Surface resistance thermometer
Model TR50

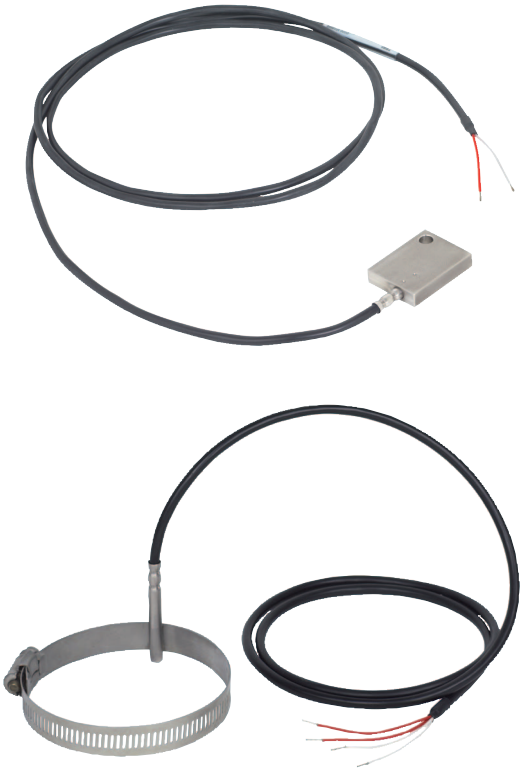
for further approvals
see page 9

Applications

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

Special features

- Application ranges up to max. 250 °C (option: 600 °C)
- Easily exchanged, no thermowell necessary
- For screw-fitting, welding or using a tightening strap
- Cable from PVC, silicone or PTFE
- Explosion-protected versions Ex i, Ex n and NAMUR NE24



Resistance thermometer
Fig. top: Model TR50-O with metal contact block
Fig. bottom: Model TR50-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.

Data sheets showing similar products:
Surface thermocouple; model TC50; see data sheet TE 65.50

Sensor

Sensor connection method
- 2-wire
- 3-wire
- 4-wire

Sensor tolerance value per DIN EN 60751
- Class B
- Class A
- Class AA

Combinations of 2-wire connection and class A or class AA are not allowed.

For detailed specifications for Pt100 sensors, see Technical information IN 00.17 at www.wika.com.

Metallic sensor

Material: Stainless steel
Diameter: 3 or 6 mm
Length: selectable
Regardless of the design, the first 60 mm of the sensor tip must not be bent.

Surface resistance thermometers can be constructed 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.
  Internally, the measuring resistor is connected directly to an insulated supply line; this is why tubular design TR50 resistance thermometers can only be used up to the temperatures specified for the supply line (see operating temperatures).

- **Sheathed design**
  In sheathed resistance thermometers 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.

  The measuring resistance is connected directly to the internal leads of the sheathed cable and is, therefore, also suitable for use at higher temperatures.
  Due to their flexibility and the small possible diameters, sheathed resistance thermometers can also be used in locations that are not easily accessible, since, with the exception of the sensor tip and the transition of the connection cable, the sheath can be bent to a radius of three times the diameter of the cable.

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 version and dimensions of the transition depend largely on the combination between supply line and metal sensor and the sealing requirements.

The dimension T describes the length of the transition.

Criterion	Dimension T in mm	Ø transition in mm
Probe Ø = transition Ø	n/a	identical to probe
Ø 2 ... 4.5 mm with crimped transition	45	6
Ø 6 mm with crimped transition	45	7
Ø 6 mm with crimped transition 1)	45	8
Ø 8 mm with crimped transition	45	10

1) With a large number of wires (e. g. 2 x 3-wire and shielding)

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: Copper (wire)
- Wire cross-section: Approx. 0.22 mm^2 (standard design)
- Number of wires: Dependent on the connection method
- 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 connection line, cable transition or plug must be observed here.

- **Sensor (measuring resistor)**
  The indicated measuring ranges refer to the operating range of the measuring resistor.
  These measuring ranges depend on the selected accuracy class (B, A or AA) and the design of the measuring resistor (thin-film or wire-wound).

