

## Application

- Measuring range: -40 .. +600°C
- Particularly suitable for steam and gas applications with high process pressures and temperatures
- Universal range of application

## Features

- Spring-loaded measuring insert provides ideal contact with protective tube
- Temperature transmitter can be installed inside connection head of sensor
- High flexibility due to modular assembly with standard terminal heads and customized immersion length
- High compatibility with a design according to DIN 43772
- Connection head with local LCD or LED display as an option (see models TWR01H, DANWdie-LED)

## Description

The sensor consists of an exchangeable measuring insert, solid machined thermowell with neck and aluminum connection head where mounting a temperature transmitter with 4-20 mA/HART® or Profibus®PA output signal is possible.

The measuring insert represents the replaceable element of the complete sensor which reduces time and costs of maintenance of the measuring apparatus installed in the object. Spring fixation of the measuring insert provides perfect pressure to the bottom of the thermowell, reduces time of reaction to changes of temperature and increases accuracy of measurement as well as reduces natural vibration thus mechanical and electrical defects can be avoided.

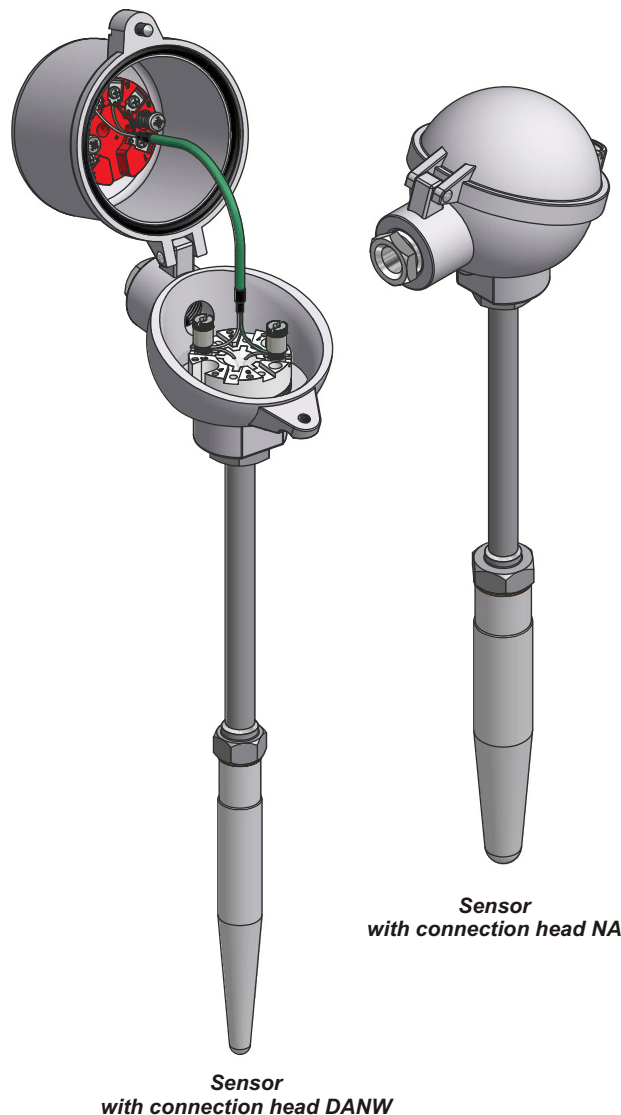
Immersion length, design of thermowell, connection head as well as type and number of sensors and accuracy can be selected individually for the respective application.

## Temperature Transmitter ( Option )

Transmitter is mounted inside the connection head of the sensor: directly on measuring inset or in the high cap of head.

The second method is advantageous as it allows changing standard measuring inset quickly without a need to disassemble the transmitter; it means reduction of time and costs of maintenance of the sensor and protecting wires against any damage possible.

Mounting of two transmitters inside the connection head available upon request.



## ATEX and EAC Ex versions



Intrinsically safe and Flameproof designs are available for applications in hazardous areas. These models are provided with certificate for „intrinsically safe“ and „flameproof“ type of protection according to Directive 2014/34/UE (ATEX) and EAC Ex TR-CU 012/2011 (Eurasian Economic Union).

