

IMPORTANT



CAREL bases the development of its products on decades of experience in HVAC, on the continuous investments in technological innovations to products, procedures and strict quality processes with in-circuit and functional testing on 100% of its products, and on the most innovative production technology available on the market. CAREL and its subsidiaries nonetheless cannot guarantee that all the aspects of the product and the software included with the product respond to the requirements of the final application, despite the product being developed according to start-of-the-art techniques.

The customer (manufacturer, developer or installer of the final equipment) accepts all liability and risk relating to the configuration of the product in order to reach the expected results in relation to the specific final installation and/or equipment. CAREL may, based on specific agreements, act as a consultant for the positive commissioning of the final unit/application, however in no case does it accept liability for the correct operation of the final equipment/system.

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Each CAREL product, in relation to its advanced level of technology, requires setup / configuration / programming / commissioning to be able to operate in the best possible way for the specific application. The failure to complete such operations, which are required/indicated in the user manual, may cause the final product to malfunction; CAREL accepts no liability in such cases.

Only qualified personnel may install or carry out technical service on the product. The customer must only use the product in the manner described in the documentation relating to the product.

In addition to observing any further warnings described in this manual, the following warnings must be heeded for all CAREL products:

- Prevent the electronic circuits from getting wet. Rain, humidity and all types of liquids or condensate contain corrosive minerals that may damage the electronic circuits. In any case, the product should be used or stored in environments that comply with the temperature and humidity limits specified in the manual.
- Do not install the device in particularly hot environments. Too high temperatures may reduce the life of electronic devices, damage them and deform or melt the plastic parts. In any case, the product should be used or stored in environments that comply with the temperature and humidity limits specified in the manual.
- Do not attempt to open the device in any way other than described in the manual.
- Do not drop, hit or shake the device, as the internal circuits and mechanisms may be irreparably damaged.
- Do not use corrosive chemicals, solvents or aggressive detergents to clean the device.
- Do not use the product for applications other than those specified in the technical manual.

All of the above suggestions likewise apply to the controllers, serial boards, programming keys or any other accessory in the CAREL product portfolio. CAREL adopts a policy of continual development. Consequently, CAREL reserves the right to make changes and improvements to any product described in this document without prior warning.

The technical specifications shown in the manual may be changed without prior warning.

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DISPOSAL



INFORMATION FOR USERS ON THE CORRECT HANDLING OF WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE)

In reference to European Union directive 2002/96/EC issued on 27 January 2003 and the related national legislation, please note that:

- WEEE cannot be disposed of as municipal waste and such waste must be collected and disposed of separately;
- the public or private waste collection systems defined by local legislation must be used. In addition, the equipment can be returned to the distributor at the end of its working life when buying new equipment;
- the equipment may contain hazardous substances: the improper use or incorrect disposal of such may have negative effects on human health and on the environment;
- the symbol (crossed-out wheeled bin) shown on the product or on the packaging and on the instruction sheet indicates that the equipment has been introduced onto the market after 13 August 2005 and that it must be disposed of separately;
- in the event of illegal disposal of electrical and electronic waste, the penalties are specified by local waste disposal legislation.

Warranty on the materials: 2 years (from the date of production, excluding consumables).

Approval: the quality and safety of CAREL INDUSTRIES Hqs products are guaranteed by the ISO 9001 certified design and production system.

WARNING: separate as much as possible the probe and digital input signal cables from the cables carrying inductive loads and power cables to avoid possible electromagnetic disturbance.
Never run power cables (including the electrical panel wiring) and signal cables in the same conduits.

NO POWER
& SIGNAL
CABLES
TOGETHER

READ CAREFULLY IN THE TEXT!

HACCP – CAUTION !



When the temperature measurement is important for food safety (i.e. HACCP), only the temperature probes suggested by Carel must be used. Standards in force may require specific documents to be completed and kept on file, as well as periodical verification of the instruments and sensors used.

In case of doubt, contact the food safety manager or site manager.

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1. INTRODUCTION

1.1 General description

The Carel passive temperature probes are devices that, when connected to the controller, provide a resistance value, which is then converted to a temperature by the electronic controller. These are used in HVAC/R applications, and represent a complete range capable of satisfying a variety of needs in different installations. The probes are made using materials that guarantee constant quality.

The range includes various models that differ based on the performance of the system and the fields of application. The probes have different types of sensor (NTC, PTC, Pt1000), caps, index of protection, cable length,

operating ranges and mechanical dimensions.

In addition, models are available for use in hydronic systems, applied directly onto the tubing, which simplify installation and offer a faster response in the reading, improving the wiring of the HVAC/R unit and improving performance.

The probes are used together with Carel electronic controllers (parametric and programmable).

2. NTC TECHNICAL SPECIFICATIONS


2.1 Models NTC*HP*

| | |
|---|---|
| Storage conditions | -50T105 °C |
| Operating range | -50T105 °C in air |
| Connections | Stripped ends, dimensions: 5±1 mm |
| Sensor | NTC 10 kΩ ±1% a 25 °C Beta 3435 |
| Dissipation factor (in air) | ca. 3 mW/°C |
| Thermal constant over time (in air) | ca. / approx. 25 s |
| Cable | Black two-wire flat cable, with tinned copper wire size 0.3 mm2 |
| Sensitive element index of protection | IP67 |
| Sensitive element housing | Polyolefin |
| Classification according to protection against electric shock (sensitive element & cable) | Basic insulation for 250 Vac |
| Category of resistance to heat and fire | Flame retardant |



Fig. 2.a

* = see table of product codes in price list.

 **Warning:** all measures present in this manual are in millimeters.

2.2 Models NTC*WF*

| | |
|---|--|
| Storage conditions | -50T105 °C |
| Operating range | -50T105 °C |
| Connections | Stripped ends, dimensions: 5±1 mm |
| Sensor | NTC 10 kΩ ±1% a 25 °C Beta 3435 |
| Dissipation factor (in air) | ca. / approx. 7 mW/°C |
| Thermal constant over time (in air) | ca. / approx. 10 s |
| Cable | Two-wire with double sheath, AWG22, tinned copper with electrical resistance ≤63 Ω/km - Insulation: TPE specific for immersion in water on outer sheath, PP/Co inside on wires, OD 3.5 mm max. |
| Sensitive element index of protection | IP67 |
| Sensitive element housing | AISI 316 steel diameter 4 mm - L= 30 mm |
| Classification according to protection against electric shock (sensitive element & cable) | Basic insulation for 250 Vac |
| Category of resistance to heat and fire | Flame retardant |

Tab. 2.a

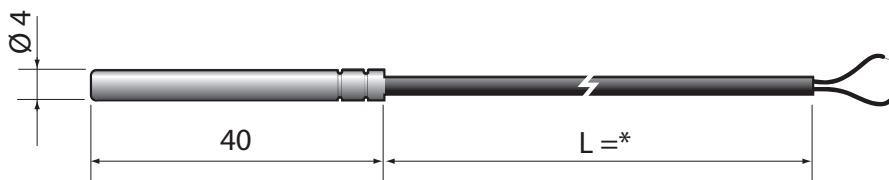


Fig. 2.b

* = see table of product codes in price list

2.3 Models NTC*WH*

| | |
|---|---|
| Storage conditions | -50T105 °C |
| Operating range | -50T105 °C |
| Connections | Stripped ends, dimensions: 5±1 mm |
| Sensor | NTC 10 kΩ ±1% a 25 °C Beta 3435 |
| Dissipation factor (in air) | ca. / approx. 2,2 mW/°C |
| Thermal constant over time (in water) | ca. / approx. 30 s |
| Cable | Two-wire with double sheath, AWG22, tinned copper with electrical resistance ≤63 Ω/km - Insulation: TPE specific for immersion in water on outer sheath, PP/Co inside on wires, OD 3.5 mm max |
| Sensitive element index of protection | IP68 |
| Sensitive element housing | PP/Co with AISI 316 outer cap |
| Classification according to protection against electric shock (sensitive element and cable) | Supplementary insulation for 250 Vac; |
| Category of resistance to heat and fire | Flame retardant |
| Standard | NSF (only for 1,5-3-6 m versions) |

Tab. 2.b

Version 1

* = see table of product codes in price list

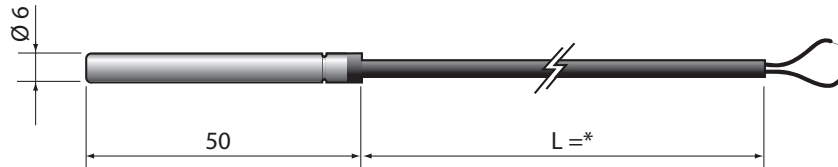


Fig. 2.c

Version 2

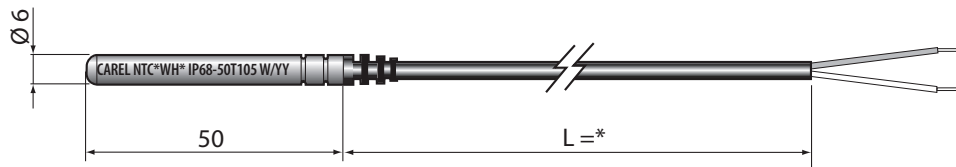


Fig. 2.d

Accessories

- Socket: nickel-coated brass - 1413306AXX

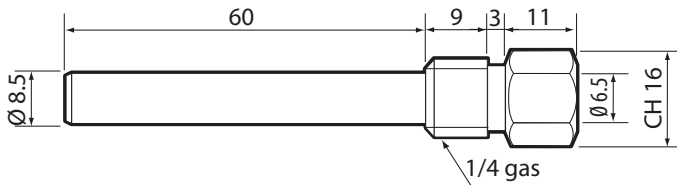


Fig. 2.e

Maximum operating pressure: 35 bar
Temperature: -20...95°C

- Socket 2: AISI 316 - code 1413309AXX

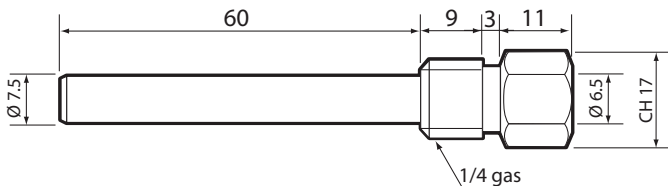


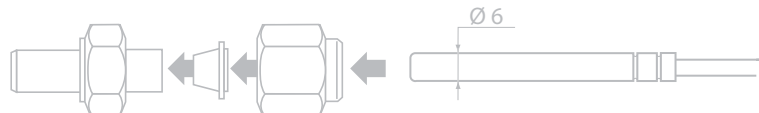
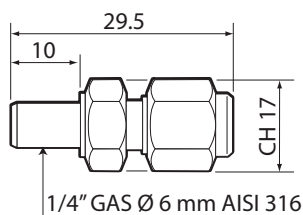
Fig. 2.f

Maximum operating pressure: 40 bar
Temperature: -20...95°C



Note: cable secured with PG7, IP68 cable gland applied to hexagonal end. - kit available complete with socket and cable gland

- Compression fitting with metal olive - code 1309589AXX



Maximum operating pressure: 40 bar
Temperature: -50...250°C

Fig. 2.g

2.4 Models NTC*WP*

| | |
|---|---|
| Storage conditions | -50T105 °C |
| Operating range | -50T105 °C |
| Connections | Stripped ends, dimensions: 5±1 mm |
| Sensor | NTC 10 kΩ ±1% a 25 °C Beta 3435 |
| Dissipation factor (in air) | ca. / approx. 2,2 mW/°C |
| Thermal constant over time (in air) | ca. / approx. 30 s |
| Cable | Two-wire with double sheath, AWG22, tinned copper with electrical resistance ≤63 Ω/km - Insulation: TPE specific for immersion in water on outer sheath, PP/Co inside on wires, OD 3.5 mm max |
| Sensitive element index of protection | IP67 |
| Sensitive element housing | PP/Co with AISI 316 outer cap |
| Classification according to protection against electric shock (sensitive element and cable) | Supplementary insulation for 250 Vac; |
| Category of resistance to heat and fire | Flame retardant |

Tab. 2.c

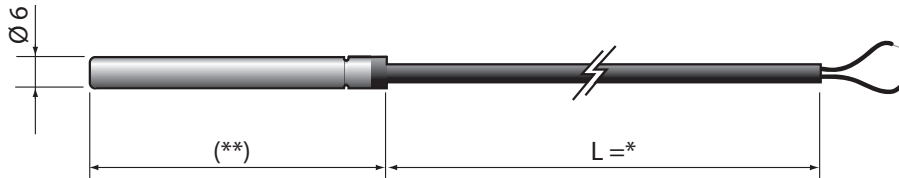


Fig. 2.h

* = see table of product codes in price list; (**) = 100, 200, 300.

Note: cable secured with PG7, IP68 cable gland applied to hexagonal end. - kit available complete with socket and cable gland

- Compression fitting with metal olive - code 1309589AXX

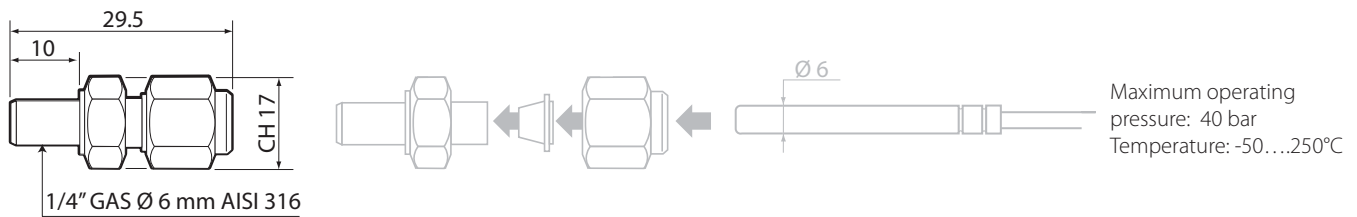


Fig. 2.i

2.5 Models NTC*WG*

| | |
|---|--|
| Storage conditions | -50T105 °C |
| Operating range | -50T105 °C |
| Connections | Stripped ends, dimensions: 5±1 mm |
| Sensor | NTC 10 kΩ ±1% a 25 °C Beta 3435 |
| Dissipation factor (in air) | ca. / approx. 1 mW/°C |
| Thermal constant over time (in air) | ca. / approx. 20 s |
| Cable | Two-wire with double sheath, AWG22, tinned copper with electrical resistance ≤63 Ω/km - Insulation: TPE specific for immersion in water on outer sheath, PP/Co inside on wires, OD 3.5 mm max. |
| Sensitive element index of protection | IP67 (in resina poliuretanic) |
| Sensitive element housing | Aluminium 6x6x40 |
| Classification according to protection against electric shock (sensitive element and cable) | Basic insulation for 250 Vac |
| Category of resistance to heat and fire | Flame retardant |

Tab. 2.d

Cap for probe sensor

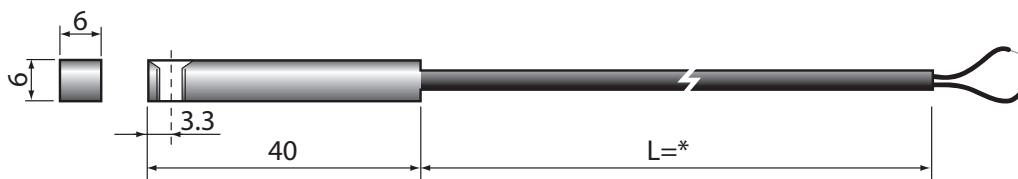


Fig. 2.j

* = see table of product codes in price list

2.6 Models NTC*HT*

| | |
|---|--|
| Storage conditions | 0T150 °C |
| Operating range | 0T150 °C in air |
| Connections | Stripped ends, dimensions 6±1mm |
| Sensor | R(25 °C)= 50 kOhm 1%; Beta (25/85)3977±1% |
| Precision | ±0,5 °C; -10T50 °C ±1,0 °C; -50T85 °C ±1,6 °C; +85T120 °C ± 2,1 °C; +120T150 °C |
| Dissipation factor (in air) | ca. / approx. 3 mW |
| Thermal constant over time (in air) | ca. / approx. 30 s |
| Cable | High temperature polyester (diam. 4x2 max.) |
| Sensitive element index of protection | IP55 |
| Sensitive element housing | High temperature polyester dim. 20x5 mm (available in version with AISI 316 stainless steel cap) |
| Classification according to protection against electric shock (sensitive element and cable) | Basic insulation for 250 Vac |
| Category of resistance to heat and fire | In accordance with CEI 20-35 |
| Insulation resistance at 1000 Vdc | >100 mOhm |
| Dielectric strength | 1500 Vac |

Tab. 2.e



Note: le sonde NTC*HT non possono essere usate in presenza prolungata di acqua e non devono essere usate a temperature inferiori a 0°.

The index of protection is IP55, therefore it is not suitable to work with frost, ice and condensing humidity. However, if the sensor isn't work, it can stay up to a minimum temperature of -30 °C.

