

Temperature Transmitter head mounted TR11, TR01-EX

analog, high accuracy,
Pt 100 (2-, 3-, 4-wire circuit)



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Operating Instructions

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1 General safety instructions

The device:

- Is built and tested in accordance with IEC 1010-1 (equivalent to EN 61 010-1 and DIN VDE 0411 Part 1 “Safety regulations for electrical measuring, control, regulation and laboratory equipment”)
- Is CE certified
- Left the factory in perfect order as regards safety.

In order to maintain this condition, when handling the device (transport, storage, installation, commissioning, operation, servicing, decommissioning), you must observe

- the content of this operating manual
- type plates, labels and safety instructions attached to it otherwise
- injury may result
- the device and other equipment may be damaged.

The ordinances, norms and guidelines named in this operating manual apply in the Federal Republic of Germany. When using the device in other countries, observe the appropriate national regulations.

If the information in this manual is insufficient, you can contact the manufacturer at any time at the address stated on the back of the manual.



Safety instructions for all models

Live circuits which are dangerous to touch can only be safely disconnected if the connected devices meet the requirements of VDE 0106 T.101 (basic requirements for safe disconnection). In order to ensure safe disconnection, lay the feed wires separately from circuits which are dangerous to touch or provide them with additional insulation.

Before switching on the device, make sure that the ambient conditions stated in the technical data are complied with and that the power supply voltage matches that of the transmitter.

If you believe that safe operation is no longer possible, shut down the device and secure it from being switched on inadvertently.



Additional safety instructions for TR 01-Ex

During all work on TR 01-EX the EEC Certificate of Conformity PTB 01 ATEX 2134 X must be observed.

The temperature transmitter TR 01-EX may be directly mounted in Zone 0.

The TR01-EX transmitter must be mounted in such a way that a housing protection degree of at least IP 20 is achieved also for the point of connection, as required by the IEC publication No. 529(144).

If, for functional reasons, the intrinsically safe circuit must be grounded due to equipotential bonding, the grounding should be effected at a single spot.

If an apparatus with an intrinsically safe circuit is connected to the transmitter, proof of the intrinsic safety of the connection must be provided in accordance with DIN VDE 0165/08.98 (=EN 60079-14/1997 as well as IEC 60079-14/1996).

Operations on an explosions-protected apparatus may be carried out by any expert and/or in any workshop, but the apparatus has to be tested and certified by an expert before recommissioning.

Before commencing work, please ensure that the safety measures regarding explosion protection have been taken!

Due to the high surface resistance of $R > 10^9$ Ohms, the TR01-EX temperature transmitter must be operated and maintained in such way that no harmful electrical discharges can occur.

Declaration of conformity

The protection requirements of the European Guidelines 94/9/EG are met.

The protection requirements of the European Guidelines 89/336/EEG with its amendments are fulfilled because of adherence to the following norms:

- Emitted interference: EN 50 081-1:1992
- Interference immunity: EN 50 082-2:1995
- Test standards: EN 61 000-4 Teil 2, 3, 4, 5 und 6.

For details of the EMC test report see Technical Data.

Necessary documentation

TR01-EX, TR 11 Data Sheet 10/11-8.11 EN

2 Technical data

2.1 Type overview

Type	Output signal	Explosion protection
Transmitters for resistance thermometers TR11 TR01-EX	4...20 mA 4...20 mA	– PTB 01 ATEX 2134 X II 1 G EEx ia IIC T6

2.2 Technical data

Types	TR11, TR01-EX
Input	
Circuit type	Pt 100 in 2-, 3- or 4-wire circuit
Measuring range type	See ordering information
Standard	Min. span 20 K (e. g. 80...200 °C)
Special	Min. span 5 K (e. g. 8...13 °C)
Measuring current	≤ 1 mA
Output	
Output current	4...20 mA temperature-linear
Current limitation	≤ 40 mA
Input voltage U_S	12...28 V DC
Max. load	$R_{Bmax} (\Omega) = \frac{U_S(V) - 12V}{0,02A}$
Rise time τ_{90}	< 1 ms
Switch-on delay	< 2 ms
Error limit, drift values (in percent, relative to span) Balancing uncertainty	if lower-range limit = 0 °C: ≤ 0.1 % or 0.1 K, greater value applies if lower-range limit ≠ 0 °C: ≤ 0.15 % or 0.15 K, greater value applies
Linearity deviation	≤ 0.1 %
Effect of ambient temperature (relative to 20 °C)	
Lower-range value	≤ 0.1 °C/10 K
Span	≤ 0.1 %/10 K
Change in supply voltage	No influence (in the range 12...28 V DC)
Electromagnetic compatibility (EMC) meets NAMUR recommendations on immunity to interface (as of 02.88) IEC 801-3	More stringent requirements met < 1 % for duration of coupling Satisfies 10 V/m
Vibrations	No influence (tested to 40g)
Error signalling	
Sensor break	> 22 mA
Sensor short-circuit	< 3 mA
Sensor line break	< 3 or > 22 mA Depending on the type of line combination
Incorrect supply voltage polarity	0 mA

