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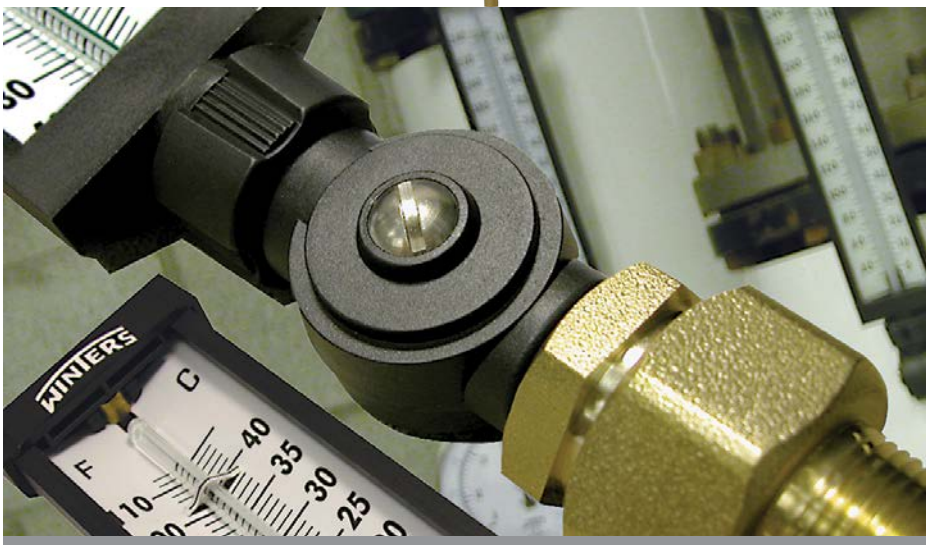


Thermometers Installation, Operation and Maintenance

WINTERS INSTRUMENTS
MANUFACTURER OF INDUSTRIAL INSTRUMENTATION

www.winters.com

Bi-Metal Thermometers

Bi-Metal Thermometers (TBM, TNR)

Winters' bi-metal thermometers are direct sensing instruments that are hermetically sealed and thus completely waterproof and dust proof. For accurate temperature readings, the stem should be immersed past the groove on the lower portion of the stem. All bi-metallic thermometers are of 304 stainless steel construction to protect against corrosive conditions. An external adjustment screw is conveniently located on the bottom of each case for easy field recalibration of thermometers, which may have shifted out of accuracy.

Installation of Bi-Metal Thermometers

Location
Vibration and extreme ambient temperatures can affect the dial reading. These areas should be avoided as much as possible. Vibration effects can be minimized by the use of a dampening liquid such as glycerin or silicone. If vibration is extreme, then a remote reading filled thermometer should be considered.

Mounting
A suitable thread sealant is required for NPT threads such as pipe dope or PTFE tape. Never use any part of the thermometer other than the hex nut that is on the stem of the thermometer just above the NPT threads for installation. Always tighten with a wrench on the hex nut. Failure to do so will severely damage the thermometer. Typically, bimetal thermometers are connected to the process through a thermowell. This allows for the removal and testing, calibration or replacement of the instrument without affecting the process operations. The selection of thermowell material and stem lengths is critical in order to properly monitor the temperature of the process.

Operation and Maintenance of Bi-Metal Thermometers

Disassembly and Assembly / Spare Parts
It is not recommended to disassemble the thermometer for any reason. If the thermometer is not functioning properly or if the lens is broken, the thermometer should be replaced. Please contact Winters for replacement.

Inspection Frequency
These thermometers are ruggedly constructed to give a reliable process temperature reading. The frequency of inspection is dependent on how critical the reading is at that point in the process. The inspection frequency can range from monthly to annual basis.

