



# INSTRUCTION MANUAL

4 ½ digit Intrinsically Safe  
4-20 mA Loop Indicator  
Model T3010S



## Characteristics

**General Description:** The single channel 4 ½ digit Intrinsically Safe 4-20 mA Loop Indicator type T3010S provides process variable reading in Hazardous Area field. It is a loop powered 4-20 mA unit with less than 1 V voltage drop. It monitors 4-20 mA current, 0-100 % percentage or process variable between -19999 to +19999 range with a 20 mm height 7-segments LCD display. Blinking display indicates over range or under range condition. An internal protected slot-in label is provided, after the last digit, to allow the unit measurement indication.

Also loop tag indication can be provided. The indicator is housed in a moulded reinforced polyamide 66 / polycarbonate IP 66 case to allow installation in field area. It can be mounted on flat surface, front panel or 2" pipe or post. The housing is divided in two parts, one for cable connection and the other for indicator parameters setting.

**Field Configurability:** 4 push button provided, protected with a cover, allows the configuration of the indicator parameters: decimal point position, low and high scale indication.

**EMC:** Fully compliant with CE marking applicable requirements.

## Technical Data

**Input Range:** 4 to 20 mA nominal (3 to 22 mA reading).

**Voltage drop:**  $\leq 1.0$  V, loop powered.

**Over range protection:**  $\leq 200$  mA without damage.

**Visualization:** 4 ½ digit, 20 mm height, 7 segments LCD display.

**Range indication:** -19999 to +19999.

**Decimal point:** any position or disabled.

**Setting:** any value within range, direct or reverse indication.

**Out of range indication:**  $\leq 3.5$  mA or  $\geq 20.5$  mA blinking display.

**Engineering value:** internal slot-in label.

**Reading rate:** 2 measures per second.

**Performance:** Ref. conditions 4-20 mA range,  $23 \pm 1$  °C ambient temperature.

**Calibration accuracy:**  $\leq \pm 5$  digit.

**Linearity error:**  $\leq \pm 3$  digit.

**Series mode rejection:**  $\leq \pm 1$  digit for 1 mA peak-peak 50 Hz signal.

**Temperature influence:**  $\leq \pm 0.2$  digit for a 1 °C change.

**Compatibility:**

 CE mark compliant, conforms to 94/9/EC Atex Directive and to 2004/108/CE EMC Directive.

**Environmental conditions: Operating:** temperature limits -20 to + 60 °C, relative humidity max 95 % non condensing, up to 35 °C.

**Storage:** temperature limits - 45 to + 80 °C.

**Safety Description:**



II 1 G D EEx ia IIC T5/T6 T85°C/100°C IP66, II 3GD EEx nA IIC T5 T100°C IP66 intrinsically safe apparatus.

Ui/Vmax = 30 V, Ii/Imax = 200/100 mA, Pi/Pi = 850 mW, Ci = 0 µF, Li = 0 µH,

Uo/Voc = 1.2 V, Io/Isc = 81 mA, Po/Po = 25 mW at input terminals.

-20 °C  $\leq$  Ta  $\leq$  60 °C.

**Approvals:** DNV-2004-OSL-ATEX-0066 conforms to EN50014, EN50020, EN50281-1-1, EN50284,

FM & FM-C No. 3024643, 3029921C, conforms to Class 3600, 3610, 3611, 3810 and C22.2 No.142, C22.2 No.157, C22.2 No.213, E60079-0, E60079-11, E60079-15,

Russia according to GOST 12.2.007.0-75, R 51330.0-99, R 51330.10-99 [Exia] IIC X.

**Mounting:** flat surface, front panel or 2" pipe/post using appropriate accessories.

**Weight:** about 650 g.

**Connection:** by disconnection of clamp terminal blocks to accommodate terminations up to 2.5 mm<sup>2</sup>.

**Location:** Hazardous Area Zone 0 (Zone 20) IIC T5/T6 (T85°C/100°C), Hazardous Locations Class I, Div. 1, Groups A, B, C, D, T-code T5, Class I, Zone 0, IIC T5 installation as Intrinsically Safe equipment. Hazardous Area Zone 2 (Zone 22) IIC T5 (T100°C), Hazardous Locations Class I, Div. 2, Groups A, B, C, D, T-code T5, Class I, Zone 2, IIC T5 installation as non-incendive equipment.