Types	TR11, TR01-EX
Environment conditions Ambient temperatures a) in non-hazardous areas – Nominal range of use – Overload temperatures (approx. twofold drift values) b) in hazardous areas – Category II 1 G (Zone 0) – Category II 2 G (Zone 1) Transport. and storage temperature range Relative humidity (with isolated sensor connection; condensing permitted)	 -25...+90 °C -50...-25 °C or 90...110 °C T6 T5 T1-T4 -20...+40 °C -20...+55 °C -20...+60 °C -40...+50 °C -40...+70 °C -40...+90 °C -50...+120 °C 0...100 %
Screws terminals	M 3.5
Weight (module)	110 g
Explosion protection Type of protection Mounting of transmitter Supply current circuit (terminals +, -) Measuring current circuit (soldered connections 1...4)	Type TR 01-EX PTB 01 ATEX 2134 X Intrinsic safety II 1 G EEx ia IIC T6 Zone 0 Zone 1 Zone 2 EEx ia IIC T6 or EEx ib IIC only for connection to certified intrinsically safe current circuits with a max. $U_i = 28$ V, $I_i = 130$ mA, $P_i = 800$ mW, effective inner inductance and capacitance negligible The type of ignition protection for the signal circuit depends on the type of protection the supply current has. EEx ia or ib IIC/IIB The maximum values are given in Tab. 1. These are dependent on the maximum voltage of the voltage supply circuit U_i .

					Type of protection			
					EEx ia/ib IIC		EEx ia/ib IIB	
U_i	U_o	I_o	P_o	I_{dyn}	C_o	L_o	C_o	L_o
28 V	28 V	52 mA	555 mW	93,2 mA	38 nF	0,5 mH	260 nF	2 mH
24 V	24 V	52 mA	467 mW	80 mA	61 nF	0,5 mH	420 nF	10 mH
18 V	18 V	52 mA	207 mW	60 mA	190 nF	2 mH	10,7 μ F	10 mH

Tab. 1: (for L_o and C_o in the table are based on the respective I_{dyn})

Characteristic curve: linear

I_o Load current for connected intrinsically safe transducers (static)

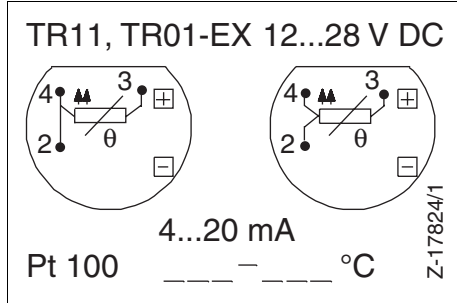
I_{dyn} Dynamic short-circuit current of the signal circuit

The signal circuit and the power circuit are electrically connected to each other.

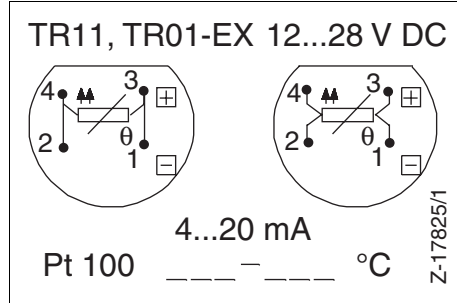
3 Connection diagrams

Construction: Module

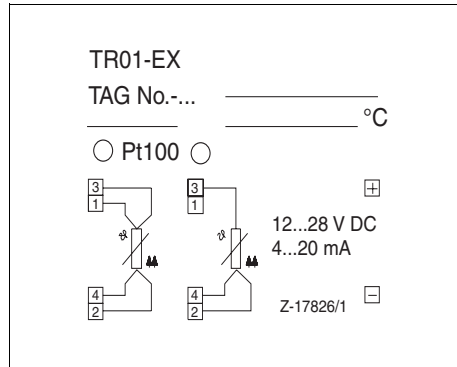
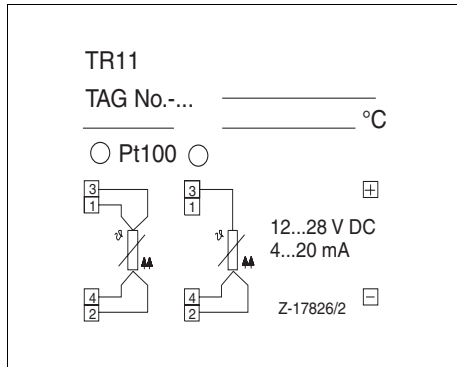
2- or 3-wire circuit



