

Surface thermocouple Model TC50

WIKA data sheet TE 65.50



for further approvals
see page 10

Applications

To measure surface temperatures on flat surfaces or pipes, in both laboratory and industrial applications

Special features

- Application ranges up to max. 400 °C (option: 600 °C)
- Easily exchanged, no thermowell necessary
- For screw-fitting, welding or using a tightening strap
- Cable from PVC, silicone, PTFE or glass fibre
- Explosion-protected versions Ex i, Ex n and NAMUR NE24



Thermocouples

Fig. top: Model TC50-O with metal contact block

Fig. bottom: Model TC50-Q with tightening strap

Description

Probe

In the variants for flat surfaces, the sensor is fitted within a contact block. This can be screwed or welded onto the vessel surface. Variants for pipes are secured using a tightening strap.

Cable

There are various insulating materials available to suit any particular environmental conditions. The cable end is made up, ready for connection, but can also be fitted with a plug or connected to a field case, as options.

Sensor

Sensor types

Model	Recommended max. operating temperature
K (NiCr-Ni)	400 °C ¹⁾
J (Fe-CuNi)	400 °C ¹⁾
E (NiCr-CuNi)	400 °C ¹⁾
T (Cu-CuNi)	350 °C
N (NiCrSi-NiSi)	400 °C ¹⁾

1) Higher temperatures on request

Thermocouple Model	Class	
	DIN EN 60584 part 2	ISA MC96.1
K	1 and 2	Standard, special
J	1 and 2	Standard, special
N	1 and 2	-
E	1 and 2	-
T	1 and 2	-

Tolerance value

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

For detailed specifications for thermocouples, see Technical information IN 00.23 at www.wika.com.

Listed models are available both as single or dual thermocouples. The thermocouple will be delivered with an insulated measuring point, unless explicitly specified otherwise.

The application range of these thermometers is limited both by the permissible maximum temperature of the thermocouple and by the maximum temperature of the process connection material. If the temperature to be measured is higher than the permissible temperature at the cable transition, the distance between the cable transition and the critical temperature must be adjusted accordingly by an increased sensor length (MI cable).

Metallic sensor

Material: Stainless steel
Diameter: 3 or 6 mm
Length: selectable

Surface thermocouples can be designed in two different ways:

■ Tubular design

The tubular design features a rigid construction to the metal sensor tip; therefore, tubular designs must not be bent.

Within the pipe, the connection cable extends almost to the sensor tip. Therefore tubular cable thermocouples can only be used up to the temperature specified for the cables (see operating temperature).

■ Sheathed design

In sheathed thermocouples the flexible part of the sensor is a mineral-insulated cable (MI-cable).

It consists of a stainless steel outer sheath, which contains the insulated internal leads, embedded within a high-density ceramic compound.

Sheath material

- Ni-alloy 2.4816 (Inconel 600)
 - Stainless steel
- Others on request

Sheathed thermocouples, with the exception of the transition, may be bent to a radius of 3-times the sheath diameter.

Due to this flexibility, the sensor can be used in areas that are difficult to access.

Transition

The junction between the metal part of the sensor and the connecting cable or wire is either rolled or potted, depending on the design. This area should not be immersed within the process and must not be bent. Compression fittings should not be attached to the transition. The type and dimensions of the transition depend largely on the combination between input leads and metal sensor and the sealing requirements.

Dimension T denotes the length of the transition.

Criterion	Dimension T in mm	Ø transition in mm
Probe Ø = transition Ø	n/a	identical to probe
Ø 3 mm with crimped transition	45	6
Ø 6 mm with crimped transition	45	7
Ø 8 mm with crimped transition	45	10

Connection lead

There are various insulating materials available to suit any particular environmental conditions.

The cable end is made up, ready for connection, but can also be fitted with a plug or connected to a field case, as options.

Connection cable (standard)

- Wire material adapted to the sensor
- Wire cross-section: approx. 0.22 mm² (standard design)
- Number of wires: depending on the number of thermocouples
- Insulation material: PVC, silicone, PTFE or glass fibre
- Screen (option)

Maximum working temperatures

The maximum working temperature for these thermometers is limited by different parameters.

