

For proper operation of your instrument, please read all instructions carefully before installing.

FM Intrinsically Safe and Non-Incendive product marking for all assemblies

IS / I / 1 / ABCD / T6*, Ta = -55°C to +40°C*; Entity
NI / I / 2 / ABCD / T6*, Ta = -55°C to +40°C*; NIFW



FM21US0021X and FM21CA0013X

*See installation drawing S00 00-090 for other
T-class / Ta range and Specific Conditions of Use

FM Explosion Proof product marking for S50 & S70 assemblies



Type:

Insert: Input:

Serial .
Number .

Date:

Class I, Division 1, Groups B, C, D T6

T4 Ta = -40°C to 80°C

T6 Ta = -40°C to 60°C



FM21US0021X and FM21CA0013X

Seal within 18 inches

Do not open when explosive atmosphere may be present

FM Explosion Proof product marking for S96 assemblies



Type:

Insert: Input:

Serial .
Number .

Date:

Class I, Division 1, Groups B, C, D T6

T4 Ta = -20°C to 60°C

T6 Ta = -20°C to 40°C



FM21US0021X and FM21CA0013X

Seal within 18 inches

Do not open when explosive atmosphere may be present

Use

The product consists of a sensor element (PT100 RTD or thermocouple) in an insulated mineral cable, which should be equipped with an aluminium alloy or stainless steel connection head. This product is suitable for application between -200°C to +1200°C with an accuracy class depending on sensor element (RTD or TC) as per IEC 60751 or IEC 60584

Installation of RTD Assemblies

Using RTD assemblies, sufficient immersion length must be provided 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.

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.

Mounting instructions for execution sensor type S

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 (fig. 1)

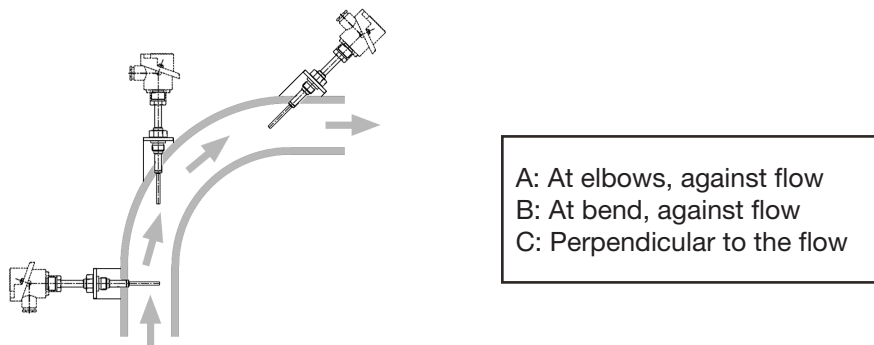


Figure 1: Installation for pipes with small diameter

Typical suggested setup for reducing the cool-down errors (fig.2)

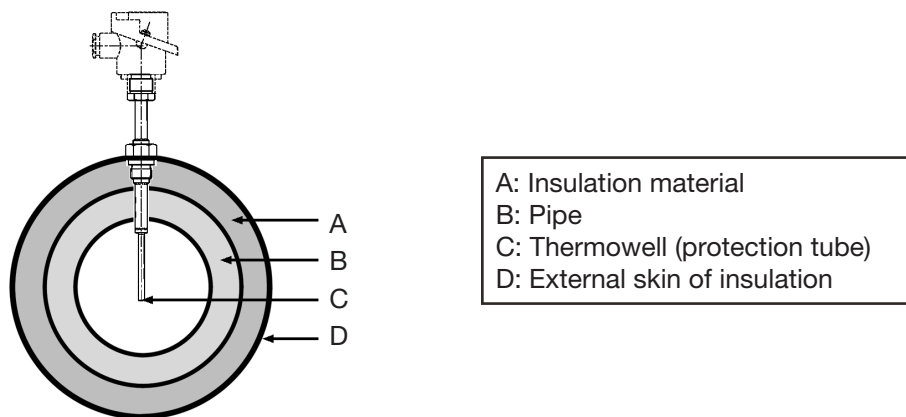


Figure 2: To reduce the cool-down errors

The recommended immersion length (L) depends on the nominal diameter (DN) of the pipe as indicated in the 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

Table 1: Recommended immersion length (mm)

The indicated values serve only as general guideline.

Notes:

- No special start-up conditions needed
- No special assembly or disassembly tools needed

Training instructions

People must be qualified to work on installation in hazardous class and division areas

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

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

Maintenance

Thermo-resistance, 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 insert.

Thermo-resistance and Thermocouples should be checked and calibrated in place, if possible.

Storage

The measuring inserts should remain in its original packing until installation. Storage temperature should not exceed - 20 °C or + 60 °C, unless specified otherwise. Consult the data sheet of the corresponding model.

Additional information for FM Intrinsically Safe & Non-Incendice certification

Electrical parameters

Entity/ NIFW Parameters:

$U_i < 30\text{Vdc}$, $I_i < 100\text{mA}$, $P_i < 0.75\text{W}$,

$L_i = 4.75\mu\text{H/foot}$, $C_i = 85.34\text{pF/foot}$.

