INSTRUMENTS
SATRAP DAMA
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Thermocouple With Terminal Block Connection Model TD 103

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for further approvals
see page 2

Applications

- Replacement measuring insert for servicing
- For all industrial and laboratory applications

Special features

- Sensor ranges from -40 ... +1,200 °C [-40 ... +2,192 °F]
- Made of mineral-insulated sheathed measuring cable
- Functional safety (SIL) with temperature transmitter
- Spring-loaded design
- Explosion-protected versions (option)

Ceramic Terminal Block, model TD 103

Description

The measuring inserts per DIN 43735 for resistance thermometers described here are designed for installation in a protective fitting. Operation without thermowell is only recommended in certain applications. The measuring insert is made of a bendable mineral-insulated sheathed cable. The thermocouple is located at the tip of the measuring insert. The measuring inserts are delivered with pressure springs to ensure that the measuring inserts are pressed down to the thermowell bottom.

Apart from the DIN versions, customer-specific versions are available, for example:

- other measuring insert lengths (also intermediate lengths)
- with mounted sleeve to suit inner diameter of the thermowell
- without terminal block
- with transmitter

Type and number of sensors, and accuracy can each be selected to suit the respective application. The range of applications is completed by designs without terminal block for direct transmitter installation. Optionally, transmitters from the Satrap Dama range can be installed. A large number of different explosion protection approvals are available for the TD 103.

Explosion protection (option)

The permissible power P_{max} as well as the permissible ambient temperature for the respective category can be seen on the EC-type examination certificate the Ex certificate or in the operating instructions.

The use of a model TD 103 measuring insert is not permitted in hazardous areas without a suitable protective fitting.

Approvals (explosion protection, further approvals)

Logo	Description	Country
CE	**EU declaration of conformity** ■ EMC directive [1] EN 61326 emission (group 1, class B) and interference immunity (industrial application) ■ RoHS directive	European Union
Ex	■ ATEX directive (option) Hazardous areas - Ex i Zone 0 gas — II 1G Ex ia IIC T1 ... T6 Ga Zone 1 gas — II 2G Ex ia IIC T1 ... T6 Gb - Ex e [2] Zone 1 gas [3] — II 2G Ex eb IIC T1 ... T6 Gb Zone 2 gas — II 3G Ex ec IIC T1 ... T6 Gc X - Ex n [2] Zone 2 gas — II 3G Ex nA IIC T1 ... T6 Gc X	
IEC IECEx	**IECEx (option) - in conjunction with ATEX** Hazardous areas - Ex i Zone 0 gas — Ex ia IIC T1 ... T6 Ga Zone 1 gas — Ex ia IIC T1 ... T6 Gb - Ex e [4] Zone 1 gas [3] — Ex eb IIC T1 ... T6 Gb Zone 2 gas — Ex ec IIC T1 ... T6 Gc - Ex n [4] Zone 2 gas — Ex nA IIC T1 ... T6 Gc	International
EAC Ex	**EAC (option)** Hazardous areas - Ex i Zone 0 gas — 0Ex ia IIC «T1 ... T6» Ga X Zone 1 mounting to zone 0 gas — Ga/Gb Ex ia IIC «T1 ... T6» X - Ex n Zone 2 gas — 2Ex nA IIC «T6 ... T1» Gc X	Eurasian Economic Community
INMETRO	**INMETRO (option)** Hazardous areas - Ex i Zone 0 gas — Ex ia IIC T3 ... T6 Ga Zone 1 gas — Ex ia IIC T3 ... T6 Gb	Brazil
Ex NEPSI	**NEPSI (option)** Hazardous areas - Ex i Zone 0 gas — Ex ia IIC T1 ~ T6 Ga Zone 1 gas — Ex ia IIC T1 ~ T6 Gb - Ex n Zone 2 gas — Ex nA IIC T1 ~ T6 Gc	China
KCs	**KCs - KOSHA (option)** Hazardous areas - Ex i Zone 0 gas — Ex ia IIC T4 ... T6 Zone 1 gas — Ex ib IIC T4 ... T6	South Korea

1) Only for built-in transmitter
2) Only for connection head
3) Only for insulated thermocouples
4) Only in combination with connection head