If the temperature to be measured inside the sensor measuring range is higher than the permissible temperature at the connection cable, the plug or the transition point, the metallic part of the sensor (mineral-insulated cable) must be long enough to place the critical components outside of the hot zone. The lowest of the maximum working temperatures of process connection, connection line, cable transition or plug must be observed here.

■ Sensor (thermocouple)

The temperature ranges indicated on page 2 refer to the operating range of the thermocouple. These measuring ranges depend on the selected thermocouple and the selected accuracy class.

Operation outside the measuring range defined for the given thermocouple type and class can result in a damage to the thermocouple.

■ Connection cable and single wires

At any point on the connection cable, the maximum temperature that may be attained is that for which the connection cable is specified. The sensor itself (see page 2) can potentially withstand higher temperatures.

For the common connection lines the following maximum operating temperatures apply:

PVC	-20 ... +100 °C
Silicone	-50 ... +200 °C
PTFE	-50 ... +250 °C
Fibreglass	-50 ... +400 °C

Since, in the tubular design variant, an isolated cable is also fitted within the metal probe, the operating limits of the connection cable apply.

■ Transition from the metal part of the thermometer to the connection cable

The temperature at the transition is further limited by the use of a potted sealing compound.

Maximum temperature of the potting compound: 150 °C (option: 250 °C)

Other variants on request

■ Plug (option)

Maximum permissible temperature at the plug: 85 °C

Ingress protection

■ IP protection

Standard versions: up to IP 65
(depending on cable sheath material and number of wires)

Special versions (on request): up to IP 67

Connection leads with a glass-fibre sheath cannot be combined with an explosion-proof design.

■ Explosion protection (optional)

Surface thermocouples of the TC50 series are available with an EC-type examination certificate for "intrinsically safe", Ex i, ignition protection.

These instruments comply with the requirements of 94/9/EC (ATEX) directive for gas and dust. Versions in accordance with NAMUR NE24 are also possible.

The classification/suitability of the instrument (permissible power P_{max} as well as the permissible ambient temperature) for the respective category can be seen on the EC-type examination certificate and in the operating instructions.

The internal inductance (L_i) and capacitance (C_i) for cable probes are found on the product label and they should be taken into account when connecting to an intrinsically-safe power supply.