**Protection class:** IP 66, panel mounting IP 40 standard or IP 65 with gasket provided in mounting kit OPT92 or OPT93.

**Dimensions:** Width 144 mm, Depth 61 mm, Height 144 mm.

**Cut-out for panel mounting:** 139 x 139 mm.

## Ordering information

Model:	T3010S	
suitable for flat surface mounting		blank
front panel mounting kit		/OPT92
2" pipe/front panel mounting kit		/OPT93

## Features

- Hazardous Area Zone 0 (Zone 20) IIC T5/T6 (T85°C/100°C IP66) for ATEX installation.
- Hazardous Locations Class I, Div. 1, Groups A, B, C, D, T-Code T5, Class I, Zone 0, IIC T5 for FM & FM-C installation.
- Hazardous Area Zone 2 (Zone 22) IIC T5 (T100°C IP66) for ATEX installation as non-incendive equipment.
- Hazardous Locations Class I, Div. 2, Groups A, B, C, D, T-Code T5, Class I, Zone 2, IIC T5 for FM & FM-C as non-incendive equipment.
- 4-20 mA loop powered, voltage drop < 1 V.
- 4 ½ digit 20 mm height LCD display.
- -19999 to +19999 visualization range.
- High Accuracy.
- IP 66 enclosure for field mounting.
- EMC Compatibility to EN61000-6-2, EN61000-6-4.
- In-field programmability by push-button.
- ATEX, FM & FM-C, Russian Certifications.
- High Reliability, SMD components.

## Parameters Table

In the system safety analysis, always check the Hazardous Area/Hazardous Locations devices to conform with the related system documentation, if the device is Intrinsically Safe check its suitability for the Hazardous Area/Hazardous Locations and gas group encountered and that its maximum allowable voltage, current, power ( $U_i/V_{max}$ ,  $I_i/I_{max}$ ,  $P_i/P_i$ ) are not exceeded by the safety parameters ( $U_o/V_{oc}$ ,  $I_o/I_{sc}$ ,  $P_o/P_o$ ) of the Associated Apparatus connected to it, indicated in the table below (also described in the enclosure side of the T3010 indicator):

T3010 Associated Apparatus Parameters	Must be	T3010 Input Parameters
$U_o / V_{oc}$	$\leq$	$U_i / V_{max} = 30 \text{ V}$
$I_o / I_{sc}$	$\leq$	$I_i / I_{max} = 200 \text{ mA (T5)}$ $I_i / I_{max} = 100 \text{ mA (T6)}$
$P_o / P_o$	$\leq$	$P_i / P_i = 850 \text{ mW}$
T3010 Associated Apparatus Parameters	Must be	T3010 + Cable Parameters
$C_o / C_a$	$\geq$	$C_i / C_i = 0 \mu\text{F} + C \text{ cable}$
$L_o / L_a$	$\geq$	$L_i / L_i = 0 \mu\text{H} + L \text{ cable}$
$L_o / R_o$	$\geq$	$L \text{ cable} / R \text{ cable}$
T3010 Output Parameters		

