

## INSTALLATION

### General

NOTE
The installation carried out in hazardous areas should follow the recommendations of the IEC60079-14 standard.

The overall accuracy of a flow, level, or pressure measurement depends on several variables. Although the transmitter has an outstanding performance, proper installation is essential to maximize its performance.

Among all factors, which may affect transmitter accuracy, environmental conditions are the most difficult to control. There are, however, ways of reducing the effects of temperature, humidity and vibration.

The **LD291** has a built-in temperature sensor to compensate for temperature variations. At the factory, each transmitter is submitted to a temperature cycle, and the characteristics under different temperatures are recorded in the transmitter memory. At the field, this feature minimizes the temperature variation effect.

### Mounting

Putting the transmitter in areas protected from extreme environmental changes can minimize temperature fluctuation effects.

In warm environments, the transmitter should be installed to avoid, as much as possible, direct exposure to the sun. Installation close to lines and vessels subjected to high temperatures should also be avoided. Use longer sections of impulse piping between tap and transmitter whenever the process fluid is at high temperatures. Use of sunshades or heat shields to protect the transmitter from external heat sources should be considered, if necessary.

Proper winterization (freeze protection) should be employed to prevent freezing within the measuring chamber, since this will result in an inoperative transmitter and could even damage the cell.

Although the transmitter is virtually insensitive to vibration, installation close to pumps, turbines or other vibrating equipment should be avoided.

The transmitter has been designed to be both rugged and lightweight at the same time. This makes its mounting easier. Mounting positions are shown in Figure 1.1.

Should the process fluid contain solids in suspension, install valves or rod-out fittings at regular intervals to clean out the pipes.

The pipes should be internally cleaned by using steam or compressed air, or by draining the line with the process fluid, before such lines are connected to the transmitter (blow-down).

NOTE
When installing or storing the level transmitter, the diaphragm must be protected against scratching or perforation of its surface.

