

# Digital Temperature Transmitter

## for PROFIBUS PA, Head Mounting

### Electrical Temperature Measurement

Standard • Model T42.10.000  
 class protection EEx ia • Model T42.10.002

#### Applications

- Process industry
- Machinery, plant construction

#### Special Features

- Field bus protocol PROFIBUS PA
- Configurable for connection to
  - RTDs
  - Thermocouples
  - Resistancesensor
  - mV-sensor
- Customer specific linearisation with max. 30 points for sensors with  $\Omega$ - or mV-output
- EMC Conformity per
  - DIN EN 50 081-1
  - DIN EN 50 082-2
  - NAMUR NE 21
- 100% Rh protection, moisture condensation permissible



#### Description

The digital temperature transmitter T42 range is designed for universal use in the process industry. The Profibus technology makes it possible to operate up to seven transmitters in parallel on one Profibus PA string via one segment coupler (ex class protection) in hazardous areas. For applications without requirements on the use in hazardous areas the number of transmitters which may be connected is yet considerably higher, depending on the segment coupler.

There is a wide range of possibilities with respect to configuration. For example, sensor type, sensor's mode of operation, scaling of the output signal and alarm limits are individually programmable. The configuration is made via a class 2 master and the definition of the profile in accordance with the Profibus guidelines. An appropriate tool for configuration is, for example, SIMATIC PDM or Freelance 2000.

High accuracy, galvanic isolation and excellent EMI protection are further features of these transmitters. The compact head mounting case fits in almost any DIN connecting head with form B.

The following sensors can be connected:

- RTDs per DIN IEC 751, JIS C 1606, DIN 43 760 in 2-, 3- and 4-lead connection, the connection system used is configurable and ensures an optimal lead wire compensation
- thermocouples per DIN IEC 584 resp. DIN 43 710 Cold junction compensation (CJC) is built-in, the use of an external CJC is selectable via configuration.
- resistance sensors up to 5000  $\Omega$  in 2-, 3- and 4-lead connection, configurable compensation of the connection cable
- mV-sensors up to 1200 mV

The variety of 15 sensor types enable registration of the temperature in a range from -270 °C up to 1820 °C.

The transmitters are delivered with a basic configuration. Alternatively, upon request, transmitters can be delivered with a customised configuration within the given limits.