Class	Measuring range, design
B	-50 ... +500 °C, thin-film
B	-200 ... +600 °C, wire-wound
A	-30 ... +300 °C, thin-film (-50 … +500 °C class B)
A	-100 ... +450 °C, wire-wound (-200 … +600 °C class B)
AA	0 ... +150 °C, thin-film (-30 … +300 °C class A)
AA	-50 ... +250 °C, wire-wound (-100 … +450 °C class A)

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

- **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 connecting 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)**
  TR50 series surface resistance thermometers are available with a EC-type examination certificate for the "Intrinsic safety" Ex i ignition protection type.
  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 TR50-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

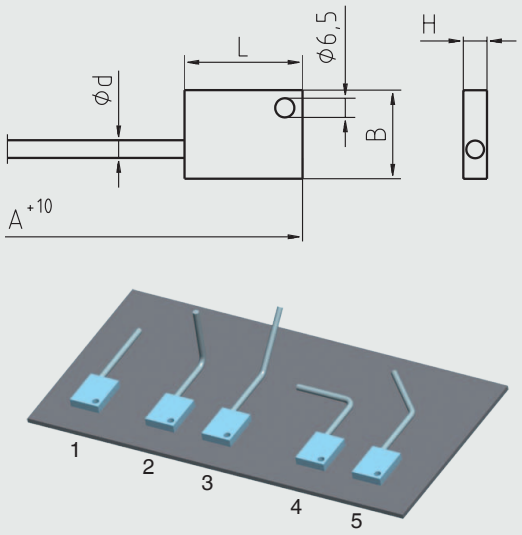
Model TR50-T, with washer
Design: Centrally-drilled washer
Material: Stainless steel
Dimensions: see drawing
other versions on request

Model TR50-Q, with tightening strap
Design: Tightening strap
Material: Stainless steel
Dimensions: see drawing
other versions on request

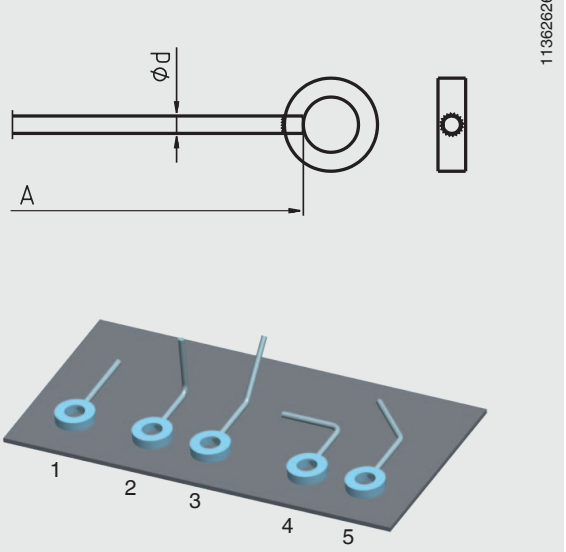
Model TR50-P, with weld-on sheet
Design: Weld-on sheet
Material: Stainless steel
Dimensions: see drawing
other versions on request

Dimensions in mm

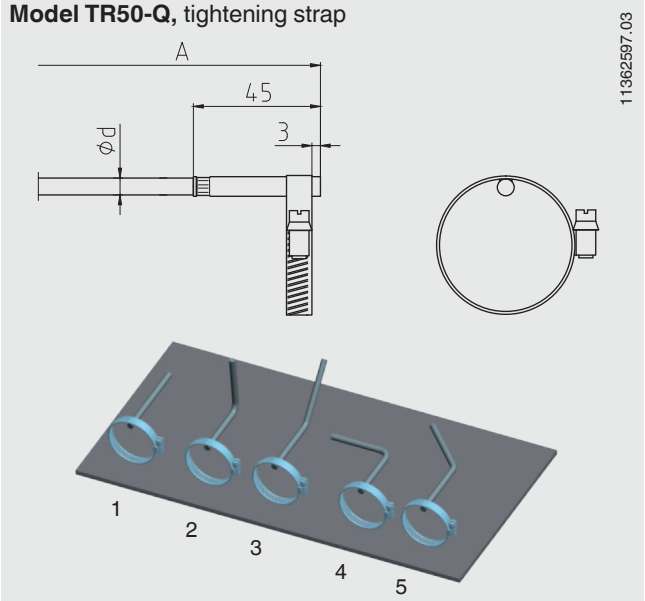
Model TR50-O, metal contact block with bore