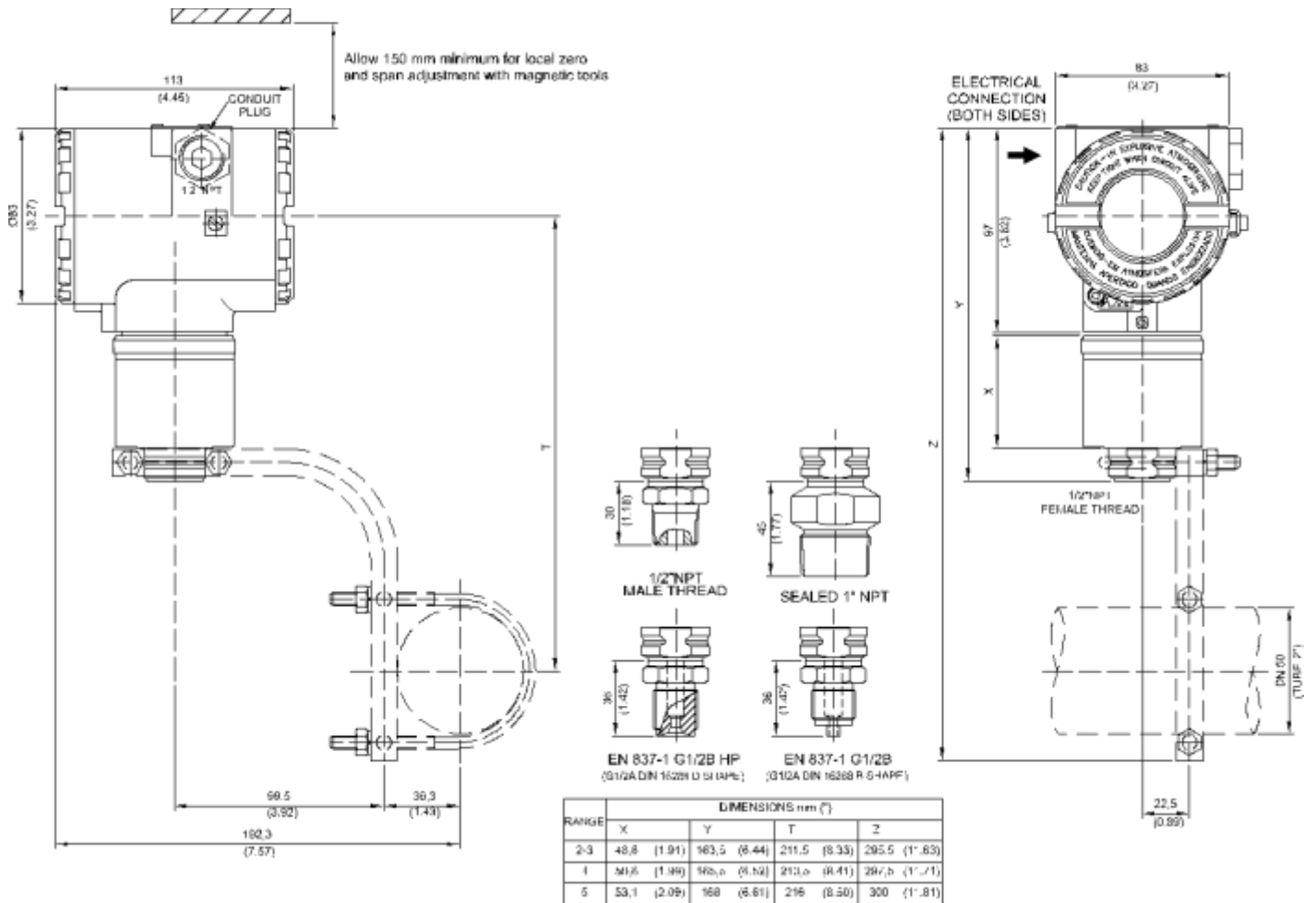


Figure 1.1(a) – Dimensional Drawing and Mounting Position for LD291

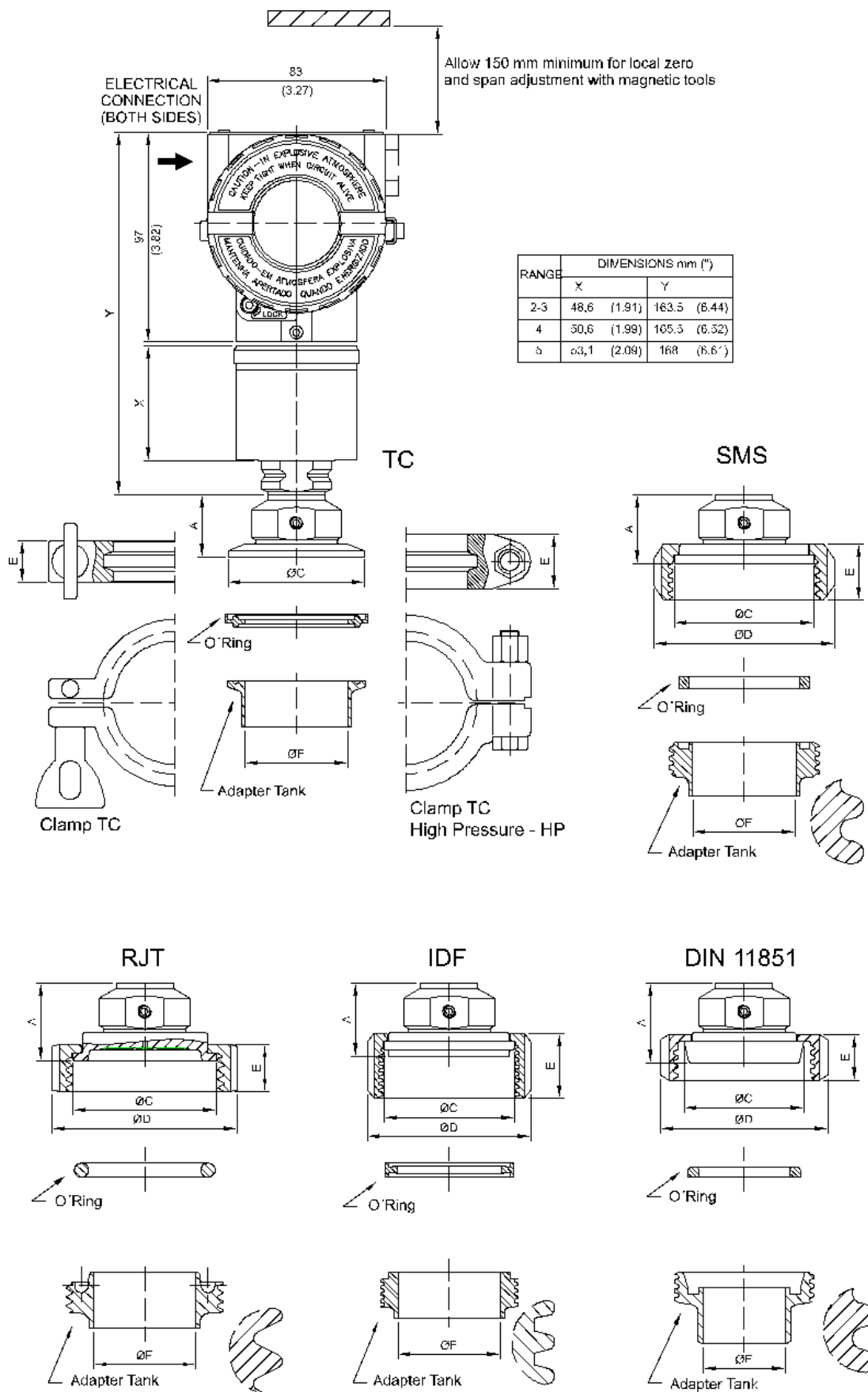
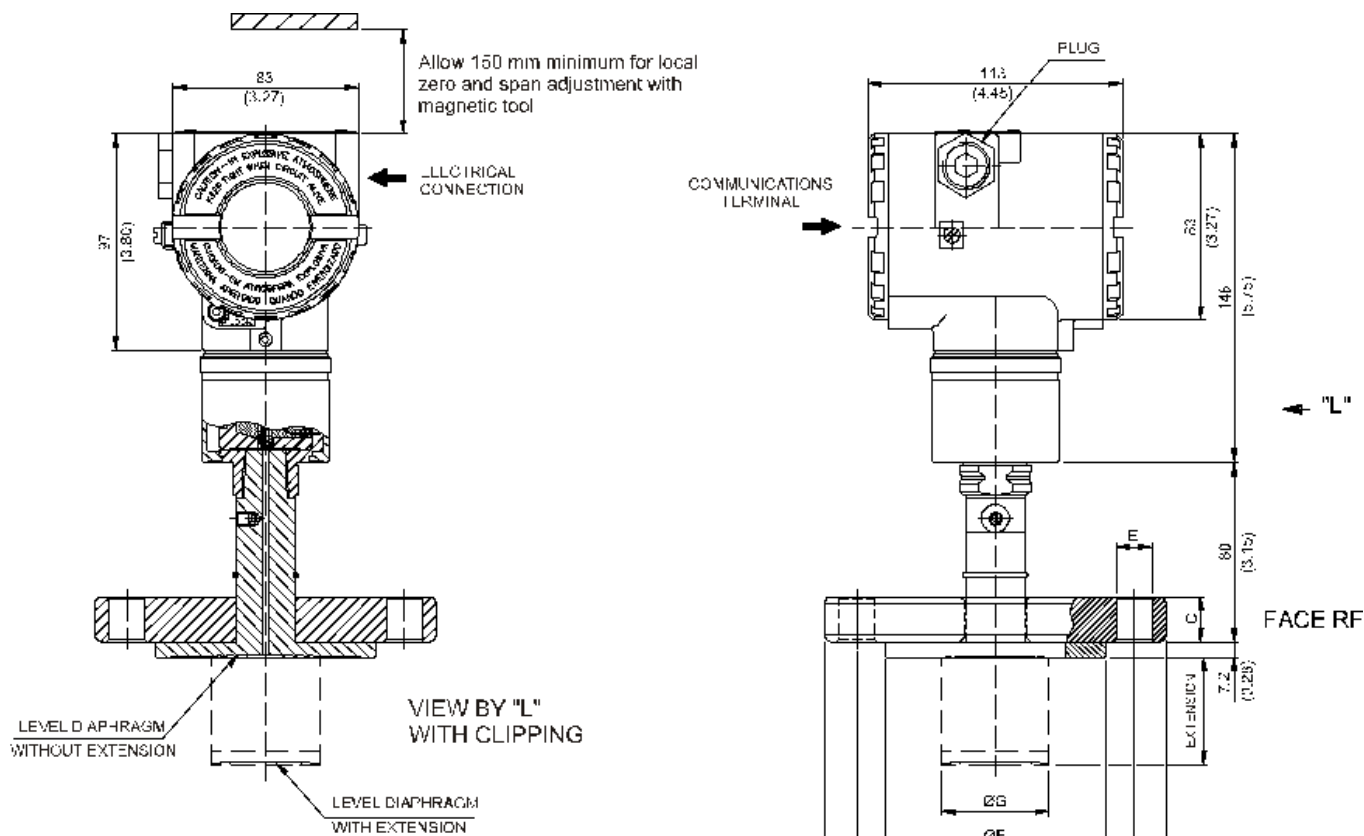


