Thermocouple / RTD with Fabricated Thermowell
PCI-CTT

'Quality Matters'



Application

- For medium pressures, fluid velocities, and temperatures
- When screwed thermowells are needed (with optional flange mounting)
- Suitable for installation on pipes, as well as open or closed vessels
- Designed for a variety of media, including vapours, gases, liquids, and non-abrasive substances
- Available in special versions certified for explosive environments (ATEX compliant)

These temperature sensor probes can be equipped with one or two resistance temperature detectors (RTDs) or thermocouples (TCs). Each probe comprises a temperature sensor (inset), a connection head, a lag extension, and a thermowell machined from solid bar stock.

The thermowells are designed for screwing into place or securing with a flange and, along with the lag extensions (forms 6 and 6F), adhere to the DIN 43772/T.2 standard. Insets can be easily replaced without removing the thermowell from the pipe or interrupting the process.

For use in explosive environments, versions are available that comply with the following standards:

- IEC/EN 60079-0: General requirements for electrical apparatus in potentially explosive atmospheres
- IEC/EN 60079-1: Flameproof enclosure “d”
- IEC/EN 60079-7: Increased safety “e”
- IEC/EN 60079-11: Intrinsic safety “i”
- IEC/EN 60079-31: Dust-proof apparatus “t”

The thermowell is designed to meet the required minimum wall thickness specifications.

Limiting temperatures for insets

The permissible operating temperature is typically defined by the maximum temperature allowed for the thermowell. The standard materials used are AISI 316 and INCONEL. Other materials and diameters are available upon request.

Limiting values for thermowells

The performance of these thermowells depends on factors such as temperature, pressure, medium velocity, immersion length, and the materials of both the thermowell and the medium.

For example, with an immersion length of 250 mm, the following temperature and pressure limits apply:

Gas / vapour (50 m/s): 100°C at 100 Bar to 400°C at 50 Bar
Fluid (5 m/s): 100°C at 100 Bar to 400°C at 50 Bar
The pressure rating of the flange must also be considered. For additional guidance, refer to DIN 43763.

For applications exceeding 400°C, each case must be evaluated individually. In critical operating conditions, calculations based on Dittrich or Murdock methods are recommended.

Thermowell materials: It is preferable to use the same material as that of the installation where the probe is mounted.

Connection head

An internal terminal board with a load spring is provided when an internal temperature transmitter is not installed.

Standard Head: is suitable for ambient temperatures ranging from -40°C to +100°C, with a degree of protection ranging from IP 54 to IP 65, depending on the configuration. The cable gland should be selected according to the cable entry requirements.

Exd Head: Made from injected aluminium casting, it offers a degree of protection rated at IP 65 for lag extensions with an integrated sealing compression fitting. The installation position is limited to a maximum of 60° from the vertical. When installed without a lag extension or when mounted with a connection head, the free length of the sheathed cable is restricted due to the weight of the head. The limits are as follows: 100 mm for cables with a diameter of 6 mm, and up to 200 mm for cables with a diameter of 1/2" (12.70 mm), depending on the mechanical conditions.

Operating position

Unrestricted, provided that the connection head is suitably remote from the heat source

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Immersion length

This is the depth to which the thermowell is immersed in the medium, measured from the tip. To minimise errors, the following minimum immersion lengths are Recommended:

Media	RTDs	Thermocouples
Gas/Vapour	175 mm	140 mm
Liquid	115 mm	85 mm

Response time

This is the time by which the reaction of the sensor lags the change in temperature;
t 0,5 time necessary for the variation in temperature to attain 50% of its total value.
t 0,9 time necessary for the variation in temperature to attain 90% of its total value.

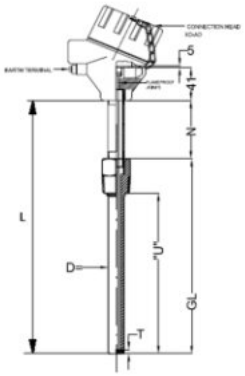
The response times given below apply only to RTDs. They are indicative only, and may vary by 30% or more. Thermocouples can have response times 10 to 25% shorter than RTDs:

Response time	In water approx. 0,2 m/s	In air approx. 1 m/s
t 0,5	48 s	400 s
t 0,9	140 s	1350 s

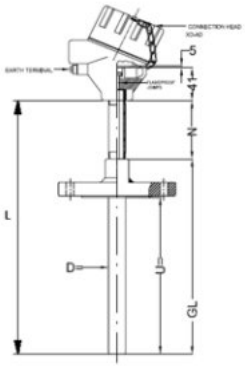
Relationship between nominal length "L" of temperature sensor, length "Li" of inset, and the corresponding insertion lengths "U":

Normal length L	Length of Inset Li	Insertion connection	Lengths U Flange
252 mm	275 mm	82 mm	61 mm
322 mm	345 mm	142 mm	121 mm
412 mm	435 mm	232 mm	211 mm
562 mm	585 mm	382 mm	361 mm

lag - Form 6



lag - Form 6F



Temperature Probes for Explosive Environments

The connection head and temperature sensor must be installed in Zone 1 or Zone 2 (Class 1 Div. 1 or Class 1 Div. 2). Zone 0 (Class 1 Div. 1) must be separated from Zone 1 or Zone 2 using thermowells made of stainless steel with a minimum wall thickness of 1 mm (3 mm or more for other types of steel). PCI assumes no liability for applications that fail to comply with regulations or recommendations for explosive environments.

Type of protection "flameproof enclosure", for Ex-d/Ext execution:

The certified system comprises the whole temperature assembly: an Exd connection head, a lag extension and an insert. The sensor marking plate gives directions on use of the probes in explosive environments. No particular restrictions apply to the measuring circuits. The eventual limitations are indicated on the safety instructions. The connection head is provided with ground terminals.

Type of protection "intrinsic safety Exi"

The normative IEC/EN 60079-11 consider the temperature sensors "simple apparatus". They must be connected to the safe area by means of certified safety barrier. They have "EC" Type certification by external-body.
The temperature sensor is fitted with one or two measuring circuits. These are tested for dielectric strength by applying 500 VAC between the circuit(s) and ground, and between the measuring circuits themselves. The sensor marking plate gives directions on use of the probes in intrinsic safety measuring circuits.

Options:

Temperature probes can be customised with temperature transmitters, either mounted directly into the connection head or remotely, including:

- Analog
- Digital SMART "HART"® or "PROFIBUS"®

How to order

Specify: model, type of sensor, range, type of thermowell and dimension of process connection, options if any
Example: model PCI-CTT-Thermocouple-0/100- 6F-1"ANSI 150 barstock U=200mm