LD292 - smar

OPERATION & MAINTENANCE
INSTRUCTIONS MANUAL

FOUNDATION FIELDBUS GAGE PRESSURE TRANSMITTER

MAR / 15
LD292
VERSION 3

FOUNDATION™

LD292ME

smar

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INTRODUCTION

The **LD292** is from the first generation of Fieldbus Devices. It is an economical alternative gauge pressure transmitter. It is based on a field-proven capacitive sensor that provides reliable operation and high performance. This lightweight design eliminates the need for mounting brackets and transmitter supports in many applications. It's microprocessor-based electronics allows total interchangeability with Smar capacitive sensors. It is automatically corrects sensors characteristics changes caused by temperature fluctuations. The digital technology used in the **LD292** enables the choice of several types of transfer functions, an easy interface between the field and the control room and several interesting features that considerably reduce the installation, operation and maintenance costs.

The **LD292** is part of Smar's complete 302 line of Fieldbus devices.

Some of the advantages of bi-directional digital communications are known from existing smart transmitter protocols: Higher accuracy, multi-variable access, remote configuration and diagnostics, and multi-dropping of several devices on a single pair of wires.

Using Fieldbus technology, with its capability to interconnect several devices, very large control schemes can be constructed. In order too be user friendly the function block concept was introduced.

The **LD292**, like the rest of the 302 family, has some Function Blocks built in, like analog Input, PID controller, Input selector and Display Block.

The need for implementation of Fieldbus in small as well as large systems was considered when developing the entire 302 line of Fieldbus devices. They have the common features of being able to act as a master on the network and be configured locally using a magnetic tool, eliminating the need for a configurator or console in many basic applications.

The **LD292** is available as a product on its own, but also replaces the circuit board for the LD291. They use the same sensor board. Refer to the maintenance section of this manual for instructions on upgrading. The **LD292** uses the same hardware and housing for the LD291.The **LD292** is part of SMAR's **Series 302** of Fieldbus devices.

The **LD292**, like its predecessor LD291, has many built-in blocks, eliminating the need for a separate control device. The communication requirement is considerably reduced, and that means less dead-time and tighter control is achieved, not to mention the reduction in cost. They allow flexibility in control strategy implementation.

Get the best results of the **LD292** by carefully reading these instructions.

NOTE
This Manual is compatible with version 3.XX, where 3 denotes software version and XX software release. The indication 3.XX means that this manual is compatible with any release of software version 3.

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.

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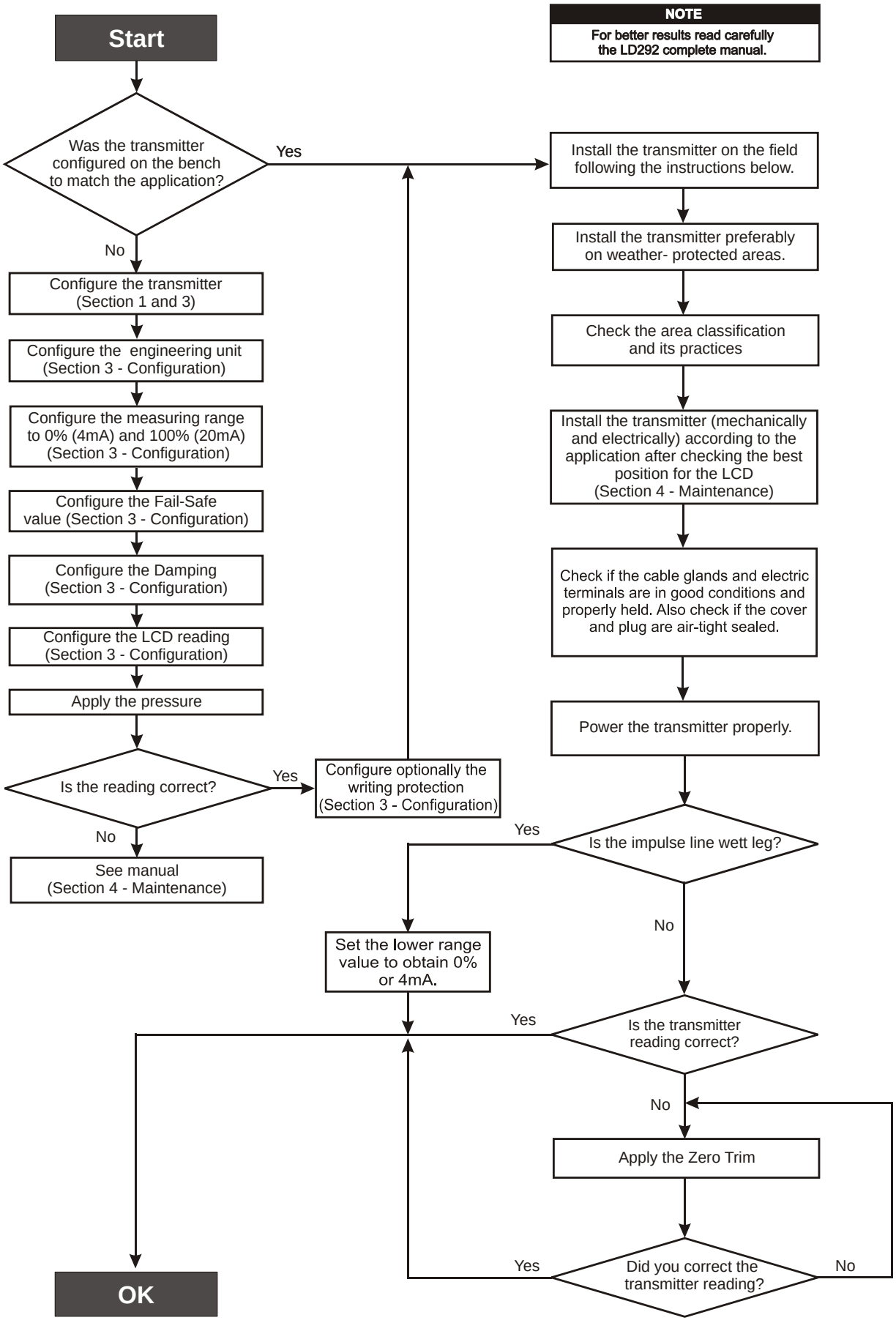

Start
Was the transmitter configured on the bench to match the application?
Yes
No
Configure the transmitter (Section 1 and 3)
Configure the engineering unit (Section 3 - Configuration)
Configure the measuring range to 0% (4mA) and 100% (20mA) (Section 3 - Configuration)
Configure the Fail-Safe value (Section 3 - Configuration)
Configure the Damping (Section 3 - Configuration)
Configure the LCD reading (Section 3 - Configuration)
Apply the pressure
Is the reading correct?
Yes
No
See manual (Section 4 - Maintenance)
Configure optionally the writing protection (Section 3 - Configuration)
NOTE
For better results read carefully the LD292 complete manual.
Install the transmitter on the field following the instructions below.
Install the transmitter preferably on weather- protected areas.
Check the area classification and its practices
Install the transmitter (mechanically and electrically) according to the application after checking the best position for the LCD (Section 4 - Maintenance)
Check if the cable glands and electric terminals are in good conditions and properly held. Also check if the cover and plug are air-tight sealed.
Power the transmitter properly.
Is the impulse line wett leg?
Yes
No
Set the lower range value to obtain 0% or 4mA.
Is the transmitter reading correct?
Yes
No
Apply the Zero Trim
Did you correct the transmitter reading?
Yes
No
OK

Section 1

INSTALLATION

General

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

The overall accuracy of 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 **LD292** has a built-in temperature sensor to compensate for temperature variations. At the factory, each transmitter is submitted to a temperature cycle process, and the characteristics under different pressures and temperatures are recorded in the transmitter memory. At the field, this feature minimizes the temperature variation effect.

Mounting

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

The transmitter should be installed in such a way as to avoid, as much as possible, direct exposure to the sun or any source of irradiated heat. Installation close to lines and vessels with 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.