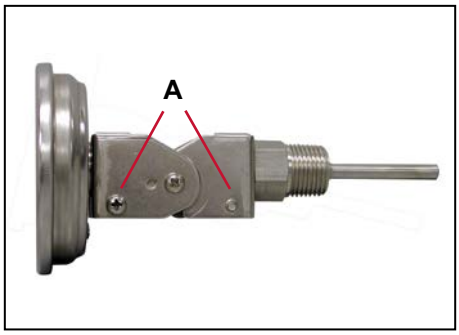
Over Range Protection
Over range protection allows the thermometer to function within its designed parameters even when the media temperature may intermittently exceed the thermometer range. The over range protection is 50% for ranges up to 500°F (260°C) and 10% above ranges of 500°F (260°C).

Recalibration
A master thermometer with a high degree of accuracy should be used for calibration. Immerse the bi-metal thermometer along side the master thermometer into an agitated liquid for at least three minutes and compare temperature readout. Note that both thermometers must be immersed at the same level. An external adjustment screw is conveniently located on the bottom of the case for easy field calibration. Winters can recalibrate and provide test certification. Please contact us for more details.

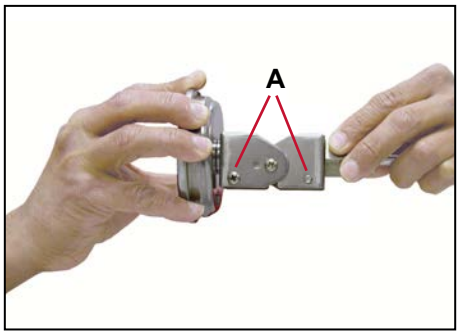
Storage
Store in a dry area at ambient temperatures not exceeding the indicator range. For example, if the indicator range is 0°C to 300°C, then the storage temperature should not exceed 300°C.

Head Rotation

NOTE: The bi-metal thermometer head can be rotated as illustrated only when in back connection position. Never rotate the thermometer head when it is in the angled position.

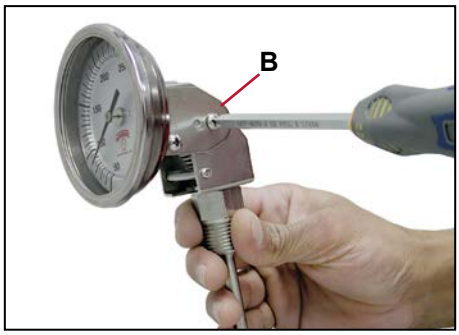


To rotate thermometer head up to 360°, make certain thermometer is in back connected position. Loosen two screws on both sides (A) until harness revolves freely.

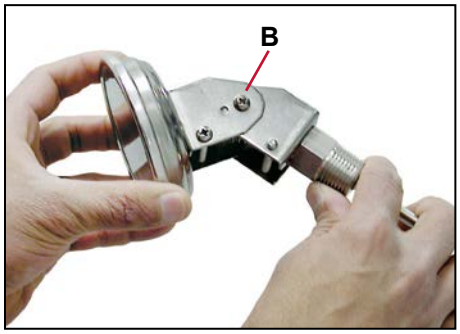


Now hold thermometer head and adjustable harness and rotate head to desired position. Retighten screws (A).

Angle Positioning



To tilt thermometer head up to a 90° angle or straighten it, loosen single screw (B) by 1/2 turn only.



Tilt to desired angle or straighten. Retighten screw (B).

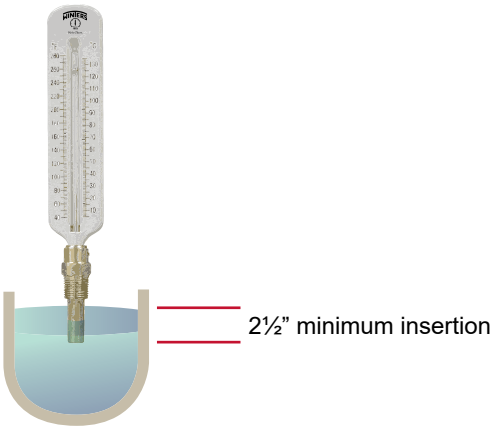
Liquid-in-Glass Thermometers

Liquid-in-Glass Thermometers (TAG, TAS, TIM, TSW)

Liquid-in-glass thermometers have a glass tube in front of a metal scale. It extends into a metal chamber and has a glass bulb attached. This tube is completely sealed and the bulb contains a predetermined amount of liquid which, on expanding and contracting caused by temperature changes, will indicate the temperature for a given temperature range.

