MANUAL

CeraTEMP® 80

Straight Thermocouple Temperature Sensors with Metal, Ceramic or Sapphire Protective Tube without/with Transmitter

- **Wire thermocouple 1x / 2x “J“, “K“, “R“, “S“, “B“ with diameter legs 0.5, 1, 2 nebo 3 mm**
- **Measuring range -40 to +900 °C (“J“), -40 to +1200 °C (“K“), 0 to +1600 °C (“R“, “S“), +300 to +1800 °C (“B“)**
- **Accuracy class 1, 2, 3 according to EN 60584-1**
- **Protective tube material stainless steel 1.4541, 1.4845, 1.4762, KANTHAL AF, ceramics SiC, C530, C610, C799, sapphire**
- **Optional length of protective tube**
- **Mounting of temperature sensor by fixing shift pipe union or flange**
- **Housing IP 53, IP 65**
- **Optional headmounted transmitter with output 4 to 20 mA, HART, Profibus, Fieldbus, including version with galvanic isolation and intrinsically safe version**

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Contents

1. General instructions and information

1.1 Symbols used


Symbol of warning; for safe use it is necessary to proceed according to the instructions


This product does not belong to public waste and it is subjected to separate collection

1.2 Safety warnings and cautions


The equipment may be installed only by a qualified personnel who are familiar with national and international laws, directives, standards and with the instructions manual. The equipment shall be supplied from a safe voltage source that meets all requirements of the standard EN 61010-1 and must be-installed in compliance with national requirements and standards providing safety.

The instrument may not be used for other purposes than as specified in this instruction manual. When used with headmounted transmitter, observe also the requirements according to transmitter manual. For elimination of a risk of injury from electric shock or fire, the maximum operational parameters of the instrument may not be exceeded.

1.3 Scope of delivery

With the product is delivered:

- Manual for installation, operation and maintenance
- Certificate of calibration (only with calibrated sensors)

1.4 Description of the delivery and packing

Temperature sensors with metal protective tubes are packed into plastic sleeves and afterwards placed in a carton box with wooden frame and filled up with fixation particles. Temperature sensors with ceramic protective tubes have these tubes inserted in transport paper tube and wrapped with several layers of cardboard and this cover is fixed by shrinkable fixing foil. Sensors are afterwards placed in a carton box with wooden frame filled up with fixation particles.

The product must not be exposed to direct rain, vibrations and shocks during transport.

1.5 Storage

The products shall be stored at temperatures from 5 °C to 35 °C and maximum relative humidity 80% in the rooms with elimination of condensation of water vapours on the products. The stored products shall not be exposed to any shocks, vibrations and effects of harmful vapours and gases.

1.6 Installation and commissioning

During installation, commissioning, operation and maintenance follow the instructions in chapter 4.

1.7 Spare parts

Any of the compact parts of the product can be also ordered as a spare part if there are not required special procedures or technological operations for the exchange.

1.8 Repairs

Products are repaired by the manufacturer. The products for repair should be sent in a packing that guarantees damping of shocks and vibrations and protects against damage during transport.

1.9 Warranty

Products are covered by a warranty for a period of 24 months from the delivery date on the delivery note. The manufacturer guarantees technical and operational parameters of the products within scope of the applicable documentation. Warranty period is specified with individual items and begins from the day of takeover of the goods by the purchaser or delivery to the carrier. Any claims concerning to defects of the goods together can be filed in writing with the manufacturer within the warranty period and the claimed product shall be presented. The claiming party shall give identification of the product, number of the delivery note and description of the fault or defect.

The manufacturer is not responsible for any defects caused by improper storage, incorrect connection, damages caused by external effects, in particular by effects of factors with excessive values, unqualified installation, improper operation or common wearing.

1.10 Lifetime

Lifetime of the product cannot be exactly determined, it depends on the operational conditions. It is necessary to take into account that lifetime (reliability) of the temperature sensors may be reduced significantly e.g. by chemical corrosiveness or abrasion or erosion effects of the measured medium, effects of vibrations or shocks and surges (caused by flowing of the medium or transferred to the sensor from the external environment, such as from big rotary machines, etc.), cyclic temperature changes, fast temperature changes, use of the sensors at the upper limit of the temperature range, etc.

2. End of service and disposal

2.1 End of service


Before removing and ending of service of the thermocouple sensor is at first necessary to switch the control loop to manual operation, or take other appropriate action to prevent potential harm associated with the end of sensor operation. The head is than opened, connecting wires of the sensor are disconnected (cut off) and sensor is dismounted.

In case of ending service of the sensor with the transmitter, previous paragraph should be observed after power supply is switched off.

2.2 Disposal


The products do not contain any environmentally hazardous parts. When disposing the packing and destroyed or irreparably damaged product proceed according to the local regulations.

