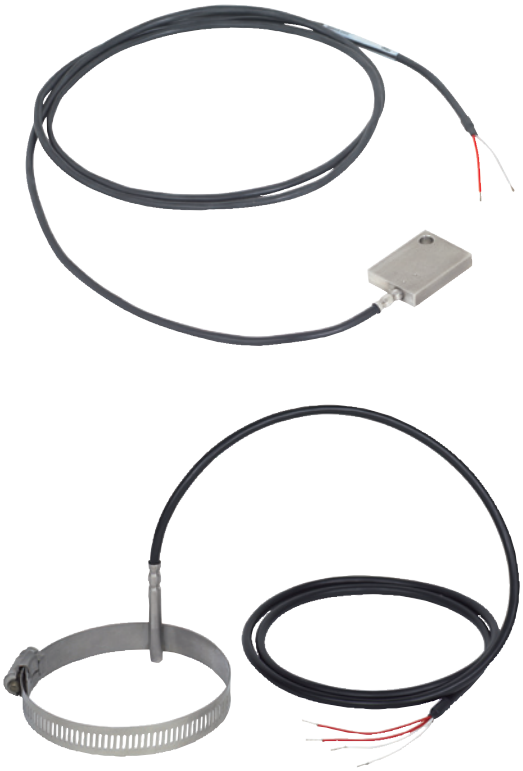
Surface resistance thermometer
Model TR50

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 worm-drive hose clip
- Cable from PVC, silicone or PTFE
- Explosion-protected versions Ex-i, Ex-n and NAMUR NE24



Resistance thermometer
Fig. top: Model TR50-O for surfaces
Fig. bottom: Model TR50-Q for pipes

Description

Probe

In versions for flat surfaces, the probe is mounted into a contact block, which can be screwed or welded to the vessel surface. Versions for pipes are simply fixed using a worm-drive hose clip.

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 housing, as options.

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

Sensor

Sensor connection method

- 2-wire The lead resistance is recorded as an error in the measurement.
- 3-wire With a cable length of approx. 30 m or longer, measuring errors can occur.
- 4-wire The internal lead resistance of the connecting wires is negligible.

Sensor tolerance value per DIN EN 60751

- Class B
- Class A
- Class AA

The combinations of a 2-wire connection with Class A / Class AA are not permissible, since the lead resistance of the measuring insert negates the higher sensor accuracy.

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

Process connection

TR50-O: with metal contact block
Design: contact block for screwing or welding to a flat surface
Material: stainless steel
Dimensions: see drawings
other versions on request

TR50-P: with weld-on sheet
Design: weld-on sheet
Material: stainless steel
Dimensions: see drawings
other versions on request

TR50-Q: with worm-drive hose clip
Design: worm-drive hose clip
Material: stainless steel
Dimensions: see drawings
other versions on request

TR50-T: with washer
Design: centrally-drilled washer
Material: stainless steel
Dimensions: see drawings
other versions on request

TR50-U: with magnet
Versions on request

Metallic sensor

Material: stainless steel
Diameter: 3 mm 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 lead, therefore tubular-design TR50 resistance thermometers can only be used up to the temperatures specified for the cable (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 be used in locations that are not easily accessible, since, with the exception of the sensor tip and the pot seal of the connection cable, the sheath can be bent to a radius of three times the diameter of the cable.

Transitions

The junction between the metal part of the resistance thermometer 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 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)

Connecting cable

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

Connection cable (standard)

- Wire material: copper (strands)
- Wire cross-section: approx. 0.22 mm² (standard version)
- Number of wires: dependent on the connection method
- Insulation material: PVC, silicone, PTFE or glass fibre
- Screen (option)

Maximum working temperatures

The maximum temperatures for this thermometer are limited by different parameters:

Sensor

The temperature range is limited by the sensor itself. Depending on the accuracy class and operating conditions the optimum can be chosen.

Outside of the defined measuring range the measurement is no longer accurate and the sensor can be damaged.