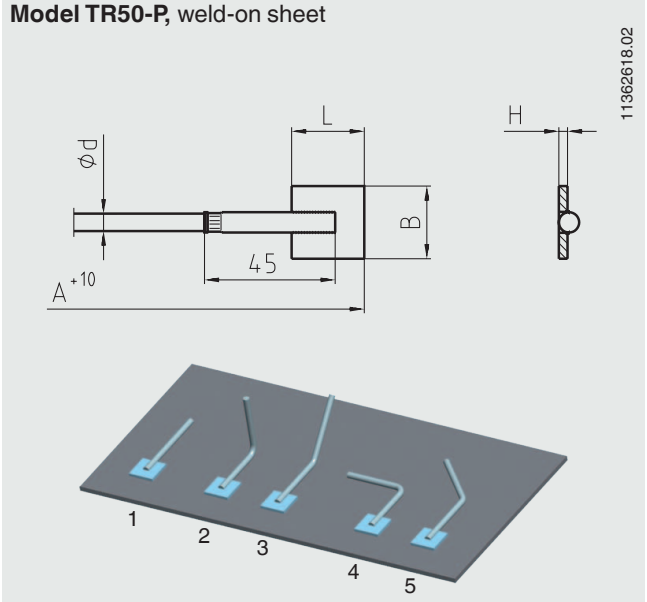
Model TR50-T, washer



Model TR50-Q, tightening strap



Model TR50-P, weld-on sheet



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 5 and 6.

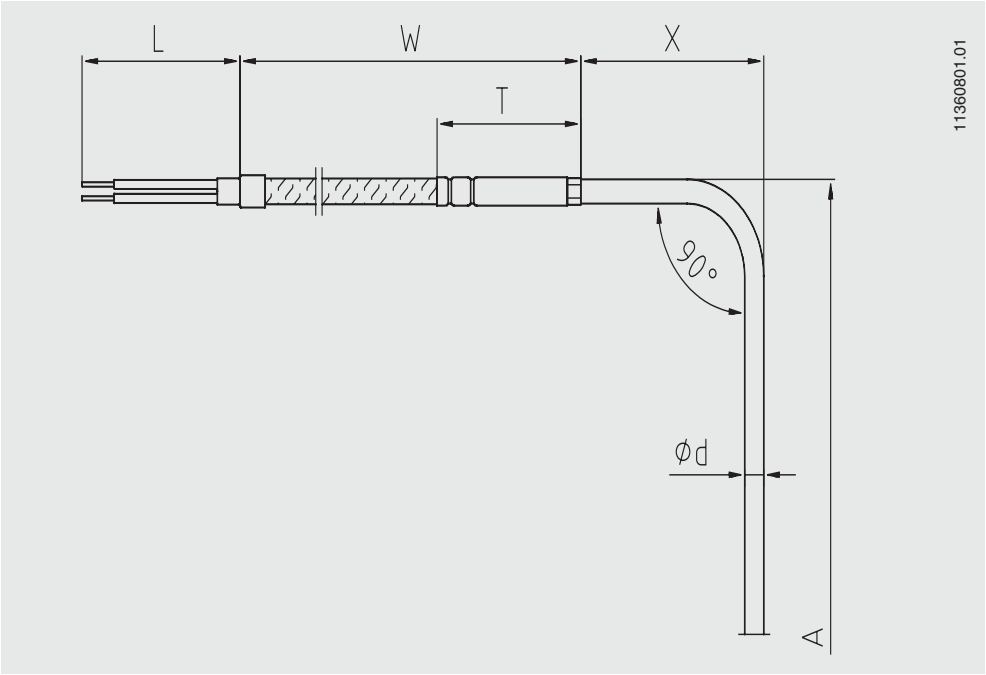
Process connection	Dimensions in mm width x length x height (W x L x H)	Outer Ø x inner Ø x thickness (OD x ID x t)
Metal contact block with bore d = 6.5 mm	30 x 40 x 8	-
Washer	-	38.1 x 19.1 x 9.5
Weld-on sheet	25 x 25 x 3.0	-
Tightening strap	-	11 ... 15
	-	13 ... 25
	-	23 ... 62
	-	60 ... 93
	-	91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