3. Product description

CeraTEMP® 80

Straight Thermocouple Temperature Sensors with Metal, Ceramic or Sapphire Protective Tube without/with Transmitter

- **Wire thermocouple 1x / 2x “J“, “K“, “R“, “S“, “B“ with diameter legs 0.5, 1, 2 nebo 3 mm**
- **Measuring range -40 to +900 °C (“J“), -40 to +1200 °C (“K“), 0 to +1600 °C (“R“, “S“), +300 to +1800 °C (“B“)**
- **Accuracy class 1, 2, 3 according to EN 60584-1**
- **Protective tube material stainless steel 1.4541, 1.4845, 1.4762, KANTHAL AF, ceramics SiC, C530, C610, C799, sapphire**
- **Optional length of protective tube**
- **Mounting of temperature sensor by fixing shift pipe union or flange**
- **Housing IP 53, IP 65**
- **Optional headmounted transmitter with output 4 to 20 mA, HART, Profibus, Fieldbus, including version with galvanic isolation and intrinsically safe version**

3.1 Application

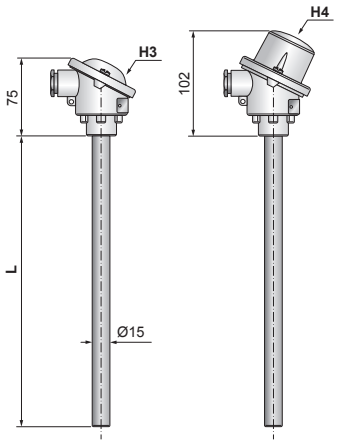
Straight thermocouple temperature sensors CeraTEMP® 80 are designed for remote temperature measurement in furnaces and incinerators and other technological devices. These sensors are mounted on walls of furnaces by fixing shift pine union or flange.
The sensors can be supplied with transmitter of output signal from 4 to 20 mA, HART, Profibus, Fiedbus embedded into the lid of sensor head (code H2 and H4).

3.2 Description

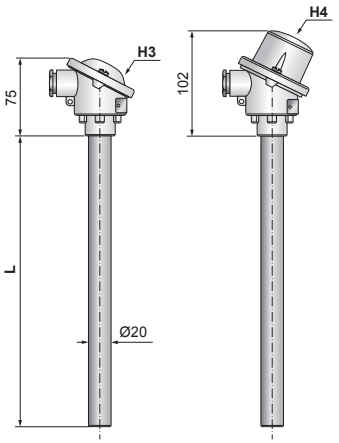
CeraTEMP® 80 sensors are based on single or double wire thermocouple placed in insulating ceramic bead or in ceramic capillary. Thermocouples are in this form placed into inner ceramic and outer metallic protective tube, possibly in two ceramic protective tubes or another combination of one to three protective tubes, including ceramic tubes with platinum coat. Cold junctions of thermocouples are connected to a terminal block in the head type A or B, serving to connection of compensating or extension wiring.
There is made use of rise of thermoelectric voltage. Its size depends on a temperature difference between a measuring junction and a cold junction of the thermocouple. At sensors with transmitter is output thermocouple signal further transformed to linearized unified current signal 4 to 20 mA, optionally to HART, Profibus, Fieldbus output.

3.3 Dimensional drawings

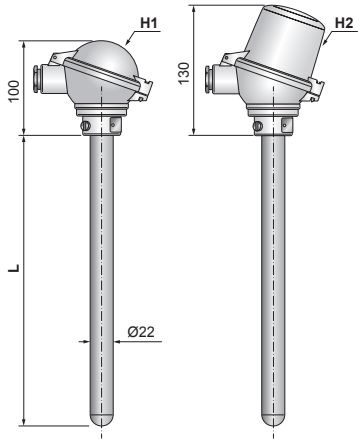
K154, K154C



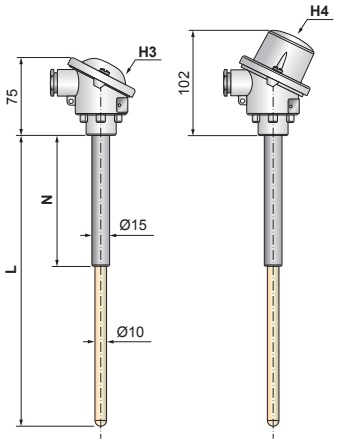
K201, K203



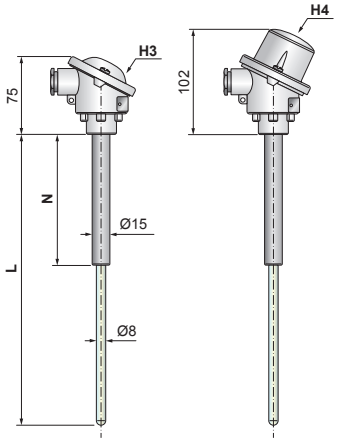
K222, K223, K223Z, K224, K222C, K223C, K224C