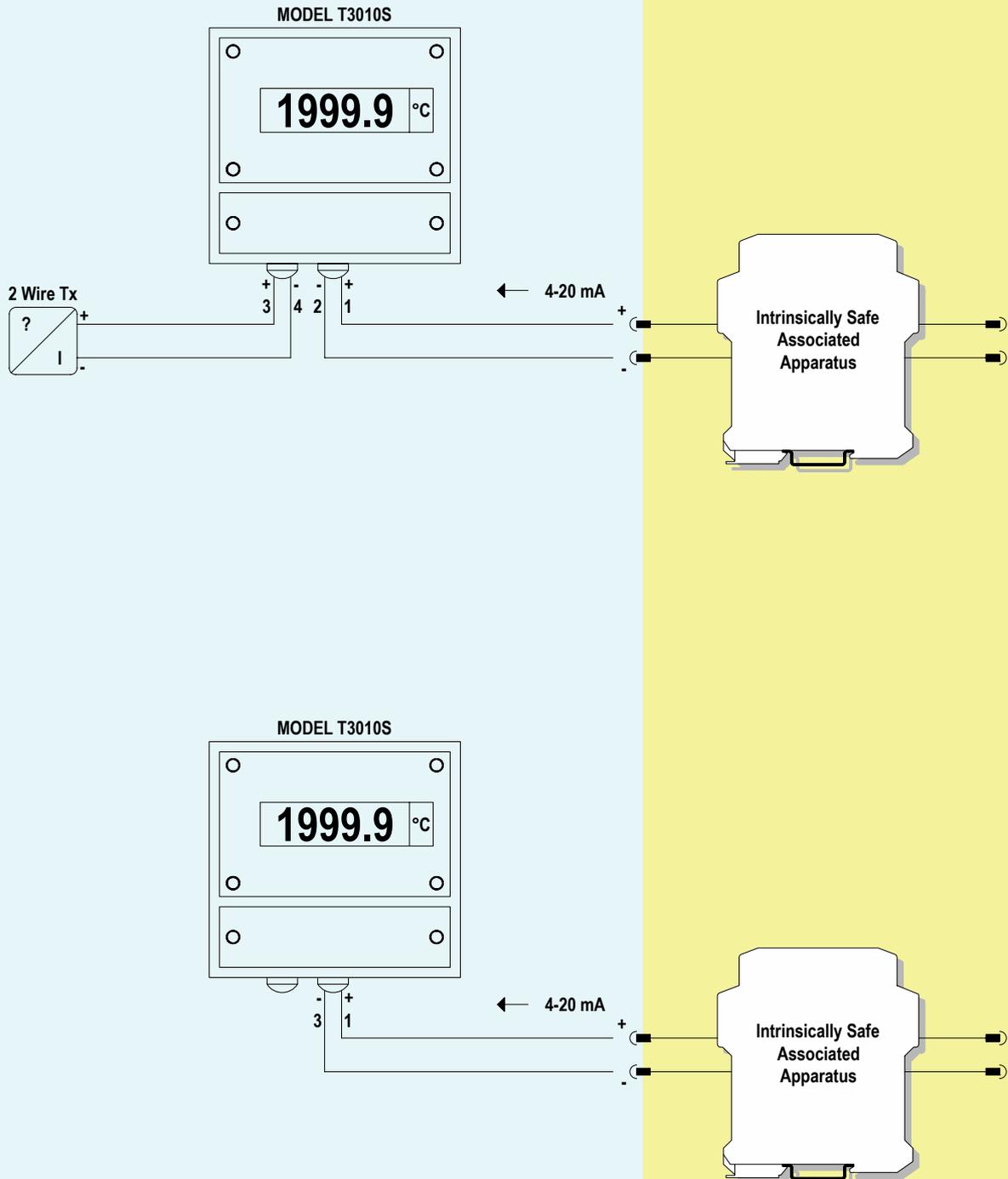
$$\begin{aligned}
 U_o / V_{oc} &= 1.2 \text{ V} \\
 I_o / I_{sc} &= 81 \text{ mA} \\
 P_o / P_o &= 25 \text{ mW} \\
 C_o/C_a &= 465 \mu\text{F} \\
 L_o/L_a &= 5.4 \text{ mH}
 \end{aligned}$$

When checking the power matching also consider the maximum operating temperature of the field device, check that added connecting cable and field device capacitance and inductance do not exceed the limits ( $C_o/C_a$ ,  $L_o/L_a$ ,  $L_o/R_o$ ) given in the Associated Apparatus parameters for the effective gas group (see parameters on installation manuals). If the cable parameters are unknown, the following value may be used: Capacitance 60pF per foot (180pF per meter), Inductance 0.20mH per foot (0.60mH per meter). T3010 indicator is certified as "non energy storing" simple apparatus. This permits the use of the indicator into any intrinsically safe loop, protected by galvanic isolator or zener barrier. The indicator can be connected into any intrinsically safe loop providing the following parameters:  $U_o \leq 30 \text{ V}$ ,  $I_o \leq 200 \text{ mA}$ ,  $P_o \leq 0.85 \text{ W}$  for T5 (T100°C) temperature classification or  $U_o \leq 30 \text{ V}$ ,  $I_o \leq 100 \text{ mA}$ ,  $P_o \leq 0.85 \text{ W}$  for T6 (T85°C) temperature classification (T6 valid only with ATEX certification, not suitable for USA or Canada installation). The Intrinsic Safety Entity Concept allows the interconnection of Intrinsically Safe devices approved with entity parameters not specifically examined in combination as a system when the above conditions are respected. For Division 1 and Zone 0 installations, the configuration of Intrinsically Safe Equipment must be FM approved under Entity Concept (or third party approved).