Pressure parameters

The sensors are never installed into pressurised area without thermowell

Ambient temperatures

IS / I / 1 / ABCD/ T4, $T_a = -55^\circ\text{C}$ to 80°C - Exi; Entity

NI / I / 2 / ABCD / T4, $T_a = -55^\circ\text{C}$ to 80°C - Exi; NIFW

IS / I / 1 / ABCD/ T5, $T_a = -55^\circ\text{C}$ to 55°C - Exi; Entity

NI / I / 2 / ABCD / T5, $T_a = -55^\circ\text{C}$ to 55°C - Exi; NIFW

IS / I / 1 / ABCD/ T6, $T_a = -55^\circ\text{C}$ to 40°C - Exi; Entity

NI / I / 2 / ABCD / T6, $T_a = -55^\circ\text{C}$ to 40°C - Exi; NIFW

Maximum surface temperature on the connection head depending on the process temperature

Process temperature	400°C / 752°F	700°C / 1292°F
Surface temperature	34°C / 93.2°F	41°C / 105.8°F

Specific conditions of use

Some versions of the temperature probes or enclosures contains aluminium and are considered to present a potential risk of ignition by impact or friction. Care must be taken into account to prevent against impact or friction when installed in a Division 1 or Zone 0 location.

The maximum permitted ambient temperature of the temperature Probe Head is 80°C. To avoid the effects of process temperature and other thermal effects, care shall be taken to ensure that the temperature of the probe head does not exceed an ambient temperature of 40°C, 55°C, or 80°C as applicable.

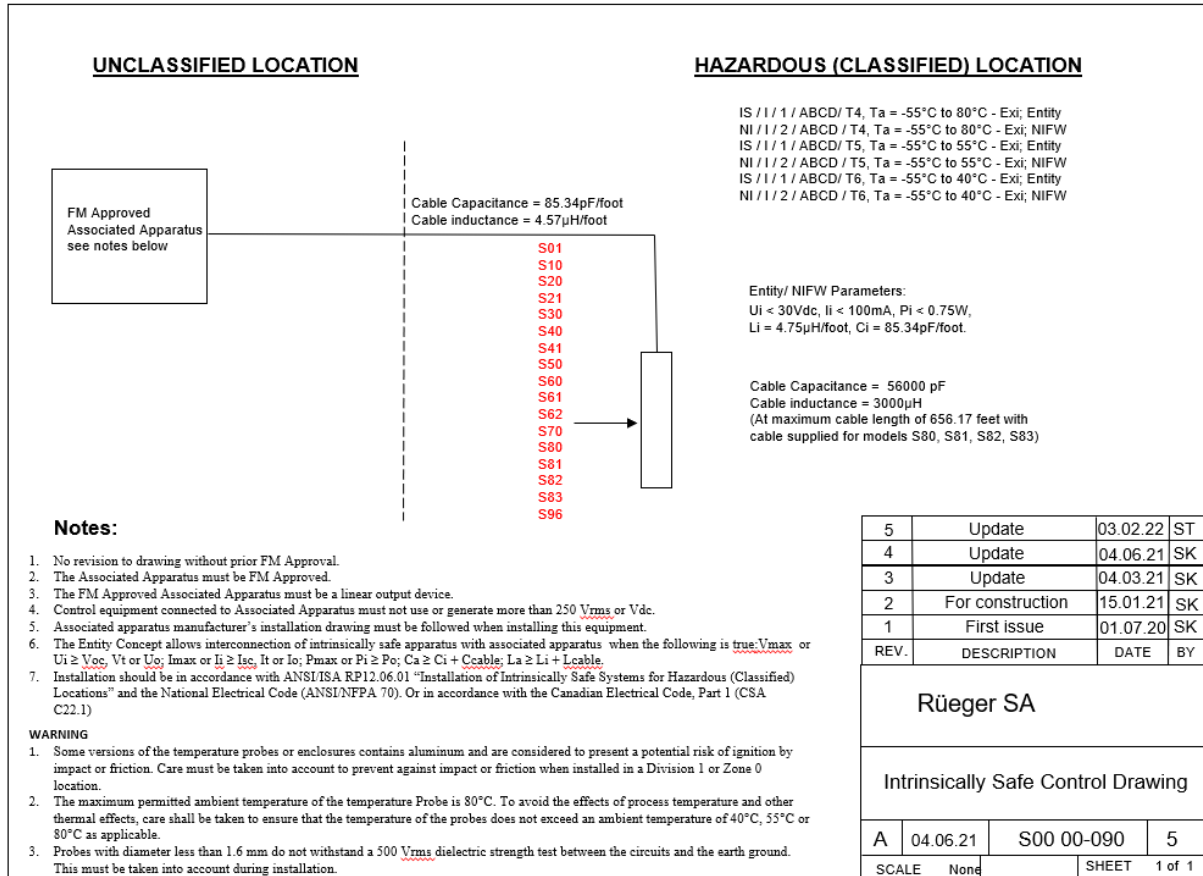
Some versions of the temperature probes do not withstand a 500Vrms dielectric strength test between the circuits and the earth ground. This must be taken into account during installation.

Thermowells are accessories and sold separately accordingly with specific standards, not included in sensors certification.

The sensors are never installed into pressurised area without thermowell.

Probes mounted in thermowells are to have thread engagement of 5 full turns wrench tight

Intrinsically Safe Control Drawing



Additional information for FM Explosion Proof certification for S50, S70 & S96 assemblies

Specific conditions of use

Refer to the manufacturer's instructions to reduce the potential of an electrostatic charging hazard on the equipment enclosure.

For ambient temperatures $\geq 60^{\circ}\text{C}$ (140 °F), use heat-resistant cables suitable for an ambient temperature at least 20°C (68°F) higher.

All models are to be mounted within thermowells suitably rated for the application they are used

Suitably rated thermowells are to have thread engagement of 5 full turns wrench tight.

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