

## Temperature gauge Installation Guide

This safety and installation guide contains important safety and handling information for Badotherm temperature gauges.



Read all information below before using the application to avoid injury, improper functioning, or damage. Additional information can be found at:  
[www.badotherm.com](http://www.badotherm.com)

**CAUTION:** Read this installation guide carefully before unpacking the temperature gauge. Improper handling can cause damage to the temperature gauge or stem. All temperature gauges are tested and calibrated in a Badotherm factory under monitored & controlled conditions.

**Unpacking the gauge** - Do not unpack the gauge by handling it by the stem. Make sure the environment is free of dirt and fluids that may damage the stem, thread, and window.

**Using spanners** - When installing the temperature gauge a suitable spanner with the correct size must be used to prevent damage to the connection. NEVER twist the case in order to tighten the gauge.

**Capillary use** - For distance temperature measurement capillary is necessary. When handling such a device the capillary must never be bent. Surplus capillary can be wound and bundled with a tie wrap.

**Thread sealing** - BSP threads are sealed on the sealing face with a washer which must be compatible with the medium. NPT threads are sealed on the thread with a metal

to metal sealing. In some cases a never seize paste or PTFE tape can be used.

**Gauge temperature** - Temperature gauges are designed to operate in a specific temperature range. Before installing the specifications of the process must be compared to the design temperature of the temperature gauge.

**Gauge inspection** - Temperature gauges should be checked thoroughly once a year to check accuracy and damage to the gauge. If the gauge is exposed to extreme conditions such as fire, extreme temperatures, or wrong process fluids the gauge must be replaced or sent back to Badotherm for inspection.

**Labelling / Safety marks** - Gauges intended to be used in hazardous areas have:

Dial marking -

*ATEX marking gasses / vapours*

II 2G Ex h IIC T6..T1 Gb X

*ATEX marking dust*

II 2D Ex h IIIC T85°C..T450°C Db X

CE-logo

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Ex-logo

Serial number

Product label -

Model number

Date of manufacturing

Permissible ambient temperature

**Mounting type** - Temperature gauges can be mounted in several ways. The stem position is dependant on this mounting variable. The bimetal and gas filled gauges can have a bottom (A), back (D) or every angle (E) execution. The gas filled gauges can also be executed with a capillary connection combined with a C, or E mounting type for panel or surface mounting several accessories are available.

**Thermowell use** - The safest use of a temperature gauge is when a thermowell is applied. When using a thermowell the stem of the temperature gauge should be coated with a heat conducting medium. Examples of such a medium are: a mixture of glycerine and graphite, Vaseline or other heavy lubricants. The thermometer stem length and diameter should be compatible with the bore diameter and length of the thermowell.

**Fill fluid** - Filling fluids reduces the vibration inside the case of the gauge which reduces the wear of the internals of the temperature gauge. When the case temperature rises the filling fluid will expand. To prevent overpressure in the case the filling plug on top of the case must be cut or pierced, depending on the execution of the plug. This makes the gauge suitable to "breathe" with the outside air so that the case compensates with the atmospheric pressure.

**Gauge position** - The position of the temperature gauge is of great importance for the accuracy of the temperature gauge. The most important factor is that at least 50 mm (2") of the stem is inserted into the process for average temperature measurement with the tip of the stem pointed towards the flow direction.

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**WARNING:** Failure to follow these safety instructions could result in injury or other damage. Badotherm refutes all responsibility for any direct or indirect damage to property or persons resulting from failure to follow the instruction in this guide.

**Pressurised installations** - Do not use the gauge in an environment where the pressure exceeds 25 bar without using a bar stock thermowell. A well makes it possible to disassemble the temperature gauge with a reduced chance of injury or damage.

**Hazardous installations** - Do not use the gauge in an environment where hazardous liquid or fumes can cause corrosion or other physical damage to the temperature gauge. The use of a thermowell reduces the chance on injuries. Make sure to follow the regulations of the installations or plant to prevent injury or spill of hazardous fluids.

**Hazardous areas** - Temperature gauges intended to be used to measure temperature in hazardous areas are marked with an Ex-logo (ATEX). Badotherm is not liable for claims of any type based on

operation contrary to the intended use.

**Skilled personnel** - The temperature gauges must be installed by skilled personnel. Skilled personnel are understood to be personnel who, based on their technical training, knowledge of measurement and control technology and on their experience and knowledge of country specific regulations, current standards and directives, are capable of carrying out the work described and independently recognising potential hazards.

**Temperature gauge design** - Make sure the design of the gauge is suitable for the purpose of use. Before installing the OPERATING TEMPERATURE, FLUID COMPATIBILITY and ENVIRONMENTAL CONDITIONS must be checked. More details on these topics can be found below.

**Operating temperature** - The operating temperature may never exceed its full scale value. The minimum and maximum measuring range is marked with a triangular symbol on the scale. These temperature limits must not be exceeded. The scale value between these two limits is called the temperature span. The maximum range of a bimetal gauge is 550°C and for a gas filled gauge 650°C.

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**Fluid compatibility** - Before installing the temperature gauge, the material/process fluid compatibility must be checked. The latest (non binding) information on material compatibility can be found in the tables at [www.badotherm.com](http://www.badotherm.com).

**Environmental conditions** - The condition of the local environment of the temperature gauge must be analysed carefully when installing the gauge. The frequency of the vibration and the surrounding atmosphere must not exceed limits of the EN13190 without the use of capillary. The surrounding atmosphere must be free of heavily corrosive gasses to prevent corrosion of the materials used in the temperature gauge.

**Mechanical shock & vibrations** - If there is a risk of mechanical shock or vibrations the temperature gauge should have a capillary connection. The limits of the vibration frequency can be found in the EN13190.

**Temperature peaks** - Exposing the gauge or the stem to a temperature in excess of the highest dial reading should be avoided. If possible, shut down the process and remove the temperature gauge to prevent excessive damage. If the temperature gauge has exceeded the maximum scale value it should

be sent (?) to the nearest Badotherm office for a full service check.

**Case temperature** - Avoid excessive case temperatures. The maximum case temperature with dry cases should be <95°C and liquid filled cases <65°C.

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**WARNING:** Use safety clothes, protective goggles and protective (chemical resistant) gloves before starting the disassembly.

The general safety of a facility often depends on the reliability of indications of the temperature gauges installed in the facility. Any temperature gauge that seems to be giving false readings must be removed immediately, and then tested with a testing device. If the tests prove the reading is unreliable, it must be replaced by a new temperature gauge. Also when the temperature gauge shows damages caused by mechanical influences it must be replaced with a new gauge.

**Periodic verifications** - Once a year a thorough check should be carried out in order to check the accuracy of the gauge. Any temperature gauge considered to have been subjected to abnormal conditions of use (e.g. fire, wrong fluid, excessive temperatures, etc.) must not be re-used.

### **Transport, Packaging and Storage** -

After transport check the Temperature gauge for any damage that may have been caused by transport. Obvious damage must be reported immediately.

Do not remove the packaging from the gauge until the moment just before mounting.

The packaging is providing the optimum protection during transport and storage.

Permissible storage temperatures are -40°C...+70°C.

**Maintenance** - Maintenance on gauges may only be carried out by the manufacturer or appropriately skilled personnel.

**Cleaning** - The temperature instrument should be cleaned regularly with a damp cloth and a soap solution. In hazardous areas make sure that no electrostatic charge is generated due to cleaning.

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**Filling level** - When filled temperature gauges are used the fluid level in the case must be checked on a regular base and must not drop below 75% of the gauge diameter.

**Stem cleaning** - When a temperature gauge is used for measuring media that may harden and build up an insulating layer on the stem without a thermowell, the gauge should be removed and cleaned regularly

### *Disassembly instruction*

For safe disassembly the following steps must be carried out sequential:

1. Study the statutory regulations before any installation will be started.
2. Check if the gauge casing is at an acceptable temperature and pressure to prevent burning.
3. Un-tighten the gauge with a correct sized spanner.
4. Check if the gauge is clear from process residues which may cause damage to persons and the environment.

5. When sending the gauge to a Badotherm office, clean the gauge, pack it safely, and attach a proof of cleanliness.
6. When disposing of the temperature gauge, observe the local waste treatment and disposal regulation.
7. When sending the temperature gauge to a Badotherm office, clean the complete temperature gauge and accessories according statutory regulations, pack it thoroughly to prevent damage, and attach a proof of cleanliness and the necessary Material Safety Data Sheet.
8. When disposing of the temperature gauge always observe the statutory waste treatment and disposal regulations.