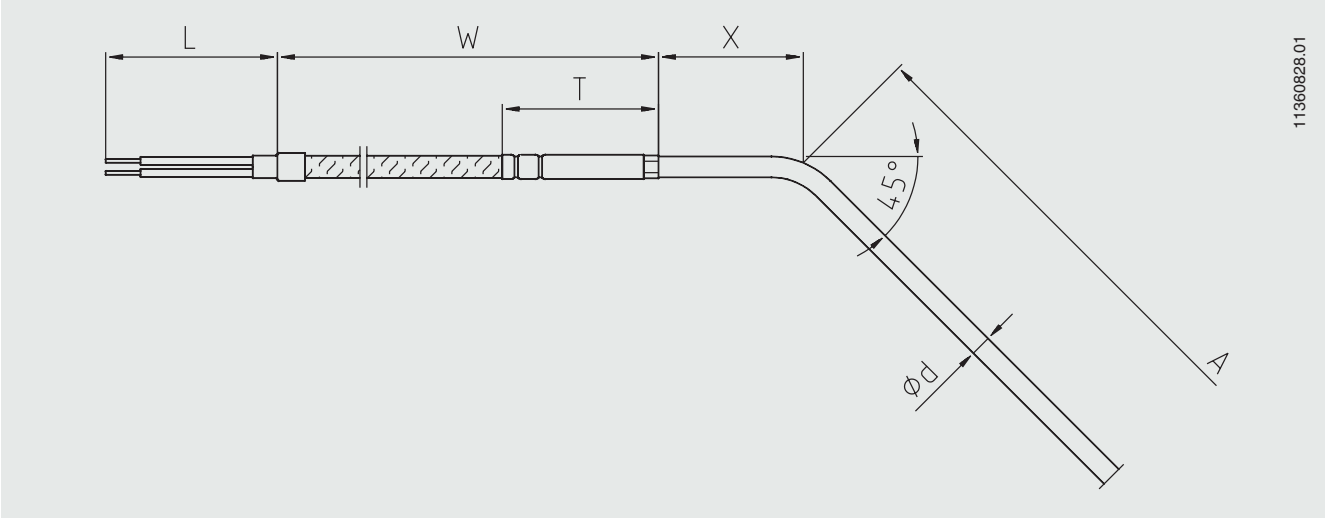
Angled probes

Surface resistance thermometers 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.

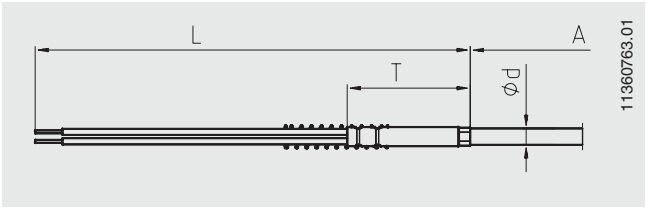




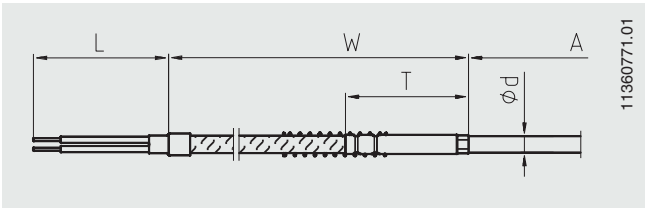
Cable end design

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 2).