# Function Diagram

HAZARDOUS AREA ZONE 0 (ZONE 20) IIC T5/T6 (T85°C/100°C)  
HAZARDOUS LOCATIONS CLASS I, DIVISION 1, GROUPS A, B, C, D, T-CODE T5  
CLASS I, ZONE 0, GROUP IIC T5

SAFE AREA/NON HAZARDOUS LOCATIONS

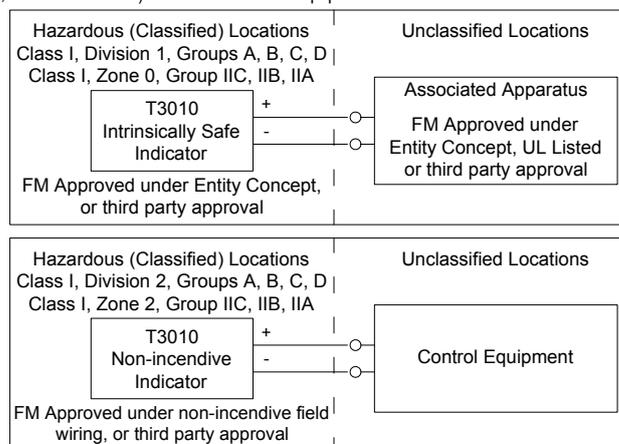


## Warning

T3010 is a Hazardous Area/Hazardous Location field mounted digital indicator Intrinsically Safe with type of protection II 1 G D EEx ia IIC T5/T6 T85°C/100°C IP66 for use in Safe Area/Non Hazardous Locations or Zone 0 (Zone 20), Group IIC, Temperature Classification T5/T6 (T85°C/100°C IP66) or Class I, Division 1, Groups A, B, C, D, T-Code T5, Class I, Zone 0, AEx ia IIC T5 and Class I, Zone 0, Ex ia IIC T5 Hazardous Area/Hazardous Locations (according to EN/IEC60079-0, EN/IEC60079-11, FM Class No. 3600, FM Class No. 3610, CSA-C22.2 No. 157-92, CSA-E60079-0, CSA-E60079-11).

It can be powered by an Intrinsically Safe 4-20 mA current loop for applications in Zone 0, 1, 2 (Zone 20, 21, 22), ATEX 1 G D, 2 G D and 3 G D, Class I Division 1, Class I Zone 0 to any certified intrinsically safe circuit whose output parameters do not exceed  $U_o \leq 30 \text{ V}$ ,  $I_o \leq 200 \text{ mA}$ ,  $P_o \leq 0.85 \text{ W}$  for T5 (T100°C) temperature code or  $U_o \leq 30 \text{ V}$ ,  $I_o \leq 100 \text{ mA}$ ,  $P_o \leq 0.85 \text{ W}$  for T6 (T85°C) temperature code (T6 valid only with ATEX certification, not suitable for USA or Canada installation).

In addition has II 3 G D EEx nA IIC T5 T100°C IP66 protection, it can be used as non-incendive equipment for use in Zone 2 (Zone 22), Group IIC T5 (T100°C) or Class I, Division 2, Groups A, B, C, D, Temperature Code T5, Class I, Zone 2, AEx nA IIC T5 and Class I, Zone 2, Ex nA IIC T5 Hazardous Area/Hazardous Locations (according to EN/IEC60079-15, FM Class No. 3611, CSA-C22.2 No. 213-M1987, CSA-E60079-15) without need of IS equipment.



Installation can be indoor/outdoor on flat surface, on 2" pole or front panel mounting.

Operating conditions are  $-20$  to  $+60$  °C ambient temperature, relative humidity up to 95 % at 35 °C.

Degree of protection provided is IP66 according to EN60529.

Voltage drop caused by the indicator in the current loop is  $\leq 1 \text{ V}$ , take care this parameter evaluating functional aspect of current loop voltage requirement.

Display has a 4 ½ digit 7 segments LCD type of presentation for process measurement data in engineering units.

T3010 indicator must be installed, operated and maintained only by qualified personnel, in accordance to the relevant national/international installation standards (e.g. IEC/EN60079-14 Electrical apparatus for explosive gas atmospheres - Part 14: Electrical installations in hazardous areas (other than mines), BS 5345 Pt4, VDE 165, ANSI/ISA RP12.06.01 Installation of Intrinsically Safe System for Hazardous (Classified) Locations, National Electrical Code NEC ANSI/NFPA 70 Section 504 and 505, Canadian Electrical Code CEC) following the installation rules.