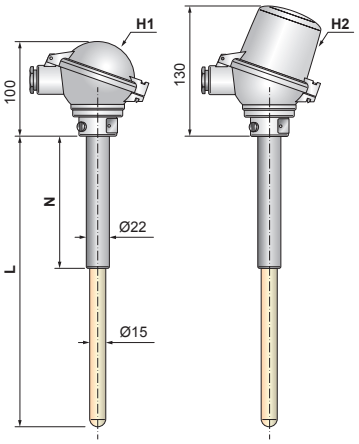
C106, C107



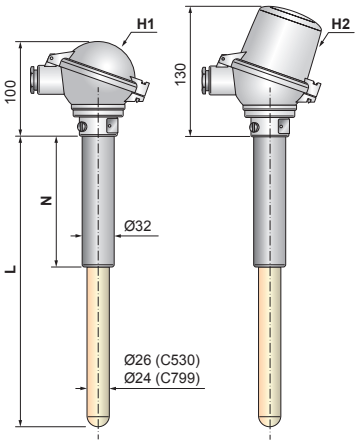
S088



C156, C157, C156S, C157S



C247, C265, C247S, C265S, C26H, C26HS



4. Installation, operation and maintenance

4.1 Installation and commissioning

4.1.1 General

Mounting position of the sensor is arbitrary. The sensor is usually mounted into technology in vertical or horizontal position, vertical is recommended. Standard mounting is preformed using fixing shift flange or fixing shift pipe union on the ceiling or furnace wall or other technological devices.

⚠ If temperature sensors with ceramic protective tubes are being installed or replaced in operation, it is necessary to insert or pull them out from high temperature environment gradually (see table) so as to prevent the ceramic protective tubes from cracking because of the heat stress caused by a rapid temperature change. Similarly, it is necessary to proceed also for lower temperatures that are not listed in the table.

Working temperature [°C]		1200	1400	1600
Speed [mm/min]	Outer tube diameter ≤ 15 mm	200	60	20
	Outer tube diameter ≥ 24 mm	50	20	15

If slow movement of the sensor is not possible, it is at least necessary to ensure a slowly and evenly preheating of the sensor.

⚠ Mounting of sensors with ceramic protective tubes C530, C610, C799 have to be done such way, to prevent of contact ceramic tube with fireclay bricks during passing through the brickwork of the wall or furnace vault. This contact at high temperatures can lead to shortening the lifetime of tubes.

Thermocouple temperature sensors without installed transmitter are connected to the decoding devices using extension or compensation cable wires with cross section 0.5 to 1.5 mm^2.

Thermocouple sensors with installed transmitter are connected to the decoding devices using cooper connection cable wires with cross section 0.5 to 1.5 mm^2.

Connection terminal is accessible after removal of the head cover. Drawing of the connection terminals and wiring are shown on the scheme of electrical connection. The sensor outlet shall be carefully sealed after connection of the wires.

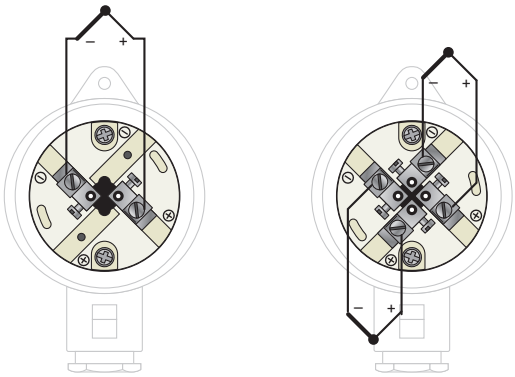
4.1.2 Commissioning

Thermocouple temperature sensor without transmitter in the head is ready for operation after connection of compensation (extension) wires between the sensor terminals and terminals of the associated apparatus (transmitter, thermostat of comparator connections, devices with internal compensation, etc.) and after mounting head cover.

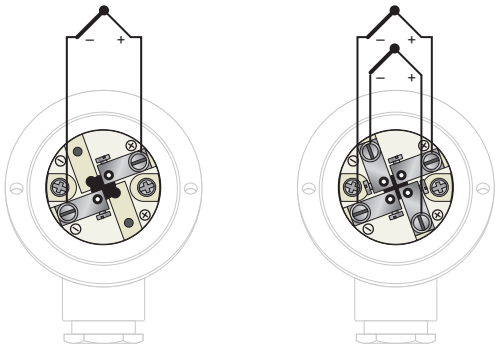
Thermocouple temperature sensor with transmitter in the head (installed in the head cover) is ready for operation if terminals of the measuring insert and transmitter are connected by the attached compensation (extension) wires and after connection of copper connection wires between the transmitter terminals and terminals of the associated apparatus and after mounting head cover.

