

smar

LD290

JUN/21  
**LD290**  
VERSION 7

OPERATION AND MAINTENANCE  
INSTRUCTION / MANUAL

## PRESSURE TRANSMITTER





Specifications and information are subject to change without notice.  
Up-to-date address information is available on our website.

web: [www.smar.com/contactus.asp](http://www.smar.com/contactus.asp)

# INTRODUCTION

The **LD290** is a pressure transmitter for gauge and level measurement. It is based on a field-proven capacitive sensor that provides reliable operation and high performance.

A liquid crystal display can be added to provide additional operation and local indication. Its microprocessed electronic circuit permits a total interchangeability with Smar's capacitive sensors. It automatically corrects the sensors' characteristic changes caused by temperature variations.

The **LD290**, besides the normal functions offered by other transmitters, offers the following functions:

**LOCAL ADJUSTMENT** – Adjust through magnet tool the lower and upper value, input/output function, and indication.

Writing protection via hardware.

**Get the best results of the LD290 by carefully reading these instructions.**  
**Smar's pressure transmitters are protected by U.S. patents 6,433,791 and 6,621,443.**

**NOTE**

This manual is compatible with version 7.XX.YY, where 7 indicates the software version, XX software release, and YY software emission. The indication 7.XX.YY means that this manual is compatible with any release of software version 7.

**WARNING**

To ensure that our products are safe and without risk to health, the manual must be read carefully before proceeding and warning labels on packages must be observed. Installation, operation, maintenance and servicing must only be carried out by suitably trained personnel and in accordance with the **Operation and Maintenance Instruction Manual**.

**Waiver of responsibility**

The contents of this manual abides by the hardware and software used on the current equipment version. Eventually there may occur divergencies between this manual and the equipment. The information from this document are periodically reviewed and the necessary or identified corrections will be included in the following editions. Suggestions for their improvement are welcome.

**Warning**

For more objectivity and clarity, this manual does not contain all the detailed information on the product and, in addition, it does not cover every possible mounting, operation or maintenance cases.

Before installing and utilizing the equipment, check if the model of the acquired equipment complies with the technical requirements for the application. This checking is the user's responsibility.

If the user needs more information, or on the event of specific problems not specified or treated in this manual, the information should be sought from Smar. Furthermore, the user recognizes that the contents of this manual by no means modify past or present agreements, confirmation or judicial relationship, in whole or in part.

All of Smar's obligation result from the purchasing agreement signed between the parties, which includes the complete and sole valid warranty term. Contractual clauses related to the warranty are not limited nor extended by virtue of the technical information contained in this manual.

Only qualified personnel are allowed to participate in the activities of mounting, electrical connection, startup and maintenance of the equipment. Qualified personnel are understood to be the persons familiar with the mounting, electrical connection, startup and operation of the equipment or other similar apparatus that are technically fit for their work. Smar provides specific training to instruct and qualify such professionals. However, each country must comply with the local safety procedures, legal provisions and regulations for the mounting and operation of electrical installations, as well as with the laws and regulations on classified areas, such as intrinsic safety, explosion proof, increased safety and instrumented safety systems, among others.

The user is responsible for the incorrect or inadequate handling of equipments run with pneumatic or hydraulic pressure or, still, subject to corrosive, aggressive or combustible products, since their utilization may cause severe bodily harm and/or material damages.

The field equipment referred to in this manual, when acquired for classified or hazardous areas, has its certification void when having its parts replaced or interchanged without functional and approval tests by Smar or any of Smar authorized dealers, which are the competent companies for certifying that the equipment in its entirety meets the applicable standards and regulations. The same is true when converting the equipment of a communication protocol to another. In this case, it is necessary sending the equipment to Smar or any of its authorized dealer. Moreover, the certificates are different and the user is responsible for their correct use.

Always respect the instructions provided in the Manual. Smar is not responsible for any losses and/or damages resulting from the inadequate use of its equipments. It is the user's responsibility to know and apply the safety practices in his country.

# TABLE OF CONTENTS

<b>SECTION 1 - INSTALLATION .....</b>	<b>1.1</b>
GENERAL.....	1.1
MOUNTING .....	1.1
ELECTRONIC HOUSING.....	1.8
WIRING .....	1.8
INSTALLATION IN HAZARDOUS AREAS .....	1.11
EXPLOSION/FLAME PROOF .....	1.11
INTRINSICALLY SAFE .....	1.11
<b>SECTION 2 - OPERATION .....</b>	<b>2.1</b>
FUNCTIONAL DESCRIPTION - SENSOR .....	2.1
FUNCTIONAL DESCRIPTION - HARDWARE.....	2.2
THE DISPLAY .....	2.4
<b>SECTION 3 - PROGRAMMING USING LOCAL ADJUSTMENT .....</b>	<b>3.1</b>
THE MAGNETIC TOOL.....	3.1
COMPLETE LOCAL ADJUSTMENT.....	3.2
SIMPLE LOCAL ADJUSTMENT .....	3.2
ZERO AND SPAN RERANGING .....	3.2
COMPLETE LOCAL ADJUSTMENT.....	3.3
LOCAL PROGRAMMING TREE .....	3.3
CONFIGURATION [CONF] .....	3.3
CONFIGURATION BRANCH (CONF) .....	3.4
RANGE (RANGE).....	3.5
RANGE BRANCH (RANGE) .....	3.5
FUNCTION (FUNCT) .....	3.7
PRESSURE TRIM [TRIM] .....	3.8
ESCAPE LOCAL ADJUSTMENT [ESC] .....	3.9
<b>SECTION 4 - MAINTENANCE PROCEDURES .....</b>	<b>4.1</b>
GENERAL.....	4.1
DIAGNOSTIC BY DISPLAY .....	4.1
DISASSEMBLY PROCEDURE .....	4.2
SENSOR.....	4.2
ELECTRONIC CIRCUIT.....	4.3
REASSEMBLY PROCEDURE .....	4.3
SENSOR.....	4.3
ELECTRONIC CIRCUIT.....	4.3
INTERCHANGEABILITY .....	4.4
RETURNING MATERIALS.....	4.4
ORDERING CODE FOR HOUSING .....	4.7
ORDERING CODE FOR SENSOR.....	4.7
<b>SECTION 5 - TECHNICAL CHARACTERISTICS .....</b>	<b>5.1</b>
ORDERING CODE.....	5.5
<b>APPENDIX A - CERTIFICATIONS INFORMATIONS .....</b>	<b>A.1</b>
EUROPEAN DIRECTIVE INFORMATION.....	A.1
HAZARDOUS LOCATIONS GENERAL INFORMATION .....	A.1
HAZARDOUS LOCATIONS APPROVALS .....	A.2
IDENTIFICATION PLATES AND CONTROL DRAWING .....	A.6
<b>APPENDIX B – SRF – SERVICE REQUEST FORM.....</b>	<b>B.1</b>



## 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 **LD290** 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.

Locating 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.

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 tighten 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. The unused outlet connection should be plugged accordingly.

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

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.

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

### Mounting

The transmitter has been designed to be both rugged and lightweight at the same time. This make 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).

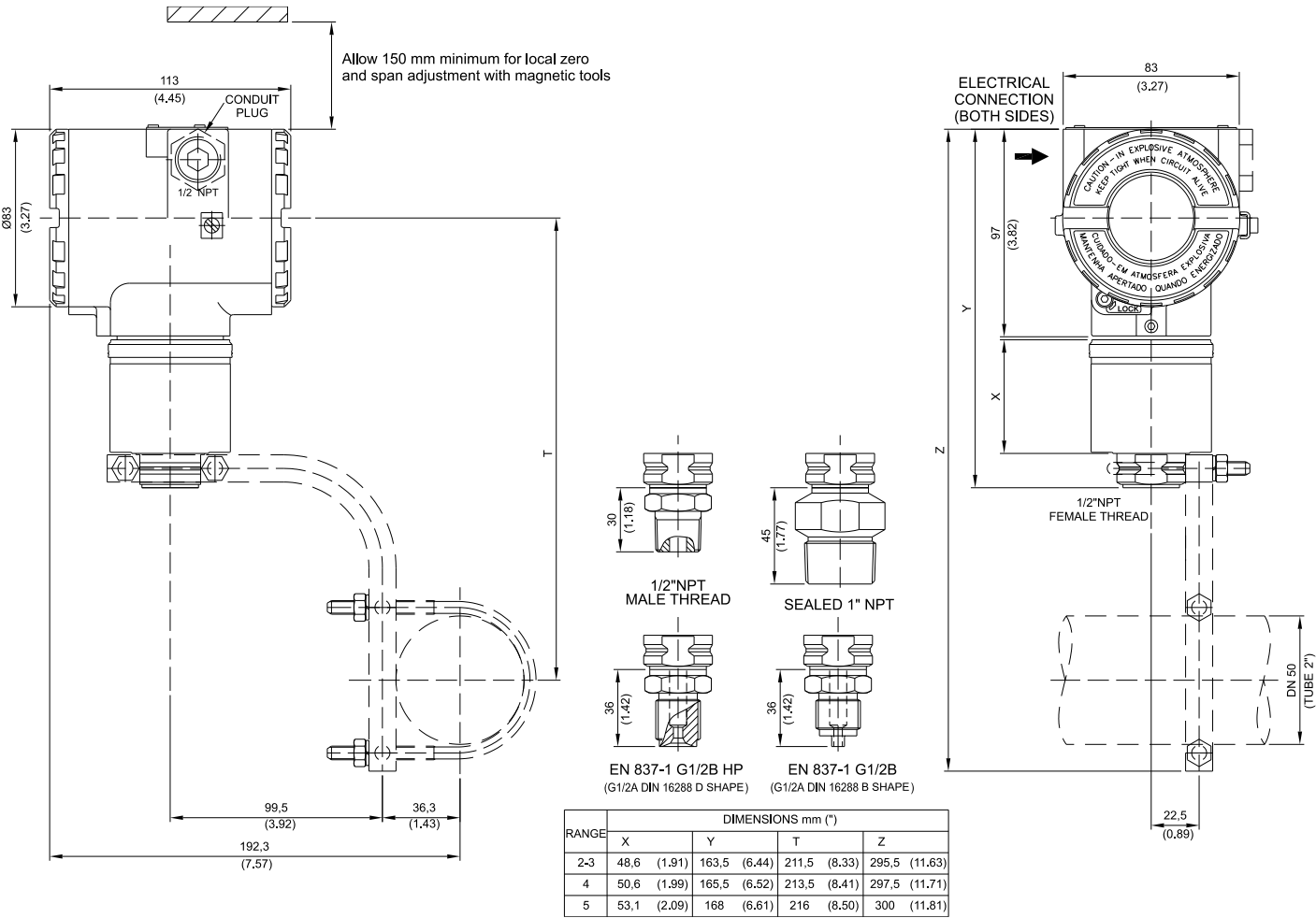


Figure 1.1 (a) – Dimensional Drawing and Mounting Position for LD290



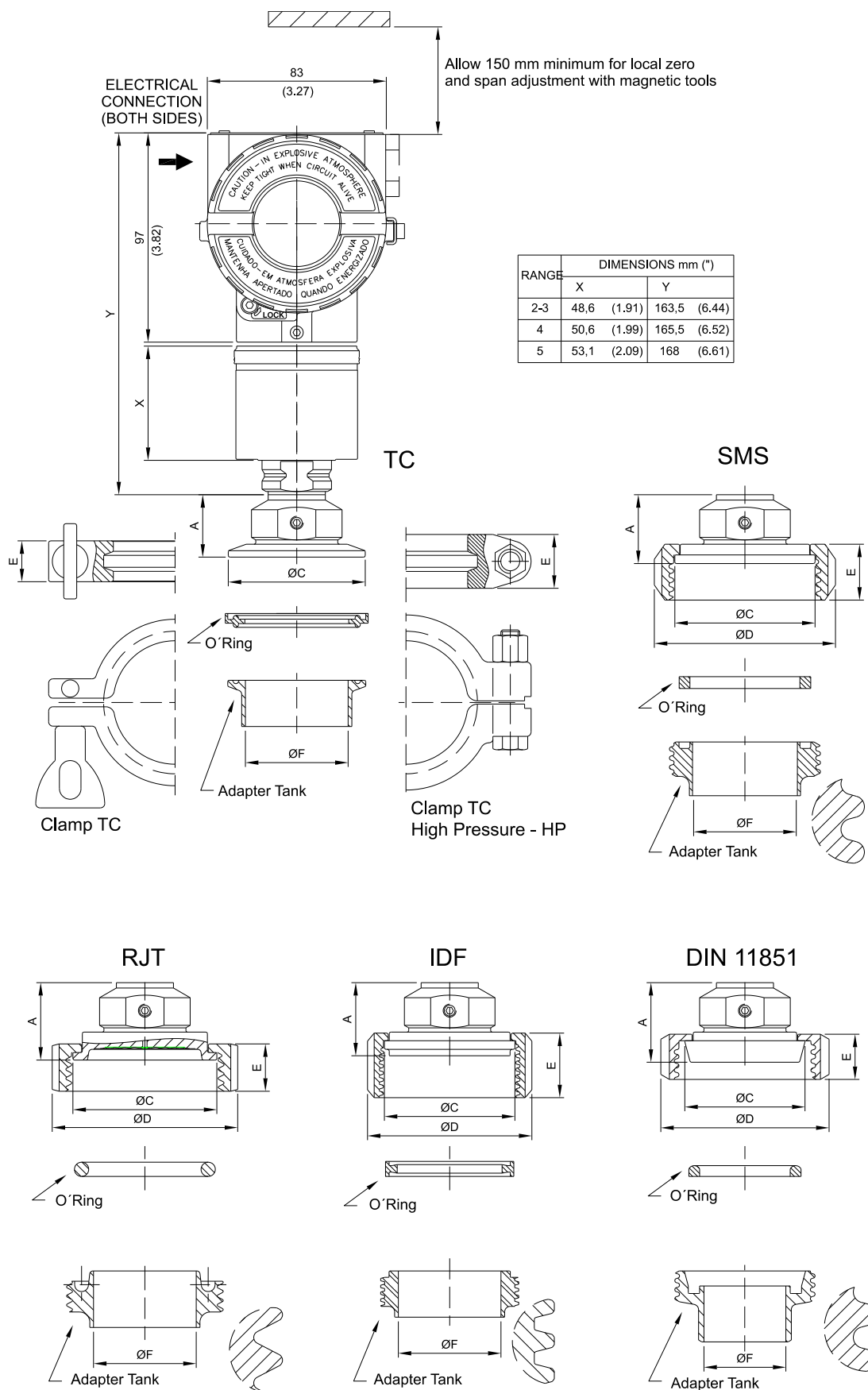
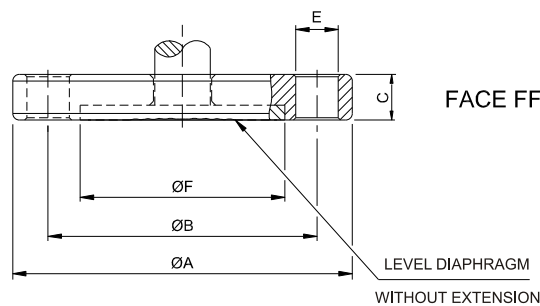


Figure 1.1 (b) – Dimensional Drawing and Mounting Position for LD290 - Sanitary

LD290S - CONNECTIONS					
CONNECTION	Dimensions in mm (inche)				
	A	ØC	ØD	E	ØF
Tri-Clamp - 1 1/2" - wihtout 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 LD290 – Sanitary**



NOTES:  
-EXTENSION LENGHT 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 (3.16)	14.3 (0.56)	16 (0.63)	50.8 (2)	-	4
	300/600	124 (4.88)	88.9 (3.5)	17.5 (0.69)	19 (0.75)	50.8 (2)	-	4
1.1/2"	150	127 (5)	98.6 (3.88)	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)	29.3 (1.15)	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 (0.8)	19 (0.75)	92 (3.62)	48 (1.89)	8
	600	165.1 (6.5)	127 (5)	25.4 (1)	19 (0.75)	92 (3.62)	48 (1.89)	8
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)	8
	600	209.5 (8.25)	168.1 (6.62)	31.8 (1.25)	22 (0.87)	127 (5)	73 (2.87)	8
4"	150	228.6 (9)	190.5 (7.5)	22.3 (0.87)	19 (0.75)	158 (6.22)	89 (3.5)	8
	300	254 (10)	200 (7.87)	30.2 (1.18)	22 (0.87)	158 (6.22)	89 (3.5)	8
	600	273 (10.75)	215.9 (8.5)	38.1 (1.5)	25 (1)	158 (6.22)	89 (3.5)	8

EN 1092-1 / DIN2501 DIMENSIONS								
DN	PN	A	B	C	E	F	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 (6.50)	125 (4.92)	20 (0.78)	18 (0.71)	102 (4.01)	48 (1.89)	4
80	10/40	200 (7.87)	160 (6.30)	24 (0.95)	18 (0.71)	138 (5.43)	73 (2.87)	8
100	10/16	220 (8.67)	180 (7.08)	20 (0.78)	18 (0.71)	158 (6.22)	89 (3.5)	8
	25/40	235 (9.25)	190 (7.50)	24 (0.95)	22 (0.87)	162 (6.38)	89 (3.5)	8

**Figure 1.1 (d) – Dimensional Drawing and Mounting Position for LD290 – Level**

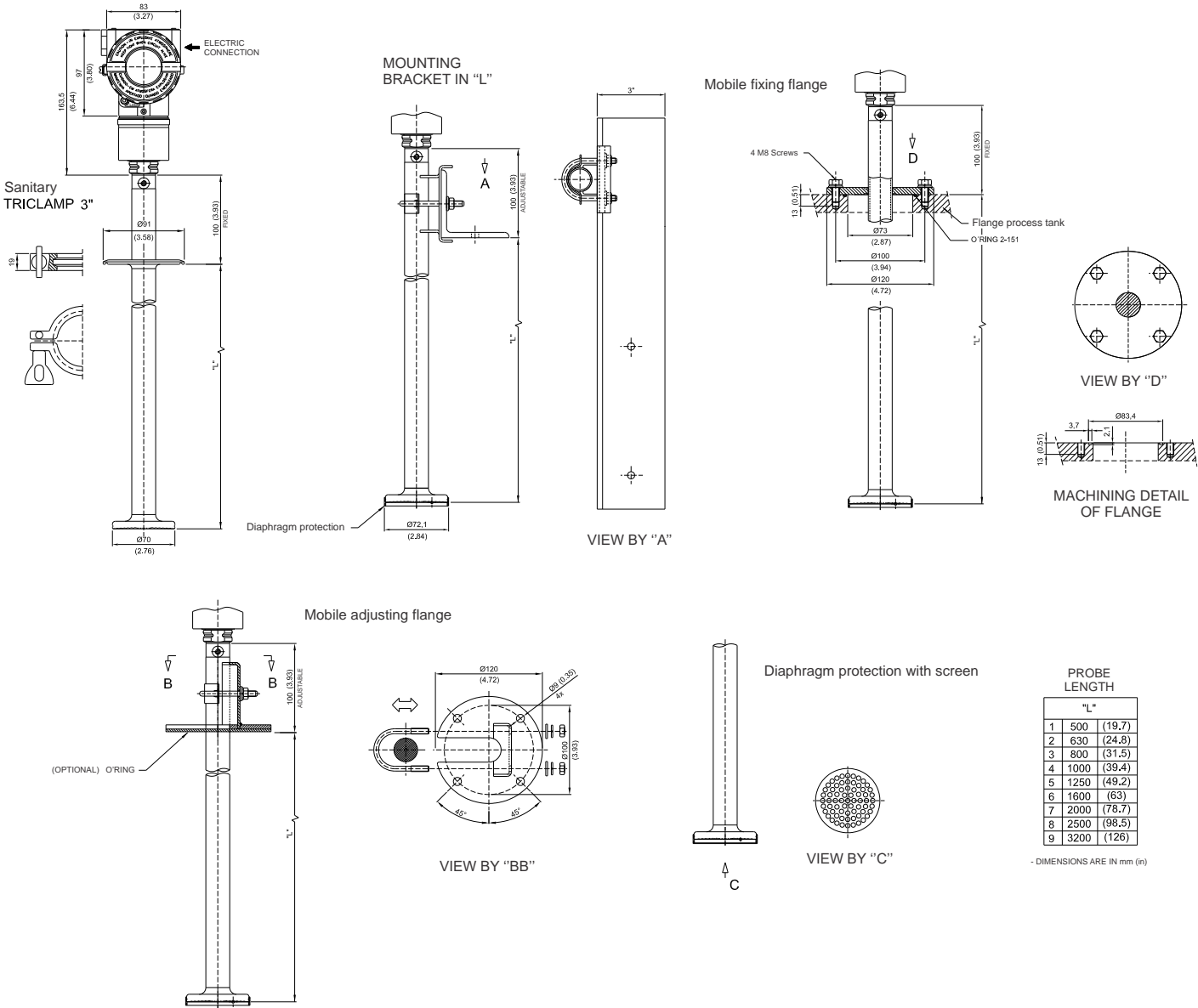
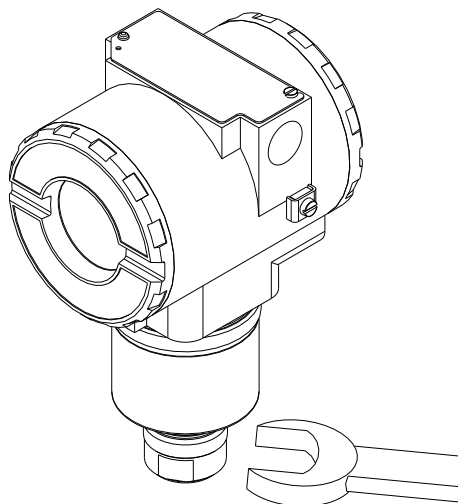


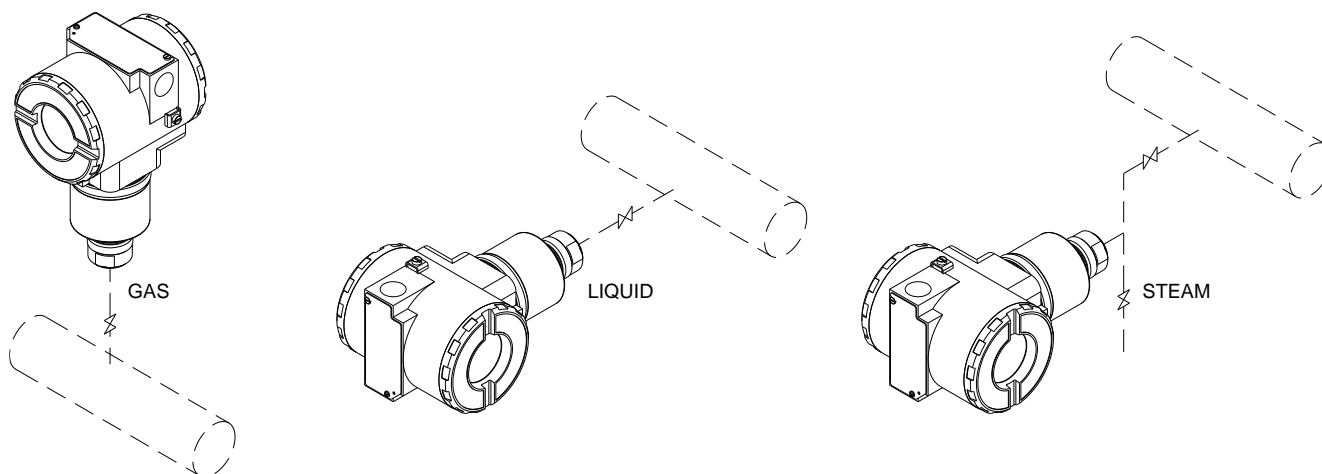
Figure 1.1 (e) – Dimensional Drawing and Mounting Position for LD290 – Level (Insertion)

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

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



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



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

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 LD290 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**

**NOTE**

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.