**Warning: substitution of components may impair Intrinsic Safety and suitability for Division 2, Zone 2.**

**Explosion Hazard: to prevent ignition of flammable or combustible atmospheres, disconnect power before servicing or unless area is known to be nonhazardous.**

Failure to properly installation or use of the equipment may risk to damage the unit or severe personal injury.

The unit cannot be repaired by the end user and must be returned to the manufacturer or his authorized representative. Any unauthorized modification must be avoided.

## Storage

If after an incoming inspection the unit is not installed directly on a system (parts for spare or expansion with long storage periods) it must be conveniently stocked.

Stocking area characteristics must comply with the following parameters:

Temperature:  $-20$  to  $+60$  °C, the  $-45$  to  $+80$  °C in the data sheet is meant for limited periods, mainly to arrange for air transport,  $-10$  to  $+30$  °C are preferred.

Humidity: 0 to 90 %, long period high humidity affects the package integrity, 0 to 60 % humidity is preferred.

Vibration: no prolonged vibration should be perceivable in the stocking area to avoid loosening of parts or fatigue ruptures of components terminals.

Pollution: presence of pollutant or corrosive gases or vapors must be avoided to prevent corrosion of conductors and degradation of insulating surfaces.

## Disposal

The product should not be disposed with other wastes at the end of its working life. It may contain hazardous substances for the health and the environment, to prevent possible harm from uncontrolled waste disposal, please separate this equipment from other types of wastes and recycle it responsibly to promote the sustainable reuse of material resources. This product should not be mixed with other commercial wastes for disposal.

## Operation

T3010 is a 4 ½ digit intrinsically safe 4-20 mA loop indicator which display the current value in engineering units. The main application is to display the measured variable in Hazardous Area/Hazardous Locations. T3010 provides a visual indication via a 4 ½ digit 7 segments LCD display. Visualization with 4 and 20 mA input can be independently set at any value between the  $-19999$  to  $+19999$  range of the indicator to show the measured variable like pressure, temperature, level or other. The decimal point can be set in any position or disabled. Over-range or under-range conditions are signaled by display blinking. The indicator introduces a voltage drop of only 1 V, allowing the use into almost any 4-20 mA current loop, take care this parameter evaluating functional aspect of current loop voltage requirement. The indicator is housed in a robust polyamide 66/lexan polycarbonate enclosure providing a IP66 degree of protection, allowing installation in field area. Installation can be indoor or outdoor on flat surface, on 2" pole or front panel mounting.

## Installation

T3010 is an indicator housed in a plastic enclosure suitable for installation on field area providing a IP66 protection degree.

It is provided with stainless steel fixing accessories permitting the use in almost industrial installation.

The indicator can be mounted on flat surface, on panel or on 2" pipe using appropriate OPT93 mounting kit.

Electrical connection of conductors up to 2.5 mm<sup>2</sup> are accommodated by clamp terminal blocks which can be plugged in/out into a loop without suffering or causing any damage **(for Hazardous Area/Hazardous Location installations check the area to be nonhazardous before servicing).**

The wiring cables have to be proportionate in base to the current and the length of the cable.

Terminal blocks are located in a separate compartment with a sealed cover to allow the connection without exposing the measuring and display circuitry.

On this manual and enclosure side a block diagram identifies connections and configuration options.

Intrinsically Safe conductors must be identified and segregated from non I.S. and wired in accordance to the relevant national/international installation standards (e.g. IEC/EN60079-14 Electrical apparatus for explosive gas atmospheres - Part 14: Electrical installations in hazardous areas (other than mines), BS 5345 Pt4, VDE 165, ANSI/ISA RP12.06.01 Installation of Intrinsically Safe System for Hazardous (Classified) Locations, National Electrical Code NEC ANSI/NFPA 70 Section 504 and 505, Canadian Electrical Code CEC), make sure that conductors are well isolated from each other and do not produce any unintentional connection.

If enclosure needs to be cleaned use only a cloth lightly moistened by a mixture of detergent in water.

**Electrostatic Hazard: to avoid electrostatic hazard, the enclosure of T3010 must be cleaned only with a damp or antistatic cloth.**

Any penetration of cleaning liquid must be avoided to prevent damage to the unit. Any unauthorized card modification must be avoided.

