

Thermo-Sensor

Installation, handling and operation

Storage

The measuring insets should remain in its original packing until installation.

Storage temperature should not exceed -20 °C or $+60\text{ °C}$, unless specified otherwise. Consult the data sheet of the corresponding model.

Installation of RTD Assemblies

Using RTD assemblies, sufficient immersion length must be provided in order to avoid cool-down errors. Cool-down errors happen when the heat is conducted away from the sensing element what causes the RTD to indicate a lower temperature than the one of the medium. Good results can be obtained by applying the following suggestions:

- in water and generally in liquids, the immersion length should be 5-6 times the outer diameter of the thermowell (protection tube) plus the length of the sensing element (about 50 mm);
- in steam, air and gases, the immersion length should be 10-15 times the outer diameter of the thermowell plus the length of the sensing element (about 50 mm).
- in case of installation where only a small immersion length can be allowed, it should be at least 1.5 times the length of the sensing element.

In pipes with small diameter, the most suited immersion length can often be achieved by installing the measuring inset at an elbow or a bend of the pipe. In this case, install the sensor assembly always against the flow (see **Fig. 1**).

Figure 2 shows typical setups for reducing the cool-down errors.

Table 1 presents typical immersion lengths for different pipe sizes. The indicated values serve only as general guideline.

Installation of TC assemblies

Installing thermocouples, it should always be taken into account that the generated EMF (mV) depends upon the temperature difference between the measuring point (hot junction) and the reference junction (cold junction). Thus to determine the temperature at the measuring point, not only the generated EMF is needed, but also the temperature at the reference junction.

The selection of the location for the thermocouple depends on the equipment or medium. Direct flame impingement on the thermocouple, for example, does not provide a representative temperature.

Evaporation, diffusion, oxidation, corrosion and contamination induce an EMF drift. It is essential that proper protection is provided whenever adverse conditions are encountered.

Errors in temperature can occur when the thermocouple is connected to the reference junction with an inappropriate cable. This "Cold-end error" is increasing with the difference in temperature between both ends of this cable.

To overcome this "Cold-end error", the thermocouple has to be connected to the reference junction either directly or by using a compensating cable. Compensation cables are made from alloys with similar thermoelectrical characteristics.

Both the thermocouple and the compensating cable should be cleaned before fastening in a terminal block to assure good electrical contact.

Using thermocouples, sufficient immersion length must be provided in order to avoid cool-down errors. Cool-down errors happen when the heat is conducted away from the hot junction what causes the thermocouple to indicate a lower temperature than the one of the medium.

As general rule a minimum immersion length of 10 times the outside diameter of the thermowell (protection tube) should be used.

The change of the immersion length of the thermocouple should be avoided because it causes inhomogeneities in wires due to evaporation and corrosion. This alters the thermocouple output and produces reading errors.

For maximum accuracy, a thermocouple should be used on one single temperature, or on successively higher temperature only. For various reasons, however, this procedure cannot always be respected.

Errors which arise from cyclic heating are similar to those generated by changes in immersion length and may range from two or three °C for thermocouples in good condition, to many °C for badly corroded couples.

Maintenance

Thermoresistance, thermocouples, wires circuits and thermowells should be checked regularly. Experience largely determines the frequency of inspection, but once a month is usually sufficient. Check the extension wire circuit to make sure that it meets the corresponding sensor.

Damaged or burned out thermowells (protection tubes) should be replaced to prevent damage to the measuring inset.

Thermoresistance and Thermocouples should be checked and calibrated in place, if possible.

Technical information for execution SIL2 sensor type S... and temperature transmitters S95 ...

When the execution is SIL2, the failure probability is calculated over 10 years and it must be replaced after 10 years.

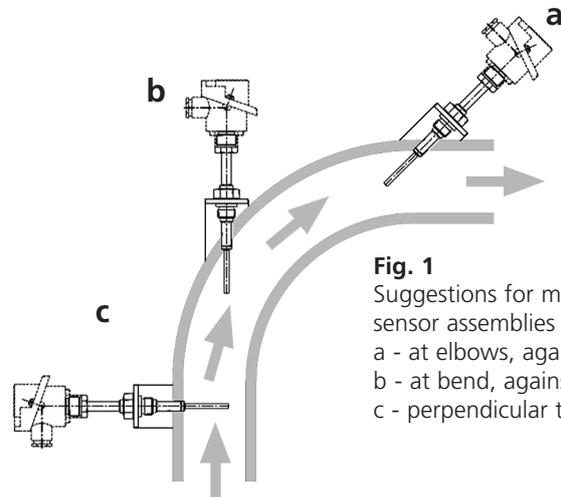


Fig. 1
Suggestions for mounting sensor assemblies on small pipes:
a - at elbows, against flow
b - at bend, against flow
c - perpendicular to the flow

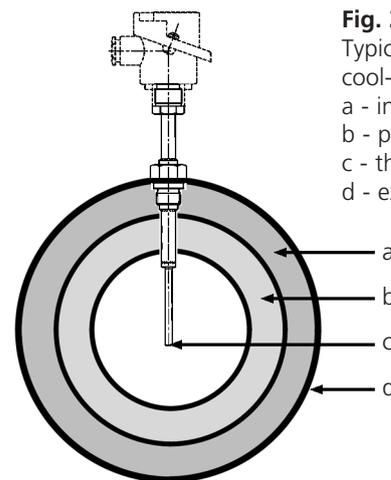


Fig. 2
Typical setup for reducing cool-down errors:
a - insulation material
b - pipe
c - thermowell (protection tube)
d - external skin of insulation

Table 1

Recommended immersion length (L) dependent on the nominal diameter (DN) of pipe. For general guidance only.

Table 1
Nominal diameter of piping (mm)

DN (mm)	50	75	100	150	200	300	400
L (mm)	30	40	50	60	80	100	120

Recommended immersion length (mm)

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