

1. General

Before commissioning the gas actuated thermometer please read these Operating Instructions.

You have purchased an instrument which was manufactured in our DIN ISO 9001 certified company according to a high quality standard. If even so, should there exist a reason for complaint, please return your instrument to our factory and include a precise description of the malfunction.

In the case of questions or any difficulties please contact us as the manufacturer or contact the supplier of your gas actuated thermometer. Please also help us to improve these Operating Instructions. Your comments are welcome.

Do not modify the instrument in any way since this will void your warranty!

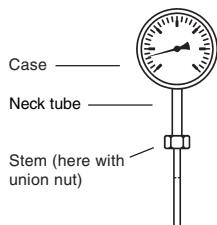
2. Instrument Description

Gas actuated thermometers in accordance with EN 13 190 convert a change in temperature at the stem into a pressure change which is then transferred by means of measurement spring and movement to the pointer.

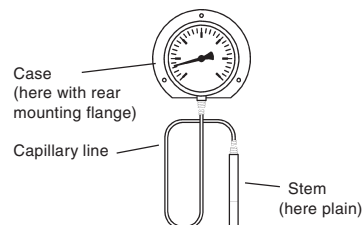
In the case of instruments with limit switches the pointer actuates through a mechanism 1 to 4 contact arms depending on the specific model. A contact is established, respectively is interrupted when the adjustable switching temperature is attained by the pointer.

Connection between stem and case:

a) rigid - with neck tube:
Model TS...



b) flexible - with capillary line:
Model TF...



For information on technical data and model designs please refer to our data sheets which you can also find in the Internet under <http://armaturenbau.com> resp. <http://manotherm.com> ("PDF-Download").

Storage and Transportation

- Permissible storage temperature: -40...+60 °C (-40...+140 °F)
- Gas actuated thermometers need to be protected during transportation and storage against mechanical damage. Therefore retain the gas actuated thermometers in their original packaging until commissioning them.
- The packaging can be disposed of as waste paper. For additional transporting or during return transports, the instrument needs to be protected sufficiently against damage.

Please note the information provided on the gas actuated thermometer.

3. Safety Information

Ensure that the gas actuated thermometer cannot be damaged during operation:



- The maximum temperature of the medium must remain within the indication range of the instrument.
- Ensure that type design and materials of the gas actuated thermometer are resistant in view of the usage conditions and the medium.
 - Note the protection type!
 - Use thermowells!
 - Note the maximum permissible operating pressure!
- Gas actuated thermometers without damping fluid in the casing are only suited for installation at locations free of vibrations and impacts.

4. Installation

The gas actuated thermometers must be installed and commissioned only by personnel authorized by the operator.

Mechanical connection:

The mechanical connection of the gas actuated thermometers is provided in accordance with the generally accepted engineering rules for the selected connection type.

When screwing in the gas actuated thermometer, do not exert any force on the casing. Hold up turnable threaded nuts and union nuts at the stem.

For the purpose of providing a seal against the process, respectively against the thermowell in the case of cylindrical fittings, gaskets made of a suitable material must be used. (Standard: aluminum or copper gaskets)

NPT fittings (conical thread) provide a seal in the thread aided by suitable sealants, for example, PTFE tape (observe usage temperature limits!).

Installation orientation of the casing:

- Dial and numbers need to be aligned vertically
- Other orientations are possible after agreement: note the corresponding position symbol on the dial!

Installation of gas actuated thermometers with capillary line:

- Exclude the possibility of exposing the capillary line to tensile stresses, in particular the joints at the casing, respectively the stem.
- Protect the capillary line against possible damage.
- The minimum bending radius is 30 mm.
- Vibrations and impacts need to be absorbed by suitably laying the line, for example freely oscillating loops between two mounting points, respectively mounting point and stem.
- Any pinching or interruption of the capillary line will cause an immediate failure of the gas actuated thermometer.
- The capillary line should be laid such that a sufficient distance is maintained with respect to sources of heat or cold so as to avoid temperature influences.



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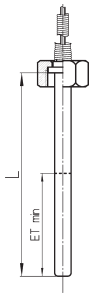
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Installing the Stem:



Install the stem such that the minimum immersion depth ET_{min} (active part of the stem) stated in the data sheets is completely immersed in the medium.

If the active part of the stem is only incompletely immersed in the medium, measurement errors will result.

Consider the temperature distribution at the installation location of the gas actuated thermometer!

Avoid, for example, measurements too close to the walls of large vessels or in dead spaces of pipes if this is not in agreement with the actual measurement task.

When using thermowells, the thermal resistance between outside wall of the stem and the thermowell can be reduced by means of a thermal contact agent.

Electrical Connection:



The electrical connection (only in the case of instruments with additional electrical facilities) must only be provided by qualified personnel.

- Observe the local regulations (Germany: VDE)
- Comply with the maximum switching capacity!

The connection of limit switches needs to be provided in line with the circuit diagram provided on the casing. Depending on the model, the maximum switching capacity is indicated on the nameplate of the limit switch or on the circuit diagram. The type of connection will depend on the specific model:

- o Connector fitted in the factory
- o Junction box
- o Connection cable run out of the instrument

5. Operation

Safe and reliable operation can only be ensured provided the instrument has been installed properly.

In order to enable precise readings, the instrument should be installed at eye level.

Note the information provided in the respective data sheets.

Ambient temperatures

The permissible ambient temperature states within which temperature limits the gas actuated thermometer may be used without the risk of damaging it.

Within the nominal usage range compliance with the error class is ensured. Outside the nominal usage range there will be additional temperature errors.

- Permissible ambient temperature: $-20...+60\text{ }^{\circ}\text{C}$ ($-4...+140\text{ }^{\circ}\text{F}$)
- Nominal usage range: $+23\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$ ($+73.4 \pm 6.4\text{ }^{\circ}\text{F}$)

Prevent injury and damage to property:



- When erecting and operating measurement systems for hazardous, combustible, explosive substances or substances which are damaging to health, all currently valid regulations need to be complied with.



- In the case of damage to the stem in the area of the vessel, the pressurized nitrogen helium mixture can suddenly be released. Suitable precautions need to be introduced so as to prevent the therefrom resulting risks to personnel and property.

Adjustment

Your gas actuated thermometer is equipped with the possibility of pointer adjustment. After removing the sealing screw, respectively the sealing plug on the side at the top of the casing, a set screw at the movement will be accessible which can be actuated by means of a screwdriver.

It is possible to correct indication errors which result, for example, through constantly deviating ambient temperatures. The correction of indication errors should only be considered provided you can crosscheck the readout. As reference instruments you may use, for example, calibrated glass thermometers or portable, calibrated digital thermometers.

The comparison of the measured values needs to be performed through measurements

- at identical ambient conditions
- at the same measurement location
- at identical immersion depth
- within a period of time during which there is no temperature change at the measurement location

6. Maintenance and Repair

Gas actuated thermometers do not require any maintenance. They do not contain any components which you may replace or repair.

Repairs will only be possible in our factory. In order to ensure the accuracy of the measurements we recommend that you check the readout regularly. Please refer to Section 5 for the necessary comparative measurements.

For possibly necessary repair or maintenance work please contact your supplier or our factory. When returning the instrument to our factory, please ensure that it is well packaged, see above.



Media residues on removed instruments can present a hazard to personnel, the environment and facilities. Suitable precautionary measures need to be introduced.

Do not modify the instrument in any way since this will void your warranty!

Repairs must be exclusively left to the manufacturer!

7. Putting out of operation

For putting out of operation remove the instrument completely from the area of usage. Here note the information provided in Section 6.

The right of alterations is reserved!