Intrinsically safe (Exi)  
Flameproof (Exd)

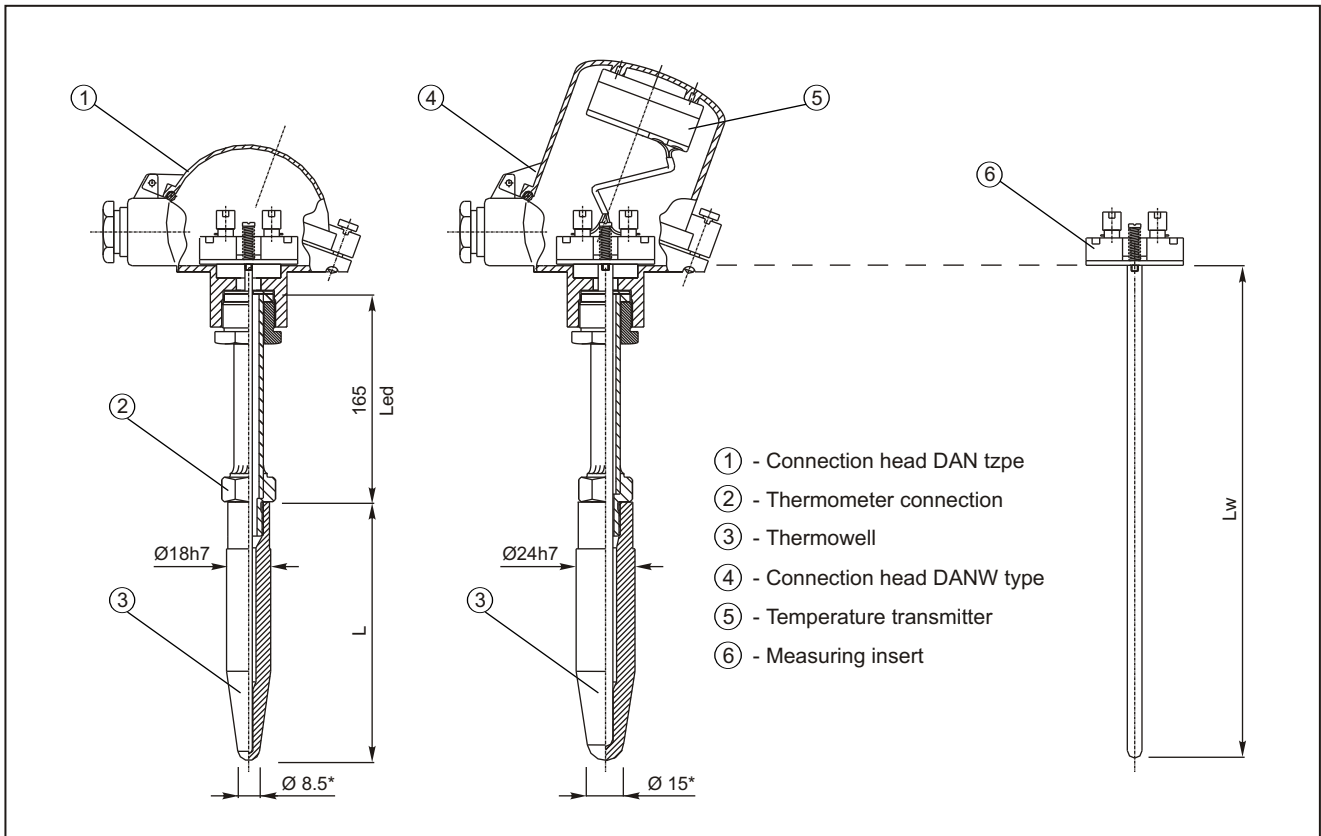
data sheet XI-TT..SW  
data sheet XD-TT..SW

## Other versions

This data sheet contains only a small portion of our program of supplying thermocouple thermometer with a replaceable measuring insert.