**Specifications**
**Model T42.10.000 / T42.10.002**

Input	configurable: type of sensor and measuring range	Measuring range	
RTDs	Pt100 ( $\alpha = 0,00385$ ) DIN IEC 751	-200 ... + 850 °C <sup>1)</sup>	
	JPt100 ( $\alpha = 0,003916$ ) JIS C 1606 (1989)	-200 ... + 500 °C	
	Ni100 DIN 43 760 (1987-09)	-60 ... + 250 °C	
thermocouples	type T, Cu-CuNi DIN IEC 584	-270 ... + 400 °C	
	type E, NiCr-CuNi DIN IEC 584	-270 ... +1000 °C	
	type J, Fe-CuNi DIN IEC 584	-210 ... +1200 °C	
	type L, Fe-CuNi DIN 43 710 (1985-12)	-200 ... + 900 °C	
	type K, NiCr-Ni DIN IEC 584	-270 ... +1372 °C	
	type N, NiCrSi-NiSi DIN IEC 584	-270 ... +1300 °C	
	type U, Cu-CuNi DIN 43 710 (1985-12)	-200 ... + 600 °C	
	type R, PtRh-Pt DIN IEC 584	-50 ... +1768 °C	
	type S, PtRh-Pt DIN IEC 584	-50 ... +1768 °C	
	type B, PtRh-PtRh DIN IEC 584	0 ... +1820 °C	
resistance sensor		0 ... 700 $\Omega$	
		0 ... 1400 $\Omega$	
		0 ... 2900 $\Omega$	
		0 ... 5000 $\Omega$	
mV-sensor		- 140 ... + 140 mV	
		- 290 ... + 290 mV	
		- 400 ... + 590 mV	
		- 400 ... + 1200 mV	
<b>RTD / resistance sensor</b>			
measuring deviation per DIN IEC 770, 23 °C $\pm$ 5 K			
	RTDs MV $\leq$ 200 °C	$\pm$ 0.08 K	
	MV > 200 °C	$\pm$ ( 0.08 K + 0.01 % (MV - 200 K) )	
	resistance-sensor	$\pm$ 0.03 $\Omega$ or 0,01 % MV , whichever is greater	
sensor current		approx. 0.2 mA	
temperature coefficient $T_c$	RTDs	$\pm$ ( 0.05 K + 0.015 % MV ) / 10 K $T_{amb}$	
	resistance-sensor	$\pm$ ( 0.01 $\Omega$ + 0.01 % MV ) / 10 K $T_{amb}$	
lead wire connection		configurable: 2-lead , 3-lead , 4-lead	
connection leads	effect	$\pm$ 0.02 $\Omega$ / 10 $\Omega$	
	max. permissible resistance	30 $\Omega$ each lead, 3-lead symmetric	
<b>thermocouples</b>			
measuring deviation per DIN IEC 770, 23 °C $\pm$ 5 K			
type T, L, U	-150 °C < MV $\leq$ 0 °C	$\pm$ ( 0.25 K + 0.15 % MV )	
	MV > 0 °C	$\pm$ ( 0.25 K + 0.015 % MV )	
E, J, K, N	-150 °C < MV $\leq$ 0 °C	$\pm$ ( 0.4 K + 0.2 % MV )	
	MV > 0 °C	$\pm$ ( 0.4 K + 0.03 % MV )	
R, S	50 °C < MV $\leq$ 400 °C	$\pm$ ( 1.2 K + 0.1 % (MV - 400 K) )	
	400 °C < MV $\leq$ 1600 °C	$\pm$ ( 1.2 K + 0.015 % (MV - 400 K) )	
B	400 °C < MV $\leq$ 1000 °C	$\pm$ ( 1.3 K + 0.25 % (MV - 1000 K) )	
	MV > 1000 °C	$\pm$ 1.3 K	
additional error of cold junction compensation at 23 °C $\pm$ 5 K		$\pm$ 0.8 K	
temperature coefficient $T_c$	type T, L, U	MV > -150 °C	$\pm$ ( 0.1 K + 0.02 % MV ) / 10 K $T_{amb}$
		MV > -150 °C	$\pm$ ( 0.1 K + 0.035 % MV ) / 10 K $T_{amb}$
	R, S	50 °C < MV $\leq$ 1600 °C	$\pm$ ( 0.3 K + 0.025 % (MV - 400 K) ) / 10 K $T_{amb}$
	B	MV > 400 °C	$\pm$ ( 0.4 K + 0.02 % (MV - 1000 K) ) / 10 K $T_{amb}$
	temperature coefficient $T_c$ of cold junction compensation		$\pm$ 0.1 K / 10 K $T_{amb}$
connection leads	effect	$\pm$ 0.1 $\mu$ V / 10 $\Omega$	
	max. permissible resistance	250 $\Omega$	
<b>mV-sensor</b>			
measuring deviation per DIN IEC 770, 23 °C $\pm$ 5 K		$\pm$ ( 10 $\mu$ V + 0.03 % MV )	
temperature coefficient $T_c$		$\pm$ ( 2 $\mu$ V + 0.03 % MV ) / 10 K $T_{amb}$	
connection leads	effect	$\pm$ 0.1 $\mu$ V / 10 $\Omega$	
	max. permissible resistance	250 $\Omega$	
<b>Communication</b>			
bus voltage		PROFIBUS PA , Profile 2.0	
model T42.10.000 (without Ex-protection)		EN 61158-2/94	
models T42.10.002 (with Ex-protection)		DC 9 ... 32 V	
bus connection		DC 9 ... 25 V	
max. current consumption		reverse polarity possible	
default address		12.8 mA	
		126	

MV measuring value (temperature measuring values in °C)