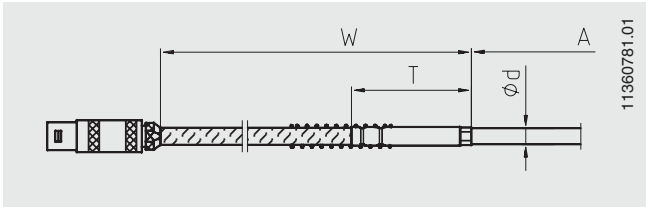
Connection with single wires
Cable length 150 mm, other lengths on request
Cu strands 0.22 mm², PTFE or glass-fibre insulated, number of leads dependent on the number of sensors and the sensor connection method, bare wire ends, other designs on request



With connection cable
Cable and sensor are permanently connected to each other. Cable length and insulation materials to customer specification.
Cu strands 0.22 mm², number of leads dependent on the number of sensors and the sensor connection method, bare wire ends

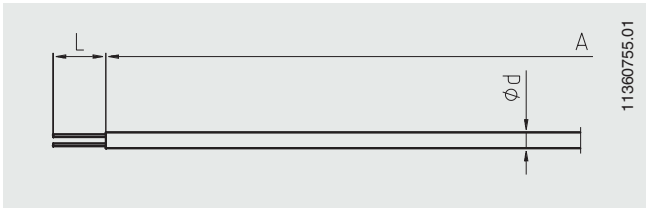


With connector fitted to connection cable
The optional connection plug is fitted to a flexible connection cable.

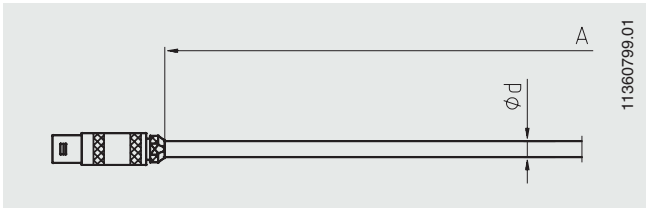


Designs with bare connecting wires
The internal leads of the mineral-insulated wire protrude.
L = 20 mm (standard)

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.



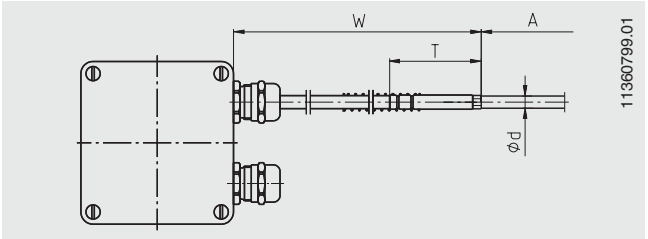
Design with connector fitted directly to the probe
These designs are based on the design with bare connection wires. The connector is fitted directly to the metallic probe.



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)

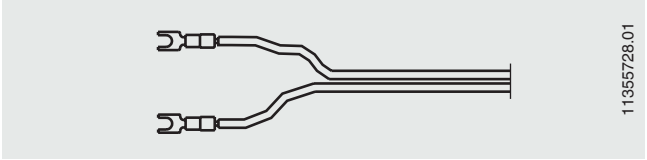


Plug (optional)

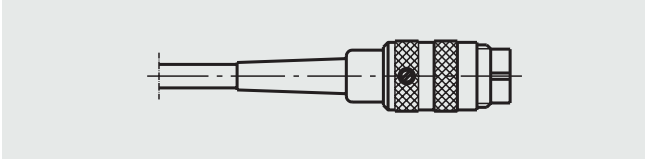
Surface resistance thermometers can be supplied with plugs fitted.

The following options are available:

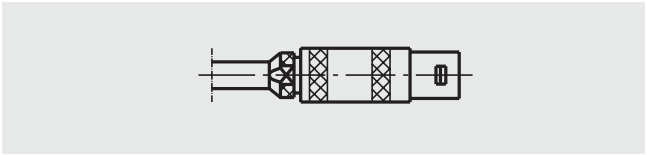
- **Spade lugs**
  (not suitable for versions with bare connecting wires)



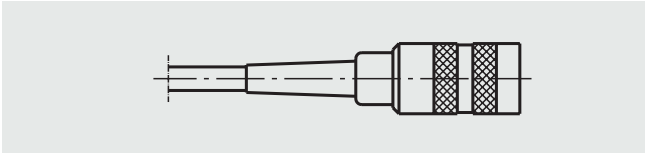
- **Screw-in-plug, Binder** (male)



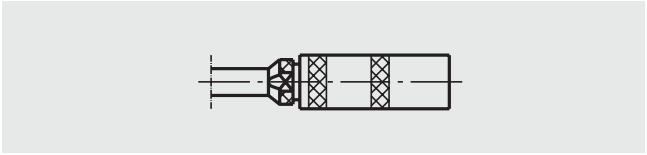
- **Lemosa connector size 1 S** (male)
- **Lemosa connector size 2 S** (male)



- **Screw-in-plug, Binder** (female)



- **Lemosa coupling size 1 S** (female)
- **Lemosa coupling size 2 S** (female)



Other plug variants (sizes) on request.