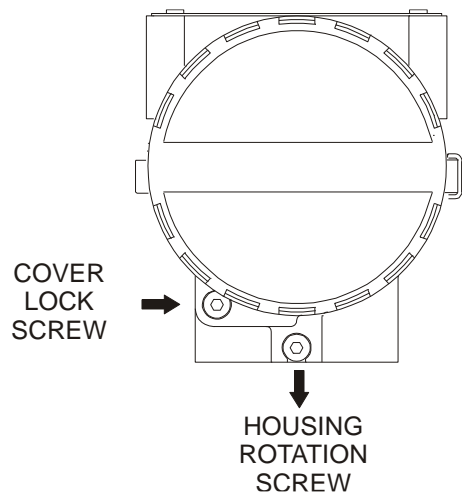
## Electronic Housing

The electronic housing can be rotated in order to better position the digital display. To rotate it use the Housing Rotation Set Screw, see Figure 1.4.

The digital display itself can also be rotated. See Section 4, Figure 4.3.

## Wiring

Reach the wiring block by removing the Electrical Connection Cover. This cover can be locked closed by the cover locking screw (Figure 1.4). To release the cover, rotate the locking screw clockwise.

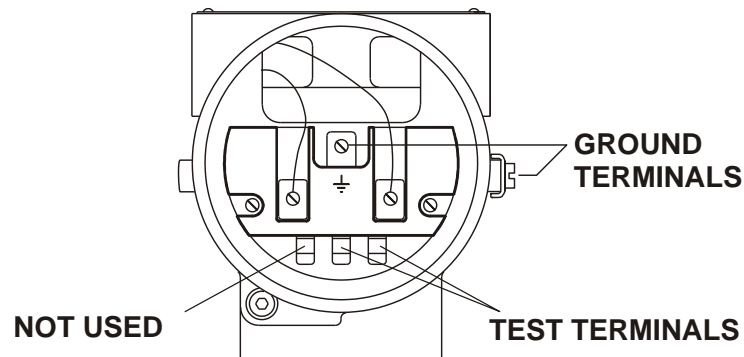


**Figure 1.4 – Housing Rotating Set Screw**

The wiring block has screws on which fork or ring-type terminals can be fastened. See Figure 1.5.

Test terminals allow measuring the current in the 4 - 20 mA loop, without opening it. To measure it, connect a multimeter in the mA scale in the "-" and "+" terminals.

The wiring block has screws on which fork or ring-type terminals can be fastened. See Figure 1.6.



**Figure 1.5 – Wiring Block**

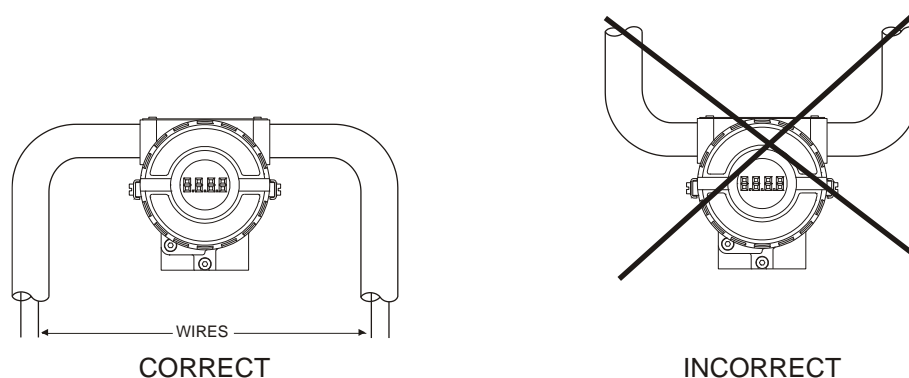
For convenience there are two ground terminals: one inside the cover and one external, located close to the conduit entries.

Use of twisted pair (22 AWG or greater than) cables is recommended.

Avoid routing signal wiring close to power cables or switching equipment.

The unused outlet connection should be plugged and sealed accordingly. The **LD290** is protected against reverse polarity. However, it will not work in this situation.

The Figure 1.6 shows the correct installation of the conduit, in order to avoid penetration of water, or other substance, which may cause malfunctioning of the equipment.

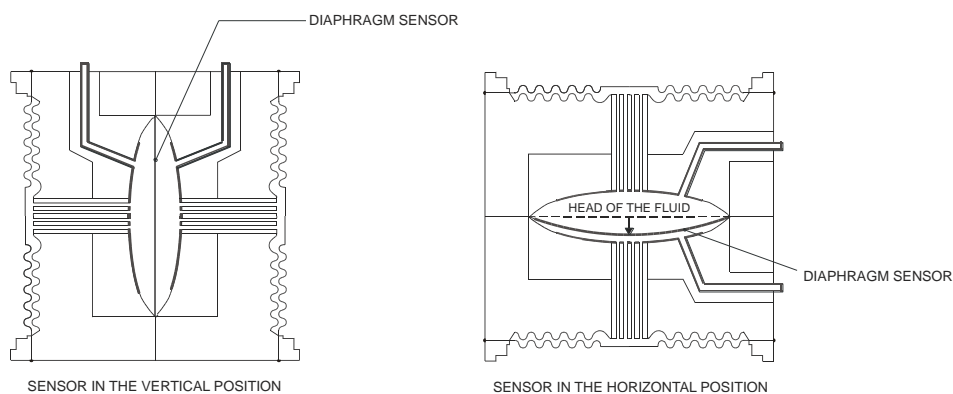


**Figure 1.6 - Conduit Installation Diagram**

**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.

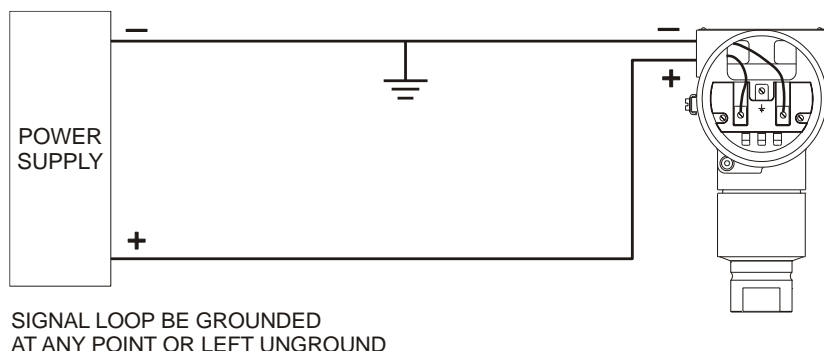
In the factory, the transmitter is ranged in the vertical position, and in this position the capacitive sensor is in the horizontal position. If it is mounted in the field in another position, it should be ranged again to avoid readout error. See Figure 1.8.



**Figure 1.7 - Sensor Positions**

It is also recommended to ground the shield of shielded cables at only one end. The ungrounded end must be carefully isolated.

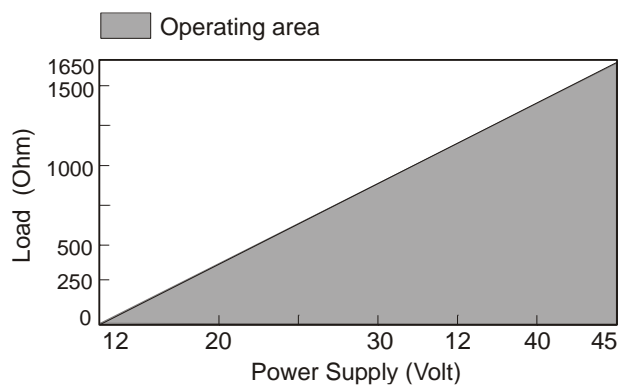
Connection of the **LD290** should be done as in Figure 1.8.



**Figure 1.8 - Wiring Diagram for the LD290**

**NOTE**

Make sure that the transmitter is operating within the operating area as shown on the load curve (Figure 1.10).



**Figure 1.9 - Load Curve**



## Installation in Hazardous Areas

### WARNING

Explosions could result in death or serious injury, besides financial damage. Installation of this transmitter in explosive areas must be carried out in accordance with the local standards and the protection type adopted. Before continuing the installation make sure the certificate parameters are in accordance with the classified area where the equipment will be installed.

The instrument modification or parts replacement supplied by other than authorized representative of Smar is prohibited and will void the certification.

The transmitters are marked with options of the protection type. The certification is valid only when the protection type is indicated by the user. Once a particular type of protection is selected, any other type of protection can not be used.

The electronic housing and the sensor installed in hazardous areas must have a minimum of 6 fully engaged threads. Lock the housing using the locking screw (Figure 1.4).

The cover must be tightened with at least 8 turns to avoid the penetration of humidity or corrosive gases. The cover must be tightened until it touches the housing. Then, tighten more 1/3 turn (120°) to guarantee the sealing. Lock the covers using the locking screw (Figure 1.4).

Consult the Appendix A for further information about certification.

## Explosion/Flame Proof

### WARNING

Only use Explosion Proof/Flameproof certified Plugs, Adapters and Cable glands.

In Explosion-Proof installations the cable entries must be connected or closed using metal cable gland and metal blanking plug, both with at least IP66 and Ex-d certification.

The standard plugs provided by Smar are certified according to CEPEL certificate. If the plug needs to be replaced, a certified plug must be used.

The electrical connection with NPT thread must use waterproofing sealant. A non-hardening silicone sealant is recommended.

For NEMKO ATEX certificate please to follow the installation guidelines in hazardous locations below: Group II Category 2G, Ex d, Group IIC, Temperature Class T6, EPL Gb U = 28VDC

Ambient Temperature: -20 to 60°C for T6

Environmental Protection: IP66/687 or IP66W/687W

The electrical connection available are ½ - 14NPT and M20x1,5.

Cable entries must be connected or closed using metal cable gland and metal blanking plug, both with at least IP66 and Ex-d certification or any appropriate ATEX approved metal cable gland and metal blanking plug. Do not remove the transmitter covers when power is ON.

## Intrinsically Safe

### WARNING

In hazardous zones with intrinsically safe or non-incendive requirements, the circuit entity parameters and applicable installation procedures must be observed.

To protect the application the transmitter **must be connected to a barrier**. Match the parameters between barrier and the equipment (Consider the cable parameters). Associated apparatus ground bus shall be insulated from panels and mounting enclosures. Shield is optional. If used, be sure to insulate the end not grounded. Cable capacitance and inductance plus  $C_i$  and  $L_i$  must be smaller than  $C_o$  and  $L_o$  of the associated Apparatus.

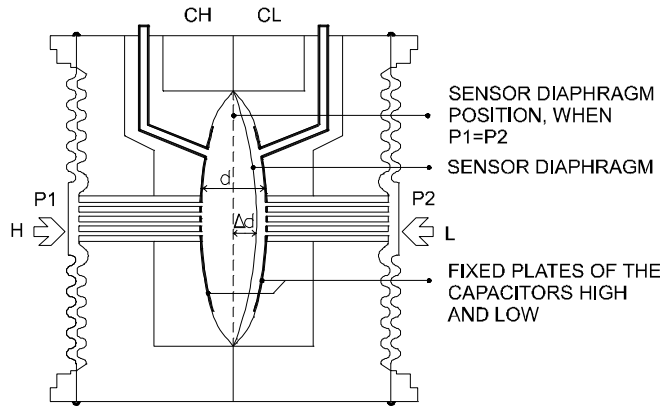
It is not recommended to remove the transmitter cover when the power is ON.



# OPERATION

## Functional Description - Sensor

The **LD290** Series Pressure Transmitters use capacitive sensors (capacitive cells) as pressure sensing elements, as shown in Figure 2.1.



**Figure 2.1 – Capacitive Cell**

Where,

$P_1$  and  $P_2$  are the pressures in chambers H and L

**CH** = capacitance between the fixed plate on  $P_1$  side and the sensing diaphragm.

**CL** = capacitance between the fixed plate on the  $P_2$  side and the sensing diaphragm.

**d** = distance between CH and CL fixed plates.

**Δd** = sensing diaphragm's deflection due to the differential pressure  $\Delta P = P_1 - P_2$ .

Knowing that the capacitance of a capacitor with flat, parallel plates may be expressed as a function of plate area (A) and distance (d) between the plates as:

$$C = \frac{\epsilon A}{d}$$

Where,

$\epsilon$  = dielectric constant of the medium between the capacitor's plates.

Should CH and CL be considered as capacitances of flat and parallel plates with identical areas, then:

$$CH = \frac{\epsilon \cdot A}{(d/2) + \Delta d} \quad \text{and} \quad CL = \frac{\epsilon \cdot A}{(d/2) - \Delta d}$$

However, should the differential pressure ( $\Delta P$ ) applied to the capacitive cell not deflect the sensing diaphragm beyond  $d/4$ ; it is possible to assume  $\Delta P$  as proportional to  $\Delta d$ .

By developing the expression  $(CL - CH) / (CL + CH)$ , it follows that:

$$\Delta P = \frac{CL - CH}{CL + CH} = \frac{2\Delta d}{d}$$

as the distance (d) between the fixed plates CH and CL is constant, it is possible to conclude that the expression  $(CL - CH) / (CL + CH)$  is proportional to  $\Delta d$  and, therefore, to the differential pressure to be measured.

Thus it is possible to conclude that the capacitive cell is a pressure sensor formed by two capacitors whose capacitances vary according to the applied differential pressure.

## Functional Description - Hardware

Refer to the block diagram Figure 2.2. The function of each block is described below.

### Oscillator

This oscillator generates a frequency as a function of sensor capacitance.

### Signal Isolator

The Control signals from the CPU are transferred through optical couplers, and the signal from the oscillator is transferred through a transformer.

### (CPU) Central Processing Unit and PROM

The CPU is the portion of the transmitter, being responsible for the management and operation of all other blocks..

The program is stored in an external PROM. For temporary storage of data the CPU has an internal RAM. The data in the RAM is lost, if the power is switched off, however the CPU also has an internal nonvolatile EEPROM where data that must be retained is stored. Examples of such data are: calibration, configuration and identification data.

### EEPROM

Another EEPROM is located within the sensor assembly. It contains data pertaining to the sensor's characteristics at different pressures and temperatures. This characterization is done for each sensor at the factory.

### D/A Converter

Converts the digital data from the CPU to an analog signal with 15-bits resolution.

### Output

Controls the current in the line feeding the transmitters.

It acts as a variable resistive load whose value depends on the voltage from the D/A converter.

### Power Supply

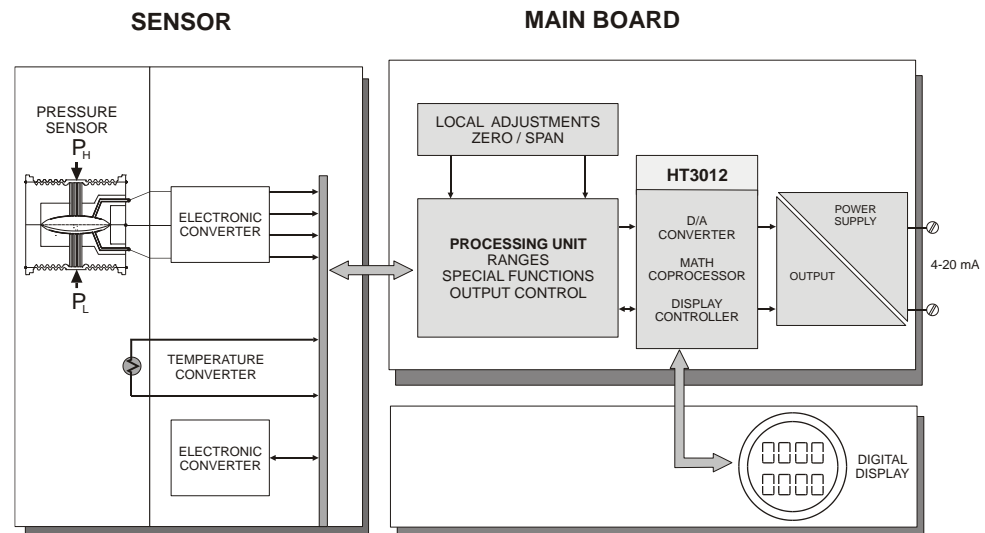


Figure 2.2 – LD290 Block Diagram Hardware

Power shall be supplied to the transmitter circuit using the signal line (2-wire system). The transmitter quiescent consumption is 3.6 mA; during operation, consumption may be as high as 21 mA, depending on the measurement and sensor status.

### Power Supply Isolation

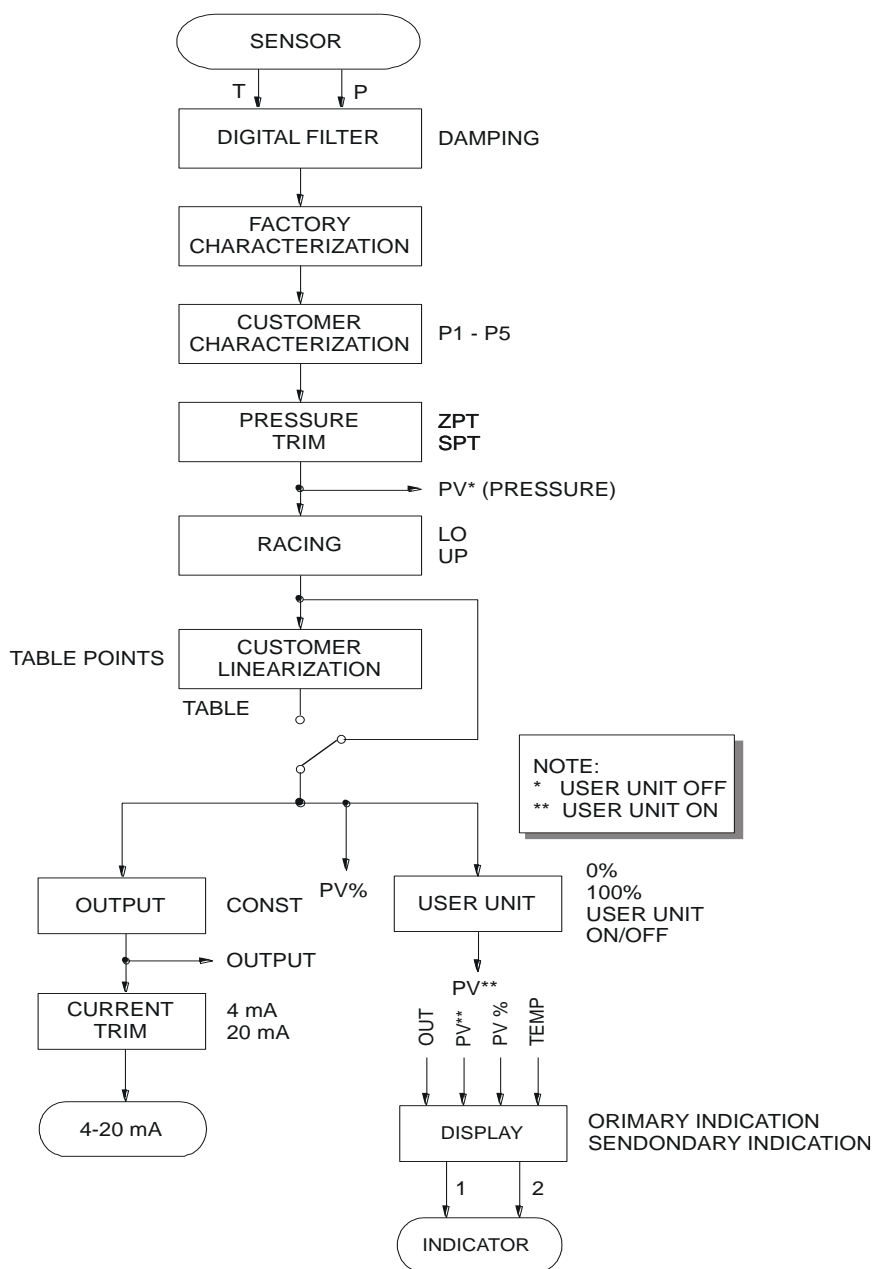
The sensor power supply is isolated from the main circuit by this module.