Figure 1.1(b) – Dimensional Drawing and Mounting Position for LD291 - Sanitary

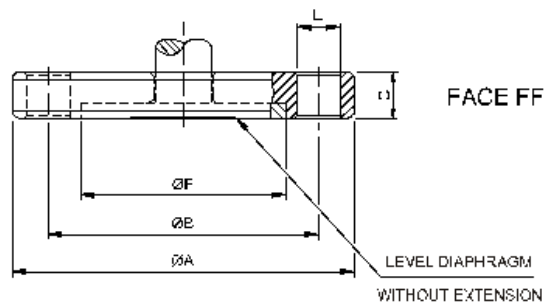
LD290S - CONNECTIONS					
CONNECTION	Dimensions in mm (inche)				
	A	ØC	ØD	E	ØF
Tri-Clamp - 1 1/2" - without extension	27 (1.06)	50 (1.96)	61 (2.40)	18 (0.71)	35 (1.38)
Tri-Clamp - 1 1/2" HP - without extension	27 (1.06)	50 (1.96)	66 (2.59)	25 (0.98)	35 (1.38)
Tri-Clamp - 2" - without extension	29 (1.14)	63,5 (2.50)	76,5 (3.01)	18 (0.71)	47,6 (1.87)
Tri-Clamp - 2" HP - without extension	29 (1.14)	63,5 (2.50)	81 (3.19)	25 (0.98)	47,6 (1.87)
Threaded DN40 - DIN 11851 - without extension	37 (1.46)	56 (2.20)	78 (3.07)	21 (0.83)	38 (1.50)
Threaded DN50 - DIN 11851 - without extension	38 (1.50)	68,5 (2.70)	92 (3.62)	22 (0.86)	50 (1.96)
Threaded SMS - 1 1/2" - without extension	31 (1.22)	55 (2.16)	74 (2.91)	25 (0.98)	35 (1.38)
Threaded SMS - 2" - without extension	32 (1.26)	65 (2.56)	84 (3.30)	26 (1.02)	48,6 (1.91)
Threaded RJT - 2" - without extension	35 (1.38)	66,7 (2.63)	86 (3.38)	22 (0.86)	47,6 (1.87)
Threaded IDF - 2" - without extension	34 (1.34)	60.5 (2.38)	76 (2.99)	30 (1.18)	47,6 (1.87)