Process connection

Model TC50-O, with metal contact block

Design: Contact block for screwing or welding to a flat surface

Material: Stainless steel

Dimensions: see drawing
other versions on request

Model TC50-T, with washer

Design: Centrally-drilled washer

Material: Stainless steel

Dimensions: see drawing
other versions on request

Model TC50-Q, with tightening strap

Design: Tightening strap

Material: Stainless steel

Dimensions: see drawing
other versions on request

Model TC50-P, with weld-on sheet

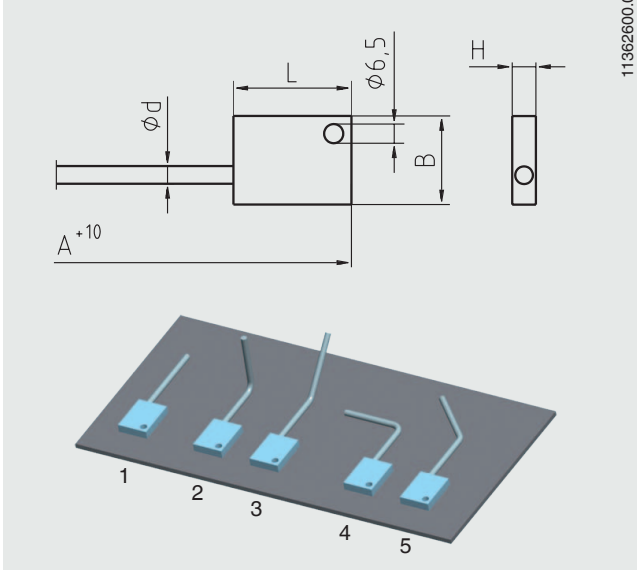
Design: Weld-on sheet

Material: Stainless steel

Dimensions: see drawing
other versions on request

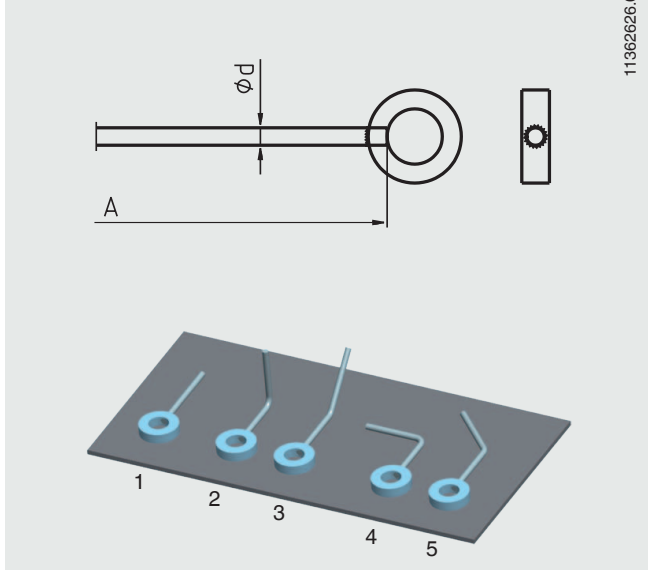
Dimensions in mm

Model TC50-O, metal contact block with bore



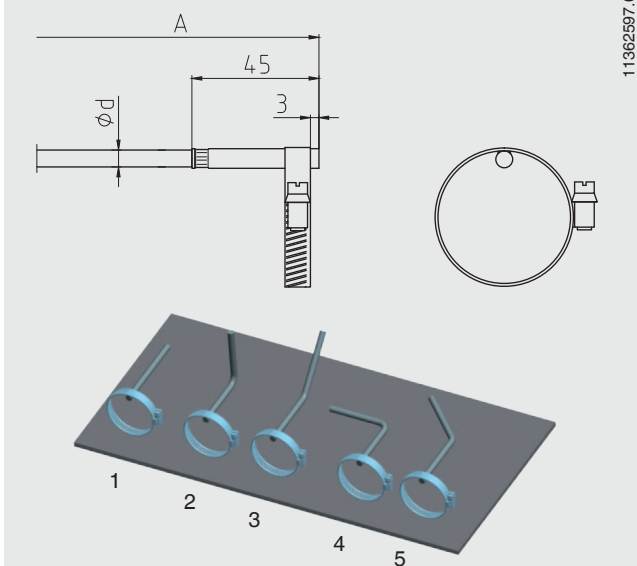
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Model TC50-T, washer



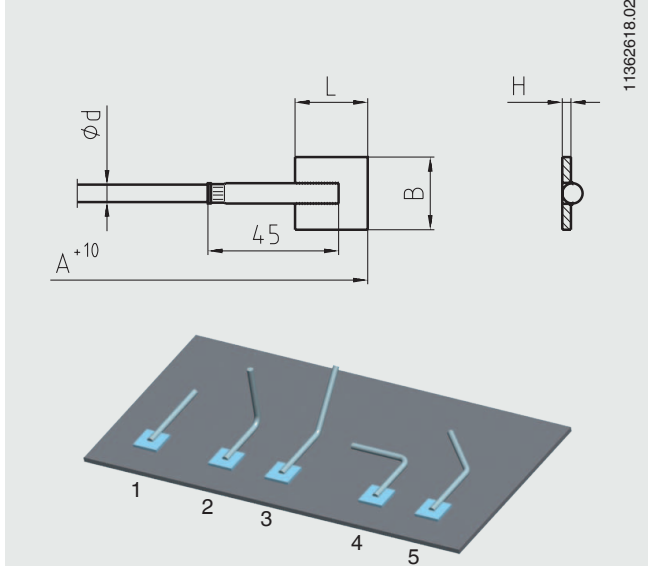
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Model TC50-Q, tightening strap



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Model TC50-P, weld-on sheet



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Bending direction (MI cable)

- 1 Standard version straight
- 2 Standard version 90° bent
- 3 Standard version 45° bent
- 4 Option (ask for delivery time)
- 5 Option (ask for delivery time)

Please note:

The complete length, A, must always be viewed in relation to the drawings on pages 6 and 7.

