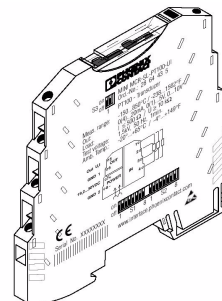


MINI MCR-SL-PT100-UI(-SP)(-NC)

Configurable Temperature Transducer for PT100



Data Sheet

04/2005

Functions

MINI MCR-SL-PT100-UI(-SP)(-NC) is a configurable 3-way isolated temperature measuring transducer. It is suitable for the connection of PT100 resistance thermometers in acc. with IEC 60751 in 2, 3 and 4-conductor connection systems.

On the output side, the analog standard signals 0...20 mA, 4...20 mA, 0...10 V, 0...5 V, 1...5 V, 10...0 V, 20...0 mA, 20...4 mA are available, electrically isolated.

The DIP switches are accessible on the side of the housing and allow the following parameters to be configured:

- Connection system,
- Temperature span to be measured,
- Output signal, and
- Type of error evaluation.

The voltage supply (19.2...30 V DC) can be provided via connecting terminal blocks "7"/"8" of the modules, or together, via the DIN rail connector (see Figure 5 on page 8). Please also observe "Connection Systems" on page 9.

Features

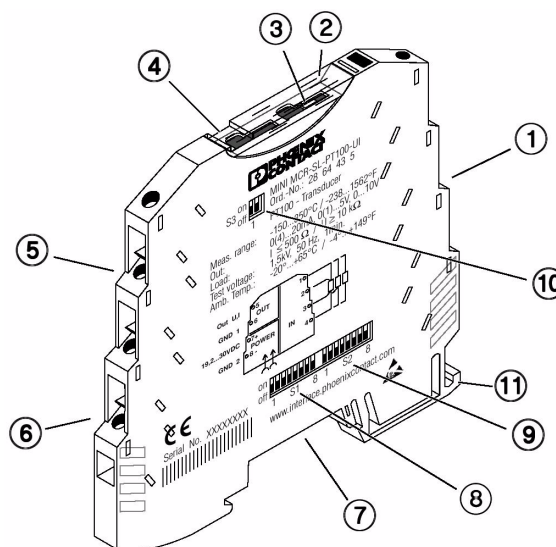


Figure 1 Features

- 1 Input: PT100 resistance thermometer
- 2 Transparent cover
- 3 Diagnostics LED
- 4 Groove for ZBF 6 Zack marker strip
- 5 Output: Standard signals
- 6 Supply voltage
- 7 Connection option for DIN rail connector
- 8 DIP switch S1
- 9 DIP switch S2
- 10 DIP switch S3
- 11 Universal snap-on foot for EN mounting rails

Technical Data

General Data	
Supply voltage	19.2...30 V DC
Current consumption at 24 V DC	< 25 mA
Power consumption	< 500 mW
Transmission error	
At max. measuring span	< 0.2%
With configured measuring span Δ_{TEMP}	$((100\text{ K} / \Delta_{TEMP} [\text{K}]) + 0.1) \%$
Temperature coefficient	0.02%/K, max.
Step response (0...99%)	< 30 ms
Test voltage (input / output / supply)	1.5 kV, 50 Hz, 1 min.
Ambient temperature range	
Operation	-20°C...+65°C
Storage	-40°C...+85°C
Error messages	LED red
Dimensions (W x H x D)	6.2 mm x 93.1 mm x 102.5 mm
Conductor cross section	0.2...2.5 mm ² (AWG 24...12)
Stripping length	
Screw connection	12 mm
Spring-cage connection	8 mm
Housing design	Polybutylenterephthalate PBT, green
Tests / Approvals	    PROCESS CONTROL EQUIPMENT FOR HAZARDOUS LOCATIONS LISTED 312N Class I Div 2 Groups A, B, C, D T5 A) This equipment is suitable for use in Class I, Division 2, Groups A, B, C and D or non-hazardous locations only. B) Warning - explosion hazard - substitution of components may impair suitability for Class 1, Division 2. C) Warning - explosion hazard - do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.
Statement of conformity in acc. with EN 60079-15	 II 3 G Ex nA II T4 X

Input (see Figure 1, detail 1)	I_{IN}
Sensor in acc. with IEC 60751	PT100
Connection system (configurable)	2-, 3-, 4-conductor connection system
Sensor input current	1 mA, constant
Max. permissible conductor resistance	10 Ω per conductor
Measuring range (configurable)	-150°C...+850°C
Measuring range span	50K, min.