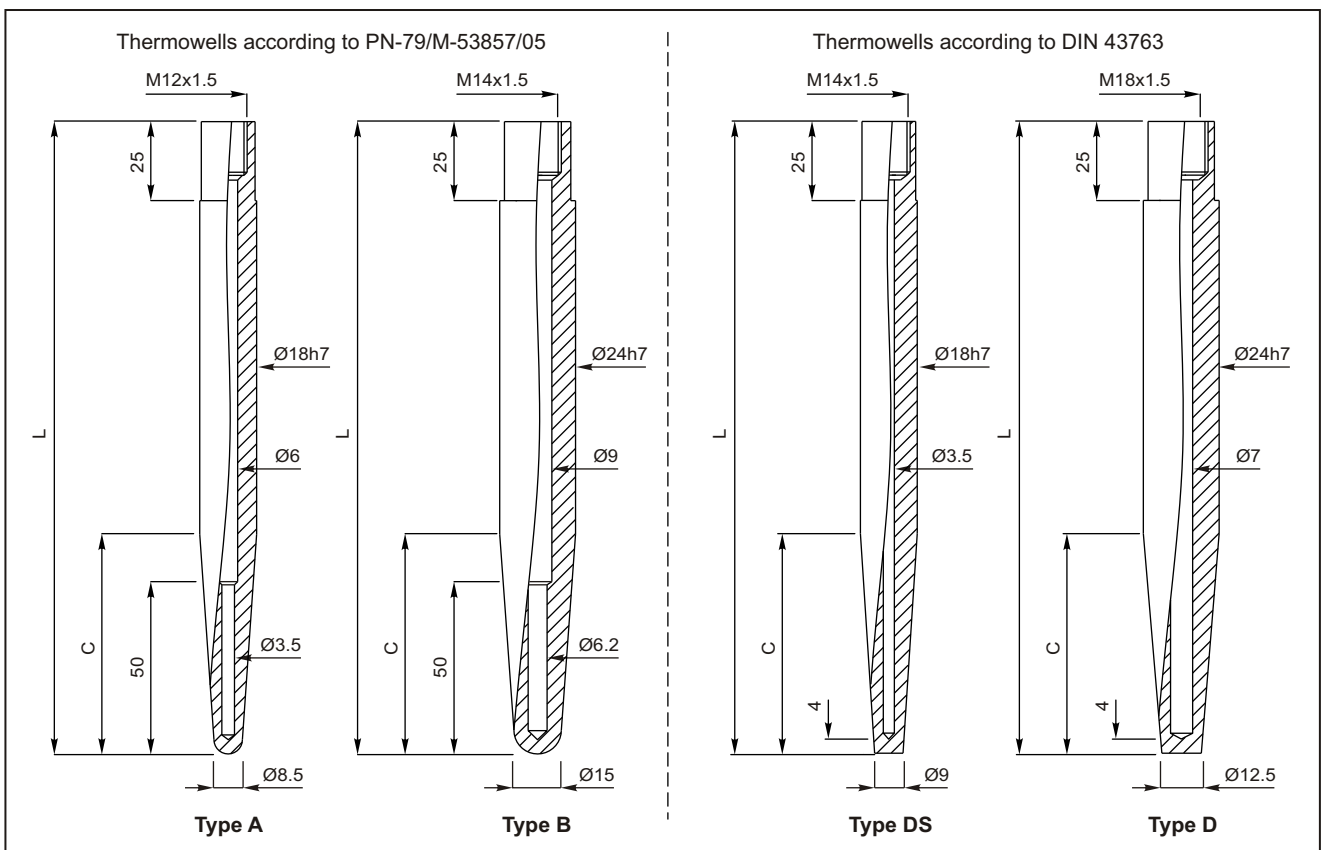
Other versions can be supplied upon customer's request.

Designs



\* other parameters upon request

Types of thermowells designed for weld-in



**Standard lengths ( PN-79/M-53857/05 )**

Thermowell diameter	Length L	C	Insert length Lw
Type A Ø18h7	100 mm	35 mm	275 mm
	140 mm	65 mm	315 mm
	200 mm		375 mm
	260 mm		435 mm
Type B Ø24h7	140 mm	65 mm	315 mm
	200 mm	65 mm	375 mm
	260 mm	65 mm 125 mm	435 mm 435 mm