Possible measuring ranges:

-50 ... +250 °C
-50 ... +450 °C
-200 ... +250 °C
-50 ... +400 °C (only Class A)
-200 ... +450 °C
-200 ... +600 °C (from 450 °C Class B)
-200 ... +400 °C
-50 ... +600 °C (only Class B)

Connection cable and single wires

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

For the common connection wires the following temperature limits apply:

PVC	-20 … +100 °C
Silicone	-50 … +200 °C
PTFE	-50 … +250 °C
Glass fibre	-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.

Transitions

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

With the option of a connecting plug fitted the maximum permissible temperature at the plug is 85 °C.

Working temperature

If the temperature to be measured is higher than the permissible temperature at the connection head, the metallic part of the sensor must be long enough to be outside of the hot zone. It should be noted that the lowest of the max. working temperatures for the cable, transition or connector must not be exceeded.

Ingress protections

■ **IP protection**

Surface resistance thermometers can be delivered with up to IP 65 (dependent on surface sheath material and number of wires).
With a special design, IP 67 is also possible on request.
Connection leads with a glass-fibre sheath cannot be combined with an explosion-proof design.

■ **Explosion protection (option)**

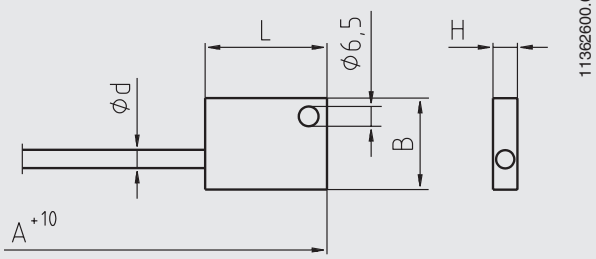
TR50 series surface resistance thermometers are available with a EC type-examination certificate for "intrinsically safe", Ex-i, ignition protection.
These instruments comply with the requirements of 94/9/EC (ATEX) directive for gas and dust. Manufacturer's declarations in accordance with NAMUR NE24 are also available.

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.

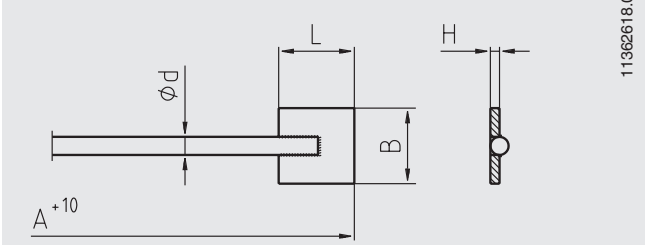
The internal inductance (Li) and capacitance (Ci) for cable probes are found on the product label and they should be taken into account when connecting to an intrinsically-safe power supply.