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

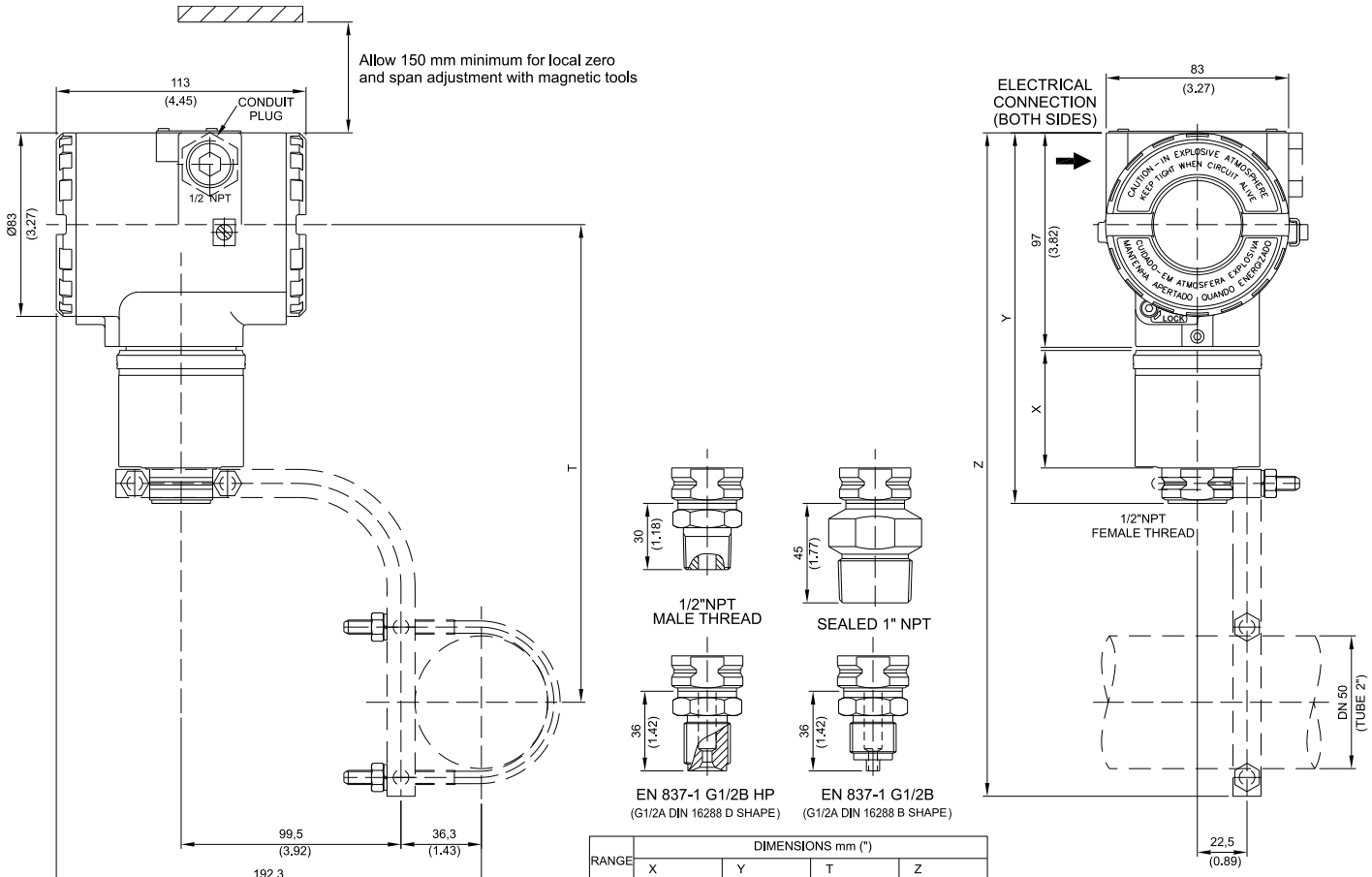
Although the transmitter is virtually insensitive to vibration, installation close to pumps, turbines or other vibrating equipment should be avoided.

The transmitter has been designed to be both rugged and lightweight at the same time. This makes its mounting easier; mounting positions are shown in Figures 1.1 and 1.2.

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

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

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



RANGE	DIMENSIONS mm (")							
	X		Y		T		Z	
2-3	48,6	(1.91)	163,5	(6.44)	211,5	(8.33)	295,5	(11.63)
4	50,6	(1.99)	165,5	(6.52)	213,5	(8.41)	297,5	(11.71)
5	53,1	(2.09)	168	(6.61)	216	(8.50)	300	(11.81)

Figure 1.1 (a) - Dimensional Drawing and Mounting Position for LD292

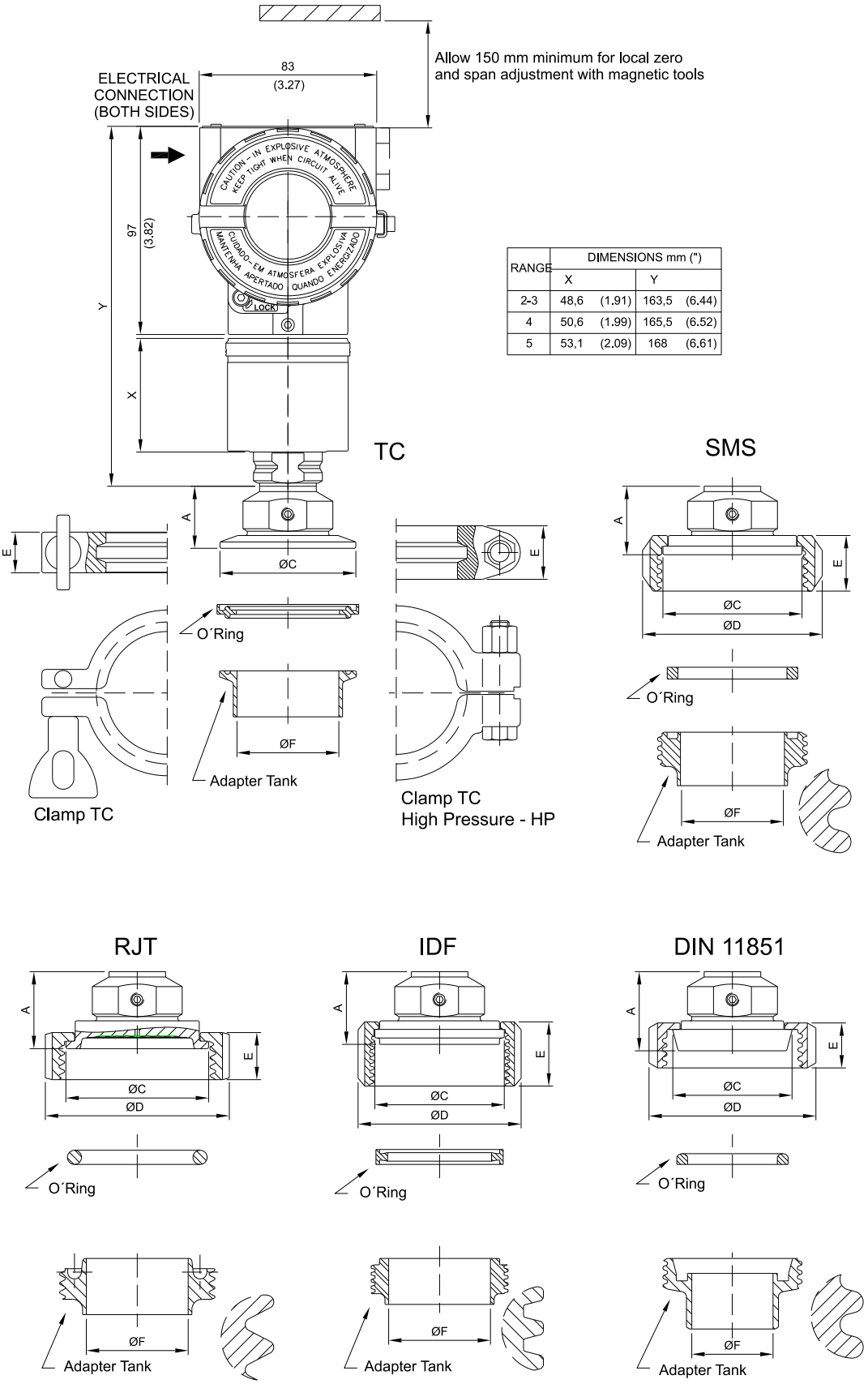
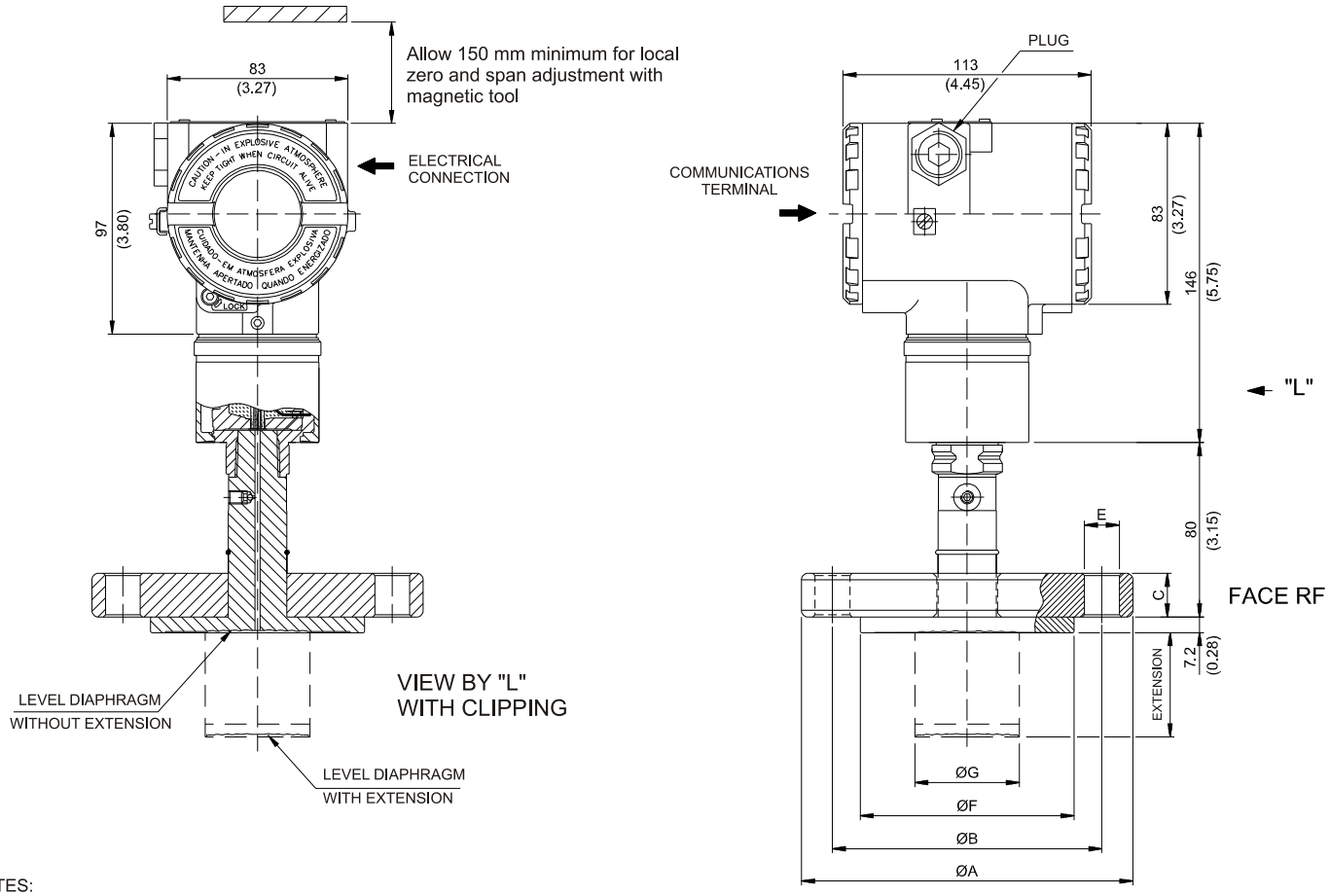