Installation of Liquid-in-glass Thermometers

NOTE: Make sure that while connecting the thermometer to the process, the sensitive portion of its stem (the last 2½" from the end) is located well within the flow of the medium being measured for temperature. This will ensure accurate readings with minimal response time.



Accuracy
Inaccuracy may be caused by a broken tube, scale shifting in slots from original position, liquid separation, sensitive bulb not fully immersed in the media, or by poor circulation. Poor circulation can be explained as follows: If there is poor agitation in a fluid, the temperature stratifies or has hot or cold spots. The thermometer will read only the temperature in which the sensitive bulb is immersed. It is, therefore, important to locate on installation the sensitive bulb in the correct position.

Corrosion
The use of separate sockets of special material is recommended for corrosive or highly abrasive service.

Location
Care should be taken to locate the instrument on the equipment where vibration is at a minimum.

Thermowell Connection
Remove the thermowell from the thermometer if supplied with one. Install this thermowell in the pipeline or service as required. Insert the stem of the thermometer through the thermowell. Position thermometer for best reading position and tighten down. If the thermowells are purchased separately from the thermometers, then a suitable temperature transfer medium must be added to the well to properly conduct the temperature to the thermometer bulb. A mixture of graphite and oil, heat transfer paste, or even a light oil will suffice.

Union Bushing (Hub) Connection
Remove the union bushing from the thermometer if supplied with it. Install this union bushing in the pipeline or service as required. Insert the stem of the thermometer through the union bushing hole, engaging stem coupling nut with union bushing threads. Position thermometer for best reading position and tighten down coupling nut.

Liquid-in-Glass Separation

All liquid-in-glass thermometers are subject to separation of the liquid column. When this occurs, the thermometer will not read correctly. Some ranges and types are more readily susceptible to separation than others.

Causes of Separation

1. Rough handling in shipment causes most separations. If the thermometer is given a sudden jar, the weight of the liquid column in the bore has sufficient inertia to separate the column.
2. If the thermometer with an expansion chamber at the top of the tube (away from the bulb) is accidentally overheated, some of the liquid is driven into the expansion chamber. As the thermometer later cools, the liquid column recedes towards the bulb. If the thermometer is left in a horizontal or inverted position while cooling, part of the liquid will remain in the expansion chamber. This would cause separation of the liquid column.

How to Re-unite Separated Liquid Column

When the reservoir or expansion chamber is at top of the tube (away from the bulb) / ranges below 550°F

Heat the bulb of the thermometer slowly, observing the rise of the liquid in the tube. The point of separation should be driven into the expansion chamber. Take care that the chamber never becomes completely filled or the internal pressure will cause the tube to break. After the separation enters the expansion chamber, put the thermometer in an upright position. Give the tube a slight jar so that the particles of entrapped gas will rise above the liquid. When the liquid recedes, the column will be joined.

When there is no reservoir at the top of the tube / ranges above 550°F

Put the thermometer bulb in dry ice, so as to draw all the liquid into the tube. Tap the bulb gently on a hard surface with the thermometer held in an upright position, bringing the liquid together. When gradual heat is applied and the liquid rises, the column will be joined.

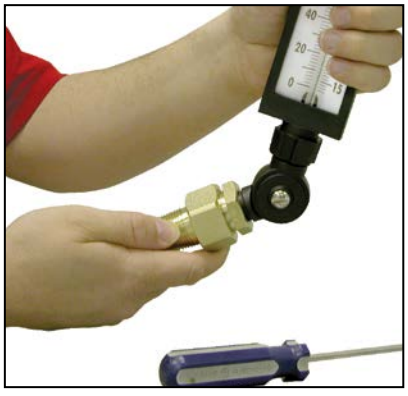
Scale Rotation

Grasp connection end firmly.

