Installation, Operation & Maintenance **Instructions**

VM Series
Models VM2, VM4 (Pressure Switches)

delta-mobrey

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.

Contents

Foreword

The unit is manufactured, checked and supplied in accordance with our published specification. 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 conditions of the product has been required as identified by the last 4 digits of the part number, follow the necessary safety instructions 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

Pressure exceeding the adjustable range can be allowed up to the max pressure 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 avoid exceeding the limits specified on the table below (i.e. remote mounting, valves, siphons, diaphragm seals. See Mounting).

Process temperature

For the instrument model VM* the following table is applicable.

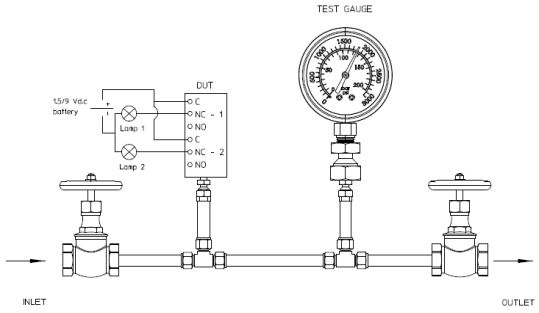
Temperature Class	Ambient temperature range	Max process temperature at the process connection	Max electrical loads (resistive loads)
T6	-20°C to +65°C or -30°C to +65°C or -55°C to +65°C	65°C	5 A @ 110/250 V a.c. or 2 A @ 30V d.c.
T5 .. T1	-20°C to +80°C or -30°C to +80°C or -55°C to +80°C	80°C	

Tools to be used for checking and calibrate the 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 used for 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



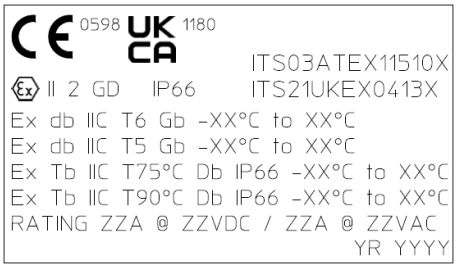
Operating principles

Pressure Switch models VM* 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 microswitch.

Marking

Flameproof models carry the following label

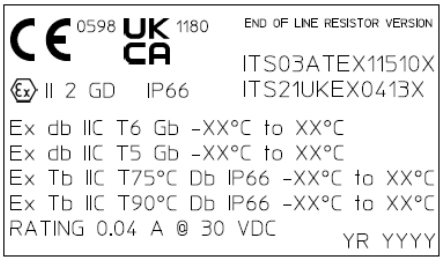
Fig. 2 - Flameproof nameplate



Instrument equipped with End of Line

Fig. 3 - Nameplate of instrument equipped with End of Line resistors

Instrument equipped with End of Line resistor carry the following label markings:



List of standard to which the product is conformed

This product complies with the following standards:		
IECEx	**ATEX**	**UKEx**
IEC 60079-0: Ed.7	EN IEC 60079-	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

Special conditions of use

Warning: The VM Pressure Switch must not be installed in a location where moving dust flow can generate an electrostatic charge on the equipment.

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, ensuring that the type of protection is not compromised .

Warning: The flamepaths are not to be repaired.

Warning: Before open the lid de-energise the instrument and wait 5 minutes.

Installation

Mounting

The instruments are designed to be mounted vertically with the process connection underneath. However, mounting up to 45° vertically is acceptable, although a small calibration shift may occur. They can be mounted either directly, or to a wall or panel using the mounting holes provided. Select the mounting point to avoid excessive shock, vibration or temperature fluctuation.

If sudden changes of pressure (pulsations) are likely then we recommend that a snubber is fitted between the process line and instrument.

Instruments should be mounted to avoid excessive heat transfer from the process lines or adjacent plant. The process fluid could crystallise/solidify, so it is recommended to use of adequate chemical seals and capillary.

Use a spanner to support the process connection when fitting the instrument. The following figures show the essential installation tips.