Figure 1.1 (b) - Dimensional Drawing and Mounting Position for LD292 – Sanitary

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 LD292 - Sanitary

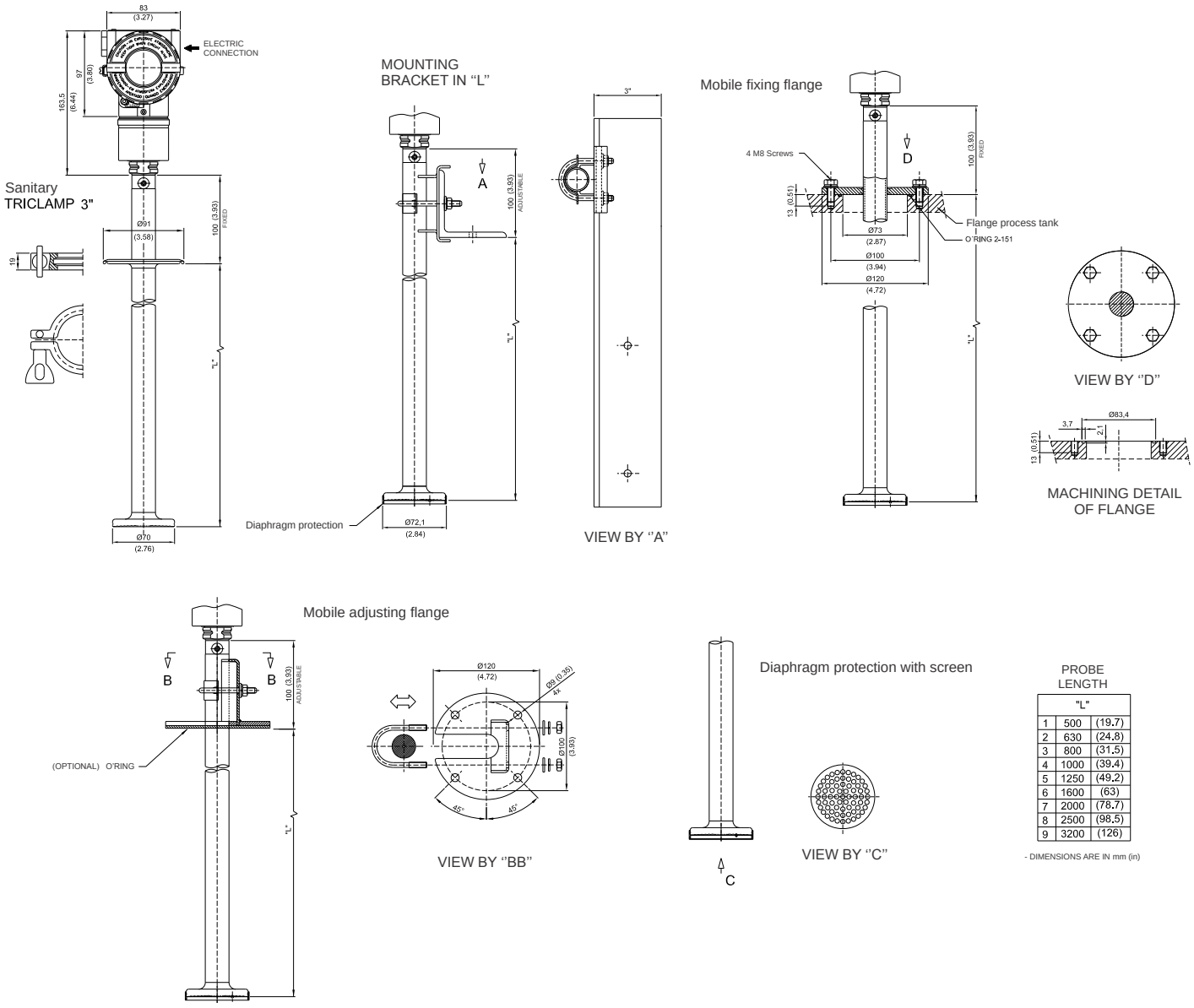


NOTES:
-EXTENSION LENGHT mm (in): 0, 50 (1.96), 100 (3.93), 150 (5.9) OR 200 (7.87)
-DIMENSIONS ARE mm (in)

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 LD292 – Level



	"L"	
1	500	(19.7)
2	630	(24.8)
3	800	(31.5)
4	1000	(39.4)
5	1250	(49.2)
6	1600	(63)
7	2000	(78.7)
8	2500	(98.5)
9	3200	(126)

Figure 1.1 (e) - Dimensional Drawing and Mounting Position for LD292 – Level (Insertion)

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

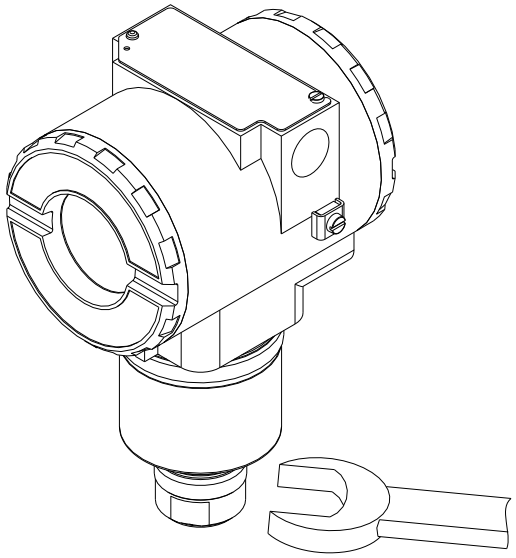


Figure 1.2 – Fixing of the Transmitter in the Tap

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

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

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

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

Process Fluid	Location of Taps	Best Location for the LD292 in Relation to the Taps
Gas	Top or Side	Above the Taps
Liquid	Side	Below the Taps or at the Piping Centrelines
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 condensation from steam or wet gases.