Further options

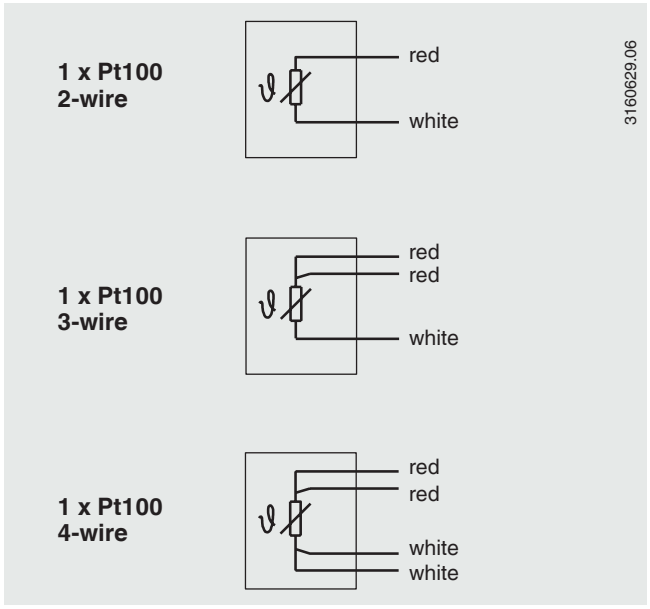
Bend protector
A cable protector (spring or shrink hose) is used to protect the transition point from rigid probe to flexible connecting cable cable. This should always be used when a relative movement between the cable and the thermometer mounting is expected.

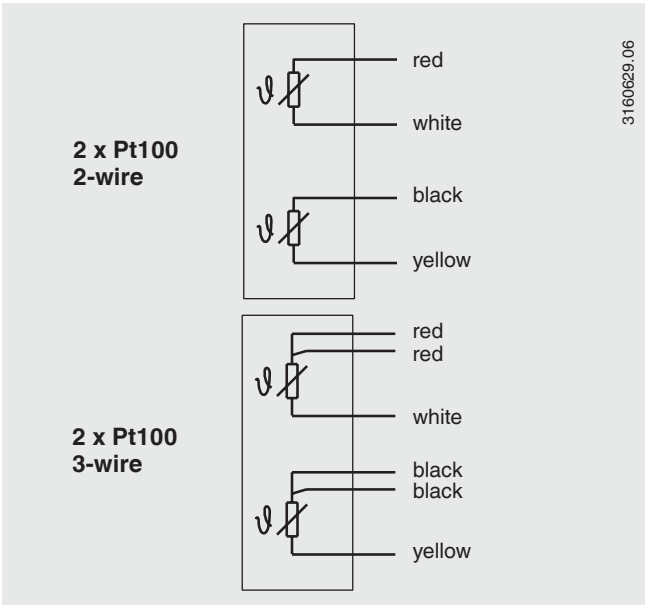
For designs to Ex n the use of bend protection is obligatory.