Output (see Figure 1, detail 5)	I_{OUT}	U_{OUT}
Output signal range	0...20 mA, 4...20 mA, 20...0 mA, 20...4 mA	0...5 V, 1...5 V, 0...10 V, 10...0 V
Load	< 500 Ω (20 mA)	≥ 10 kΩ
Ripple	< 20 mV _{ss} (500 Ω)	< 20 mV _{ss}
Max. output signal	23 mA / 12.5 V	12.5 V / 10 mA
Behavior in the case of a sensor fault (configurable)	0...105%	

Conformance With EMC Guideline 89/336/EEC And Low Voltage Directive 73/23/EEC		
Immunity to Interference According to EN 61000-6-2¹		
Discharge of static electricity (ESD)	EN 61000-4-2	Criterion B ²
Electromagnetic HF field	EN 61000-4-3	Criterion A ³
Fast transients (Burst)	EN 61000-4-4	Criterion B ⁴
Surge voltage capacities (Surge)	EN 61000-4-5	Criterion B ⁴
Conducted disturbance	EN 61000-4-6	Criterion A ³
Noise Emission According to EN 61000-6-4		
Noise emission of housing	EN 55011 ⁵	Class A ⁶

¹ EN 61000 corresponds to IEC 1000

² Criterion B: Take protective measures against electrostatic discharge.

³ Criterion A: Normal operating behavior within the defined limits.

⁴ Criterion B: Temporary impairment to operational behavior that is corrected by the device itself.

⁵ EN 55011 corresponds to CISPR11

⁶ Class A: Area of application industry.

Ordering Data

Description	Order Designation	Order No.
Configurable temperature transducer for PT100 Screw terminal block, preconfigured (see "Ordering Key for MINI MCR-SL-PT100-UI and MINI MCR-SL-PT100-UI-SP" on page 5)	MINI MCR-SL-PT100-UI	28 64 43 5
Configurable temperature transducer for PT100 Screw terminal block, not configured (see "NC Version" on page 10)	MINI MCR-SL-PT100-UI-NC	28 64 27 3
Configurable temperature transducer for PT100 Spring-cage terminal block, preconfigured (see "Ordering Key for MINI MCR-SL-PT100-UI and MINI MCR-SL-PT100-UI-SP" on page 5)	MINI MCR-SL-PT100-UI-SP	28 64 73 6
Configurable temperature transducer for PT100 Spring-cage terminal block, not configured (see "NC Version" on page 10)	MINI MCR-SL-PT100-UI-SP-NC	28 64 28 6

Accessories

Description	Order Designation	Order No.
DIN rail connector	ME 6,2 TBUS-2 1,5/5-ST-3,81 GN	28 69 72 8
Power terminal block with screw connection	MINI MCR-SL-PTB	28 64 13 4
Power terminal block with spring-cage connection	MINI MCR-SL-PTB-SP	28 64 14 7
System power supply (not for Zone 2!)	MINI-SYS-PS-100-240AC/24DC/1,5	28 66 98 3

Ordering Key for MINI MCR-SL-PT100-UI and MINI MCR-SL-PT100-UI-SP

If the customer order information is incorrect or missing, the standard configuration is delivered (shown as an example in the ordering key).

Order No.	Connection Method	Measuring Range [°C] ¹		Output	Failure Information ²	Manufacturer's Calibration Certificate WKZ
		Start	End			
28 64 43 5 28 64 73 6 (see "Ordering Data")	3	0	100	OUT01	A	NONE
			Range Length of step	(see below)	(see page 6)	
	2 ≙ 2-cond.	0	0...100 5 K	OUT01	A	NONE ≙ without WKZ
	3 ≙ 3-cond.	-10	110...300 10 K	OUT02	B	YES ≙ with WKZ (a charge will be made)
	4 ≙ 4-cond.	-20	320...700 20 K	OUT03	C	
		-30	750...850 50 K	OUT05	D	YESPLUS ≙ WKZ with 5 measuring points (a charge will be made)
		-40		OUT06		
		-50		OUT07		
		-100		OUT08		
		-150		OUT09		

¹ Smallest span 50 K

² Depending on the output signal range, for further details see "DIP Switch S2" on page 11.