**Figure 1.1(c) – Dimensional Drawing and Mounting Position for LD291 – Sanitary**



NOTES:  
 -EXTENSION LENGTH mm (in): 0, 50 (1.96), 100 (3.93), 150 (5.9) OR 200 (7.87)  
 -DIMENSIONS ARE mm (in)

ANSI-B 16.5 DIMENSIONS								
DN	CLASS	A	B	C	E	F (RF); (FF)	G	HOLES
1"	150	108 (4.25)	79.4 (3.13)	14.3 (0.56)	18 (0.63)	50.8 (2)	-	4
	300/400	124 (4.88)	98.0 (3.85)	17.5 (0.69)	19 (0.75)	50.8 (2)	-	4
1.1/2"	150	127 (5)	96.6 (3.8)	20 (0.78)	16 (0.63)	73.2 (2.88)	40 (1.57)	4
	300	155.4 (6.12)	114.3 (4.5)	21 (0.83)	22 (0.87)	73.2 (2.88)	40 (1.57)	4
	600	155.4 (6.12)	114.3 (4.5)	28.3 (1.11)	22 (0.87)	73.2 (2.88)	40 (1.57)	4
2"	150	152.4 (6)	120.7 (4.75)	17.5 (0.69)	19 (0.75)	92 (3.62)	48 (1.89)	4
	300	165.1 (6.5)	127 (5)	20.7 (0.81)	19 (0.75)	92 (3.62)	48 (1.89)	6
	600	165.1 (6.5)	127 (5)	25.4 (1)	19 (0.75)	92 (3.62)	48 (1.89)	6
3"	150	190.5 (7.5)	152.4 (6)	22.3 (0.87)	19 (0.75)	127 (5)	73 (2.87)	4
	300	209.5 (8.25)	168.1 (6.62)	27 (1.06)	22 (0.87)	127 (5)	73 (2.87)	6
	600	209.5 (8.25)	168.1 (6.62)	31.8 (1.25)	22 (0.87)	127 (5)	73 (2.87)	6
4"	150	228.6 (9)	190.5 (7.5)	22.3 (0.87)	19 (0.75)	158 (6.22)	89 (3.5)	6
	300	254 (10)	200 (7.87)	30.2 (1.18)	22 (0.87)	158 (6.22)	89 (3.5)	6
	600	273 (10.75)	215.9 (8.5)	38.1 (1.5)	25 (1)	158 (6.22)	89 (3.5)	6



EN 1092-1 / DIN2501 DIMENSIONS								
DN	PN	A	B	C	E	-	G	HOLES
25	10/40	115 (4.53)	85 (3.35)	18 (0.71)	14 (0.55)	68 (2.68)	-	4
40	10/40	150 (5.9)	110 (4.33)	20 (0.78)	18 (0.71)	88 (3.46)	40 (1.57)	4
50	10/40	165 (6.5)	125 (4.92)	20 (0.78)	18 (0.71)	102 (4.01)	48 (1.89)	4
80	10/40	200 (7.87)	160 (6.3)	24 (0.95)	18 (0.71)	138 (5.43)	73 (2.87)	6
100	10/18	220 (8.67)	180 (7.08)	20 (0.78)	18 (0.71)	152 (6.02)	89 (3.5)	6
	25/40	255 (10.04)	190 (7.5)	24 (0.95)	22 (0.87)	162 (6.38)	89 (3.5)	6