4.1.3 Electrical connection

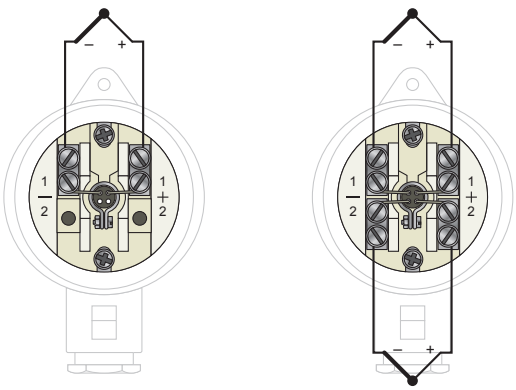
Head type A - version with thermocouple “J“, “K“, diameter of wires 2 and 3 mm



Head type B - version C107, S088



Head type A - version with thermocouple “R“, “S“, “B“, diameter of wires 0.5 mm and “J“, “K“, diameter of wires 1 mm

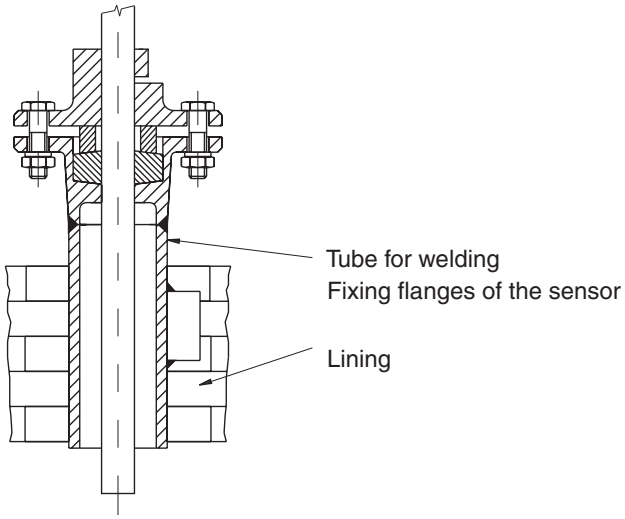


Terminals with connected positive branches are marked acc. to DIN 43 722:

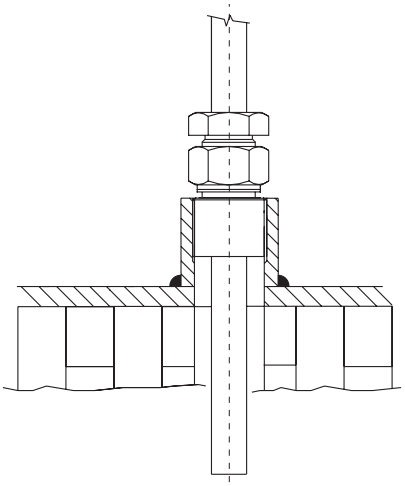
“J“	black
“K“	green
“R“	orange
“S“	orange
“B“	gray

4.1.4 Examples of mounting of the sensors in operation

Fixing shift flange with counter-flange



Fixing shift pipe union



4.2 Operation and maintenance

The product does not need any operation or maintenance.

It is recommended to check the mounting of the sensor at preselected intervals.

To ensure metrological parameters of the sensors, periodic checks of calibration parameters must be performed. Period of calibrations is set by the user and it is based on operating conditions and internal metrology regulations. Manufacturer's recommended period is 12 months. If there is during the calibration found difference from the expected metrological parameters, it is necessary to replace the sensor.

5. Product specifications

5.1 Technical specifications

Thermocouple:

"J" (Fe-CuNi) accuracy class 2 acc. to EN 60584-1
"K" (NiCr-NiAl) accuracy class 2 acc. to EN 60584-1
"R" (PtRh13-Pt) accuracy class 1, 2 acc. to EN 60584-1
"S" (PtRh10-Pt) accuracy class 1, 2 acc. to EN 60584-1
"B" (PtRh30-PtRh6) accuracy class 2, 3 acc. to EN 60584-1

Measuring range:

according to used thermocouple and protective tube material (see ordering table)

Output signal:

without transmitter voltage
with transmitter linearized 4 to 20 mA
other after agreement

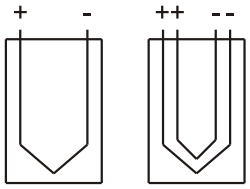
Dielectric strength:

500 V eff

Thermocouple wires diameter:

"J", "K"	1; 2; 3 mm
"R", "S", "B"	0.5 mm

Version of measuring end



single insulated — double insulated separated

Materials:

head - aluminium alloy
support tube
- varnished carbon steel
- stainless steel 1.4541 (AISI 321)
- heat-resisting steel1.4762 (AISI 446)
- heat-resisting steel 1.4845 (AISI 310)

protective tubes
- stainless steel 1.4541 (AISI 321)
- heat-resisting steel 1.4762 (AISI 446)
- heat-resisting steel 1.4845 (AISI 310)
- Kanthal AF (1.4767)
- alloy PtRh10
- ceramics C530 (73 až 80 % Al_2O_3), porous
- ceramics C610 (60 % Al_2O_3)
- ceramics C799 (99.5 % Al_2O_3)
- sapphire
- silicon carbide SiC (HALSIC-R, ≥ 99 % SiC)
- ceramics C530, C610, C799 coated with Pt (platinum)
- ceramics C530, C610, C799 coated with PtRh10 (standard for C610, C799)

insulating bead, capillary
- ceramics C610, C799, sapphire

Standard composition of ceramics:

C530	73 to 80 % Al_2O_3
C610	60 % Al_2O_3
C799	99.5 % Al_2O_3
SiC	≥ 99 % SiC

Porosity of ceramics:

C530	2 µm
C610, C799	none
SiC (HALSIC-R)	21-27 µm

Housing (according to EN 60529):
IP 53, IP 65

5.2 Operation conditions

Maximal temperature of the head:
150 °C (without transmitter, head type A)
100 °C (without transmitter, head type B)
85 °C (with transmitter P5310, P5311, P5315 and 5320)

Max. operating pressure:
for gas-proof mounting of straight thermocouple sensors is recommended max. pressure load up to 100 kPa (1 bar)

5.3 Metrological parameters

Temperature sensors CeraTEMP® 80 can be supplied:
- as sensors with calibration,
- as sensors without calibration.

Tolerance limits of accuracy classes are listed IEC 584-2. The initial tolerance is related to the initial calibration of the sensor.To ensure accuracy of measurement, it is necessary to calibrate sensors periodically according to the operating parameters. Sensors can be supplied with calibration at several temperature points, according to customer requirements. Standard temperature range for calibration is -40 to +1100 °C (-40 to +1550 °C after agreement). Sensors with the transmitter can be also with calibration including transmitter with current output signal 4 to 20 mA.

5.4 Supplementary parameters

EMC (Electromagnetic compatibility):
according to EN 61326-1

Protective tubes application - reference values:
(not a general valid values)

- Heat-resisting steel 1.4762: applicable in air up to 1150 °C, suitable for oxidizing or reducing environment containing sulphur
- Heat-resisting steel 1.4845: applicable in air up to 1150 °C, suitable for nitrogen rich environment with small amount of oxygen
- Kanthal AF (1.4767): applicable in air up to 1400 °C
- Ceramics C530: applicable up to 1600 °C, suitable for gasses of all kind when using gas-proof inner tube
- Ceramics C610: applicable up to 1500 °C, suitable for gasses without alkalic and hydrofluoric acid
- Ceramics C799: applicable up to 1800 °C, contact with alkaline steams allowed up to 1500 °C, for glass melt up to 1500 °C
- Sapphire: applicable up to 2000 °C, suitable for glass furnaces, production of lead crystal or coloured glass
- Silicone carbide SiC: applicable up to 1600 °C, suitable for non-ferrous metal melts, incinerators, etc.

Protective tubes for application to molten glass in glassworks:

- Ceramics C530, C610, C799 with coat Pt (platinum):
applicable up to 1550 °C

- Ceramics C530, C610, C799 with coat PtRh10:
applicable up to 1600 °C (usually for C610, C799, coat diameters according to customer)

- Alloy PtRh10 (connected to ceramic tube):
applicable up to 1650 °C
- Alloy PtRh10 (connected to metallic tube):
applicable up to 1650 °C (diameters according to agreemen)

5.4.1 Version with transmitters

Sensors CeraTEMP® 80 with transmitters may be completed with transmitters in heads with output 1x/2x 4 to 20 mA, HART, Profibus, Fiedbus. This version is usable only for heads with high head cover (order codes H2 and H4), where the transmitter (diameter 44 to 64 mm) is placed inside the sensor head cover.

⚠ Using the transmitter in sensor head is possible if temperature of sensor head in place of application does not exceed max. allowed ambient temperature of transmitter. This temperature is typically 80 °C or 85 °C according to used transmitte.

Applicable transmitters
For range of transmitter see category optional accessories in transmitters for head mounting and the catalogue transmitters. For application in explosion hazard environment, transmitters with individual approval have to be selected.

⚠ For application with headmounted transmitter, observe also the requirements according to transmitter manual.