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

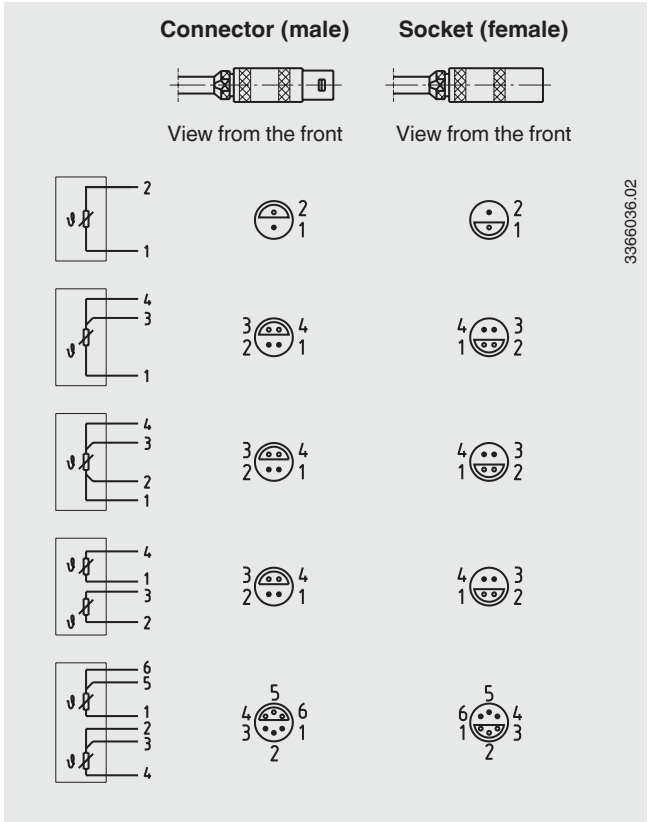
Electrical connection

Without connector

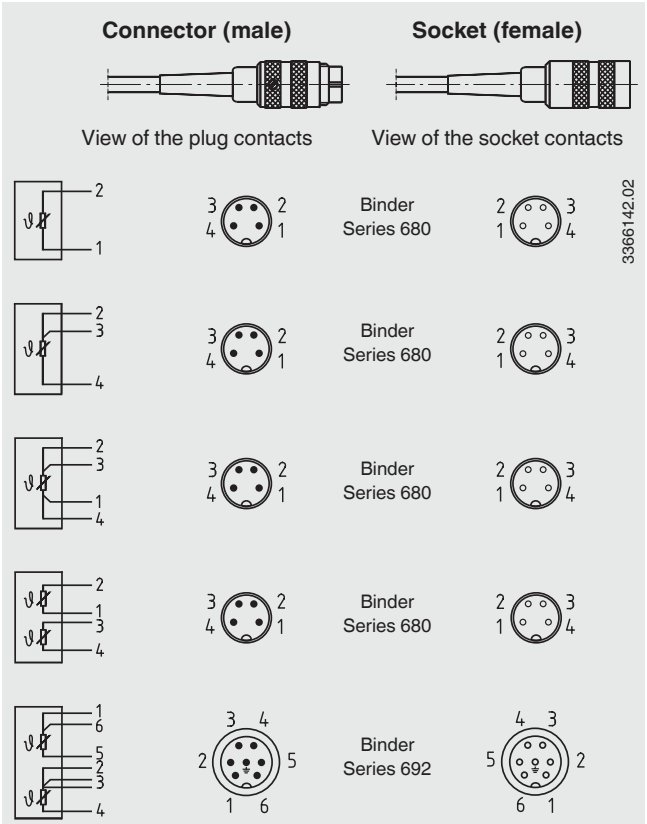




Lemosa connector



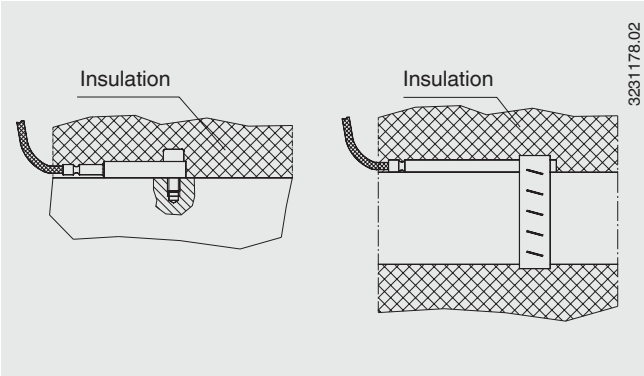
Binder screw/plug-in connector



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 / Sensor diameter / Connection cable, sheath / Cable end version / Cable connection accessories / Measuring element / Connection method / Temperature range / Certificates / Options

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