**WARNING:** Mishandling products exposed to a hazardous substance can cause serious injury or death. If the product is exposed to a hazardous substance a copy of the Material Safety Data Sheet (MSDS) must attached to the returned goods.

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### Special conditions for safe use

**Permissible ambient temperature** -  
-40...+60°C (unfilled gauges)

-20...+60°C (glycerine filled gauges)

-40...+60°C (silicone oil filling)

**Permissible medium temperature in hazardous areas** - The permissible temperature not only depends on the instrument design, but also on the ignition temperature of the surrounding gases, vapours or dusts. Both aspects have to be taken into account.

Gases / Vapours:

Temp.	dry	filled
Class	gauges	gauges
T1	+440°C	+440°C(*)
T2	+290°C	+290°C(*)
T3	+195°C	+195°C(*)
T4	+130°C	+130°C(*)
T5	+95°C	+95°C(*)
T6	+80°C	+80°C(*)

\* BDTB and BDTE liquid filled temperature gauges have a max. permissible medium temperature +90°C.

### **Dust atmosphere**

The dust ignition temperature has to be determined. The ignition temperature for dust clouds and dust layers must be determined separately. The ignition temperature of dust layers depend on the thickness of the dust layer.

Medium temperature must be less than 2/3 of the ignition temperature of the dust cloud and at least 75°K less than the ignition temperature of the dust layer.

### **Reaction with instrument material**

Avoid handling of materials that react dangerously with the materials used for the instrument, and substances liable to spontaneous combustion.

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### Earthing

The instruments must be earthed via the process connection. This is why electrically conductive sealing should be used at the process connection. Alternatively, take other measures for grounding.

External sources depend on end use application and must be assessed by the end user.

No potential difference between individual metal parts may exist. Therefore earthing resistance between the instrument and the process must be checked before use and shall be maximum 1 M $\Omega$  between individual items and to earth. An earthing resistance higher than 10 $\Omega$  may indicate bad earth connections.

### Convection and heat radiation

Mount the instrument in such a way that, taking into consideration the influence of convection and heat radiation, no deviation above or below the permissible ambient and medium temperatures can occur.

<b>WARNING</b>	-	<b>POTENTIAL</b>
<b>ELECTROSTATIC</b>		<b>CHARGING</b>
<b>HAZARD</b>		

Instruments with Polycarbonate sightglasses may be susceptible for electrostatic charge. Clean with a water-wet cloth only and allow to dry naturally in order to avoid charging when cleaning.



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### Special conditions when gauge is equipped with inductive contact

#### Intended use

Inductive contacts are installed in temperature gauges. The instruments pointer moves the flag of the inductive contact out or into the slot sensor. The change of the current supply due to the move of the flag is used to trigger a switching amplifier.

The inductive contact has been designed and build solely for the intended use described and may only be used accordingly.

The manufacturer is not liable for claims of any type based on operation contrary to the intended use.

#### Product label

Beside the label mentioned above there will be a second label giving information about the electrical pin assignment.

#### Admissible ambient temperature

The permissible ambient temperature range for the inductive contact is depending on

the applied type and T-class. Please verify the original manufacturer documentation for further details. If the permissible ambient temperature of the basic instrument deviates from this range, the lower value is valid.

#### Function

The electrical switch contacts are non-contact slot-type inductive proximity sensors, which are powered from switching amplifiers with certified intrinsically safe circuits. When the adjustable set points are reached, their output circuits will be opened or closed.

#### Certificates

All inductive contacts plus optionally obtainable switching amplifiers are add-on devices from Wiebrock or Pepperl+Fuchs. Badotherm keeps all current certificates in their information system. Any time these certificates can be handed out. The certificates can also be found on the webpage of both the suppliers (<http://www.wiebrock.de> and <http://www.pepperl-fuchs.com>)

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### **Electromagnetic compatibility**

The instrument is to be protected against strong electromagnetic fields.

### **Adjusting the set pointers**

Setting of the set points is achieved using the adjustment lock in the window with the aid of the adjustment key.

The set pointers for the limit switches are freely adjustable over the full scale range. The switch points are limited between 10% and 90% of the measuring span.

### **Installation**

Optional inductive sensors shall be installed in an intrinsically safe circuit according to EN60079-14 and sensor manufacturer's instructions, separately provided with this manual if applicable.