Dimensions in mm

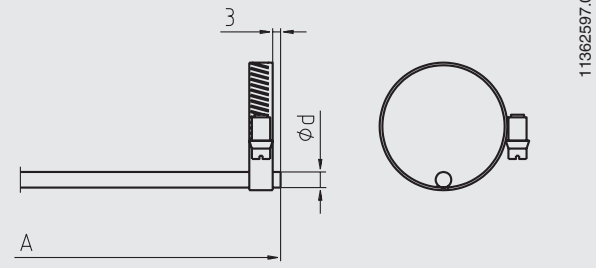
TR50-O contact block with bore



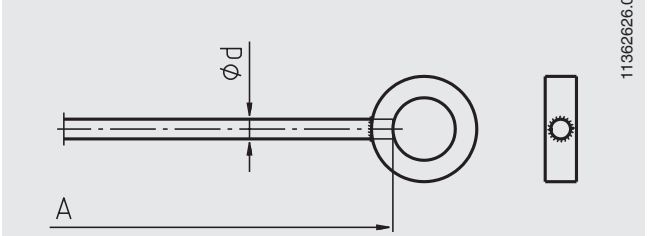
TR50-P weld-on sheet



TR50-Q worm-drive hose clip



TR50-T washer



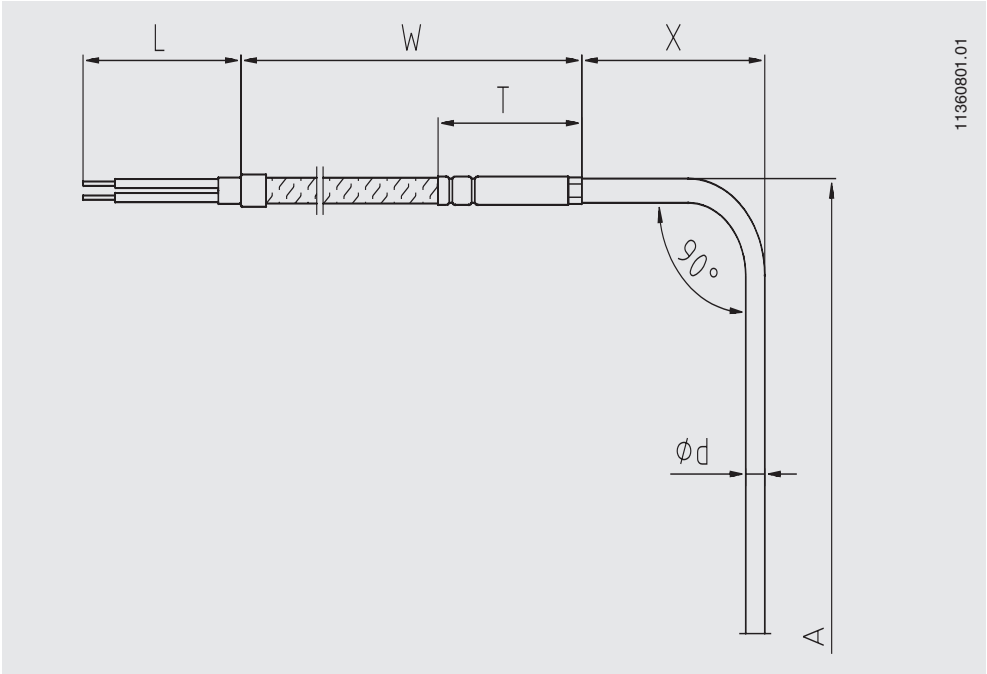
Please note:
The complete length, A, must always be viewed in relation to the drawings on pages 5 and 6.

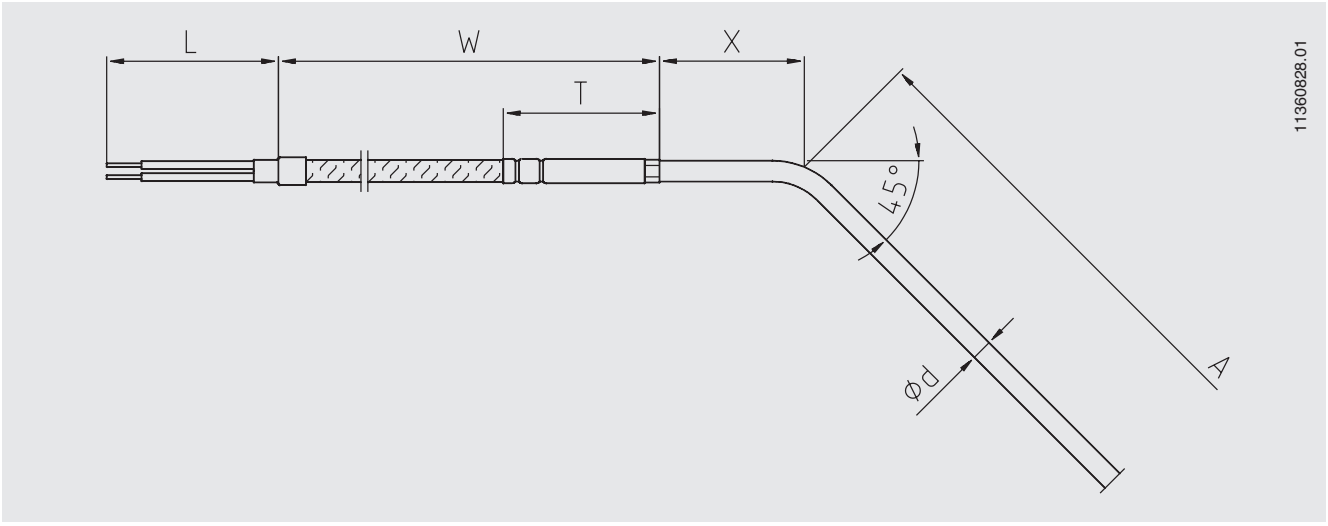
Process connection	Dimensions in mm width x length x height (W x L x H)	for pipe diameter	outer Ø x inner Ø x thickness (OD x ID x t)
Metal contact block with bore d = 6.5 mm	30 x 40 x 8	-	-
Weld-on sheet	25 x 25 x 3.0	-	-
Worm-drive hose clip	-	7 ... 17	-
Worm-drive hose clip	-	14 ... 34	-
Worm-drive hose clip	-	17 ... 57	-
Worm-drive hose clip	-	60 ... 75	-
Worm-drive hose clip	-	78 ... 93	-
Worm-drive hose clip	-	97 ... 112	-
Washer	-	-	38.1 x 19.1 x 9.5