Fig. 4 - Remote installation

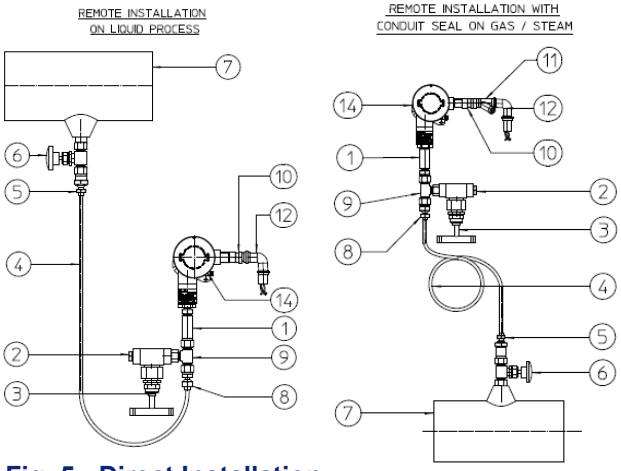
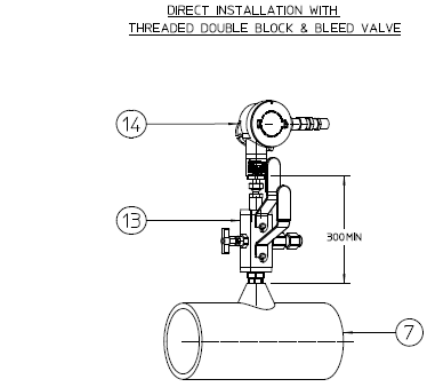


Fig. 5 - Direct Installation



Caution: Check the connection thread size and specification on the unit to avoid mismatching with the process connection adaptor. See no. 11 of product code.

Electrical Connections

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

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

Furthermore, in order to guarantee the degree of protection IP66 and the non-loosening of cable gland/adaptor, it is recommended to seal the threads of connection with an anaerobic sealant. For instance, a sealant like Loctite ® 542 can be applied on the thread before screwing it into the enclosure entry.

Wiring

Disconnect all supply circuits before wiring.

Wire in accordance with local and national codes. Use cables no larger than 2.5 mm^2 (14 AWG)

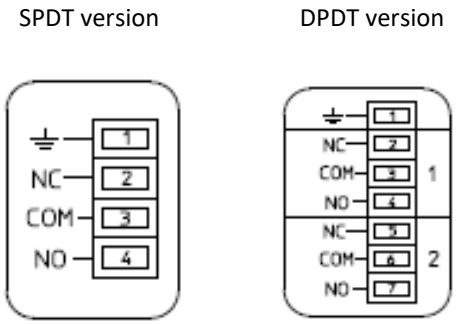
Warning: Do not exceed electrical ratings stated in literature and on nameplates.

Warning: If the ambient temperature exceeds 60 °C it is recommended to use cables suitable for operating temperatures no less than 105 °C.

The three switch terminals are clearly marked “NC - NORMALLY CLOSED”, “NO - NORMALLY OPEN” and “C - COMMON”.

The following diagram can be used as a guide for wiring.

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 microswitch single pole, double throw or two independent switches settled at the same set point.

Before closing the lid:

- Ensure the 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.

End of line resistors

Some products may be supplied to order, fitted with end of line resistors. Resistors in use may generate heat. The type, quantity, configuration, fitment method and allowable electrical loads are limited by the scope of the certification.

Warning: Never fit the end of line resistors or modify without contacting Delta-Mobrey.

For wiring see the figure on the last page.

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

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 to a conductor with a cross-sectional area of at least 4 mm^2.

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 realised to prevent an electrostatic surcharge on the instrument surface. **CLEAN ONLY with a damp cloth**

Operation

Adjustments

Pressure Switches are supplied to a midscale falling, unless otherwise specified.
If the instrument has been ordered with a specific calibration value the adhesive label shows the set point value.
It is a good rule to check the calibration values are marked on the relevant adhesive label, prior to installation.

Calibration

Please follow the below suggested steps to calibrate the set point of the instrument:
Connect the instrument to the pneumatic tools in the normal installation position (see Fig.1).
Loosen the lid lock screw and unscrew the lid.
Connect the warning lamp appropriately.