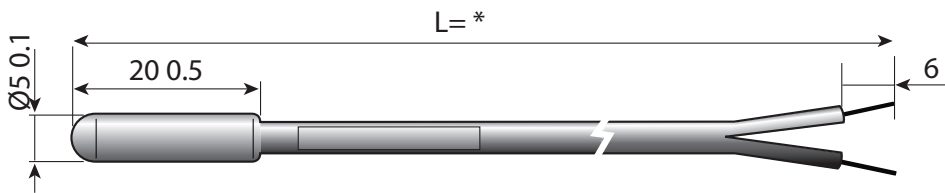


Fig. 2.k

Version with stainless steel cap

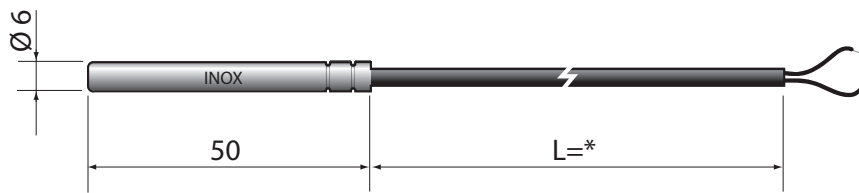


Fig. 2.l

* = see table of product codes in price list

2.7 Models NTC*HF*

| | |
|---|---|
| Storage conditions | -50T105 °C |
| Operating range | -50T105 °C |
| Connections | Stripped ends, dimensions 6±1mm |
| Sensor | R(25 °C)= 10 kOhm 1%; Beta 3435 |
| Precision | +/- 0.5 °C at 25 °C; +/- 1.0 °C from -50T90 °C |
| Dissipation factor (in air) | 3 mW |
| Thermal constant over time (in air) | approx. 50 s |
| Cable | Black, thermoplastic rubber flat cable (diam. 3.6x1.6 max.) |
| Sensitive element index of protection | IP67 |
| Sensitive element housing | Thermoplastic with fastening clamp |
| Classification according to protection against electric shock (sensitive element and cable) | Basic insulation for 250 Vac |
| Category of resistance to heat and fire | UL/HB cable |
| Insulation resistance at 500 Vdc | >20 mOhm |
| Dielectric strength | 1500 Vac |

Tab. 2.f

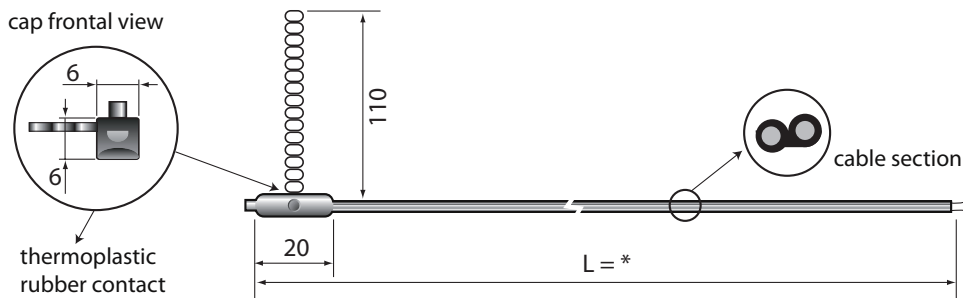


Fig. 2.m

* = see table of product codes in price list

2.8 Models NTC*WS*

| | |
|---|--|
| Storage conditions | -40T105 °C |
| Operating range | -40T105 °C |
| Connections | Terminating pins on the cable |
| Sensor | R(25 °C)= 10 kOhm 1%; Beta 3435 |
| Precision | +/- 0.5 °C at 25°C; +/- 1.0 °C from -50T90 °C |
| Dissipation factor (in air) | 3 mW |
| Thermal constant over time (in air) | approx. 50 s |
| Cable | Black, thermoplastic rubber cable with black-white wires, cross-section 2x0.25 mm ² diam. 3.3mm |
| Sensitive element index of protection | IP67 |
| Sensitive element housing | Copper cap - dimensions 4x16 mm ±1.5% with polyurethane resin packing |
| Cable tie tension | Typical 250N (position 6 on the tool); Maximum 260N (position 7 on the tool); |
| Classification according to protection against electric shock (sensitive element and cable) | Basic insulation for 250 Vac |
| Category of resistance to heat and fire | UL/HB cable |
| Insulation resistance at 500 Vdc | >20 MOhm 500 Vdc |
| Dielectric rigidity | 1500 Vac |

Tab. 2.g

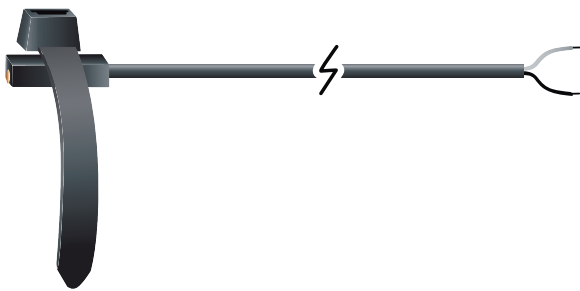


Fig. 2.n



Fig. 2.o

* = see table of product codes in price list



Fig. 2.p

Cable tie tension and cut-off tool with tension adjustment (Carel P/N CM00000006)

Tool for tightening the cable tie at a constant set tension to ensure continuous contact between the sensor and the surface of the pipe.

Cable tie tension can be adjusted simply using the screw at the base of the handle, which moves the index on a scale from 1 to 8. The corresponding force applied is shown in the following table:

| Tool | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Tolerance |
|------|-----|-----|--------|-----|-----|------|-----|-----|-----------|
| | Low | | Medium | | | High | | | |
| MK6 | 135 | 160 | 180 | 235 | 250 | 250 | 260 | 290 | ± 2 |

Tab. 2.h

The values are expressed in newtons (N)

NTC*WS sensor assembly instructions using the cable tie tension tool



1) Wrap the cable tie around the pipe and secure it;



2) On the cable tie tension tool (P/N CM00000006) set the tension to 250N (position 6 on the index);



3) Use the tool to tighten and then cut the cable tie;



4) Wrap the electrical cable twice around the pipe;



5) Cover the sensor with thermal insulation for at least 10 cm around the end of the cap and the wound cable;

2.9 Models NTC*LT*

| | |
|---|--|
| Storage conditions | -80T105 °C |
| Operating range | -80T105 °C |
| Connections | M8 male-connector, |
| Sensor | R(25 °C)= 750 Ohm 1%; Beta 3969 |
| Precision | +/- 0.2 °C at 25°C; +/- 1.15 °C from -80T105 °C |
| Dissipation factor (in air) | 3 mW |
| Thermal constant over time (in air) | ca. 35 s in water - 10 s in air |
| Cable | Nickel for mounting clamp |
| Sensitive element index of protection | IP67 |
| Sensitive element housing | Mineral oxide insulation MgO - sheath 316 - Ø 3mm radius of curvature (exception of the sensitive element) |
| Cable tie tension | Typical 250N (position 6 on the tool); Maximum 260N (position 7 on the tool); |
| Classification according to protection against electric shock (sensitive element and cable) | Basic insulation for 250 Vac |
| Category of resistance to heat and fire | Flame retardant |
| Insulation resistance | 100 MOhm @ 500Vdc |
| Dielectric rigidity | 1500 Vac |
| Maximum operating pressure: | 40 bar |

Tab. 2.i

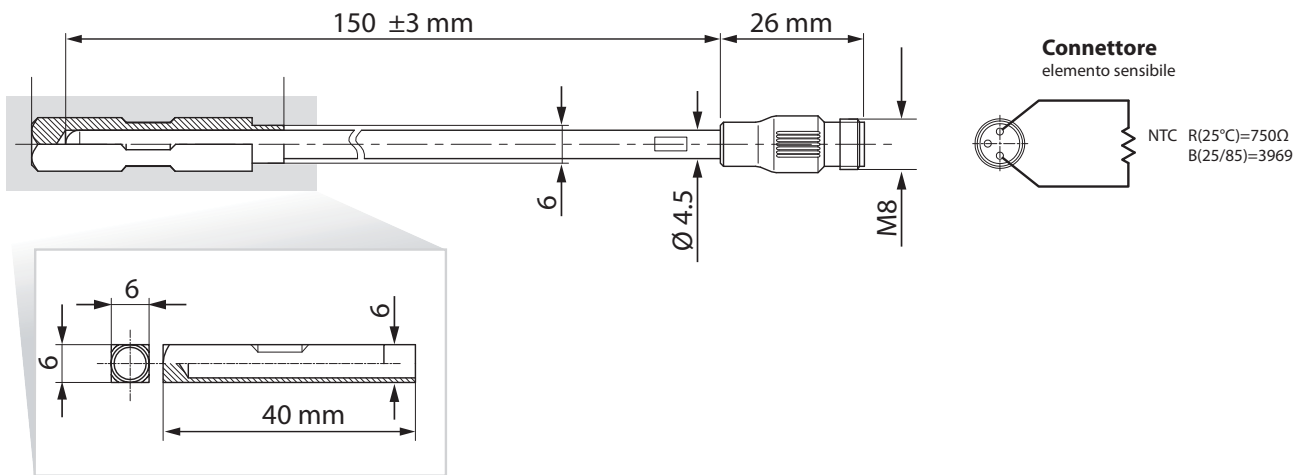


Fig. 2.q

Connection cable P/Ns for NTC*LT sensor

| | |
|---|--|
| A | TSOPZCV030: silicone cable with M8 connector, 3 m long |
| | TSOPZCV100: silicone cable with M8 connector, 10 m long |
| B | TSOPZCV070: silicone cable extension with M8 male/female connector, 7 m long |

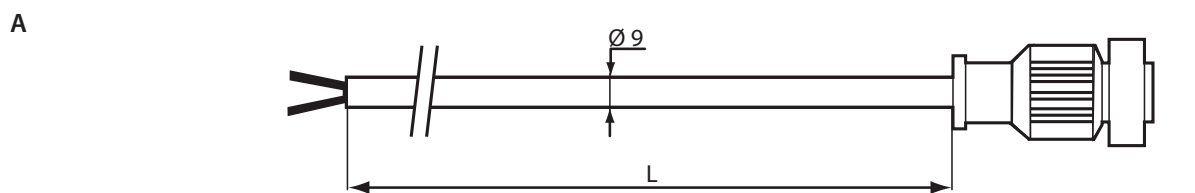


Fig. 2.r

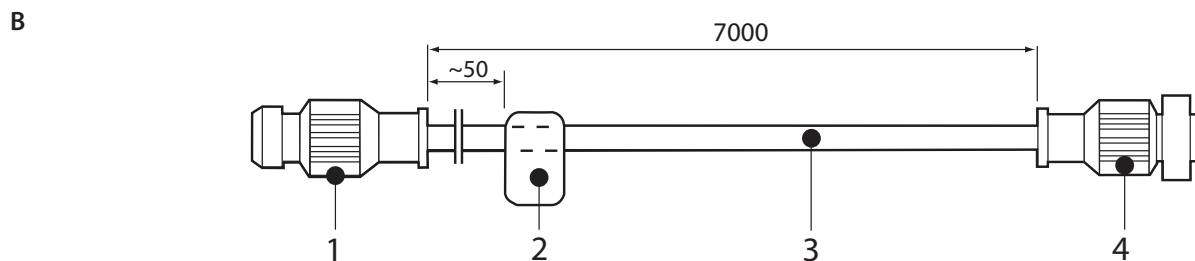


Fig. 2.s

Key:

| | |
|---|--|
| 1 | M8 connector |
| 2 | rating label |
| 3 | 24 AWG cable, 2 wires insulated with silicone rubber |
| 4 | M8 F connector with moulded cap |

NTC*LT sensor assembly instructions using the cable tie tension tool



1) Place the sensor on the pipe, wrap and secure the cable ties around the two ends;



2) On the cable tie tension tool (P/N CM00000006) set the tension to 250N (position 6 on the index);



3) Use the tool to tighten and then cut the cable tie 1209874AXX;



4) Wrap the electrical cable twice around the pipe at the base of the sensor;

5) Cover the sensor with thermal insulation for at least 10 cm around the end of the cap and the wound cable;

2.10 Models NTC*PS*

| | |
|---|---|
| Storage conditions | -50T105 °C |
| Operating range | -50T105 °C |
| Connections | Stripped and soldered ends, dimensions: 4±1 mm |
| Sensors | NTC 10 kΩ ±1% a 25 °C Beta 3435 |
| Dissipation factor (in air) | 2 mW/°C |
| Thermal constant over time (in air) | ca. / approx. 50 min (V=1 m/s) |
| Cable | Two-wire with double sheath, AWG22, tinned copper with electrical resistance ≤73.9 Ω/km - Insulation: TPE specific for immersion in water on outer sheath, PP/Co inside on wires, OD 3.30+/-0.10 mm |
| Sensitive element index of protection | IP67 |
| Case | Santoprene grey RAL7032 Compatible for food contact |
| Classification according to protection against electric shock (sensitive element and cable) | Basic insulation for 250 Vac |
| Category of resistance to heat and fire | Flame retardant |

Tab. 2.j

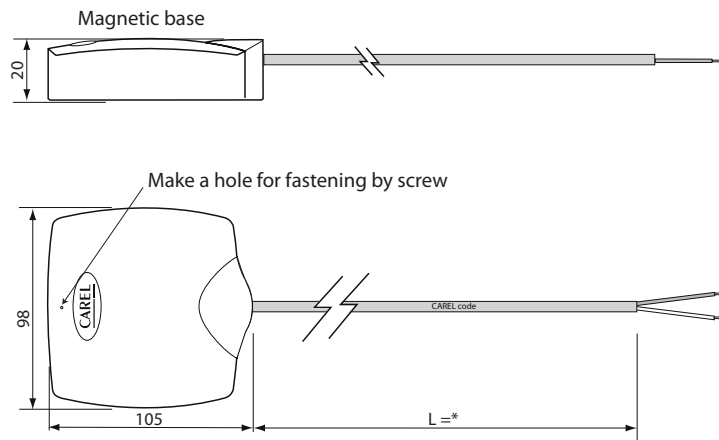


Fig. 2.t

* = see table of product codes in price list

3. NTC IMMERSION PROBE TECHNICAL SPECIFICATIONS

3.1 Models TSN1300000

Immersion probes feature the sensor directly in contact with the liquid, and are installed on the tubing. Wired using the electrical connector.

| | |
|----------------------------|--|
| Storage conditions | -40T120 °C |
| Operating range | -40T120 °C |
| Sensor | NTC 10 kΩ ±1% a 25 °C Beta 3435 |
| Construction | Direct immersion with connection to the 1/8" GAS male process fitting as per UNI 338 |
| Electrical connection | 4-pin co-moulded nylon, M12x1 (DIN-VDE0627) metric thread, IP67 max. temp. 90 °C |
| Thermal constant over time | approx. 5 s in water - 30 s in air |
| Sensitive element housing | AISI 316 |
| Insulation | 100 Mohm a 500 Vcc |
| Maximum operating pressure | 40 bar |

Tab. 3.a

Key:

| | |
|---|-------------------------------|
| 1 | NTC sensitive element 10 Kohm |
| 2 | Stainless steel socket |
| 3 | EX14 |
| 4 | Co-moulded body |
| 5 | M12 male connector |

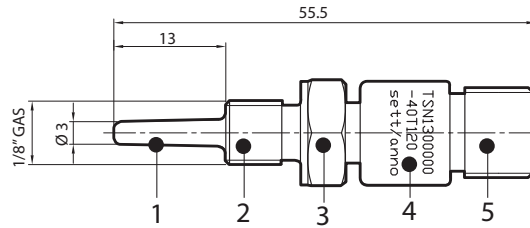


Fig. 3.a

Accessories:

- 4-pin M12 connector for 1/8 GAS sensor - cable length 3 m Code TSOPZCW030

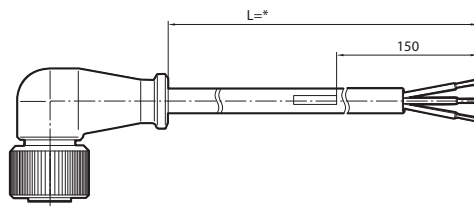


Fig. 3.b

Wiring:



NTC 10kohm

| | |
|---|-------|
| 1 | red |
| 2 | red |
| 3 | white |

- 4-pin M12 connector for 1/8 GAS sensor code TSOPZCM000
- M12 connector can be assembled on site, recommended cable 3x0.2 mm² with outer sheath.

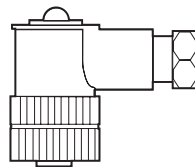
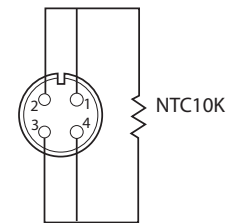


Fig. 3.c

Wiring:

Sensor connector side view



- Probe socket 1/4 Gas Code TSOPZPT000

| | |
|---|---|
| A | 1/8" GAS cyl. fitting for sensor |
| B | 1/4" GAS cyl. process fitting with immersion L= 10.5 mm |

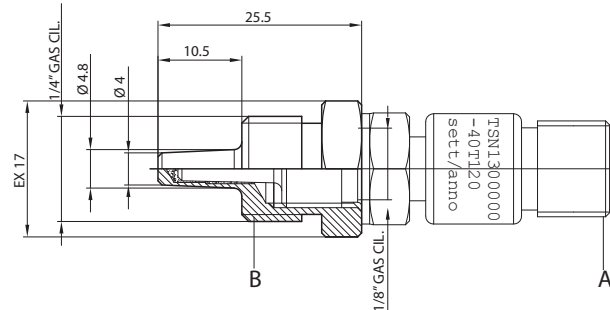


Fig. 3.d

- Welding fitting Code TSOPZCW030

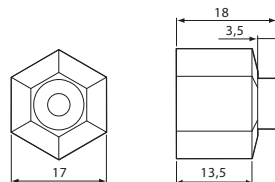


Fig. 3.e

3.2 Models TSC1500030

Immersion probes feature the sensor directly in contact with the liquid and are secured to the tubing using a connector, available in the screw or weldable versions.

