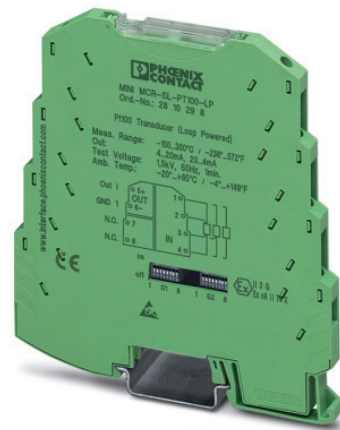


MINI MCR-SL-PT100-LP

Configurable loop-powered temperature measuring transducer for Pt 100 sensors



Data sheet
103154_en_04

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1 Description

The 6.2 mm wide MINI MCR-SL-PT100-LP... is a configurable loop-powered temperature measuring transducer. It is suitable for the connection of Pt 100 resistance thermometers according to IEC 60751 in 2, 3 and 4-wire connection methods.

The module is operated in a 4...20 mA current loop on the output side, which simultaneously provides the required supply power for signal conversion.

The DIP switches that are accessible on the side of the housing enable configuration of the following parameters:

- Connection method
- Temperature range to be measured
- Output signal
- Type of error evaluation

Features

- No separate voltage supply
- 2-, 3-, 4-conductor connection method for Pt 100 resistance thermometer
- Configurable measuring range of -150°C to +300°C
- 4...20 mA or 20...4 mA output signal range
- Configurable error evaluation via signal output and diagnostics LED (wire break, short-circuit and overrange/underrange of the measuring range)
- Approval for Ex-zone 2 (nA)
- Screw or spring-cage connection can be provided
- Can be supplied configured or unconfigured



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".



Make sure you always use the latest documentation.

It can be downloaded from the product at www.phoenixcontact.net/catalog.



This data sheet is valid for all products listed on the following page:

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3 Ordering data

Description	Type	Order No.	Pcs. / Pkt.
Configurable loop-powered temperature measuring transducer for Pt 100 temperature sensors for the -150°C ... 300°C	MINI MCR-SL-PT100-LP	2810298	1
Configurable loop-powered temperature measuring transducer for Pt 100 temperature sensors for the -150°C ... 300°C	MINI MCR-SL-PT100-LP-SP	2810382	1
Configurable loop-powered temperature measuring transducer for Pt 100 temperature sensors for the -150°C ... 300°C	MINI MCR-SL-PT100-LP-NC	2810308	1
Configurable loop-powered temperature measuring transducer for Pt 100 temperature sensors for the -150°C ... 300°C	MINI MCR-SL-PT100-LP-NC-SP	2810395	1

4 Order key

Order No.	Connection Method	Measuring Range [°C]		Output	Failure Information ¹⁾	Factory Calibration Certificate
		Start	End			
2810298	3	0	100	OUT02	A	NONE
2810298 ≙ ...-PT100-LP	2 ≙ 2-wire 3 ≙ 3-wire 4 ≙ 4-wire	0 -10 -20 -30 -40 -50 -100 -150	Range (increment) 0...300 (5 K)	OUT02 ≙ 4...20 mA OUT08 ≙ 20...4 mA	A B C D	NONE ≙ Without factory calibration certificate YES ≙ With factory calibration certificate (a fee is charged) YESPLUS ≙ Factory calibration certificate with 5 measuring points (a fee is charged)
2810382 ≙ ...-PT100-LP-SP						

¹⁾ Failure information:

	Open Circuit	Measuring Range Overrange	Measuring Range Underrange	Short Circuit
A	Start of the measuring range	-	-	Start of the measuring range
B	21.5 mA	21.5 mA	21.5 mA	21.5 mA
C	3.5 mA	3.5 mA	3.5 mA	3.5 mA
D	21.5 mA	21.5 mA	3.5 mA	3.5 mA