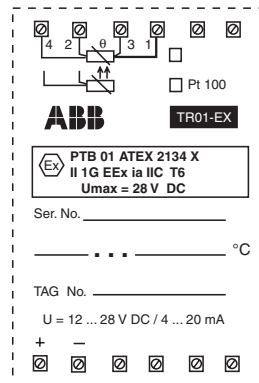
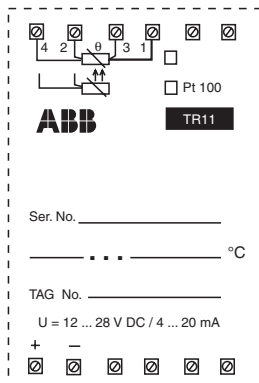
2- or 4-wire circuit



Construction: field housing

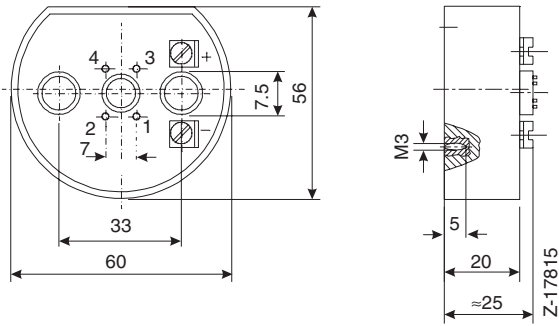


Construction: serial field housing

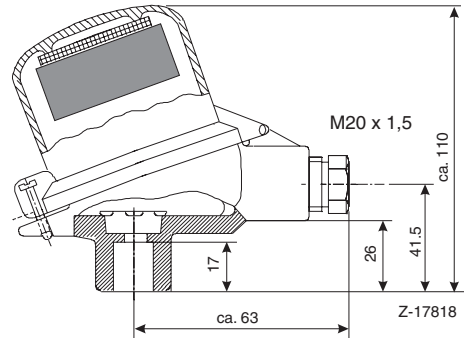


4 Dimensional drawings (all dimensions in mm)

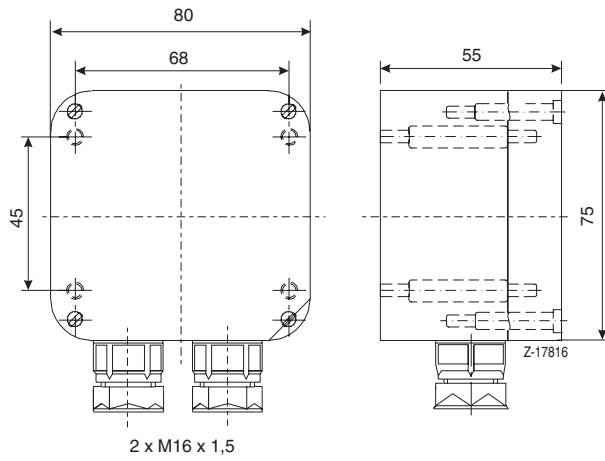
Module (with soldered connection)



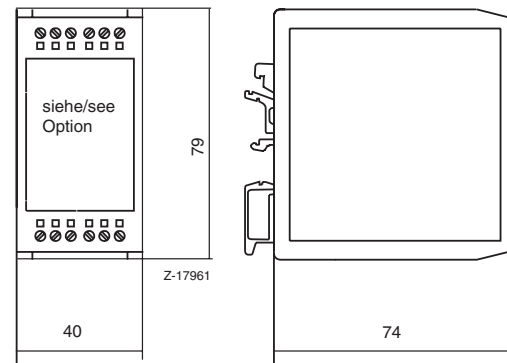
Connection head (type BUZH)