The body is nickel-coated brass, index of protection IP67, and the gasket (O-ring) is supplied together with the probe.

| | |
|----------------------------|--|
| Storage conditions | -40T90 °C |
| Operating range | -40T90 °C |
| Sensor | NTC 10 kΩ ±1% at 25 °C Beta 3435 |
| Construction | Direct immersion with connection to M14 male process fitting |
| Cable | 2 wires AWG 22, with TPE sheath |
| Thermal constant over time | approx. 5 s in water - 45 s in air |
| Sensitive element housing | Nickel-coated brass & grey PA6 co-moulded body |
| Insulation | 100 Mohm at 100 Vdc |
| Maximum operating pressure | 25 bar |
| Compatible liquids | Water |

Tab. 3.b

Key:

| | |
|---|---|
| 1 | sensitive element |
| 2 | nickel-coated brass locking ring |
| 3 | co-moulded body |
| 4 | cable marking |
| 5 | tinned copper 2-wire cable |
| 6 | NTC sensor |
| 7 | 2015 O-ring |
| 8 | nickel-coated brass thermome- ter socket |

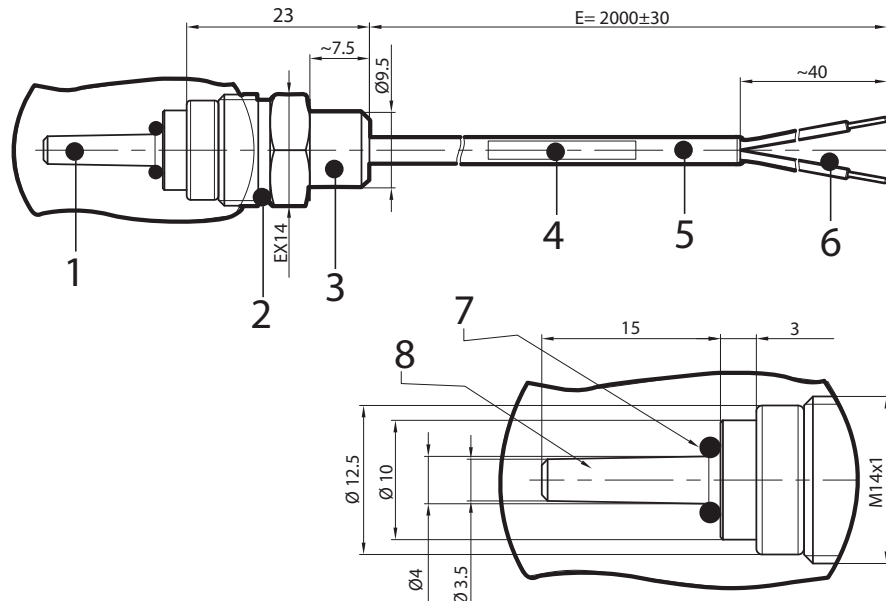
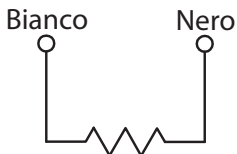


Fig. 3.f

Wiring:



NTC 10 kOhm @ 25 °C ±1%
 $\beta(25/85) = 3435$

Fig. 3.g

Accessories:

- Adapter from M14 to 3/8 GAS Code TSOPZRV000

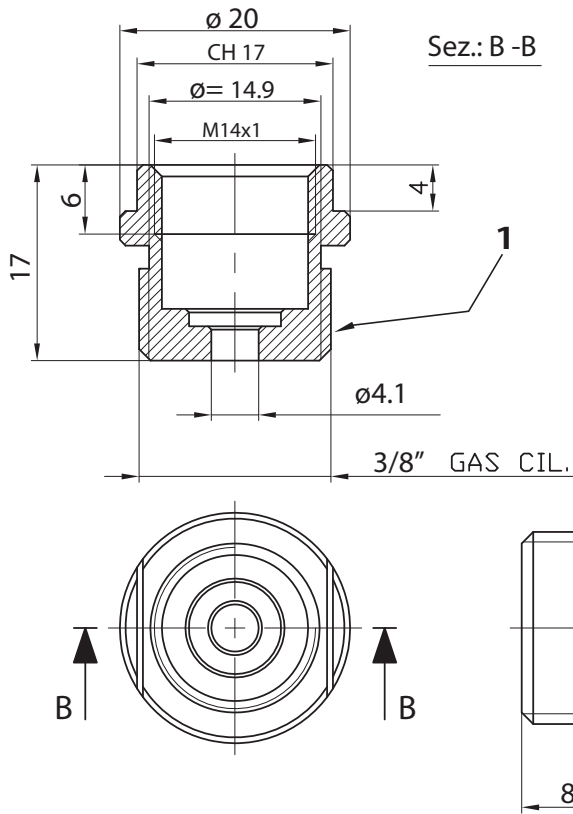


Fig. 3.h

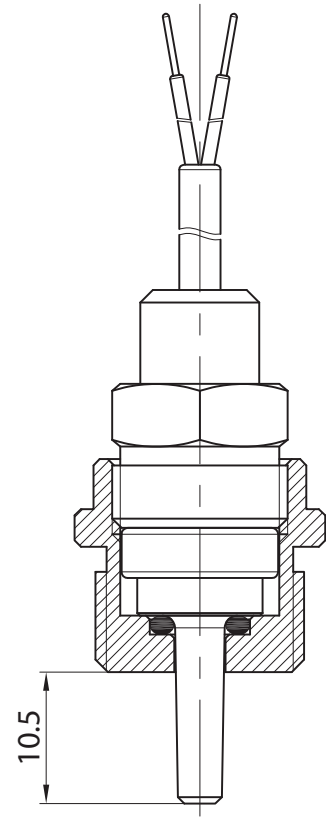


Fig. 3.i

- Weldable adapter for M14 Code TSOPZRS000

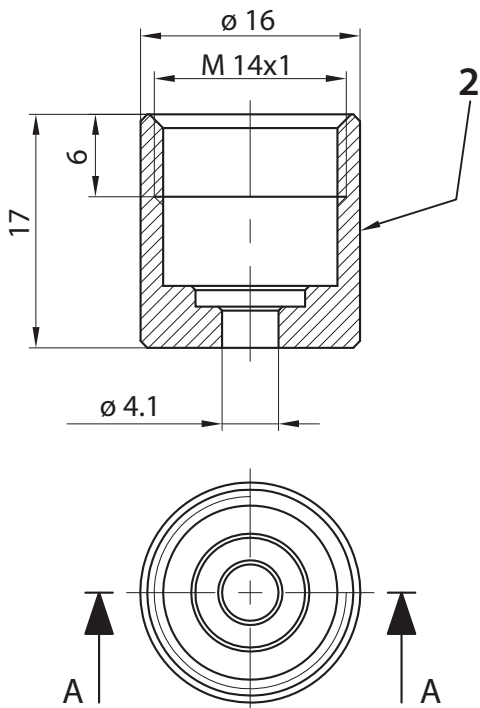


Fig. 3.j

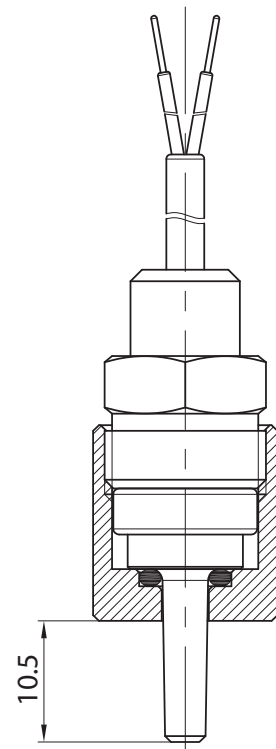


Fig. 3.k

Key:

| | | |
|---|--|------------------|
| 1 | 3/8 cyl. threaded fitting with round seat, nickel-coated brass | code: C058042A04 |
| 2 | weldable cylindrical fitting with round seat, brass | code C058042A03 |

4. NTC PIERCING PROBE TECHNICAL SPECIFICATIONS

4.1 Models NTC*INF*

Piercing probes with 90° e 180° handle

| | |
|---|---|
| Storage conditions | -50T90 °C |
| Operating range | -50T90 °C |
| Connections | Stripped ends, dimensions: 5±1 mm |
| Sensor | NTC 10 kOhm ±1% at 25 °C Beta 3435 |
| Dissipation factor (in air) | approx. 2.2 mW/°C |
| Thermal constant over time (in air) | approx. 45 s |
| Cable | Two-wire with double sheath, tinned copper wire size 0.35 mm ² with electrical resistance ≤63 Ohm/km |
| Sensitive element index of protection | IP67 |
| Sensitive element housing | AISI 304 stainless steel with silicone resin filling |
| Classification according to protection against electric shock (sensitive element and cable) | Insulation: silicone both on outer sheath and inside on wires |
| Category of resistance to heat and fire | Flame retardant |
| Food compatibility | Suitable for permanent food contact |

Tab. 4.a

NTCINF600*

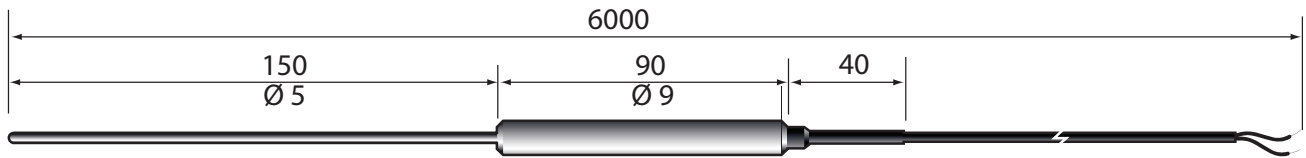


Fig. 4.a

NTCINF610*

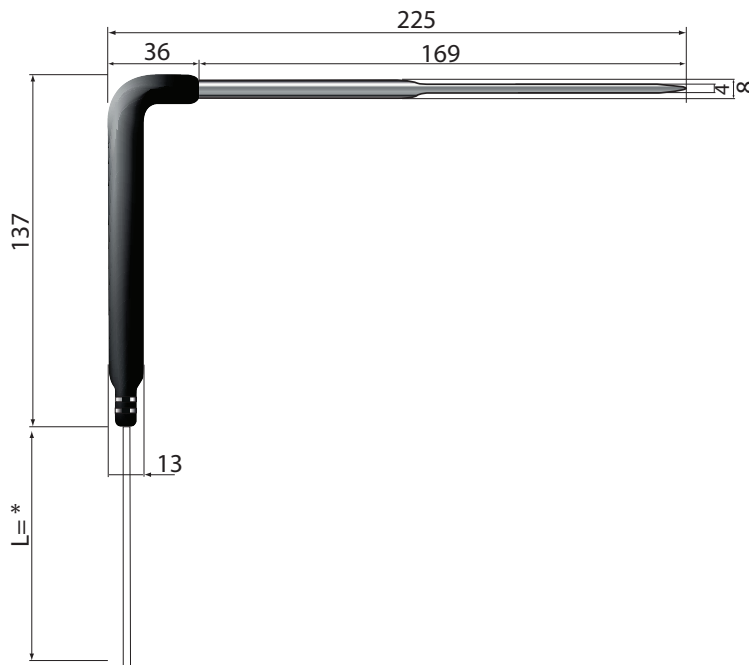


Fig. 4.b

* = see table of product codes in price list

4.2 Models NTCINF0340 and NTCINF0640

Piercing probe with 90° handle and heating system

| | |
|---|---|
| Storage conditions | -50T90 °C |
| Operating range | -50T90 °C |
| Connections | Stripped ends, with terminals |
| Sensor | NTC 10 kOhm ±1% at 25 °C Beta 3435 |
| Thermal constant over time (in air) | approx. 45 s |
| Cable | Food-safe thermoplastic sheath with 4 wires size 0.15 mm ² |
| Wires colours | White-black, NTC / red, electric heater. |
| Maximum heater voltage | 24 Vac (20 W) |
| Electrical resistance of heater | 7 Ohm ±0,6 |
| Cable lenght | 3 m |
| Sensitive element index of protection | IP67 |
| Sensitive element housing | AISI 316 stainless steel. Length 100 mm diam. 4 mm. With pointed tip. |
| Cap filler | Aluminium |
| Classification according to protection against electric shock (sensitive element and cable) | Insulation: Outer sheath, and inside on wires |
| Category of resistance to heat and fire | Flame retardant |
| Insulation resistance | 20 Mohm 500 Vcc |
| Dielectric strength | 500 Vac |
| Food compatibility | Suitable for permanent food contact |

Tab. 4.b

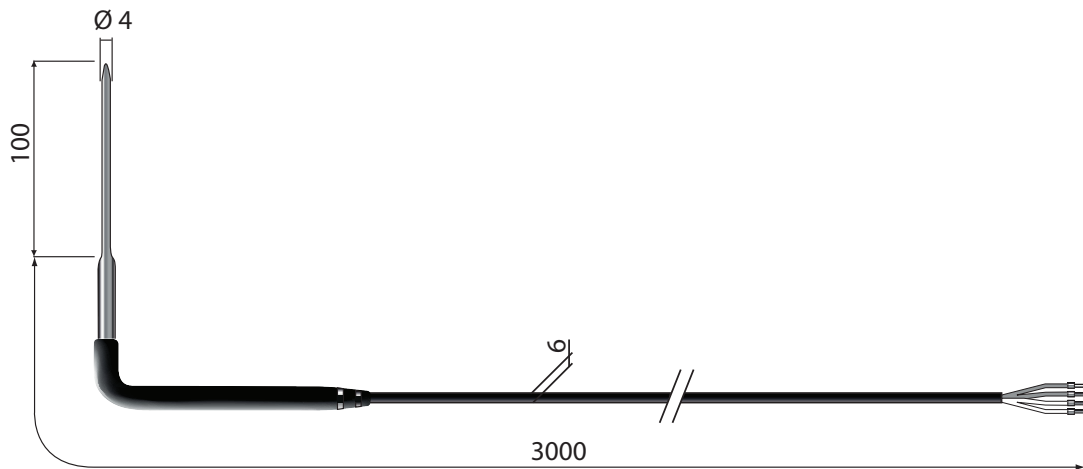


Fig. 4.c

- a | red, electric heater
- b | white/black, NTC

4.3 Models NTCINF0150

Piercing probe with 180° thermoplastic rubber handle and spiral cable

| | |
|---|---|
| Storage conditions | -40T90 °C |
| Operating range | -40T90 °C |
| Connections | Tripped ends with pins |
| Sensor | NTC 10 kOhm ±1% at 25°C Beta 3435 |
| Thermal constant over time (in air) | approx. 45 s |
| Cable | Spiral black cable, 2 wires, diam. 4mm |
| Colours | white-red, 2x0.22mm ² |
| Cable length | 1.5 m, extendable up to 3m |
| Sensitive element index of protection | IP67 |
| Sensitive element housing | AISI 316 stainless steel, 150 mm long, diam. 4 mm, with rounded tip |
| Packing | Polyurethane resin |
| Classification according to protection against electric shock (sensitive element and cable) | Insulation: external sheath and on wires |
| Category of resistance to heat and fire | No fire propagation |
| Isolation resistor | 20 MOhm 500 Vdc |
| Rigidity | 2000 Vac |
| Food compatibility | Suitable for permanent food contact |

Tab. 4.c

Mechanical drawing

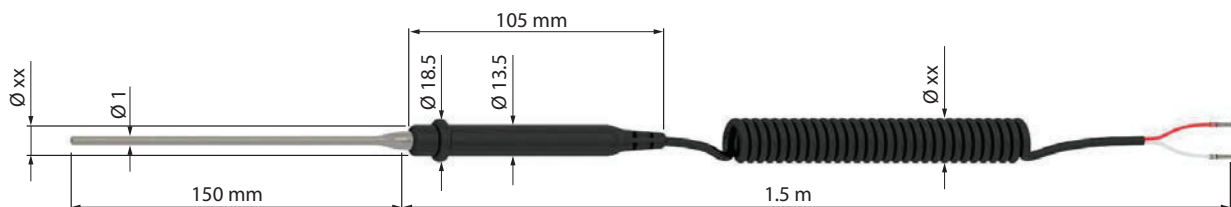


Fig. 4.d

5. TABLE OF TEMPERATURE VALUES

5.1 Table of temperature-resistance values for NTC sensor 10K@25°C β 3435

| Temp. °C | Resistance value | | |
|-------------|------------------|---------------|------------|
| | Max. KΩ | Typical KΩ | Min. KΩ |
| -50 | 344,60 | 329,50 | 314,90 |
| -49 | 325,00 | 310,90 | 297,30 |
| -48 | 306,60 | 293,50 | 280,90 |
| -47 | 289,40 | 277,20 | 265,40 |
| -46 | 273,40 | 262,00 | 251,00 |
| -45 | 258,30 | 247,70 | 237,40 |
| -44 | 244,20 | 234,30 | 224,70 |
| -43 | 231,00 | 221,70 | 212,80 |
| -42 | 218,60 | 209,90 | 201,60 |
| -41 | 207,00 | 198,90 | 191,00 |
| -40 | 196,00 | 188,50 | 181,10 |
| -39 | 185,50 | 178,50 | 171,60 |
| -38 | 175,60 | 169,00 | 162,60 |
| -37 | 166,30 | 160,20 | 154,20 |
| -36 | 157,60 | 151,90 | 146,30 |
| -35 | 149,40 | 144,10 | 138,80 |
| -34 | 141,70 | 136,70 | 131,80 |
| -33 | 134,50 | 129,80 | 125,20 |
| -32 | 127,70 | 123,30 | 119,00 |
| -31 | 121,20 | 117,10 | 113,10 |
| -30 | 115,20 | 111,30 | 107,50 |
| -29 | 109,40 | 105,70 | 102,20 |
| -28 | 103,90 | 100,50 | 97,20 |
| -27 | 98,68 | 95,52 | 92,45 |
| -26 | 93,80 | 90,84 | 87,97 |
| -25 | 89,20 | 86,43 | 83,73 |
| -24 | 84,85 | 82,26 | 79,74 |
| -23 | 80,76 | 78,33 | 75,96 |
| -22 | 76,89 | 74,61 | 72,39 |
| -21 | 73,23 | 71,10 | 69,01 |
| -20 | 69,77 | 67,77 | 65,82 |
| -19 | 66,44 | 64,57 | 62,74 |
| -18 | 63,30 | 61,54 | 59,83 |
| -17 | 60,32 | 58,68 | 57,07 |
| -16 | 57,51 | 55,97 | 54,46 |
| -15 | 54,85 | 53,41 | 51,99 |
| -14 | 52,33 | 50,98 | 49,65 |
| -13 | 49,95 | 48,68 | 47,43 |
| -12 | 47,69 | 46,50 | 45,32 |
| -11 | 45,55 | 44,43 | 43,33 |
| -10 | 43,52 | 42,47 | 41,43 |
| -9 | 41,55 | 40,57 | 39,60 |
| -8 | 39,69 | 38,77 | 37,86 |
| -7 | 37,92 | 37,06 | 36,21 |
| -6 | 36,25 | 35,44 | 34,64 |
| -5 | 34,66 | 33,90 | 33,15 |
| -4 | 33,15 | 32,44 | 31,73 |
| -3 | 31,72 | 31,05 | 30,39 |
| -2 | 30,36 | 29,73 | 29,11 |
| -1 | 29,06 | 28,48 | 27,89 |
| 0 | 27,83 | 27,28 | 26,74 |