### Display Controller

It receives the data from the CPU and activates the LCD segments. Also it activates the back plane and the control signals for each segment.

### Local Adjustment

Two switches that are magnetically activated. The magnetic tool without mechanical or electrical contact can activate them.



**Figure 2.3 – LD290 – Software Block Diagram**

### Output

Calculates the current proportional to the process variable or manipulated variable to be transmitted on the 4-20 mA output depending on the configuration in OP-MODE. This block also contains the constant current function configured in OUTPUT. The output is physically limited to 3.6 to 21 mA.

### Current Trim

The 4 mA TRIM and 20 mA TRIM adjustment is used to make the transmitter current comply with a current standard, should a deviation arise.

### User Unit

Converts 0 and 100% of the process variable to a desired engineering unit read out available for the display. It is used, e.g., to get a volume or flow indication from a level or differential pressure measurement, respectively. A unit for the variable can also be selected.

### Display

Can alternate between two indications as configured in DISPLAY.

The Display

The integral indicator is able to display one or two variables, which are user selectable. When two variables are chosen, the display will alternate between the two with an interval of 3 seconds.

The liquid crystal display includes a field with 4 ½ numeric digits, a field with 5 alphanumeric digits and an information field, as shown on Figure 2.4.

DISPLAY V6.00

The display controller, from release V6.00 on, is integral to the main board. Please observe the new spare parts codes.

Monitoring

During normal operation, the LD290 is in the monitoring mode. In this mode, indication alternates between the primary and secondary variable as configured by the user. See Figure. 2.5. The display indicates engineering units, values and parameters simultaneously with most status indicators.

The monitoring mode is interrupted when the user does complete local adjustment.

The display is also capable of displaying an error and other messages (See table 2.1).

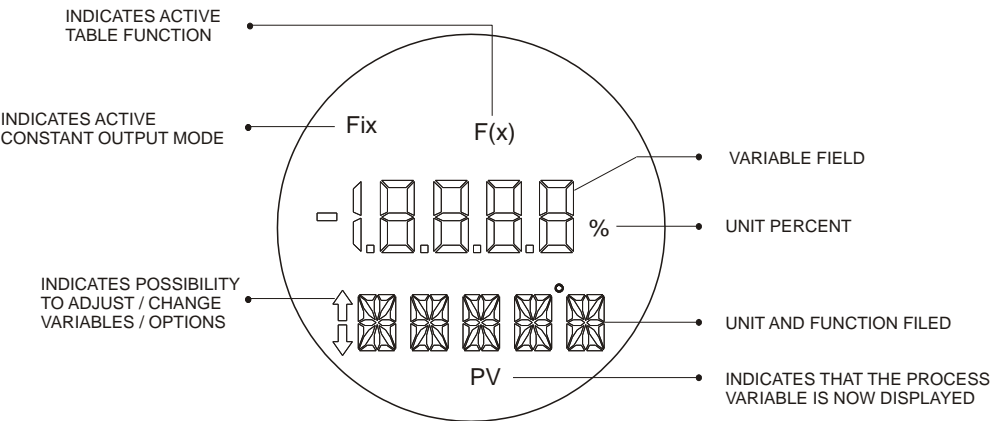


Figure 2.4 - Display

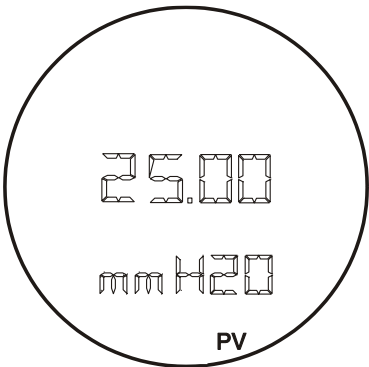


Figure 2.5 – Typical Monitoring Mode Display Showing PV, in this case 25.00 mmH<sub>2</sub>O

DISPLAY	DESCRIPTION
INIT	The LD290 is in initializing after power on.
FAIL SENS	Sensor failure. Refer to Section 4 - Maintenance.
SAT	Current output saturated in 3.8 or 20.5 mA. Refer to Section 4 - Maintenance.

Table 2.1 - Display Messages

## Section 3





# PROGRAMMING USING LOCAL ADJUSTMENT

### The Magnetic Tool

If the transmitter is fitted with a display, and configured for Complete Local Adjustment (using the internal jumper), the magnetic tool become a powerful configuration tool.

If the transmitter is not fitted with a display, or is configured for Simple Local Adjustment (using the internal jumper) the adjustment capability is reduced to reranging.

To select the function mode of the magnetic switches configures the jumpers located at the top of the main circuit board as indicated in Table 3.1.

SI/COM OFF/ON	NOTE	WRITE PROTECT	SIMPLE LOCAL ADJUSTMENT	COMPLETE LOCAL ADJUSTMENT
		Disables	Disables	Disables
	1	<b>Enables</b>	Disables	Disables
	2	Disables	<b>Enables</b>	Disables
		Disables	Disables	<b>Enables</b>

**Table 3.1 – Local adjustment Selection**

**Notes:** 1 - If the hardware protection is selected, the EEPROM will be protected.

2 - The local adjustment default condition is simple enabled and write protect disabled.

The transmitter has, under the identification plate, holes for two magnetic switches activated by the magnetic tool (See Figure 3.1).



**Figure 3.1 – Local Zero and Span Adjustment and Local Adjustment Switches**

The holes are marked with **Z** (Zero) and **S** (Span) and from now on will be designated simply by (**Z**) and

(S), respectively. Table 3.2 shows the action performed by the magnetic tool while inserted in (Z) and (S) in accordance with the selected adjustment type.

Browsing the functions and their branches works as follows:

Inserting the handle of the magnetic tool in (Z), the transmitter passes from the normal measurement state to the transmitter configuration state. The transmitter software automatically starts to display the available functions in a cyclic routine.

1. Inserting the handle of the magnetic tool in (Z), the transmitter passes from the normal measurement state to the transmitter configuration state. The transmitter software automatically starts to display the available functions in a cyclic routine.
2. In order to reach the desired option, browse the options, wait until they are displayed and move the magnetic tool from (Z) to (S). Refer to Figure 3.2, in order to know the position of the desired option. By placing the magnetic tool once again in (Z), it is possible to browse for other options within this new branch.
3. The procedure to reach the desired option is similar to the one described on the previous item, for the whole hierarchical level of the programming tree.

Ação	Simple Local Adjustment	Complete Local Adjustment
Z	Selects the Lower Range Value	Moves among all the options
S	Selects the Upper Range Value	Activates the selected Functions

**Table 3.2 - Local Adjustment Description**

NOTE
For <b>LD290</b> versions prior to a <b>V6.00</b> , the digital display shall be number 214-0108 as per spare parts list for <b>LD290</b> V5.xx.
For <b>LD290</b> versions V6.xx, the digital display shall be number 400-0559, as per the updated spare parts list

## Simple Local Adjustment

The **LD290** allows, only, the calibration of the values inferior and superior in this configuration.

## Zero and Span Reranging

The **LD290** can be very easily calibrated. It requires only Zero and Span adjustment in accordance with the working range.

The jumpers shall be configured for simple local adjustment. In case the **LD290** display is not connected, the simple local adjustment is automatically activated.

Zero calibration with reference shall be done as follows:

- ✓ Apply the Lower Value pressure.
- ✓ Wait for the pressure to stabilize.
- ✓ Insert the magnetic tool in the ZERO adjustment hole. (See Figure 3.1)
- ✓ Wait 2 seconds. The transmitter should be reading 4 mA.
- ✓ Remove the tool.

Zero calibration with reference does not affect the span. In order to change the span, the following procedure shall be observed:

- ✓ Apply the Upper Value pressure.
- ✓ Wait for the pressure to stabilize.
- ✓ Insert the magnetic tool in the SPAN adjustment hole.
- ✓ Wait 2 seconds. The transmitter should be reading 20 mA.
- ✓ Remove the tool.

Zero adjustment causes zero elevation / suppression and a new upper value (URV) is calculated in accordance with the effective span. In case the resulting URV is higher than the Upper Limit Value (URL), the URV will be limited to the URL value, and the span will be automatically affected.

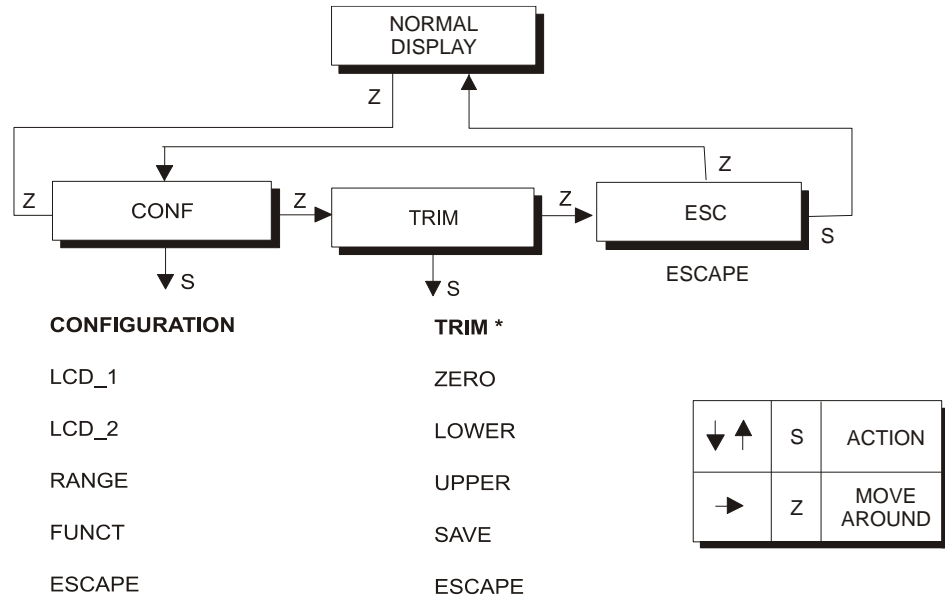


## Complete Local Adjustment

The transmitter must be fitted with the digital display for this function to be enabled. The following functions are available for local adjustment: Engineering Unit, Lower and Upper Range Value, Zero and Span Adjust with Reference, Damping, Pressure Trim,

## Local Programming Tree

The local adjustment uses a tree structure where, by placing the magnetic tool in (Z) it is possible to browse the options of a branch and, by placing it in (S), details of the chosen option are shown. Figure 3.2 shows the **LD290** available options.



\* PROTECTED BY A PASSWORD

THE PASSWORD CONSIST IN INSERT SCREWDRIVER HANDLE 2 TIMES IN THE "S" ORIFICE.

**Figure 3.2 – Local Adjustment Programming Tree – Main Menu**

### NOTE

The following functions are **NOT** available for local adjustment: Constant Current, Table Points Adjustment, User Units, Fail-safe, and Current Trim.

**CONFIGURATION (CONF)** - Is the option where the output and display related parameters are configured: unit, primary and secondary display, calibration, function, and operation mode.

**TRIM (TRIM)** - Is the option used to calibrate the "without reference" characterization and the digital reading.

**ESCAPE (ESC)** - Is the option used to go back to normal monitoring mode.

The local adjustment is activated by actuation in (Z).

## Configuration [CONF]

Configuration functions affect directly the 4-20 mA output current and the display indication. The configuration options implemented in this branch are the following:

- ✓ Selection of the variable to be shown on Display 1 and on Display 2.
- ✓ Working range calibration of work. Options With and Without Reference are available.
- ✓ Digital filter damping time configuration of the readout signal input.
- ✓ Selection of the transference function to be applied to the measured variable.

Figure 3.3 shows branch CONF with the available options.

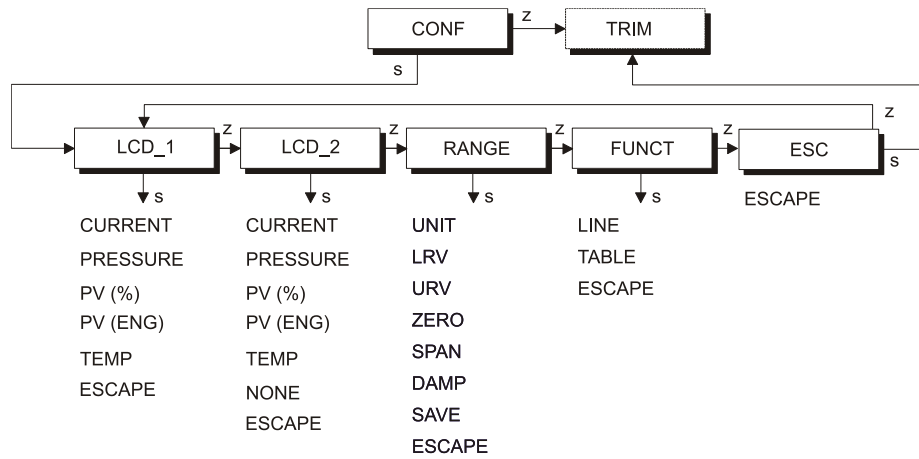
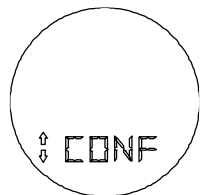


Figure 3.3 – Local Adjustment Configuration Tree

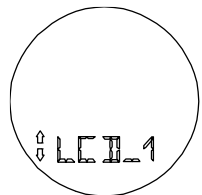
* NOTE
Among the units shown by LD290 only the units from Table 3.3 are valid.

Configuration Branch (CONF)



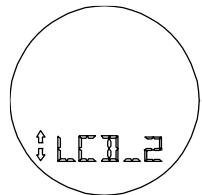
Display 1 (LCD\_1)

- Z: Moves to the TRIM branch.
- S: Enters the CONFIGURATION branch, starting with function display (LCD\_1).



- Z: Moves to the function Display 2 (LCD\_2).
  - S: Starts selection of variable to be indicated as primary display. After activating (S), you can move around the options available in the following table by activating (Z). See table 3.3.
- The desired variable is activated using (S). Escape leaves primary variable unchanged.

Display 2 (LCD\_2)



- Z: Moves to the RANGE function.
- S: Starts selection of variable to be indicated as secondary display. The procedure for selection is the same as for LCD\_1, above.

CURRENT	CURRENT IN MILIAMPERES
CO	Analog Output Current in mA
PR	Pressre in pressure unit.
PV%	Process Variable in percentage.
PV	Process Variable in engineering units.
TE	Ambient temperature.
	NONE - No variable on display (only LCD_2)
ESC	Escape.

Table 3.3 - Display Indication

## Range (RANGE)

Function Calibration (RANGE) presents the calibration options as a tree branch, as described on Figure 3.4.

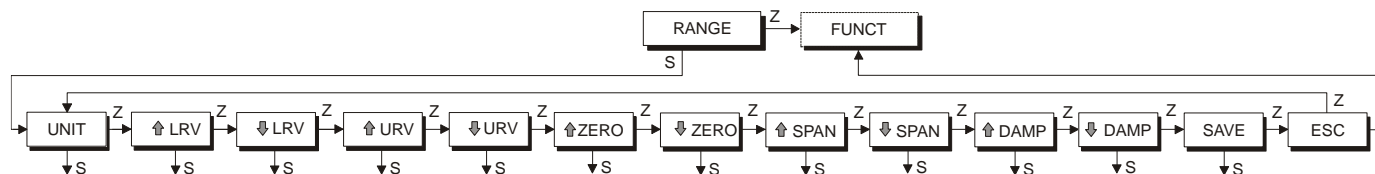
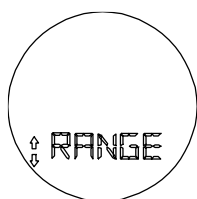


Figure 3.4 – Local Range Tree

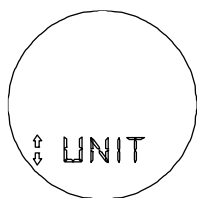
## Range Branch (RANGE)



**Z:** Moves to the FUNCT function.

**S:** Enters the RANGE branch, starting with the function UNIT.

### Unit (UNIT)



**Z:** Moves to the LRV function.

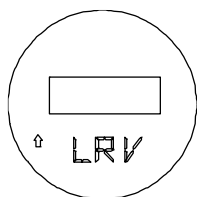
**S:** Starts selection of engineering unit for process variable and setpoint indication. After activating (**S**), you can move around the options available in the table below by activating (**Z**). Using (**S**) activates the desired unit. Escape leaves the unit unchanged.

UNIT	
DISPLAY	DESCRIPTION
InH <sub>2</sub> O	Inches water column at 20°C
InHg	Inches mercury column at 0°C
ftH <sub>2</sub> O	Feet water column at 20°C
mmH <sub>2</sub> O	millimeter water column at 20°C
mmHg	millimeter mercury column at 0°C
psi	pounds per square centimeter
Bar	Bar
Mbar	Millibar
g/cm <sup>2</sup>	grams per square centimeter
k/cm <sup>2</sup>	Kilograms per square centimeter
Pa	Pascals
kPa	Kilo Pascals
Torr *	Torr at 0°C
atm	Atmospheres
ESC	-escape-

Table 3.4 – Units

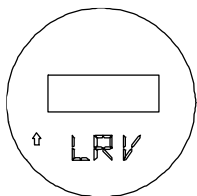
The Torr unit has been changed to mH<sub>2</sub>O@20°C for version 6.04 or greater.

### Lower Range Value Adjustment without Reference (LRV)



**Z:** Moves to the LRV DECREASE function.

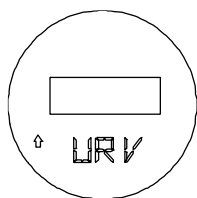
**S:** Increases the Lower Value until the magnetic tool is removed or the maximum for the Lower Value is reached.



**Z:** Moves to the URV ADJUSTMENT function.

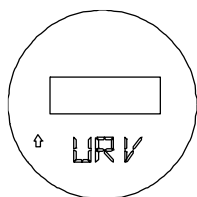
**S:** Decreases the Lower Value until the magnetic tool is removed or the minimum for the Lower Value is reached.

### Upper Range Value Adjust without Reference {URV}



**Z:** Moves to the URV DECREASE function.

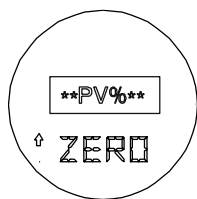
**S:** Increases the Upper Value until the magnetic tool is removed or the maximum for the Upper Value is reached.



**Z:** Moves to the ZERO ADJUSTMENT function.

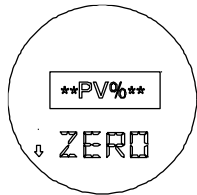
**S:** Decreases the Upper Value until the magnetic tool is removed or the minimum for the Upper Value is reached.

### Zero Adjust with Reference {ZERO}



**Z:** Moves to the ZERO DECREASE function.

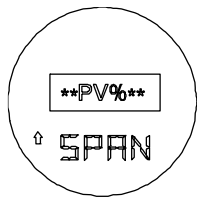
**S:** Increases output in transmitter mode, decreases the Lower Pressure Value until the magnetic tool is removed or the minimum for the Lower Value is reached. The span is maintained.



**Z:** Moves to the SPAN ADJUSTMENT function.

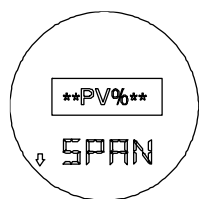
**S:** Decreases Output in transmitter mode, increases the Lower Pressure Value until the magnetic tool is removed or the maximum for the Lower Value is reached. The span is maintained.

### Span Adjust with Reference (SPAN)



**Z:** Moves to the SPAN DECREASE function.

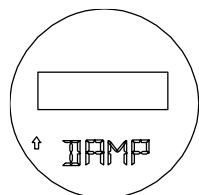
**S:** Increases the Output in transmitter mode, decreases the Upper Pressure Value until the magnetic tool is removed or the minimum for the Upper Value is reached.