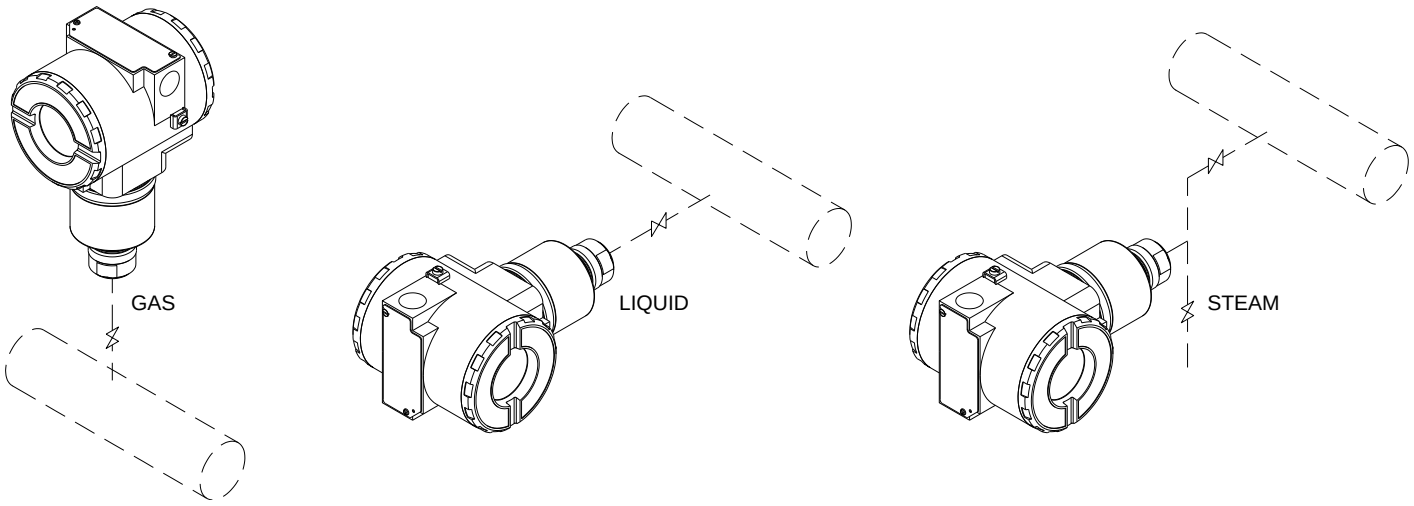
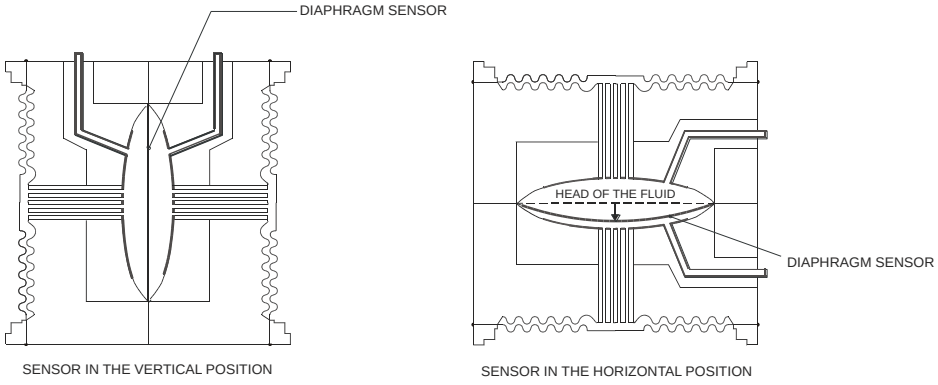


Figure 1.3 - Position of the Transmitter and Taps

NOTE

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

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



Electronic Housing

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

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

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

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

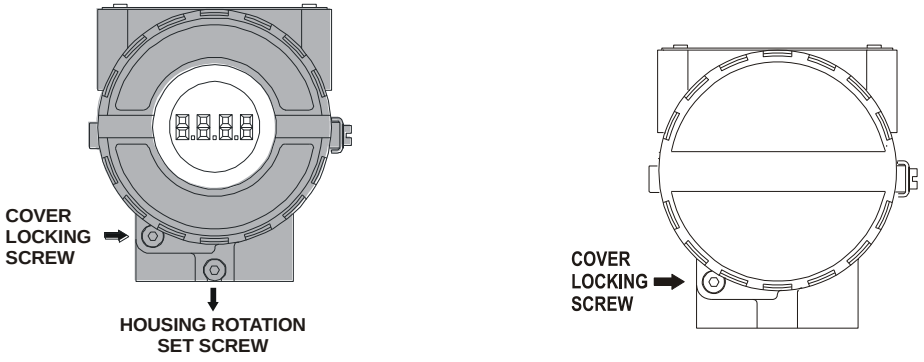


Figure 1.4 - Cover Locking and Housing Rotating Set Screw (a) Electronic Board Side (b) Terminal Connection Side

Wiring

To access the wiring block, loosen the cover locking screw to release the cover. See Figure 1.4 (b).

The **LD292** is protected against reverse polarity, and can withstand ±35 VDC without damage, and will not work if connected in reverse polarity.

For convenience there are three ground terminals: one inside the cover and two externals, located close to the conduit entries, see figure 1.5.

The **LD292** uses the 31.25 kbit/s voltage mode option for the physical signaling. All other devices on the same bus must use the same signaling. All devices are connected in parallel along the same pair of wires.

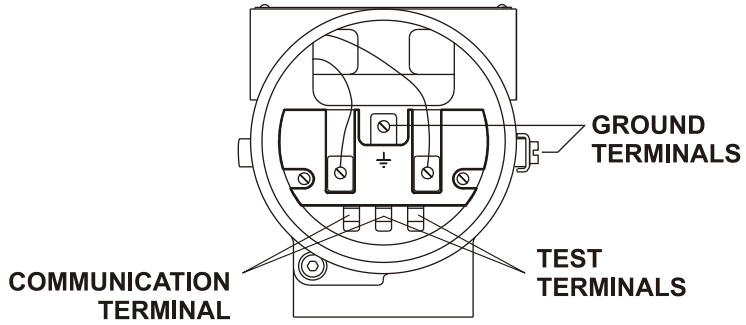


Figure 1.5 - Terminal Block

Various types of Fieldbus devices may be connected on the same bus.

The **LD292** current consumption quiescent is 12 mA.

The **LD292** is powered via the bus. The limit for such devices is 16 for one bus for non-intrinsically safe requirement.

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.

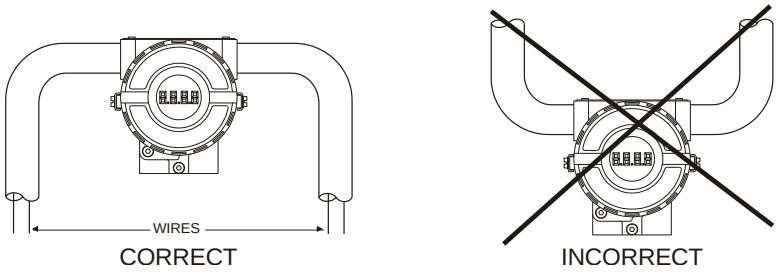


Figure 1.6 - Conduit Installation

NOTE
For more installation details please refer to the Fieldbus Installation Manual

Bus Topology and Network Configuration

Other types of cable may be used, other than for conformance testing. Cables with improved specifications may enable longer trunk length or superior interface immunity. Conversely, cables with inferior specifications may be used subject to length limitations for trunk and spurs plus possible nonconformance to the RFI/EMI susceptibility requirements. For intrinsically safe applications, the inductance/ resistance ratio (L/R) should be less than the limit specified by the local regulatory agency for the particular implementation.

Bus topology (See Figure 1.7) and tree topology (See Figure 1.8) are supported. Both types have a trunk cable with two terminations. The devices are connected to the trunk via spurs. The spurs may be integrated in the device giving zero spur length. A spur may connect more than one device, depending on the length. Active couplers may be used to extend spur length.
Active repeaters may be used to extend the trunk length.

The total cable length, including spurs, between any two devices in the Fieldbus should not exceed 1900 m.

The connection of couplers should be kept less than 15 per 250 m.