| Temp. °C | Resistance value | | |
|-------------|------------------|---------------|------------|
| | Max. KΩ | Typical KΩ | Min. KΩ |
| 1 | 26,65 | 26,13 | 25,62 |
| 2 | 25,52 | 25,03 | 24,55 |
| 3 | 24,44 | 23,99 | 23,54 |
| 4 | 23,42 | 23,00 | 22,57 |
| 5 | 22,45 | 22,05 | 21,66 |
| 6 | 21,53 | 21,15 | 20,78 |
| 7 | 20,64 | 20,30 | 19,95 |
| 8 | 19,81 | 19,48 | 19,15 |
| 9 | 19,01 | 18,70 | 18,39 |
| 10 | 18,25 | 17,96 | 17,67 |
| 11 | 17,51 | 17,24 | 16,97 |
| 12 | 16,81 | 16,56 | 16,30 |
| 13 | 16,14 | 15,90 | 15,67 |
| 14 | 15,50 | 15,28 | 15,06 |
| 15 | 14,89 | 14,69 | 14,48 |
| 16 | 14,31 | 14,12 | 13,92 |
| 17 | 13,75 | 13,58 | 13,39 |
| 18 | 13,22 | 13,06 | 12,89 |
| 19 | 12,72 | 12,56 | 12,40 |
| 20 | 12,24 | 12,09 | 11,94 |
| 21 | 11,77 | 11,63 | 11,50 |
| 22 | 11,32 | 11,20 | 11,07 |
| 23 | 10,90 | 10,78 | 10,66 |
| 24 | 10,49 | 10,38 | 10,27 |
| 25 | 10,10 | 10,00 | 9,90 |
| 26 | 9,73 | 9,63 | 9,53 |
| 27 | 9,38 | 9,28 | 9,18 |
| 28 | 9,04 | 8,94 | 8,84 |
| 29 | 8,72 | 8,62 | 8,52 |
| 30 | 8,41 | 8,31 | 8,21 |
| 31 | 8,11 | 8,01 | 7,92 |
| 32 | 7,83 | 7,73 | 7,63 |
| 33 | 7,55 | 7,45 | 7,36 |
| 34 | 7,29 | 7,19 | 7,10 |
| 35 | 7,04 | 6,94 | 6,85 |
| 36 | 6,79 | 6,70 | 6,61 |
| 37 | 6,56 | 6,47 | 6,37 |
| 38 | 6,34 | 6,25 | 6,15 |
| 39 | 6,12 | 6,03 | 5,94 |
| 40 | 5,92 | 5,83 | 5,74 |
| 41 | 5,72 | 5,63 | 5,54 |
| 42 | 5,53 | 5,44 | 5,35 |
| 43 | 5,34 | 5,26 | 5,17 |
| 44 | 5,17 | 5,08 | 4,99 |
| 45 | 5,00 | 4,91 | 4,83 |
| 46 | 4,83 | 4,75 | 4,67 |
| 47 | 4,68 | 4,59 | 4,51 |
| 48 | 4,52 | 4,44 | 4,36 |
| 49 | 4,38 | 4,30 | 4,22 |
| 50 | 4,24 | 4,16 | 4,08 |
| 51 | 4,10 | 4,03 | 3,95 |
| 52 | 3,97 | 3,90 | 3,82 |
| 53 | 3,85 | 3,77 | 3,70 |
| 54 | 3,73 | 3,65 | 3,58 |
| 55 | 3,61 | 3,54 | 3,46 |

| Temp. °C | Resistance value | | |
|-------------|------------------|---------------|------------|
| | Max. KΩ | Typical KΩ | Min. KΩ |
| 56 | 3,50 | 3,43 | 3,35 |
| 57 | 3,39 | 3,32 | 3,25 |
| 58 | 3,28 | 3,22 | 3,15 |
| 59 | 3,18 | 3,12 | 3,05 |
| 60 | 3,09 | 3,02 | 2,95 |
| 61 | 2,99 | 2,93 | 2,86 |
| 62 | 2,90 | 2,84 | 2,77 |
| 63 | 2,82 | 2,75 | 2,69 |
| 64 | 2,73 | 2,67 | 2,61 |
| 65 | 2,65 | 2,59 | 2,53 |
| 66 | 2,57 | 2,51 | 2,45 |
| 67 | 2,50 | 2,44 | 2,38 |
| 68 | 2,42 | 2,36 | 2,31 |
| 69 | 2,35 | 2,30 | 2,24 |
| 70 | 2,28 | 2,23 | 2,17 |
| 71 | 2,22 | 2,16 | 2,11 |
| 72 | 2,15 | 2,10 | 2,05 |
| 73 | 2,09 | 2,04 | 1,99 |
| 74 | 2,03 | 1,98 | 1,93 |
| 75 | 1,98 | 1,92 | 1,87 |
| 76 | 1,92 | 1,87 | 1,82 |
| 77 | 1,87 | 1,82 | 1,77 |
| 78 | 1,81 | 1,77 | 1,72 |
| 79 | 1,76 | 1,72 | 1,67 |
| 80 | 1,72 | 1,67 | 1,62 |
| 81 | 1,67 | 1,62 | 1,58 |
| 82 | 1,62 | 1,58 | 1,53 |
| 83 | 1,58 | 1,53 | 1,49 |
| 84 | 1,54 | 1,49 | 1,45 |
| 85 | 1,49 | 1,45 | 1,41 |
| 86 | 1,45 | 1,41 | 1,37 |
| 87 | 1,42 | 1,37 | 1,33 |
| 88 | 1,38 | 1,34 | 1,30 |
| 89 | 1,34 | 1,30 | 1,26 |
| 90 | 1,31 | 1,27 | 1,23 |
| 91 | 1,27 | 1,23 | 1,19 |
| 92 | 1,24 | 1,20 | 1,16 |
| 93 | 1,21 | 1,17 | 1,13 |
| 94 | 1,17 | 1,14 | 1,10 |
| 95 | 1,14 | 1,11 | 1,07 |
| 96 | 1,12 | 1,08 | 1,04 |
| 97 | 1,09 | 1,05 | 1,02 |
| 98 | 1,06 | 1,02 | 0,99 |
| 99 | 1,03 | 1,00 | 0,97 |
| 100 | 1,01 | 0,97 | 0,94 |
| 101 | 0,98 | 0,95 | 0,92 |
| 102 | 0,96 | 0,92 | 0,89 |
| 103 | 0,93 | 0,90 | 0,87 |
| 104 | 0,91 | 0,88 | 0,85 |
| 105 | 0,89 | 0,86 | 0,83 |
| 106 | 0,87 | 0,84 | 0,81 |
| 107 | 0,84 | 0,82 | 0,79 |
| 108 | 0,82 | 0,80 | 0,77 |
| 109 | 0,80 | 0,78 | 0,75 |
| 110 | 0,79 | 0,76 | 0,73 |

Tab. 5.a

5.2 Table of temperature-resistance values for NTC sensor 50K@25°C β 3977

| Temp. | Resistance value | | | Temp. | Resistance value | | | Temp. | Resistance value | | |
|-------|------------------|------------|------------|-------|------------------|------------|------------|-------|------------------|------------|------------|
| | Max. | Typical | Min. | | Max. | Typical | Min. | | Max. | Typical | Min. |
| °C | K Ω | K Ω | K Ω | °C | K Ω | K Ω | K Ω | °C | K Ω | K Ω | K Ω |
| 0 | 165239 | 161638 | 158036 | 51 | 17760 | 17401 | 17042 | 102 | 3293 | 3176 | 3058 |
| 1 | 157036 | 153694 | 150352 | 52 | 17109 | 16757 | 16405 | 103 | 3199 | 3084 | 2969 |
| 2 | 149288 | 146187 | 143086 | 53 | 16485 | 16140 | 15795 | 104 | 3108 | 2995 | 2883 |
| 3 | 141965 | 139088 | 136211 | 54 | 15887 | 15549 | 15211 | 105 | 3019 | 2909 | 2799 |
| 4 | 135043 | 132375 | 129706 | 55 | 15314 | 14982 | 14651 | 106 | 2934 | 2826 | 2719 |
| 5 | 128498 | 126023 | 123548 | 56 | 14764 | 14439 | 14114 | 107 | 2851 | 2746 | 2641 |
| 6 | 122307 | 120012 | 117717 | 57 | 14236 | 13918 | 13600 | 108 | 2771 | 2668 | 2565 |
| 7 | 116449 | 114321 | 112194 | 58 | 13730 | 13418 | 13107 | 109 | 2694 | 2593 | 2492 |
| 8 | 110904 | 108932 | 106961 | 59 | 13244 | 12939 | 12634 | 110 | 2619 | 2520 | 2422 |
| 9 | 105654 | 103827 | 102001 | 60 | 12778 | 12479 | 12181 | 111 | 2547 | 2450 | 2354 |
| 10 | 100682 | 98990 | 97298 | 61 | 12330 | 12038 | 11746 | 112 | 2477 | 2382 | 2288 |
| 11 | 95971 | 94405 | 92838 | 62 | 11901 | 11615 | 11329 | 113 | 2409 | 2316 | 2224 |
| 12 | 91507 | 90057 | 88608 | 63 | 11488 | 11208 | 10928 | 114 | 2343 | 2252 | 2162 |
| 13 | 87276 | 85934 | 84593 | 64 | 11092 | 10818 | 10544 | 115 | 2279 | 2191 | 2102 |
| 14 | 83263 | 82022 | 80782 | 65 | 10711 | 10443 | 10175 | 116 | 2218 | 2131 | 2044 |
| 15 | 79456 | 78310 | 77163 | 66 | 10345 | 10083 | 9821 | 117 | 2158 | 2073 | 1988 |
| 16 | 75845 | 74786 | 73727 | 67 | 9993 | 9737 | 9481 | 118 | 2100 | 2017 | 1934 |
| 17 | 72417 | 71440 | 70462 | 68 | 9655 | 9405 | 9154 | 119 | 2044 | 1962 | 1881 |
| 18 | 69163 | 68261 | 67359 | 69 | 9330 | 9085 | 8840 | 120 | 1989 | 1910 | 1830 |
| 19 | 66073 | 65241 | 64410 | 70 | 9018 | 8778 | 8538 | 121 | 1937 | 1859 | 1781 |
| 20 | 63137 | 62372 | 61606 | 71 | 8717 | 8483 | 8248 | 122 | 1886 | 1809 | 1733 |
| 21 | 60348 | 59643 | 58939 | 72 | 8428 | 8199 | 7969 | 123 | 1836 | 1761 | 1687 |
| 22 | 57697 | 57049 | 56401 | 73 | 8150 | 7926 | 7701 | 124 | 1788 | 1715 | 1642 |
| 23 | 55177 | 54582 | 53987 | 74 | 7882 | 7663 | 7443 | 125 | 1742 | 1670 | 1598 |
| 24 | 52780 | 52234 | 51688 | 75 | 7625 | 7410 | 7195 | 126 | 1697 | 1626 | 1556 |
| 25 | 50500 | 50000 | 49500 | 76 | 7377 | 7167 | 6957 | 127 | 1653 | 1584 | 1515 |
| 26 | 48373 | 47873 | 47373 | 77 | 7138 | 6933 | 6727 | 128 | 1610 | 1543 | 1476 |
| 27 | 46348 | 45848 | 45349 | 78 | 6908 | 6707 | 6506 | 129 | 1569 | 1503 | 1437 |
| 28 | 44417 | 43920 | 43422 | 79 | 6686 | 6490 | 6294 | 130 | 1529 | 1465 | 1400 |
| 29 | 42577 | 42082 | 41587 | 80 | 6473 | 6281 | 6089 | 131 | 1490 | 1427 | 1364 |
| 30 | 40823 | 40332 | 39840 | 81 | 6267 | 6080 | 5892 | 132 | 1453 | 1391 | 1329 |
| 31 | 39151 | 38663 | 38174 | 82 | 6069 | 5886 | 5702 | 133 | 1416 | 1355 | 1295 |
| 32 | 37556 | 37072 | 36588 | 83 | 5878 | 5699 | 5520 | 134 | 1381 | 1321 | 1262 |
| 33 | 36034 | 35554 | 35075 | 84 | 5694 | 5519 | 5343 | 135 | 1346 | 1288 | 1230 |
| 34 | 34581 | 34107 | 33633 | 85 | 5517 | 5345 | 5174 | 136 | 1313 | 1256 | 1199 |
| 35 | 33195 | 32726 | 32258 | 86 | 5346 | 5178 | 5010 | 137 | 1280 | 1224 | 1168 |
| 36 | 31871 | 31408 | 30945 | 87 | 5181 | 5017 | 4853 | 138 | 1249 | 1194 | 1139 |
| 37 | 30607 | 30150 | 29694 | 88 | 5022 | 4861 | 4701 | 139 | 1218 | 1164 | 1111 |
| 38 | 29400 | 28949 | 28499 | 89 | 4868 | 4711 | 4554 | 140 | 1189 | 1136 | 1083 |
| 39 | 28246 | 27802 | 27358 | 90 | 4720 | 4566 | 4413 | 141 | 1160 | 1108 | 1056 |
| 40 | 27143 | 26706 | 26269 | 91 | 4577 | 4427 | 4277 | 142 | 1132 | 1081 | 1030 |
| 41 | 26090 | 25659 | 25229 | 92 | 4439 | 4292 | 4145 | 143 | 1104 | 1055 | 1005 |
| 42 | 25082 | 24659 | 24235 | 93 | 4306 | 4162 | 4019 | 144 | 1078 | 1029 | 980 |
| 43 | 24118 | 23702 | 23286 | 94 | 4177 | 4037 | 3896 | 145 | 1052 | 1004 | 956 |
| 44 | 23197 | 22787 | 22378 | 95 | 4053 | 3916 | 3778 | 146 | 1027 | 980 | 933 |
| 45 | 22315 | 21913 | 21511 | 96 | 3933 | 3799 | 3664 | 147 | 1003 | 957 | 911 |
| 46 | 21471 | 21076 | 20681 | 97 | 3817 | 3686 | 3554 | 148 | 979 | 934 | 889 |
| 47 | 20663 | 20275 | 19888 | 98 | 3705 | 3577 | 3448 | 149 | 956 | 912 | 868 |
| 48 | 19890 | 19509 | 19129 | 99 | 3597 | 3471 | 3346 | 150 | 933 | 890 | 847 |
| 49 | 19149 | 18776 | 18402 | 100 | 3492 | 3369 | 3246 | | | | |
| 50 | 18440 | 18074 | 17707 | 101 | 3391 | 3271 | 3151 | | | | |

Tab. 5.b

5.3 Table of temperature-resistance values for NTC sensor 750 Ohm @25°C B 3969

| °C | Ohms | °C | Ohms | °C | Ohms | °C | Ohms | °C | Ohms |
|-----|-----------|-----|----------|----|---------|----|--------|-----|-------|
| -80 | 577421.72 | -40 | 25693.65 | 0 | 2457.67 | 40 | 399.77 | 80 | 94.66 |
| -79 | 527949.43 | -39 | 32432.58 | 1 | 2335.27 | 41 | 384.06 | 81 | 91.67 |
| -78 | 483039.76 | -38 | 22489.43 | 2 | 2219.68 | 42 | 369.06 | 82 | 88.78 |
| -77 | 442244.46 | -37 | 21055.15 | 3 | 2110.50 | 43 | 354.73 | 83 | 86.00 |
| -76 | 405161.84 | -36 | 19721.40 | 4 | 2007.32 | 44 | 341.03 | 84 | 83.32 |
| -75 | 371431.66 | -35 | 18480.57 | 5 | 1909.80 | 45 | 327.93 | 85 | 80.73 |
| -74 | 340730.65 | -34 | 17325.63 | 6 | 1817.58 | 46 | 315.40 | 86 | 78.24 |
| -73 | 312768.50 | -33 | 16250.14 | 7 | 1730.35 | 47 | 303.42 | 87 | 75.84 |
| -72 | 287284.35 | -32 | 15248.17 | 8 | 1647.82 | 48 | 291.96 | 88 | 73.52 |
| -71 | 264043.66 | -31 | 14314.26 | 9 | 1569.70 | 49 | 281.00 | 89 | 71.29 |
| -70 | 242835.52 | -30 | 13443.41 | 10 | 1495.74 | 50 | 270.50 | 90 | 69.13 |
| -69 | 223469.52 | -29 | 12630.97 | 11 | 1425.69 | 51 | 260.45 | 91 | 67.05 |
| -68 | 205774.90 | -28 | 11872.71 | 12 | 1359.32 | 52 | 250.83 | 92 | 65.04 |
| -67 | 189597.20 | -27 | 11164.69 | 13 | 1296.43 | 53 | 241.61 | 93 | 63.10 |
| -66 | 174797.23 | -26 | 10503.29 | 14 | 1236.81 | 54 | 232.78 | 94 | 61.23 |
| -65 | 161249.35 | -25 | 9885.19 | 15 | 1180.27 | 55 | 224.32 | 95 | 59.43 |
| -64 | 148840.08 | -24 | 9307.28 | 16 | 1126.64 | 56 | 216.22 | 96 | 57.68 |
| -63 | 137466.39 | -23 | 8766.74 | 17 | 1075.75 | 57 | 208.44 | 97 | 56.00 |
| -62 | 127036.93 | -22 | 8260.92 | 18 | 1027.45 | 58 | 200.99 | 98 | 54.37 |
| -61 | 117466.39 | -21 | 7787.41 | 19 | 981.59 | 59 | 193.84 | 99 | 52.80 |
| -60 | 108679.25 | -20 | 7343.85 | 20 | 938.04 | 60 | 186.99 | 100 | 51.28 |
| -59 | 100606.67 | -19 | 6928.47 | 21 | 896.67 | 61 | 180.41 | 101 | 49.81 |
| -58 | 93186.24 | -18 | 6539.04 | 22 | 857.36 | 62 | 174.10 | 102 | 48.39 |
| -57 | 86361.37 | -17 | 6173.88 | 23 | 819.99 | 63 | 168.04 | 103 | 47.02 |
| -56 | 80080.67 | -16 | 5831.34 | 24 | 784.46 | 64 | 162.22 | 104 | 45.69 |
| -55 | 74297.50 | -15 | 5509.89 | 25 | 750.00 | 65 | 156.64 | 105 | 44.41 |
| -54 | 68969.45 | -14 | 5208.12 | 26 | 718.52 | 66 | 151.27 | | |
| -53 | 64057.99 | -13 | 4924.70 | 27 | 687.93 | 67 | 146.12 | | |
| -52 | 59528.05 | -12 | 4658.43 | 28 | 658.81 | 68 | 141.17 | | |
| -51 | 55347.72 | -11 | 4408.16 | 29 | 631.09 | 69 | 136.41 | | |
| -50 | 51489.92 | -10 | 4172.85 | 30 | 604.69 | 70 | 131.84 | | |
| -49 | 47922.16 | -9 | 3951.51 | 31 | 579.54 | 71 | 127.44 | | |
| -48 | 44626.30 | -8 | 3743.25 | 32 | 555.57 | 72 | 123.21 | | |
| -47 | 41578.30 | -7 | 3547.21 | 33 | 532.73 | 73 | 119.15 | | |
| -46 | 38758.05 | -6 | 3362.61 | 34 | 510.95 | 74 | 115.23 | | |
| -45 | 36147.17 | -5 | 3188.72 | 35 | 490.18 | 75 | 111.47 | | |
| -44 | 33728.89 | -4 | 3024.86 | 36 | 470.37 | 76 | 107.85 | | |
| -43 | 31487.85 | -3 | 2870.40 | 37 | 451.47 | 77 | 104.36 | | |
| -42 | 29410.02 | -2 | 2724.74 | 38 | 433.43 | 78 | 101.01 | | |
| -41 | 27482.54 | -1 | 2587.33 | 39 | 416.21 | 79 | 97.78 | | |