6. Standards and marking

6.1 Standards and directives

General:
EN 60584-1

RoHS:
2011/65/EU

Electromagnetic compatibility:
EN 61326-1

6.2 Marking and type tag information

Marking on temperature sensors head:
Standard version - stainless steel tag (example):

T1580 22 7 K222 L700 H1	number type (version number) - incomplete marking
1xK/2	number of sensors, sensor material, accuracy class
-40 ..1100 °C	temperature range
3214567	serial number
IP 53	housing
JSP, s.r.o. Raisova 547 506 01 Jičín Czech Republic	address of manufacturer
	logo of JSP, s.r.o.
www.jsp.cz	website address
CE	marking of conformity

7. Ordering information

7.1 Ordering table

	Type	Description		
°	**T1580**	**Straight thermocouple temperature sensor with metal, ceramic or sapphire protective tube**		
	Code	**Thermocouple Type, measuring end style**	**Measuring range**	**Max. recommended temperature for continuous operation**
°	**21**	**1x"J" (Fe-CuNi), insulated**	**-40 to +900 °C**	**+700 °C (+600 °C for wire diameter 1 mm)**
°	**61**	**2x"J" (Fe-CuNi), insulated, isolated junctions**	**-40 to +900 °C**	**+700 °C (+600 °C for wire diameter 1 mm)**
°	**22**	**1x"K" (NiCr-NiAl), insulated** [1]	**-40 to +1200 °C**	**+1000 °C (+800 °C for wire diameter 1 mm)**
°	**62**	**2x"K" (NiCr-NiAl), insulated, isolated junctions** [1]	**-40 to +1200 °C**	**+1000 °C (+800 °C for wire diameter 1 mm)**
	25	1x"R" (PtRh13-Pt), insulated	0 to +1600 °C	+1300 °C
	65	2x"R" (PtRh13-Pt), insulated, isolated junctions	0 to +1600 °C	+1300 °C
°	**26**	**1x"S" (PtRh10-Pt), insulated**	**0 to +1600 °C**	**+1300 °C**
°	**66**	**2x"S" (PtRh10-Pt), insulated, isolated junctions**	**0 to +1600 °C**	**+1300 °C**
°	**28**	**1x"B" (PtRh30-PtRh6), insulated**	**+300 to +1800 °C**	**+1600 °C**
°	**68**	**2x"B" (PtRh30-PtRh6), insulated, isolated junctions**	**+300 to +1800 °C**	**+1600 °C**
	99	Other		
	Code	**Accuracy class according to EN 60584-1**		
°	**T8**	**3 (standard for thermocouple "B")**		
°	**T7**	**2 (standard for thermocouple "J", "K", "R","S")**		
	T6C	1 (optional for thermocouple "J", "K", "R", "S"), with certificate of calibration, (must be ordered with calibration - code KTE)		
	T9	Other		

FITTING VERSION

	Code	Outer protective tube Dimensions [mm] / Material	Inner protective tube Dimensions [mm] / Material	Capilary Material	Diameter of TC wires [mm] R; S; B	Diameter of TC wires [mm] J; K (1x/2x)	Support tube Diameter [mm]	Tmax [2] of protective tubes
	K154	15 x 1.3 / Kanthal AF (1.4767)	-	ceramics C610		3 / 2	-	up to +1300 °C
°	**K201**	**20 x 3 / 1.4541**	**-**	**ceramics C610**	**-**	**3 / 2**	**-**	**up to +800 °C**
°	**K203**	**20 x 3 / 1.4845**	**-**	**ceramics C610**	**-**	**3 / 2**	**-**	**up to +1100 °C**
°	**K222**	**22 x 2 / 1.4762**	**-**	**ceramics C610**	**-**	**3 / 3**	**-**	**up to +1100 °C**
°	**K223**	**22 x 2 / 1.4845**	**-**	**ceramics C610**	**-**	**3 / 3**	**-**	**up to +1100 °C**
	K223Z	22 x 3,5 / 1.4845	-	ceramics C610	-	3 / 2	-	up to +1100 °C
	K224	22 x 1,3 / Kanthal AF (1.4767)	-	ceramics C610	-	3 / 3	-	up to +1300 °C
	K154C	15 x 1.3 / Kanthal AF (1.4767)	10 x 1.5 / C610	ceramics C610	0.5	1 / 1	-	up to +1300 °C
°	**K222C**	**22 x 2 / 1.4762**	**15 x 2 / C610**	**ceramics C610**	**0.5**	**3 / 2**	**-**	**up to +1100 °C**
°	**K223C**	**22 x 2 / 1.4845**	**15 x 2 / C610**	**ceramics C610**	**0.5**	**3 / 2**	**-**	**up to +1100 °C**
	K224C	22 x 1,3 / KANTHAL AF (1.4767)	15 x 2 / C610	ceramics C610	0.5	3 / 2	-	up to +1300 °C
°	**C106**	**10 x 1.5 / ceramics C610**	**-**	**ceramics C610**	**0.5**	**1 / 1**	**15**	**up to +1550 °C**
°	**C107**	**10 x 1.5 / ceramics C799**	**-**	**ceramics C799**	**0.5**	**1 / 1**	**15**	**up to +1700 °C**
°	**C156**	**15 x 2 / ceramics C610**	**-**	**ceramics C610**	**0.5**	**3 / 2**	**22**	**up to +1550 °C**
°	**C157**	**15 x 2.5 / ceramics C799**	**-**	**ceramics C799**	**0.5**	**3 / 2**	**22**	**up to +1700 °C**
°	**C247**	**24 x 3 / ceramics C799**	**15 x 2.5 / C799**	**ceramics C799**	**0.5**	**3 / 2**	**32**	**up to +1700 °C**
°	**C265**	**26 x 4 / ceramics C530**	**15 x 2 / C610**	**ceramics C610**	**0.5**	**3 / 2**	**32**	**up to +1550 °C**
	C26H	26 x 5 / ceramics SiC	15 x 2.5 / C799	ceramics C799	0.5	3 / 2	32	up to +1600 °C
	S088	8 x 1.5 / sapphire	-	ceramics C799	0.5	-	15	up to +2000 °C
	....SF	Inner protective tube sapphire diameter 4.8x0.7 – only with codes C..., PC..., PK…						acc. to code C…
	....PT	Pt coat on measuring end of ceramic protective tube (coat dimensions according to customer requirement) – only with codes C…						up to +1550 °C
	....PR	PtRh10 coat on measuring end of ceramic protective tube (coat dimensions according to customer requirement) – only with codes C…						up to +1600 °C
	PC999	Protective tube made of PtRh10 connected on ceramic tube (dimensional version according to the agreement)						up to +1650 °C
	PK999	Protective tube made of PtRh10 connected on metal support tube (dimensional version according to the agreement)						up to +1650 °C
	C999	Other						