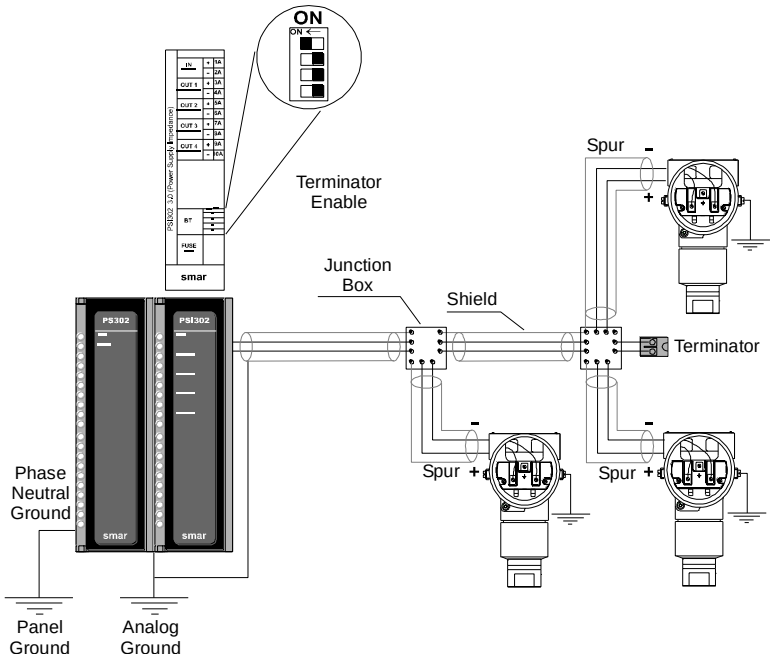


Figure 1.7 - Bus Topology

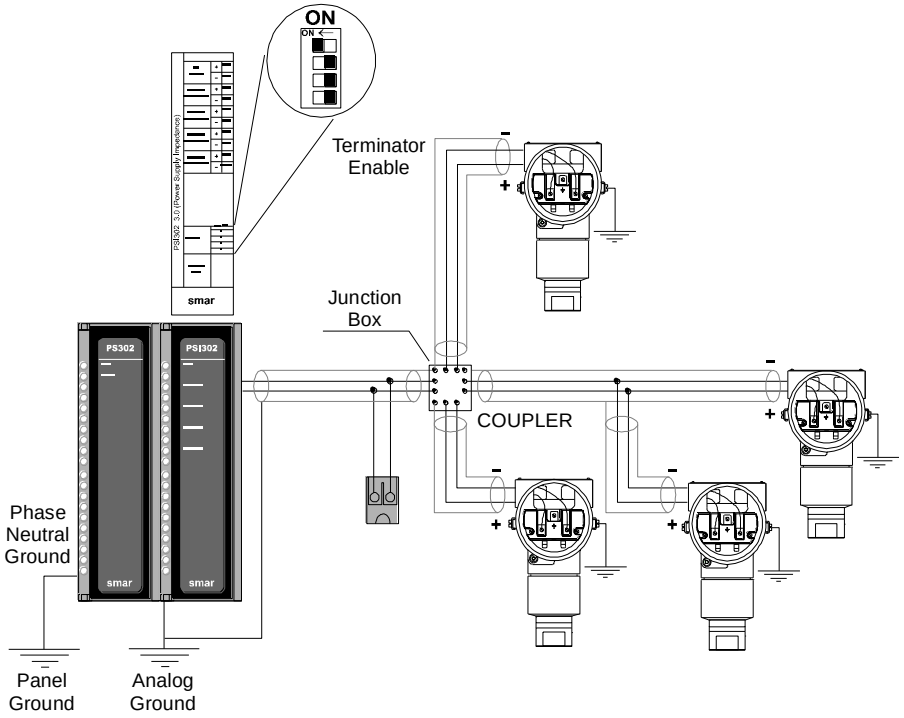


Figure 1.8 - Tree Topology

Intrinsic Safety Barrier

When the Fieldbus is in an area requiring intrinsic safety, a barrier must be inserted on the trunk between the power supply and the transmitters.

Use of **SB312LP** or **DF47** is recommended.

Jumper Configuration

In order to work properly, the jumpers J1 and W1 located in the **LD292** main board must be correctly configured (See Table 1.2).

J1	This jumper enables the simulation mode parameter in the AI block.
W1	This jumper enables the local adjustment programming tree.

Table 1.2 - Description of the Jumpers

Power Supply

The **LD292** receives power from the bus via the signal wiring. The power supply may come from a separate unit or from another device such as a controller or DCS.

The voltage should be between 9 to 32 Vdc for non-intrinsic safe applications.

A special requirement applies to the power supply used in an intrinsically safe bus and depends on the type of barrier used.

Use of **PS302** is recommended as power supply.

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 I n 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 60ºC 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 Ci and Li must be smaller than Co and Lo of the associated Apparatus.

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

OPERATION

The **LD292** Series Pressure Transmitters use capacitive sensors (capacitive cells) as pressure sensing elements, as shown in Figure 2.1. This is exactly the same sensor as the LD291 series uses, the sensor modules are therefore interchangeable.

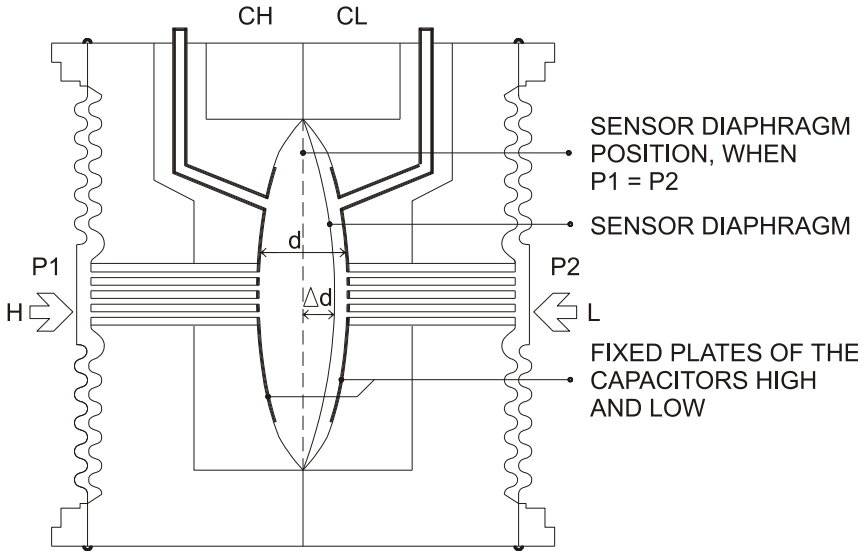


Figure 2.1 - Capacitive Cell

Functional Description - Sensor

Where,
P_1 and P_2 are the pressures and $P_1 \geq P_2$
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

$$C \approx \frac{\varepsilon \times A}{d}$$

expressed as a function of plate area (A) and distance (d) between the plates:

Where,
ε = Dielectric constant of the medium between the capacitor's plates.

$$CH \approx \frac{\varepsilon \times A}{(d/2) + \Delta d} \text{ and } \frac{\varepsilon \times A}{(d/2) - \Delta d} \approx CL$$

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

However, should the differential pressure (ΔP) applied to the capacitive cell not deflect the sensing diaphragm beyond d/4, it is possible to assume ΔP as proportional to Δd.

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

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

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 Δd 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 capacitance vary according to the applied differential pressure.

Functional Description – Electronics

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

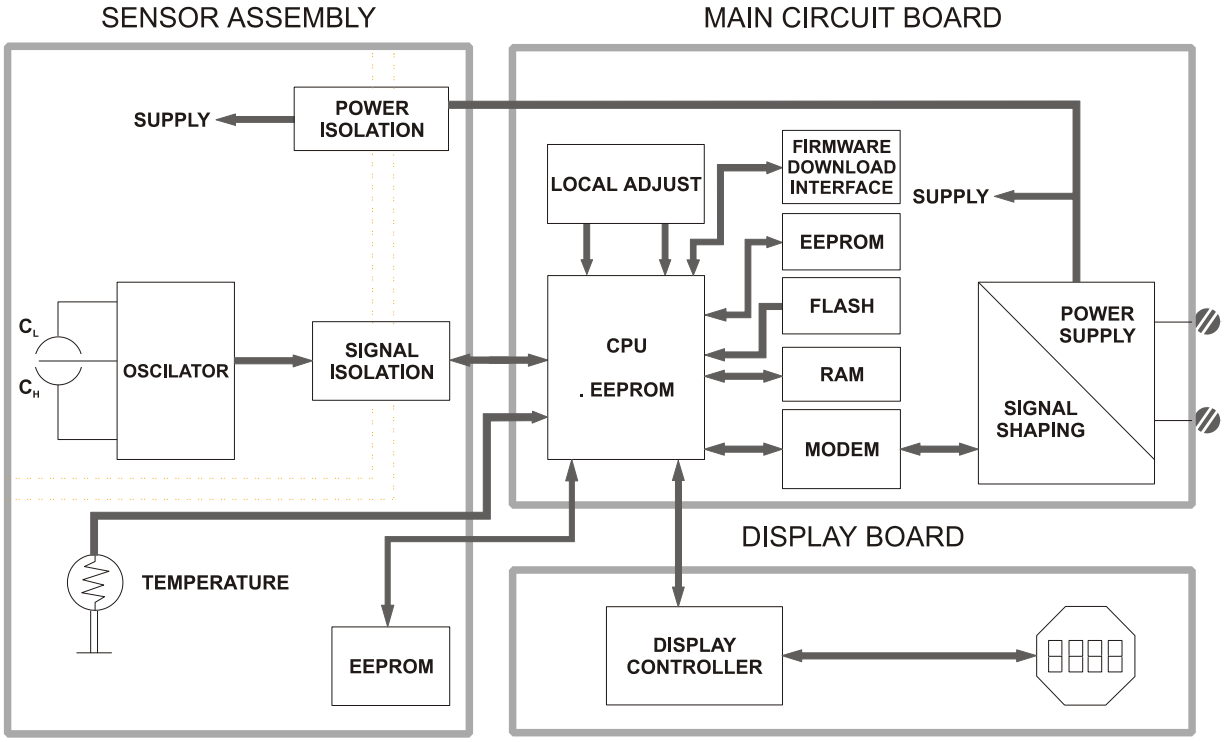


Figure 2.2 - LD292 Block Diagram Hardware

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

Signal Isolator
The control signals from the CPU and the signal from the oscillator are isolated to avoid ground loops.