**Z:** Moves to the DAMPING function.

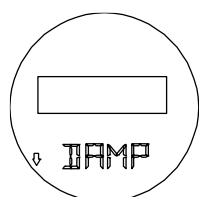
**S:** Decreases the Output in transmitter mode, increases the Upper Pressure Value until the magnetic tool is removed or the maximum for the Upper Value is reached.

### Damping (DAMP)



**Z:** Moves to the DAMPING DECREASE function.

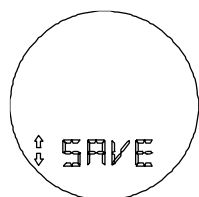
**S:** Increases the damping time constant until the magnetic tool is removed or 32 seconds are reached.



**Z:** Moves to the SAVE function.

**S:** Decreases the damping time constant until the magnetic tool is removed or 0 seconds is reached.

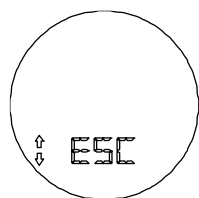
### Save (SAVE)



**Z:** Moves to the ESCAPE of RANGE menu.

**S:** Saves the LRV, URV, ZERO, SPAN and DAMP values in the transmitter EEPROM.

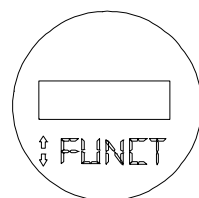
### Escape (ESC)



**Z:** Moves to the UNIT function.

**S:** Escapes to the ESC function, of the RANGE branch.

## Function (FUNCT)



**Z:** Moves to the ESCAPE function.

**S:** Starts selection of input function. After activating (**S**) you can move around the available options in the table below by activating (**Z**).

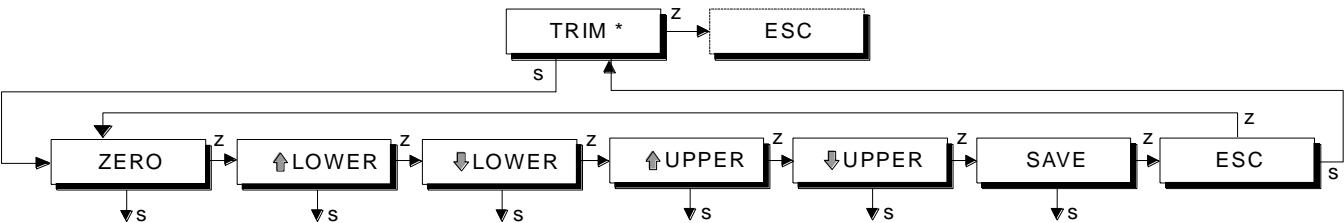
FUNCTIONS	
DISPLAY	DESCRIPTION
LINE	Linear to Pressure
TABLE	16 Point Table
ESC	-escape-

Table 3.5 - Functions

The desired function is activated using (**S**). Escape leaves function unchanged.

Pressure Trim [TRIM]

This field of the tree is used to adjust the digital reading according to the applied pressure. The pressure TRIM differs from RANGING WITH REFERENCE, since the TRIM is used to correct the measure and RANGING WITH REFERENCE reach only the applied pressure with the output signal of 4 to 20 mA.

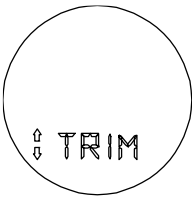


PROTECTED BY PASSWORD. THE PASSWORD CODE IS SIMILAR THAT DESCRIBED FOR THE OPERATION (MODE), IN THE PAGE 4.11.

Figure 3.5 shows the options available to run the pressure TRIM.

Figure 3.5 – Pressure Trim Tree

Trim Branch (TRIM)



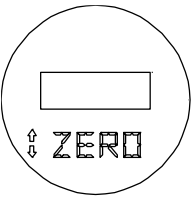
**Z:** Moves to ESC function.

**S:** These functions are protected by a "password." When prompted PSWD activates (**S**) 2 times to proceed. After entering the password, the TRIM branch starting with the Zero Trim function is accessed.

Zero Pressure Trim (ZERO)

NOTE

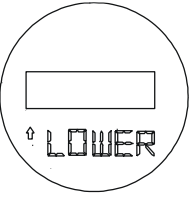
Check on section 1, the note on the influence of the mounting position on the indicator.  
For better accuracy, the trim adjustment should be made in the in the lower and upper values of the operation range values.



**Z:** Moves to the LOWER pressure TRIM function.

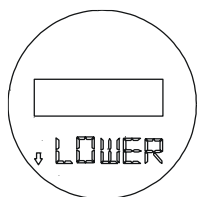
**S:** Trims the transmitters' internal reference to read 0 at the applied pressure.

Lower Pressure Trim (Lower)



**Z:** Moves to option DECREASES THE LOWER PRESSURE VALUE.

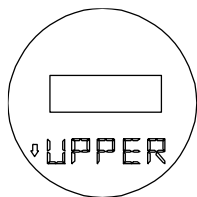
**S:** Adjusts the transmitter's internal reference, increasing the displayed value that will be interpreted as the Lower Pressure value corresponding to the applied pressure.



**Z:** Moves on to function SAVE if the Lower Pressure Trim (LOWER) is running or to the Upper Pressure Trim (UPPER).

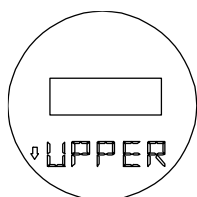
**S:** Adjusts the transmitter's internal reference, decreasing the displayed value that will be interpreted as the Lower Pressure value corresponding to the applied pressure.

#### Upper Pressure Trim (UPPER)



**Z:** Moves to the decrease upper pressure reading.

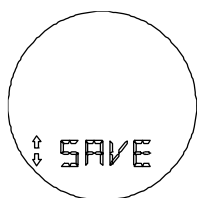
**S:** Sets the transmitters' internal reference increasing to the value on the display, which is the reading of the applied pressure.



**Z:** Moves to the SAVE function.

**S:** Sets the transmitters' internal reference decreasing to the value on the display, which is the reading of the applied pressure.

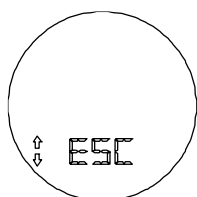
#### Save (SAVE)



**Z:** Moves to the ESCAPE from TRIM menu.

**S:** Saves the LOWER and UPPER TRIM point in the transmitter EEPROM and actualize the internal parameters pressure measurement.

#### Escape (ESC)

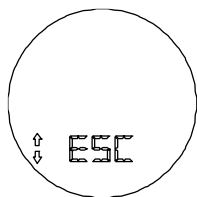


**Z:** Moves to the ZERO TRIM function.

**S:** Escapes to the MAIN menu.

### Escape Local Adjustment [ESC]

This branch of the main tree is used to leave the Local Adjustment mode, placing the Transmitter in the monitoring mode.



**Z:** Selects the OPERATION branch.

**S:** Escapes to NORMAL DISPLAY mode, adjusting the **LD290** in monitoring mode.





# MAINTENANCE PROCEDURES

## General

NOTE
Equipments installed in hazardous atmospheres must be inspected in compliance with the IEC60079-17 standard.

SMAR **LD290** pressure transmitters are extensively tested and inspected before delivery to the end user. Nevertheless, its design includes additional information for diagnosis purposes, in order to provide an easier fault detection capability and, as a consequence, an easier maintenance.

In general, it is recommended that end users do not try to repair printed circuit boards. Spare circuit boards may be ordered from SMAR whenever necessary.

The sensor has been designed to operate for many years without malfunctions. Should the process application require periodic cleaning of the transmitter, the flanges may be easily removed and reinstalled.

Should the sensor eventually require maintenance, it may not be changed in the field. In this case, the possibly damaged sensor should be returned to SMAR for evaluation and, if necessary, repair. Refer to the item "Returning Materials" at the end of this Section.

## Diagnostic by Display

### **Symptom: NO LINE CURRENT**

#### **Probable Source of Trouble:**

- ✓ **Transmitter Connections**
  - Check wiring polarity and continuity.
  - Check for shorts or ground loops.
  - Check if the power supply connector is connected to main board.
- ✓ **Power Supply**
  - Check power supply output. The voltage must be between 12 and 45 Vdc at transmitter terminals.
- ✓ **Electronic Circuit Failure**
  - Check the main board for defect by using a spare one.

### **Symptom: CURRENT OF 21.0 mA or 3.6 mA**

#### **Probable Source of Trouble:**

- ✓ **Pressure Tap (Piping)**
  - Verify if blocking valves are fully open.
  - Check for gas in liquid lines or for liquid in dry lines.
  - Check the pressure connection.
  - Check if pressure applied is not over upper limit of transmitter's range.  
Sensor to Main Circuit Connection
- ✓ **Electronic Circuit Failure**
  - Check the sensor circuit for damage by replacing it with a spare one.
  - Replace sensor.

### **Symptom: INCORRECT OUTPUT**

#### **Probable Source of Trouble:**

- ✓ **Transmitter Connections**
  - Check power supply voltage.
  - Check for intermittent short circuits, open circuits and grounding problems.

- ✓ **Noise Measurement Fluid**
  - Adjust damping
- ✓ **Pressure Tap**
  - Check for gas in liquid lines and for liquid in steam or gases lines.
  - Check the integrity of the circuit by replacing it with a spare one.
- ✓ **Calibration**
  - Check calibration of the transmitter.

**NOTE**

A 3.6 or 21.0 mA current indicates that the transmitter is in BURNOUT, and 3.8 or 20.5 mA Indicates that it is SATURATED.

**Symptom: DISPLAY INDICATES "FAIL SENS"**

**Probable Error Source:**

- ✓ **Sensor Connection to the Main Board**  
Check the connection (flat cable, male and female connectors).
- ✓ **Type of Sensor Connected to the Main Board**  
Check if the sensor connected to the main board is the one specified for the **LD290** model: Sensor type shall be hyper - High Performance.
- ✓ **Electronic Circuit Failure**  
Check if the sensor set is damaged, replacing it for a spare one.

## Disassembly Procedure

**WARNING**

Do not disassemble with power on.

Figure 4.3 shows transmitter's exploded view and will help you to visualize the following.

### Sensor

In order to have access to the sensor (**18**) for cleaning purposes, the transmitter should be removed from its process connections.

Loosen the hex screw (**8**) and carefully unscrew the electronic housing from the sensor, observing that the flat cable is not excessively twisted.

**CAUTION**

To avoid damage do not rotate the electronic housing more than 270° starting from the fully threaded without disconnecting the electronic circuit from the sensor and from the power supply. See Figure 4.1.



**Figure 4.1 – Safety Housing Rotation**

## Electronic Circuit

To remove the circuit board (6), loosen the two screws (5) that anchor the board and hold the (7) spacers in the other side to avoid losing them.

### WARNING

The board has CMOS components, which may be damaged by electrostatic discharges. Observe correct procedures for handling CMOS components. It is also recommended to store the circuit boards in electrostatic-proof cases.

Pull the main board out of the housing and disconnect the power supply and the sensor connectors.

## Reassembly Procedure

### WARNING

Do not assemble with power on.

## Sensor

When mounting the sensor (18), it is recommended to make use of a new set of gaskets (17) compatible with the process fluid.

O'rings should be lightly lubricated with silicone oil before they are fitted into their recesses. Use halogen grease for inert fill applications.

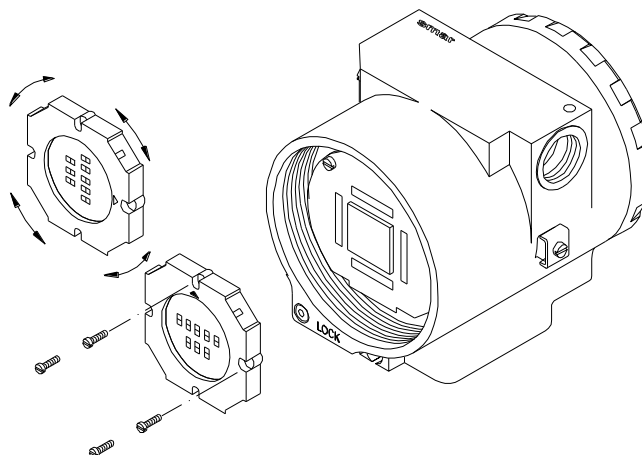
The fitting of the sensor must be done with the main board out of the electronic housing. Mount the sensor to the housing turning it clockwise until it stops. Tighten the screw (8) to lock the body to the sensor.

## Electronic Circuit

Plug sensor connector and power supply connector to main board. If there is a display, attach it to the main board by means of 4 screws (3). The display can be installed in any of the 4 possible positions (See Figure 4.2).

The "▲" mark indicates up position.

Pass the screws (5) through the main board holes (6) and the spacers (7) as shown on Figure 4.3 and tighten them to the body.



**Figure 4.2 – Four Possible Positions of the Display**

After tightening the protective cover (1), mounting procedure is complete. The transmitter is ready to be energized and tested. It is recommended that adjustment be done on the ZERO TRIM and on the UPPER PRESSURE TRIM.

## **Interchangeability**

In order to obtain an accurate and better temperature compensated response, each sensor is submitted to a characterization process and the specific data is stored in an EEPROM located in the sensor body.

The main board, in this operation, reads the sensor serial number and compares it with the number stored in the main board. In case they do not match, the circuit considers that the sensor has been changed and will probe the memory of the new sensor for the following information:

- ✓ Temperature compensation coefficients.
- ✓ Sensor trim data, including 5-point characterization curve.
- ✓ Sensor characteristics: type, range, diaphragm material and fill fluid.

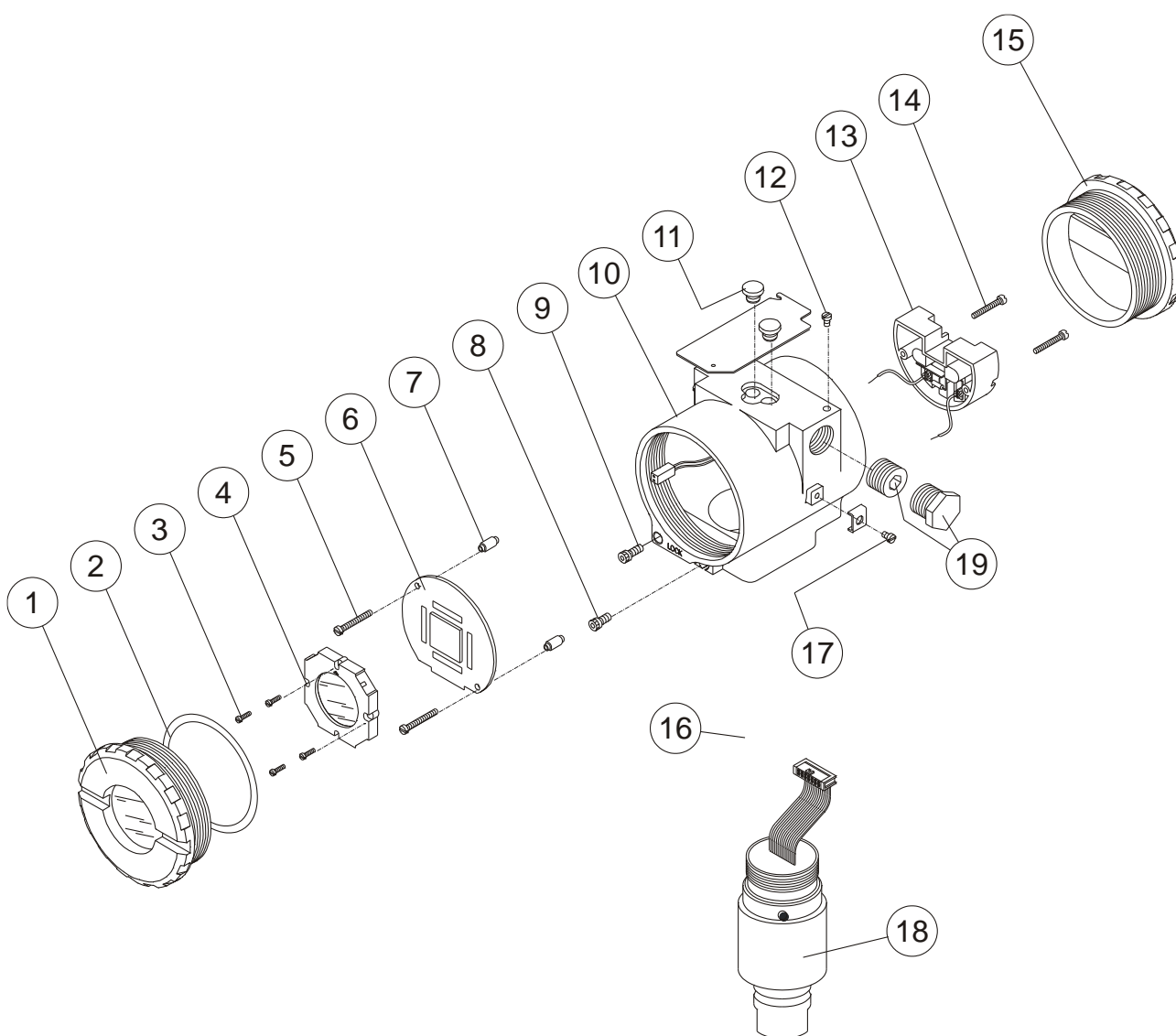
Information not transferred during sensor replacement will remain unchanged in the main board memory. Thus, information such as Upper Value, Lower Value, Damping, Pressure Unit and replaceable transmitter parts (Flange, O-ring, etc.) shall be updated, depending whether the correct information is that of the sensor or the main board. In the case of a new sensor, the main board will have the most updated information; in the opposite case, the sensor will have the correct information. Depending on the situation, the updating shall be from one or the other.

## **Returning Materials**

Should it become necessary to return the transmitter and/or configurator to **SMAR**, simply contact our office, informing the defective instrument serial number, and return it to our factory.

If it becomes necessary to return the transmitter and/or configurator to Smar, simply contact our office, informing the defective instrument's serial number, and return it to our factory. In order to speed up analysis and solution of the problem, the defective item should be returned with the Service Request Form (SRF – Appendix B) properly filled with a description of the failure observed and with as much details as possible. Other information concerning to the instrument operation, such as service and process conditions, is also helpful.

Instruments returned or to be revised outside the guarantee term should be accompanied by a purchase order or a quote request.



**Figure 4.1 – Exploded View**

ACCESSORIES	
ORDERING CODE	DESCRIPTION
SD-1	Magnetic Tool for local adjustment

SPARE PARTS LIST FOR TRANSMITTER				
DESCRIPTION OF PARTS		POSITION	CODE	CATEGORY (NOTE 1)
HOUSING (NOTE 2)		10	(NOTE 6)	
COVER (Includes O-ring)	. Aluminum	1 and 15	204-0102	
	. Stainless Steel 316	1 and 15	204-0105	
COVER WITH WINDOW FO120 R INDICATOR (Includes O-ring)	. Aluminum	1	204-0103	
	. Stainless Steel 316	1	204-0106	
COVER LOCKING SCREW		9	204-0120	
SENSOR LOCKING SCREW		8	400-1121	
EXTERNAL GROUND SCREW		21	204-0124	
IDENTIFICATION PLATE FIXING SCREW		12	204-0116	
DISPLAY ( Included Screws )		3 and 4	400-0559	
TERMINAL BLOCK ISOLATOR		13	400-0058	
MAIN BOARD ( Without display and mounting Kit Included ) GLL 1071		6	400-0607	A
MAIN BOARD ( Display and Mounting Kit not Included ) – GLL 1071		6	400-0570	A
MAN BOARD with Mounting Kit and without display - GLL 1071		6	400-0608	A
MAIN FIXATION BOARD KIT ( Screws and Spacers )		5 and 7	400-0560	
O-RINGS (NOTE 3)	. Cover, BUNA-N	2	204-0122	B
	. Neck, BUNA-N	20	204-0113	
TERMINAL HOLDING SCREW	. HOUSING, Aluminum	14	304-0119	
	. HOUSING, 316 SS	14	204-0119	
MAIN BOARD SCREW HOUSING IN ALUMINUM	.Units without indicator	3	304-0118	
	.Units with indicator	3	304-0117	
MAIN BOARD SCREW HOUSING IN 316 STAINLESS STEEL	.Units with indicator	3	204-0118	
	.Units without indicator	3	204-0117	
MOUNTING BRACKET FOR 2" PIPE MOUNTING (NOTE 5)	.Carbon Steel	-	209-0801	
	.Stainless Steel 316	-	209-0802	
	.Carbon Steel with bolts, nuts, washers and U-clamp in 316SS	-	209-0803	
LOCAL ADJUSTMENT PROTECTION CAP		11	204-0114	
SENSOR		27	(NOTE 4)	B
PLUG	Interno 1/2 NPT Aço Carbono Bicromatizado BR Ex d.	19	400-0808	
	Interno 1/2 NPT Aço Inox 304 BR Ex d.	19	400-0809	
	Externo M20 X 1.5 Aço Inox 316 BR Ex d.	19	400-0810	
	Externo PG13.5 Aço Inox 316 BR Ex d.	19	400-0811	

**Note:** 1) for category **A**, it is recommended to keep, in stock, 25 parts installed for each set, and for category **B**, 50.