Process connection	Dimensions in mm width x length x height (W x L x H)	outer ϕ x inner ϕ x thickness (OD x ID x t)
Metal contact block with bore d = 6.5 mm	30 x 40 x 8	-
Washer	-	38.1 x 19.1 x 9.5
Weld-on sheet	25 x 25 x 3.0	-
Tightening strap	-	11 ... 15
		13 ... 25
		23 ... 62
		60 ... 93
		91 ... 125
		123 ... 158

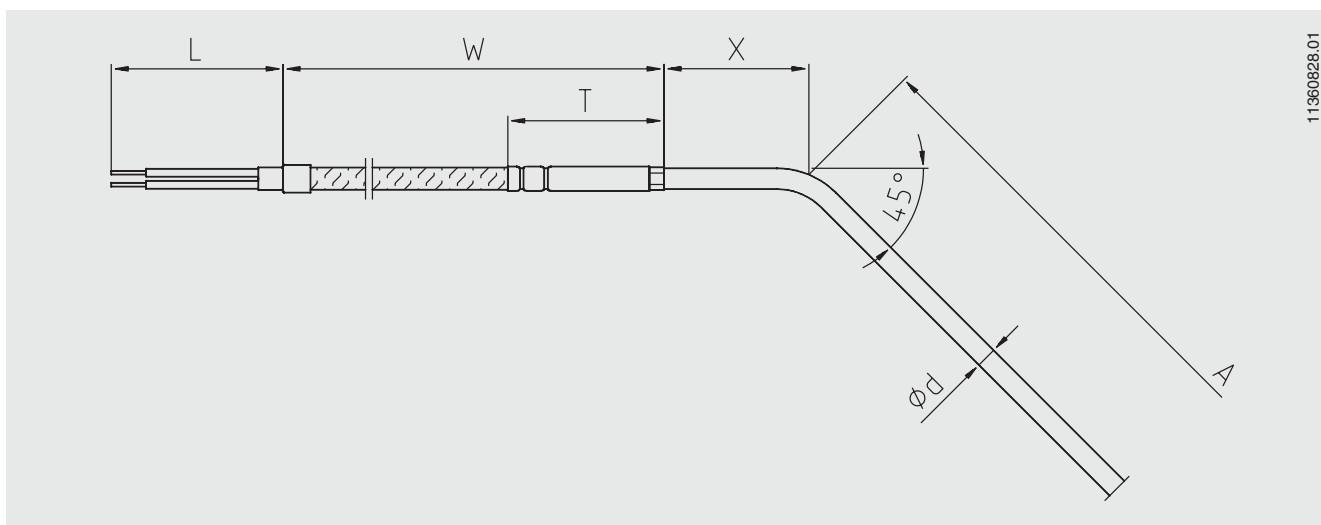
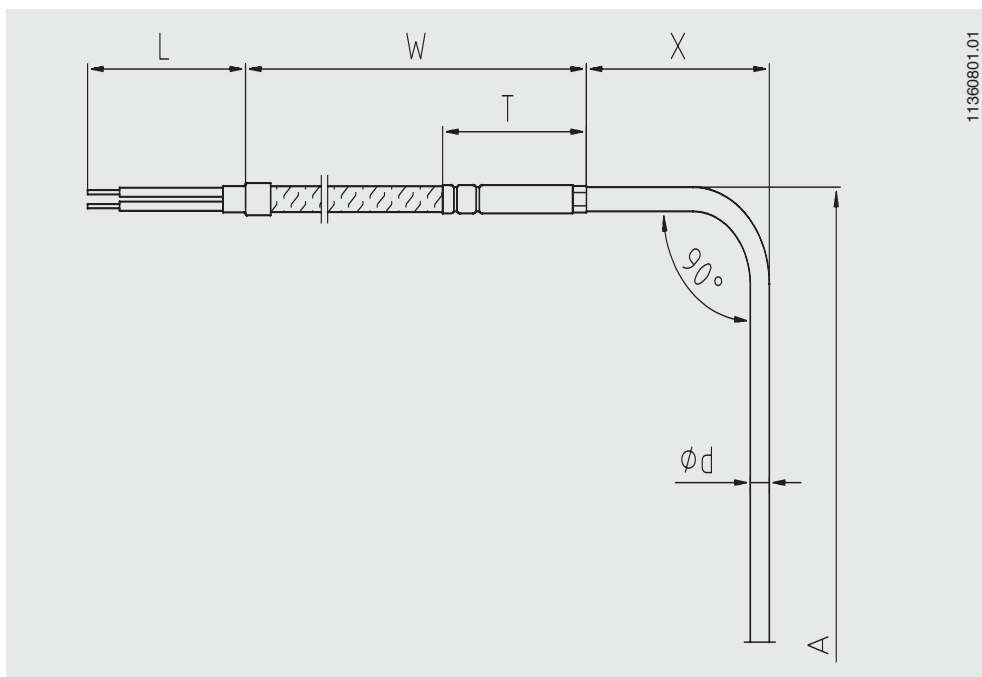
Angled probes