Central Processing Unit (CPU), RAM, FLASH and EEPROM
The CPU is the intelligent portion of the transmitter, being responsible for the management and operation of measurement, block execution, self-diagnostics and communication. The program is stored in a FLASH memory for easy upgrade and saving data on power-down event occurrence. For temporary storage of data there is a RAM. The data in the RAM is lost if the power is switched off, however the main board has a nonvolatile EEPROM memory where the static data configured that must be retained is stored. Examples of such data are the following: calibration, links and identification data.

Sensor 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. It also contains the factory settings; they are useful in case of main board replacement, when its does an automatic upload of data from the sensor board to main board.

Fieldbus Modem
Monitors line activity, modulate and demodulate communication signals, inserts and deletes start and end delimiters, and checks integrity of frame received.

Power Supply
Takes power of the loop-line to power the transmitter circuitry.

Power Isolation
Isolates the signals to and from the input section, the power to the input section must be isolated.

Display Controller
Receives data from the CPU identifying which segments on the liquid crystal Display use to turn on. The controller drives the backplane and the segment control signals.

Local Adjustment
There are two switches that are magnetically activated. They can be activated by the magnetic tool without mechanical or electrical contact.

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 2.3.

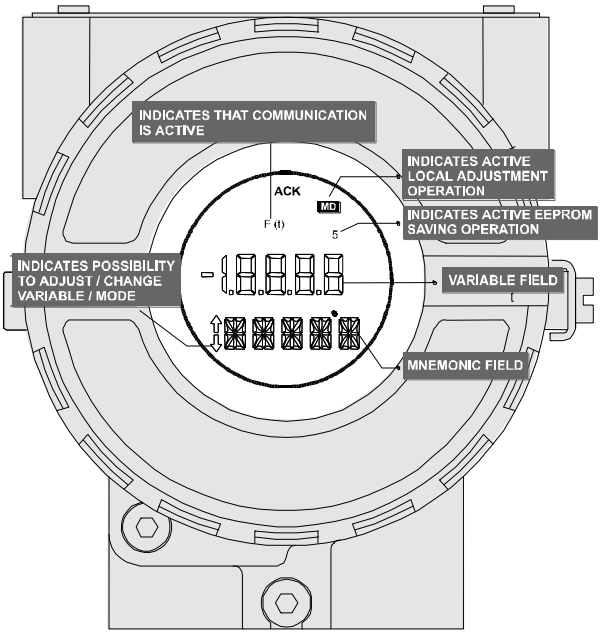


Figure 2.3 - LCD Indicator

Section 3

CONFIGURATION

One of the many advantages of Fieldbus is that device configuration is independent of the configurator. The **LD292** may be configured by a third party terminal or operator console. Any particular configurator is therefore not addressed here.

This section describes the characteristics of the blocks in the **LD292**. They follow the Fieldbus specifications, but in terms of transducer blocks, the input transducer block and display, they have some special features on top of this.

Transducer Block

Transducer block insulates function block from the specific I/O hardware, such as sensors, actuators. Transducer block controls access to I/O through manufacturer specific implementation. This permits the transducer block to execute as frequently as necessary to obtain good data from sensors without burdening the function blocks that use the data. It also insulates the function block from the manufacturer specific characteristics of certain hardware.

By accessing the hardware, the transducer block can get data from I/O or passing control data to it. The connection between Transducer block and Function block is called channel. These blocks can exchange data from its interface.

Normally, transducer blocks perform functions, such as linearization, characterization, temperature compensation, control and exchange data to hardware.

Rel. Index	Param Mnemonic	Description
1.	ST_REV	Indicates the level of static data.
2.	TAG_DESC	Description of Transducer Block.
3.	STRATEGY	This parameter is not checked and processed by Transducer Block.
4.	ALERT_KEY	Number of identification in the plant.
5.	MODE_BLK	Indicates the operation mode of Transducer Block.
6.	BLOCK_ERR	Indicates the status associated with hardware or software in theTransducer.
7.	UPDATE_EVT	It is the alert for any static data.
8.	BLOCK_ALM	It is used for configuration, hardware and others fails.
9.	TRANSDUCER_DIRECTORY	It is used to select several Transducer Blocks.
10.	TRANSDUCER_TYPE	Indicates the type of Transducer according to its class.
11.	XD_ERROR	It is used to indicate calibration status.
12.	COLLECTION_DIRECTORY	Specifies the number of transducer index into Transducer Block.
13.	PRIMARY_VALUE_TYPE	Defines the calculation type for Transducer Block.
14.	PRIMARY_VALUE	It is the value and status used by channel.
15.	PRIMARY_VALUE_RANGE	The High and Low range limit values, the engineering unit code and the number of digits to the right of the decimal point to be used for Primary Value.
16.	CAL_POINT_HI	The highest calibrated value.
17.	CAL_POINT_LO	The lowest calibrated value.
18.	CAL_MIN_SPAN	The minimum calibration span value allowed. This minimum span information is necessary to ensure that when calibration is done, the two calibrated points (high and low) are not too close together.
19.	CAL_UNIT	The Device Description engineering units code index for the calibration values.
20.	SENSOR_TYPE	The type of sensor.
21.	SENSOR_RANGE	The range of sensor.
22.	SENSOR_SN	The serial number of sensor.
23.	SENSOR_CAL_METHOD	The method of last sensor calibration. ISO defines several standard methods of calibration. This parameter is intended to record that method, or if some other method was used.

Rel. Index	Param Mnemonic	Description
24.	SENSOR_CAL_LOC	The location of last sensor calibration. This describes the physical location at which the calibration was performed.
25.	SENSOR_CAL_DATE	The date of the last sensor calibration.
26.	SENSOR_CAL_WHO	The name of person who is in charge of last calibration.
27.	SENSOR_ISOLATION_MTL	Defines the construction material of the isolating diaphragms.
28.	SENSOR_FLUID	Defines the type of fill fluid used in the sensor
29.	SECONDARY_VALUE	The secondary value (temperature value), related to the sensor.
30.	SECONDARY_VALUE_UNIT	The engineering units to be used with SECONDARY_VALUE.
31.	PRESS_LIN_NORMAL	The Linear Normalized Pressure value.
32.	PRESS_NORMAL	The Normalized Pressure value.
33.	PRESS_CUTOFF	The Cutoff Pressure value.
34.	CUTOFF_FLAG	The bypass flag for Pressure value.
35.	DIGITAL_TEMPERATURE	The digital temperature value.
36.	DIFF	The differential pressure value.
37.	YDIFF	The y differential pressure value.
38.	CAPACITANCE_LOW	The low capacitance value.
39.	CAPACITANCE_HIGH	The high capacitance value.
40.	BACKUP_RESTORE	This parameter is used to do backup or to restore configuration data.
41.	SENSOR_RANGE_CODE	Indicates the sensor range code.
42.	COEFF_POL0	The polynomial coefficient 0.
43.	COEFF_POL1	The polynomial coefficient 1.
44.	COEFF_POL2	The polynomial coefficient 2.
45.	COEFF_POL3	The polynomial coefficient 3.
46.	COEFF_POL4	The polynomial coefficient 4.
47.	COEFF_POL5	The polynomial coefficient 5.
48.	COEFF_POL6	The polynomial coefficient 6.
49.	COEFF_POL7	The polynomial coefficient 7.
50.	COEFF_POL8	The polynomial coefficient 8.
51.	COEFF_POL9	The polynomial coefficient 9.
52.	COEFF_POL10	The polynomial coefficient 10.
53.	COEFF_POL11	The polynomial coefficient 11.
54.	POLYNOMIAL_VERSION	Indicates the polynomial version.
55.	CHARACTERIZATION_TYPE	Indicates the type of characterization curve.
56.	CURVE _BYPASS_LD	Enable and disable the characterization curve.
57.	CURVE_LENGTH	Indicates the length of characterization curve.
58.	CURVE_X	Input points of characterization curve.
59.	CURVE_Y	Output points of characterization curve.
60.	CAL_POINT_HI_BACKUP	Indicates the backup for high calibration point.
61.	CAL_POINT_LO_ BACKUP	Indicates the backup for low calibration point.
62.	CAL_POINT_HI_FACTORY	Indicates the factory high calibration point.
63.	CAL_POINT_LO_FACTORY	Indicates the factory low calibration point.
64.	CAL_TEMPERATURE	Defines the temperature calibration point.
65.	DATASHEET	Indicates information about the sensor.
66.	ORDERING_CODE	Indicates information about the sensor and control from factory production.
67.	MAXIMUM_MEASURED_PRESSURE	Indicates the maximum pressure measured
68.	MAXIMUM_MEASURED_TEMPERATURE	Indicates the maximum temperature measured
69.	ACTUAL_OFFSET	Indicates the actual calibrated offset
70.	ACTUAL_SPAN	Indicates the actual span offset