Figure 1.1(d) – Dimensional Drawing and Mounting Position for LD291 – Level

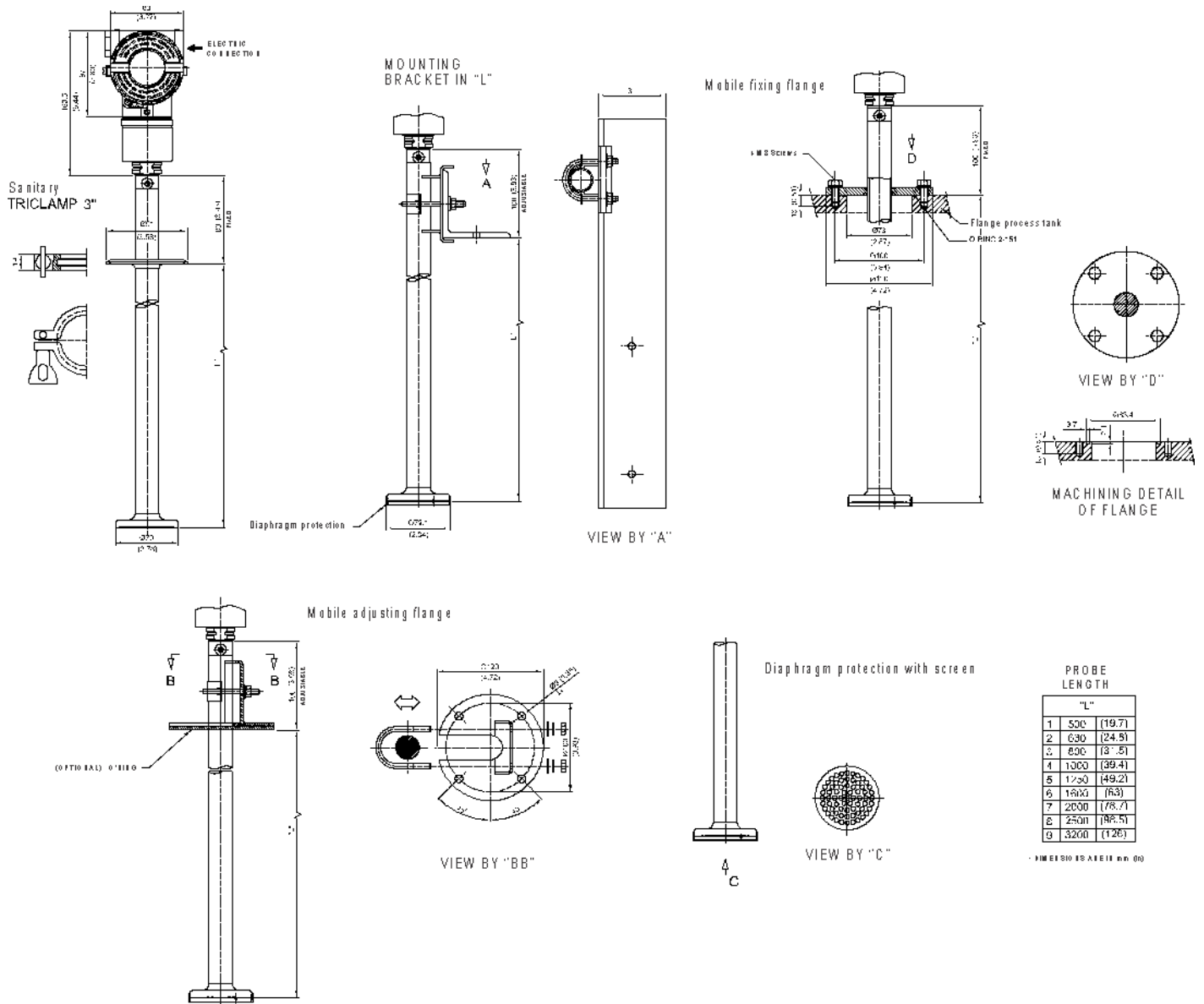
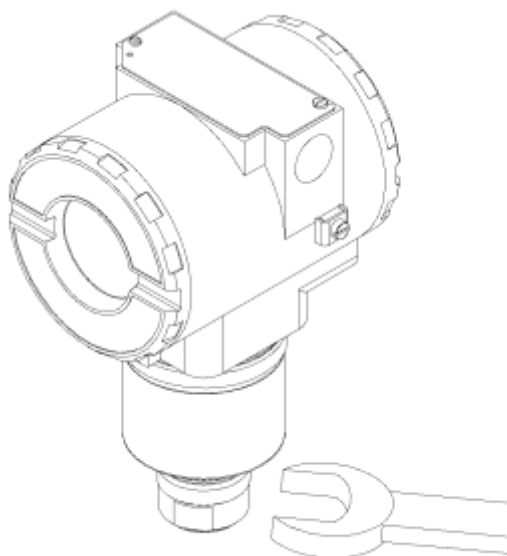


Figure 1.1 (e) – Dimensional Drawing and Mounting Position for LD291 – Level (Insertion)

The figure 1.2 shows how to use the tool to fix the process transmitter tap.



**Figure 1.2 – Fixing of the Transmitter in the Tap**

Observe operating safety rules during wiring, draining or blow-down.

<b>WARNING</b>	
Normal safety precautions must be taken to avoid the possibility of an accident occurring when operating in conditions of high pressure and/or temperature.	
<b>Electrical shock can result in death or serious injury.</b>	
Avoid contact with the leads and terminals.	
<b>Process leaks could result in death or serious injury</b>	
Do not attempt to loosen or remove flange bolts while the transmitter is in service.	
<b>Replacement equipment or spare parts not approved by Smar could reduce the pressure retaining capabilities of the transmitter and may render the instrument dangerous.</b>	
Use only bolts supplied or sold by Smar as spare parts.	