Tab. 5.c

6. PT100 PROBE TECHNICAL SPECIFICATIONS

6.1 Models PT100

| | |
|---|---|
| Storage conditions | -50T250 °C |
| Operating range elemento sensibile | PT100000A1: -50 °C...+250 °C PT100000A2: 0 °C...+400 °C |
| Sensor | Pt100 Class B in accordance with DIN IEC751, 3 wire |
| Precision | +/- class B=(0,005xt)+0,3, a 100°C = ±0,8°C |
| Connections aliment. e uscita | Stripped ends, dimensions 6±1mm |
| Cable | PT100000A1: silicone rubber HALOGEN COMPOUNDS ≤ 1.1 x 10 ⁻³ mg/g PT100000A2: 3x0.5 mm ² fibreglass wire and secondary insulation |
| Dissipation factor (in air) | 0,3 K/mW at 0 °C |
| Thermal constant over time (in air) | ca./approx 20 s |
| Category of resistance to heat and fire | Range -20 °C +200°C for PT100000A1, +500 °C for PT100000A2 |
| Insulation resistance | >500 Mohm / 250 V |
| Dielectric strength | 250 Vac (code PT100000A1 only) not applicabile for PT100000A2 |
| Primary insulation (porbe and cable) | 250 Vac |
| Sensitive element index of protection | IP65 |
| Sensitive element housing | AISI 316 stainless steel |

Tab. 6.a



Fig. 6.a

* = see table of product codes in price list

** = 3-wires cable compensates for the resistance introduced by the cable

7. TABLE OF TEMPERATURE VALUES PT100 PROBE

7.1 Table of temperature values PT100 Probe Class B

R (0) = 100,00 Ω

α = 0,003 850 1/°C

| °C | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | °C |
|-----|--------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|-----|
| -50 | 80,31 | 79,91 | 79,51 | 79,11 | 78,72 | 78,32 | 77,92 | 77,52 | 77,13 | 76,73 | 76,33 | -50 |
| -40 | 84,27 | 83,88 | 83,48 | 83,08 | 82,69 | 82,29 | 81,89 | 81,50 | 81,10 | 80,70 | 80,31 | -40 |
| -30 | 88,22 | 87,83 | 87,43 | 87,04 | 86,64 | 86,25 | 85,85 | 85,46 | 85,06 | 84,67 | 84,27 | -30 |
| -20 | 92,16 | 91,77 | 91,37 | 90,98 | 90,59 | 90,19 | 89,80 | 89,40 | 89,01 | 88,62 | 88,22 | -20 |
| -10 | 96,09 | 95,69 | 95,30 | 94,91 | 94,52 | 94,12 | 93,73 | 93,34 | 92,95 | 92,55 | 92,16 | -10 |
| 0 | 100,00 | 99,61 | 99,22 | 98,83 | 98,44 | 98,04 | 97,65 | 97,26 | 96,87 | 96,48 | 96,09 | 0 |
| 0 | 100,00 | 100,390 | 100,78 | 101,17 | 101,56 | 101,95 | 102,34 | 102,73 | 103,12 | 103,51 | 103,90 | 0 |
| 10 | 103,90 | 104,29 | 104,68 | 105,07 | 105,46 | 105,85 | 106,24 | 106,63 | 107,02 | 107,40 | 107,79 | 10 |
| 20 | 107,79 | 108,18 | 108,57 | 108,96 | 109,35 | 109,73 | 110,12 | 110,51 | 110,90 | 111,28 | 111,67 | 20 |
| 30 | 111,67 | 112,06 | 112,45 | 112,83 | 113,22 | 113,61 | 113,99 | 114,38 | 114,77 | 115,15 | 115,54 | 30 |
| 40 | 115,54 | 115,93 | 116,31 | 116,70 | 117,08 | 117,47 | 117,85 | 118,24 | 118,62 | 119,01 | 119,40 | 40 |
| 50 | 119,40 | 119,78 | 120,16 | 120,55 | 120,93 | 121,32 | 121,70 | 122,09 | 122,47 | 122,86 | 123,24 | 50 |
| 60 | 123,24 | 123,62 | 124,01 | 124,39 | 124,77 | 125,16 | 125,54 | 125,92 | 126,31 | 126,69 | 127,07 | 60 |
| 70 | 127,07 | 127,45 | 127,84 | 128,22 | 128,60 | 128,98 | 129,37 | 129,75 | 130,13 | 130,51 | 130,89 | 70 |
| 80 | 130,89 | 131,27 | 131,66 | 132,04 | 132,42 | 132,80 | 133,18 | 133,56 | 133,94 | 134,32 | 134,70 | 80 |
| 90 | 134,70 | 135,08 | 135,46 | 135,84 | 136,22 | 136,60 | 136,98 | 137,36 | 137,74 | 138,12 | 138,50 | 90 |
| 100 | 138,50 | 138,88 | 139,26 | 139,64 | 140,02 | 140,39 | 140,77 | 141,15 | 141,53 | 141,91 | 142,29 | 100 |
| 110 | 142,29 | 142,66 | 143,04 | 143,42 | 143,80 | 144,17 | 144,55 | 144,93 | 145,31 | 145,68 | 146,06 | 110 |
| 120 | 146,06 | 146,44 | 146,81 | 147,19 | 147,57 | 147,94 | 148,32 | 148,70 | 149,07 | 149,45 | 149,82 | 120 |
| 130 | 149,82 | 150,20 | 150,57 | 150,95 | 151,33 | 151,70 | 152,08 | 152,45 | 152,83 | 153,20 | 153,58 | 130 |
| 140 | 153,58 | 153,95 | 154,32 | 154,70 | 155,07 | 155,45 | 155,82 | 156,19 | 156,57 | 156,94 | 157,31 | 140 |
| 150 | 157,31 | 157,69 | 158,06 | 158,43 | 158,81 | 159,18 | 159,55 | 159,93 | 160,30 | 160,67 | 161,04 | 150 |
| 160 | 161,04 | 161,42 | 161,79 | 162,16 | 162,53 | 162,90 | 163,27 | 163,65 | 164,02 | 164,39 | 164,76 | 160 |
| 170 | 164,76 | 165,13 | 165,50 | 165,87 | 166,24 | 166,61 | 166,98 | 167,35 | 167,72 | 168,09 | 168,46 | 170 |
| 180 | 168,46 | 168,83 | 169,20 | 169,57 | 169,94 | 170,31 | 170,68 | 171,05 | 171,42 | 171,79 | 172,16 | 180 |
| 190 | 172,16 | 172,53 | 172,90 | 173,26 | 173,63 | 174,00 | 174,37 | 174,74 | 175,10 | 175,47 | 175,84 | 190 |
| 200 | 175,84 | 176,21 | 176,57 | 176,94 | 177,31 | 177,68 | 178,04 | 178,41 | 178,78 | 179,14 | 179,51 | 200 |
| 210 | 179,51 | 179,88 | 180,24 | 180,61 | 180,97 | 181,34 | 181,71 | 182,07 | 182,44 | 182,80 | 183,17 | 210 |
| 220 | 183,17 | 183,53 | 183,90 | 184,26 | 184,63 | 184,99 | 185,36 | 185,72 | 186,09 | 186,45 | 186,82 | 220 |
| 230 | 186,82 | 187,18 | 187,54 | 187,91 | 188,27 | 188,63 | 189,00 | 189,36 | 189,72 | 190,09 | 190,45 | 230 |
| 240 | 190,45 | 190,81 | 191,18 | 191,54 | 191,90 | 192,26 | 192,63 | 192,99 | 193,35 | 193,71 | 194,07 | 240 |
| 250 | 194,07 | 194,44 | 194,80 | 195,16 | 195,52 | 195,88 | 196,24 | 196,60 | 196,96 | 197,33 | 197,69 | 250 |
| 260 | 197,69 | 198,05 | 198,41 | 198,77 | 199,13 | 199,49 | 199,85 | 200,21 | 200,57 | 200,93 | 201,29 | 260 |
| 270 | 201,29 | 201,65 | 202,01 | 202,36 | 202,72 | 203,08 | 203,44 | 203,80 | 204,16 | 204,52 | 204,88 | 270 |
| 280 | 204,88 | 205,23 | 205,59 | 205,95 | 206,31 | 206,67 | 207,02 | 207,38 | 207,74 | 208,10 | 208,45 | 280 |
| 290 | 208,45 | 208,81 | 209,17 | 209,52 | 209,88 | 210,24 | 210,59 | 210,95 | 211,31 | 211,66 | 212,02 | 290 |
| 300 | 212,02 | 212,37 | 212,73 | 213,09 | 213,44 | 213,80 | 214,15 | 214,51 | 214,86 | 215,22 | 215,57 | 300 |
| 310 | 215,57 | 215,93 | 216,28 | 216,64 | 216,99 | 217,35 | 217,70 | 218,05 | 218,41 | 218,76 | 219,12 | 310 |
| 320 | 219,12 | 219,47 | 219,82 | 220,18 | 220,53 | 220,88 | 221,24 | 221,59 | 221,94 | 222,29 | 222,65 | 320 |

Tab. 7.a

8. PT1000 PROBE TECHNICAL SPECIFICATIONS

8.1 Models PT1*HP*

| | |
|---|---|
| Storage conditions | -50T105 °C in air |
| Operating range | -50T105 °C in air |
| Connections | Stripped ends, dimensions: 5±1 mm |
| Sensor | Pt1000 - Class B |
| Dissipation factor (in air) | ca. 3 mW/°C |
| Costante term. nel tempo (in air) | ca. / approx. 20 s |
| Cable | Black two-wire flat cable, with tinned copper wire size 0.3 mm ² |
| Sensitive element index of protection | IP67 |
| Sensitive element housing | Polyolefin |
| Classification according to protection against electric shock (sensitive element and cable) | Basic insulation for 250 Vac |
| Category of resistance to heat and fire | Flame retardant |

Tab. 8.a



Fig. 8.a

* = see table of product codes in price list

8.2 Models PT1*WF*

| | |
|---|--|
| Storage conditions | -50T105 °C |
| Operating range | -50T105 °C |
| Connections | Stripped ends, dimensions: 5±1 mm |
| Sensor | Pt1000 - Class B |
| Dissipation factor (in air) | ca. / approx. 7 mW/°C |
| Thermal constant over time (in air) | ca. / approx. 15 s |
| Cable | Two-wire with double sheath, AWG22, tinned copper with electrical resistance ≤63 Ω/km - Insulation: TPE specific for immersion in water on outer sheath, PP/Co inside on wires, OD 3.5 mm max. |
| Sensitive element index of protection | IP67 |
| Sensitive element housing | AISI 316 steel diameter 4 mm - L= 30 mm |
| Classification according to protection against electric shock (sensitive element & cable) | Basic insulation for 250 Vac |
| Category of resistance to heat and fire | Flame retardant |

Tab. 8.b

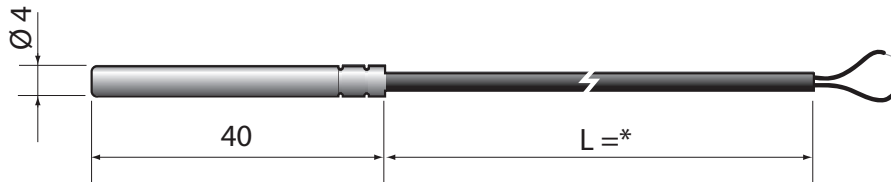


Fig. 8.b

* = see table of product codes in price list

8.3 Models PT1*WP*

| | |
|---|--|
| Storage conditions | -50T105 °C |
| Operating range | -50T105 °C |
| Connections | Stripped ends, dimensions: 5±1 mm |
| Sensor | Pt1000 - Class B |
| Dissipation factor (in air) | ca. / approx. 2.2 mW/°C |
| Thermal constant over time (in air) | ca. / approx. 25 s |
| Cable | Two-wire with double sheath, AWG22, tinned copper with electrical resistance ≤63 Ω/km - Insulation: TPE specific for immersion in water on outer sheath, PP/Co inside on wires, OD 3.5 mm max. |
| Sensitive element index of protection | IP67 |
| Sensitive element housing | PPcop. with AISI 316 outer cap |
| Classification according to protection against electric shock (sensitive element and cable) | Insulation supplementare per 250 Vac; |
| Category of resistance to heat and fire | Flame retardant |

Tab. 8.c

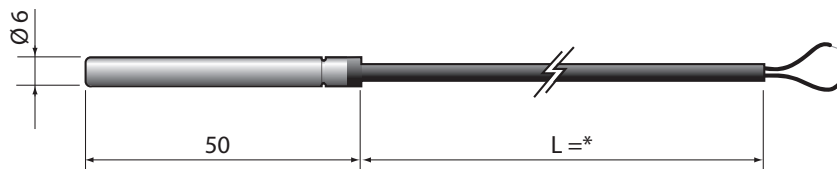


Fig. 8.c

* = see table of product codes in price list

Accessories

- Socket: nickel-coated brass - 1413306AXX

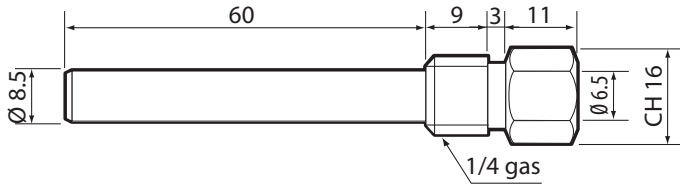


Fig. 8.d

Maximum operating pressure 35 bar
Temperature -20...95°C

- Socket 2: AISI 316 - code 1413309AXX

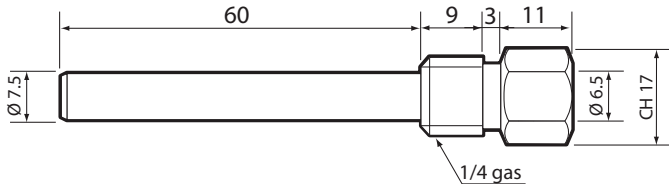


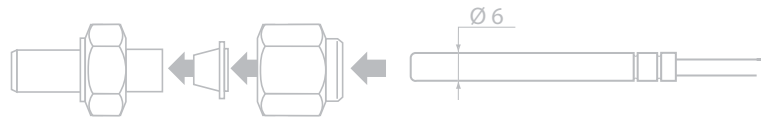
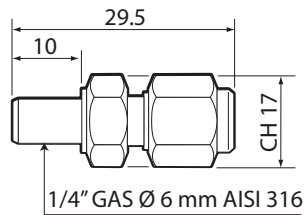
Fig. 8.e

Maximum operating pressure 40 bar
Temperature -20...95°C



Note:

- cable secured with PG7 - IP68 cable gland applied to hexagonal end
- kit available complete with socket and cable gland
- Compression fitting with metal olive - code 1309589AXX



Maximum operating pressure 40 bars
Temperature -50 to 250°C

Fig. 8.f

8.4 Models PT1*HT*

| | |
|---|--|
| Storage conditions | -50T250 °C |
| Operating range | -50T250 °C |
| Connections | with crimped metal terminals |
| Sensor | Pt1000 - Class B (2 wires) |
| Dissipation factor (in air) | ca. / approx. 7 mW/°C |
| Thermal constant over time (in air) | ca. / approx.20 s (V=2m/s) |
| Cable | White Teflon with two cables red and white Section. 2x0.22 mm2 Ø3 mm |
| Sensitive element index of protection | IP67 |
| Sensitive element housing | Silicone resin |
| Materiale cappuccio | Stainless steel Aisi 304 |
| Dimensioni cappuccio | 6x40 mm |
| Classification according to protection against electric shock (sensitive element and cable) | additional insulation |
| Category of resistance to heat and fire | Flame retardant |
| Resistenza Insulation | 20 Mohm 500 Vcc |
| Dielectric rigidity | 2000Vac |

Tab. 8.d

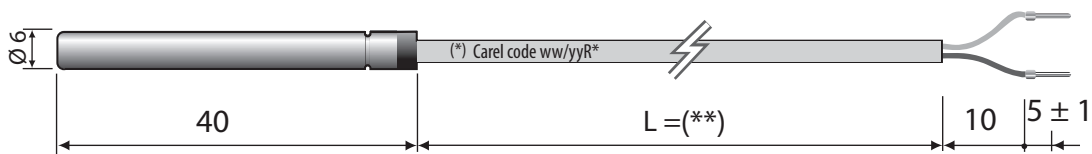


Fig. 8.g



Note:

- (*) ww/yyR*:
ww = week of production;
yy = year of production;
R* = Revision.
- (**) see table of product codes in price list