Rel. Index	Param Mnemonic	Description
71.	MAXIMUM_OFFSET_DEVIATION	Defines the maximum offset before an alarm is generate
72.	MAXIMUM_GAIN_DEVIATION	Defines the maximum gain before an alarm is generate
73.	OVERPRESSURE_LIMIT	Defines the maximum overpressure limit before an alarm is generate
74.	MAXIMUM_NUMBER_OF_OVERPRESSURE	Defines the maximum number of overpressure before an alarm is generate

Rel. Index	Param Mnemonic	Obj. Type	Data Type	Store	Size	Valid Range	Initial/ Default Value	Units	Class	View
1.	ST_REV	S	Unsigned16	S	2	Positive	0	none	R/W	1,2,3,4
2.	TAG_DESC	S	VisibleString	S	32		TRD BLOCK	na	R/W	
3.	STRATEGY	S	Unsigned16	S	2		0	none	R/W	4
4.	ALERT_KEY	S	Unsigned8	S	1	1-255	0	na	R/W	4
5.	MODE_BLK	R	DS-69	S	4	OS,AUTO	O/S	none	R/W	1,3
6.	BLOCK_ERR	S	Bit String	D	2			E	R	1,3
7.	UPDATE_EVT	R	DS-73	D	5			na	R	
8.	BLOCK_ALM	R	DS-72	D	13			na	R	
9.	TRANSDUCER_DIRECTORY	S	Array of Unsigned16	N	Variable			none	R	
10.	TRANSDUCER_TYPE	S	Unsigned16	N	2		100	none	R	1,2,3,4
11.	XD_ERROR	S	Unsigned8	D	1		0	none	R	1,3
12.	COLLECTION_DIRECTORY	S	Array of Unsigned 32	S	Variable			None	R	
13.	PRIMARY_VALUE_TYPE	S	Unsigned16	S	2		107	None	R/W	2
14.	PRIMARY_VALUE	R	DS-65	D	5		0	XD_SCALE	R	1,3
15.	PRIMARY_VALUE_RANGE	R	DS-68	S	11	0-100%		XD_SCALE	R	4
16.	CAL_POINT_HI	S	Float	S	4		5080.0	CAL_UNIT	R/W	2
17.	CAL_POINT_LO	S	Float	S	4		0.0	CAL_UNIT	R/W	2
18.	CAL_MIN_SPAN	S	Float	S	4	URL/40 to URL	0.0	CAL_UNIT	R	4
19.	CAL_UNIT	S	Unsigned16	S	2		1149	E	R	4
20.	SENSOR_TYPE	S	Unsigned16	S	1		117	na	R/W	4
21.	SENSOR_RANGE	R	DS-68	S	11		0-100%	XD_SCALE	R	4
22.	SENSOR_SN	S	Unsigned32	S	4	0 to 2^{32}	0	None	R/W	4
23.	SENSOR_CAL_METHOD	S	Unsigned8	S	1		103	none	R/W	4
24.	SENSOR_CAL_LOC	S	VisibleString	S	32		NULL	none	R/W	
25.	SENSOR_CAL_DATE	S	Time of Day	S	7			none	R/W	
26.	SENSOR_CAL_WHO	S	VisibleString	S	32		NULL	none	R/W	
27.	SENSOR_ISOLATION_MTL	S	Unsigned16	S	2		2	none	R/W	4
28.	SENSOR_FLUID	S	Unsigned16	S	2		1	none	R/W	4
29.	SECONDARY_VALUE	R	DS-65	D	5		0	SVU	R	1,3
30.	SECONDARY_VALUE_UNIT	S	Unsigned16	S	2		1001	E	R	2
31.	PRESS_LIN_NORMAL	R	DS-65	D	5	± 1	0	none	R	3
32.	PRESS_NORMAL	R	DS-65	D	5	± 1	0	none	R	3
33.	PRESS_CUTOFF	R	DS-65	D	5	± 1	0	none	R	
34.	CUTOFF_FLAG	S	Unsigned8	S	1	True/False	True	none	R/W	
35.	DIGITAL_TEMPERATURE	R	DS-65	D	5	0-255	0	none	R	3

Rel. Index	Param Mnemonic	Obj. Type	Data Type	Store	Size	Valid Range	Initial/ Default Value	Units	Class	View
36.	DIFF	S	Float	D	4		0	none	R	3
37.	YDIFF	S	Float	D	4		0	none	R	3
38.	CAPACITANCE_LOW	S	Float	D	4		0	none	R	3
39.	CAPACITANCE_HIGH	S	Float	D	4		0	none	R	3
40.	BACKUP_RESTORE	S	Unsigned8	S	1		0	none	R/W	4
41.	SENSOR_RANGE_CODE	S	Unsigned16	S	2		1	none	R/W	4
42.	COEFF_POL0	S	Float	S	4	± INF	-1	none	R/W	4
43.	COEFF_POL1	S	Float	S	4	± INF	0	none	R/W	4
44.	COEFF_POL2	S	Float	S	4	± INF	1	none	R/W	4
45.	COEFF_POL3	S	Float	S	4	± INF	0	none	R/W	4
46.	COEFF_POL4	S	Float	S	4	± INF	2	none	R/W	4
47.	COEFF_POL5	S	Float	S	4	± INF	0	none	R/W	4
48.	COEFF_POL6	S	Float	S	4	± INF	0	none	R/W	4
49.	COEFF_POL7	S	Float	S	4	± INF	0	none	R/W	4
50.	COEFF_POL8	S	Float	S	4	± INF	0	none	R/W	4
51.	COEFF_POL9	S	Float	S	4	± INF	0	none	R/W	4
52.	COEFF_POL10	S	Float	S	4	± INF	0	none	R/W	4
53.	COEFF_POL11	S	Float	S	4	± INF	25	none	R/W	4
54.	POLYNOMIAL_VERSION	S	Unsigned8	S	1	30h to FFh	32	None	R/W	4
55.	CHARACTERIZATION_TYPE	S	Unsigned8	S	1		255	None		2
56.	CURVE _BYPASS_LD	S	Unsigned16	S	2		Enable& Backup	None	R/W	2
57.	CURVE_LENGTH	S	Unsigned8	S	1	2 to 5	5	None	R/W	2
58.	CURVE_X	R	Array of Float	S	20			None	R/W	2
59.	CURVE_Y	R	Array of Float	S	20			None	R/W	2
60.	CAL_POINT_HI_BAKUP	S	Float	S	4		5080	CAL_UNIT	R	2
61.	CAL_POINT_LO_BAKUP	S	Float	S	4		0	CAL_UNIT	R	2
62.	CAL_POINT_HI_FACTORY	S	Float	S	4		5080	CAL_UNIT	R	
63.	CAL_POINT_LO_FACTORY	S	Float	S	4		0	CAL_UNIT	R	
64.	CAL_TEMPERATURE	S	Float	S	4	-40 a 85 °C	17.496	°C	R/W	
65.	DATASHEET	R	Array of Unsigned8	S	10			None	R/W	
66.	ORDERING_CODE	S	VisibleString	S	50		NULL	None	R/W	
67.	MAXIMUM_MEASURED_PRESSURE	S	Float	S	4	± INF	- INF	none	R/w	
68.	MAXIMUM_MEASURED_TEMPERATURE	S	Float	S	4	± INF	- INF	none	R/W	
69.	ACTUAL_OFFSET	S	Float	S	4	± INF		none	R	
70.	ACTUAL_SPAN	S	Float	S	4	± INF		none	R	
71.	MAXIMUM_OFFSET_DEVIATION	S	Float	S	4	± INF	0.5	none	R/W	
72.	MAXIMUM_GAIN_DEVIATION	S	Float	S	4	± INF	2.0	none	R/W	
73.	OVERPRESSURE_LIMIT	S	Float	S	4	± INF	+ INF	none	R/W	
74.	MAXIMUM_NUMBER_OF_OVERPRESSURE	S	Float	S	4	± INF	0	none	R/W	

How to Configure a Transducer Block

Each time when you select a field device on **SYSCON** by instantiating on the Operation menu, automatically you instantiate one transducer block and it appears on screen.

The icon indicates that one transducer block has been created and by clicking twice on the icon, you can access it.

The transducer block has an algorithm, a set of contained parameters and a channel connecting it to a function block.