Surface thermocouples made from sheathed cable can be delivered in a pre-formed shape. In this case, the position of the bend is defined by a further dimension.

The dimension X describes the distance of the bend from the lower edge of the transition.

Other bend angles on request.

Strain relief loops are also possible on request.

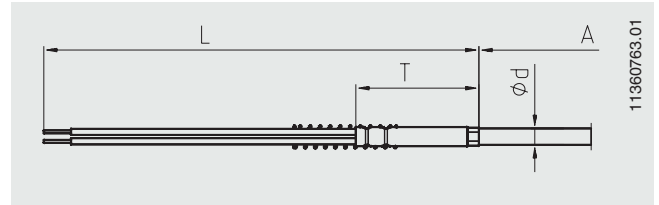


Cable end design

The dimension A defines the sensor length. The dimension W describes the length of the connecting wire. L is the length of the free cable ends. The dimension T describes the transition (if present). T is always a constituent of the length W or L (see table on page 3).

Connection with single wires

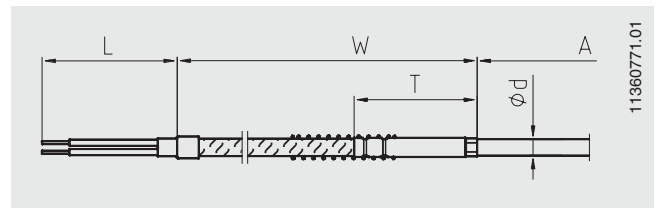
Cable length 150 mm, other lengths on request, thermo wire \varnothing 0.5 mm, compensating cable type according to the sensor type, PTFE-insulated, number of cable end pairs according to the number of sensors, bare wire ends, other designs on request



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With connection cable

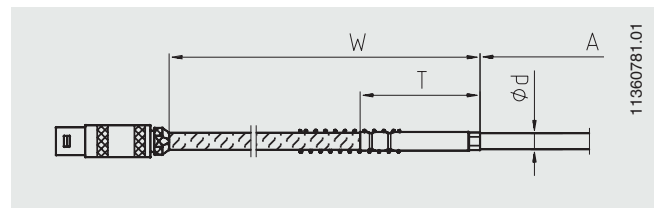
Cable and sensor are permanently connected to each other. Cable length to user specifications. Compensating cable, leads 0.22 mm², compensating cable type depending on the sensor type, number of cores according to number of sensors, stripped lead wires



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With connector fitted to connection cable

The optional connection plug is fitted to a flexible connection cable.