	Code	Nominal length L [mm]	
°	**L180**	**180**	
°	**L250**	**250**	
°	**L350**	**350**	
°	**L500** [3]	**500**	
°	**L700** [3]	**700**	
°	**L800** [3]	**800**	**- not for C107**
°	**L1000** [3]	**1000**	**- not for C107**
°	**L1200** [3]	**1200**	**- not for C106, C107**
°	**L1400** [3]	**1400**	**- not for C106, C107**
°	**L1600** [3]	**1600**	**- not for C106, C107 and all armatures with sapphire, diameter 4.8 mm**
	L2000 [3]	2000	- not for C106, C107 and all armatures with sapphire
	L ...	Other length specify in mm	

	Code	Head	
°	**H1**	**Type A, Al alloy, cable outlet 4 to 12.5 mm, IP 53**	**- not for C106, C107, K154, K154C, S088**
°	**H2** [4]	**Type A, cap for transmitter Ø 62 mm, Al alloy, cable outlet 4 to 12.5 mm, IP 53**	**- not for C106, C107, K154, K154C, S088**
°	**H2D** [4]	**Type A, cap for transmitter Ø 62 mm, Al alloy, 2x cable outlet 4 to 12.5 mm, IP 53**	**- not for C106, C107, K154, K154C, S088**
°	**H3**	**Type B, Al alloy, cable outlet 4 to 12.5 mm, IP 53**	**- for C106, C107, K201, K203, K154, K154C, S088**
°	**H4** [4]	**Type B, cap for transmitter Ø 44 mm, Al alloy, cable outlet 4 to 12.5 mm, IP 53**	**- for C106, C107, K201, K203, K154, K154C, S088**
	H9	Other	

	Code	Support tube Length N [mm] ONLY FOR VERSION WITH SUPPORT TUBE!
°	**N080**	**80 (standard for length L 180 mm)**
°	**N150**	**150 (standard for length L 250 and 350 mm)**
°	**N200**	**200 (standard for length L 500, 700 and 800 mm)**
°	**N300**	**300**
°	**N400**	**400 (standard for length L 1000, 1400, 1600 and 2000 mm)**
	N ...	Other length specify in mm

° ... Marked version can be dispatched up to 5 working days (with calibration up to two weeks)

[1] … Wire thermocouples type "K" are not suitable for a reducing atmosphere, where the material of TC branches is degraded by the "Green rot" as it is called; in this environment, it is more suitable to choose a sensor with plastic insert, see the series of ModuTEMP® 70 sensors.

[2] … Effective temperature resistance of protective tube is affected other process parameters (aggressivity, flow speed and abrasive of measuring medium, temperature shocks, vibrations etc.).