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 pressure, the switch closes the circuit as the pressure increase when the desired value is reached.
- The circuit is closed at the normal operating pressure, the switch opens the circuit as the pressure decreases when the desired value is reached

Connection C-NC terminal

- The circuit is closed at the normal operating pressure, the switch opens the circuit as the pressure increases when the desired value is reached.
- The circuit is open at the normal operating pressure, the switch closes the circuit as the pressure decreases when the desired value is reached

Pressurise the circuit and slowly increase the pressure up to the set point. 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 pressure and increase (or decrease) the pressure up the relative lamp turn ON (or OFF). Read the pressure on the test gauge. Eventually adjust the range adjuster and re-check again using the lamp until the set point is achieved with the required accuracy.
Close the instrument lid and tighten lid lock screw.
Write the set point on the adhesive label

Caution: The microswitch is factory set and should not be adjusted. Should these parts be accidentally loosened, please contact Delta Mobrey for assistance.

Periodical calibration check

Connect the instrument to the pneumatic tools in the normal installation position (see Fig.1).
Loosen the lid lock screw and unscrew the lid.
Connect the warning lamp according to the desired function.

Set point calibrated with increasing pressure

On atmospheric pressure, pressurise the circuit and slowly increase the pressure up to the set point (the warning lamp turns ON).
Record the pressure read out on the test gauge. Return to atmospheric pressure.
Repeat the above operation twice.

Set point calibrated with decreasing pressure

On atmospheric pressure, pressurise the circuit up to the upper range value.
Decrease the pressure slowly up to the set point (the warning lamp turns ON).
Record the pressure read on the test gauge.
Return to upper range pressure value.
Repeat the above operation twice.

Evaluation of set point value and repeatability

With all the above values detected, calculate:

- Average set point value
- Repeatability find the maximum difference of the detected set point values

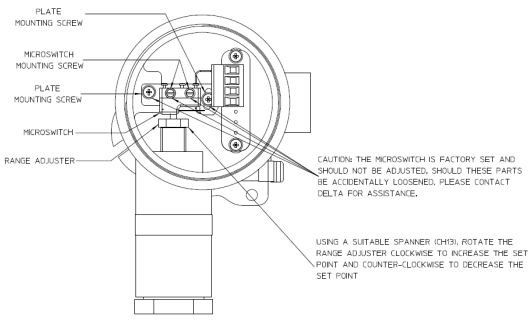
If the average set point is different from the expected setpoint, the instrument must be recalibrated.

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 pneumatic tool and disconnect the warning lamp
Close the instrument lid and tighten the lid lock screw.

Fig. 7 - Set point adjusting



Commissioning

Warning: Ensure the enclosure is sealed and the cover locking set screw is tightened fully before the switch is energised.
The instrument starts operating as soon as it is energised and the root valve is opened.

Inspections and maintenance

The instrument is maintenance-free but it is a good practice to proceed with periodical inspections (visual and functional).
Inspections should be carried out at list once a year depending upon operational and, environmental conditions and customer planning.

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

Periodical visual inspection

Isolate the unit from the power supply and operational location.
Warning: Flameproof instruments installed in the explosive atmospheres of combustible dust, must be periodically cleaned 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, molds and insects.
Verify the leakage of the process externally.
Loosen the lid lock screw and unscrew the lid
Warning: Before removing the lid or the cable gland, de-energise the instrument and wait 5 minutes.

- Check all terminals for tightness.
- Check the cable tails are not fouled or chaffed.
- 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, removing the instrument from the plant and perform the verification in a test room (see periodical calibration check paragraph).
Warning: Before removing the lid or the cable gland, de-energise the instrument and wait 5 minutes.
If the verification is done on-site the preferred procedure is the verification of the entire loop without removing the lid or the cable gland.
Warning: The flameproof instruments may be checked on site only if the apparatus suitable for explosive atmospheres are used.

Warning: Verify that loop is in a safe configuration before acting on the valves and instrument. Do not dispose the process fluid into the environment if this causes pollution or personal injury.

Replacement parts

Only the microswitch and terminals can be replaced. Use factory authorised parts only.
IMPORTANT NOTE: Operations involving the replacement of essential components must be carried out at our workshop, especially for instruments with flameproof certification; this is to guarantee the user accurate restoration of the products original settings.
Warning: The flame paths (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 acting on the valves and instrument. Power off the instrument.
Warning: before removing the lid or the cable glands de-energise the instrument and wait 5 minutes.
Do not dispose the process fluid into the environment if this cause pollution or personal injury.
Warning: In the case of flameproof instruments, it is recommended to follow the standard IEC 60079-17 and for the withdrawal from service of electrical apparatus.

- Isolate the instrument from the process and depressurise acting on the valves.
- Loosen 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.