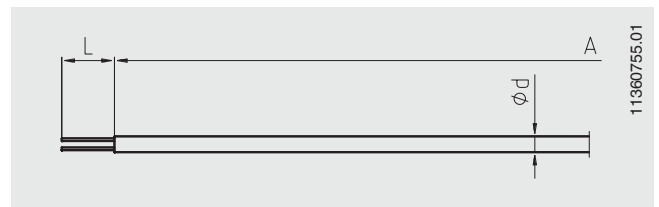


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Designs with bare connecting wires

The internal leads of the mineral-insulated wire protrude. L = 20 mm (standard)

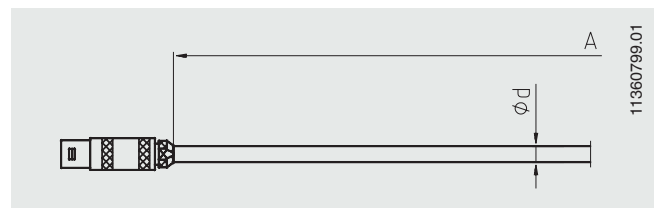
The length of the bare connection wires can be matched to customer requirements. These bare internal leads are made from solid wire, and so are not suitable to be run over long distances.



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Design with connector fitted directly to the probe

These designs are based on the design with bare connection wires. The connector is fitted directly to the metallic probe.



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Version with connected field case

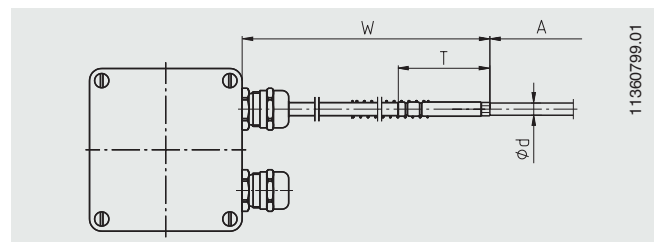
The connection cable is connected to the field case (plastic, ABS) via a cable gland. A second cable gland is mounted for the cable outlet. An aluminium case is available as an option.

Ambient temperature at case:

-40 ... +80 °C

Cable gland material:

- Plastic (standard)
- Metal (option)



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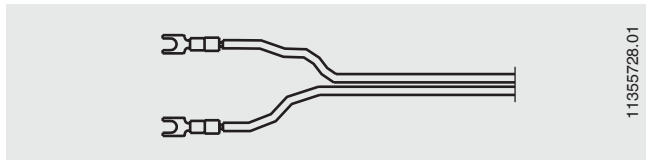
Plug (optional)

Surface thermocouples can be supplied with plugs fitted.

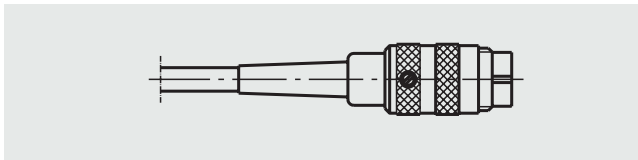
The following options are available:

■ Spade lugs

(not suitable for versions with bare connecting wires)

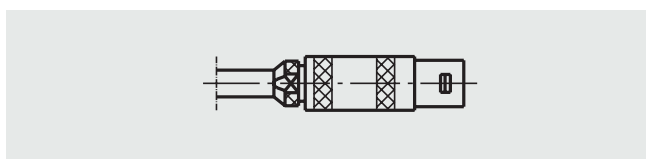


■ Screw-in-plug, Binder (male)

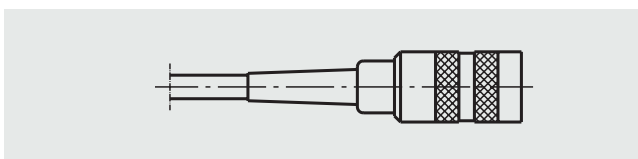


■ Lemosa connector size 1 S (male)

■ Lemosa connector size 2 S (male)