- 2) Includes Terminal Block, Screws, caps and Identification plate without certification.
- 3) O-rings and Backup Rings are packaged in packs of 12 units, except for spring loaded.
- 4) To specify sensors, use the ordering code for sensors.
- 5) Including U-Clamp, nuts, bolts and washers.
- 6) To specify housing, use the ordering code for housing.

## Ordering Code for Housing

CODE	DESCRIPTION			
400-1314 - 2	HOUSING: LD290			
	Option	Communication Protocol		
	0	4-20 mA		
	Option	Electrical Connection		
	0	½ NPT		
	A	M20 X 1.5		
	B	PG13.5		
	Option	Material		
	H0	Aluminium (IP/Type)		
	H1	316 SST (IP/Type)		
	H2	Aluminium – for saline atmospheres (IPW/Type X)		
	H4	Aluminium Copper Free (IPW/Type X)		
	Option	Painting		
	P0	Gray Munsell N 6,5		
	P8	Without Painting		
	P9	Safe Blue Base EPÓXI – electrostatic painting		

400-1314 - 2	0	0	H0	P0
--------------	---	---	----	----

## Ordering Code for Sensor

209-0241	SPARE PART NUMBER FOR PRESSURE GAGE SENSOR				
CODE	Type	Range Limits			
		Min.	Max.	Unit	
M2	Gage	12.5	500	mbar	
M3	Gage	-1000	2500	mbar	
M4	Gage	-1	25	bar	
M5	Gage	-1	250	bar	
CODE	Diaphragm Material and Fill Fluid				
1	316L SST - Silicone Oil			E	Hastelloy C276 – Inert Krytox Oil (2)
2	316L SST – Inert Fluorolube Oil (2)			Q	316L SST – Inert Halocarbon 4.2 Oil (2)
3	Hastelloy C276 - Silicone Oil (1)			R	Hastelloy C276 – Inert Halocarbon 4.2 Oil (2)
4	Hastelloy C276 – Inert Fluorolube Oil (2)			Z	User's specifications
D	316L SST – Inert Krytox Oil (2)				
CODE	Process Connections Material				
H	Hastelloy C276 (1)		I	316L SST	Z User's specifications
CODE	Process Connections				
1	1/2 - 14 NPT - Female			U	1/2 BSP – Male
A	M20 X 1.5 Male			V	Valve Manifold integrated to the transmitter
G	G 1/2 A DIN 16288 - Form B (3)			X	1" NPT Sealed
H	G 1/2 DIN 16288 - Form D (3)			Z	User's specifications
M	1/2 - 14 NPT - Male				

209-0241	M2	1	I	A
----------	----	---	---	---

← Typical Model Number

### NOTE

- (1) Meets NECE MR - 01 - 75/ISO 15156 recommendations.
- (2) Inert Fluid: safe for oxygen service.
- (3) The DIN 16288 standards was substituted by the DIN EN 837-1.

209-0241	SPARE PART NUMBER FOR SANITARY PRESSURE SENSOR							
	CODE	Type	Range Limits		Range Limits			
			Min.	Max.	Unit	Min.	Max.	Unit
	2	Sanitary	12.5	500	mbar	5.02	201.09	inH <sub>2</sub> O
	3	Sanitary	62.5	2500	mbar	25.13	1005,45	inH <sub>2</sub> O
	4	Sanitary	0.625	25	bar	157.1	10054.5	inH <sub>2</sub> O
	5	Sanitary	6.25	55.15	bar	90.65	799.89	psi
	CODE	Diaphragm Material						
	H	Hastelloy C276			M	Monel		
	I	316L SST			T	Tantalum		
	CODE	Fill Fluid (Low Side)						
	D	Silicone DC-704 Oil (2)					N	Propileno Glicol Neobee M20 Oil (Approved 3A) (3)
	F	Inert Fluorolube MO-10 Oil (1) (4)					S	Silicone DC-200/20 Oil (2)
	K	Inert Krytox Oil (1) (4)					T	Syltherm 800 Oil
	CODE	Process Connections						
	B	Thread IDF - 2" 300#			H	DN40 300# - DIN 11851		
	C	Thread RJT - 2" 300#			P	Tri-Clamp - 2" 800#		
	D	Tri-Clamp - 2" 300#			Q	Tri-Clamp - 1 1/2" 800#		
	E	Thread SMS - 2" 300#			Z	User's specifications		
	F	Tri-Clamp - 1 1/2" 300#						
	CODE	Optional Items						
209-0241	2	I	N	D	*	← Typical Model Number		

209-0241 2 I N D \* ← Typical Model Number

\*Leave blank for no optional items.

#### NOTES

- (1) Meets NACE MR – 01 – 75/ISO 15156 recommendations.
- (2) Silicone Oil is not recommended for Oxygen (O<sub>2</sub>) or Chlorine service.
- (3) Compliant with 3A-7403 standard for food and other applications where sanitary connections are required:
  - Neobee M20 Fill Fluid
  - Finishing wet Face: 0,8 µm Ra (32 µ" AA)
  - Wet O-Ring: Viton, Buna-N and Teflon
- (4) Inert Fluid: Oxygen Compatibility, safe for oxygen service.



209-0241	SPARE PART NUMBER FOR FLANGED PRESSURE SENSOR											
	COD.	Type	Range Limits Min.      Max.		Min. Span	Unit		Range Limits Min.      Max.		Min. Span	Unit	
	L2	Level	-50	50	1,25	kPa		-200	200	5	inH <sub>2</sub> O	Note: The range can be extended up to 0.75 LRL and 1.2 URL with small degradation of accuracy. The upper range value must be limited to the flange rating.
	L3	Level	-250	250	2,08	kPa		-36	36	0,3	psi	
	L4	Level	-2500	2500	20,83	kPa		-360	360	3	psi	
	L5	Level	-25000	25000	208,30	kPa		-3625	3625	30,2	psi	
	COD.	Diaphragm Material (Sensor) and Fill Fluid (Sensor)										
	1	316L SST - Silicone Oil										
	COD.	Process Connection										
	U	1" 150# (ANSI B16.5)							C	3" 600# (ANSI B16.5)		
	V	1" 300# (ANSI B16.5)							3	4" 150# (ANSI B16.5)		
	W	1" 600# (ANSI B16.5)							4	4" 300# (ANSI B16.5)		
	O	1½" 150# (ANSI B16.5)							D	4" 600# (ANSI B16.5)		
	P	1½" 300# (ANSI B16.5)							5	DN25 PN 10/40		
	Q	1½" 600# (ANSI B16.5)							R	DN40 PN 10/10		
	9	2" 150# (ANSI B16.5)							E	DN50 PN10/40		
	A	2" 300# (ANSI B16.5)							6	DN80 PN25/40		
	B	2" 600# (ANSI B16.5)							7	DN100 PN10/16		
	1	3" 150 # (ANSI B16.5)							8	DN100 PN25/40		
	2	3" 300# (ANSI B16.5)							Z	User's specifications		
	COD.	Type and Material Flange										
	4	304 SST (slip-on flange)							6	Carbon Steel (slip-on flange)		
	5	316 SST (slip-on flange)							Z	User's specifications		
	COD.	Extension Length										
	0	0 mm (0")							3	150 mm (6")		
	1	50 mm (2")							4	200 mm (8")		
	2	100 mm (4")							Z	User's specifications		
	COD.	Diaphragm Material/Extension (Process Connection)										
	1	316 L SST / 316 SST							5	Titanium / 316 SST (3)		
	2	Hastelloy C276 / 316 SST							6	316L SST with Teflon Lining		
	3	Monel 400 / 316 SST							L	316L SST with Halar Lining		
	4	Tantalum / 316 SST (3)							Z	User's specifications		
	COD.	Fill Fluid (Process Connection)										
	S	Silicone DC-200/20 Oil							H	Halocarbon 4.2 Oil		
	F	Inert Fluorolube MO-10 Oil (4)							N	Propileno Glicol (Neobee) Oil		
	D	Silicone DC-704 Oil							T	Syltherm 800 Oil		
	K	Krytox Oil							Z	User's specifications		
	COD.	Lower Housing Material										
	0	Without Lower Housing							4	Duplex (UNS 31803)		
	1	316L SST							5	304L SST		
	2	Hastelloy C276							Z	User's specifications		
	3	Super Duplex (UNS 32750)										
	COD.	Gasket Material										
	0	Without Gasket							T	Teflon (PTFE)		
	C	Copper							Z	User's specifications		
	G	Grafoil (Flaxible Lead)										
209-0241	L2	1	1	6	0	1	S	1	0	TYPICAL MODEL NUMBER		

## NOTES

- (1) Silicone Oils not recommendations for Oxygen (O<sub>2</sub>) or Chlorine service.
- (2) Not applicable for vacuum service.
- (3) Attention, check corrosion rate for the process, tantalum plate 0.1 mm, AISI 316L extension 3 to 6mm.
- (4) Fluorolube fill fluid is not available for Monel diaphragm.
- (5) Inert Fluid: Safe for oxygen service.



## Section 5

# TECHNICAL CHARACTERISTICS

Functional Specifications																																																														
Process Fluid	Liquid, gas or steam.																																																													
Output	Two-wire, 4-20 mA controlled according to NAMUR NE43 Specification. See the figure below. <div></div>																																																													
Power Supply	12 to 45 Vdc.																																																													
Load Limitation	Max. Impedance ≈ (V power supply - 12VDC) / 0.02 Ω.																																																													
Indicator	Optional 4½-digit numerical and 5-character alphanumeric LCD indicator.																																																													
Hazardous Area Certifications	See appendix A																																																													
European Directive Information	See appendix A																																																													
Zero and Span Adjustments	Non interactive, via magnet tool.																																																													
Temperature Limits	<div>By Local Adjustment from 0 to 0.975 URL, URL = Upper Range Limit.</div> <table><tr><th colspan="6">Temperature Limits</th></tr><tr><th>Ambient</th><td>-40</td><td>to</td><td>85 °C</td><td>-40</td><td>to 185 °F</td></tr><tr><td></td><td>-15</td><td>to</td><td>85 °C</td><td>-59</td><td>to 185 °F</td></tr><tr><td rowspan="5">Process</td><td>-40</td><td>to</td><td>100 °C</td><td>-40</td><td>to 212 °F</td></tr><tr><td>0</td><td>to</td><td>85 °C</td><td>32</td><td>to 185 °F</td></tr><tr><td>-25</td><td>to</td><td>85 °C</td><td>-13</td><td>to 185 °F</td></tr><tr><td>-40</td><td>to</td><td>150 °C</td><td>-40</td><td>to 302 °F</td></tr><tr><td>-15</td><td>to</td><td>150 °C</td><td>-59</td><td>to 302 °F</td></tr><tr><td>Storage</td><td>40</td><td>to</td><td>100 °C</td><td>-40</td><td>to 212 °F</td></tr><tr><td rowspan="2">Digital Display</td><td>-20</td><td>to</td><td>80 °C</td><td>-4</td><td>to 176 °F</td></tr><tr><td>-40</td><td>to</td><td>85 °C</td><td>-40</td><td>to 185 °F</td></tr></table>	Temperature Limits						Ambient	-40	to	85 °C	-40	to 185 °F		-15	to	85 °C	-59	to 185 °F	Process	-40	to	100 °C	-40	to 212 °F	0	to	85 °C	32	to 185 °F	-25	to	85 °C	-13	to 185 °F	-40	to	150 °C	-40	to 302 °F	-15	to	150 °C	-59	to 302 °F	Storage	40	to	100 °C	-40	to 212 °F	Digital Display	-20	to	80 °C	-4	to 176 °F	-40	to	85 °C	-40	to 185 °F
Temperature Limits																																																														
Ambient	-40	to	85 °C	-40	to 185 °F																																																									
	-15	to	85 °C	-59	to 185 °F																																																									
Process	-40	to	100 °C	-40	to 212 °F																																																									
	0	to	85 °C	32	to 185 °F																																																									
	-25	to	85 °C	-13	to 185 °F																																																									
	-40	to	150 °C	-40	to 302 °F																																																									
	-15	to	150 °C	-59	to 302 °F																																																									
Storage	40	to	100 °C	-40	to 212 °F																																																									
Digital Display	-20	to	80 °C	-4	to 176 °F																																																									
	-40	to	85 °C	-40	to 185 °F																																																									
Failure Alarm	In case of sensor or circuit failure, the self-diagnostics drives the output to 3.6 or 21.0 mA, according to the user's choice.																																																													
Turn-on Time	Performs within specifications in less than 5 seconds after power is applied to the transmitter.																																																													

## Functional Specifications

14 MPa (138 bar) for ranges 2, 3, 4.

31 MPa (310 bar) for range 5.

For Level Ranges ASME/DIN (models **LD290L**):

150#: 6 psia to 235 psi (-0,6 to 16 bar) to 199,4 °F (93 °C)

300#: 6 psia to 620 psi (-0,6 to 43 bar) to 199,4 °F (93 °C)

600#: 6 psia to 1240 psi (-0,6 to 85 bar) to 199,4 °F (93 °C)

PN10/16: -60 kPa to 1,02 MPa to 212 °F (100 °C)

PN25/40: -60 kPa to 2,55 MPa to 212 °F (100 °C)

Overpressures above will not damage the transmitter, but a new calibration may be necessary.

**WARNING**

It is described here only the maximum pressures of the materials referenced in each rule, it can't be manufactured on request.

Temperatures above 150°C are not available in standard models.

**PRESSURES TABLE FOR SEAL AND LEVEL FLANGES DIN EN 1092-1 2008 STANDARD**

**Overpressure  
Limits (MWP –  
Maximum  
Working  
Pressure)**

Material Group	Pressure Class	Maximum Temperature Allowed						
		RT	100	150	200	250	300	350
		Maximum Pressure Allowed (bar)						
10E0 AISI 304/304L	PN 16	16	13.7	12.3	11.2	10.4	9,6	9.2
	PN 25	25	21.5	19.2	17.5	16.3	15.1	14.4
	PN 40	40	34.4	30.8	28	26	24.1	23
	PN 63	63	54,3	48,6	44,1	41,1	38,1	36,3
	PN 100	100	86.1	77.1	70	65.2	60.4	57.6
	PN 160	160	137.9	123.4	112	104.3	96.7	92.1
	PN 250	250	215.4	192.8	175	163	151.1	144

Material Group	Pressure Class	Maximum Temperature Allowed						
		RT	100	150	200	250	300	350
		Maximum Pressure Allowed (bar)						
14E0 AISI 316/316L	PN 16	16	16	14.5	13.4	12.7	11.8	11.4
	PN 25	25	25	22.7	21	19.8	18.5	17.8
	PN 40	40	40	36.3	33.7	31.8	29.7	28.5
	PN 63	63	63	57.3	53.1	50.1	46.8	45
	PN 100	100	100	90.9	84.2	79.5	74.2	71.4
	PN 160	160	160	145.5	134.8	127.2	118.8	114.2
	PN 250	250	250	227.3	210.7	198.8	185.7	178.5

Material Group	Pressure Class	Maximum Temperature Allowed						
		RT	100	150	200	250	300	350
		Maximum Pressure Allowed (bar)						
16E0 1.4410 Super Duplex 1.4462 Duplex	PN 16	16	16	16	16	16	-	-
	PN 25	25	25	25	25	25	-	-
	PN 40	40	40	40	40	40	-	-
	PN 63	63	63	63	63	63	-	-
	PN 100	100	100	100	100	100	-	-
	PN 160	160	160	160	160	160	-	-
	PN 250	250	250	250	250	250	-	-

## Functional Specifications

 Overpressure  
Limits (MWP –  
Maximum  
Working  
Pressure)  
(continuation)

PRESSURES TABLE FOR SEAL AND LEVEL FLANGES ASME B16.5 2017 STANDARD

Material Group	Pressure Class	Maximum Temperature Allowed								
		-29 to 38	50	100	150	200	250	300	325	350
		Maximum Pressure Allowed (bar)								
Hastelloy C276	150	20	19.5	17.7	15.8	13.8	12.1	10.2	9.3	8.4
	300	51.7	51.7	51.5	50.3	48.3	46.3	42.9	41.4	40.3
	400	68.9	68.9	68.7	66.8	64.5	61.7	57	55	53.6
	600	103.4	103.4	103	100.3	96.7	92.7	85.7	82.6	80.4
	900	155.1	155.1	154.6	150.6	145	139	128.6	124	120.7
	1500	258.6	258.6	257.6	250.8	241.7	231.8	214.4	206.6	201.1
	2500	430.9	430.9	429.4	418.2	402.8	386.2	357.1	344.3	335.3

Material Group	Pressure Class	Maximum Temperature Allowed								
		-29 to 38	50	100	150	200	250	300	325	350
		Maximum Pressure Allowed (bar)								
S31803 Duplex S32750 Super Duplex	150	20	19.5	17.7	15.8	13.8	12.1	10.2	9.3	8.4
	300	51.7	51.7	50.7	45.9	42.7	40.5	38.9	38.2	37.6
	400	68.9	68.9	67.5	61.2	56.9	53.9	51.8	50.9	50.2
	600	103.4	103.4	101.3	91.9	85.3	80.9	77.7	76.3	75.3
	900	155.1	155.1	152	137.8	128	121.4	116.6	114.5	112.9
	1500	258.6	258.6	253.3	229.6	213.3	202.3	194.3	190.8	188.2
	2500	430.9	430.9	422.2	382.7	355.4	337.2	323.8	318	313.7

Material Group	Pressure Class	Maximum Temperature Allowed								
		-29 to 38	50	100	150	200	250	300	325	350
		Maximum Pressure Allowed (bar)								
AISI316L	150	15.9	15.3	13.3	12	11.2	10.5	10	9.3	8.4
	300	41.4	40	34.8	31.4	29.2	27.5	26.1	25.5	25.1
	400	55.2	53.4	46.4	41.9	38.9	36.6	34.8	34	33.4
	600	82.7	80	69.6	62.8	58.3	54.9	52.1	51	50.1
	900	124.1	120.1	104.4	94.2	87.5	82.4	78.2	76.4	75.2
	1500	206.8	200.1	173.9	157	145.8	137.3	130.3	127.4	125.4
	2500	344.7	333.5	289.9	261.6	243	228.9	217.2	212.3	208.9

Material Group	Pressure Class	Maximum Temperature Allowed								
		-29 to 38	50	100	150	200	250	300	325	350
		Maximum Pressure Allowed (bar)								
AISI316	150	19	18.4	16.2	14.8	13.7	12.1	10.2	9.3	8.4
	300	49.6	48.1	42.2	38.5	35.7	33.4	31.6	30.9	30.3
	400	66.2	64.2	56.3	51.3	47.6	44.5	42.2	41.2	40.4
	600	99.3	96.2	84.4	77	71.3	66.8	63.2	61.8	60.7
	900	148.9	144.3	126.6	115.5	107	100.1	94.9	92.7	91
	1500	248.2	240.6	211	192.5	178.3	166.9	158.1	154.4	151.6
	2500	413.7	400.9	351.6	320.8	297.2	278.1	263.5	257.4	252.7

Humidity Limits 0 to 100% RH (Relative Humid).

Damping Adjustment Through magnet tool: adjustable for any value from 0 to 128 seconds, added to the sensor response time (0.2 seconds).

Performance Specifications	
<b>Reference Conditions</b>	Range starting at zero, temperature 25°C (77°F), atmospheric pressure, power supply of 24 Vdc, silicone oil fill fluid, isolating diaphragms in 316L SS and digital trim equal to lower and upper range values.
<b>Accuracy</b>	<p>For ranges 2, 3, 4 and 5:  <math>\pm 0.075\%</math> of span (for span <math>\geq 0.1</math> URL)  <math>\pm [0.0375 + 0.00375 \text{ URL/SPAN}] \%</math> of span (for span <math>&lt; 0.1</math> URL)</p> <p>For Level Transmitter:  <math>\pm 0.08 \%</math> of span (for span <math>\geq 0.1</math> URL)  <math>\pm [0.0504 + 0.0047 \text{ URL/span}] \%</math> of span (for span <math>&lt; 0.1</math> URL)</p> <p>For Insertion Model:  <math>\pm 0.2\%</math> of span</p>
<b>Stability</b>	$\pm 0.15\%$ of URL + for 5 years.
<b>Temperature Effect</b>	$\pm [0.02 \text{ URL} + 0.06\% \text{ of span}]$ , per 20 °C (68 °F) for span $\geq 0.2$ URL $\pm [0.023 \text{ URL} + 0.045\% \text{ of span}]$ , per 20°C (68 °F) for span $< 0.2$ URL  For <b>LD290L</b> 6 mmH <sub>2</sub> O per 20 °C for 4" and DN100 17 mmH <sub>2</sub> O per 20 °C for 3" and DN80
<b>Power Supply Effect</b>	$\pm 0.005\%$ of calibrated span per volt.
<b>Mounting Position Effect</b>	Zero shift of up to 250 Pa (1 inH <sub>2</sub> O), which can be calibrated out. No span effect.
<b>Electromagnetic Interference Effect</b>	Approved according to IEC61326-1:2006, IEC61326-2-3:2006, IEC61000-6-4:2006, IEC61000-6-2:2005.