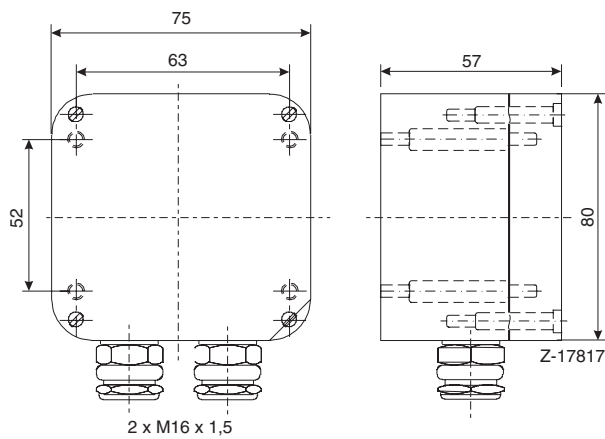
Polyester field housing



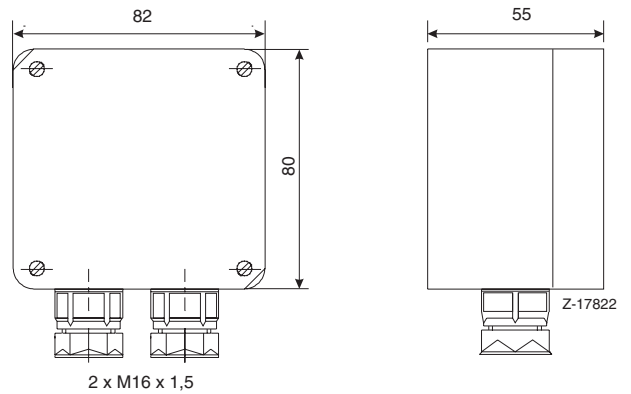
Serial rail housing



Aluminium field housing



Polycarbonat field housing



5 Type examination certificate

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin



(1) **EC-TYPE-EXAMINATION CERTIFICATE**
(Translation)

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 94/9/EC**



(3) EC-type-examination Certificate Number:

PTB 01 ATEX 2134 X

(4) Equipment: Temperature measuring transducer, type TR 01-Ex

(5) Manufacturer: ABB Automation Products GmbH

(6) Address: Borsigstraße 2, 63755 Alzenau, Germany

(7) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential report PTB Ex 02-21330.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 50014:1997 + A1 + A2

EN 50020:1994

EN 50284:1999

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-type-examination Certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

(12) The marking of the equipment shall include the following:

II 1 G EEx ia IIC T6

Zertifizierungsstelle Explosionsschutz
By order:

Braunschweig, February 28, 2002

Dr.-Ing. U. Johannsmeyer
Regierungsdirektor



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EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.

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Braunschweig und Berlin



SCHEDULE

(13)

(14) **EC-TYPE-EXAMINATION CERTIFICATE PTB 01 ATEX 2134 X**

(15) Description of equipment

The temperature measuring transducer, type TR 01-Ex, is used in conjunction with measuring sensors for the detection, amplification and transmission of measured values in intrinsically safe circuits. Sensors that may be connected to the input may be resistance thermometers, thermocouples or other sensing elements with defined quantities of resistance and d.c. voltage.

For the relationship between permissible ambient temperature range and temperature class as well as equipment category, reference is made to the following table.

Temperature class	T6	T5	T4, T3, T2, T1
Category II 1 G	-20 °C...+40 °C	-20 °C...+55 °C	-20 °C...+60°C
Category II 2 G	-40 °C...+50 °C	-40 °C...+70 °C	-40 °C...+90°C

Electrical data

Supply circuittype of protection Intrinsic Safety EEx ia IIC or EEx ib IIC
(Terminals "+" and "-") for connection to certified intrinsically safe circuits,
Maximum input values:

$$U_i = 28 \text{ V}$$

$$I_i = 130 \text{ mA}$$

$$P_i = 800 \text{ mW}$$

$$C_i \approx 0$$

$$L_i \approx 0$$

Measuring circuit.....type of protection Intrinsic Safety EEx ia IIC/IIB
(solder terminations 1, 2, 3 & 4) or EEx ib IIC/IIB

The maximum values, which are determined by the maximum voltage of the supply circuit U_i , are listed in the table below.

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SCHEDULE TO EC-TYPE-EXAMINATION CERTIFICATE PTB 01 ATEX 2134 X

U _i	U _o	I _o	P _o	I _{dyn}	EEx ia/ib IIC		EEx ia/ib IIB	
					C _o	L _o	C _o	L _o
28 V	28 V	52 mA	555 mW	93.2 mA	38 nF	0.5 mH	260 nF	2 mH
24 V	24 V	52 mA	467 mW	80 mA	61 nF	0.5 mH	420 nF	10 mH
18 V	18 V	52 mA	207 mW	60 mA	190 nF	2 mH	10.7 μF	10 mH

(the tabulated L_o and C_o are based on the respective I_{dyn})

Linear characteristic

I_o load current for connected intrinsically safe measuring sensors (static)

I_{dyn} dynamic short-circuit current of the measuring circuit

The measuring circuit and the supply circuit are electrically interconnected.

(16) Test report PTB Ex 02-21330

(17) Special conditions for safe use

1. The measuring transducer, type TR 01-Ex, shall be installed in such a way that also for the connection facilities a degree of protection of at least IP 20 according to IEC publication 60529:1989 is met.
2. Inadmissible electrostatic charge of the plastic housing of the measuring transducer TR 01-Ex shall be avoided. A warning note on the equipment shall point to this danger.

(18) Essential health and safety requirements

Covered by standards.

Zertifizierungsstelle Explosionsschutz

Braunschweig, February 28, 2002

By order:

Dr.-Ing. U. Johannsmeyer
Regierungsdirektor



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