5 Technical data

Input	
Number of inputs	1
Configurable/programmable	Yes, preconfigured
Sensor type	Pt 100 (IEC 60751/EN 60751)
Sensor input current	1 mA (constant)
Max. permissible overall conductor resistance	10 Ω (Per cable)
Temperature measuring range	-150 °C ... 300 °C (can be set via DIP switches)
Measuring range span	min. 50 K
Connection method	2, 3, 4-wire
Error detection limit (short-circuit)	(< 30 Ω)
Error detection limit (underrange)	(30 Ω ≤ (start span - 2.5% span))
Error detection limit (overrange)	((end span + 2.5% span) ≤ approx. 254 Ω)
Error detection limit (open circuit)	(> approx. 254 Ω)
Output	
Number of outputs	1
Current output signal	4 mA ... 20 mA 20 mA ... 4 mA
Max. current output signal	23 mA (output limit)
Configurable/programmable	Yes, preconfigured
Ripple	< 20 mV _{PP} (at 500 Ω)
Load/output load current output	((U _{supply} - 12 V) / 22 mA)
Behavior in the event of a sensor error	(configurable)
Supply	
Supply voltage	Loop-powered
Supply voltage range	12 V DC ... 30 V DC (to bridge the supply voltage, the DIN rail connector (ME 6,2 TBUS-2 1,5/5-ST-3,81 GN, Order No. 2869728) can be used. It can be snapped onto a 35 mm DIN rail according to EN 60715)
Max. current consumption	< 3.5 mA (without signal current)
Power consumption	< 42 mW (without signal current)
General data	
Transmission error in the set measuring range	((90 K / set measuring range [K]) + 0.05)%
Transmission error in the full measuring range	≤ 0,25 %
Maximum temperature coefficient	< 0.02 %/K
Step response (0–99%)	< 200 ms
Linearity error	< 0.05 % (for full measuring range)
Electrical isolation	Basic insulation according to EN 61010
Surge voltage category	II
Mounting position	Any
Degree of protection	IP20
Pollution degree	2
Rated insulation voltage	50 V AC/DC
Rated insulation voltage	50 V AC/DC
Test voltage, input/output/supply	1.5 kV (50 Hz, 1 min.)
Dimensions W / H / D	6.2 mm / 93.1 mm / 102.5 mm
Type of housing	PBT green

Connection data	Screw connection	Spring-cage conn.
Conductor cross section, solid	0.2 mm ² ... 2.5 mm ²	0.2 mm ² ... 2.5 mm ²
Conductor cross section, stranded	0.2 mm ² ... 2.5 mm ²	0.2 mm ² ... 2.5 mm ²
Stripping length	12 mm	8 mm

Ambient conditions	
Ambient temperature (operation)	-20 °C ... 65 °C
Ambient temperature (storage/transport)	-40 °C ... 85 °C

Conformance with EMC Directive 2004/108/EC	
Noise immunity according to EN 61000-6-2	
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 Recognized
UL, USA / Canada	Class I, Div. 2, Groups A, B, C, D T5 applied for

6 Safety regulations and installation notes

6.1 Installation notes

- The category 3 device is suitable for installation in the zone 2 potentially explosive area. It fulfills the requirements of EN 60079-0:2009 and EN 60079-15:2010.
- Installation, operation, and maintenance may only be carried out by qualified electricians. Follow the installation instructions described. When installing and operating the device, the applicable regulations and safety directives (including national safety directives), as well as general technical regulations, must be observed. The technical data is provided in this package slip and on the certificates (conformity assessment, additional approvals where applicable).
- It is not permissible to open or modify the device. Do not repair the device yourself but 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 degree of protection (IEC 60529/EN 60529) of the device is intended for use in a clean and dry environment. Do not subject the device to any load that exceeds the described limits.
- The device is not designed for use in atmospheres with a danger of dust explosions.

