLED, BLUEMARK LED, Plotter, Mounting type: Adhesive, Lettering field: 15 x 5 mm	UC-EMLP (15X5)	0819301	10
Plastic label, Sheet, white, unlabeled, can be labeled with: BLUEMARK CLED, BLUEMARK LED, Plotter, Mounting type: Adhesive, Lettering field: 15 x 5 mm	UC-EMLP (15X5)L	0820138	5

Accessories	Type	Order No.	Pcs./Pkt.
Plastic label, Sheet, yellow, unlabeled, can be labeled with: BLUEMARK CLED, BLUEMARK LED, Plotter, Mounting type: Adhesive, Lettering field: 15 x 5 mm	UC-EMLP (15X5) YE	0822615	10
Plastic label, can be ordered: by sheet, white, labeled according to customer specifications, Mounting type: Adhesive, Lettering field: 15 x 5 mm	UC-EMLP (15X5) CUS	0824550	1
Plastic label, can be ordered: by sheet, yellow, labeled according to customer specifications, Mounting type: Adhesive, Lettering field: 15 x 5 mm	UC-EMLP (15X5) YE CUS	0824551	1
Plastic label, can be ordered: by sheet, white, labeled according to customer specifications, Mounting type: Adhesive, Lettering field: 15 x 5 mm	UC-EMLP (15X5)L CUS	0824552	1
Plastic label, Sheet, yellow, unlabeled, can be labeled with: BLUEMARK CLED, BLUEMARK LED, Plotter, Mounting type: Adhesive, Lettering field: 15 x 5 mm	UC-EMLP (15X5)L YE	0825325	5
Plastic label, can be ordered: by sheet, yellow, labeled according to customer specifications, Mounting type: Adhesive, Lettering field: 15 x 5 mm	UC-EMLP (15X5)L YE CUS	0826680	1
Plastic label, Sheet, silver, unlabeled, can be labeled with: BLUEMARK CLED, BLUEMARK LED, Plotter, Mounting type: Adhesive, Lettering field: 15 x 5 mm	UC-EMLP (15X5) SR	0828095	10
Plastic label, can be ordered: by sheet, silver, labeled according to customer specifications, Mounting type: Adhesive, Lettering field: 15 x 5 mm	UC-EMLP (15X5) SR CUS	0828099	1
Plastic label, Sheet, silver, unlabeled, can be labeled with: BLUEMARK CLED, BLUEMARK LED, Plotter, Mounting type: Adhesive, Lettering field: 15 x 5 mm	UC-EMLP (15X5)L SR	0828103	5
Marker strip, Roll, white, unlabeled, can be labeled with: THERMOMARK ROLL, THERMOMARK X, THERMOMARK S1.1, THERMOMARK ROLL X1, Mounting type: Adhesive, Lettering field: continuous x 5 mm	SK 5,0 WH:REEL	0805221	1
Electronics housing	ME 6,2 TBUS-2 1,5/5-ST-3,81 GY	2695439	10