8.5 Models PT1*HF

Probe with fastening clamp

| | |
|---|--|
| Storage conditions | -50T105 °C |
| Sensitive element operating range | -50T105 °C |
| Connections | Stripped ends, dimensions 6±1 mm |
| Sensor | Pt1000 Class B |
| Precision | +/- 0.8 °C; -50T90 °C |
| Dissipation factor (in air) | 3 mW |
| Thermal constant over time (in air) | approx. 15 s |
| Cable | Black thermoplastic rubber flat cable (diam. 3.6x1.6 max.) |
| Sensitive element index of protection | IP67 |
| Sensitive element housing | Thermoplastic with fastening clamp |
| Classification according to protection against electric shock (sensitive element & cable) | Basic insulation for 250 Vac |
| Category of resistance to heat and fire | UL/HB cable |
| Insulation resistance at 1000 Vdc | >20 Mohm |
| Dielectric strength | 1500 Vac |

Tab. 8.e

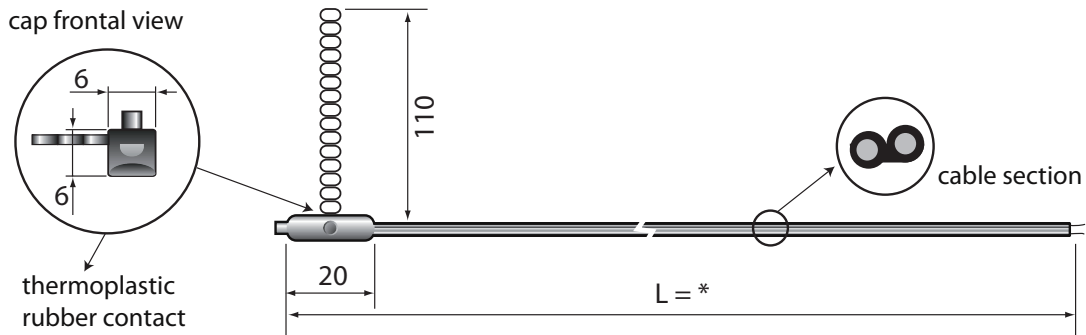


Fig. 8.h

* = see table of product codes in price list

8.6 Models PT1*PS*

| | |
|---|---|
| Storage conditions | -50T105 °C |
| Operating range | -50T105 °C |
| Connections | Stripped and soldered ends, dimensions: 4±1 mm |
| Sensor | Pt1000 Class B |
| Dissipation factor (in air) | 2 mW/°C |
| Thermal constant over time (in air) | approx. 50 min (V=1 m/s) |
| Cable | Two-wire with double sheath, AWG22, tinned copper with resistance ≤73.9Ω/km - Insulation: TPE specific for immersion in water on outer sheath, PP/co inside on wires, OD 3.30+/-0.10 mm |
| Sensitive element index of protection | IP67 |
| Case | RAL7032 grey Santoprene Food safe Supplementary insulation for 250 Vac |
| Classification according to protection against electric shock (sensitive element and cable) | Flame retardant |
| Category of resistance to heat and fire | Flame retardant |

Tab. 8.f

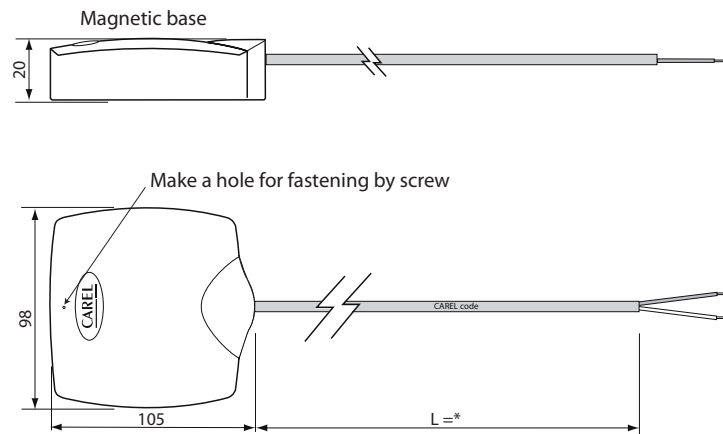


Fig. 8.i

* = see table of product codes in price list

9. PT1000 IMMERSION PROBE TECHNICAL SPECIFICATIONS

9.1 Models TST1300000

Immersion probes feature the sensor directly in contact with the liquid, and are installed on the tubing. Wired using the electrical connector.

| | |
|----------------------------|--|
| Storage conditions | -40T120 °C |
| Operating range | -40T120 °C |
| Sensor | Pt1000 Class B |
| Construction | Direct immersion with connection to the 1/8" GAS male process fitting as per UNI 338 |
| Electrical connection | 4-pin co-moulded nylon, M12x1 (DIN-VDE0627) metric thread, IP67 max. temp. 90°C |
| Thermal constant over time | ca. / approx. 5 s in water - 30 s in air |
| Sensitive element housing | AISI 316 |
| Insulation | 100 Mohm a 500 Vcc |
| Maximum operating pressure | 40 bar |

Tab. 9.a

Key:

| | |
|---|-------------------------------|
| 1 | sensitive element NTC 10 Kohm |
| 2 | stainless steel socket |
| 3 | EX14 |
| 4 | co-moulded body |
| 5 | M12 male connector |

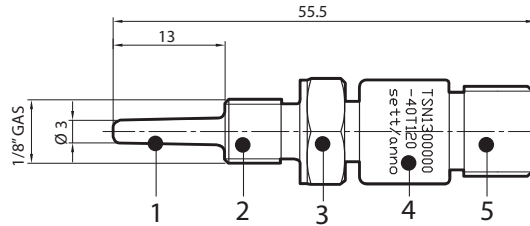


Fig. 9.a

Accessories:

- 4-pin M12 connector for 1/8 GAS sensor - cable length 3 m
Code TSOPZCW030

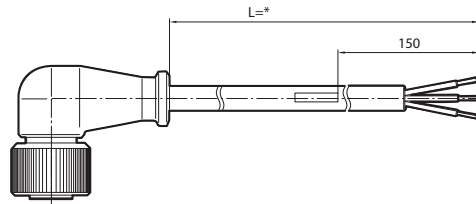
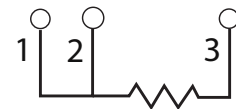


Fig. 9.b

Wiring:



| | |
|--------|-------|
| PT1000 | |
| 1 | red |
| 2 | red |
| 3 | white |

- 4-pin M12 connector for 1/8 GAS sensor
Code TSOPZCM000
- M12 connector can be assembled on site, recommended cable 3x0.2 mm² with outer sheath.

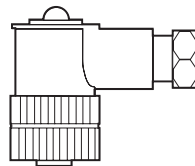
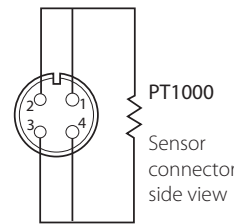


Fig. 9.c

Wiring:



Note: the three-wire connection for the Pt100 must be used when the controller is fitted accordingly. If not, the ends are to be connected together on the same terminal.



- Welding fitting Code TSOPZPT000

| | |
|---|---|
| A | Compact thermistor with 1/8" GAS cyl. fitting |
| B | 1/4" GAS cyl. process fitting with immersion L= 10.5 mm |

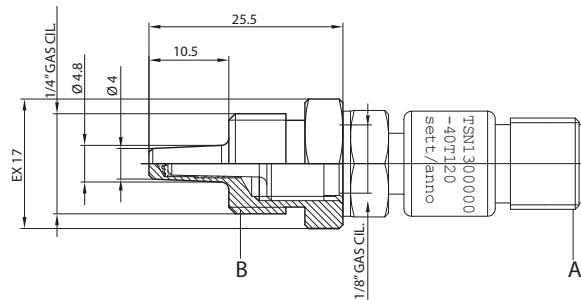


Fig. 9.d

- Welding fitting Code TSOPZRT000

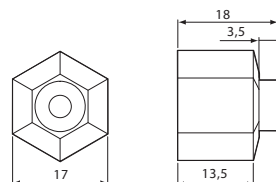


Fig. 9.e

9.2 Models TSM1500B30

Immersion probes feature the sensor directly in contact with the liquid and are secured to the tubing using a connector, available in the screw or weldable versions.

The body is nickel-coated brass, index of protection IP67, and the gasket (O-ring) is supplied together with the probe.

| | |
|----------------------------|--|
| Storage conditions | -40T90 °C |
| Operating range | -40T90 °C |
| Sensor | Pt1000 Class B |
| Construction | Direct immersion with connection to the M14 male process |
| Cable | 2 wires AWG 22, with sheath in TPE |
| Thermal constant over time | ca. / approx. 5 s in water - 45 s in air |
| Sensitive element housing | Nickel-coated brass & grey PA6 co-moulded body |
| Insulation | 100 Mohm a 100 Vcc |
| Maximum operating pressure | 25 bar |
| Compatible liquids | Water |

Tab. 9.b

Key:

| | |
|---|--|
| 1 | sensitive element |
| 2 | nickel-coated brass locking ring |
| 3 | co-moulded body |
| 4 | cable marking |
| 5 | tinned copper 2-wire cable |
| 6 | NTC sensor |
| 7 | 2015 O-ring |
| 8 | nickel-coated brass thermometer socket |

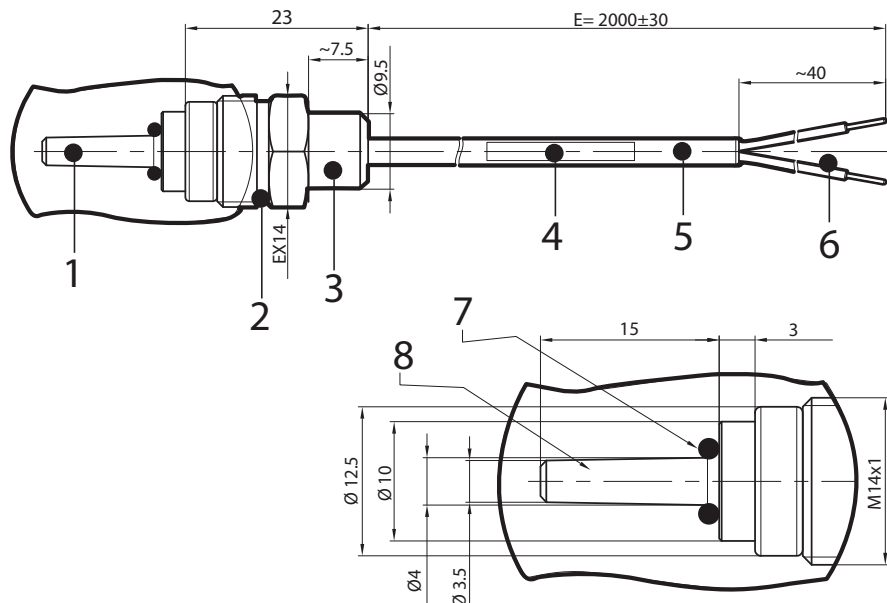


Fig. 9.f

Wiring:

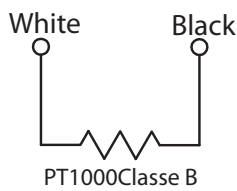


Fig. 9.g

Accessories:

- Adapter from M14 to 3/8 GA Code TSOPZRV000

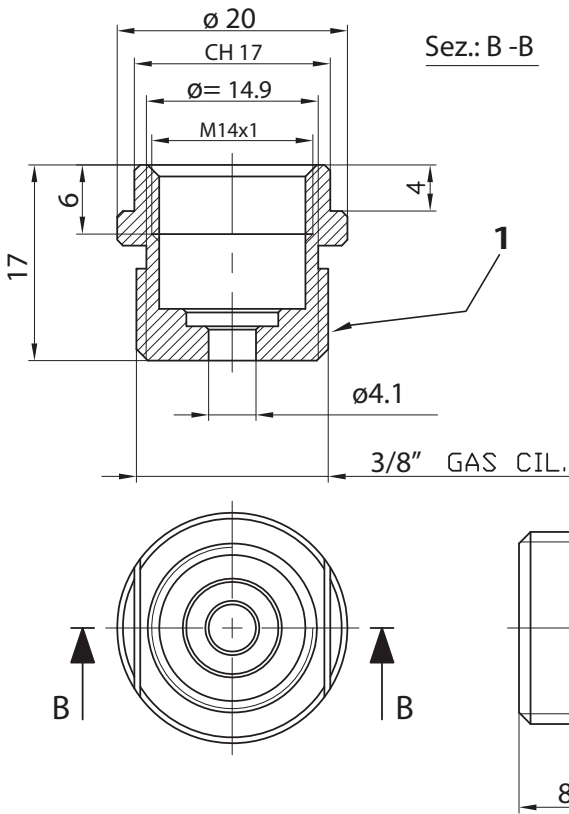


Fig. 9.h

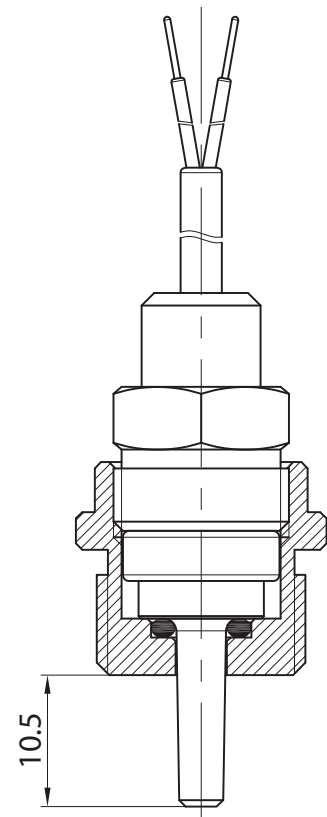


Fig. 9.i

- Weldable adapter for M14 Code TSOPZRS000

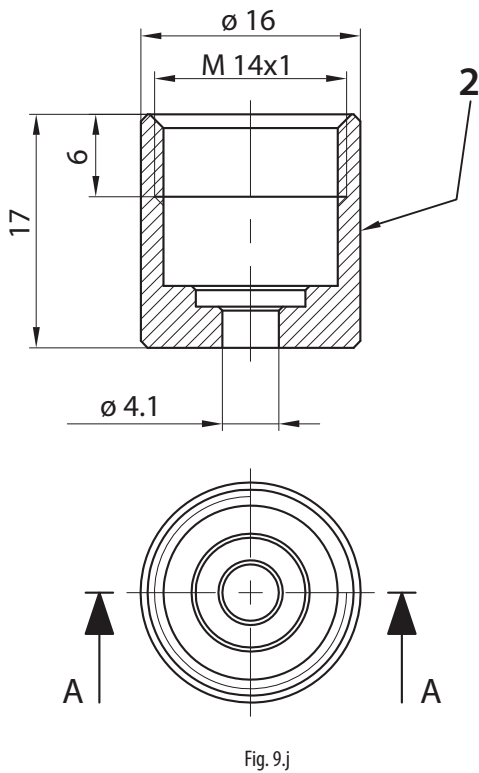


Fig. 9.j

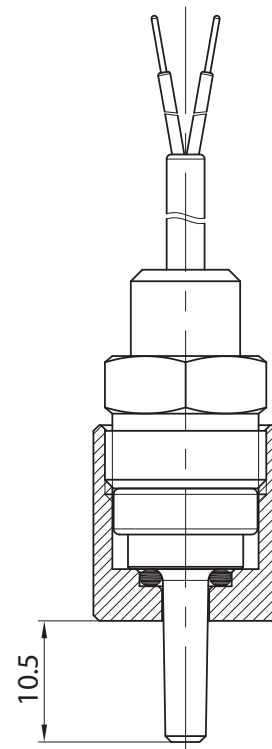


Fig. 9.k

Key:

| | | |
|---|--|-----------------|
| 1 | 3/8 cyl. threaded fitting with round seat, nickel-coated brass | cod: C058042A04 |
| 2 | weldable cylindrical fitting with round seat, brass | cod: C058042A03 |

9.3 Models TSQ15MAB00

| | |
|---|---|
| Storage conditions | -50T350 °C |
| Operating range | -50T350 °C |
| Connections | 3-pin DIN connector |
| Sensor | Pt1000 Class B |
| Thermal constant over time | approx. 2.5 s in water - 10 s in air |
| Cable cod.TSOPZCV030 & cod.TSOPZCV100 & extension cable cod. TSOPZCV070 | silicone cable L= 3 m, 10 m (max. temp. = 180 °C) with 3-pin DIN connector (max. conn. temp.= 90 °C) as for DIN-VDE0627 with M8x1 screw coupling. |
| Optional compression fitting TSOPZFGD30 | AlSI 316, 1/4 gas (see paragraph 4.4) |
| Index of protection connession | IP65 |
| Sensitive element housing | AlSI 316 steel |
| Insulation resistance | Insulation at 100 Vdc > 100 mOhm |
| Maximum operating pressure | 40 bar |
| Category of resistance to heat and fire | flame retardant |

Tab. 9.c

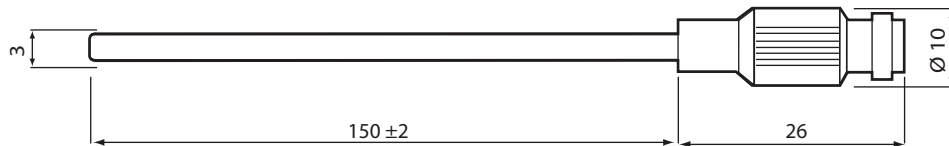


Fig. 9.l

Accessories:

| | | |
|---|-------------|--|
| A | TSOPZCV030: | silicone cable with M8 connector, length 3 m |
| | TSOPZCV100: | silicone cable with M8 connector, length 10 m |
| B | TSOPZCV070: | silicone extension cable with M8 male/female connector, length 7 m |
| C | TSOPZFGD30: | compression fitting suitable for 3 mm |