6.2 Installation in the Ex area (zone 2)

- Observe the specified conditions for use in potentially explosive areas.
- The device must be installed in a housing (control or distributor box) which meets the requirements of EN 60079-15 and provides at least IP54 (EN 60529) degree of protection.
- During installation and when connecting the supply and signal circuits, observe the requirements of EN 60079-14. Devices may only be connected to circuits in zone 2 if they are suitable for operation in Ex zone 2 and for the prevailing conditions at the place of use.
- 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, has been subjected to an impermissible load, has been stored incorrectly, or if it malfunctions.
- You can download the latest documents for these devices from www.phoenixcontact.net/catalog.

7 Installation

7.1 Connection notes



NOTE: Electrostatic discharge!

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 EN 61340-5-2.

7.2 Structure

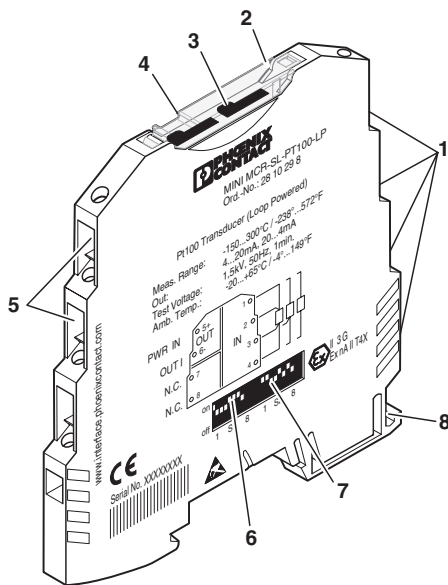


Figure 1 Structure

1. Input: Pt 100 resistance thermometer
2. Cover
3. Diagnostics LED
4. Groove for ZBF 6 zack marker strip
5. Output: Standard signals
6. DIP switch S1
7. DIP switch S2
8. Universal snap-on foot for EN DIN rails

7.3 Block diagram

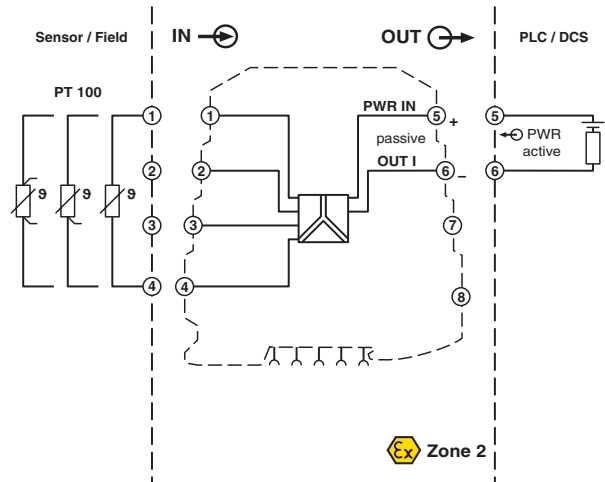


Figure 2 Block diagram

7.4 Power supply



NOTE: Never connect the supply voltage directly to the DIN rail connector. It is not permitted to draw power from the DIN rail connector or from individual modules.

Power feed

The configurable loop-powered temperature measuring transducers do not require a separate power supply. The required power is supplied via the current loop on the output side, e. g., via an active SPS card (see "connection/application example").



However, the loop-powered temperature transducer can be snapped onto a DIN rail connector - an electrical conductive connection is not established. This means that it is not necessary to disconnect an existing DIN rail connector element connection.

7.5 Assembly

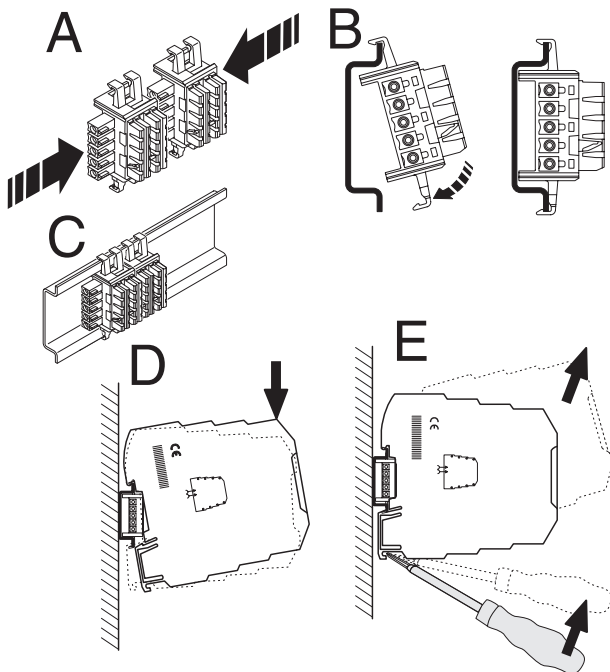


Figure 3 Mounting and removing

- 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.

7.6 Connecting the wires

The MINI MCR-SL-PT100-LP is available in two connection variants:

- Screw terminal blocks (MINI MCR-SL-PT100-LP)
- Spring-cage terminal blocks (MINI MCR-SL-PT100-LP-SP)

Screw connection:

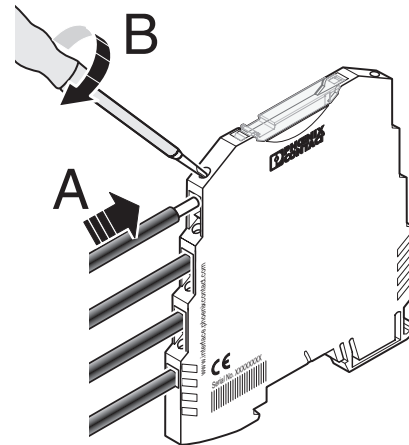


Figure 4 Screw connection

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

Spring-cage connection:

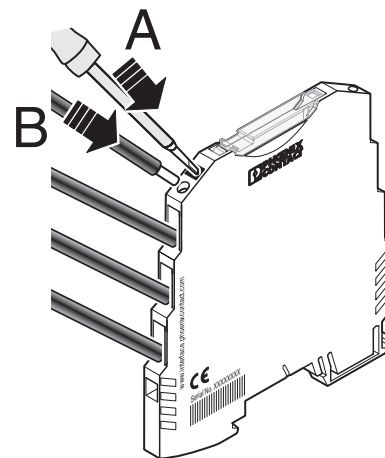


Figure 5 Spring-cage connection

- Insert a screwdriver into the opening above the connection terminal block.
- Insert the wire into the corresponding connection terminal block.

8 Configuration

If the modules are not configured (all DIP switches set to position 0), the module does not have a defined function until the DIP switches have been set.



In the case of preconfigured modules, please enter the order numbers as well as the entire order key. If the order key is incomplete, the standard configuration will be supplied (see order key)

DIP switch S1 specifies the connection method, output signal range, and the start of the measuring range.

DIP switch S2 specifies the measuring range final value and error evaluation.

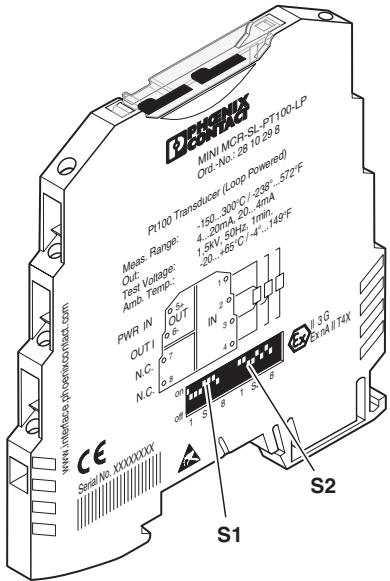


Figure 6 Location of the DIP switches

8.1 Configuration table

DIP S1		Connection Method		Output Signal Range OUT			Start Temperature			
1	2	3	4	5	6	7	8	[°C]	[°F]	
		x	x					0	32	
•		x	x					-10	14	
	•							-20	-4	
	•							-30	-22	
•	•							-40	-40	
	•							-50	-58	
	•							-100	-148	
•	•							-150	-238	