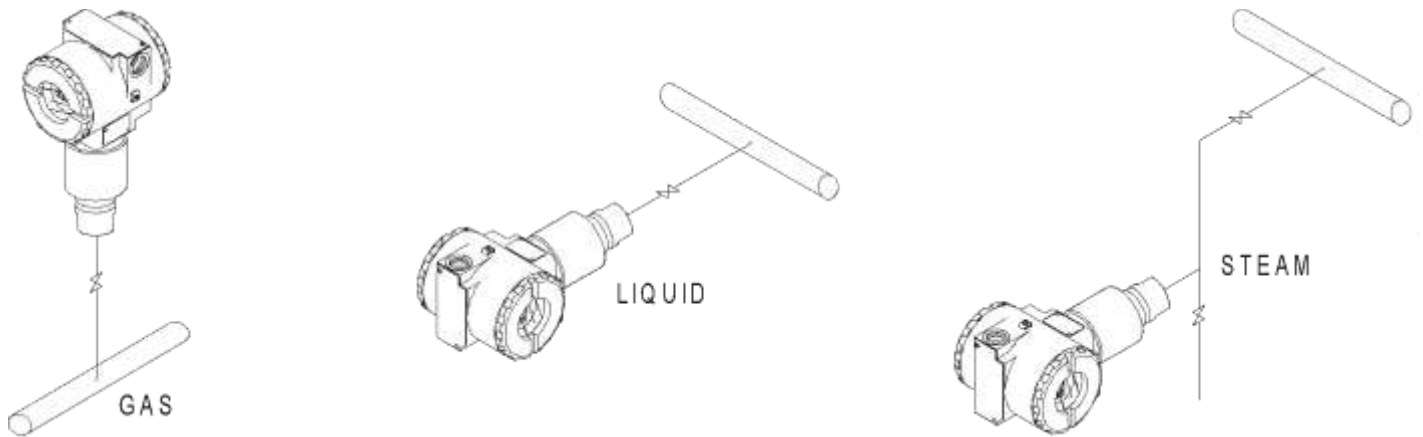
Some examples of installation, illustrating the position of the transmitter in relation to the taps, are shown in Figure 1.3.

The location of pressure taps and the relative position of the transmitter are indicated in Table 1.1.

Process Fluid	Location of Taps	Location of LD291 in Relation to the Taps
Gas	Top or Side	Above the Taps.
Liquid	Side	Below the Taps or at the Piping Centerline.
Steam	Side	Below the Taps using Sealing (Condensate) Pots.

**Table 1.1 - Location of Pressure Taps**

<b>NOTE</b>	
Except for dry gases, all impulse lines should slope at the ratio 1:10, in order to avoid trapping bubbles in the case of liquids, or condensate for steam or wet gases.	

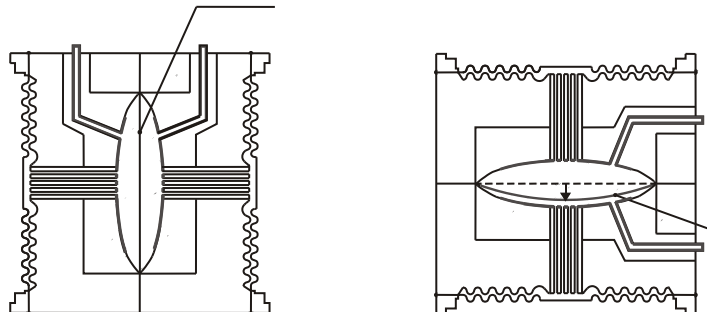


**Figure 1.3 – Position of the Transmitter and Taps**

**NOTE**

The transmitters are calibrated in the vertical position and a different mounting position displaces the zero point. Consequently, the indicator will indicate a different value from the applied pressure. In these conditions, it is recommended to do the zero pressure trim. The zero trim is to compensate the final assembly position and its performance, when the transmitter is in its final position. When the zero trim is executed, make sure the equalization valve is open and the wet leg levels are correct.

For the absolute pressure transmitter, the assembly effects correction should be done using the Lower trim, due to the fact that the absolute zero is the reference for these transmitters, so there is no need for a zero value for the Lower trim.



## Electronic Housing

Humidity is fatal to electronic circuits. In areas subjected to high relative humidity, the O-rings for the electronic housing covers must be correctly placed and the covers must be completely closed by tightening them by hand until you feel the O-rings being compressed. Do not use tools to close the covers. Removal of the electronics cover in the field should be reduced to the minimum necessary, since each time it is removed; the circuits are exposed to the humidity.

The electronic circuit is protected by a humidity proof coating, but frequent exposures to humidity may affect the protection provided. It is also important to keep the covers tightened in place. Every time they are removed, the threads are exposed to corrosion, since painting cannot protect these parts. Code-approved sealing methods should be employed on conduit entering the transmitter.

**WARNING**

The unused cable entries should be plugged and sealed accordingly to avoid humidity entering, which can cause the loss of the product's warranty.



The electronic housing can be rotated to adjust the digital display on a better position. To rotate it, loose the Housing Rotation Set Screw, see Figure 1.4 (a). To prevent humidity entering, the electric housing and the sensor joint must have a minimum of 6 fully engaged threads. The provided joint allows 1 extra turn to adjust the position of the display window by rotating the housing clockwise. If the thread reaches the end before the desired position, then rotate the housing counterclockwise, but not more than one thread turn. Transmitters have a stopper that restricts housing rotation to one turn. See Section 4, Figure 4.1.

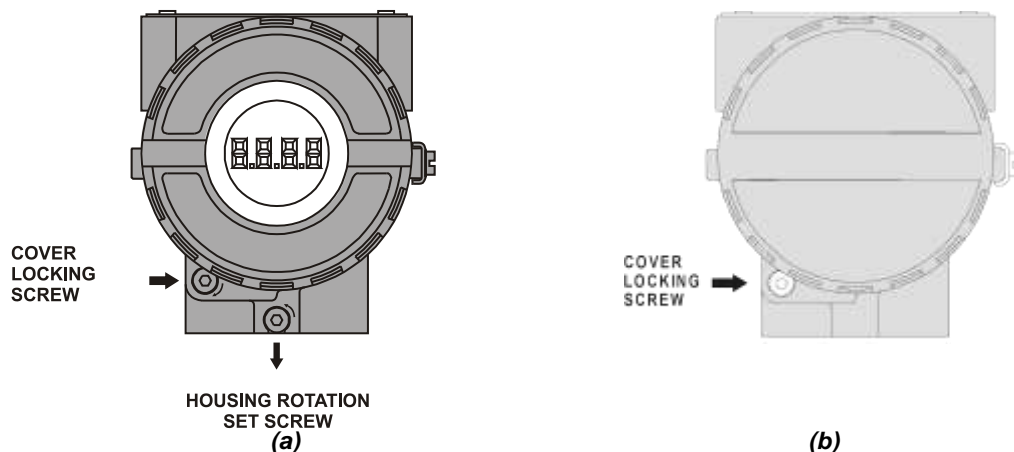


Figure 1.4 - Cover Locking and Housing Rotating Set Screw (a) Electronic Board Side (b) Terminal Connection Side

## Wiring

To release the cover that gives access to the wiring block, turn the cover locking screw clock wise, see the direction of the arrow in the figure 1.4.

**Test** and **Communication terminals** allow, respectively, to measure the current in the 4 - 20 mA loop, without opening it, and to communicate with the transmitter. To measure it, connect a multimeter in the mA scale in the "-" and "+" terminals, and to communicate, use a **HART** configurator in the "COMM" and "-" terminals. The wiring block has screws on which fork or ring-type terminals can be fastened. See Figure 1.6.

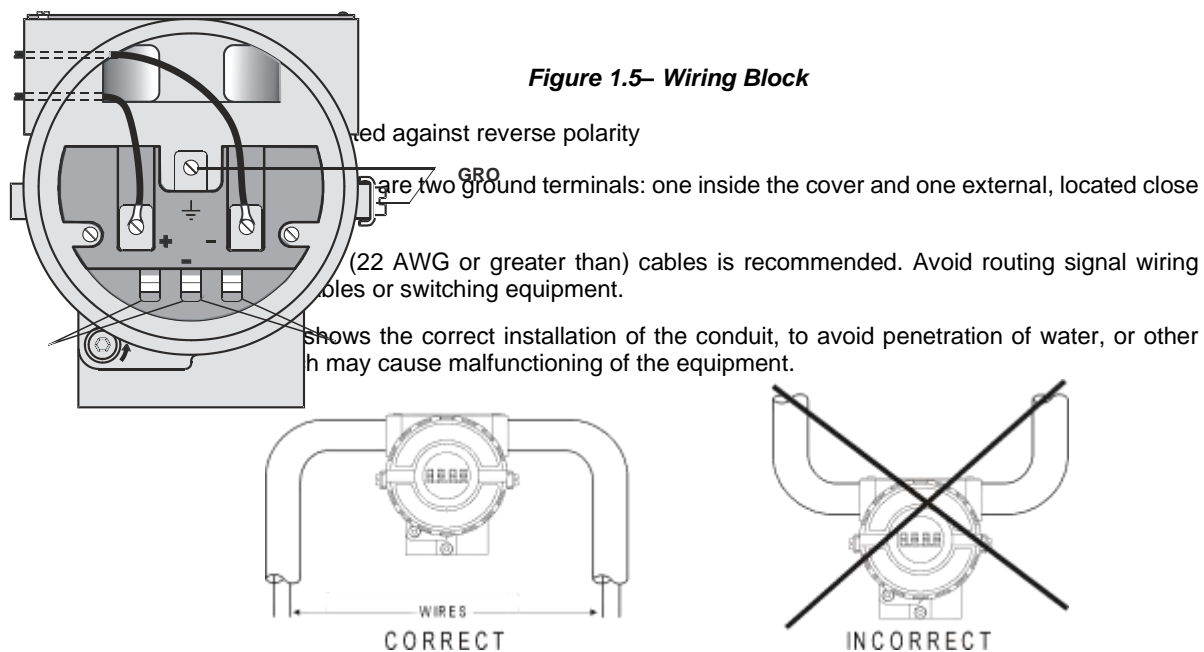


Figure 1.6 - Conduit Installation

## Loop Connections

Connection of the **LD291** should be done as in Figure 1.7. Connection in multi-drop configuration should be done as in Figure 1.8. Note that a maximum of 15 transmitters can be connected on the same line and that they should be connected in parallel.

Take care to the power supply as well, when many transmitters are connected on the same line. The current through the 250 Ohm resistor will be high causing a high voltage drop. Therefore make sure that the power supply voltage is sufficient.