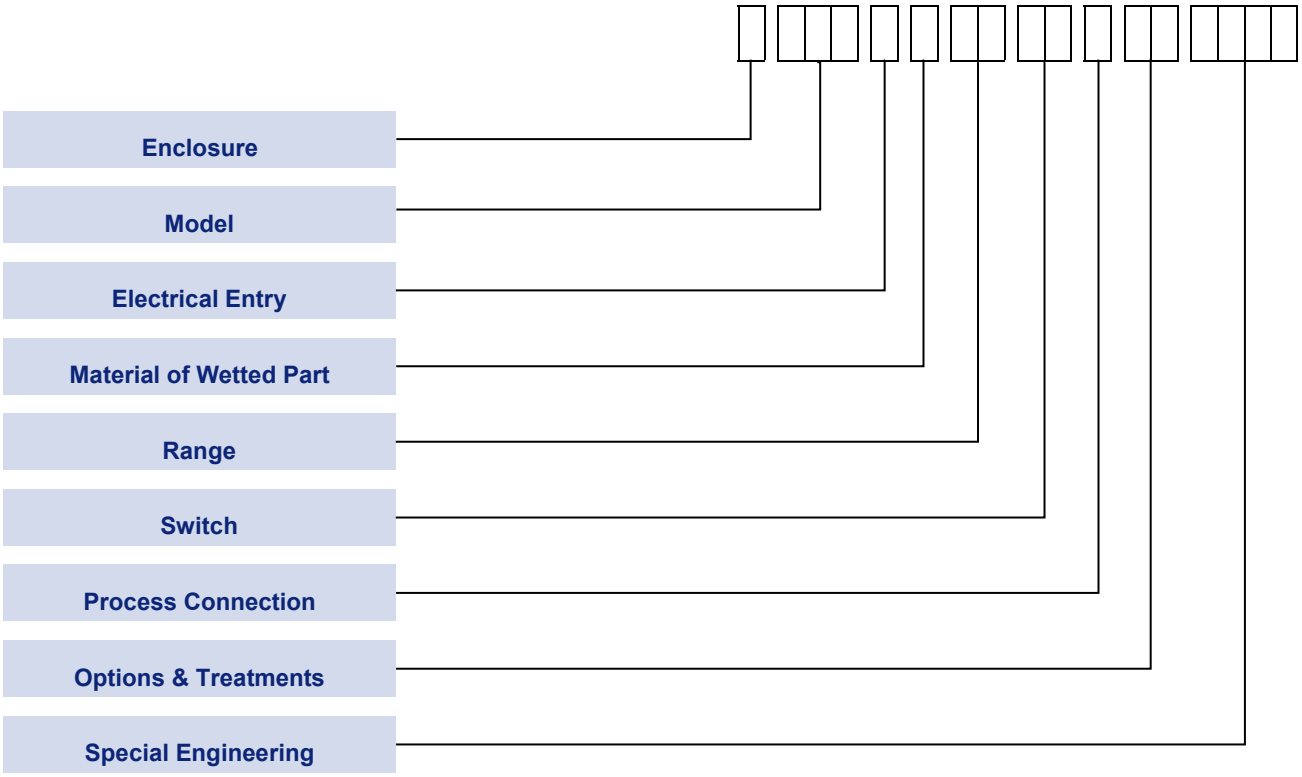
Warning: The process fluid can be hot or corrosive.

- Plug the process pipe.
- Re-assemble the lid.
- Remove the mounting screws to the wall/panel.