## Start-up

Before powering the unit check that all wires are properly connected, particularly their polarity, also check that Intrinsically Safe conductors and cable trays are segregated (no direct contacts with other non I.S. conductors) and identified either by color coding, preferably blue, or by marking.

Check conductors for exposed wires that could touch each other causing dangerous unwanted shorts.

If configuration is needed remove the instrument front panel protecting the LCD display, turn on the signal loop power, wait about 5 second to permit the self check routine to perform, indicated by dashing display, and then read the display variable corresponding to 4-20 mA current loop value.

If possible change the current loop value and check the variation in display indication.

To display current loop value remove the instrument cover and press the pushbutton labeled 'UP' (the leftmost one); changing loop current the display will change accordingly.

Pressing the button 'DOWN' instead of 'UP' the reading will be in percentage. Visualization will be automatically changed in engineering value after 5 seconds.

## Configuration

This procedure is required to set the proper values of the reading with 4 and 20 mA respectively and the proper decimal point. To access the push buttons remove the display cover and proceed as follows: press the pushbuttons 'DOWN' and 'ENTER' simultaneously, the message 'SET' will be shown, now press 'ENTER': the display will show 'dECP', this is the first item of the configuration menu, pressing the pushbutton 'SELECT' the menu item will be changed with the following sequence:

dECP	Decimal point setting
DnSC	Setting of the reading corresponding to 4 mA
UPSC	Setting of the reading corresponding to 20 mA

Pressing "ENTER" the selected menu item will be activated.

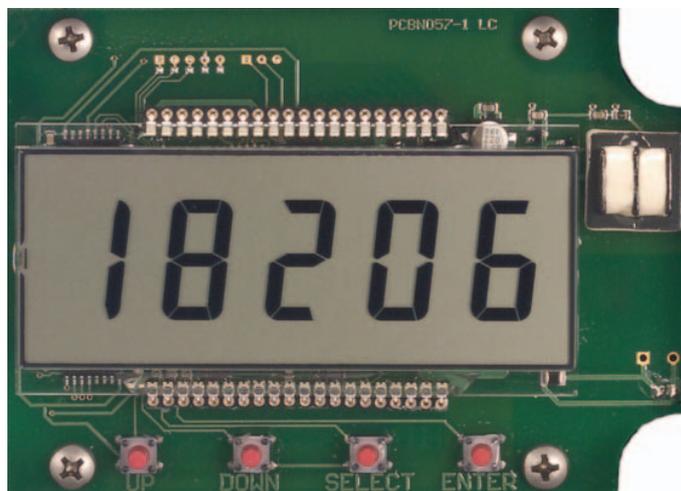
The menu dECP has the following choices:

19999	The reading has no decimal point
1.9999	Reading will be displayed with 4 decimal places
19.999	Reading will be displayed with 3 decimal places
199.99	Reading will be displayed with 2 decimal places
1999.9	Reading will be displayed with 1 decimal place

The menus DnSC and UPSC are identical: the displayed value is the current setting, to change it use the buttons as follows:

UP	The flashing digit is incremented
DOWN	The flashing digit is decremented
SELECT	The flashing digit is changed left to right
ENTER	The value on display is stored in memory

The scroll between selections is activated by the 'SELECT' button, when the desired choice is displayed pressing the 'ENTER' button the writing in memory will be activated, this is displayed by four dashed lines; entering the function the current selection is shown. If no buttons are activated, after a timeout the indicator will revert to its normal operation.



## Mounting

Vertical Pipe mounting



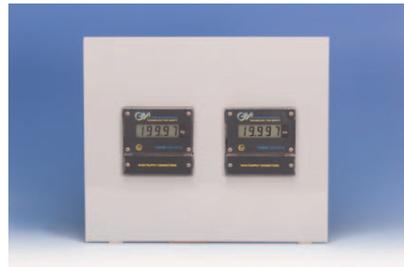
Horizontal Pipe mounting



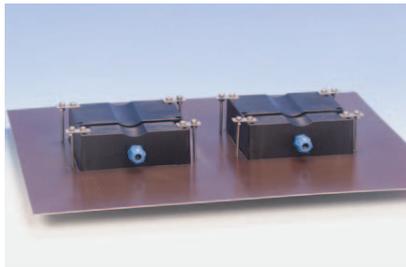
Option 93 for Pipe / Panel mounting Accessories



Front Panel mounting



Fixing for front panel mounting



Gasket positioning for Panel mounting



Fixing for front panel mounting:

