Installation, Operation & Maintenance **Instructions**

delta-mobrey

CS Series
Models CS2, CS4 (Pressure 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.

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 user should ensure the equipment is suitable for use in the application with aggressive substances.

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.

CONTENTS

Allowed over range

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

Process temperature

The following tables are applicable:

Temperature Class	Ambient temperature range	Max process temperature at process	Max electrical loads (resistive loads)
T6 .. T5	From –40 to +60°C	60°C	Up to 5 A (see nameplate)
T4 … T1	From –40 to +85°C	85 °C	

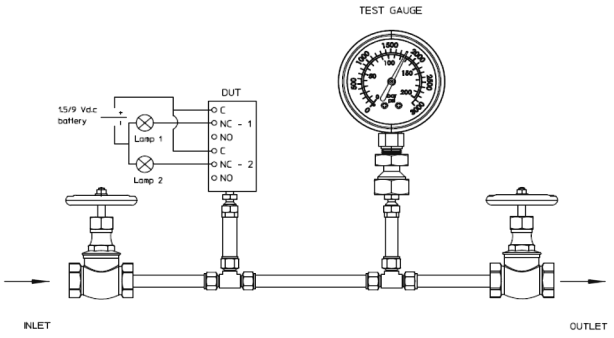
Temperature Class	Ambient temperature range	Max process temperature at process	Max electrical loads (resistive loads)
T6 .. T5	From –40 to +45°C	45°C	Up to 11 A (see nameplate)
T4 … T1	From –40 to +85°C	85 °C	

Tools to be used for checking and adjusting set point

The following calibration circuit is to be used 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

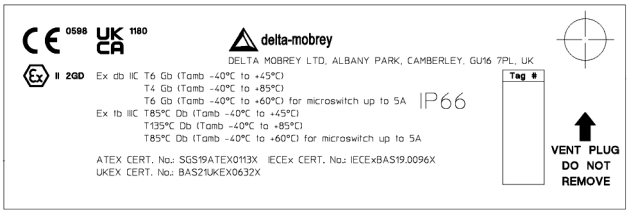
Pressure Switch models CS2 & CS4 are diaphragm operated switches.

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

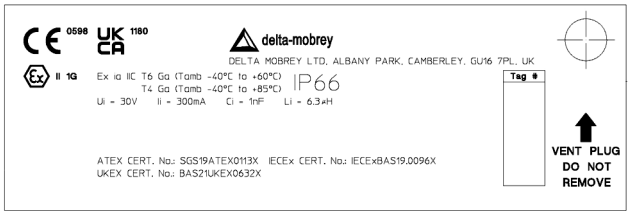
Flameproof models carry the following label markings:

Fig. 2 - Flameproof nameplate



Intrinsically safe models carry the following label markings:

Fig. 3 - Intrinsic Safety nameplate



Input limitations for intrinsic safety:
Ui = 30V, Ii = 300mA, Ci = 1 nF; Li = 6.3 mH

Product Standards List

This product complies with the following standards:		
IECEx	ATEX	UKEx
IEC 60079-0: Ed.7	EN 60079-0:2018	BS EN IEC 60079-
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 instrument is not capable of withstanding the 500V rms insulation test, this must be taken into account when installing the equipment

Warning: The equipment wire should be protected from mechanical damage by the use of metal conduit or an equivalent method, to prevent the wiring from being subjected to tension or torque.

Warning: If the instrument is to be terminated within a potentially explosive atmosphere, a suitably certified junction box must be used.

Warning: The corrosive environmental conditions may adversely affect the life and the type of protection of the instrument. It is the responsibility of the user to take suitable precautions that prevent it, verify the compatibility of the environmental with stainless steel and polymeric material.

INSTALLATION

Mounting (All models)

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 direct to the process. Select the mounting point to avoid stresses, excessive shock, vibration or temperature fluctuation being imparted to the switch during the operation.

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

Instruments should be mounted to avoid excessive heat transfer from the process lines or adjacent plant.

With process fluid applications, that could crystallise/ solidify, we suggest the use of adequate chemical seals and capillary.

Caution: Always hold a wrench on the pressure entry hex when making a pressure connection to the switch. Do not tighten by turning the electrical entry; the microswitch assembly with factory sealed leads has been carefully positioned at the factory. Any disturbance may render this unit inoperative.

The following figures show the minimal installation tips (Fig 4,5 and 6).

Fig. 4 - Remote installation

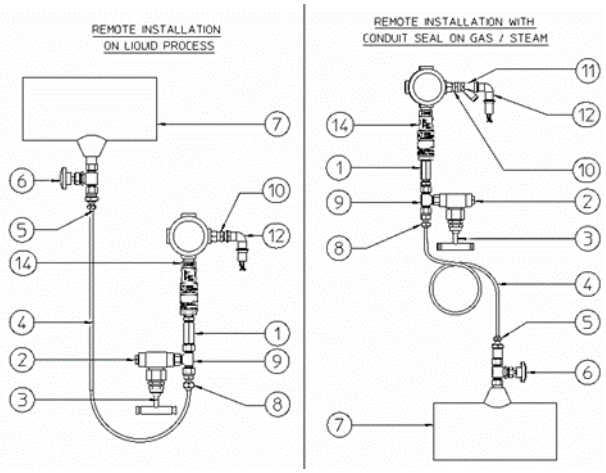


Fig. 5 - Direct Installation

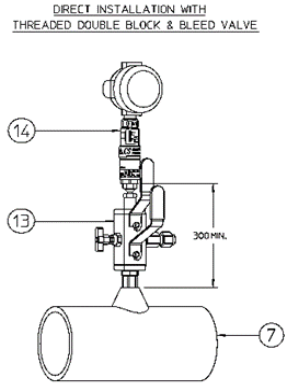
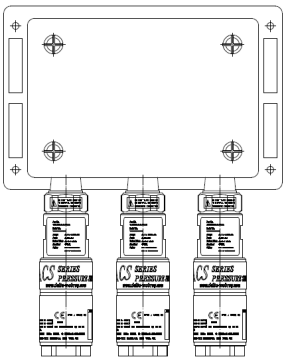


Fig. 6 - Installation on Junction Box



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

Electrical Connections

The instrument is provided with one electrical entry. The thread type and size is marked on the enclosure, just below the connection.

Warning: The leads are factory sealed. However, the leads must be suitably protected against mechanical damage and terminated in a suitable junction box in accordance with local and national codes.

Warning: Fittings/adaptor/plugs/terminal box used for the electrical connection of the flameproof instruments shall be certified according to IEC or EN standards and shall guarantee the instrument a level of protection to IP66

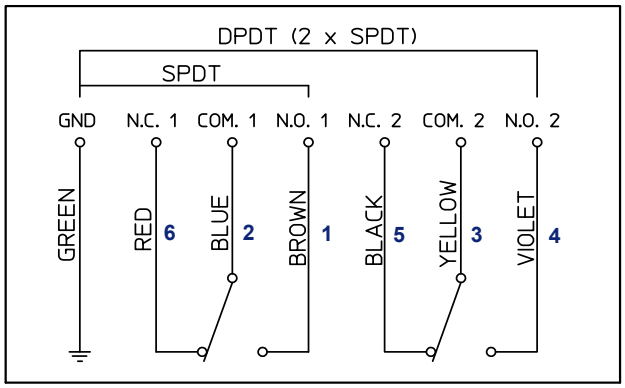
Warning: In order to guarantee the IP66 level of protection and the non-loosening of fittings/ adaptor/plugs/terminal, we recommend sealing the threads of connection with the same anaerobic sealant. For instance, a sealant like Loctite ® 542 can be applied on the thread, before screwing them.

Warning: The corrosive environmental conditions may adversely affect the life and the type of protection of the instrument. It is the responsibility of the user to take suitable precautions that prevent it, verify the compatibility of the environmental with stainless steel and polymeric material.

Wiring

The instrument is equipped with wire with a cross section of 0,75 mm^2 (18 AWG). Individual cores of cable can be coloured or numbered as show in fig.7.

Fig. 7 - Wire Circuit



The instrument may be equipped with micro switches SPDT or DPDT.

Warning: Intrinsically safe instruments; where two microswitches are fitted, the two switches must be part of the same intrinsically safe circuit.
The entry parameters relevant for intrinsic safety are listed on the nameplate of the instrument.

Earthing connections

Warning: The instrument is to be grounded **according to applicable electrical codes**. Make use of the internal green wire and, if the cable is not protected by metal tubing, make sure that the equipment on which the instrument is installed is suitably earthed.

Operation Adjustments

Pressure switches are supplied and adjusted at midscale falling, unless otherwise specified.
If the instrument has been ordered with 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 suggested steps below to calibrate the set point of the instrument:
Connect the instrument to the pneumatic tools in the normal installation position (see Fig.1).
If the instrument is supplied with a Junction box, 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 pressure, the switch closes the circuit as the pressure increases 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.
Slide the cover upwards.
Using a screwdriver, rotate the range adjuster right to left to increase the set point and left to right to decrease the set point until the relative lamp is turned ON, or OFF.
As a guide, one complete revolution of the adjuster will alter the set point by approximately 15% of the range.
Go to the normal operating pressure and increase (or decrease) the pressure until the relative lamp turn ON or OFF. Read the pressure on the test gauge. Gradually adjust the range adjuster and recheck again using the lamp until the set point is achieved with the required accuracy.
Slide the cover downwards.
Write the set point on the adhesive label

Periodical calibration checks

Connect the instrument to the pneumatic tools in the normal installation position (see Fig.1).
Connect the warning lamp according to the desired function.

Set point calibrated with increasing pressure

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

Set point calibrated with decreasing pressure

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

Evaluation of set point value and repeatability

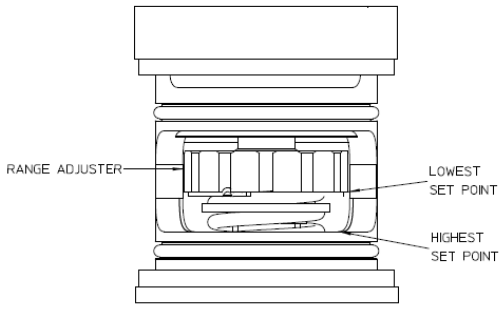
With all the above values detected, calculate:

- Average set point value
- Repeatability correspondent to the max difference of the detected set point values.

If the average set point is different from the expected, the instrument must be recalibrated.
If the repeatability is higher than the value in the product Technical Data Sheet replace the instrument with a new one and contact the factory.

End of verification

Fig. 7 - Set point adjusting



Safety Integrity Level (SIL) instrument and installation requirements

Refer to Functional Safety Manual CS Series.

Commissioning

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 good practice to have periodical inspections (visual and functional).
Inspections should be carried out at least once a year depending upon 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 flameproof instruments installed in explosive atmospheres of the 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 a guide.
Verify there is no external leakage of the process media.

Should the diaphragm fail, the process will vent to the atmosphere via a control orifice without pressurising the switch enclosure. Periodically ensure the vent area does not become blocked and vent plug has not degraded. Ensure that the vent area is not obstructed.

Periodical functional verification

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

Warning: Flameproof instruments. Before removing the lid or the cable gland check that the electrical supply is not energised 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 removing the lid or the cable gland.

Warning: The flameproof instruments maybe checked on site only if the apparatus suitable for explosive atmospheres is used.

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

Replacement parts

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

Warning: The equipment contains no user-replaceable parts and is not intended to be repaired by the user.

Warranty

See Standard Conditions of Sale.

Decommissioning

Warning: Verify that the loop is in a safe state before working on the valves and instrument. Power off the instrument and verify, especially for a flameproof product, the absence of an explosive atmosphere. Do not dispose of the process fluid into the environment if this causes pollution or personal injury.

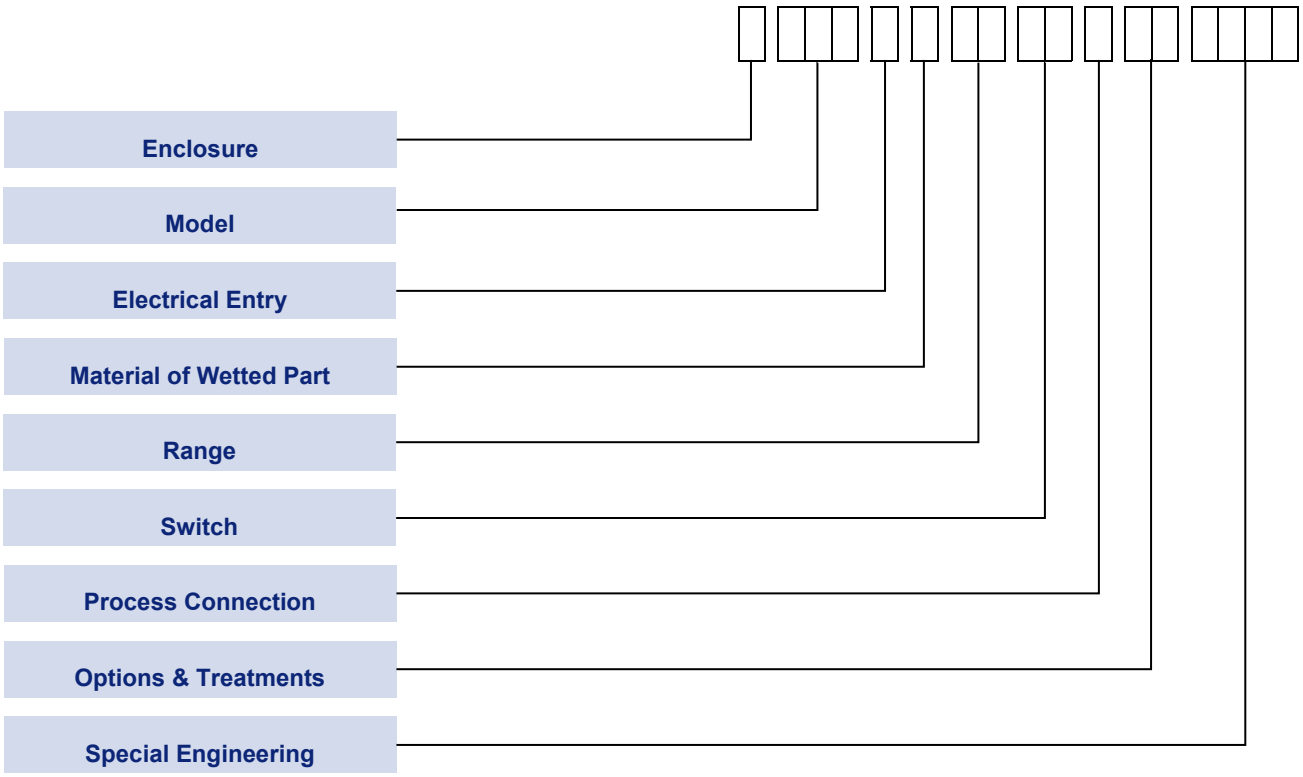
- Isolate the instrument from the process and depressurise utilising the valves
- Disconnect all the live terminals and insulate the cables
- Disconnect the grounding
- Remove the cable gland
- Disconnect the instrument from the process connection.

Warning: The process fluid can be hot and or corrosive.

Disposal

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

Model code



DIMENSIONS

Enclosures Styles