Physical Specifications	
<b>Electrical Connection</b>	1/2 -14 NPT, PG 13.5, or M20 x 1.5.
<b>Process Connection</b>	See ordering code.
<b>Wetted Parts</b>	<b>Isolating Diaphragms and Process Connection</b> 316L SST or Hastelloy C276.
<b>Nonwetted Parts</b>	<p><b>Electronic Housing</b>  Injected aluminum or 316 SST with polyester painting with option 316 without painting. According to NEMA Type 4X or Type 4, IP66, IP66W*.  *The IP66W sealing test (immersion) was performed at 1 bar for 24 hours. For any other situation, please consult Smar. IP66W tested for 200h to according NBR 8094 / ASTM B 117 standard.</p> <p><b>Level Flange (LD290L)</b>  316L SST, Hastelloy C276</p> <p><b>Fill Fluid</b>  Silicone or Inert Fluorolube Oil or krytox oil or Halocarbon oil.</p> <p><b>Cover O-Rings</b>  Buna-N.</p> <p><b>Mounting Bracket</b>  Optional universal mounting bracket for surface or vertical/horizontal 2"-pipe (DN 50) Carbon Steel zinc plated or 316 SST. Accessories (bolts, nuts, washers, and U-clamp) in Carbon Steel or 316 SST.</p> <p><b>Identification Plate</b>  316 SST.</p>
<b>Approximate Weights</b>	< 2.0kg (4 lb): aluminum housing without mounting bracket.

## Ordering Code

MODEL	GAGE PRESSURE TRANSMITTERS									
LD290M	4-20 mA									
	CODE	Type	Range Limits							
			Min.	Max.	Unit					
	2	Gage	12.5	500	mbar					
	3	Gage	-1000	2500	mbar					
	4	Gage	-1	25	bar					
	5	Gage	-1	250	bar					
	CODE	Diaphragm Material and Fill Fluid								
	1	316L SST - Silicone Oil								
	2	316L SST – Inert Fluorolube Oil <b>(2)</b>								
	3	Hastelloy C276 - Silicone Oil <b>(1)</b>								
	4	Hastelloy C276 – Inert Fluorolube Oil <b>(1) (2)</b>								
	D	316L SST – Inert Krytox Oil <b>(2)</b>								
	E	Hastelloy C276 – Inert Krytox Oil <b>(1) (2)</b>								
	Q	316L SST – Inert Halocarbon 4.2 Oil <b>(2)</b>								
	R	Hastelloy C276 – Inert Halocarbon 4.2 Oil <b>(1) (2)</b>								
	CODE	Process Connections Material								
	H	Hastelloy C276 <b>(1)</b>								
	I	316L SST								
	CODE	Local Indicator								
	0	Without Indicator				1	With Indicator			
	CODE	Process Connections								
	1	1/2 - 14 NPT - Female				R	Remote Seal			
	A	M20 X 1,5 Male				U	1/2 BSP – Male			
	B	1/4 - 18 NPT - Female (with adapter)				V	Valve Manifold integrated to the transmitter			
	C	1/4 - 18 NPT - Male (with adapter)				X	1" NPT Sealed			
	G	DIN EN 837-1 G1/2B Male <b>(3)</b>				Z	User's specifications			
	H	DIN EN 837-1 G1/2B HP Macho <b>(3)</b>								
	M	1/2 - 14 NPT - Male								
	CODE	Electrical Connections								
	0	1/2 - 14 NPT				A	M20 X 1.5			
1	1/2 - 14 NPT X 3/4 NPT (316 SST) - with adapter				B	PG 13.5 DIN <b>(4)</b>				
2	1/2 - 14 NPT X 3/4 BSP (316 SST) - with adapter <b>(4)</b>				Z	User's specifications				
3	1/2 - 14 NPT X 1/2 BSP (316 SST) - with adapter <b>(4)</b>									
	CODE	Mounting Bracket								
	0	Without Mounting Bracket								
	1	Carbon Steel Mounting Bracket with Carbon Steel accessories								
	2	316 SST Mounting Bracket with 316 SST accessories								
	7	Carbon Steel Mounting Bracket with 316 SST accessories								
	CODE	Continues Next Page								
LD290M	2	1	I	1	1	A	0	*	Typical Model Number	

LD290M 2 1 I 1 1 A 0 \*

Typical Model Number

\* Leave blank for no optional items.

MODEL	GAGE PRESSURE TRANSMITTER (CONTINUATION)										
LD290M	CODE	Special Procedure									
	C1	Degrease Cleaning (Oxygen or Chlorine Service)									
	CODE	Output Signal									
	G0	4-20 mA									
	G1	0-20 mA									
	CODE	Housing Material (7)									
	H0	Aluminum (IP/TYPE)				H3	316 SST for Saline Atmosphere (IPW/TYPEX) (6)				
	H1	316 SST (IP/TYPE)				H4	Copper Free Aluminum (IPW/TYPEX) (6)				
	H2	Aluminum for Saline Atmosphere (IPW/TYPEX) (6)									
	CODE	Identification Plate									
	I1	FM: XP, IS, NI, DI				IC	IECEX MINING				
	I4	EXAM (DMT): Ex-ia; NEMKO: Ex-d				IF	IECEX				
	I5	CEPEL: Ex-d, Ex-ia				IJ	NEMKO – EEX-D				
	I6	Without Certification				IO	CEPEL (COMBUSTIBLE DUST)				
	I7	EXAM (DMT) Grupo I, M1 Ex-ia				IR	TIBR CJSC - GOST RUSSIA: EX-D, EX-IA				
	CODE	Painting									
	P0	Munsell N 6,5 Gray				P8	Without Painting				
	P1	Blue Safety N4845 (standard 1374 Petrobras)				P9	Blue Safety Base Epoxy – Electrostatic Painting				
	P2	Blue Safety N4845 (standard 1735 Petrobras)									
	P3	Polyester Black									
	CODE	Manufacturing Standard									
	S0	SMAR									
	S5	BASF									
	CODE	Display Unit									
	Y0	Percentage				Y4	Display 2: Current (mA)				
	Y1	Display 1: Current (mA)				Y5	Display 2: Pressure (Eng. Unit)				
	Y2	Display 1: Pressure (Eng. Unit)				Y6	Display 2: Temperature (°C)				
	Y3	Display 1: Temperature (°C)				YU	User's specification (5)				
	CODE	Tag Plate									
	J0	With TAG				J2	User's specification				
	J1	Without TAG									
	CODE	Burn Out									
	BD	Down scale				BU	Up scale				
	CODE	Special Options									
	ZZ	Special – See notes									
LD290M	*	G0	H0	I1	P0	S0	Y0**	J0	BD		Typical Model Number

LD290M \* G0 H0 I1 P0 S0 Y0\*\* J0 BD Typical Model Number

\* Leave blank for no special procedure

\*\*Can choose 1 option for each Display (1 and 2)

#### NOTES

- (1) Meets NACE material recommendation per MR-01-75.
- (2) Inert fluid: safe for oxygen service.
- (3) Standard DIN16288 was replaced by DIN EN 837-1.
- (4) Thread PG13.5 certified Ex-d in CEPEL.  
Threads ½ BSP ¾ BSP and Z (user option) is not certified Ex-d.
- (5) Limited values to 4 1/2 digits; limited unit to 5 characters.
- (6) IPW/TYPEX was tested for 200 hours.
- (7) IPX8 tested for 10 meters of water column for 24 hours.



MODEL	SANITARY PRESSURE TRANSMITTERS						
LD290S	4-20 mA						
CODE	Type	Range Limits			Range Limits		
		Min.	Max.	Unit	Min.	Max.	Unit
2	Sanitary	12.5	500	mbar	5.02	201.09	inH <sub>2</sub> O
3	Sanitary	62.5	2500	mbar	25.13	1005,45	inH <sub>2</sub> O
4	Sanitary	0.625	25	bar	157.10	10054.50	inH <sub>2</sub> O
5	Sanitary	6.25	55.15	bar	90.65	799.89	psi
CODE	Diaphragm Material						
H	Hastelloy C276						
I	316L SST						
CODE	Fill Fluid						
F	Fluorolube Oil MO-10						
H	Inert Halocarbon 4.2 Oil						
K	Krytox						
S	Silicone DC-200/20 Oil						
CODE	Local Indicator						
0	Without Indicator						
1	With Indicator						
CODE	Process Connections						
F	Tri-Clamp – 1.1/2"					C	Thread RJT – 2"
Q	Tri-Clamp – 1.1/2" HP					5	Thread RJT – 2" – with extension
D	Tri-Clamp – 2"					B	Thread IDF – 2"
P	Tri-Clamp – 2" HP					4	Thread IDF – 2" – with extension
6	Tri-Clamp – 2" – with extension					8	Thread DN25 – DIN 11851 – with extension
N	Tri-Clamp – 2" HP – with extension					H	Thread DN40 – DIN 11851
S	Thread SMS – 1.1/2"					9	Thread DN40 – DIN 11851 – with extension
E	Thread SMS – 2"					U	Thread DN50 – DIN 11851
7	Thread SMS – 2" – with extension					V	Thread DN50 – DIN 11851 – with extension
Y	Special option connection					Z	User's specifications
CODE	Electrical Connections						
0	1/2" - 14 NPT					A	M20 X 1.5
1	1/2 - 14 NPT X 3/4 NPT (316 SST) - with adapter					B	PG 13.5 DIN (1)
2	1/2 - 14 NPT X 3/4 BSP (316 SST) - with adapter (1)					Z	User's specifications
3	1/2 - 14 NPT X 1/2 BSP (316 SST) - with adapter (1)						
CODE	O'Ring Material						
0	Without O'Ring					V	Viton
B	Buna-N						
T	Teflon						
CODE	Tank Adapter						
0	Without adapter						
1	With 316 SST adapter						
CODE	Tri-Clamp Connection						
0	Without Clamp						
2	With 304 SST Clamp						
CODE	Sanitary Diaphragm						
H	Hastelloy C276						
I	SST 316L						
CODE	Fill fluid Sanitary Connection						
N	Propylene glycol (neobee) max.: 200 °C						
S	Silicone DC-200/20 Oil						
CODE	Continues Next Page						

LD290S 2 I N 1 D 0 V 1 2 I N \* Typical Model Number

\*Leave blank for no optional items.

MODEL	SANITARY PRESSURE TRANSMITTERS (CONTINUATION)										
LD290S	CODE	Output Signal									
	G0	4-20 mA									
	G1	0-20 mA									
	CODE	Housing Material (4)									
	H0	Aluminum (IP/TYPE)						H3	316 SST for Saline Atmosphere (IPW/TYPEX) (3)		
	H1	316 SST (IP/TYPE)						H4	Copper Free Aluminum (IPW/TYPEX) (3)		
	H2	Aluminum for Saline Atmosphere (IPW/TYPEX) (3)									
	CODE	Identification Plate									
	I1	FM: XP, IS, NI, DI					IC	IECEX MINING			
	I4	EXAM (DMT): Ex-ia; NEMKO: Ex-d					IF	IECEX			
	I5	CEPEL: Ex-d, Ex-ia					IJ	NEMKO: EEx-d			
	I6	Without Certification					IO	CEPEL (Combustible Dust)			
	I7	EXAM (DMT) Grupo I, M1 Ex-ia					IR	TIBR CJSC - GOST RUSSIA: EX-D, EX-IA			
	CODE	Painting									
	P0	Munsell N 6,5 Gray						P8	Without Painting		
	P1	Blue Safety N4845 (standard 1374 Petrobras)						P9	Blue Safety Base Epoxy – Electrostatic Painting		
	P2	Blue Safety N4845 (standard 1735 Petrobras)									
	P3	Polyester Black									
	CODE	Manufacturing Standard									
	S0	SMAR									
	S5	BASF									
	CODE	Display Unit									
	Y0	Percentage						Y4	Display 2: Current (mA)		
	Y1	Display 1: Current (mA)						Y5	Display 2: Pressure (Eng. Unit)		
	Y2	Display 1: Pressure (Eng. Unit)						Y6	Display 2: Temperature (°C)		
	Y3	Display 1: Temperature (°C)						YU	User's specification (2)		
	CODE	Tag Plate									
	J0	With TAG						J2	User's specification		
	J1	Without TAG									
	CODE	Burn Out									
	BD	Down scale						BU	Up scale		
	CODE	Special Sanitary Connection									
	K0	No special connection						K2	Varivent 68		
LD290S	G0	H0	I1	P0	S0	Y0**	J0	BD	K0	*	Typical Model Number

LD290S G0 H0 I1 P0 S0 Y0\*\* J0 BD K0 \* Typical Model Number

\*Leave blank for no optional items.

\*\*Can choose 1 option for each Display (1 and 2)

#### NOTES

- (1) Thread PG13.5 certified Exd in CEPEL.  
Threads ½ BSP ¾ BSP and Z (user option) is not certified Exd.
- (2) Limited values to 4 1/2 digits; limited unit to 5 characters.
- (3) IPW/TYPEX was tested for 200 hours.
- (4) IPX8 tested for 10 meters of water column for 24 hours.

MODEL	LOW COST FLANGED PRESSURE TRANSMITTER													
LD290L	4-20 mA													
CODE	Type	Range Limits		Unit	Range Limits		Unit							
		Min.	Max.		Min.	Max.								
2	Level	12.5	500	mbar	5.02	201.09	inH <sub>2</sub> O							
3	Level	62.5	2500	mbar	25.13	1005.45	inH <sub>2</sub> O							
4	Level	0.625	25	bar	157.10	10054.50	inH <sub>2</sub> O							
5	Level	6.25	250	bar	90.65	3625.94	psi							
CODE	Diaphragm Material (Sensor) and Fill Fluid (Sensor)													
1	316L SST - Silicone Oil													
2	316L SST – Inert Fluorolube Oil (12)													
3	Hastelloy C276 - Silicone Oil (11)													
4	Hastelloy C276 – Inert Fluorolube Oil (11) (12)													
D	316L SST – Inert Krytox Oil (12)													
E	Hastelloy C276 – Inert Krytox Oil (11) (12)													
Q	316L SST – Inert Halocarbon 4.2 Oil (12)													
R	Hastelloy C276 – Inert Halocarbon 4.2 Oil (11) (12)													
CODE	Local Indicator													
0	Without Indicator						1	With Digital Indicator						
CODE	Process Connection													
U	1" 150# (ASME B16.5) (10)				C	3" 600# (ASME B16.5)				F	3" 900# (ASME B16.5)			
V	1" 300# (ASME B16.5) (10)				3	4" 150# (ASME B16.5)				I	1" 1500# (ASME B16.5)			
W	1" 600# (ASME B16.5) (10)				4	4" 300# (ASME B16.5)				J	2" 1500# (ASME B16.5)			
O	1½" 150# (ASME B16.5)				D	4" 600# (ASME B16.5)								
P	1½" 300# (ASME B16.5)				5	DN25 PN10/40 (DIN EN 1092-1) (10)								
Q	1½" 600# (ASME B16.5)				R	DN40 PN10/40 (DIN EN 1092-1)								
9	2" 150# (ASME B16.5)				E	DN50 PN10/40 (DIN EN 1092-1)								
A	2" 300# (ASME B16.5)				6	DN80 PN10/40 (DIN EN 1092-1)								
B	2" 600# (ASME B16.5)				7	DN100 PN10/16 (DIN EN 1092-1)								
1	3" 150 # (ASME B16.5)				8	DN100 PN25/40 (DIN EN 1092-1)								
2	3" 300# (ASME B16.5)				Z	User's specifications								
CODE	Electrical Connection													
0	1/2 - 14 NPT						A	M20 X 1.5						
1	1/2 - 14 NPT X 3/4 NPT (Al 316) - with adapter						B	PG 13.5 DIN (3)						
2	1/2 - 14 NPT X 3/4 BSP (Al 316) - with adapter (3)						Z	User's specifications						
3	1/2 - 14 NPT X 1/2 BSP (Al 316) - with adapter (3)													
CODE	Type and Flange Material													
2	316L SST Integral Flange													
3	Hastelloy C276 Integral Flange													
D	Duplex (UNS 31803/32205)													
S	Super Duplex (UNS 32750/32760)													
Z	Special – See notes													
CODE	Extension Length													
0	0 mm (0")				2	100mm (4")				4	200 mm (8")			
1	50 mm (2")				3	150 mm (6")				Z	User's specifications			
CODE	Diaphragm Material / Extension (Process Connection)													
1	316 L SST / 316 SST						6	316L SST with Teflon Lining						
2	Hastelloy C276 / 316 SST						L	316L SST with Halar Lining						
3	Monel 400 / 316 SST						S	Super Duplex (UNS 32750/32760)						
4	Tantalum / 316 SST (4)						Z	Special – See notes						
5	Titanium / 316 SST (4)													
CODE	Fill Fluid (Process Connection)													
S	Silicone DC-200/20 Oil						H	Halocarbon 4.2 Oil (6)						
F	Inert Fluorolube MO-10 Oil (2)(5)(6)						N	Propylene Glycol (Neobee) Oil						
D	Silicone DC-704 Oil						T	Syltherm 800 Oil						
K	Krytox Oil (6)						Z	User's specifications						
CODE	Lower Housing Material													
0	Without Lower Housing						4	Duplex (UNS 31803)						
1	316L SST						Z	User's specifications						
2	Hastelloy C276													
3	Super Duplex (UNS 32750)													
CODE	Gasket Material													
0	Without Gasket						T	Teflon (PTFE)						
G	Grafoil (Flexible Lead)						Z	User's specifications						
I	316L SST													
CODE	Continues Next Page													
LD290L	2	1	1	1	0	2	0	1	S	1	T	*	Typical Model Number	

LD290L 2 1 1 1 0 2 0 1 S 1 T \* Typical Model Number

\*Leave it blank when there are not optional items.

MODEL	LOW COST FLANGED PRESSURE TRANSMITTER (CONTINUATION)													
LD290L	CODE	Special Procedure												
	C1	Degrease Cleaning (Oxygen or Chlorine Service)												
	CODE	Output Signal												
	G0	4-20 mA												
	G1	0-20 mA												
	CODE	Housing Material (9)												
	H0	Aluminum (IP/TYPE)					H3	316 SST for saline atmosphere (IPW/TYPEX) (8)						
	H1	316 SST (IP/TYPE)					H4	Copper Free Aluminum (IPW/TYPEX) (8)						
	H2	Aluminum for saline atmosphere (IPW/TYPEX) (8)												
	CODE	Identification Plate												
	I1	FM: XP, IS, NI, DI					IC	IECEX MINING						
	I4	EXAM (DMT): Ex-ia; NEMKO: Ex-d					IF	IECEX						
	I5	CEPEL: Ex-d, Ex-ia					IJ	NEMKO: EEX-D						
	I6	Without Certification					IO	CEPEL (Combustible Dust)						
	I7	EXAM (DMT) Grupo I, M1 Ex-ia					IR	TIBR CJSC - GOST RUSSIA: EX-D, EX-IA						
	CODE	Painting												
	P0	Munsell N 6,5 Gray					P8	Without Painting						
	P1	Blue Safety N4845 (standard 1374 Petrobras)					P9	Blue Safety Base Epoxy – Electrostatic Painting						
	P2	Blue Safety N4845 (standard 1735 Petrobras)												
	P3	Polyester Black												
	CODE	Manufacturing Standard												
	S0	SMAR												
	S5	BASF												
	CODE	Display Unit												
	Y0	Percentage					Y4	Display 2: Current (mA)						
	Y1	Display 1: Current (mA)					Y5	Display 2: Pressure (Eng. Unit)						
	Y2	Display 1: Pressure (Eng. Unit)					Y6	Display 2: Temperature (°C)						
	Y3	Display 1: Temperature (°C)					YU	User's specification (7)						
	CODE	Tag Plate												
	J0	With TAG					J2	User's specification						
	J1	Without TAG												
	CODE	Burn Out												
	BD	Down scale					BU	Up scale						
	CODE	Flange Face												
	Q0	Raised Face RF (ASME DIN)					Q2	Ring Joint Face (RTJ)						
	Q1	Flat Face FF (ASME DIN)												
	CODE	Lower Housing Connection												
	U0	With 1 Flush Connection 1/4" NPT (if supplied with lower housing)												
	U1	With 2 Flush connections 1/4NPT per 180°												
	U3	With 2 Flush connections 1/2NPT per 180° (with cover)												
	U4	Without flush connections												
	U5	With 1 Flush Connection 1/2" NPT (with cover)												
	CODE	Special options												
	ZZ	See notes												
LD290L	C1	GO	H0	I1	P0	S0	Y0**	J0	BD	Q0	U0	ZZ	Typical Model Number	

\*\*Can choose 1 option for each Display (1 and 2)

#### NOTES

- (1) Silicone Oils not recommendations for Oxygen (O<sub>2</sub>) or Chlorine service.
- (2) Not applicable for vacuum service.
- (3) Thread PG13.5 certified Exd in CEPEL.  
Threads ½ BSP ¾ BSP and Z (user option) is not certified Exd.
- (4) Attention, check corrosion rate for the process, tantalum, and titanium plate 0.1 mm, AISI 316L extension 3 to 6mm.
- (5) Fluorolube fill fluid is not available for Monel diaphragm.
- (6) Inert Fluid: Safe for oxygen service.
- (7) Limited values to 4 1/2 digits; limited unit to 5 characters.
- (8) IPW/TYPEX was tested for 200 hours.
- (9) IPX8 tested for 10 meters of water column for 24 hours.
- (10) process connection NPS1 and DN25 only available without extension
- (11) Meets NACE material recommendation per MR-01-75.
- (12) Inert fluid: safe for oxygen service.