	Code	Support tube material	
○	**M1**	**Varnished carbon steel**	**- not for code C106, C107 and S088**
○	**M2**	**Stainless steel 1.4541**	
	M3	Heat-resisting steel 1.4845	- for support tube diameter 22 mm, for other diameters consult with supplier
	M4	Heat-resisting steel 1.4762	- for support tube diameter 22, 32 mm, for other diameters consult with supplier
	M5	Kanthal AF (1.4767)	- for support tube diameter 15, 22 mm, for other diameters consult with supplier
	M9	Other	
		OPTIONAL ACCESSORIES	
	Code	**Special version**	
•	**RU**	**Snap lock**	**- only for heads H1, H2, H2D**
○	**ZT**	**Sealed joint between the support and ceramic tube**	**- only for M4, M5**
○	**ZK**	**Increased housing to IP 65**	**- only for M4, M5, not for C530** [5]
	Code	**Calibration in customer defined points, including certificate of calibration**	
○	**KTE32AB**	**Thermocouple temperature sensor calibration in three points in range -40 to +1100 °C**	
○	**KTE42AB**	**Thermocouple temperature sensor calibration in four points in range -40 to +1100 °C**	
○	**KTE52AB**	**Thermocouple temperature sensor calibration in five points in range -40 to +1100 °C**	
○	**KTE32B**	**Thermocouple temperature sensor calibration in three points in range +400 to +1600 °C**	
○	**KTE42B**	**Thermocouple temperature sensor calibration in four points in range +400 to +1600 °C**	
○	**KTE52B**	**Thermocouple temperature sensor calibration in five points in range +400 to +1600 °C**	
	KTE9	Other	
	Code	**Accessories**	
•	**BZS**	**Stainless steel tag for attachment (70x15 mm) with laser description according to order**	
	Code	**Fixing shift flanges and pipe unions**	
•	**UP02**	**Fixing shift flange for diameter 15 mm (see data sheet No. 0126)**	
•	**UP03**	**Fixing shift flange for diameter 22 mm (see data sheet No. 0126)**	
•	**UP04**	**Fixing shift flange for diameter 32 mm (see data sheet No. 0126)**	
•	**UPS15M27**	**Fixing shift pipe union for diameter 15 mm, connecting thread M27x2 (see data sheet No. 0126)**	
•	**UPS20M30**	**Fixing shift pipe union for diameter 20 mm, connecting thread M30x2 (see data sheet No. 0126)**	
•	**UPS22M33**	**Fixing shift pipe union for diameter 22 mm, connecting thread M33x2 (see data sheet No. 0126)**	
	P9	Other	
	Code	**Transmitters for headmounting**	
•	**P5310 H10**	**Transmitter with LHP protocol (see data sheet No. 0824)**	
○	**P5310EN2 H10**	**Transmitter with LHP protocol, (Ex) II 3G Ex nA IIC T4 Gc (see data sheet No. 0824)**	
•	**P5311 H10**	**Transmitter with LHP protocol with galvanic isolation (see data sheet No. 0824)**	
○	**P5311EN2 H10**	**Transmitter with LHP protocol with galvanic isolation, (Ex) II 3G Ex nA IIC T4 Gc (see data sheet No. 0824)**	
○	**P5311EI1 H10**	**Transmitter with LHP protocol with galvanic isolation, (Ex) II 1G Ex ia IIC T4-T6 Ga, (Ex) II 1D Ex ia IIIC T106°C Da (see data sheet No. 0824)**	
•	**P5315 H10**	**Precision transmitter with LHP protocol with galvanic isolation (see data sheet No. 2098)**	
	P5315EN2 H10	Precision transmitter with LHP protocol with galvanic isolation, (Ex) II 3G Ex nA [ic] IIC T4 Gc (see data sheet No. 2098)	
•	**P5320 H10**	**Precision transmitter with HART protocol with galvanic isolation (see data sheet No. 0825)**	
•	**P5320EN2 H10**	**Precision transmitter with HART protocol with galvanic isolation, (Ex) II 3G Ex nA [ic] IIC T4 Gc (see data sheet No. 0825)**	
	P5320EI1 H10	Precision transmitter with HART protocol with galvanic isolation, (Ex) II 1G Ex ia IIC T4-T6 Ga, (Ex) II 1D Ex ia IIIC Txx°C Da (see data sheet No. 0825)	
Example of order: T1580 26 T6C C247 L700 H1 N200 M1 KTE32AB (0, 400, 800 °C) UP04			

• ... Ex stock version ° ... Marked version can be dispatched up to 5 working days (with calibration up to two weeks)

[3] … The actual length of the sensor with fitting version C156, C157 is 10 mm shorter than the specified nominal length.

[4] … Temperature of head with transmitter inside should not exceed 80 or 85 °C according to transmitter type.

[5] … C530 is a porous material and cannot fully ensure the tightness of the sensor against medium leakage into the sensor fitting.

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