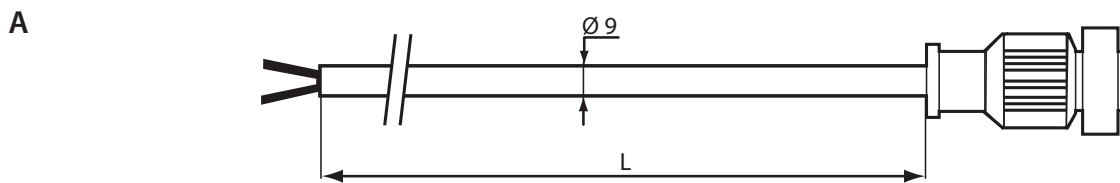


Fig. 9.m

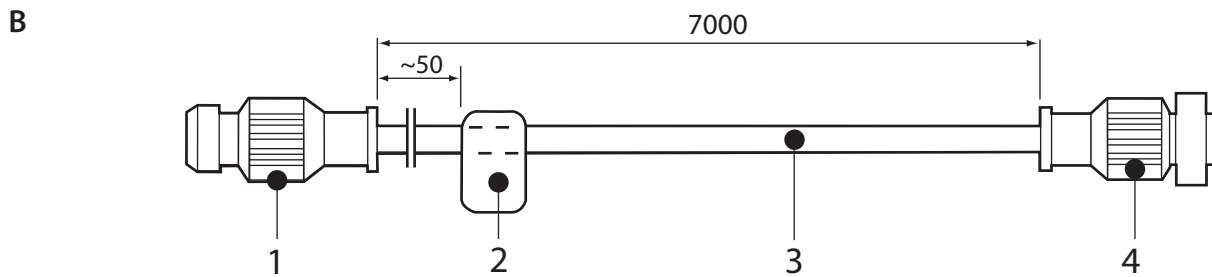


Fig. 9.n

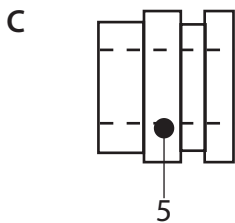


Fig. 9.o

Key:

| | |
|---|--|
| 1 | M8 connector |
| 2 | rating label |
| 3 | 24 AWG 2 wire cable insulated with silicone rubber |
| 4 | M8 co-moulded connector |
| 5 | 1/4" compression fitting - D= 3 mm, AlSI316 steel |

10. PT1000 PIERCING PROBE TECHNICAL SPECIFICATIONS

10.1 Models PT1INF0340

Piercing probe with "L" handle and heating system.

| | |
|---|---|
| Storage conditions | -50T200 °C |
| Operating range | -50T200 °C |
| Connections | Stripped ends, with terminals |
| Sensor | Pt1000 Class B |
| Thermal constant over time (in air) | approx. 45 s |
| Cable | Food-safe thermoplastic sheath with 4 wires size 0.15 mm ² |
| Wires colours | White-black, PT1000 / red, electric heater. |
| Maximum heater voltage | 24 Vac |
| Electrical resistance of heater | 7 Ohm ±0,6 |
| Cable length | 3 m |
| Sensitive element index of protection | IP67 |
| Sensitive element housing | AISI 316 stainless steel. Length 100 mm diam. 4 mm. With pointed tip |
| Cap filler | Aluminium |
| Classification according to protection against electric shock (sensitive element & cable) | Insulation: Outer sheath, and inside on wires |
| Category of resistance to heat and fire | Flame retardant |
| Insulation resistance | 20 Mohm 500 Vcc |
| Dielectric strength | 500 Vac |
| Food compatibility | Suitable for permanent food contact |

Tab. 10.a

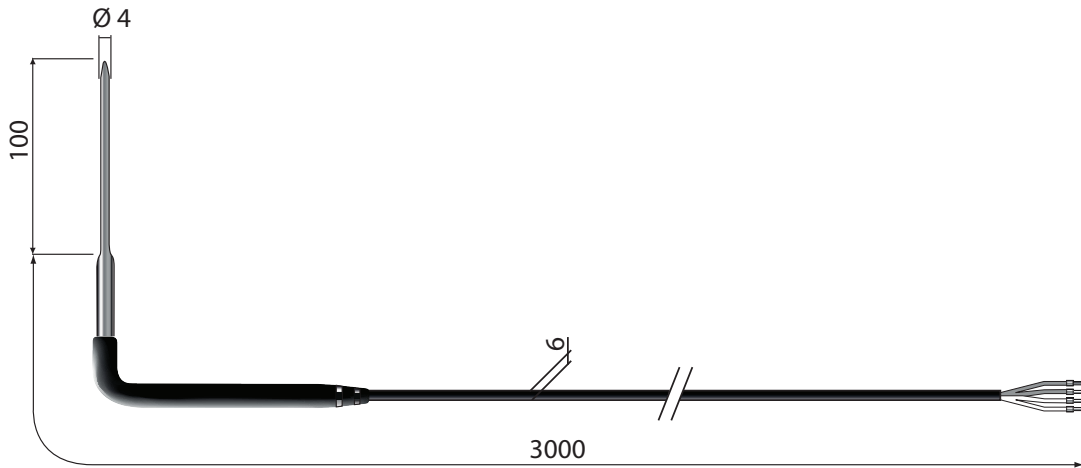


Fig. 10.a

Key:

| | |
|---|----------------------|
| a | red, electric heater |
| b | white/white, NTC |

11. TABLE OF PT1000 PROBE VALUES

11.1 Table of temperature-resistance values for PT1000 probe class B

R (0) = 1000.00 Ω

α = 0.003 850 1/°C

| Temper. [°C] | Resist. [W] | Temper. [°C] | Resist. [W] | Temper. [°C] | Resist. [W] | Temper. [°C] | Resist. [W] | Temper. [°C] | Resist. [W] | Temper. [°C] | Resist. [W] |
|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|
| -196 | 202,47 | -125 | 500,60 | -54 | 787,17 | 17 | 1066,27 | 88 | 1339,46 | 159 | 1606,82 |
| -195 | 206,77 | -124 | 504,70 | -53 | 791,14 | 18 | 1070,16 | 89 | 1343,26 | 160 | 1610,54 |
| -194 | 211,08 | -123 | 508,81 | -52 | 795,12 | 19 | 1074,05 | 90 | 1347,07 | 161 | 1614,27 |
| -193 | 215,38 | -122 | 512,91 | -51 | 799,09 | 20 | 1077,94 | 91 | 1350,87 | 162 | 1617,99 |
| -192 | 219,67 | -121 | 517,00 | -50 | 803,06 | 21 | 1081,82 | 92 | 1354,68 | 163 | 1621,71 |
| -191 | 223,97 | -120 | 521,10 | -49 | 807,03 | 22 | 1085,70 | 93 | 1358,48 | 164 | 1625,43 |
| -190 | 228,25 | -119 | 525,19 | -48 | 811,00 | 23 | 1089,59 | 94 | 1362,28 | 165 | 1629,15 |
| -189 | 232,54 | -118 | 529,28 | -47 | 814,97 | 24 | 1093,47 | 95 | 1366,08 | 166 | 1632,86 |
| -188 | 236,82 | -117 | 533,37 | -46 | 818,94 | 25 | 1097,35 | 96 | 1369,87 | 167 | 1636,58 |
| -187 | 241,10 | -116 | 537,46 | -45 | 822,90 | 26 | 1101,23 | 97 | 1373,67 | 168 | 1640,30 |
| -186 | 245,38 | -115 | 541,54 | -44 | 826,87 | 27 | 1105,10 | 98 | 1377,47 | 169 | 1644,01 |
| -185 | 249,65 | -114 | 545,62 | -43 | 830,83 | 28 | 1108,98 | 99 | 1381,26 | 170 | 1647,72 |
| -184 | 253,92 | -113 | 549,70 | -42 | 834,79 | 29 | 1112,86 | 100 | 1385,06 | 171 | 1651,43 |
| -183 | 258,19 | -112 | 553,78 | -41 | 838,75 | 30 | 1116,73 | 101 | 1388,85 | 172 | 1655,14 |
| -182 | 262,45 | -111 | 557,86 | -40 | 842,71 | 31 | 1120,60 | 102 | 1392,64 | 173 | 1658,85 |
| -181 | 266,71 | -110 | 561,93 | -39 | 846,66 | 32 | 1124,47 | 103 | 1396,43 | 174 | 1662,56 |
| -180 | 270,96 | -109 | 566,00 | -38 | 850,62 | 33 | 1128,35 | 104 | 1400,22 | 175 | 1666,27 |
| -179 | 275,22 | -108 | 570,07 | -37 | 854,57 | 34 | 1132,21 | 105 | 1404,00 | 176 | 1669,97 |
| -178 | 279,47 | -107 | 574,14 | -36 | 858,53 | 35 | 1136,08 | 106 | 1407,79 | 177 | 1673,68 |
| -177 | 283,71 | -106 | 578,21 | -35 | 862,48 | 36 | 1139,95 | 107 | 1411,58 | 178 | 1677,38 |
| -176 | 287,96 | -105 | 582,27 | -34 | 866,43 | 37 | 1143,82 | 108 | 1415,36 | 179 | 1681,08 |
| -175 | 292,20 | -104 | 586,33 | -33 | 870,38 | 38 | 1147,68 | 109 | 1419,14 | 180 | 1684,78 |
| -174 | 296,43 | -103 | 590,39 | -32 | 874,32 | 39 | 1151,55 | 110 | 1422,93 | 181 | 1688,48 |
| -173 | 300,67 | -102 | 594,45 | -31 | 878,27 | 40 | 1155,41 | 111 | 1426,71 | 182 | 1692,18 |
| -172 | 304,90 | -101 | 598,50 | -30 | 882,22 | 41 | 1159,27 | 112 | 1430,49 | 183 | 1695,88 |
| -171 | 309,13 | -100 | 602,56 | -29 | 886,16 | 42 | 1163,13 | 113 | 1434,26 | 184 | 1699,58 |
| -170 | 313,35 | -99 | 606,61 | -28 | 890,10 | 43 | 1166,99 | 114 | 1438,04 | 185 | 1703,27 |
| -169 | 317,57 | -98 | 610,66 | -27 | 894,04 | 44 | 1170,85 | 115 | 1441,82 | 186 | 1706,96 |
| -168 | 321,79 | -97 | 614,71 | -26 | 897,98 | 45 | 1174,70 | 116 | 1445,59 | 187 | 1710,66 |
| -167 | 326,01 | -96 | 618,76 | -25 | 901,92 | 46 | 1178,56 | 117 | 1449,37 | 188 | 1714,35 |
| -166 | 330,22 | -95 | 622,80 | -24 | 905,86 | 47 | 1182,41 | 118 | 1453,14 | 189 | 1718,04 |
| -165 | 334,43 | -94 | 626,84 | -23 | 909,80 | 48 | 1186,27 | 119 | 1456,91 | 190 | 1721,73 |
| -164 | 338,64 | -93 | 630,88 | -22 | 913,73 | 49 | 1190,12 | 120 | 1460,68 | 191 | 1725,42 |
| -163 | 342,84 | -92 | 634,92 | -21 | 917,67 | 50 | 1193,97 | 121 | 1464,45 | 192 | 1729,10 |
| -162 | 347,04 | -91 | 638,96 | -20 | 921,60 | 51 | 1197,82 | 122 | 1468,22 | 193 | 1732,79 |
| -161 | 351,24 | -90 | 643,00 | -19 | 925,53 | 52 | 1201,67 | 123 | 1471,98 | 194 | 1736,48 |
| -160 | 355,43 | -89 | 647,03 | -18 | 929,46 | 53 | 1205,52 | 124 | 1475,75 | 195 | 1740,16 |
| -159 | 359,63 | -88 | 651,06 | -17 | 933,39 | 54 | 1209,36 | 125 | 1479,51 | 196 | 1743,84 |
| -158 | 363,82 | -87 | 655,09 | -16 | 937,32 | 55 | 1213,21 | 126 | 1483,28 | 197 | 1747,52 |
| -157 | 368,00 | -86 | 659,12 | -15 | 941,24 | 56 | 1217,05 | 127 | 1487,04 | 198 | 1751,20 |
| -156 | 372,19 | -85 | 663,15 | -14 | 945,17 | 57 | 1220,90 | 128 | 1490,80 | 199 | 1754,88 |
| -155 | 376,37 | -84 | 667,17 | -13 | 949,09 | 58 | 1224,74 | 129 | 1494,56 | 200 | 1758,56 |
| -154 | 380,55 | -83 | 671,20 | -12 | 953,02 | 59 | 1228,58 | 130 | 1498,32 | 201 | 1762,24 |
| -153 | 384,72 | -82 | 675,22 | -11 | 956,94 | 60 | 1232,42 | 131 | 1502,08 | 202 | 1765,91 |
| -152 | 388,89 | -81 | 679,24 | -10 | 960,86 | 61 | 1236,26 | 132 | 1505,83 | 203 | 1769,59 |
| -151 | 393,06 | -80 | 683,25 | -9 | 964,78 | 62 | 1240,09 | 133 | 1509,59 | 204 | 1773,26 |
| -150 | 397,23 | -79 | 687,27 | -8 | 968,70 | 63 | 1243,93 | 134 | 1513,34 | 205 | 1776,93 |
| -149 | 401,40 | -78 | 691,29 | -7 | 972,61 | 64 | 1247,77 | 135 | 1517,10 | 206 | 1780,60 |
| -148 | 405,56 | -77 | 695,30 | -6 | 976,53 | 65 | 1251,60 | 136 | 1520,85 | 207 | 1784,27 |
| -147 | 409,72 | -76 | 699,31 | -5 | 980,44 | 66 | 1255,43 | 137 | 1524,60 | 208 | 1787,94 |
| -146 | 413,88 | -75 | 703,32 | -4 | 984,36 | 67 | 1259,26 | 138 | 1528,35 | 209 | 1791,61 |
| -145 | 418,03 | -74 | 707,33 | -3 | 988,27 | 68 | 1263,09 | 139 | 1532,10 | 210 | 1795,28 |
| -144 | 422,18 | -73 | 711,34 | -2 | 992,18 | 69 | 1266,92 | 140 | 1535,84 | 211 | 1798,94 |
| -143 | 426,33 | -72 | 715,34 | -1 | 996,09 | 70 | 1270,75 | 141 | 1539,59 | 212 | 1802,60 |
| -142 | 430,48 | -71 | 719,34 | 0 | 1000,00 | 71 | 1274,58 | 142 | 1543,33 | 213 | 1806,27 |
| -141 | 434,62 | -70 | 723,35 | 1 | 1003,91 | 72 | 1278,40 | 143 | 1547,08 | 214 | 1809,93 |
| -140 | 438,76 | -69 | 727,35 | 2 | 1007,81 | 73 | 1282,23 | 144 | 1550,82 | 215 | 1813,59 |
| -139 | 442,90 | -68 | 731,34 | 3 | 1011,72 | 74 | 1286,05 | 145 | 1554,56 | 216 | 1817,25 |
| -138 | 447,04 | -67 | 735,34 | 4 | 1015,62 | 75 | 1289,87 | 146 | 1558,30 | 217 | 1820,91 |
| -137 | 451,17 | -66 | 739,34 | 5 | 1019,53 | 76 | 1293,70 | 147 | 1562,04 | 218 | 1824,56 |
| -136 | 455,31 | -65 | 743,33 | 6 | 1023,43 | 77 | 1297,52 | 148 | 1565,78 | 219 | 1828,22 |
| -135 | 459,44 | -64 | 747,32 | 7 | 1027,33 | 78 | 1301,33 | 149 | 1569,52 | 220 | 1831,88 |
| -134 | 463,56 | -63 | 751,31 | 8 | 1031,23 | 79 | 1305,15 | 150 | 1573,25 | 221 | 1835,53 |
| -133 | 467,69 | -62 | 755,30 | 9 | 1035,13 | 80 | 1308,97 | 151 | 1576,99 | 222 | 1839,18 |
| -132 | 471,81 | -61 | 759,29 | 10 | 1039,03 | 81 | 1312,78 | 152 | 1580,72 | 223 | 1842,83 |
| -131 | 475,93 | -60 | 763,28 | 11 | 1042,92 | 82 | 1316,60 | 153 | 1584,45 | 224 | 1846,48 |
| -130 | 480,05 | -59 | 767,26 | 12 | 1046,82 | 83 | 1320,41 | 154 | 1588,18 | 225 | 1850,13 |
| -129 | 484,16 | -58 | 771,25 | 13 | 1050,71 | 84 | 1324,22 | 155 | 1591,91 | 226 | 1853,78 |
| -128 | 488,28 | -57 | 775,23 | 14 | 1054,60 | 85 | 1328,03 | 156 | 1595,64 | 227 | 1857,43 |
| -127 | 492,39 | -56 | 779,21 | 15 | 1058,49 | 86 | 1331,84 | 157 | 1599,37 | 228 | 1861,07 |
| -126 | 496,49 | -55 | 783,19 | 16 | 1062,38 | 87 | 1335,65 | 158 | 1603,09 | 229 | 1864,72 |