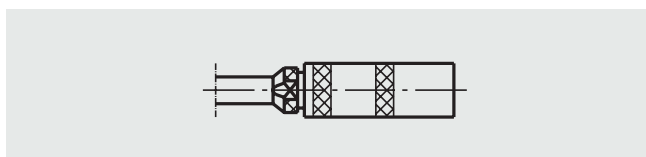


■ Screw-in-plug, Binder (female)



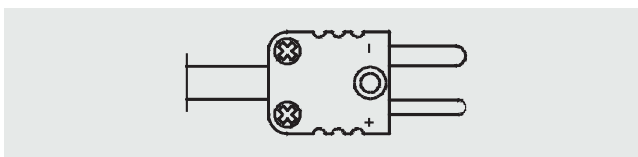
■ Lemosa coupling size 1 S (female)

■ Lemosa coupling size 2 S (female)



■ Standard thermo plug 2-pin (male)

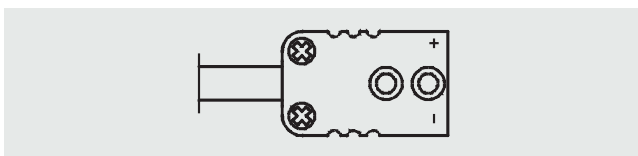
■ Miniature thermo plug 2-pin (male)



Other plug variants (sizes) on request.

■ Standard thermo plug 2-pin (female)

■ Miniature thermo plug 2-pin (female)