**Standard lengths ( DIN 43763 )**

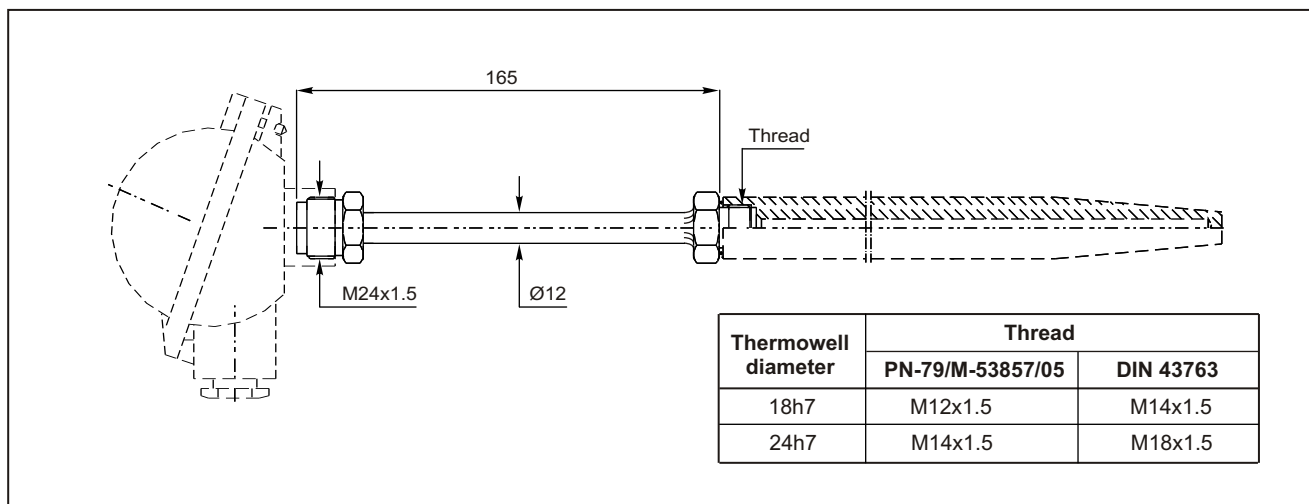
Thermowell diameter	Type	Length L	C	Insert length Lw
Ø18h7	D0S	115 mm	40 mm	290 mm
	D1S	140 mm	65 mm	315 mm
	D4S	200 mm	65 mm	375 mm
	D5S	260 mm	125 mm	435 mm
Ø24h7	D1	140 mm	65 mm	315 mm
	D4	200 mm	65 mm	375 mm
	D5	260 mm	125 mm	435 mm

**Maximal process pressure**

Thermowell length L [mm]	Maximal pressure [MPa]			
	Thermowell SW1		Thermowell SW2	
	air	water	air	water
100	15.7	44	-	-
140	13.4		22	44
200				
260	-	-	-	-

values calculated for air velocity of 60 m/s and for water velocity of 5 m/s.

**Cooling neck**



### Non-standard neck lengths

In case of non-standard lengths, below formula should be used to calculate length of measuring insert:

$$L_w = L_{(\text{thermowell length})} + 165_{(\text{neck length})} + 10$$

Example:

$$L_w = 200 + 165 + 10$$

For thermowell L=200 mm long, length of measuring insert is 375 mm.

### Basic values of thermocouples type J, K, N according to PN-EN 60584 / IEC 584

Temperature		°C	100	200	300	400	500	600	700
Nominal value	Type J	mV	5.27	10.78	16.33	21.85	27.39	33.10	39.13
	Type K	mV	4.10	8.14	12.21	16.40	20.64	24.91	29.13
	Type N	mV	2.77	5.91	9.34	12.97	16.75	20.61	24.53
Tolerance	Class 1	°C	±1.5	±1.5	±1.5	±1.6	±2.0	±2.4	±2.8
	Class 2	°C	±2.5	±2.5	±2.5	±3.0	±3.7	±4.5	±5.2

### Tolerance

The PN-EN 60584 Standard defines the formulas for calculating acceptable measure tolerance. More information available in the general thermocouple thermometer sheet.