| Temper. [°C] | Resist. [W] | Temper. [°C] | Resist. [W] | Temper. [°C] | Resist. [W] | Temper. [°C] | Resist. [W] | Temper. [°C] | Resist. [W] | Temper. [°C] | Resist. [W] |
|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|--------------|-------------|
| 230 | 1868,36 | 281 | 2052,63 | 332 | 2233,90 | 383 | 2412,17 | 434 | 2587,43 | 485 | 2759,68 |
| 231 | 1872,00 | 282 | 2056,22 | 333 | 2237,43 | 384 | 2415,63 | 435 | 2590,83 | 486 | 2763,03 |
| 232 | 1875,64 | 283 | 2059,80 | 334 | 2240,95 | 385 | 2419,10 | 436 | 2594,24 | 487 | 2766,38 |
| 233 | 1879,28 | 284 | 2063,38 | 335 | 2244,47 | 386 | 2422,56 | 437 | 2597,64 | 488 | 2769,72 |
| 234 | 1882,92 | 285 | 2066,96 | 336 | 2247,99 | 387 | 2426,02 | 438 | 2601,05 | 489 | 2773,07 |
| 235 | 1886,56 | 286 | 2070,54 | 337 | 2251,51 | 388 | 2429,48 | 439 | 2604,45 | 490 | 2776,41 |
| 236 | 1890,19 | 287 | 2074,11 | 338 | 2255,03 | 389 | 2432,94 | 440 | 2607,85 | 491 | 2779,75 |
| 237 | 1893,83 | 288 | 2077,69 | 339 | 2258,55 | 390 | 2436,40 | 441 | 2611,25 | 492 | 2783,09 |
| 238 | 1897,46 | 289 | 2081,27 | 340 | 2262,06 | 391 | 2439,86 | 442 | 2614,65 | 493 | 2786,43 |
| 239 | 1901,10 | 290 | 2084,84 | 341 | 2265,58 | 392 | 2443,31 | 443 | 2618,04 | 494 | 2789,77 |
| 240 | 1904,73 | 291 | 2088,41 | 342 | 2269,09 | 393 | 2446,77 | 444 | 2621,44 | 495 | 2793,11 |
| 241 | 1908,36 | 292 | 2091,98 | 343 | 2272,60 | 394 | 2450,22 | 445 | 2624,83 | 496 | 2796,44 |
| 242 | 1911,99 | 293 | 2095,55 | 344 | 2276,12 | 395 | 2453,67 | 446 | 2628,23 | 497 | 2799,78 |
| 243 | 1915,62 | 294 | 2099,12 | 345 | 2279,63 | 396 | 2457,13 | 447 | 2631,62 | 498 | 2803,11 |
| 244 | 1919,24 | 295 | 2102,69 | 346 | 2283,14 | 397 | 2460,58 | 448 | 2635,01 | 499 | 2806,44 |
| 245 | 1922,87 | 296 | 2106,26 | 347 | 2286,64 | 398 | 2464,03 | 449 | 2638,40 | 500 | 2809,78 |
| 246 | 1926,49 | 297 | 2109,82 | 348 | 2290,15 | 399 | 2467,47 | 450 | 2641,79 | | |
| 247 | 1930,12 | 298 | 2113,39 | 349 | 2293,66 | 400 | 2470,92 | 451 | 2645,18 | | |
| 248 | 1933,74 | 299 | 2116,95 | 350 | 2297,16 | 401 | 2474,37 | 452 | 2648,57 | | |
| 249 | 1937,36 | 300 | 2120,52 | 351 | 2300,66 | 402 | 2477,81 | 453 | 2651,95 | | |
| 250 | 1940,98 | 301 | 2124,08 | 352 | 2304,17 | 403 | 2481,25 | 454 | 2655,34 | | |
| 251 | 1944,60 | 302 | 2127,64 | 353 | 2307,67 | 404 | 2484,70 | 455 | 2658,72 | | |
| 252 | 1948,22 | 303 | 2131,20 | 354 | 2311,17 | 405 | 2488,14 | 456 | 2662,10 | | |
| 253 | 1951,83 | 304 | 2134,75 | 355 | 2314,67 | 406 | 2491,58 | 457 | 2665,48 | | |
| 254 | 1955,45 | 305 | 2138,31 | 356 | 2318,16 | 407 | 2495,02 | 458 | 2668,86 | | |
| 255 | 1959,06 | 306 | 2141,87 | 357 | 2321,66 | 408 | 2498,45 | 459 | 2672,24 | | |
| 256 | 1962,68 | 307 | 2145,42 | 358 | 2325,16 | 409 | 2501,89 | 460 | 2675,62 | | |
| 257 | 1966,29 | 308 | 2148,97 | 359 | 2328,65 | 410 | 2505,33 | 461 | 2679,00 | | |
| 258 | 1969,90 | 309 | 2152,52 | 360 | 2332,14 | 411 | 2508,76 | 462 | 2682,37 | | |
| 259 | 1973,51 | 310 | 2156,08 | 361 | 2335,64 | 412 | 2512,19 | 463 | 2685,74 | | |
| 260 | 1977,12 | 311 | 2159,62 | 362 | 2339,13 | 413 | 2515,62 | 464 | 2689,12 | | |
| 261 | 1980,73 | 312 | 2163,17 | 363 | 2342,62 | 414 | 2519,06 | 465 | 2692,49 | | |
| 262 | 1984,33 | 313 | 2166,72 | 364 | 2346,10 | 415 | 2522,48 | 466 | 2695,86 | | |
| 263 | 1987,94 | 314 | 2170,27 | 365 | 2349,59 | 416 | 2525,91 | 467 | 2699,23 | | |
| 264 | 1991,54 | 315 | 2173,81 | 366 | 2353,08 | 417 | 2529,34 | 468 | 2702,60 | | |
| 265 | 1995,14 | 316 | 2177,36 | 367 | 2356,56 | 418 | 2532,77 | 469 | 2705,97 | | |
| 266 | 1998,75 | 317 | 2180,90 | 368 | 2360,05 | 419 | 2536,19 | 470 | 2709,33 | | |
| 267 | 2002,35 | 318 | 2184,44 | 369 | 2363,53 | 420 | 2539,62 | 471 | 2712,70 | | |
| 268 | 2005,95 | 319 | 2187,98 | 370 | 2367,01 | 421 | 2543,04 | 472 | 2716,06 | | |
| 269 | 2009,54 | 320 | 2191,52 | 371 | 2370,49 | 422 | 2546,46 | 473 | 2719,42 | | |
| 270 | 2013,14 | 321 | 2195,06 | 372 | 2373,97 | 423 | 2549,88 | 474 | 2722,78 | | |
| 271 | 2016,74 | 322 | 2198,60 | 373 | 2377,45 | 424 | 2553,30 | 475 | 2726,14 | | |
| 272 | 2020,33 | 323 | 2202,13 | 374 | 2380,93 | 425 | 2556,72 | 476 | 2729,50 | | |
| 273 | 2023,93 | 324 | 2205,67 | 375 | 2384,40 | 426 | 2560,13 | 477 | 2732,86 | | |
| 274 | 2027,52 | 325 | 2209,20 | 376 | 2387,88 | 427 | 2563,55 | 478 | 2736,22 | | |
| 275 | 2031,11 | 326 | 2212,73 | 377 | 2391,35 | 428 | 2566,96 | 479 | 2739,57 | | |
| 276 | 2034,70 | 327 | 2216,26 | 378 | 2394,82 | 429 | 2570,38 | 480 | 2742,93 | | |
| 277 | 2038,29 | 328 | 2219,79 | 379 | 2398,29 | 430 | 2573,79 | 481 | 2746,28 | | |
| 278 | 2041,88 | 329 | 2223,32 | 380 | 2401,76 | 431 | 2577,20 | 482 | 2749,63 | | |
| 279 | 2045,46 | 330 | 2226,85 | 381 | 2405,23 | 432 | 2580,61 | 483 | 2752,98 | | |
| 280 | 2049,05 | 331 | 2230,38 | 382 | 2408,70 | 433 | 2584,02 | 484 | 2756,33 | | |

Tab. 11.a

12. PTC TECHNICAL SPECIFICATIONS

12.1 Models PTC0150000 – PTC0600000

| | |
|---|--|
| Storage conditions | 0T150 °C |
| Operating range | 0T150 °C |
| Connections | Stripped ends, dimensions 6±1mm |
| Sensor | SEN.KTY81/121-20/5 |
| Precision | ± 2 °C; 0T50 °C; ± 3 °C; -50T90 °C; ± 4 °C; 90T120 °C. |
| Dissipation factor (in air) | 3 mW |
| Thermal constant over time (in air) | ca. 15 s |
| Cable | Silicone |
| Sensitive element index of protection | IP65 |
| Sensitive element housing | Dim. 40x6 mm |
| Classification according to protection against electric shock (sensitive element and cable) | Basic insulation for 250 Vac |
| Insulation resistance at 500 Vdc | >20 MOhm |
| Dielectric strength | 2000 Vac |

Tab. 12.b

12.2 Models PTC015W000 - PTC060W000 - PTC060WA00

| | |
|---|--|
| Storage conditions | -50T100 °C |
| Operating range | -50T100 °C |
| Connections | Stripped ends, dimensions 6±1mm |
| Sensor | SEN.KTY81/121-20/5 |
| Precision | ± 2 °C; 0T50 °C; ± 3 °C; -50T90 °C; ± 4 °C; 90T120 °C. |
| Dissipation factor (in air) | 3 mW |
| Thermal constant over time (in air) | ca. 15 s |
| Cable | Siliconico |
| Sensitive element index of protection | IP67 |
| Sensitive element housing | Dim. 40x6 mm - 180x6 mm (PTC060WA00) |
| Classification according to protection against electric shock (sensitive element and cable) | Basic insulation for 250 Vac |
| Insulation resistance at 500 Vdc | >20 mOhm |
| Dielectric strength | 2000 Vac |

Tab. 12.c

12.3 Models PTC03000W1 - PTC03003000D1 - PTC03000G1

| | | |
|---|--|------------------|
| Storage conditions | -30T105 °C | |
| Operating range | PTC03000W1 | Range -30*105 °C |
| | PTC03000D1 | Range -30*105 °C |
| | PTC03000G1 | Range -50*120 °C |
| Connections | Stripped ends, dimensions 6±1mm | |
| Sensor | SEN.KTY81/121-20/5 | |
| Precision | ± 2 °C; 0T50 °C; ± 3 °C; -50T90 °C; ± 4 °C; 90T120 °C | |
| Dissipation factor (in air) | 3 m | |
| Thermal constant over time (in air) | approx. 15 s | |
| Cable | Black PVC (PTC03000D1) Grey silicone (PTC03000G1) White PVC (PTC03000W1) | |
| Sensitive element index of protection | IP67 | |
| Sensitive element housing | Dim. 40x6 mm | |
| Classification according to protection against electric shock (sensitive element & cable) | Basic insulation for 250 Vac | |
| Insulation resistance at 500 Vdc | >20 mOhm | |
| Dielectric strength | 2000 Vac | |

Tab. 12.d

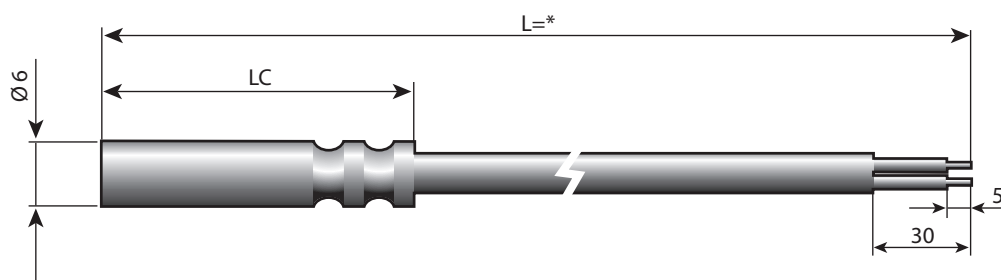


Fig. 12.b

* = see table of product codes in price list

Accessories

- Socket: nickel-coated brass - 1413306AXX

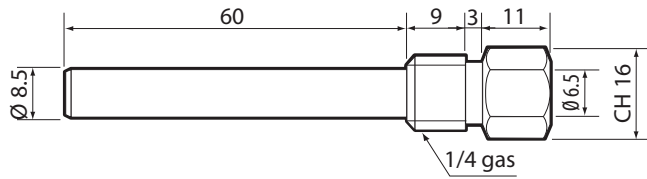


Fig. 12.c

Maximum operating pressure 35 bar
Temperature -20...95°C

- Socket 2: AISI 316 - code 1413309AXX

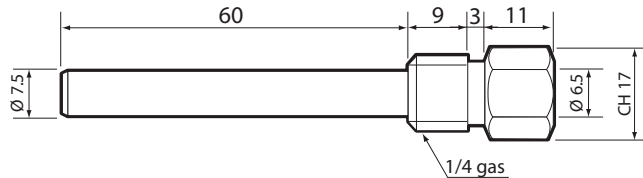


Fig. 12.d

Maximum operating pressure 40 bar
Temperature -20...95°C



Note:

- cable secured with PG7 - IP68 cable gland applied to hexagonal end
- kit available complete with socket and cable gland
- Compression fitting with metal olive - code 1309589AXX

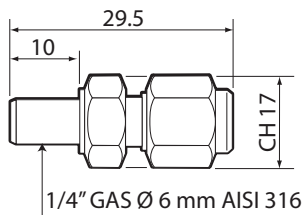


Fig. 12.e

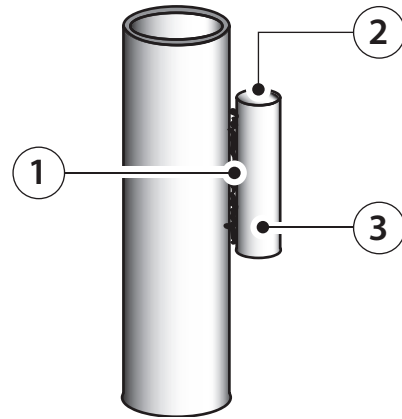
Maximum operating pressure 40 bars
Temperature -50 to 250°C

13. TEMPERATURE SENSOR INSTALLATION INSTRUCTIONS

1



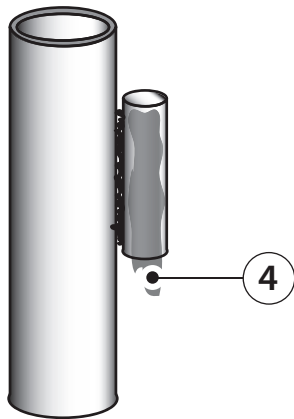
2



- 1. welding of socket to pipe
- 2. closed end of socket at top
- 3. tubular section ID 6 mm - min. length 70 mm

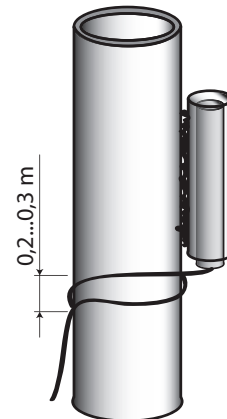
Weld the socket so as to create good thermal contact.

3



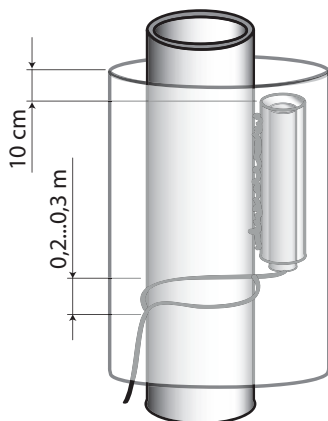
- 4. conductive paste
- Fill the socket with conductive paste.

4



- Insert the sensor completely into the socket.
- Wrap 0.2-0.3 m of cable around the pipe.

5



Make sure the contact area is thermally insulated.



Note: if installing on a horizontal pipe, the same precautions apply, however without restrictions for the closed end of the socket.

14. LIGHT SENSOR TECHNICAL SPECIFICATIONS

14.1 Models PSOPZLHT00

| | |
|------------------------------------|---|
| Storage conditions | -20T70 °C |
| Operating range elemento sensibile | -20T70 °C |
| Sensor | Perkin Elmer optoelectronics A906011 sensor |
| Capsule material | Transparent polypropylene with epoxy resin |
| Cable | Black PVC diam 4.6 mm |
| Power and output connections | Stripped ends, dimensions 6±1mm |
| Insulation resistance | 20 Mohm 500 V |
| Dielectric strength | 2000 Vac |
| Sensitive element housing | Transparent polypropylene |
| Sensitive element housing | Dim. 7x26 mm |

Tab. 14.e



Fig. 14.a

14.2 Sensitive element specifications

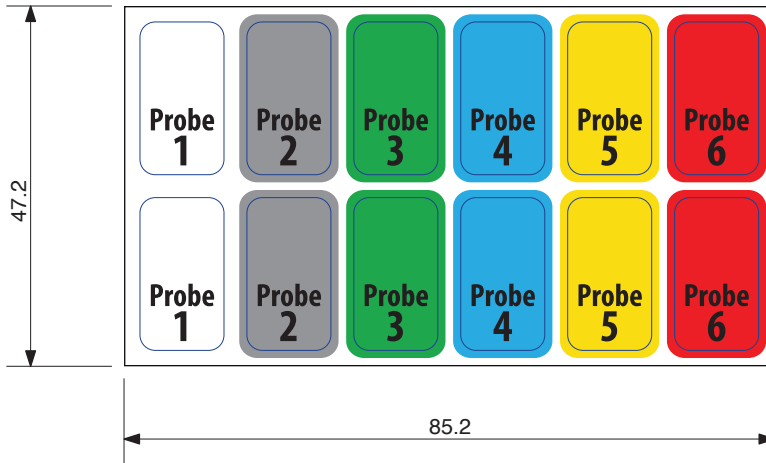
| Type | R10 | R100 | R01 | R05 | Vmax | Pmax | γ10/100 | λpeak |
|-----------|--------|---------|--------|--------|------|------|---------|-------|
| unit | KΩ | KΩ typ. | M Ωmin | MΩ min | V | mW | typ | nm |
| A 9060 11 | 9...20 | 3,5 | 0,06 | 0,18 | 150 | 90 | 0,65 | 600 |

Tab. 14.a

15. ACCESSORIES

Coloured labels to be applied to the end of the sensors and simplify connection to the controller for installers

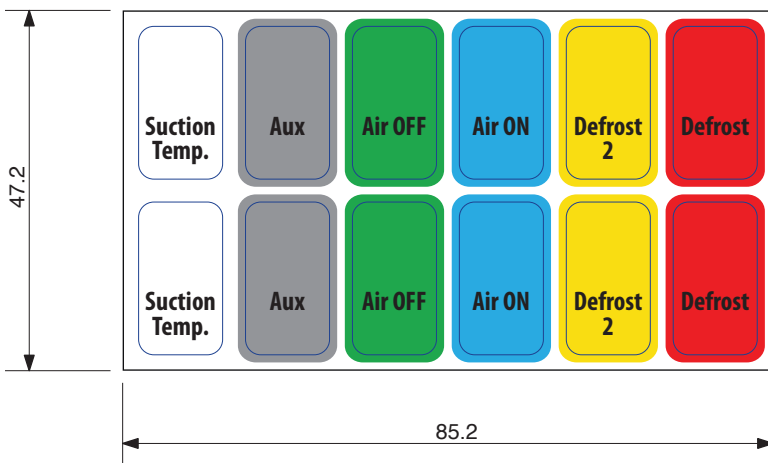
For refrigeration applications



Cod. 62C588A005

Fig. 15.a

For general applications



Cod. 62C588A006

Fig. 15.b

Example



Fig. 15.c

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CAREL INDUSTRIES - Headquarters
Via dell'Industria, 11 - 35020 Brugine - Padova (Italy)
Tel. (+39) 049.9716611 - Fax (+39) 049.9716600
e-mail: carel@carel.com - www.carel.com

Agenzia / Agency: