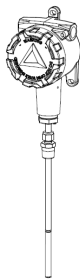




Installation, Operation & Maintenance Instructions



Sentry Series
Models T01, T02 (Vapour pressure temperature switches)

SAFETY INSTRUCTIONS

-  **Information** ..points out useful tips, recommendations and information for efficient and trouble-free operation.
-  **CAUTION!** ..indicates a potentially dangerous situation that can result in light injuries or damage to equipment or the environment, if not avoided.
-  **WARNING!** ..indicates a potentially dangerous situation that can result in serious injury or death, if not avoided.
-  **WARNING!** ..identifies hazards caused by electric power. Should the safety instructions not be observed, there is a risk of serious or fatal injury.
-  **WARNING!** ..indicates a potentially dangerous situation that can result in burns, caused by hot surfaces or liquids, if not avoided.
-  **WARNING!** ..indicates a potentially dangerous situation in the hazardous area that can result in serious injury or death, if not avoided.
-  **Ex applications** ..special instructions for Ex applications.

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Foreword

The unit is manufactured, checked and supplied in accordance with our published specification, and when installed and used in normal or prescribed applications, with the lid in place and within the parameters set for mechanical and electrical performance, will not cause danger or hazard to life or limb.



Warning: Units must be selected and installed by suitably trained and qualified personnel in accordance with appropriate codes of practice so that the possibility of failure resulting in injury or damage caused by misuse or misapplication is avoided.

Warning: before installation **check** that the instrument **characteristics** comply with process and plant requirements.

Warning: The users attention is drawn to the fact that, when the unit is 'live' with respect to electrical or pressure supplies, a hazard may exist if the unit is opened or dismantled

Warning: where any special condition of the product has been required as identified by the last 4 digits of the part number, follow the necessary safety instruction for a correct installation.

If the equipment is likely to come into contact with aggressive substances, suitable precautions should be taken that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised. Aggressive substances: e.g. acidic liquids or gases that may attack metals or solvents that may affect non-metallic materials. Suitable precautions: e.g. regular checks as part of routine inspections or establishing from the material's data sheet that it is resistant to specific chemicals.

Allowed over range

Temperature exceeding the adjustable range can be allowed up to the max temperature stated on nameplate. The voltage and current limits for the microswitch must not be exceeded (see fig 2 & 3). Transitory electrical over ranges can have a destructive effect on the microswitch

Ambient temperature

The surface temperature of the instrument is influenced by the process temperature, electrical working conditions, installation and environmental. Special attention must be taken to exceed the limits specified on tables below

Process temperature

For the **remote mounted flameproof and intrinsically safe instrument** model *T02*the following table is applicable:



Temperature Class	Ambient temperature range	Max process temperature at bulb	Max electrical loads (resistive loads)
T6	-30°C to +65°C or -60°C to +65°C	See nameplate max temp.	15 A, 250 V a.c. & 5 A, 30V d.c.
T5 or T100	-30°C to +80°C or		

For the **direct mounted flameproof and intrinsically safe instrument** model *T01 the following table is applicable:



Temperature Class	Ambient temperature range	Max process temperature at bulb	Max electrical loads
T6	-30°C to +65°C or -60°C to +65°C	85°C	15 A, 250 V a.c. & 5 A, 30V d.c.
T5 or T100	-30°C to +80°C or	100°C	
T4 or T135	-60°C to +80°C	110°C	

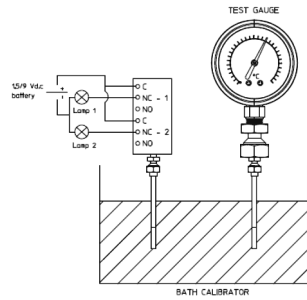
Tools to be use for checking and adjusting set point

- ◆ Hex Socket Key 1.5 mm
- ◆ Open ended spanner A/F 13mm
- ◆ Screwdriver Pozidriv size 1

The following calibration circuit is to be use to proceed with the calibration of the set point or periodical functional verification.

The test gauge should have a range similar to the instrument under verification with an accuracy consistent with the accuracy required to calibrate the set point.

Fig. 1 - Calibration Circuit



Operating principles

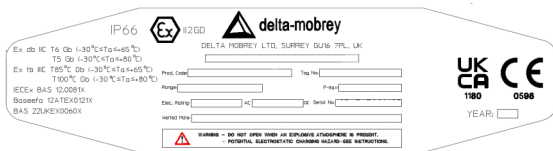
Temperature Switches models T0* are diaphragm operated switches. These diaphragms generate a force proportional to the applied pressure and are balanced by a user adjustable control spring. When the force exceeds that created by the control spring, the diaphragm moves causing a push rod to actuate a snap-acting micro-switch. The applied pressure comes from the expansion of a vapour enclosed in either a rigid stem or semi-rigid thermal system.

Marking

Flameproof models carry the following label markings:



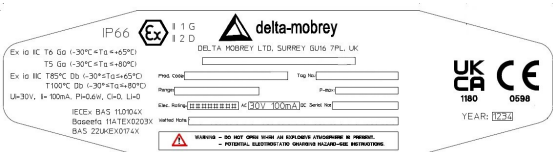
Fig. 2 - Flameproof nemeplate



Intrinsic Safety Model carry the following label markings:



Fig. 3 - Intrinsic Safety nemeplate



Input limitations for intrinsic safety:
 $U_i = 30V$, $I_i = 100mA$, $P_i = 0.6W$

List of standards to which the product is conform

This product complies with the following standards:

IECEX	ATEX	UKEx
IEC 60079-0: Ed.7	EN IEC 60079-0:2018	BS EN IEC 60079-0:2018
IEC 60079-1: Ed 7	EN 60079-1:2014	BS EN 60079-1:2014
IEC 60079-31: Ed.2	IEC 60079-31:2014	BS EN 60079-31:2014
IEC 60079-11: Ed 6	EN 60079-11:2012	BS EN 60079-11:2012

Special conditions of use

Warning: The Sentry Temperature Switches must not be installed in a location where moving dust flow can generate an electrostatic charge on the equipment.



Warning: Instruments with aluminium enclosure. The instrument must be protected against accidental damage and impacts of the housing.



Warning: if the equipment is likely to come into contact with aggressive substances, e.g. acidic liquids or gases that may attack metals or solvents that may affect polymeric materials, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected thus ensuring that the type of protection is not compromised.

Warning: The flamepaths are not to be repaired.

Installation Mounting

The instruments are designed to be mounted vertically with the process connection underneath. However, mounting up to 45° from the vertical in any plane is acceptable, although a small calibration shift may occur. They can be mounted either direct to process, or to a wall or panel using the mounting holes provided. Select the mounting point so as to avoid excessive shock, vibration or temperature fluctuation. Instruments should be mounted to avoid excessive heat transfer from the process lines or adjacent plant. The following figures show the minimal installation tips:

Fig. 4 - Direct Installation

DIRECT INSTALLATION

- 3-Thermowell
- 4-Bulb
- 5-Branch connection fitting
- 6-Process pipe

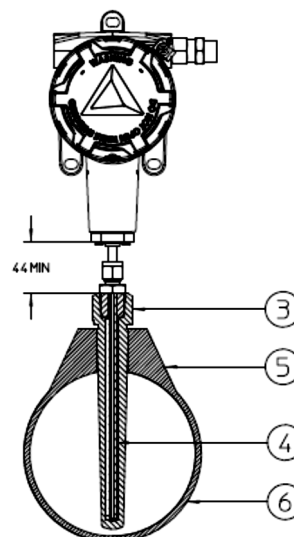
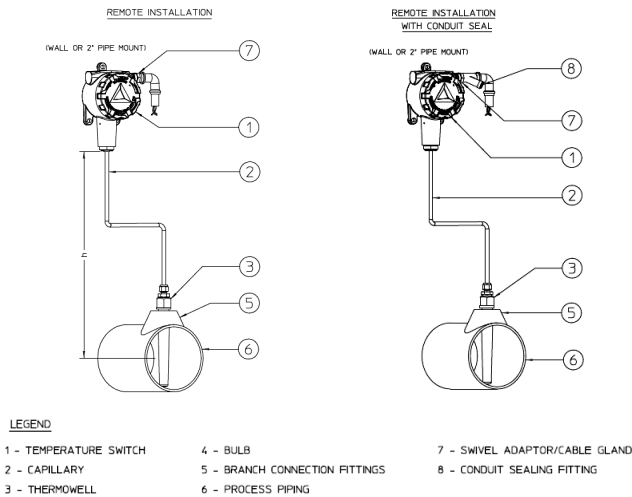


Fig. 5 - Remote installation

Warning: When the sensor of a remote thermal system is fitted to process greater than 100°C, the pipe and exposed sensor surface shall be insulated sufficiently to reduce the exposed surface temperature below 100°C



Caution: Check the connection thread size and specification on the unit to avoid mismatching with the thermowell connection. See digit 11 of product code.

Direct Mounting (T01 - Rigid Stem)

Assemble the unit via a thermowell, using the spanner facility provided and ensuring that the sensing bulb is fully immersed in the process temperature (see fig. 4). The stem is fitted with a sliding compression gland to accommodate different thermowells (see Dimensions)

Remote Mounting (T02 - Capillary system)

The capillary is fitted with a sliding compression gland to accommodate different thermowells. Mount the sensing bulb so that the capillary end is above the bulb and the bulb is level with, or no more than 2500mm below the base of the instrument (see fig. 5 — dimension h).

Instrument classified SAMA IIA (see Technical Data Sheet)

In case of difference in height between bulb and enclosure greater than 2500 mm the set point can be adjusted during calibration.

Instrument classified SAMA IIC (see Technical Data Sheet)

In case of difference in height between bulb and enclosure greater than 2500 mm the instrument may be affected by a random set point error as a function of the difference in height.

Electrical connections

One or two electrical entries are provided, into which cable glands can be assembled. The thread type and size is marked on the enclosure, just below the connection.



Warning: fittings used for the electrical connection of the flameproof instruments shall be certified according to the IEC or EN standards and shall guarantee instrument degree of protection (IP66)



Warning: cable entries not used must be plugged and sealed with plugs so as to prevent rainwater or other from entering the instrument enclosure. **In case of flameproof instruments these plugs, if not correctly installed and sealed to prevent their removal, do NOT guarantee the mode of protection Ex d.**

Furthermore, in order to guarantee the degree of protection IP66 and the non-loosening of plugs, it is recommended to seal the threads of connection with the same anaerobic sealant used for the glands. For instance, a sealant like Loctite ® 542 can be applied on the thread of plugs, before screwing them into the unused enclosure entry.

Wiring



Disconnect all supply circuits before wiring. Wire in accordance with local and national codes. Use cables no larger than 2.5 mm² (14 AWG)

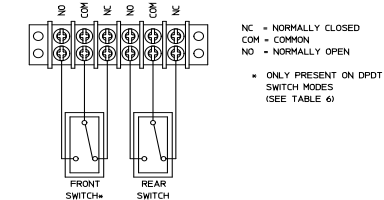
Warning: Do not exceed electrical ratings stated in literature and on nameplates.



Warning: If the ambient temperature exceeds 60 °C it is recommended to use cables suitable for operating temperatures not less than 105 °C.



The three switch terminals are clearly marked “NORMALLY CLOSED”, “NORMALLY OPEN” and “COMMON” as per fig. 6

Fig. 6 - Electrical Connections

Insert bare wires fully into the terminal block and tighten securely. Keep wiring tails to a minimum and check that wires do not interfere with the operating mechanism.

The instrument may be equipped with a micro switch single or double pole, double throw or two independent switches.



Warning: in case of Intrinsically Safe Instruments: All the electrical connections must form part of the same intrinsically safe circuit. The relevant entry parameters are written on the nameplate and are: $U_i = 30 \text{ V d.c.}$; $I_i = 100 \text{ mA}$; $P_i = 0.60 \text{ W}$; $C_i = 0 \text{ mF}$; $L_i = 0 \text{ mH}$

Before closing the lid:

- Ensure wire is clear of all moving parts.
- Ensure that wires do not touch the lid as it is closed.

Close the lid, being careful not to trap any wires in doing so. Securely tighten the M3 lid locking screw set provided using a 1.5mm hex key.



Earthing connections

Warning: The instrument is supplied with two protective grounding connections, one inside and one outside the enclosure. The two connections provide effective connection of a conductor with a cross-sectional area of at least 4 mm².



Warning: In order to protect the instrument against extreme environmental conditions, a coating thicker than 0,2 mm should be applied. The grounding connection has to be adequately realized to prevent an electrostatic charge on the instrument surface. **CLEAN ONLY with a damp cloth**

Operation Adjustments

Temperature Switches are supplied adjusted at midscale falling unless otherwise specified. If the instrument has been ordered with a specific calibration values the adhesive label shows the set point values.

It is a good rule to check the calibration values marked on the relevant adhesive label, prior to installation.

Calibration

Please follow the below suggested steps to calibrate the set point of the instrument: Immerse the bulb of the instrument in the thermostatic bath settled at the normal working temperature in the normal installation position (see Fig.1). Wait 5 minutes for stabilization. Slacken the lid lock screw and unscrew the lid. Connect the warning lamp according the desired function.



Caution: Do not attempt to set the switch outside the scale limits.

Though the unit may be set anywhere within its range, for optimum performance, it is good practice to have a set point value between 25% and 75% of span.

Connection C-NO terminal

- The circuit is open at the normal operating temperature, the switch close the circuit as the temperature increase when the desired value is reached.
- The circuit is closed at the normal operating temperature, the switch open the circuit as the temperature decrease when the desired value is reached

Connection C-NC terminal

- The circuit is closed at the normal operating temperature, the switch open the circuit as the temperature increase when the desired value is reached.
- The circuit is open at the normal operating temperature, the switch close the circuit as the temperature decrease when the desired value is reached

Increase or decrease slowly the temperature up to the set point (1.5 °C/minute).

Slacken the set point lock screw.

Using a suitable spanner (Ch 13), rotate the range adjuster clockwise to increase the set point and counter-clockwise to decrease the set point up to the relative lamp turn ON (or OFF).

Go to the normal operating temperature and increase (or decrease) the temperature up the relative lump turn ON (or OFF). Read the temperature on the test gauge. Adjust the range adjuster if necessary and recheck using the lump up to the set point is reached with the required accuracy.

Tighten the set point lock screw.

Close the instrument lid and tighten lid lock screw.

Write the set point on the adhesive label.



Caution: The striker screw and lock nut are factory set and should not be adjusted. Should these parts be accidentally loosened, please contact Delta for assistance.

Periodical calibration check.

Immerse the bulb of the instrument in the thermostatic bath settled at the normal working temperature in the normal installation position (Fig.1). Wait 5 minutes for stabilization. Slacken the lid lock screw and unscrew the lid. Connect the warning lamp according the desired function.

Set point calibrated with increasing temperature

Increase slowly (1.5 °C/minute) the temperature up to the set point (the warning lamp became ON).

Record the temperature read on the test gauge. Slowly reduce the temperature up the reset point (the warning lamp became OFF).

Repeat the above operation twice.

Set point calibrated with decreasing temperature

Decrease slowly (1.5 °C/minute) the temperature up to the set point (the warning lamp became ON).

Record the temperature read on the test gauge.

Slowly increase the temperature up the reset point (the warning lamp became OFF).

Repeat the above operation twice.

Evaluation of set point value and repeatability.

With all the above values detected, calculate:

- Average set point value
- Repeatability as the max difference of the detected set point value

If the average set point is different from the expected, instrument must be recalibrated.

If the repeatability is higher than the value in the Technical Data Sheet of the product replace the instrument with a new one and contact the factory.

End of verification

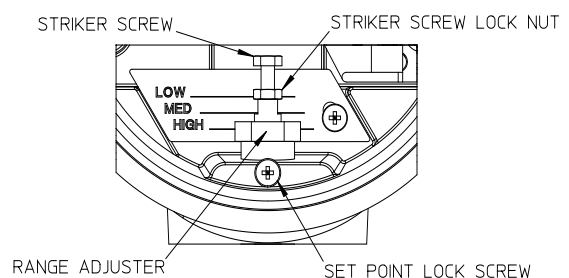
Remove the instrument from the thermostatic bath and disconnect the warning lamp

Warning: the bulb can be hot

Close the instrument lid and tighten lid lock screw



Fig. 7 - Set point adjusting



Safety Integrity Level (SIL) instrument and installation requirements

Refer to Functional Safety Manual Sentry series

Commissioning

The instrument starts operating as soon as it is energized and the bulb is installed on the thermowell

Inspections and maintenance

The instrument is maintenance-free but it is good practices to conduct periodic inspection (visual and functional).

Inspections should be carried out at least once a year depending upon the operating, environmental conditions and customer plan.



Caution: It is recommended that instruments used to provide an alarm or a shutdown safety related are operated periodically to ensure they are functioning correctly. If further maintenance is required seek advice from Delta Mobrey before attempting repair or replacement of parts.

Periodical visual inspection

Isolate the unit from process and power.



Warning: The flame proof and intrinsically safe instruments installed in explosive atmospheres of combustible dust, must be periodically cleaned up externally in order to remove any accumulation of dust.

Verify the integrity of the electrical unit using IEC 60079-17 as guide.

Verify if the device for natural ventilation is in place and is free from obstructions such as fungi, moulds and insects.

Slacken the lid lock screw and unscrew the lid



Warning: flameproof instrument. Before removing the lid or the cable gland check that no explosive atmosphere is present and that the instrument is de-energized.

- Check all terminals for tightness.
- Check that cable tails are not fouled or chafed.
- Check for internal condensation.
- Check that the gasket is seated properly in the lid recess and is not worn.
- Check that the vent area does not become blocked or obstructed and vent plug has not degraded.

Periodical functional verification

The verification consists of checking the set point. This verification is done, usually by removing the instrument from the plant and performing the verification on in a test room (see calibration check paragraph).



Warning: Flameproof instrument. Before removing the lid or the cable gland check that the electrical supply is not energized and that no explosive atmosphere is present.

If the verification is done on site the preferred procedure is the verification of the entire loop without remove the lid or the cable gland.



Warning: The flameproof instruments may be checked on site only if apparatus suitable for explosive atmospheres are used.



Warning: Verify that loop is in a safe configuration before acting on the bulb and instrument. The bulb of the instrument can be

Replacement parts

Only the microswitch and terminals can be replaced. Use factory authorised parts only.



IMPORTANT NOTE: operations involving replacement of essential components must be carried out at our workshop, especially for instruments with a flameproof certificate; this is to guarantee the user the total and correct restoration of the products original characteristics.



Warning: The flamepaths (cable entry & cover threads, range adjuster) are not to be repaired.

Warranty

See Standard Conditions of Sale.

Decommissioning



Warning: Verify that the loop is in a safe configuration before working on the bulb and instrument. Power off the instrument.



Warning: verify, in the case of a flameproof instrument, the absence of an explosive atmosphere before removing the lid or the cable glands.



Warning: In case of flame proof instruments, it is recommended to follow at least the standard IEC 60079-17 and for the withdrawal from service of electrical apparatus.

- Remove the bulb from the thermowell.

Warning the bulb can be hot.

- Slacken the lid lock screw and unscrew the lid.

- Disconnect all the live terminals and insulate the cables.

- Disconnect the grounding.

- Remove the cable gland.

- Dismount the instrument from the process connection.

- Plug the thermowell.

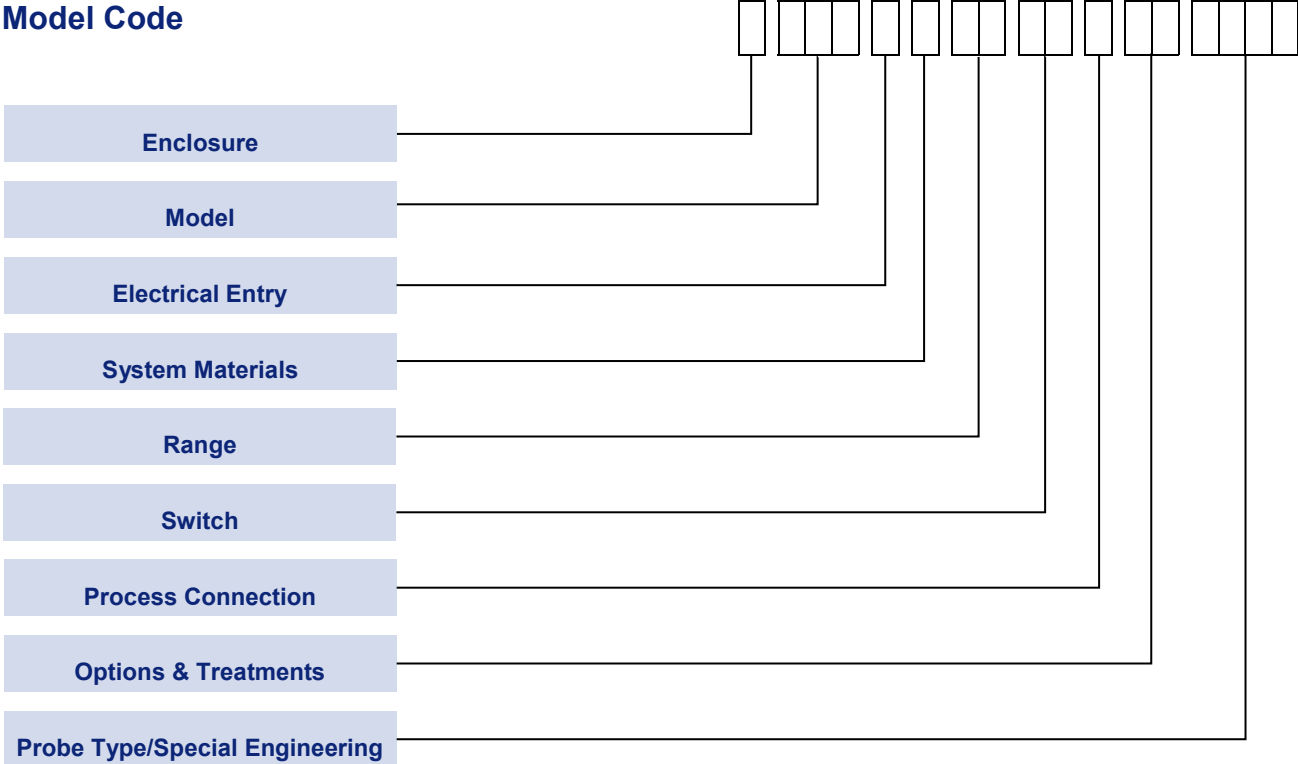
- Reassembly the lid.

- Remove the mounting screws to the wall/ panel.