Logo	Description	Country
-	**PESO (option)** Hazardous areas - Ex i Zone 0 gas Ex ia IIC T1…T6 Ga Zone 1 gas Ex ia IIC T1…T6 Gb	India
	GOST (option) Metrology, measurement technology	Russia
	KazInMetr (option) Metrology, measurement technology	Kazakhstan
-	**MTSCHS (option)** Permission for commissioning	Kazakhstan
	BelGIM (option) Metrology, measurement technology	Belarus
	UkrSEPRO (option) Metrology, measurement technology	Ukraine
	Uzstandard (option) Metrology, measurement technology	Uzbekistan

Ceramic Terminal Block

Measuring element

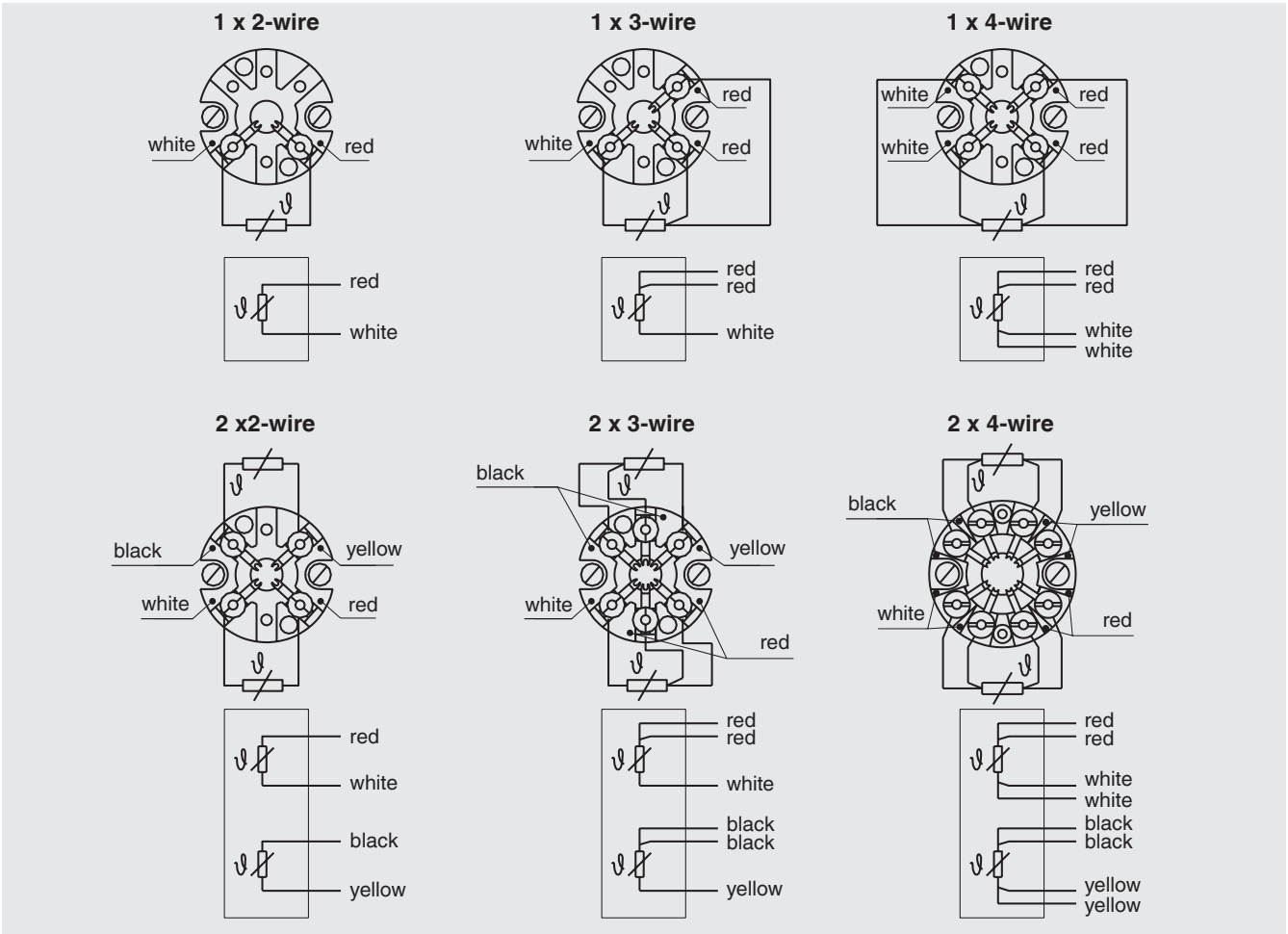
measuring current: 0.1 ...1.0 mA [1)]