MODEL	PRESSURE TRANSMITTER WITH EXTENDED PROBE									
LD290I	4-20 mA									
CODE	Type	Range Limits			Unit					
		Min.	Max.							
2	Level	12.5	500		mbar					
CODE	Diaphragm Material and Fill Fluid									
1	316L SST – Silicon Oil (1)									
CODE	Local Indicator									
0	Without Indicator									
1	With Indicator									
CODE	Fixing Transmitter									
1	Bracket in L						Z	User's specification		
2	Flanged Bracket									
3	Tri-clamp 3"									
CODE	Electrical Connection									
0	1/2 - 14 NPT						A	M20 X 1.5		
1	1/2 - 14 NPT X 3/4 NPT (316 SST) – with adapter						B	PG 13.5 DIN (1)		
2	1/2 - 14 NPT X 3/4 BSP (316 SST) - with adapter (1)						Z	User's specification		
3	1/2 - 14 NPT X 1/2 BSP (316 SST) - with adapter (1)									
CODE	Probe Material/Diaphragm (Wetted Parts)									
A	304L SST / 316L SST									
H	304L SST / Hastelloy C276									
I	316L SST / 316L SST									
U	316L SST / Hastelloy C276									
Z	User's specification									
CODE	Probe Length									
1	500 mm						6	1600 mm		
2	630 mm						7	2000 mm		
3	800 mm						8	2500 mm		
4	1000 mm						9	3200 mm		
5	1250 mm						Z	User's specification		
CODE	Probe Fill Fluid									
N	Propylene Glicol Oil (Neobee M20)									
Z	User's specification									
CODE	Continues Next Page									
LD290I	2	1	1	3	A	I	1	N	*	Typical Model Number

LD290I 2 1 1 3 A I 1 N \* Typical Model Number

\*Leave blank for no optional items.

MODEL	PRESSURE TRANSMITTER WITH EXTENDED PROBE (CONTINUATION)									
LD290I	CODE	Output Signal								
	G0	4-20 mA								
	G1	0-20 mA								
	CODE	Housing Material (4)								
	H0	Aluminum (IP/TYPE)					H3	316 SST for saline atmosphere (IPW/TYPEX) (3)		
	H1	316 SST (IP/TYPE)					H4	Copper Free Aluminum (IPW/TYPEX) (3)		
	H2	Aluminum for saline atmosphere (IPW/TYPEX) (3)								
	CODE	Identification Plate								
	I1	FM: XP, IS, NI, DI				I7	EXAM (DMT) Grupo I, M1 Ex-ia			
	I4	EXAM (DMT): Ex-ia; NEMKO: Ex-d				IC	IECEX MINING			
	I5	CEPEL: Ex-d, Ex-ia				IF	IECEX			
	I6	Without Certification				IO	CEPEL (Combustible Dust)			
	CODE	Painting								
	P0	Munsell N 6,5 Gray					P8	Without Painting		
	P1	Blue Safety N4845 (standard 1374 Petrobras)					P9	Blue Safety Base Epoxy – Electrostatic Painting		
	P2	Blue Safety N4845 (standard 1735 Petrobras)								
	P3	Polyester Black								
	CODE	Display Unit								
	Y0	Percentage					Y4	Display 2: Current (mA)		
	Y1	Display 1: Current (mA)					Y5	Display 2: Pressure (Eng. Unit)		
	Y2	Display 1: Pressure (Eng. Unit)					Y6	Display 2: Temperature (°C)		
	Y3	Display 1: Temperature (°C)					YU	User Specification (2)		
	CODE	Tag Plate								
	J0	With TAG					J2	User Specification		
	J1	Without TAG								
	CODE	Burn Out								
	BD	Down scale					BU	Up scale		
LD290I	G0	H0	IN	P0	Y0**	J0	BD	Typical Model Number		

Typical Model Number

\*\*Can choose 1 option for each Display (1 and 2)

## NOTES

- (1) Thread PG13.5 certified Exd in CEPEL.  
Threads ½ BSP ¾ BSP and Z (user option) is not certified Exd.
- (2) Limited values to 4 1/2 digits; limited unit to 5 characters.
- (3) IPW/TYPEX was tested for 200 hours.
- (4) IPX8 tested for 10 meters of water column for 24 hours.

## CERTIFICATIONS INFORMATION

### European Directive Information

Consult [www.Smar.com](http://www.Smar.com) for the EC declarations of conformity and certificates.

**Authorized representative/importer located within the Community:**

Smar Europe BV De Oude Wereld 116 2408 TM Alphen aan den Rijn Netherlands

**ATEX Directive 2014/34/EU - "Equipment for explosive atmospheres"**

The EC-Type Examination Certificate is released by DNV GL Presafe AS (CE2460) and DEKRA Testing and Certification GmbH (CE0158).

Designated certification body that monitors manufacturing and released QAN (Quality Assurance Notification) and QAR (Quality Assessment Report) is Nemko AS (CE0470).

**LVD Directive 2014/35/EU – "Low Voltage"**

According the LVD directive Annex II, electrical equipment for use in an explosive atmosphere is outside the scope of this directive.

According to IEC standard: IEC 61010-1 Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements.

**PED Directive 2014/68/EU - "Pressure Equipment"**

This product is in compliance with Article 4 paragraph 3 of the Pressure Equipment Directive 2014/68/EU and was designed and manufactured in accordance with the sound engineering practice. This equipment cannot bear the CE marking related to PED compliance. However, the product bears the CE marking to indicate compliance with other applicable European Community Directives.

**ROHS Directive 2011/65/EU - "Restriction of the use of certain hazardous substances in electrical and electronic equipment"**

For the evaluation of the products the following standards were consulted: EN 50581.

**EMC Directive 2014/30/EU - "Electromagnetic Compatibility"**

For products evaluation, the standard IEC 61326-1 were consulted and to comply with the EMC directive the installation must follow these special conditions:

Use shielded, twisted-pair cable for powering the instrument and signal wiring.

Keep the shield insulated at the instrument side, connecting the other one to the ground.

### Hazardous locations general information

**Ex Standards:**

IEC 60079-0 General Requirements

IEC 60079-1 Flameproof Enclosures "d"

IEC 60079-7 Increased Safe "e"

IEC 60079-11 Intrinsic Safety "i"

IEC 60079-18 Encapsulation "m"

IEC 60079-26 Equipment with equipment protection level (EPL) Ga

IEC 60079-31 Equipment dust ignition protection by enclosure "t"

IEC 60529 Classification of degrees of protection provided by enclosures (IP Code)

IEC 60079-10 Classification of Hazardous Areas

IEC 60079-14 Electrical installation design, selection and erection

IEC 60079-17 Electrical Installations, Inspections and Maintenance

IEC 60079-19 Equipment repair, overhaul and reclamation

ISO/IEC80079-34 Application of quality systems for equipment manufacture

**Warning:**

**Explosions could result in death or serious injury, besides financial damage.**

Installation of this instrument in hazardous areas must be in accordance with the local standards and type of protection. Before proceedings with installation make sure that the certificate parameters are in accordance with the classified hazardous area.

**Maintenance and Repair**

The instrument modification or replaced parts supplied by any other supplier than authorized representative of

Smar is prohibited and will void the Certification.

#### **Marking Label**

The instrument is marked with type of protection options. The certification is valid only when the type of protection is indicated by the user. Once a particular type of protection is installed, do not reinstall it using any other type of protection.

#### **Intrinsic Safety / Non Incendive application**

In hazardous areas with intrinsic safety or or non-incendive requirements, the circuit entity parameters and applicable installation procedures must be observed.

The instrument must be connected to a proper intrinsic safety barrier. Check the intrinsically safe parameters involving the barrier and equipment including the cable and connections. Associated apparatus ground bus shall be insulated from panels and mounting enclosures. Shield is optional, when using shielded cable, be sure to insulate the end not grounded.

Cable capacitance and inductance plus  $C_i$  and  $L_i$  must be smaller than  $C_o$  and  $L_o$  of the Associated Apparatus.

It is recommended do not remove the housing covers when powered on.

#### **Explosionproof / Flameproof application**

Only use Explosionproof/Flameproof certified Plugs, Adapters and Cable glands.

The electrical connections entries must be connected using a conduit with sealed unit or closed using metal cable gland or metal blanking plug with at least IP66.

Do not remove the housing covers when powered on.

#### **Enclosure**

The electronic housing and sensor threads installed in hazardous areas must have a minimum of 6 fully engaged threads.

The covers must be tightening with at least 8 turns, to avoid the penetration of humidity or corrosive gases, and until it touches the housing. Then, tighten more 1/3 turn (120°) to guarantee the sealing.

Lock the housing and covers using the locking screw.

#### **Degree of Protection of enclosure (IP)**

IPx8: Second numeral meaning continuous immersion in water under special condition defined as 10m for a period of 24 hours (Ref: IEC60529).

IPW/ TypeX: Supplementary letter W or X meaning special condition defined as saline environment tested in saturated solution of NaCl 5% w/w at 35°C for a period of 200 hours (Ref: NEMA 250/ IEC60529).

For enclosure with IP/IPW/TypeX applications, all NPT threads must apply a proper water-proof sealant (a non-hardening silicone group sealant is recommended).

## **Hazardous Locations Approvals**

#### **FM Approvals**

FM20US0149X

XP Class I Division 1, Groups A, B, C, D

DIP Class II, Class III Division 1, Groups E, F, G

IS Class I, II, III Division 1, Groups A, B, C, D, E, F G

NI Class I, Division 2, Groups A, B, C, D; NIFW

T4A;  $T_a = -25^{\circ}\text{C} < T_a < 60^{\circ}\text{C}$ ; Type 4, 4X, 6P

Electrical parameters: 30Vdc

Entity Parameters/Nonincendive Field Wiring Parameters:

Supply terminals:  $V_{max} = 30\text{ V dc}$ ,  $I_{max} = 110\text{ mA}$ ,  $C_i = 5\text{nf}$ ,  $L_i = 0$

Overpressure Limits:

2000 psi for ranges 2, 3 and 4 and 3600 psi for range 5

Special conditions for safe use:

The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction.

Care must be taken during installation and use to prevent impact or friction.

Drawing 38A-2075, 102A-1212, 102A-1335, 102A-1630, 102A-1631

**ATEX DNV GL Presafe A/S**



Explosion Proof (PRESAFE 18 ATEX 12410X)  
 II 2 G Ex db IIC T6 Gb  
 Ta -20 °C to +60 °C  
 Options: IP66/68W or IP66/68

**Special Conditions for Safe Use**

Repairs of the flameproof joints must be made in compliance with the structural specifications provided by the manufacturer. Repairs must not be made on the basis of values specified in tables 1 and 2 of EN/IEC 60079-1.

The Essential Health and Safety Requirements are assured by compliance with:

EN IEC 60079-0:2018 General Requirements

EN 60079-1:2014 Flameproof Enclosures "d"

Drawing 102A-1455, 102A-1511, 102A-2145, 102A-2146

**IECEx DNV GL Presafe A/S**

Explosion Proof (IECEx PRE 18.0031X)

Ex db IIC T6 Gb

Ta -20 °C to +60 °C

Options: IP66/68W or IP66/68

**Special Conditions for Safe Use**

Repairs of the flameproof joints must be made in compliance with the structural specifications provided by the manufacturer. Repairs must not be made on the basis of values specified in tables 1 and 2 of EN/IEC 60079-1.

The Essential Health and Safety Requirements are assured by compliance with:

IEC 60079-0:2017 General Requirements

IEC 60079-1:2014-06 Equipment protection by flameproof enclosures "d"

Drawing 102A-2103, 102A-2104, 102A-2180, 102A-2181

**ATEX DEKRA Testing and Certification GmbH**

Intrinsic Safety (DMT 01 ATEX E 059)

Ex I M1 Ex ia I Ma

Ex II 1/2 G Ex ia IIC T4/T5/T6 Ga/Gb

Supply and signal circuit intended for the connection to an intrinsically safe 4-20 mA current loop

Ui = 28 Vdc, Ii = 93 mA, Ci ≤ 5 nF, Li = Neg

Ambient Temperature: -40°C ≤ Ta ≤ + 85°C

Maximum Permissible power:

Max. Ambient temperature Ta	Temperature Class	Power Pi
85°C	T4	700mW
75°C	T4	760mW
44°C	T5	760mW
50°C	T5	700mW
55°C	T5	650mW
60°C	T5	575mW
65°C	T5	500mW
70°C	T5	425mW
40°C	T6	575mW

The Essential Health and Safety Requirements are assured by compliance with:

EN 60079-0:2018 General Requirements

EN 60079-11:2012 Intrinsic Safety "i"

EN 60079-26:2015 Equipment with equipment protection level (EPL) Ga

Drawing 102A-1455, 102A-1511, 102A-2145, 102A-2146, 102A-1453, 102A-1509

Intrinsic Safety (IECEx BVS 19.0015)

Ex ia I Ma

Ex ia IIC T4/T5/T6 Ga/Gb

Supply and signal circuit intended for the connection to an intrinsically safe 4-20 mA current loop

Ui = 28 Vdc, Ii = 93 mA, Ci ≤ 5 nF, Li = Neg

Ambient Temperature: -40°C ≤ Ta ≤ + 85°C

Maximum Permissible power:

Max. Ambient temperature Ta	Temperature Class	Power Pi
85°C	T4	700 mW
50°C	T5	700 mW
55°C	T5	650 mW
60°C	T5	575 mW
65°C	T5	500 mW
70°C	T5	425 mW
40°C	T6	575 mW

The Essential Health and Safety Requirements are assured by compliance with:

IEC 60079-0:2017 General Requirements



IEC 60079-11:2011 Intrinsic Safety "i"

IEC 60079-26:2014 Equipment with equipment protection level (EPL) Ga



Drawing 102A-2103, 102A-2104, 102A-2134, 102A-2135, 102A-2180, 102A-2181

#### CEPEL (Centro de Pesquisa de Energia Elétrica)

Intrinsic Safety (CEPEL 95.0049X)

<p><b>Segurança</b></p> <p> </p> <p>CEPEL 95.0049X</p> <p>Ex ia IIC T5 Ga/Gb</p> <p>Ex ia IIIC T100 °C Da/Db</p>	
IP66W (aço inox e alumínio Copper Free)	IP66 (alumínio)
<p>Ui = 30 V Ii = 100 mA Pi = 0,7 W Ci = 6,40 nF Li = desp</p> <p>Tamb: -20 °C a +50 °C</p>	

Explosion Proof (CEPEL 96.0039)

<p><b>Segurança</b></p> <p> </p> <p>CEPEL 96.0039</p> <p>Ex db IIC T6 Ga/Gb</p> <p>Ex tb IIIC T85 °C Db</p>	
IP66W (aço inox e alumínio Copper Free)	IP66 (alumínio)

Observações:

- O número do certificado é finalizado pela letra "X" para indicar que para a versão do Transmissor de pressão, intrinsecamente seguro, modelo LD290 equipado com invólucro fabricado em liga de alumínio, somente pode ser instalado em "Zona 0", se durante a instalação for excluído o risco de ocorrer impacto ou fricção entre o invólucro e peças de ferro/aço.

- O produto adicionalmente marcado com a letra suplementar "W" indica que o equipamento foi ensaiado em uma solução saturada a 5% de NaCl p/p, à 35 °C, pelo tempo de 200 h e foi aprovado para uso em atmosferas salinas, condicionado à utilização de acessórios de instalação no mesmo material do equipamento e de bujões de aço inoxidável ASTM-A240, para fechamento das entradas roscadas não utilizadas. Os materiais de fabricação dos equipamentos aprovados para letra "W" são: aço inoxidável AISI 316 e alumínio Copper Free SAE 336 pintados (Procedimento P-CQ-FAB764-10) com tinta Resina Poliéster ou Resina Epoxy com espessura da camada de tinta de 70 a 150 µm e 120 a 200 µm, respectivamente, ou pintados com o plano de pintura P1 e P2

(Procedimento P-CQ-FAB-765-05) com tinta Resina Epoxy ou Poliuretano Acrílico Alifático com espessura de camada de tinta de 290 µm a 405 µm e 185 µm a 258 µm, respectivamente.

- Os planos de pintura P1 e P2 são permitidos apenas para equipamento fornecido com plaqueta de identificação com marcação para grupo de gases IIB.

- Equipamentos com tipo de proteção Ex d aprovados para categoria Gb, não podem ter o sensor de pressão instalados em processos industriais classificadas como "Zona 0".

- As atividades de instalação, inspeção, manutenção, reparo, revisão e recuperação dos equipamentos são de responsabilidade dos usuários e devem ser executadas de acordo com os requisitos das normas técnicas vigentes e com as recomendações do fabricante.

**Normas Aplicáveis:**

ABNT NBR IEC 60079-0:2013 Atmosferas explosivas - Parte 0: Equipamentos – Requisitos gerais

ABNT NBR IEC 60079-1:2016 Atmosferas explosivas - Parte 1: Proteção de equipamento por invólucro à prova de explosão "d"

ABNT NBR IEC 60079-11:2013 Atmosferas explosivas - Parte 11: Proteção de equipamento por segurança intrínseca "i"

ABNT NBR IEC 60079-26:2016 Equipamentos elétricos para atmosferas explosivas - Parte 26: Equipamentos com nível de proteção de equipamento (EPL) Ga

ABNT NBR IEC 60079-31:2014 Atmosferas explosivas - Parte 31: Proteção de equipamentos contra ignição de poeira por invólucros "t"

ABNT NBR IEC 60529:2017 Graus de proteção para invólucros de equipamentos elétricos (Código IP)

Desenhos 102A1370, 102A1250, 102A2024, 102A2023, 102A2084

## Identification Plate

### FM Approvals

**smar LD290 Pressure Transmitter**

Nova Smar S/A  
Av. Dr Antônio Furlan Jr, 1028  
Sertãozinho-SP 14170-480  
Brazil

Temp. Class: T4A
Tamb. 60°C max.
Vmax. 30 VDC
I max. 110 mA
Pi 825 mW
Ci= 5 nF Li= neg

XP CL I, DIV 1, GP A,B,C,D  
DIP CL II, DIV 1, GP E,F,G.  
IS CL I,II,III, DIV 1, GP A,B,C,D,E,F,G.  
NI CL I, DIV 2, GP A,B,C,D.

Per inst. dwg 38A2075. Pmax= 3600 psi.

**FM APPROVED**

"The apparatus enclosure may contain aluminum which is considered to constitute a potential risk of ignition by impact or friction. Care must be taken into account during installation and use to prevent impact or friction."

0000000 - 0000

**CE** 121201

**smar LD290 Pressure Transmitter**

Nova Smar S/A  
Av. Dr Antônio Furlan Jr, 1028  
Sertãozinho-SP 14170-480  
Brazil

Temp. Class: T4A
Tamb. 60°C max.
Vmax. 30 VDC
I max. 110 mA
Pi 825 mW
Ci= 5 nF Li= neg

XP CL I, DIV 1, GP A,B,C,D  
DIP CL II, DIV 1, GP E,F,G.  
IS CL I,II,III, DIV 1, GP A,B,C,D,E,F,G.  
NI CL I, DIV 2, GP A,B,C,D.

Per inst. dwg 38A2075. Pmax= 3600 psi.

**FM APPROVED**

"The apparatus enclosure may contain aluminum which is considered to constitute a potential risk of ignition by impact or friction. Care must be taken into account during installation and use to prevent impact or friction."

0000000 - 0000

**CE** 133501

**smar LD290 Pressure Transmitter**

Nova Smar S/A  
Av. Dr Antônio Furlan Jr, 1028  
Sertãozinho-SP 14170-480 Brazil  
Final Assembly is completed in  
Houston-TX  
USA

Temp. Class: T4A
Tamb. 60°C max.
Vmax. 30 VDC
I max. 110 mA
Pi 825 mW
Ci= 5 nF Li= neg

XP CL I, DIV 1, GP A,B,C,D  
DIP CL II, DIV 1, GP E,F,G.  
IS CL I,II,III, DIV 1, GP A,B,C,D,E,F,G.  
NI CL I, DIV 2, GP A,B,C,D.

Per inst. dwg 38A2075. Pmax= 3600 psi.

**FM APPROVED**

"The apparatus enclosure may contain aluminum which is considered to constitute a potential risk of ignition by impact or friction. Care must be taken into account during installation and use to prevent impact or friction."

0000000 - 0000

**CE** 163102

**smar LD290 Pressure Transmitter**

Nova Smar S/A  
Av. Dr Antônio Furlan Jr, 1028  
Sertãozinho-SP 14170-480 Brazil  
Final Assembly is completed in  
Houston-TX  
USA

Temp. Class: T4A
Tamb. 60°C max.
Vmax. 30 VDC
I max. 110 mA
Pi 825 mW
Ci= 5 nF Li= neg

XP CL I, DIV 1, GP A,B,C,D  
DIP CL II, DIV 1, GP E,F,G.  
IS CL I,II,III, DIV 1, GP A,B,C,D,E,F,G.  
NI CL I, DIV 2, GP A,B,C,D.

Per inst. dwg 38A2075. Pmax= 3600 psi.