4 Technical data

Input	
Number of inputs	1
Configurable/programmable	Yes
Voltage input signal	0 V ... 5 V (via DIP switch) 1 V ... 5 V (via DIP switch) -5 V ... 5 V (via DIP switch) 0 V ... 10 V (via DIP switch) 2 V ... 10 V (via DIP switch) -10 V ... 10 V (via DIP switch) 0 V ... 20 V (via DIP switch) 4 V ... 20 V (via DIP switch) -20 V ... 20 V (via DIP switch) 0 V ... 24 V (via DIP switch) 4.8 V ... 24 V (via DIP switch) -24 V ... 24 V (via DIP switch) 0 V ... 30 V (via DIP switch) 6 V ... 30 V (via DIP switch) -30 V ... 30 V (via DIP switch)
Max. voltage input signal	33 V
Current input signal	0 mA ... 20 mA (via DIP switch) 4 mA ... 20 mA (via DIP switch) -20 mA ... 20 mA (via DIP switch)
Max. current input signal	24 mA
Input resistance of voltage input	> 1000 k Ω
Input resistance current input	approx. 63 Ω
Output	
Number of outputs	1
Voltage output signal	0 V ... 5 V (via DIP switch) 1 V ... 5 V (via DIP switch) -5 V ... 5 V (via DIP switch) 0 V ... 10 V (via DIP switch) 2 V ... 10 V (via DIP switch) -10 V ... 10 V (via DIP switch)
Short-circuit current	< 32 mA
Current output signal	0 mA ... 20 mA (via DIP switch) 4 mA ... 20 mA (via DIP switch)
Max. current output signal	22 mA
Non-load voltage	< 17 V
Configurable/programmable	Yes
Load/output load voltage output	\geq 10 k Ω
Ripple	< 20 mV _{PP} (at 600 Ω)
Load/output load current output	\leq 600 Ω (at 20 mA)
Supply	
Nominal supply voltage	24 V DC
Supply voltage range	9.6 V DC ... 30 V DC (The DIN rail bus connector (ME 6,2 TBUS-2 1,5/5-ST-3,81 GN, Order No. 2869728) can be used to bridge the supply voltage. It can be snapped onto a 35 mm DIN rail according to EN 60715))
Typical current consumption	25 mA (Current output, at 24 V DC incl. load) 54 mA (Current output, at 12 V DC incl. load)
Power consumption	\leq 800 mW (at I _{OUT} = 20 mA, 9.6 V DC, 600 Ω load)
Diagnostic and status indicators	
Operating voltage display	Green LED

General data

Limit frequency (3 dB)	30 Hz (via DIP switch) 5 kHz (via DIP switch)
Maximum transmission error	≤ 0.1 % (of final value) ≤ 0.15 % (of final value, at IN: 4 ... 20 mA / OUT: -10 V ... 10 V)
Maximum temperature coefficient	0.01 %/K
Step response (10-90%)	< 8.5 ms (with 30 Hz filter)
Electrical isolation	Reinforced insulation in accordance with IEC 61010-1
Overvoltage category	II
Mounting position	any
Degree of protection	IP20
Degree of pollution	2
Rated insulation voltage	300 V (effective)
Test voltage, input/output/supply	3 kV (50 Hz, 1 min.)
Dimensions W/H/D	6.2 mm / 110.5 mm / 120.5 mm
Type of housing	PBT gray

Connection data
Screw connection
Push-in connection

Solid conductor cross section with ferrule	0.2 mm ² ... 1.5 mm ²	0.14 mm ² ... 2.5 mm ²
Solid conductor cross section without ferrule	0.2 mm ² ... 2.5 mm ²	0.14 mm ² ... 2.5 mm ²
Conductor cross section, flexible	0.2 mm ² ... 1.5 mm ²	0.14 mm ² ... 2.5 mm ²
Conductor cross section AWG	24 ... 12	24 ... 12
Stripping length	10 mm	10 mm

Ambient conditions

Ambient temperature (operation)	-40 °C ... 70 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C
Permissible humidity (operation)	5 % ... 95 % (non-condensing)

Conformance with EMC Directive 2004/108/EC (valid until 19.04.2016) / 2014/30/EU (valid from 20.04.2016)

Noise immunity according to EN 61000-6-2
When being exposed to interference, there may be minimal deviations.