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.



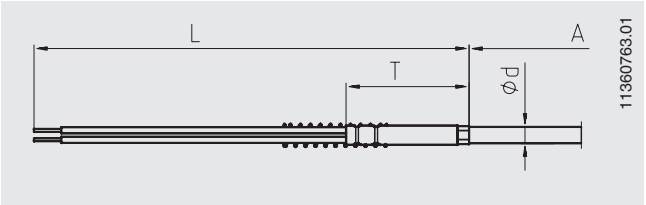


Cable end design

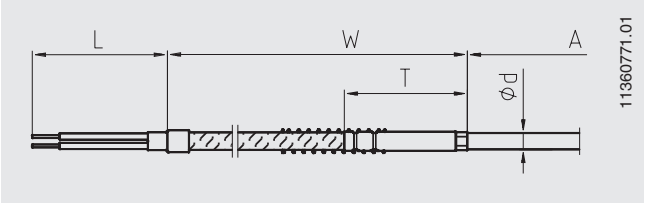
Dimension A defines the probe length, dimension W the length of the connection lead, L the length of the free single strands and dimension T the transition (if present).

T is always forms part of lengths W and L respectively. (see table on page 3).

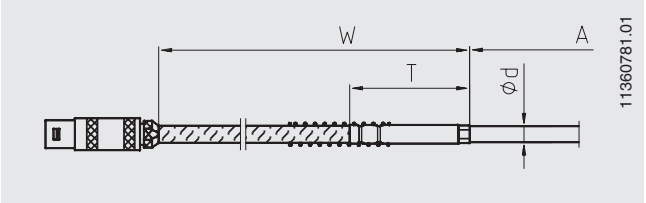
Connection with single wires
Cable length 150 mm, other lengths on request
Cu strands 0.22 mm², PTFE or glass-fibre insulated, number of leads dependent on the number of sensors and the sensor connection method, bare wire ends, other designs on request



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

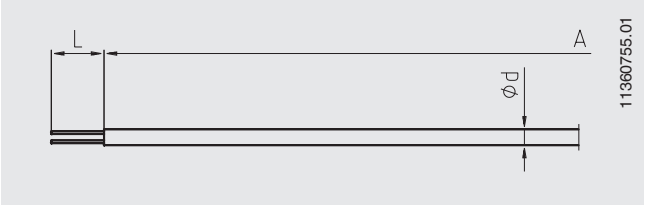


With connector fitted to connection cable
The optional connection plug is fitted to a flexible connection cable.

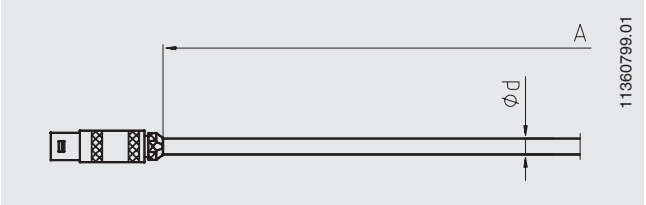


Designs with bare connecting wires
The internal leads of the mineral-insulated wire protrude.
L = 20 mm (standard)

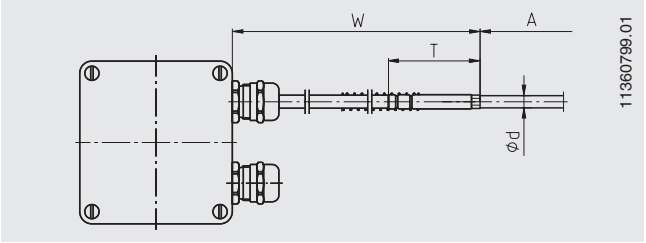
The length of the bare connection wires can be matched to customer requirements. These bare internal leads are made from solid wire, and so are not suitable to be run over long distances.



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 housing
The cable gland (plastic) connects the connection cable with the field housing (plastic, ABS). A second cable gland is fitted for the flying lead.
An aluminium case is available as an option.

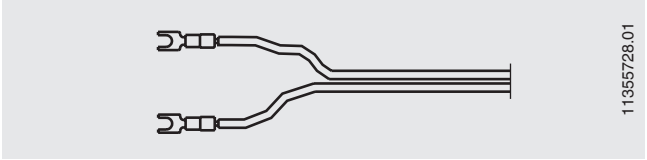


Plug (option)

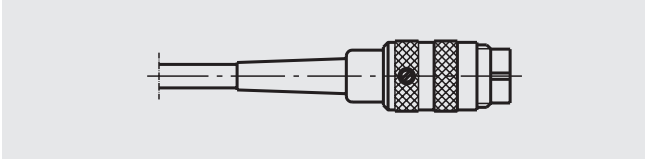
Surface resistance thermometers can be supplied with plugs fitted.

The following options are available:

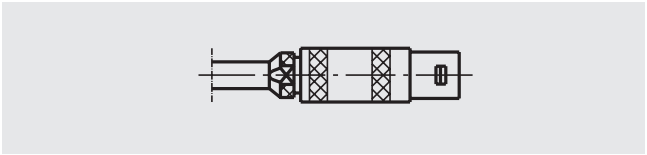
■ **Spade lugs**
(not suitable for versions with bare connecting wires)



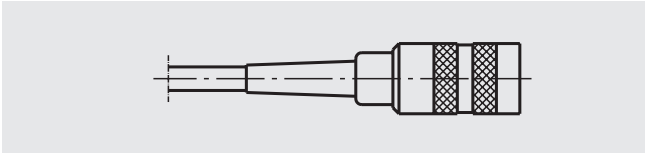
■ **Screw-in-plug, Binder (male)**



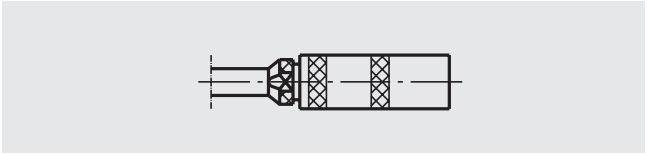
■ **Lemosa plug size 1 S (male)**
■ **Lemosa plug size 2 S (male)**



■ **Screw-in-plug, Binder (female)**



■ **Lemosa socket size 1 S (female)**
■ **Lemosa socket size 2 S (female)**



Other plug variants (sizes) on request.

Further options

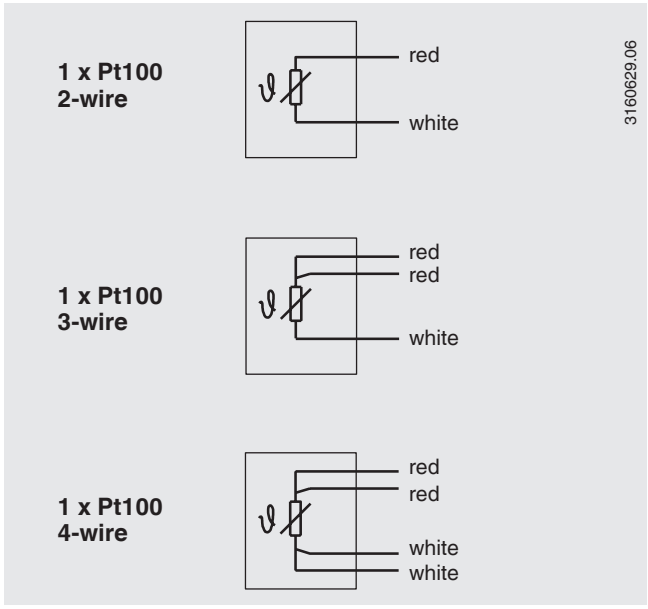
Bend protector
A cable protector (spring or shrink sleeving) is used to protect the transition point from rigid probe to flexible connection cable. This should always be used when a relative movement between the cable and the thermometer mounting is expected.

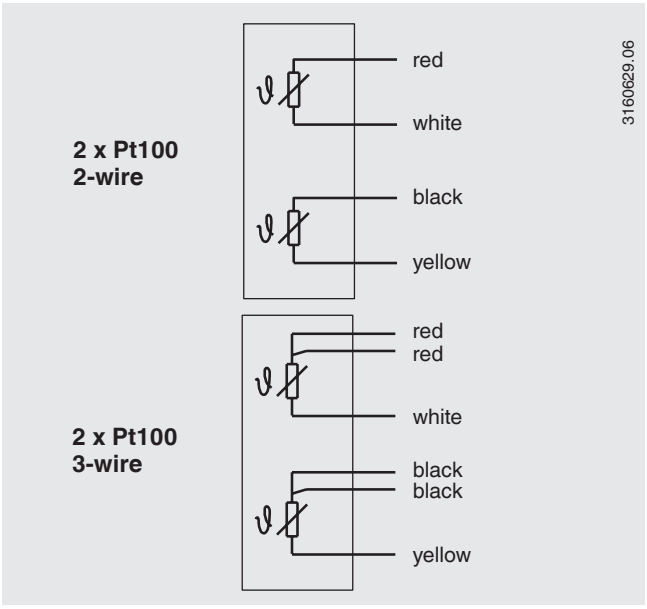
For designs to EEx n the use of bend protection is obligatory.