**FM APPROVED**

"The apparatus enclosure may contain aluminum which is considered to constitute a potential risk of ignition by impact or friction. Care must be taken into account during installation and use to prevent impact or friction."

0000000 - 0000

**CE** 163002

### DNV GL Presafe A/S / DEKRA Testing and Certification GmbH

**smar LD290 Pressure Transmitter**

Nova Smar S/A  
Av. Dr Antônio Furlan Jr 1028  
Sertãozinho-SP 14170-480  
Brazil

Ex II 1/2G Ex ia IIC T4/T5/T6 Ga/Gb DMT 01 ATEX E 059 ( )  
Pi = 760 mW (T4, Ta = 75°C) -40°C ≤ Ta ≤ +85°C  
700 mW (T4, Ta = 85°C) Ui = 28 VDC li = 93 mA  
575 mW (T5, Ta = 60°C) Li = neg Ci ≤ 5 nF  
575 mW (T6, Ta = 40°C)

IP66  
IP68 10m/24h

Ex II 2G Ex db IIC T6 Gb PRESAFE 18 ATEX 12410X ( )  
Tamb = -20°C to 60°C U = 28 VDC

0000000 - 0000

**CE** 0470 145504

**smar LD290 Pressure Transmitter**

Nova Smar S/A  
Av. Dr Antônio Furlan Jr 1028  
Sertãozinho-SP 14170-480  
Brazil

Ex II 1/2G Ex ia IIC T4/T5/T6 Ga/Gb DMT 01 ATEX E 059 ( )  
Pi = 760 mW (T4, Ta = 75°C) -40°C ≤ Ta ≤ +85°C  
700 mW (T4, Ta = 85°C) Ui = 28 VDC li = 93 mA  
575 mW (T5, Ta = 60°C) Li = neg Ci ≤ 5 nF  
575 mW (T6, Ta = 40°C)

IP66W  
IP68W 10m/24h

Ex II 2G Ex db IIC T6 Gb PRESAFE 18 ATEX 12410X ( )  
Tamb = -20°C to 60°C U = 28 VDC

0000000 - 0000

**CE** 0470 151104

**smar <sup>ALDOTA</sup> LD290 Pressure Transmitter**

Nova Smar S/A  
Av. Dr Antônio Furlan Jr, 1028  
Sertãozinho-SP 14170-480 Brazil  
Final Assembly is completed in  
Navi Mumbai IND

Ex II 1/2G Ex ia IIC T4/T5/T6 Ga/Gb DMT 01 ATEX E 059 ( )  
Pi = 760 mW (T4, Ta = 75°C) -40°C ≤ Ta ≤ +85°C  
700 mW (T4, Ta = 85°C) Ui = 28 VDC li = 93 mA  
575 mW (T5, Ta = 60°C) Li = neg Ci ≤ 5 nF  
575 mW (T6, Ta = 40°C)

IP66W  
IP68W 10m/24h

Ex II 2G Ex db IIC T6 Gb PRESAFE 18 ATEX 12410X ( )  
Tamb = -20°C to 60°C U = 28 VDC

0000000 - 0000

**CE** 0470 214600

**smar <sup>ALDOTA</sup> LD290 Pressure Transmitter**

Nova Smar S/A  
Av. Dr Antônio Furlan Jr, 1028  
Sertãozinho-SP 14170-480 Brazil  
Final Assembly is completed in  
Navi Mumbai IND

Ex II 1/2G Ex ia IIC T4/T5/T6 Ga/Gb DMT 01 ATEX E 059 ( )  
Pi = 760 mW (T4, Ta = 75°C) -40°C ≤ Ta ≤ +85°C  
700 mW (T4, Ta = 85°C) Ui = 28 VDC li = 93 mA  
575 mW (T5, Ta = 60°C) Li = neg Ci ≤ 5 nF  
575 mW (T6, Ta = 40°C)

IP66  
IP68 10m/24h

Ex II 2G Ex db IIC T6 Gb PRESAFE 18 ATEX 12410X ( )  
Tamb = -20°C to 60°C U = 28 VDC

0000000 - 0000

**CE** 0470 214500

**smar LD290 Pressure Transmitter**

Nova Smar S/A  
Av. Dr Antônio Furlan Jr 1028  
Sertãozinho-SP 14170-480  
Brazil

Ex ia IIC T4/T5/T6 Ga/Gb IECEX BVS 19.0015 ( )  
Pi = 700 mW (T4, Ta = 85°C) -40°C ≤ Ta ≤ +85°C  
575 mW (T5, Ta = 60°C) Ui = 28 VDC li = 93 mA  
575 mW (T6, Ta = 40°C) Li = neg Ci ≤ 5 nF

IP66  
IP68 10m/24h

Ex db IIC T6 Gb IECEX PRE 18.0031X ( )  
Tamb = -20°C to 60°C U = 28 VDC

0000000 - 0000

**CE** 210302

**smar LD290 Pressure Transmitter**

Nova Smar S/A  
Av. Dr Antônio Furlan Jr 1028  
Sertãozinho-SP 14170-480  
Brazil

Ex ia IIC T4/T5/T6 Ga/Gb IECEX BVS 19.0015 ( )  
Pi = 700 mW (T4, Ta = 85°C) -40°C ≤ Ta ≤ +85°C  
575 mW (T5, Ta = 60°C) Ui = 28 VDC li = 93 mA  
575 mW (T6, Ta = 40°C) Li = neg Ci ≤ 5 nF

IP66W  
IP68W 10m/24h

Ex db IIC T6 Gb IECEX PRE 18.0031X ( )  
Tamb = -20°C to 60°C U = 28 VDC

0000000 - 0000

**CE** 210402

**smar** **ALDOTA** LD290 Pressure Transmitter

Nova Smar S/A  
Av. Dr Antônio Furlan Jr, 1028  
Sertãozinho-SP  
14170-480 Brazil  
Final Assembly is completed in  
Navi Mumbai IND

Ex ia IIC T4/T5/T6 Ga/Gb IECEx BVS 19.0015 ( )  
Pi = 700 mW (T4, Ta = 85°C) -40°C ≤ Ta ≤ +85°C  
575 mW (T5, Ta = 60°C) Ui = 28 VDC li = 93 mA  
575 mW (T6, Ta = 40°C) Li = neg Ci ≤ 5 nF

IP66  
IP68  
10m/24h

Ex db IIC T6 Gb IECEx PRE 18.0031X ( )  
Tamb = -20°C to 60°C U = 28 VDC

0000000 - 0000

218000

**smar** **ALDOTA** LD290 Pressure Transmitter

Nova Smar S/A  
Av. Dr Antônio Furlan Jr, 1028  
Sertãozinho-SP  
14170-480 Brazil  
Final Assembly is completed in  
Navi Mumbai IND

Ex ia IIC T4/T5/T6 Ga/Gb IECEx BVS 19.0015 ( )  
Pi = 700 mW (T4, Ta = 85°C) -40°C ≤ Ta ≤ +85°C  
575 mW (T5, Ta = 60°C) Ui = 28 VDC li = 93 mA  
575 mW (T6, Ta = 40°C) Li = neg Ci ≤ 5 nF

IP66W  
IP68W  
10m/24h

Ex db IIC T6 Gb IECEx PRE 18.0031X ( )  
Tamb = -20°C to 60°C U = 28 VDC

0000000 - 0000

218100

**smar** LD290 Pressure Transmitter

Nova Smar S/A  
Av. Dr Antônio Furlan Jr  
1028 Sertãozinho-SP  
14170-480 Brazil

Ex I M1 Ex ia I Ma DMT 01 ATEX E 059  
-40°C ≤ Ta ≤ +85°C  
Pi = 700 mW (Ta = 85°C)  
Ui = 28 VDC li = 93 mA Li = neg Ci ≤ 5 nF

IP66

0000000 - 0000

CE 0470

145302

**smar** LD290 Pressure Transmitter

Nova Smar S/A  
Av. Dr Antônio Furlan Jr  
1028 Sertãozinho-SP  
14170-480 Brazil

Ex I M1 Ex ia I Ma DMT 01 ATEX E 059  
-40°C ≤ Ta ≤ +85°C  
Pi = 700 mW (Ta = 85°C)  
Ui = 28 VDC li = 93 mA Li = neg Ci ≤ 5 nF

IP66W

0000000 - 0000

CE 0470

150902

**smar** LD290 Pressure Transmitter

Nova Smar S/A  
Av. Dr Antônio Furlan Jr  
1028 Sertãozinho-SP  
14170-480 Brazil

Ex ia I Ma IECEx BVS 19.0015  
-40°C ≤ Ta ≤ +85°C  
Pi = 700 mW (Ta = 85°C)  
Ui = 28 VDC li = 93 mA Li = neg Ci ≤ 5 nF

IP66

0000000 - 0000

IEC Ex

213400

**smar** LD290 Pressure Transmitter

Nova Smar S/A  
Av. Dr Antônio Furlan Jr  
1028 Sertãozinho-SP  
14170-480 Brazil

Ex ia I Ma IECEx BVS 19.0015  
-40°C ≤ Ta ≤ +85°C  
Pi = 700 mW (Ta = 85°C)  
Ui = 28 VDC li = 93 mA Li = neg Ci ≤ 5 nF

IP66W

0000000 - 0000

IEC Ex

213500

### CEPEL (Centro de Pesquisa de Energia Elétrica)

**smar** LD290 Transmissor de Pressão

Nova Smar S/A  
Av. Dr Antônio Furlan Jr  
1028 Sertãozinho-SP  
14170-480 Brazil

Ex db IIC T6 Ga/Gb CEPEL 96.0039 ( )  
Ex ia IIC T5 Ga/Gb CEPEL 95.0049 X ( )  
Tamb = -20° a 50°C  
Ui = 30V li = 100mA Pi = 0,7W  
Ci = 6,4nF Li = desp

IP66

Segurança  
Eletróbios  
INMETRO

0000000 - 0000

CE

137002

**smar** LD290 Transmissor de Pressão

Nova Smar S/A  
Av. Dr Antônio Furlan Jr  
1028 Sertãozinho-SP  
14170-480 Brazil

Ex db IIC T6 Ga/Gb CEPEL 96.0039 ( )  
Ex ia IIC T5 Ga/Gb CEPEL 95.0049 X ( )  
Tamb = -20° a 50°C  
Ui = 30V li = 100mA Pi = 0,7W  
Ci = 6,4nF Li = desp

IP66W

Segurança  
Eletróbios  
INMETRO

0000000 - 0000

CE

125002

**smar** LD290 Transmissor de Pressão

Nova Smar S/A  
Av. Dr Antônio Furlan Jr  
1028 Sertãozinho-SP  
14170-480 Brazil

Ex db IIB T6 Ga/Gb CEPEL 96.0039 ( )  
Ex ia IIB T5 Ga/Gb CEPEL 95.0049 X ( )  
Tamb = -20° a 50°C  
Ui = 30V li = 100mA Pi = 0,7W  
Ci = 6,4nF Li = desp

IP66  
P1/P2  
Pintura

Segurança  
Eletróbios  
INMETRO

0000000 - 0000

CE

202401

**smar** LD290 Transmissor de Pressão

Nova Smar S/A  
Av. Dr Antônio Furlan Jr  
1028 Sertãozinho-SP  
14170-480 Brazil

Ex db IIB T6 Ga/Gb CEPEL 96.0039 ( )  
Ex ia IIB T5 Ga/Gb CEPEL 95.0049 X ( )  
Tamb = -20° a 50°C  
Ui = 30V li = 100mA Pi = 0,7W  
Ci = 6,4nF Li = desp

IP66W  
P1/P2  
Pintura

Segurança  
Eletróbios  
INMETRO

0000000 - 0000

CE

202301


**smar** LD290 Transmissor de Pressão

Nova Smar S/A  
Av. Dr. Antônio Furlan Jr  
1028 Sertãozinho-SP  
14170-480  
Brazil

Ex tb IIIC T85°C Db CEPEL 96.0039 ( )  
Ex ia IIIC T100°C Da CEPEL 95.0049 X ( )  
Tamb= -20° a 50°C  
Uj= 30V Ii= 100mA Pi= 0,7W  
Ci= 6,4nF Li= desp

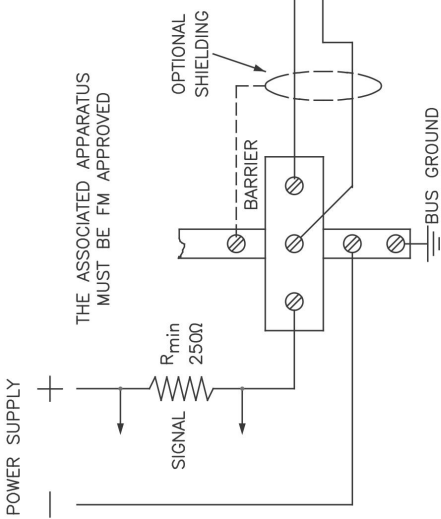
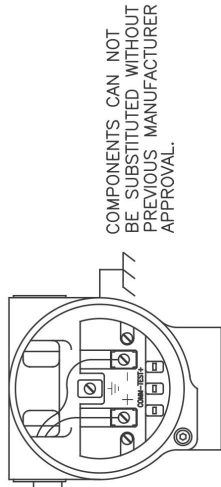


**Segurança**  
Eletrôbras  
OCP 0001  
INMETRO

IP  
66

  
0000000 - 0000

**CE** 208401


## FM Approvals

UNCLASSIFIED LOCATION				HAZARDOUS AREA			
<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;">           SAFE AREA APPARATUS            CONTROL EQUIPMENT CONNECTED TO            ASSOCIATED APPARATUS MUST            NOT USE OR GENERATE MORE THAN            250VRMS OR VDC.         </div> <p>DUST-TIGHT CONDUIT SEAL MUST BE USED WHEN INSTALLED IN CLASS II AND CLASS III ENVIRONMENTS.</p>  <p>POWER SUPPLY + -</p> <p>SIGNAL</p> <p><math>R_{min}</math> 2500</p> <p>OPTIONAL SHIELDING</p> <p>BARRIER</p> <p>BUS GROUND</p> <p>THE ASSOCIATED APPARATUS MUST BE FM APPROVED</p>				<p>REQUIREMENTS:</p> <ol style="list-style-type: none"> <li>1 - INSTALLATION SHOULD BE IN ACCORDANCE WITH ANSI/ISA RP12.06.01 "INSTALLATION OF INTRINSICALLY SAFE SYSTEMS FOR HAZARDOUS (CLASSIFIED) LOCATIONS" AND THE NATIONAL ELECTRICAL CODE (ANSI/NFPA 70).</li> <li>2 - ASSOCIATED APPARATUS GROUND BUS MUST BE INSULATED FROM HAZARDOUS AREAS GROUND BUS.</li> <li>3 - RESISTANCE BETWEEN INTRINSICALLY SAFE GROUND AND EARTH GROUND MUST BE LESS THAN 1.0 OHM.</li> <li>4 - WIRES: TWISTED PAIR, 22AWG OR LARGER.</li> <li>5 - SHIELD IS OPTIONAL AND IF USED, BE SURE TO INSULATE THE END NOT GROUNDED.</li> <li>6 - CABLE CAPACITANCE AND INDUCTANCE PLUS <math>C_i</math> AND <math>L_i</math> MUST BE SMALLER THAN <math>C_a</math> AND <math>L_a</math> OF THE ASSOCIATED APPARATUS.</li> </ol> <p>INTRINSICALLY SAFE APPARATUS</p> <p>THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS WITH ASSOCIATED APPARATUS WHEN THE FOLLOWING IS TRUE:</p> <p><math>V_{max}</math> OR <math>U_i \geq V_{oc}</math>, <math>V_t</math> OR <math>U_o</math>; <math>I_{max}</math> OR <math>I_i \geq I_{sc}</math>, <math>I_t</math> OR <math>I_o</math>;  <math>P_{max}</math> OR <math>P_i \geq P_o</math>; <math>C_a \geq C_i + C_{cable}</math>; <math>L_a \geq L_i + L_{cable}</math>;</p> <p>ENTITY PARAMETERS:</p> <p><math>P_i = 825mW</math> <math>C_i = 5nF</math> <math>L_i = NEGLIGIBLE</math> <math>V_{max} = 30VDC</math> <math>I_{max} = 110mA</math>        CLASS I,II,III DIV.1, GROUPS A,B,C,D,E,F &amp; G        MODEL LD290, LD291 and LD301 PRESSURE TRANSMITTER.</p>  <p>COMPONENTS CAN NOT BE SUBSTITUTED WITHOUT PREVIOUS MANUFACTURER APPROVAL.</p> <p>NO REVISION TO DRAWING WITHOUT FM APPROVAL.        WARNING: SUBSTITUTION OF COMPONENTS MAY IMPAIR INTRINSIC SAFETY.        WARNING: TO PREVENT IGNITION OF FLAMMABLE OR COMBUSTIBLE ATMOSPHERES,        DISCONNECT POWER BEFORE SERVICING.        WARNING: TO PREVENT IGNITION OF FLAMMABLE OR COMBUSTIBLE ATMOSPHERES,        READ, UNDERSTAND AND ADHERE TO THE MANUFACTURE'S LIVE        MAINTENANCE PROCEDURES.        WARNING: THE APPARATUS ENCLOSURE CONTAINS ALUMINUM AND IS CONSIDERED        TO CONSTITUTE A POTENTIAL RISK OF IGNITION BY IMPACT OR FRICTION.        CARE MUST BE TAKEN INTO ACCOUNT DURING INSTALLATION AND USE        TO PREVENT IMPACT OR FRICTION.</p>			
<p>ENTITY PARAMETERS FOR ASSOCIATED APPARATUS</p> <p>CLASS I,II,III DIV.1, GROUPS A,B,C,D,E,F &amp; G</p> <p><math>C_a \geq 5nF</math> + CABLE CAPACITANCE</p> <p><math>L_a \geq L_i</math> + CABLE INDUCTANCE</p> <p><math>V \leq 30V</math></p> <p><math>I \leq 110mA</math></p> <p>THE FM APPROVED ASSOCIATED APPARATUS MUST BE A LINEAR OUTPUT DEVICE.        ASSOCIATED APPARATUS MANUFACTURER'S INSTALLATION DRAWING MUST BE FOLLOWED WHEN INSTALLING THIS EQUIPMENT.</p>				 APPROVED			
APPROVAL CONTROLLED BY WEBCONTDOC				DRAWN	CHECKED	PROJECT	APPROVAL
7	MARCIAL 20/11/20	ENIO 20/11/20	ALT 0794/20	DITO 3/12/92	DITO 3/12/92	BASÍLIO 3/12/92	BASÍLIO 3/12/92
6	MARCIAL 23/03/20	ENIO 23/03/20	ALT 0758/20	EQUIPMENT: LD290 / LD291 / LD301 CONTROL DRAWING			
5	MELONI 12/09/18	ENIO 12/09/18	ALT 0674/18				
REV	BY	APPROVAL	DOC				
				 CONTROLLED BY DIGITAL MEDIA			
				NUMBER 38A207507			
				SCALE - SHEET 01/01			





# Appendix B

		<b>SRF – Service Request Form Pressure Transmitters</b>				<b>Proposal No.:</b>	
<b>Company:</b>				<b>Unit:</b>		<b>Invoice:</b>	
<b>COMMERCIAL CONTACT</b>				<b>TECHNICAL CONTACT</b>			
<b>Full Name:</b>				<b>Full Name:</b>			
<b>Function:</b>				<b>Function:</b>			
<b>Phone:</b>		<b>Extension:</b>		<b>Phone:</b>		<b>Extension:</b>	
<b>Fax:</b>				<b>Fax:</b>			
<b>Email:</b>				<b>Email:</b>			
<b>EQUIPMENT DATA</b>							
<b>Model:</b>				<b>Serial Number:</b>		<b>Sensor Number:</b>	
<b>Technology:</b> ( ) 4-20 mA   ( ) HART®   ( ) FOUNDATION fieldbus™   ( ) PROFIBUS PA						<b>Version Firmware:</b>	
<b>PROCESS DATA</b>							
<b>Process Fluid:</b>							
<b>Calibration Range</b>		<b>Ambient Temperature ( °F )</b>		<b>Process Temperature ( °F )</b>		<b>Process Pressure</b>	
<b>Min.:</b>	<b>Max.:</b>	<b>Min.:</b>	<b>Max.:</b>	<b>Min.:</b>	<b>Max.:</b>	<b>Min.:</b>	<b>Max.:</b>
<b>Static Pressure</b>		<b>Vacuum</b>					
<b>Min.:</b>	<b>Max.:</b>	<b>Min.:</b>	<b>Max.:</b>				
<b>Normal Operation Time:</b>				<b>Failure Date:</b>			
<b>FAILURE DESCRIPTION</b> (Please, describe the failure. Can the error be reproduced? Is it repetitive?)							
<b>OBSERVATIONS</b>							
<b>USER INFORMATION</b>							
<b>Company:</b> <b>Contact:</b> _____ <b>Title:</b> _____ <b>Section:</b> _____ <b>Phone:</b> _____ <b>Extension:</b> _____ <b>E-mail:</b> _____ <b>Date:</b> _____ <b>Signature:</b> _____							
For warranty or non-warranty repair, please contact your representative. Further information about address and contacts can be found on <a href="http://www.smar.com/contactus.asp">www.smar.com/contactus.asp</a> .							