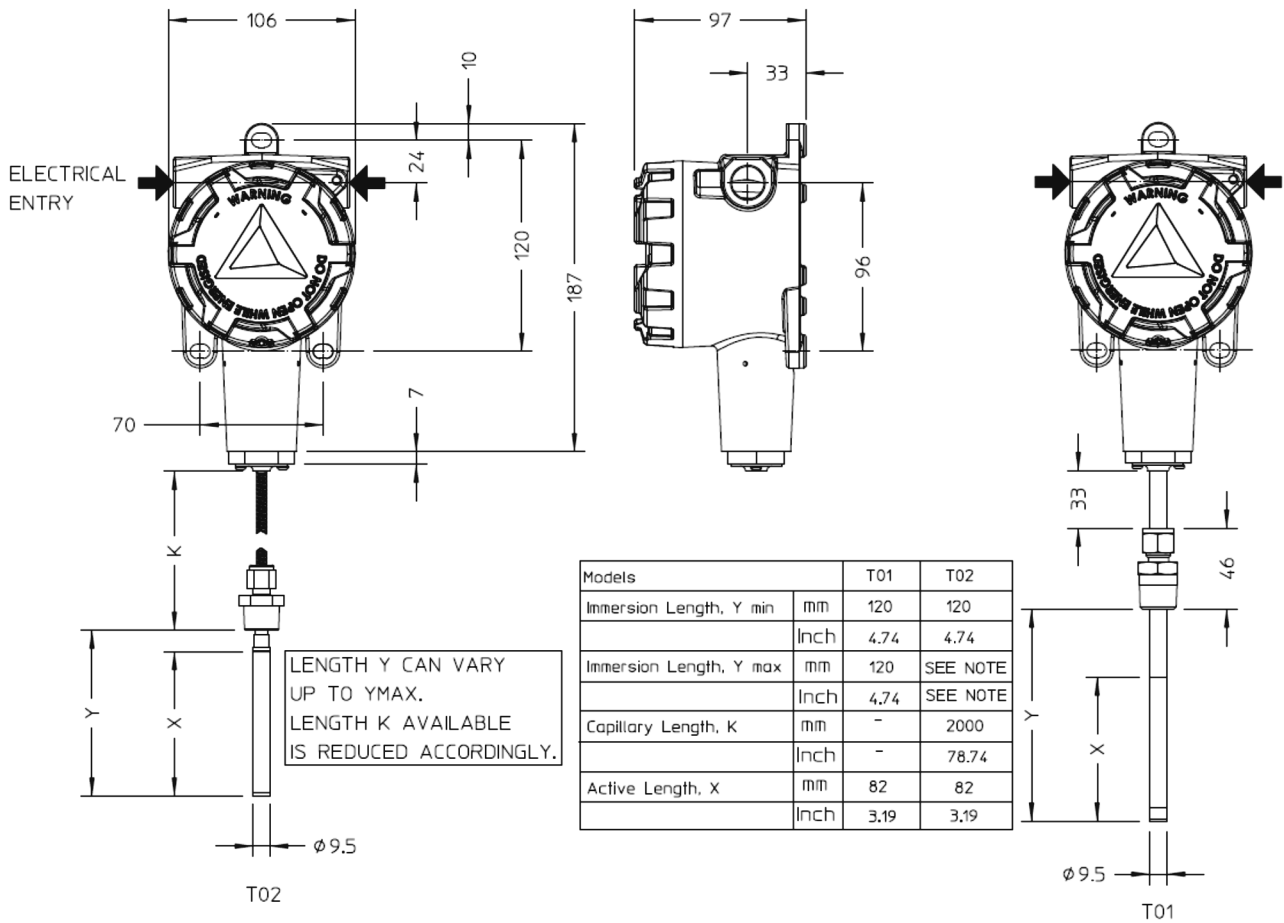
Disposal

The instrument is mainly made of aluminium and stainless steel. Remove the microswitch and clean the wetted parts before scrap the instrument.

Model Code



DIMENSIONS



Model	Weight (Kg)	Weight (lb)
WT01* / HT01* / 5T01	1.8	4,0
WT02* / HT02* / 5T02	1.8	4,0
AT01* / RT01* / 4T01*	3.9	8.6
AT02* / RT02* / 4T02	3.9	8,6

Weights will vary, according to the type and length of the sensing element.