Disposal

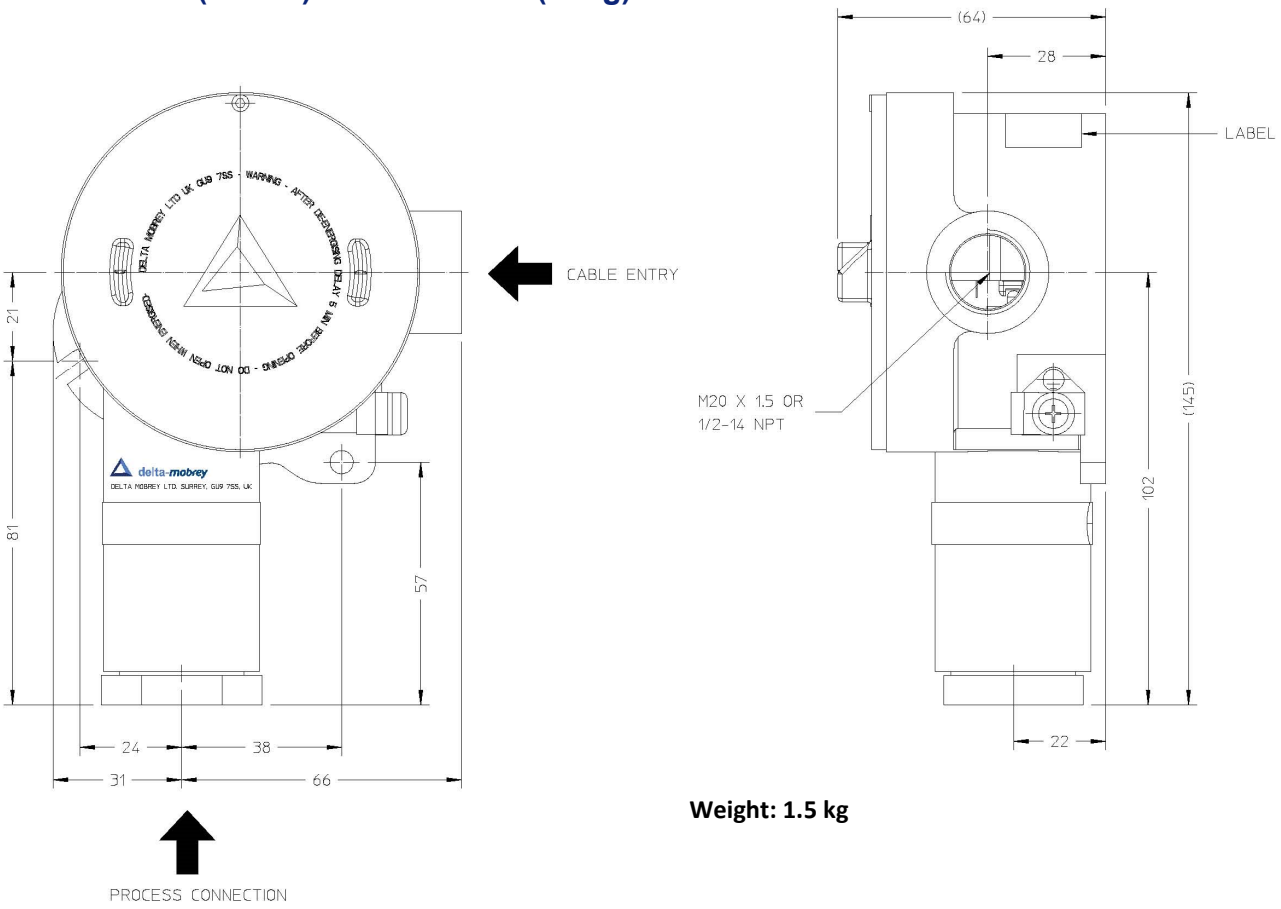
The instrument is mainly made of aluminium and stainless steel. Remove the microswitch and clean the wetted parts before disposing the instrument.

Model code



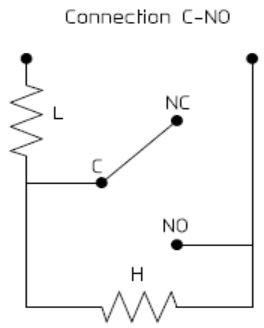
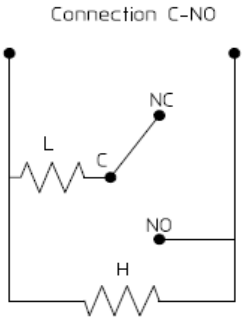
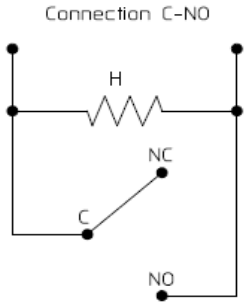
Dimensions

DIMENSIONS (in mm) AND WEIGHT (in kg)



Weight: 1.5 kg

END OF LINE RESISTOR TYPICAL WIRING

SCHEME A - DUAL RESISTORS	SCHEME B - DUAL RESISTORS	SCHEME C - SINGLE RESISTOR
		
SCHEME D - DUAL RESISTORS	**SCHEME E - DUAL RESISTORS**	**SCHEME F - SINGLE RESISTOR**