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

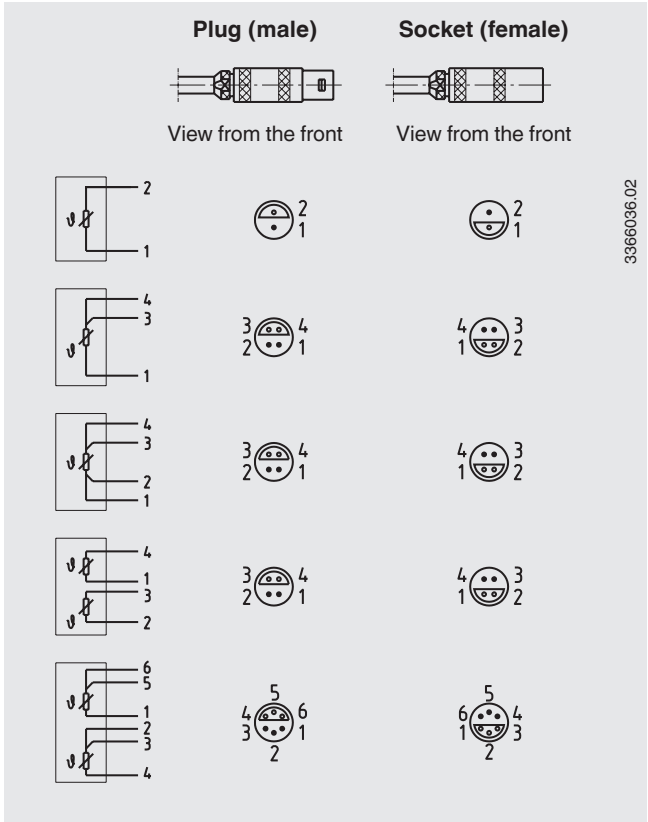
Electrical connection

Without connector

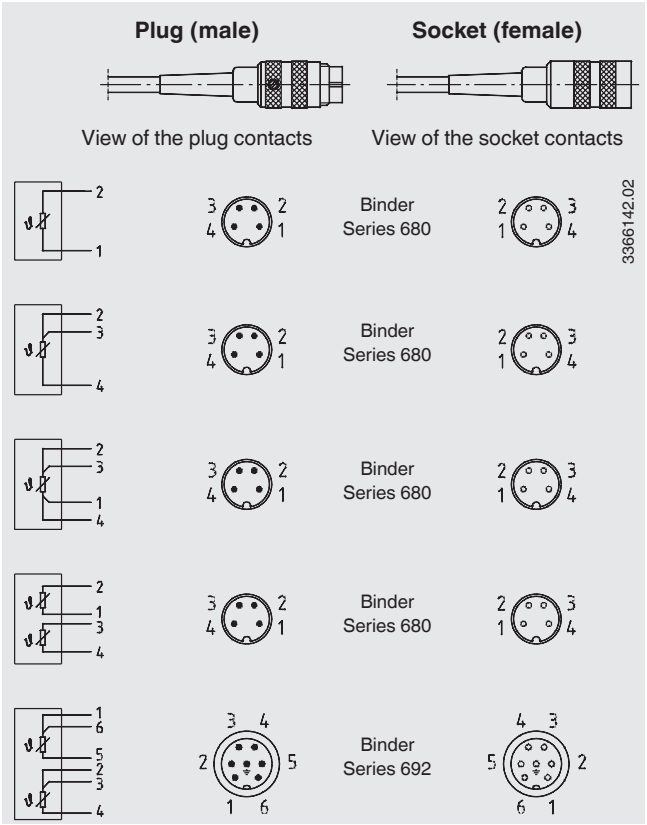




Lemosa plug

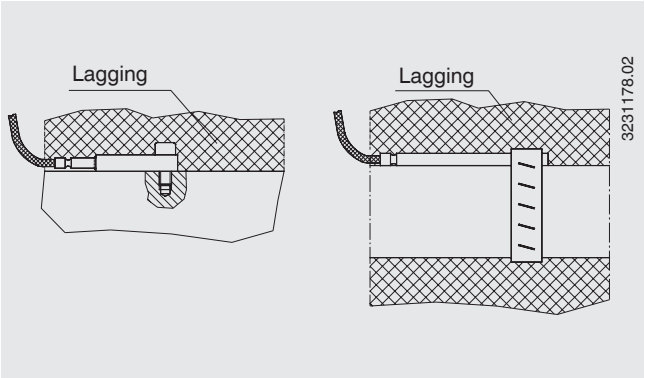


Binder screw/plug-in connector



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 probe should have direct, metallic contact with the measuring point and sit firmly on the measuring point. Lagging must be applied around the mounting point in order to eliminate heat-loss errors. This lagging must have sufficient temperature resistance and is not part of the scope of supply.



WIKA Alexander Wiegand SE & Co. KG
Alexander-Wiegand-Straße 30
63911 Klingenberg/Germany
Tel. (+49) 9372/132-0
Fax (+49) 9372/132-406
E-mail info@wika.de
www.wika.de