Further options

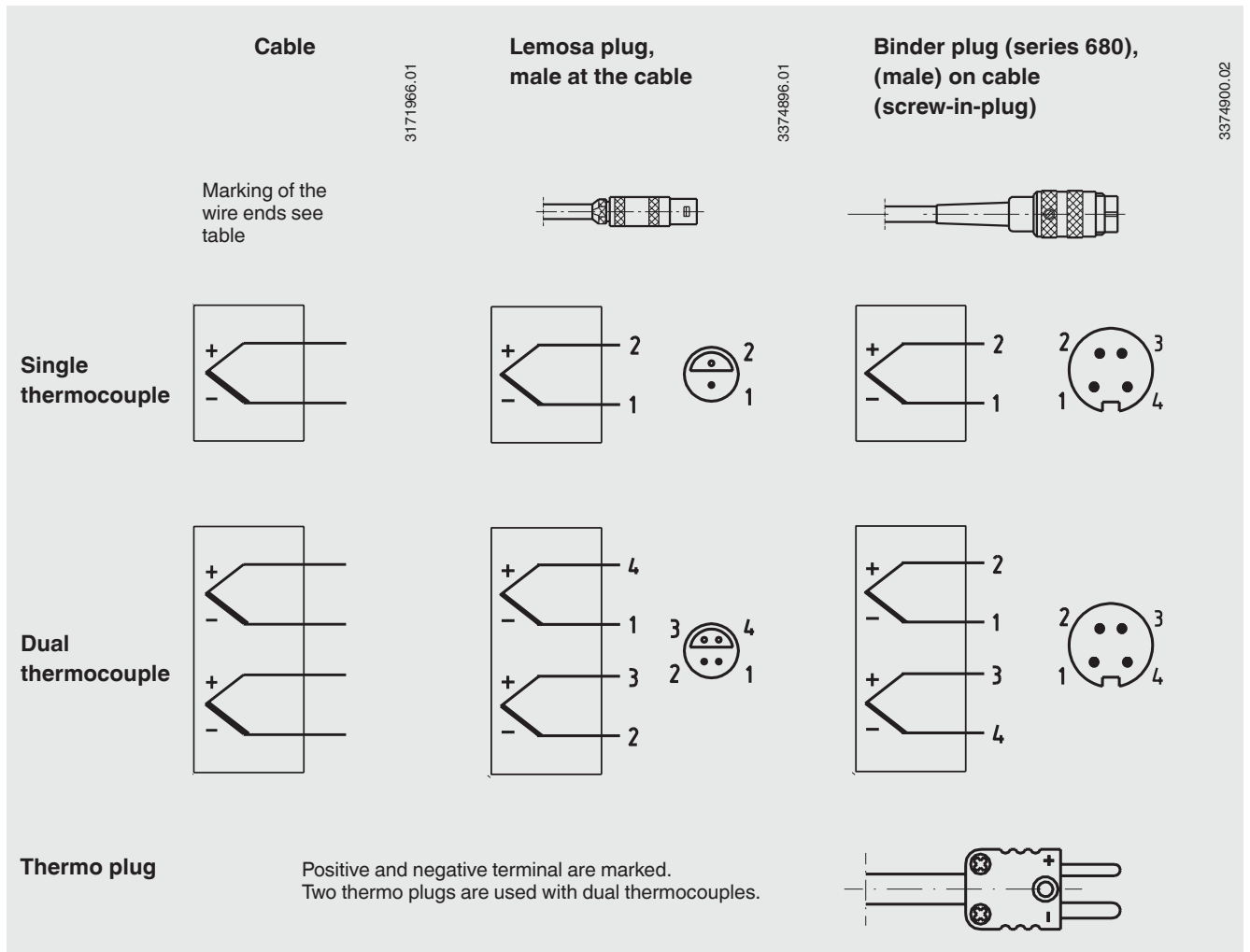
Bend protector

A cable protector (spring or shrink hose) is used to protect the transition point from rigid probe to flexible connecting cable. This should always be used when a relative movement between the cable and the thermometer mounting is expected.

For designs to Ex n the use of bend protection is obligatory.

The standard length of the bend protection spring is 60 mm.

Electrical connection



Other connector plugs and pin assignments on request.

Colour code of cable

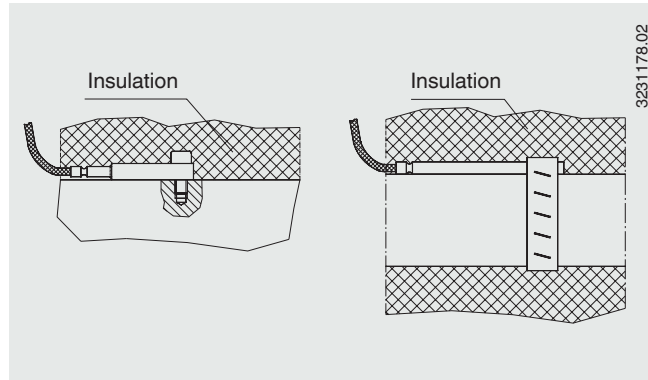
Sensor type	Standard	Positive	Negative
K	DIN EN 60584	green	white
J	DIN EN 60584	black	white
N	DIN EN 60584	pink	white
E	DIN EN 60584	violet	white
T	DIN EN 60584	brown	white

Mounting instructions

The basic requirements to ensure a perfect measurement result is to retain good thermal contact between the probe and the outside wall of the vessel or pipe. Minimal heat loss to the environment from both the probe and the measuring point is imperative.

The sensor should have direct, metallic contact with the measuring point and sit firmly on the surface of the measuring point.

Insulation must be applied at the installation site to avoid error due to heat loss. This insulation must have sufficient temperature resistance and is not included in the scope of delivery.



CE conformity

ATEX directive (option)

94/9/EG, EN 60079-0, EN 60079-11

Approvals (option)

- **IECEX**, international certification for the Ex area
- **NEPSI**, ignition protection type "i" - intrinsic safety, China
- **GOST-R**, import certificate, Russia
- **GOST**, metrology/measurement technology, Russia
- **KOSHA**, ignition protection type "i" - intrinsic safety, South Korea
- **PESO (CCOE)**, ignition protection type "i" - intrinsic safety, India

Certificates (option)

Certification type	Measuring accuracy	Material certificate
2.2 Test report	x	x

Other certificates on request.

Approvals and certificates, see website

Ordering information

Model / Process connection / Sensor version / Explosion protection / Material of the process mounting / Probe diameter / Connection cable, sheath / Cable end version / Cable connection accessories / Measuring element / Number of measuring points / Sensor tolerance value / Temperature range / Certificates / Options

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