

Installation, Operation & Maintenance Manual for Filled



Thermometer

Reference Standards
EN 13190
Dial Thermometers

1. Safety Instructions

The appropriate national safety regulations must be observed when installing, commissioning and operating these devices.

- ++ Do not work on gauges with alarm contacts unless the power has been isolated.
- ++ Serious injury and/or damage can occur if the appropriate regulations are not observed.
- ++ Only appropriately qualified personnel should work on these instruments.

2. Description

Gas actuated thermometers consist of a stem, a capillary and a case containing the bourdon tube element. These components are connected to form a single system. The complete measuring system is filled with an inert gas under pressure. Any temperature variation causes a change in the internal pressure of the stem, leading to a deflection of the bourdon tube. A mechanical linkage (movement) transmits this deflection to the pointer. Variations in the ambient temperature acting on the case are compensated for by a bimetal element mounted between the movement and the bourdon tube.

Strataa Controls Inc. gas actuated thermometers are available for temperature ranges from -80 °C to +600 °C with an accuracy complying with Class 1 of EN 13190.

3. Installation conditions and installations

++ Before installing the probe, check whether the probe material used (specified in the delivery note) is chemically resistant/neutral to the medium being measured. This also applies to thermowells.
++ Ensure that all the necessary accessories for the mounting method ordered have been supplied e.g. instrument mounting brackets, clamp straps for panel mounting, contact adjustment buttons, etc..
The accessories will be either on the instrument or supplied in a separate bag, which in most cases will be attached to the thermometer.

3.1. Installation conditions

++ If possible, the entire length of the stem should be exposed to the temperature to be measured, but, if not, it should at least be the length of the active part (active length), which corresponds to the length of the gas expansion vessel.
++ In pipelines or other measuring points the temperature probe should be directed as far towards the flow as possible.
++ Heat conduction errors occur when the size, volume or area of the medium to be measured is very small, so that the temperature probe becomes noticeable as a thermal mass. Heat conduction errors may also occur when the insertion length is not sufficient, or when the instrument mounting fittings are attached to a good heat conductor (e.g. metal plates) and the temperature difference between them and the medium to be measured is very high.
++ The indicator case must be mounted free of shock and vibration.
If necessary, the indicator can be isolated from the measuring point e.g. by a flexible capillary between the two with the thermometer mounted on a suitable instrument mounting bracket.
If this is not possible, the following limits must not be exceeded:

Dry gauges:

Frequency range < 150 Hz
Acceleration < 0.7 g (7 m/s²)

Liquid-filled gauges:

Frequency range < 150 Hz
Acceleration < 4 g (40 m/s²)

The liquid filling must be checked on a regular basis.
The liquid level must not drop below 75 % of the gauge diameter.

High shock and vibration leads to indication errors, increased wear in the transmission mechanism and to fractures at welded and soldered joints.
In thermometers with integral contacts, the switches may chatter as a result of vibrations, which can lead to increased wear of the contacts and a shift in the contact set-point. By using magnetic snap-action contacts or slow-acting relays, the effects of shocks and vibrations on contact thermometers can be reduced, within certain limits.

3.2. Installation

When mounting a gauge with a screw fitting the sealing torque must not be applied through the case or terminal box but only with a suitable tool using the spanner flats provided for this purpose on the square connector shaft.



Installation using a spanner

1. Position the indicator as required, tighten the hexagon bolts and slotted screws, and finally tighten the lock nut or union nut firmly.
- ++ If a thermowell is used, the stem must not be allowed to touch the bottom of the thermowell.
- ++ Capillaries must be kink protected. The minimum bending radius for capillaries must not be less than 6 mm. Any kinks or discontinuities in the capillary may result in the failure of the instrument.
- ++ If the probe is installed in a location which is exposed to shock and vibration, it is essential that the capillary is coiled in several loops, and free of tension between the last attachment point and the probe. Any excess length should also be coiled into loops, as cutting the cable would make the instrument unserviceable.
- ++ Any welding or soldering of the capillary, as well as any permanent fastening of the capillary, must be avoided, as this can severely damage the capillary, and impair the operation of the instrument.

3.3 Ambient conditions

Unless the ingress protection of the thermometer's case is specifically identified in the order confirmation, the instrument must be protected from humid air and other aggressive atmospheres.

The ambient temperature at the indicator case should be between 0 °C ... + 40 °C in order to ensure the best possible measuring accuracy. Higher or lower ambient temperatures can lead to indication errors.

IP Ingress protection (EN 60 529 / IEC 529)
IP 65 / 66 / 67

4. Troubleshooting

Gas-actuated thermometers, both with and without contacts, are maintenance free instruments according to their basic design. As measuring instruments, their measuring accuracy should be checked at application-specific intervals. The wear condition of probes exposed to a permanent thermal stress (even if this stress is very low), of electromechanical contacts and of capillaries exposed to vibratory stress must be checked from time to time. If any visible damage is found, the instrument must be replaced.

5. Indicator Check

Indicator checks should only be carried out in comparison with a more accurate instrument or, if possible, with a calibrated instrument. The temperature during the check must remain constant. Fluctuating temperatures can lead to reading errors caused by the different response times of the probes. Before checking the indicators of thermometers without thermowells, a waiting time of at least 5 minutes with the stem's full length properly inserted is required to allow temperature equalization. Temperature checks using thermometers with probes assembled with thermowells can, in many cases, only result in a reference temperature at the instrument under test, due to permanent heat dissipation caused by the thermowell.
In temperature applications fitted with static checking thermometers (e.g. pipeline systems), permanent offsets in reference temperatures can also be caused by the heat transfer path. Ambient temperatures around the indicator housing which differ substantially from room temperature can lead to steady indication errors with constant ambient temperatures and to varying indication errors with fluctuating ambient temperatures. Permanent indication errors caused by the ageing of the measuring system can be ignored, as they only account for a fraction of the indication accuracy.

6. Indicator correction

Any interference with or modification to the instrument will invalidate the warranty.

Indicator corrections on gas-actuated thermometers with contacts may only be carried out by the manufacturer or in adequately equipped workshops by qualified persons. The micro adjustment mechanism built into the pointer should only be operated using a screwdriver, and only if the thermometer has been damaged due to improper handling, severe shocks, during transport, etc. When correcting an indication error using the micro-adjustment mechanism, a calibrated thermometer must be used for comparison. The thermometer can be opened by turning the bayonet-lock bezel of the case counterclockwise using a strap wrench.

7. Electrical Contacts

Gas-actuated thermometers can be equipped with magnetic snap-action, inductive contacts (see data sheet). In most cases, gas-actuated thermometers with contacts are used as two position controllers for on-off control or as three-position controllers for on-off on control with adjustable dead-band. In general, thermometer contacts can only carry the operating current of an interposing control relay. The contact mechanism consists of the red set pointer and the measured-value pointer. The red set pointer can be adjusted using the supplied setting tool. The measured-value pointer in a magnetic snap-action contact mechanism consists of a pair of drag pointers, which are held against the red set pointer by springs and is opened and closed at the set value by means of an operating pin on the measured-value pointer.
++ Electrical connection should only be carried out by qualified electricians.
++ The switches are terminated on screw terminals within the terminal box.
++ The terminal assignment is stated on the connection diagram of the thermometer.

7.1 Magnetic Snap Action Contacts

Magnetic snap-action or sliding contacts are control switches which make or break connected electric circuits as the contact arm, moved by the measured value pointer, reaches the appointed set point.

Surface oxidation at the contact points may lead to malfunction, which can result in contact-arcing, particularly in the case of intrinsically safe circuits (low voltages and currents), and in the case of relatively high contact loads. Since the indication must not be affected by the contact mechanism, actuating forces, and therefore also the possible contact rating, are low. Sliding contacts are not suitable for liquid-filled instruments. Magnetic snap-action or sliding contacts are not intrinsically safe and therefore they are not suitable for applications in potentially explosive atmospheres.

7.2 Inductive Contacts

Inductive alarm sensors are non-contact inductive proximity sensors, which make or break when a control flag, linked to the measured-value pointer, moves adjacent to or disengages from the control head (slot-type initiator). Changes in the signal level will then actuate a control unit (switch amplifier).

8. Maintenance & Servicing / cleaning

The instruments require no maintenance or servicing. The indicator and switching function should be checked once or twice every 12 months. For this the instrument must be disconnected from the process and checked using a temperature calibrator. The instruments should be cleaned with a damp cloth, moistened with soap solution. When cleaning the inside of the terminal box, the mains power must be disconnected. All parts must be dry before the power is reconnected.

9. Repairs

Repairs are only to be carried out by the manufacturer or appropriately trained personnel. For further details see Strataa Controls Inc. data sheet for the respective basic gauge.

10. Disposal

Disposal of instrument components and packaging materials should be in accordance with the respective waste treatment and disposal regulations of the region or country to which the instrument is supplied.

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