Noise emission according to EN 61000-6-4

Conformance / approvals

Conformance	CE-compliant
ATEX	Ⓜ II 3 G Ex nA IIC T4 Gc X
UL, USA / Canada	UL 508 Listed
UL, USA / Canada	Class I, Div. 2, Groups A, B, C, D T6
UL, USA / Canada	Class I, Zone 2, Group IIC T6
Shipbuilding DNV GL 14445-15HH	C, EMC2

5 Safety regulations and installation notes

5.1 Installation notes

- The category 3 device is suitable for installation in potentially explosive area zone 2. It fulfills the requirements of EN 60079-0:2012 and EN 60079-15:2010.
- Installation, operation, and maintenance may only be carried out by qualified electricians. Follow the installation instructions as described. When installing and operating the device, the applicable regulations and safety directives (including national safety directives), as well as generally approved technical regulations, must be observed. The safety data is provided in this package slip and on the certificates (conformity assessment, additional approvals where applicable).
- While the devices are in operation, contact-dangerous voltages may be present on the control elements. For this reason parameterization, conductor connection, and opening of the module lid are allowed only when devices are in a de-energized state unless the connected circuits are exclusively SELV or PELV circuits.
- The device must not be opened or modified. Do not repair the device yourself, replace it with an equivalent device. Repairs may only be carried out by the manufacturer. The manufacturer is not liable for damage resulting from violation.
- The IP20 protection (IEC 60529/EN 60529) of the device is intended for use in a clean and dry environment. The device must not be subject to mechanical strain and/or thermal loads, which exceed the limits described.
- The device is not designed for use in atmospheres with a danger of dust explosions.
- The device complies with the EMC regulations for industrial areas (EMC class A). When using the device in residential areas, it may cause radio interference.
- If the device is not used as described in the documentation, the intended protection can be negatively affected.
- To protect the device against mechanical or electrical damage, install it in a suitable housing with appropriate degree of protection as per IEC 60529.
- Provide a switch/circuit breaker close to the device, which is labeled as the disconnecting device for this device.
- Provide for an overcurrent protection device ($I \leq 4 \text{ A}$) in the installation.
- Thanks to its housing, the device has basic insulation to the neighboring devices, for 150 Veff. If several devices are installed next to each other, this has to be taken into account, and additional insulation has to be installed if necessary!
- The voltages present at the input, output and supply are extra-low voltages (ELV). Depending on the application, dangerous voltage ($> 30 \text{ V}$) against ground could occur. For this event, safe electrical isolation from the other connections has been implemented.
- The device must be stopped if it is damaged, has been subjected to an impermissible load, stored incorrectly, or if it malfunctions.
- Only use copper connecting cables providing the permitted temperature range ($60^\circ\text{C}/75^\circ\text{C}$).

5.2 Installation in Zone 2

- Observe the specified conditions for use in potentially explosive areas! Install the device in a suitable approved housing (with a minimum of IP54 protection) that meets the requirements of EN 60079-15. Observe the requirements of EN 60079-14.
- Only devices which are designed for operation in Ex zone 2 and are suitable for the conditions at the installation location may be connected to the circuits in the Ex zone.
- In potentially explosive areas, terminals may only be snapped onto or off the DIN rail connector and wires may only be connected or disconnected when the power is switched off.
- The device must be stopped and immediately removed from the Ex area if it is damaged, was subject to an impermissible load, stored incorrectly or if it malfunctions.

5.3 UL Notes

INDUSTRIAL CONTROL EQUIPMENT FOR HAZARDOUS LOCATIONS 45FP

- 1 Suitable for use in class 1, division 2, groups A, B, C and D hazardous locations, or nonhazardous locations only.
- 2 **WARNING - EXPLOSION HAZARD:** Do not disconnect equipment unless power has been removed or the area is known to be non-hazardous.
- 3 **WARNING - EXPLOSION HAZARD:** Substitution of any components may impair suitability for Class I, Division 2.
- 4 This device is open-type and is required to be installed in an enclosure suitable for the environment and can only be accessed with the use of a tool or key.

6 Installation

6.1 Connection notes



The device contains components that can be damaged or destroyed by electrostatic discharge. When handling the device, observe the necessary safety precautions against electrostatic discharge (ESD) according to EN 61340-5-1 and IEC 61340-5-1.

6.2 Structure

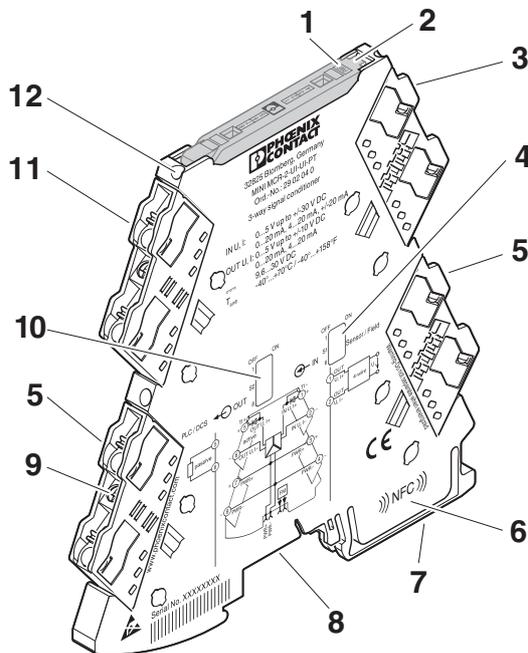


Figure 1 Structure

- 1 Green "PWR" LED, power supply
- 2 Cover with labeling option
- 3 Voltage/current input
- 4 DIP switch S1
- 5 Supply voltage
- 6 NFC coil
- 7 Universal snap-on foot for EN DIN rails
- 8 Connection for DIN rail connector
- 9 Spindle screw
- 10 DIP switch S2
- 11 Voltage output / current output
- 12 Current measuring socket

6.3 Block diagram

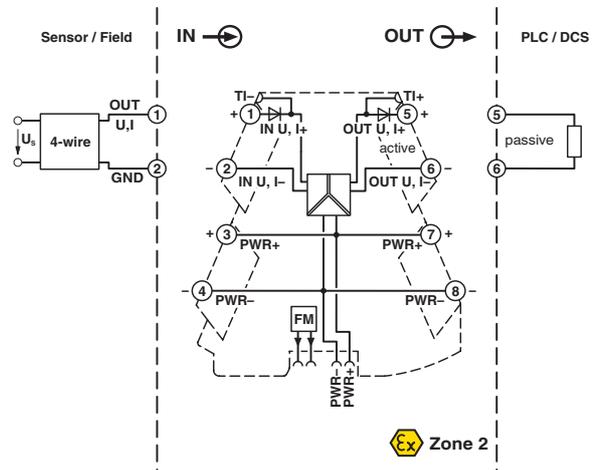


Figure 2 Block diagram

6.4 Power supply

You must refer to the MACX and MINI Analog power manual for the design of the power supply.



NOTE

Never connect the supply voltage directly to the DIN rail connector. Drawing power from individual devices is not permitted!

Supply via the module

Where the total current consumption of the aligned modules does not exceed 400 mA, the power can be supplied directly at the connection terminal blocks of the module.

We recommend connecting a 630 mA fuse (normal-blow or slow-blow) upstream.

Supply via a power terminal block

The MINI MCR-2-PTB power terminal block (Order No. 2902066) or the MINI MCR-2-PTB-PT power terminal block (Order No. 2902067) of the same shape is used to supply the supply voltage to the DIN rail connector.

We recommend connecting a 4 A fuse upstream.

Supply via a system power supply unit

The system power supply unit with 1.5 A output current connects the DIN rail connector to the supply voltage and can thus be used to supply several modules from the mains.

- MINI-SYS-PS-100-240AC/24DC/1.5 (Order No. 2866983)
- Potentially explosive areas:
MINI-PS-100-240AC/24DC/1.5/EX (Order No. 2866653)

6.5 Assembly

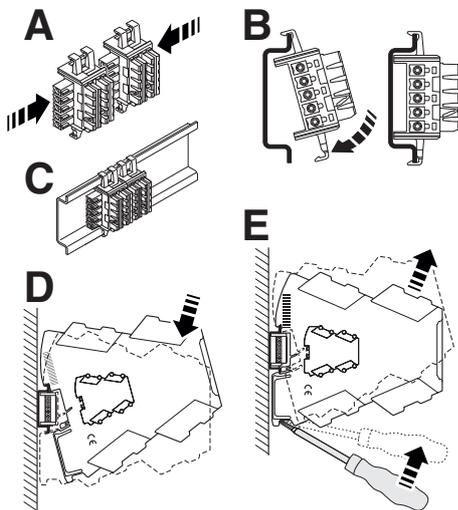


Figure 3 Mounting and removing

- Mount the module on a 35 mm DIN rail according to EN 60715.
- When using the DIN rail connector, first place it into the DIN rail (see A – C). It is used to bridge the power supply. It is also absolutely vital that you snap the module and the DIN rail connector into position in the correct direction: the snap-on foot should be at the bottom and the connector on the left.

6.6 FASTCON Pro plugs

The device has pluggable connection terminals with an integrated test disconnect terminal block, with either push-in or screw-in connection technology.

You can plug or screw the FASTCON Pro plugs onto the device directly without tools. You can use the integrated spindle screw to easily remove the plugs from the module or set the isolating position, even when the plugs are connected. For this purpose, use a screwdriver of sufficient width, e.g. SZF 1-0.6x3.5 (order number: 1204517).

4-way coding prevents incorrect insertion into the module.

Screw connection:

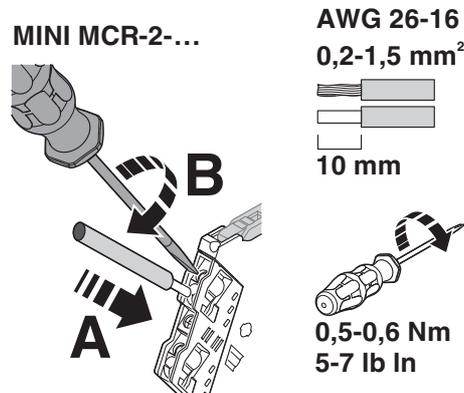


Figure 4 Screw connection

- Insert the wire into the corresponding connection terminal block.
- Use a screwdriver to tighten the screw in the opening above the connection terminal block.

Push-in connection:

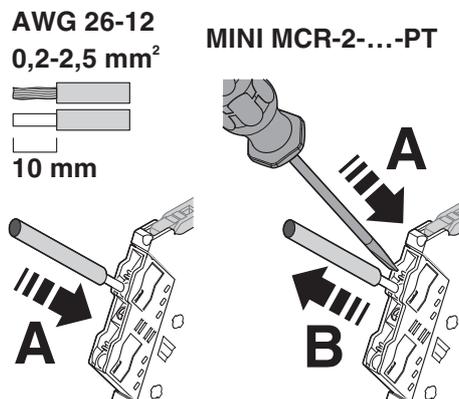


Figure 5 Push-in connection

- Insert the wire into the corresponding connection terminal block.

6.7 Fault monitoring FM

A module or power supply failure is reported to the form-matched MINI MCR-2-FM-RC fault monitoring module (order number 2904504) or MINI MCR-2-FM-RC-PT fault monitoring module (order number 2904508) via the DIN rail connector. The module reports the error centrally via an N/C contact.

A fault monitoring module is only required once in a group. There is no need for individual evaluation of up to 115 connected Mini Analog Pro signal conditioners.

6.8 Current measurement

The device allows current measurement without disconnection of the conductors by means of integrated test disconnect terminals.

Test sockets which support current measurement are marked T1+ or T1-.

For the current measurement, use 2 mm probe tips of the type Fluke TL75-1 or probe tips with a comparable tip shape.

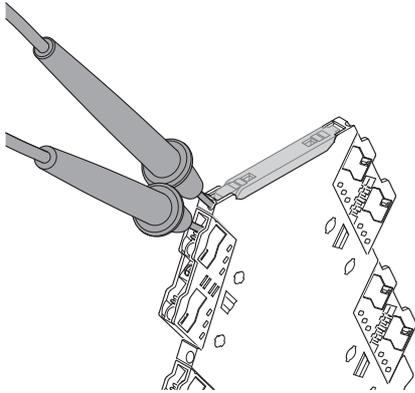


Figure 6 Test disconnect terminal block

Furthermore, individual circuits can be specifically disconnected, e.g. for commissioning.

You can set the isolating position by turning the integrated spindle screw through 180°. The isolating position is indicated by the marking on the plugs.

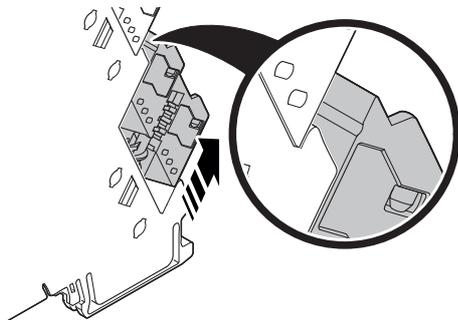


Figure 7 Disconnect position

6.9 Marking

Standard UCT-EM... or UC-EMLP tags are available for marking the devices and can be printed as per customer requirements. In addition, the covers provide enough space for the use of freely chosen sticky labels such as SK 5.0 WH:REEL without concealing the LED diagnostic indicators.

7 Configuration

Standard configuration for devices not configured to order:
Input 0...10 V, output 0...20 mA (all DIP switches in the "off" position; transmission error <0.1 %).

DIP switches

You can use DIP switches S1 and S2 to specify the combination of the input and output standard signal range (see the configuration table) or you can use the DIP switch setting help in the MINI Analog Pro app to display the DIP switch positions for the desired configuration.

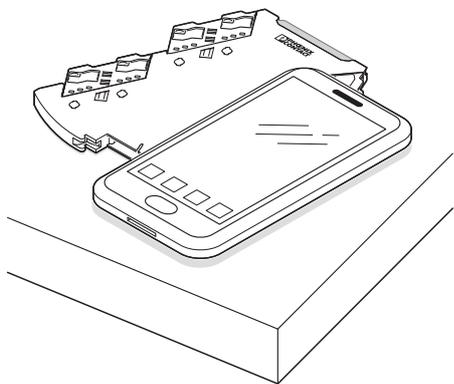


Figure 8 Configuration

There is no need for readjustment following a measuring range switch-over.

All 108 adjustable measuring ranges are already calibrated ex works.

7.1 Configuration table

	Unipolar	Bipolar	• ± ON Live zero	DIP S1						DIP S2			
				1	2	3	4	5	6	1	2	3	
IN	0...5 V	±5 V	1...5 V	•									
	0...10 V	±10 V	2...10 V										
	0...20 V	±20 V	4...20 V		•								
	0...24 V	±24 V	4.8...24 V			•							
	0...30 V	±30 V	6...30 V				•						
	0...20 mA	±20 mA	4...20 mA						•	•			
OUT	0...5 V	±5 V	1...5 V							•	•		
	0...10 V	±10 V	2...10 V							•		•	
	0...20 mA		4...20 mA										

IN	OUT	DIP S2				Example	
		4	5	6	7	IN	OUT
Bipolar	Bipolar					±20 mA	±10 V
Bipolar	Unipolar	•	•			±20 mA	0...10 V
Bipolar	Live zero	•	•	•		±10 V	4...20 mA
Unipolar	Unipolar					0...10 V	0...10 V
Unipolar	Bipolar	•	•			0...10 V	±10 V
Unipolar	Live zero		•			0...10 V	4...20 mA
Live zero	Live zero					4...20 mA	4...20 mA
Live zero	Unipolar	•				4...20 mA	0...20 mA
Live zero	Bipolar	•			•	4...20 mA	±10 V

Limit frequency	DIP S2
30 Hz	8
5 kHz	•

8 Status indicator

Green LED **PWR** Supply voltage
 Lit Supply voltage present