#### Type J ( Fe-CuNi )

Class	Temperature range	Tolerance
1	-40 °C .. +375 °C	± 1.5 °C
	+375 °C .. +750 °C	± 0.0040 x   t
2	-40 °C .. +333 °C	± 2.5 °C
	+333 °C .. +750 °C	± 0.0075 x   t

#### Type K ( NiCr-Ni ), Type N ( NiCrSi-NiSi )

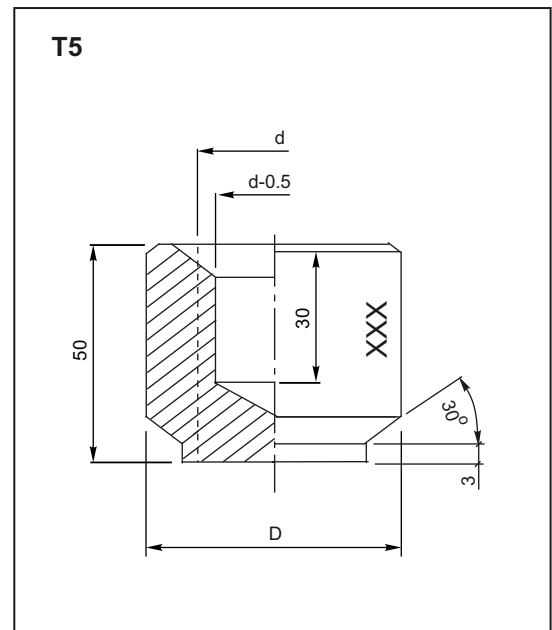
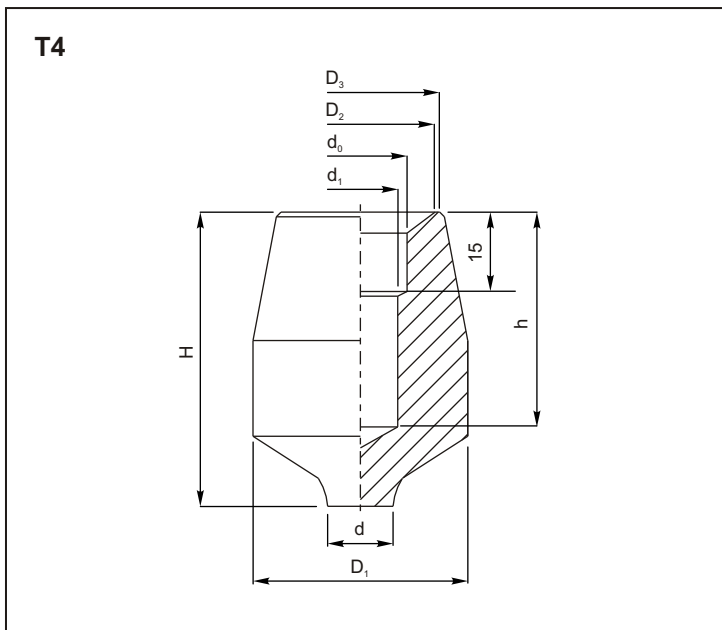
Class	Temperature range	Tolerance
1	-40 °C .. +375 °C	± 1.5 °C
	+375 °C .. +1000 °C	± 0.0040 x   t
2	-40 °C .. +333 °C	± 2.5 °C
	+333 °C .. +1200 °C	± 0.0075 x   t

### Response time

Average response time at mixed water 0.4 m/s ( acc. to DIN EN 60751 ), at temperature change from 23 to 33°C. Tests refers to thermocouples with isolated measuring junction ( SO, SOB ).

Thermowell diameter	Response time	Length C=65 mm	Length C=125 mm
Ø 18h7	t <sub>50</sub>	7.5 s	7.5 s
	t <sub>90</sub>	19 s	19 s
Ø 24h7	t <sub>50</sub>	18 s	16 s
	t <sub>90</sub>	50 s	46 s