Connection method	
Single elements	1 x 2-wire 1 x 3-wire 1 x 4-wire 1 x 3-wire (face-sensitive sensor) 1 x 4-wire (face-sensitive sensor)
Dual elements	2 x 2-wire [2)] 2 x 3-wire 2 x 4-wire

Tolerance value of the measuring insert per EN 60751	
Class	**Thin-film**
Class B	-50 ... +250 °C
Class A [3)]	-30 ... +250 °C
Class AA [3) 4)]	0 ... +150 °C

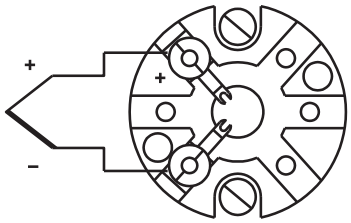
1) For detailed specifications for Pt100 sensors
2) Not with 3 mm diameter
3) Not with 2-wire connection method
4) Not with face-sensitive sensor

Electrical connection



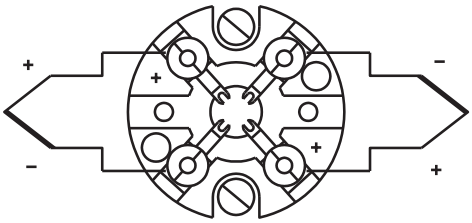
For the electrical connections of built-in temperature transmitters see the corresponding data sheets or operating instructions.

Single thermocouple



The color coding at the positive poles of the instrument decides the correlation of polarity and terminal.

Dual thermocouple



Sensor

Thermocouple per IEC 60584-1 or ASTM E230
Types K, J, E, N, T (single or dual thermocouple)

Measuring point

- Ungrounded (standard)
- Grounded

Sensor types

Type	Validity limits of class accuracy			
	IEC 60584-1		ASTM E230	
	Class 2	Class 1	Standard	Special
K	-40 ... +1,200 °C	-40 ... +1,000 °C	0 ... 1,260 °C	
J	-40 ... +750 °C	-40 ... +750 °C	0 ... 760 °C	
E	-40 ... +900 °C	-40 ... +800 °C	0 ... 870 °C	
N	-40 ... +1,200 °C	-40 ... +1,000 °C	0 ... 1,260 °C	
T	-40 ... +350 °C		0 ... 370 °C	

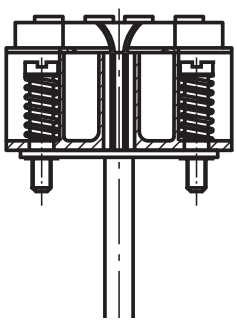
The table shows the temperature ranges listed in the respective standards, in which the tolerance values (class accuracies) are valid.

The actual operating temperature of the thermometers is limited both by the maximum permissible working temperature and the diameter of the thermocouple and the MI cable, as well as by the maximum permissible working temperature of the thermowell material.

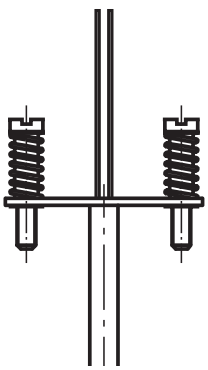
Tolerance value
For the tolerance value of thermocouples, a cold junction temperature of 0 °C has been taken as the basis.

Transmitter (option)

A transmitter can be built upon the measuring insert. In this case, the transmitter replaces the terminal block and is directly attached to the terminal plate of the measuring insert. The temperature transmitter should be protected from temperatures over 85 °C.



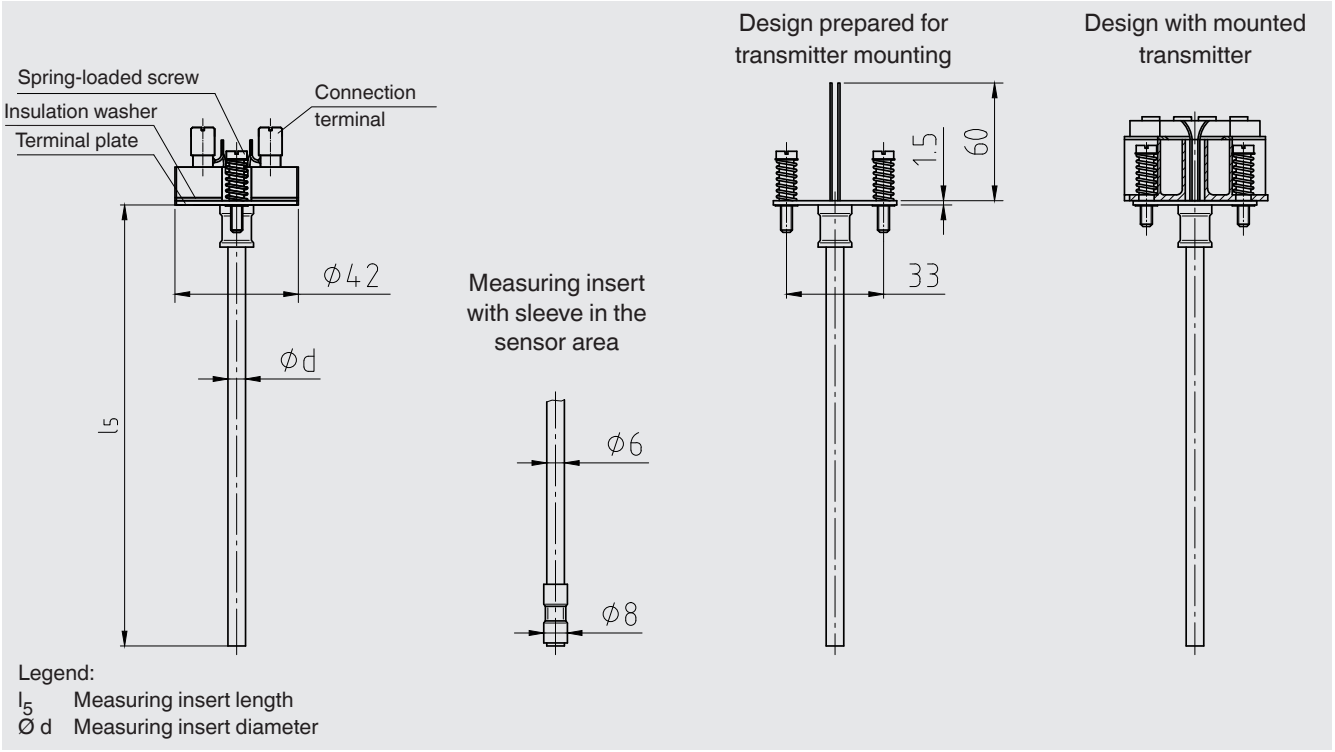
Measuring insert with mounted transmitter



Measuring insert prepared for transmitter mounting

Dimensions in mm

The replaceable measuring insert is made of a vibration-resistant, sheathed measuring cable (MI cable).