Output:

Output	Output signal
OUT01 ≙	0...20 mA
OUT02 ≙	4...20 mA
OUT03 ≙	0...10 V
OUT05 ≙	0...5 V
OUT06 ≙	1...5 V
OUT07 ≙	20...0 mA
OUT08 ≙	20...4 mA
OUT09 ≙	10...0 V

Failure Information:

	Line break			Overrange		
	0...20 mA	4...20 mA	0...10 V	0...20 mA	4...20 mA	0...10 V
A ≙	21 mA	21 mA	10.5 V	20.5 mA	20.5 mA	10.25 V
B ≙	21 mA	21 mA	10.5 V	20.5 mA	20.5 mA	10.25 V
C ≙	21 mA	21 mA	10.5 V	20 mA	20 mA	10 V
D ≙	0 mA	4 mA	0 V	20 mA	20 mA	10 V

	Underrange			Short circuit		
	0...20 mA	4...20 mA	0...10 V	0...20 mA	4...20 mA	0...10 V
A ≙	0 mA	4 mA	0 V	0 mA	4 mA	0 V
B ≙	0 mA	3.5 mA	0 V	0 mA	3 mA	0 V
C ≙	0 mA	4 mA	0 V	21 mA	21 mA	10.5 V
D ≙	0 mA	4 mA	0 V	0 mA	4 mA	0 V

Installation

Screw Connection

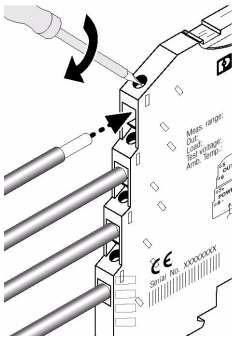


Figure 2 MINI MCR-SL-PT100-UI
MINI MCR-SL-PT100-UI-NC

Spring-Cage Connection

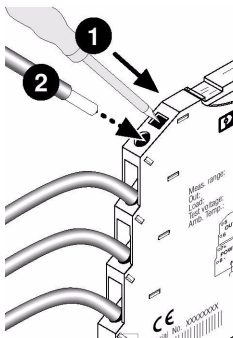


Figure 3 MINI MCR-SL-PT100-UI-SP
MINI MCR-SL-PT100-UI-SP-NC



The device may only be installed and put into operation by qualified personnel. The corresponding national regulations (e.g. VDE, DIN) must be observed.



Notes for Ex:

The device is category 3 electrical apparatus. Please observe the instructions given here for installation. The device must be installed in a housing with IP54 protection in acc. with EN 60529. The limits for mechanical or thermal loads described for the device must not be exceeded. Only devices designed for operation in the hazardous areas of Zone 2 may be connected. Under no circumstances may repairs be carried out by the user.



Only engage or connect conductors in the hazardous area when the device is deenergized!

The assignment of the connecting terminal blocks is shown in Figure 4.

Block Diagram

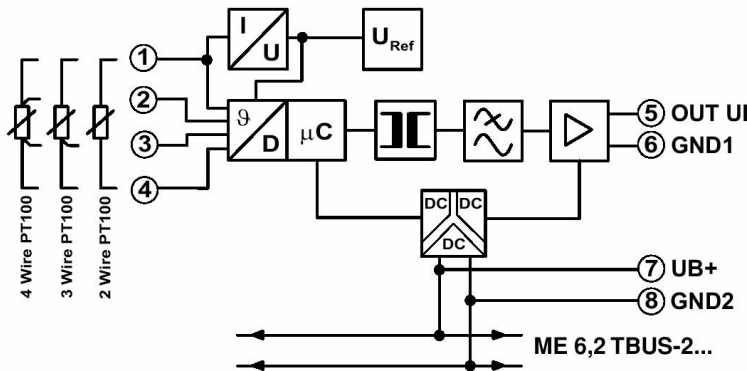


Figure 4 Block diagram

The MINI Analog module can be snapped onto all 35 mm DIN rails corresponding to EN 60715.

Using DIN rail connector ME 6,2 TBUS-2 1,5/5-ST-3,81 GN (Order No.: 28 69 72 8)



Please also pay particular attention to the direction of the MINI Analog module and DIN rail connector when snapping into position:

Snap-on foot (Figure 5, detail D 11)
below and **plug** (Figure 5, detail C 12)
left!

- First position the DIN rail connector in the DIN rail to bridge the voltage supply (see Figure 5).

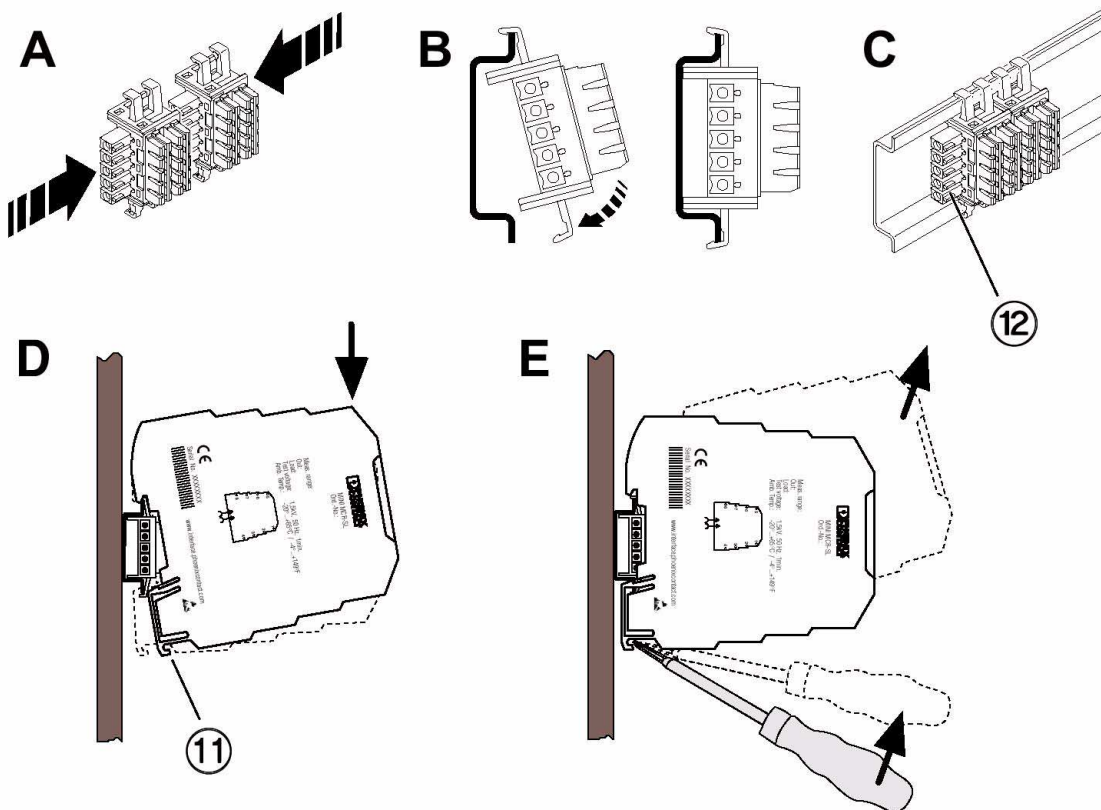


Figure 5 Mounting/Removing

Power Supply



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 MINI Analog modules!

Feeding in power via the MINI Analog module

Where the total current consumption of the aligned MINI Analog modules does not exceed 400 mA, the power can be fed in directly at the connecting terminal blocks of a MINI Analog module. We recommend connecting a 400 mA fuse upstream.

Feeding in power with a power terminal block

Power terminal block MINI MCR-SL-PTB (Order No.: 28 64 13 4) or MINI MCR-SL-PTB-SP (Order No.: 28 64 14 7), of the same shape, is used to feed in the supply voltage to the DIN rail connector. We recommend connecting a 2 A fuse upstream.

Feeding in the power with a system power supply unit

System power supply unit MINI-SYS-PS-... (Order No.: 28 66 98 3) with 1.5 A output current contacts the DIN rail connector with the supply voltage, allowing several MINI Analog modules to be supplied from the network.

Connection Systems

2-conductor connection system (Figure 6)

- For short distances (< 10 m)
- Cable resistances R_{L1} and R_{L2} are incorporated in the measurement result directly and falsify the result accordingly.

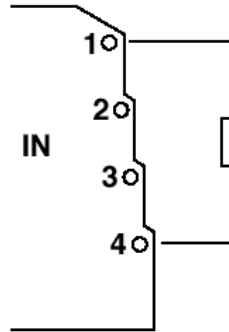


Figure 6 2-conductor connection system

3-conductor connection system (Figure 7)

- For long distances between PT100 sensor and MINI Analog module
- The value of all cable resistances must be exactly the same in order to balance out the sensor cable resistances ($R_{L1} = R_{L2} = R_{L3}$).

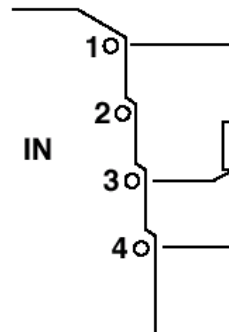


Figure 7 3-conductor connection system

4-conductor connection system (Figure 8)

- For long distances between the PT100 sensor and the MINI Analog module and different cable resistances (RL1 ≠ RL2 ≠ RL3 ≠ RL4).

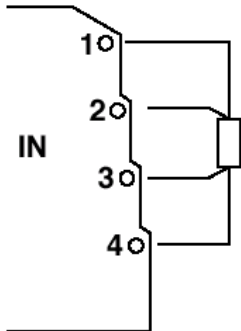


Figure 8 4-conductor connection system

Diagnostics

LED (Figure 1, detail 3) is visible on the front and displays the following error statuses:

- LED flashes: Measuring range span less than 50 K
- LED lit: Line break on the sensor side
- LED lit: Short circuit on the sensor side
- LED lit: Measuring range exceeded
- LED lit: Measuring range fallen below

Configuration



Electrostatic Discharge!

The module contains components that can be damaged or destroyed by electrostatic discharge. When handling the module, observe the necessary safety precautions against electrostatic discharge (ESD), in accordance with EN 61340-5-1 and EN 61340-5-2, as well as IEC 61340-5-1 and IEC 61340-5-2.

NC Version

If the device is not configured ("NC version": MINI MCR-SL-PT100-UI-NC or ...-SP-NC), all DIP switches are at pos. 0. The device does not have a defined function until the DIP switches have been set.

DIP Switch S1

DIP switch S1 (Figure 1, detail 8) defines the connection system, output signal range and the start of the measuring range.

Connection System			Output Signal Range			Start Temperature						
1	2		3	4	5	OUT		6	7	8	[°C]	[°F]
		2-cond.				0...20 mA					0	32
•		2-cond.	•			20...0 mA		•			-10	14
	•	3-cond.		•		4...20 mA			•		-20	-4
•	•	4-cond.	•	•		20...4 mA		•	•		-30	-22
• = ON					•	0...10 V				•	-40	-40
				•	•	10...0 V		•	•	-50	-58	
				•	•	0...5 V			•	•	-100	-148
				•	•	1...5 V		•	•	•	-150	-238

DIP Switch S3

DIP switch S3 (Figure 1, detail 10) is used to select the voltage and current output.

1	2	OUT
•		0(4)...20 mA, 20...0(4) mA
	•	0...10 V, 10...0 V, 0(1)...5 V

• = ON

DIP Switch S2

DIP switch S2 (Figure 1, detail 9) defines the end value of the measuring range and error evaluation.

End Temperature						°C	°F
1	2	3	4	5	6		
						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
•	•			•		110	230
	•	•		•		120	248
•	•	•		•		130	266
			•	•		140	284
•			•	•		150	302
	•		•	•		160	320
•	•		•	•		170	338
		•	•	•		180	356
•		•	•	•		190	374
	•	•	•	•		200	392

End Temperature						°C	°F
1	2	3	4	5	6		
•	•	•	•	•		210	410
					•	220	428
•					•	230	446
	•				•	240	464
•	•				•	250	482
		•			•	260	500
•	•	•			•	270	518
	•	•			•	280	536
•	•	•			•	290	554
			•		•	300	572
•			•		•	320	608
	•		•		•	340	644
•	•		•		•	360	680
		•	•		•	380	716
•		•	•		•	400	752
	•	•	•		•	420	788
•	•	•	•		•	440	824
				•	•	460	860
•				•	•	480	896
	•			•	•	500	932
•	•			•	•	520	968
		•		•	•	540	1004
•		•		•	•	560	1040
	•	•		•	•	580	1076
•	•	•		•	•	600	1112
			•	•	•	620	1148
•			•	•	•	640	1184
	•		•	•	•	660	1220
•	•		•	•	•	680	1256
		•	•	•	•	700	1292
•		•	•	•	•	750	1382
	•	•	•	•	•	800	1472
•	•	•	•	•	•	850	1562

	7	8	Line Break	Overrange	Underrange	Short Circuit
A			Measuring range end +5%	Measuring range end +2.5%	Measuring range start	Measuring range start
B	•		Measuring range end +5%	Measuring range end +2.5%	Measuring range start -12.5%	Measuring range start -25%
C		•	Measuring range end +5%	Measuring range end	Measuring range start	Measuring range end +5%
D	•	•	Measuring range start	Measuring range end	Measuring range start	Measuring range start



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