The configuration can be connected to the communication terminals of the transmitter or at any point of the signal line by using the alligator clips. It is also recommended to ground the shield of shielded cables at only one end. The ungrounded end must be carefully isolated.

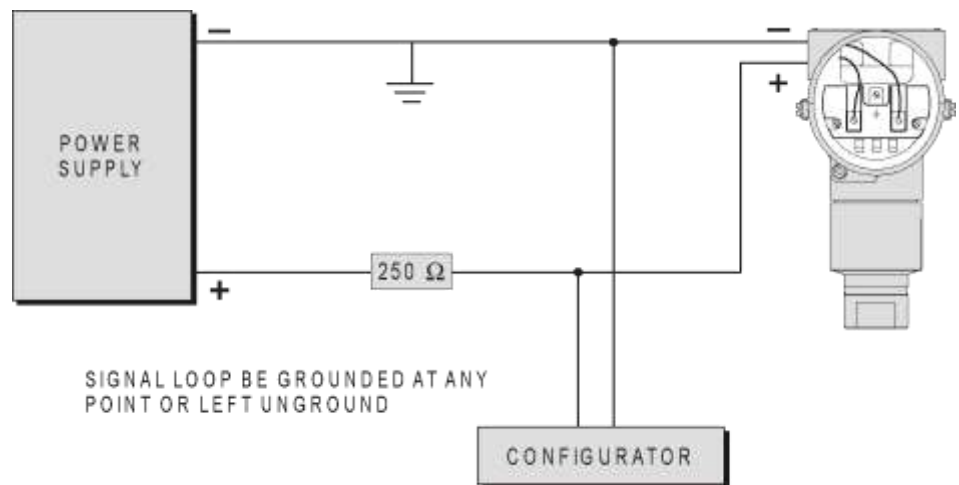


Figure 1.7 – Wiring Diagram for the LD291

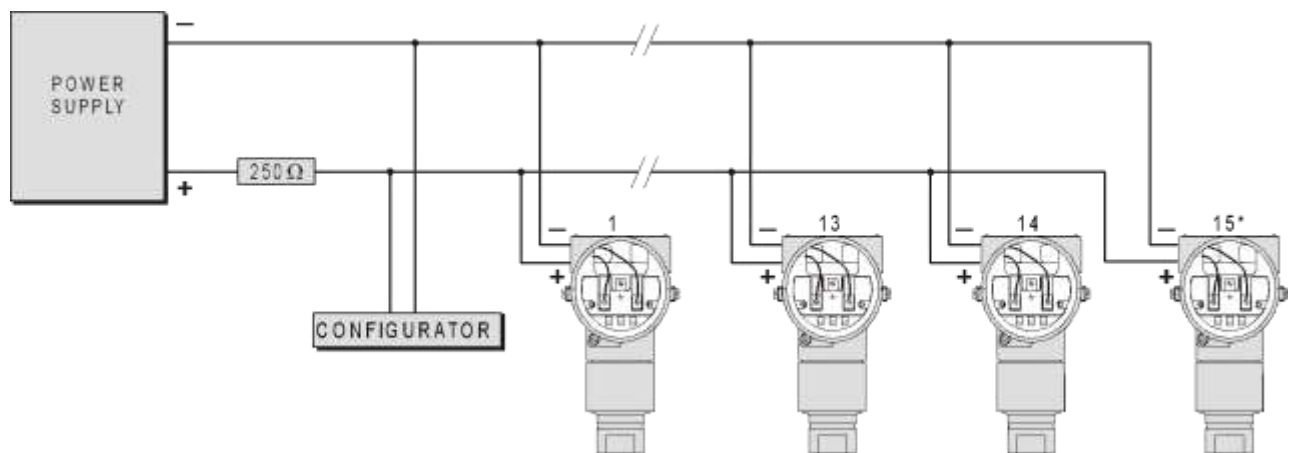


Figure 1.8 – Wiring Diagram for the LD291 in Multidrop Configuration

### NOTE

Make sure that the transmitter is operating within the operating area as shown on the load curve (Figure 1.9). Communication requires a minimum load of 250 Ohm.

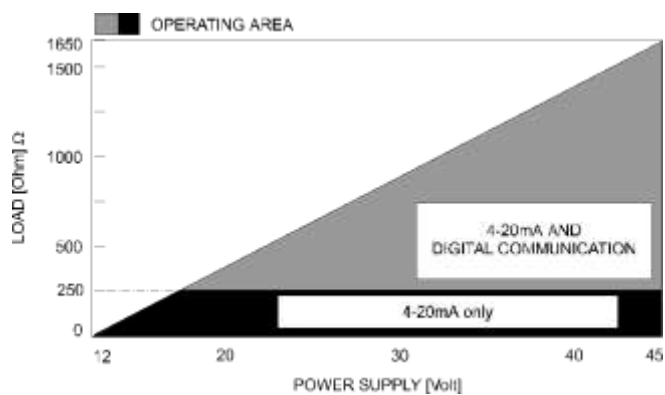


Figure 1.9 – Load Curve

## ***Installation in Hazardous Areas***

Consult the Appendix A for Hazardous Location Approvals.