Rotate locking nut by hand.

Vari-angle Rotation

Loosen single screw (A).



Tilt to desired angle.

Tighten screw (A) to secure the angle.

Remote Reading Thermometers

Remote Reading Thermometers (THR, TRR)

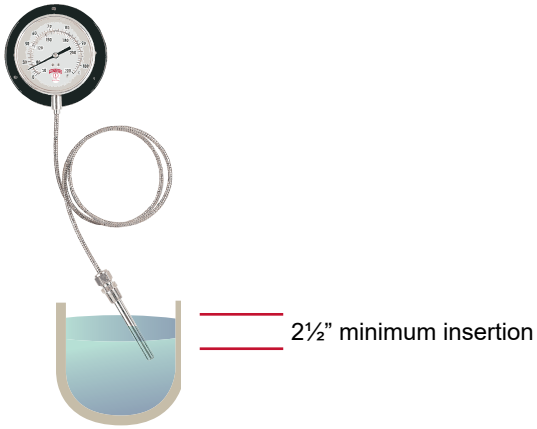
Remote reading thermometers are instruments used to measure temperature from a remote source. By means of a capillary tube with a sensing probe at one end and an indicating dial on the other, temperatures can be determined from a source that is up to 30' (100 m) away.

Remote reading thermometers are filled with either gas or vapour depending on the specification. As temperature changes, the gas or vapour expands/contracts, creating pressure that is measured by a bourdon tube.

Installation of Remote Reading Thermometers

Accuracy

The thermometer will read only the temperature in which the sensitive bulb is immersed. It is important to place at least 2 ½" of the sensitive bulb in the media to ensure reading accuracy.



Corrosion

The use of separate sockets of special material is recommended for corrosive or highly abrasive service. Capillaries are available in copper braided and stainless steel (with or without flexible armor), in an assortment of lengths. Winters recommends using a stainless steel bulb and capillary for all process temperatures above 500°F (260°C).

Location

These thermometers offer the advantage of taking temperature readings away from locations that have heavy vibration or are possibly dangerous. Each thermometer with a front or back flange will have three mounting holes for securing the thermometer to a panel. Alternatively, u-clamps are available.

Thermowell Connection

Remove the thermowell from the thermometer if supplied with one. Install this thermowell in the pipeline or service as required. Insert the stem of the thermometer through the thermowell. Position thermometer for best reading position and tighten down. If the thermowells are purchased separately from the thermometers, then a suitable temperature transfer medium must be added to the well to properly conduct the temperature to the thermometer bulb. A mixture of graphite and oil, heat transfer paste, or even a light oil will suffice.

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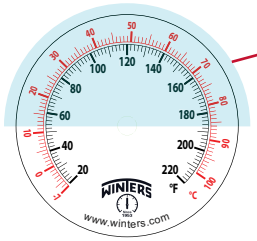
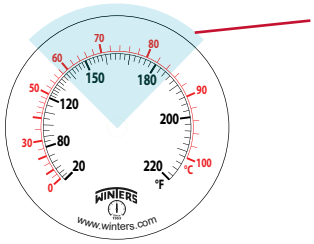
Gas-Filled Thermometers

Gas-filled thermometers are designed for industrial applications requiring accurate and uniform response over the entire range. The entire system is filled under pressure with inert gas for positive movement, accuracy and sensitivity. The accuracy delivered by this system is +/-0.5% of the full scale value. We recommend the operating temperature range fall in the upper half of the dial.



Vapour-Filled Thermometers

Vapour-filled thermometers have non-linear scales (non-equal graduations across the entire scale). To ensure exceptionally close readings, the operating temperature should fall in the 2/3 of the scale. The accuracy delivered by this system is +/-2% of the full scale value.



Note: When selecting a thermometer, always refer to ASME B40.200 (2008)

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