 $T_{amb}$  ambient temperature

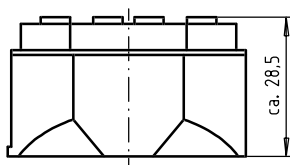
 $T_c$  temperature coefficient

1) increased up to 1000 °C

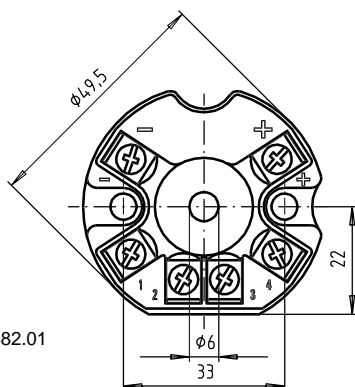
<b>IP-protection</b>	EC Type Examination Certificate DMT 99 ATEX E 033 X
model T42.10.002	II 1G EEx ia IIB / IIC T4 / T5 / T6
permissible ambient temperature	-50 °C ... +85 °C with T4 -50 °C ... +70 °C with T5 -50 °C ... +50 °C with T6
maximum values for connection of the bus (connections + and -) suited to connect a power supply acc. to FISCO-Model with maximum values as listed	$U_i = 25 \text{ V}$ $L_i = \text{negligible}$ $C_i = \text{negligible}$  Power supply with trapezoid characteristic: $U_o = 24 \text{ V}$ $I_o = 250 \text{ mA}$ $P_o = 1.2 \text{ W}$  Power supply with square wave characteristic: $U_o = 17.5 \text{ V}$ $I_o = 280 \text{ mA}$ $P_o = 4.9 \text{ W}$
maximum values for connection of the sensor circuit (connections 1 up to 4)	$U_o = 8.6 \text{ V}$ $I_o = 10 \text{ mA}$ $P_o = 22 \text{ mW}$ Group IIB: $C_o = 40 \text{ }\mu\text{F}$ $L_o = 10 \text{ mH}$ Group IIC: $C_o = 5 \text{ }\mu\text{F}$ $L_o = 10 \text{ mH}$
<b>Electromagnetic compatibility (EMC)</b>	<b>CE</b> Conformity per DIN EN 50081-1 (March 93) and DIN EN 50082-2 (February 96) NAMUR NE 21 (May 93)
<b>Special features</b>	
isolation voltage (input versus bus connection)	AC 1500 V, 60 s
ambient and storage temperature standard range	-40 ... +85 °C
climate class	Cx (-40 ... +85 °C, 5 % up to 95 % relative humidity) DIN EN 60 654-1
maximum permissible humidity	100 % relative humidity (unlimited with isolated connection wires), moisture condensation permissible DIN IEC 68-2-30 Var. 2
vibration	10 ... 2000 Hz 5 g DIN IEC 68-2-6
shock	DIN IEC 68-2-27
salt fog	DIN IEC 68-2-11 $g_N = 30$
warm-up time	approx. 5 Min. 1)
measured value update	approx. 2.5 / s
temperature units	configurable: K, °C, °F, °R
configuration and calibration data	permanently stored in EEPROM
testing current to monitor sensor	nom. 1 $\mu\text{A}$ during testing cycle, otherwise 0 $\mu\text{A}$
self-monitoring	automatic execution of initial test after connection to power supply, thereafter monitoring for internal malfunction
<b>Case</b>	head mounting design
material	plastic
ingress protection	case IP 66 / IP 67 IEC 529 / EN 60529
terminal connections	IP 00 IEC 529 / EN 60529
cross section of terminal connections	max. 2.5 mm <sup>2</sup> , screws captive
weight	approx. 70 g
dimensions	see drawings

1) Time, after turn on, until the instrument will function within specified repeatability