Adaptor for weld-in

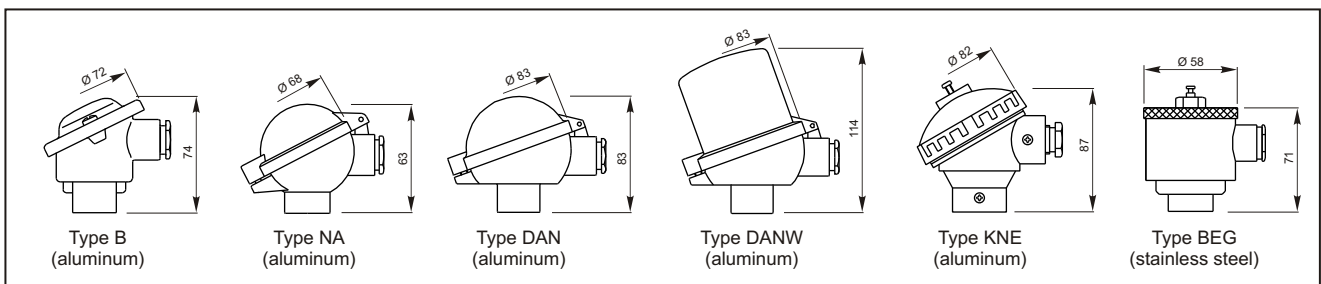


Adaptor type	Dimensions [ mm ]							
	d <sub>0</sub>	d <sub>1</sub>	D <sub>2</sub>	D <sub>3</sub>	d	D <sub>1</sub>	h	H
T4 - 18	Ø18h8	Ø14	Ø28	Ø30	Ø12	Ø40	40	55
T4 - 24	Ø24h8	Ø20	Ø34	Ø38	Ø18	Ø50	45	65

Adaptor type	Dimensions [ mm ]		
	d	d <sub>1</sub>	D
T5 - 18	Ø18H7	Ø22	Ø40
T5 - 24	Ø24H7	Ø28	Ø50

Connection heads

This sensor can be fitted with one of the following connection heads. For more information about the connection heads see section "Accessories".



## Connection head DANWdie with local LED display

The display is mounted in connection head cover with glass window which allows preview of measuring temperature. 4 digits with a height of 9.5 millimeter ensure clear reading of values.

Programming of measure range can be performed via three buttons placed on the back of display panel.

Mounted temperature transmitter 4..20mA on measuring insert is necessary for proper use. It also works with temperature transmitters with HART® protocol.



### Display parameters

Supply voltage, DC	10.5...45 V
Voltage drop	10.5 VDC
Protection degree: case/terminals	IP 68 / IP00
Galvanic isolation input/output	2.0 kVAC
Vibrations	IEC 60068-26 4 g / 2 .. 150 Hz
Sensor current	nom. 0.2 mA
<b>Current output:</b>	
Range	4 .. 20 mA
Response time	1 s
Load	$< (U_{zasil.} - 10.5) / 0.0208$

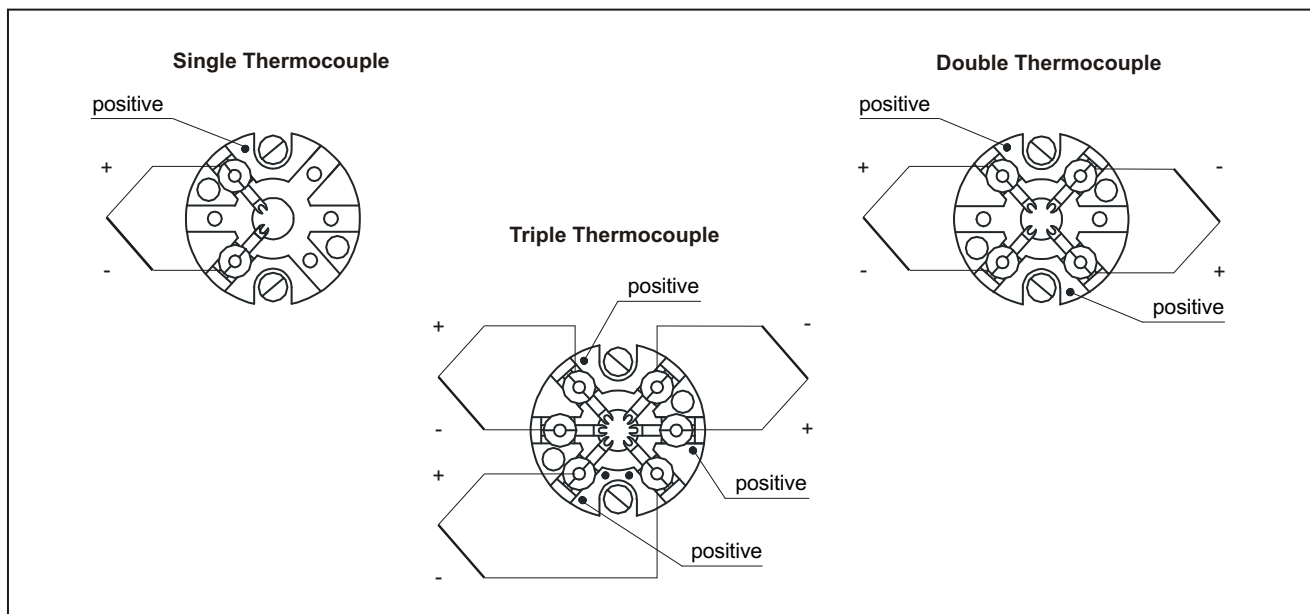
Thermocouple	Accuracy
K, J, T, E	0.5°C or 0.08%
N	1.0°C or 0.08%
S, B, R	2.0°C or 0.08%