DIP S2						Final Temperature	
1	2	3	4	5	6	[°C]	[°F]
						0	32
•						5	41
•	•					10	50
•	•					15	59
		•				20	68
•	•					25	77
	•	•				30	86
•	•	•				35	95
			•			40	104
•		•				45	113
	•	•				50	122
•	•	•				55	131
			•			60	140
•	•	•				65	149
	•	•	•			70	158
•	•	•	•			75	167
				•		80	176
•					•	85	185
	•				•	90	194
•	•				•	95	203
		•			•	100	212
•	•	•			•	105	221
	•	•	•		•	110	230
•	•	•	•		•	115	239
			•	•		120	248
•			•	•		125	257
	•		•	•		130	266
•	•		•	•		135	275
		•	•	•		140	284
•	•	•	•	•		145	293
	•	•	•	•		150	302
•	•	•	•	•		155	311
					•	160	320
•					•	165	329
	•				•	170	338
•	•				•	175	347
			•		•	180	356
•	•				•	185	365
	•	•			•	190	374
•	•	•			•	195	383
			•		•	200	392
•			•		•	205	401
	•		•		•	210	410
•	•		•		•	215	419
		•	•		•	220	428
•	•	•	•		•	225	437
	•	•	•		•	230	446
•	•	•	•		•	235	455
				•	•	240	464
•				•	•	245	473
	•			•	•	250	482
•	•			•	•	255	491
		•		•	•	260	500
•	•	•		•	•	265	509
	•	•		•	•	270	518
•	•	•		•	•	275	527
			•	•	•	280	536
•			•	•	•	285	545
	•		•	•	•	290	554
•	•	•		•	•	295	563
x	x	•	•	•	•	300	572

DIP S2		7	8	Open Circuit	Measuring Range Overrange	Measuring Range Underrange	Short Circuit
A				Start of the measuring range	-	-	Start of the measuring range
B	•			21.5 mA	21.5 mA	21.5 mA	21.5 mA
C		•		3.5 mA	3.5 mA	3.5 mA	3.5 mA
D	•	•		21.5 mA	21.5 mA	3.5 mA	3.5 mA

- ≙ ON
- ≙ OFF
- x ≙ Any

9 Diagnostics LED

The LED indicates the following error states:

- LED flashes: Faulty configuration
- LED ON: Open circuit on the sensor side
- LED ON: Short-circuit on the sensor side
- LED ON: Measuring range overrange
- LED ON: Measuring range underrange

10 Connection/application example

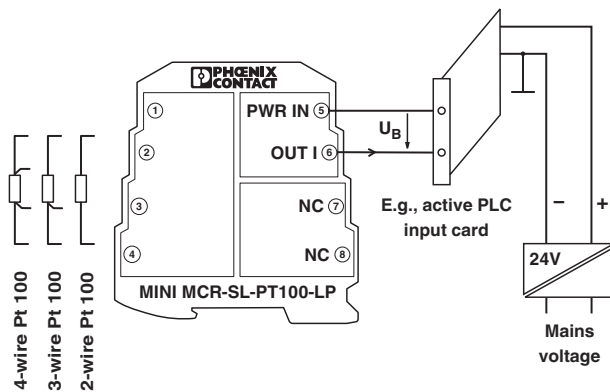


Figure 7 Connection example

2-Wire Connection Method

For short distances (< 10 m). The RL1 and RL2 cable resistance are incorporated directly into the measurement result.

3-Wire Connection Method

For long distances between the Pt100 sensor and the MINI Analog module. All cable resistances must have exactly the same values to compensate for cable resistances ($RL1 = RL2 = RL3$).

4-Wire Connection Method

For long distances between the Pt 100-Sensor and the MINI analog module and different cable resistances ($RL1 \neq RL2 \neq RL3 \neq RL4$).