Legend:
l_5 Measuring insert length
Ø d Measuring insert diameter

Measuring insert length l_5 in mm	Tolerance in mm
75 ... 825	+2 0
> 825	+3 0

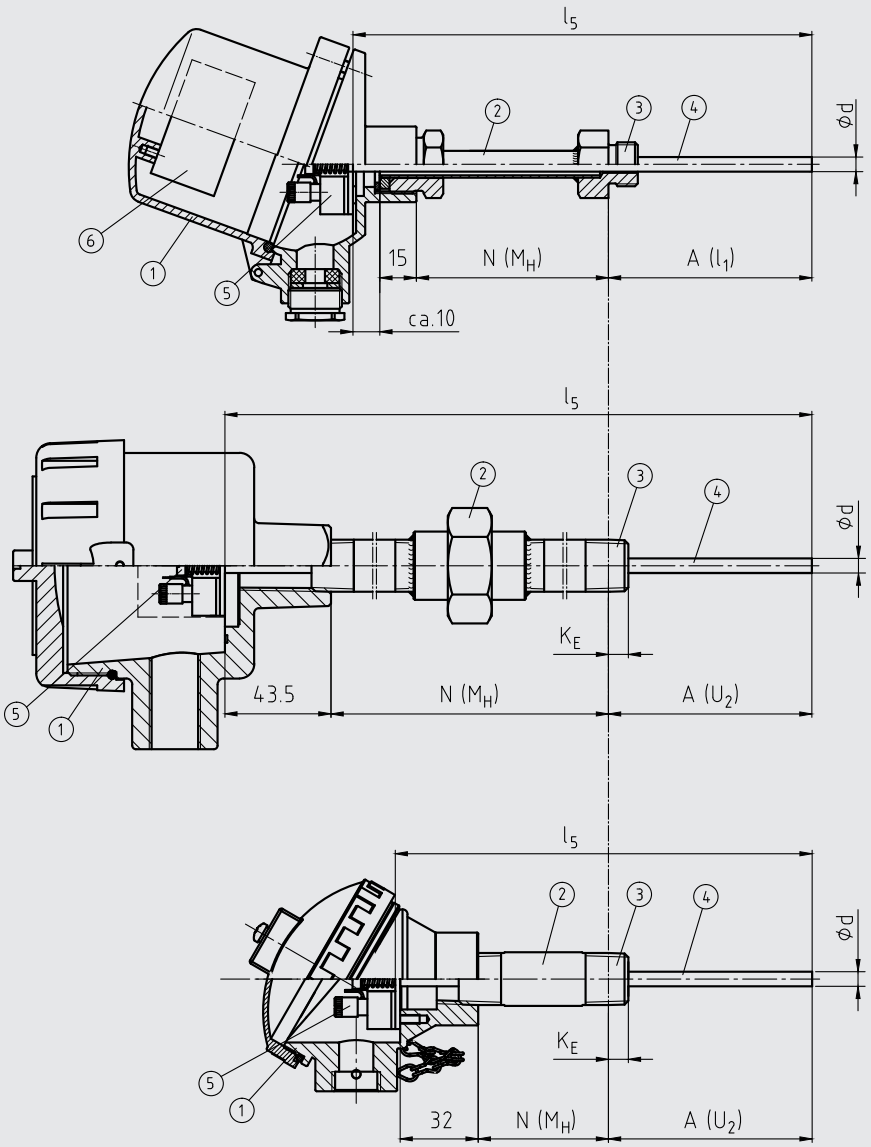
Measuring insert diameter Ø d in mm		Index per DIN 43735	Tolerance in mm
3 [1)]	Standard	30	3 ±0.05
6	Standard	60	6 $^{0}_{-0.1}$
8 (6 mm with sleeve)	Standard	-	8 $^{0}_{-0.1}$
8	Standard	80	8 $^{0}_{-0.1}$
1/8 inch (3.17 mm) **1/4 inch (6.35 mm)** **3/8 inch (9.53 mm)**	Option, on request	-	-

Only correct measuring insert length and correct measuring insert diameter ensure sufficient heat transfer from thermowell to the measuring insert.

The bore diameter of the thermowell should be a max. 1 mm larger than the measuring insert diameter. Gaps of more than 0.5 mm between thermowell and the measuring insert will have a negative effect on the heat transfer, and they will result in unfavorable response behavior of the thermometer.

When fitting the measuring insert into a thermowell, it is very important to determine the correct insertion length (= thermowell length for bottom thicknesses of ≤ 5.5 mm). In order to ensure that the measuring insert is firmly pressed down onto the bottom of the thermowell, the measuring insert must be spring-loaded (spring travel: max. 10 mm).

Components model TD 103



Legend:

① Connection head
② Neck tube
③ Connection to thermowell
④ Measuring insert (TD 101)
⑤ Terminal block/transmitter (option)
⑥ Transmitter (option)

A (l_1)	Insertion length (parallel threads)
A (U_2)	Insertion length (tapered threads)
l_5	Measuring insert length
N (M_H)	Neck length
K_E	1/2 NPT: 8.13 mm 3/4 NPT: 8.61 mm
Ø d	Measuring insert diameter

Materials

Material	
Sheath material	Ni alloy: alloy 600

Other sheath materials on request.

Ingress protection

IP00 per IEC/EN 60529

The measuring inserts for the model TD 103 are designed for mounting into protective components (connection head + protection tube/thermowell). These protective components feature connection heads/cable glands/thermowells/protection tubes which ensure a higher IP protection.

Operating conditions

The replaceable measuring insert is made of a vibration- resistant, sheathed measuring cable (MI cable). Standard vibration resistance: 50 g (sensor tip)

Ambient and storage temperature

-60 / -40 ... +80 °C

Other ambient and storage temperatures on request

Ordering information

Model / Explosion protection / Ignition protection type / Zone / Sensor / Class accuracy / Application range of the thermometer / Measuring insert length l5 / Measuring insert diameter Ø d / Sheath material / Mechanical requirements / ceramic terminal block / Terminal Block

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