**Sensor error current:** 3.8 mA

### Standards:

EMC 89/336/EEC, emission and influence:  
GB/T17626.2-1998 acc. to IEC 61000-4-3:1995

## Electrical connection on ceramic block



## Ordering code

1	2	3	4	5	6	7	8	9	10	11	12										
□	TT	□	SW	□	□	-	□	-	□	-	□	-	□	-	□	-	□	-	□	-	□

1		<b>Version</b>				
			Single thermocouple			
		AP	Single thermocouple, with 4..20 mA temperature transmitter			
		APW	Single thermocouple, 4..20 mA temperature transmitter and local LED display*			
		2	Double thermocouple			
		3	Triple thermocouple			
		* only with connection head DANWdie				
		<b>Thermocouple type</b>				
2		J	Type J ( Fe-CuNi )			
		K	Type K ( NiCr-Ni )			
		xxx	other, please specify			
		<b>Thermowell diameter</b>				
3		1	Ø 18h7 mm			
		2	Ø 24h7 mm			
		<b>Closing method of connection head</b>				
4		1	closing by screw			
		3	closing by clamp			
		<b>Connection head</b>				
5		NA	Type NA	Aluminium	Cable gland: M20x1.5	IP65
		DAN	Type DAN	Aluminium	Cable gland: M20x1.5	IP65
		DANW	Type DANW	Aluminium	Cable gland: M20x1.5	IP65
		B	Type B	Aluminium	Cable gland: M20x1.5	IP65
		BEG	Type BEG	Stal kwasoodporna	Cable gland: M20x1.5	IP65
		xxx	other, please specify			
		<b>Thermowell diameter</b>				
6		1.4541	Stainless steel 1.4541 ( AISI321 )			
		1.4571	Stainless steel 1.4571 ( AISI316Ti )			
		1.7335	Steel 1.7335 ( A182 Grade F11 )			
		1.7380	Steel 1.7380 ( A182 Grade F22 )			
		xxx	other, please specify			
		<b>Length L [mm]</b>				
7		100	100 mm			
		140	140 mm			
		200	200 mm			
		260	260 mm			
		xxx	other, please specify			
		<b>Neck length Led [mm]</b>				
8			165 mm ( standard )			
		250	250 mm			
		xxx	other, please specify			
		<b>Measuring junction</b>				
9		SO	Junction isolated			
		SP	Junction grounded			
		SOB	Junctions isolated ( double and triple thermocouples )			
		<b>Tolerance</b>				
10		1	Class 1 according to PN-EN 60584-2			
		2	Class 2 according to PN-EN 60584-2			
		<b>Measuring range of temperature transmitter</b>				
11		0..100	input signal for 4..20mA: 0..100°C			
		xxx	other, please specify			
		<b>Type of temperature transmitter</b>				
12		PR5334A3B	Output signal 4..20 mA			
		PR5335A	Output signal 4..20 mA, with HART® protocol			
		PR5350A	Output signal Profibus® PA / Foundation Fieldbus			
		xxx	other, please specify			

## Example

Temperature sensor TTKSW11-DAN-1.4541-200-SO-1

( sensor 1xK, connection head type DAN closed by screw, thermowell Ø18h7, length L=200mm, neck length Led=165mm, thermowell material 1.4541, class 1 ).