## Dimensions in mm



3209 482.01

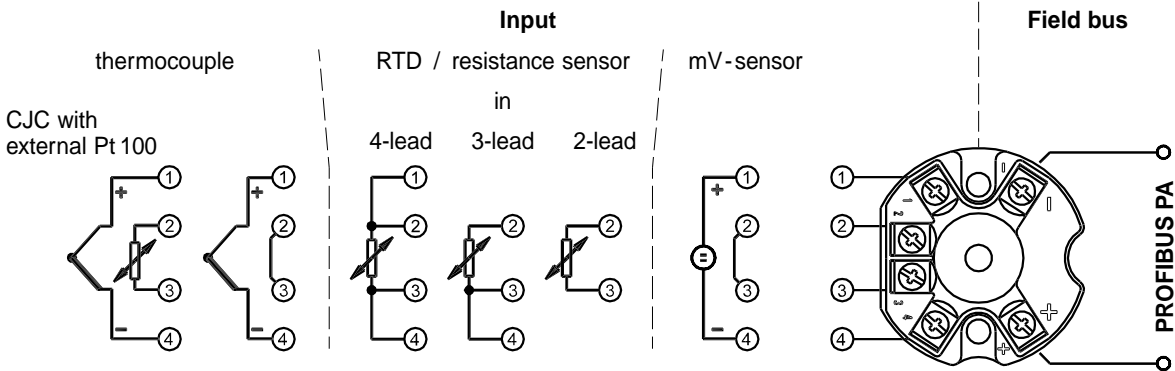


## Accessories

### Mounting material

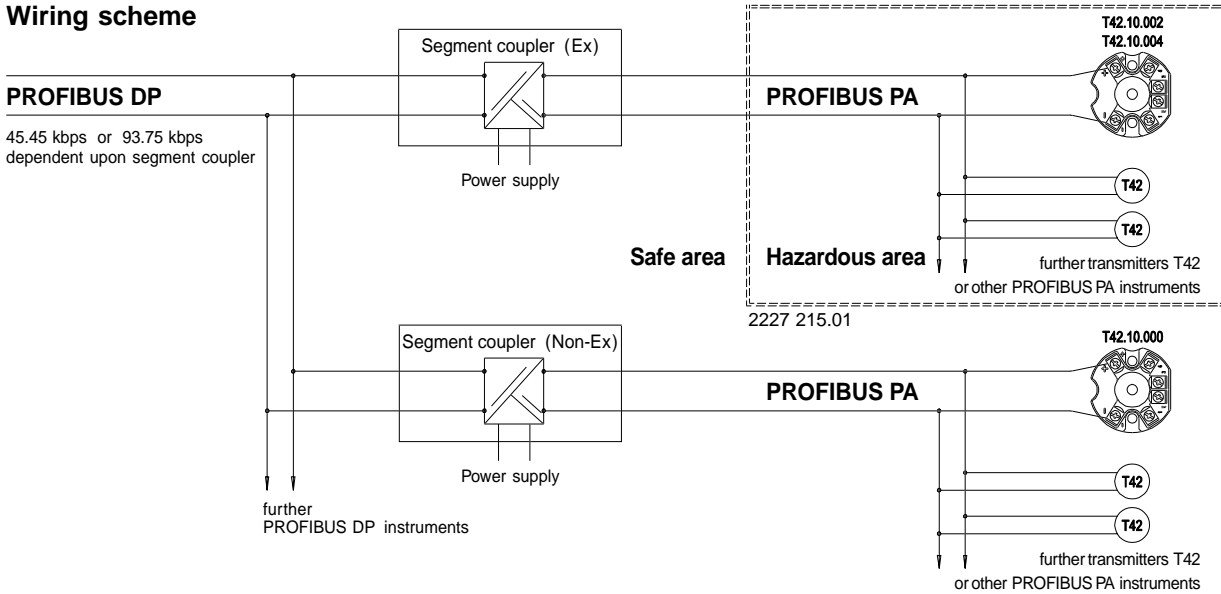
- To use for mounting
- in the top of a connection head
  - on a measuring insert, spring-loaded
  - on a standard rail

## Designation of terminal connectors



3204 073.01

## Wiring scheme



## Ordering information for temperature transmitter Model T42

Field No.	Code	Features
1	0	Explosion protection without
	2	II 1G EEx ia IIC T4/T5/T6
2	PB	Measuring range basic configuration <sup>1)</sup>
	PK	customer's specification <sup>2)</sup> <i>please state as additional text</i>
3	YES	Additional order info
	T	Z additional text <i>Please state as clearly understandable text !</i>

- 1) Pt 100, 3 wire, 0 ... 150 °C
- 2) Please pay attention to the limits of measuring ranges on page 2.

### Order code:

T42.10 - 00  -  -

1                      2                      3

Additional text: \_\_\_\_\_

Specifications and dimensions given in this leaflet represent the state of engineering at the time of printing. Modifications may take place and materials specified may be replaced by others without prior notice.



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