The algorithm describes the behavior of the transducer as a data transfer function between the I/O hardware and other function block. The set of contained parameters, it means, you are not able to link them to other blocks and publish the link via communication, defines the user interface to the transducer block. They can be divided into Standard and Manufacturer Specific.

The standard parameters will be present for such class of device, as pressure, temperature, actuator, etc., whatever is the manufacturer. Oppositely, the manufacturers specific ones are defined only for its manufacturer. As common manufacturer specific parameters, we have calibration settings, material information, linearization curve, etc.

When you perform a standard routine as a calibration, you are conducted step by step by a method. The method is generally defined as guide line to help the user to make common tasks. The **SYSCON** identifies each method associated to the parameters and enables the interface to it.

The SYSCON configuration software can configure many parameters of the Input Transducer block.

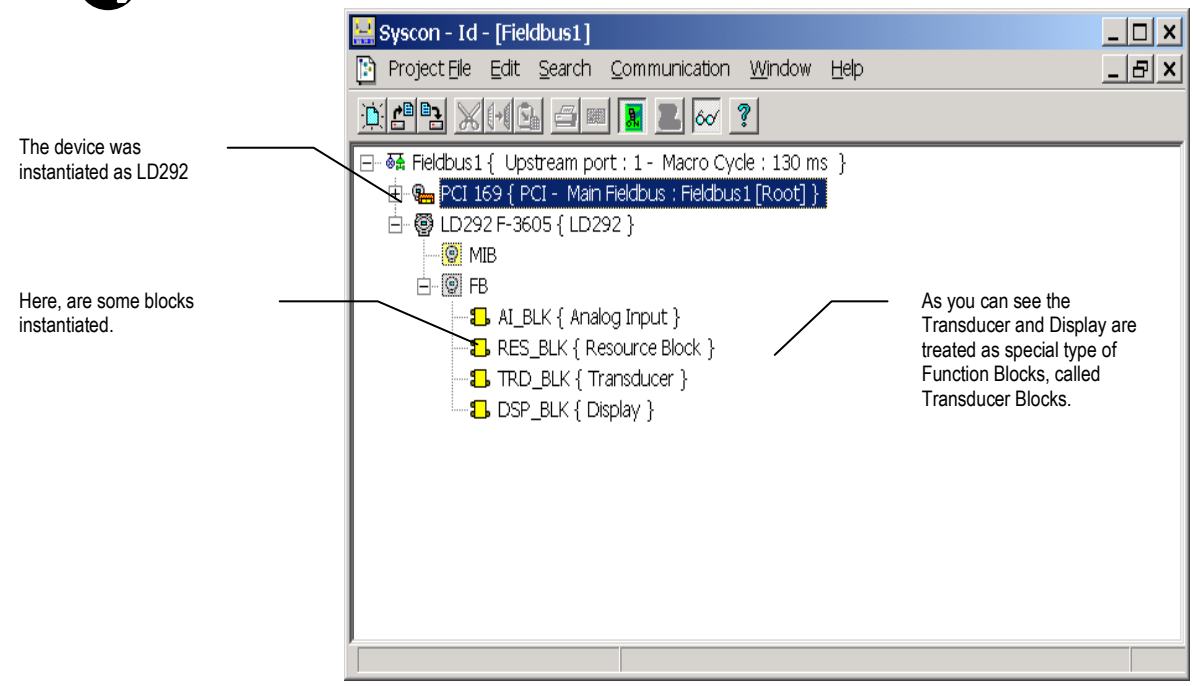


Figure 3.1 - Function and Transducers Blocks

Lower and Upper Trim

Each sensor has a characteristic curve that establishes a relation between the applied pressure and the sensor signal. This curve is determined for each sensor and it is stored in a memory together with the sensor. When the sensor is connected to the transmitter circuit, the content of its memory is made available to the microprocessor.

Sometimes the value on the transmitter display and transducer block reading may not match the applied pressure.
The reasons may be:

- The transmitter mounting position.
- The user's pressure standard differs from the factory standard.
- The transmitter had its original characterization shifted by over pressurization, over heating or by long term drift.

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.

The **TRIM** is used to match the reading with the applied pressure.
There are three types of trim available:
Lower Trim: It is used to trim the reading at the lower range. The operator informs the **LD292** the correct reading for the applied pressure. The most common discrepancy is the lower reading.

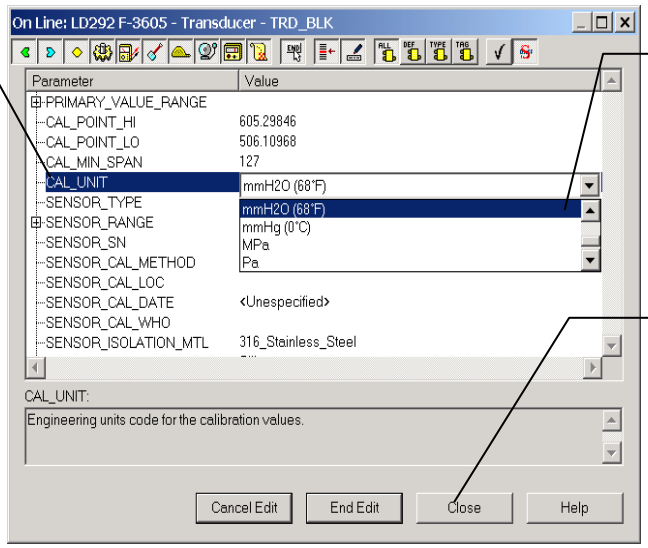
Upper Trim: It is used to trim the reading at the upper range. The operator informs the correct reading to **LD292** for the applied pressure.

For best accuracy, trim should be done at the operating range. The Figure 3.2 - LD292 SYSCON – Transducer Configuration Screen, Figure 3.3 - LD292 SYSCON - Transducer Configuration Screen and Figure 3.4 - LD292 SYSCON - Transducer Configuration Screen below show the trim adjustment operation into SYSCON.

Pressure Trim - LD292

Via SYSCON
It is possible to calibrate the transmitter by means of parameters CAL_POINT_LO and CAL_POINT_HI.
First of all, a convenient engineering unit should be chosen before starting the calibration. This engineering unit is configured by CAL_UNIT parameter. After its configuration the parameters related to calibration will be converted to this unit.

The parameter CAL_UNIT should be configured according to the Engineering Unit wished for calibrating the device.



The Engineering Units can be choosen from the Pressure Units list box.

After the selection this key should be pressed to complete the operation

Figure 3.2 - LD292 SYSCON – Transducer Configuration Screen

There are the following engineering units for pressure according to Foundation Fieldbus® standard:

Units	Code
inH_2O a 68 °F	1148
inHg a 0 °C	1156
ftH_2O a 68 °F	1154
mmH_2O a 68 °F	1151
mmHg a 0 °C	1158
psi	1141
bar	1137
mbar	1138
g/cm^2	1144
k/cm^2	1145
Pa	1130
kPa	1133
torr	1139
atm	1140
MPa	1132
inH_2O a 4 °C	1147
mmH_2O a 4 °C	1150

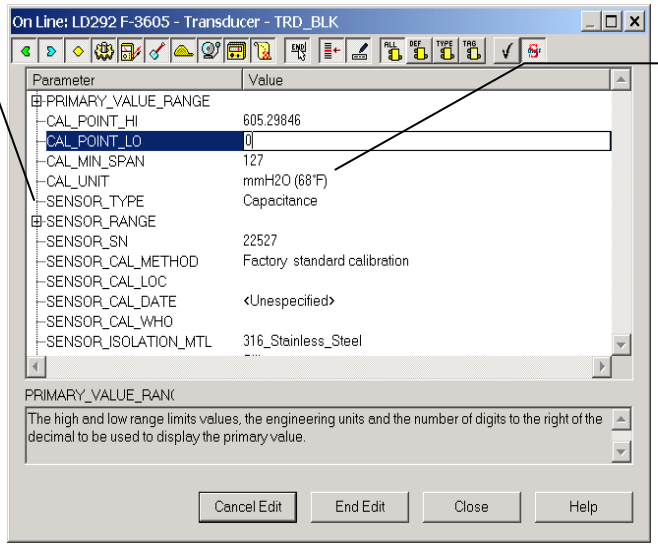
Table 3.3 - Engineering Units for Pressure

CAL_UNIT allows the user to select different units for calibration purposes than the units defined by SENSOR_RANGE. The SENSOR_RANGE parameter defines the maximum and minimum values the sensor is capable of indicating, the engineering units used, and the decimal point.

Let's take the lower value as an example:
Apply to the input zero or the pressure lower value in an engineering unit, this being the same used in parameter CAL_UNIT, and wait until the readout of parameter PRIMARY_VALUE stabilizes.

Write zero or the lower value in parameter CAL_POINT_LO. For each value written a calibration is performed at the desired point.

The Lower Range Value should be entered. This value must be inside of the Sensor range limits allowed for each type of sensor.

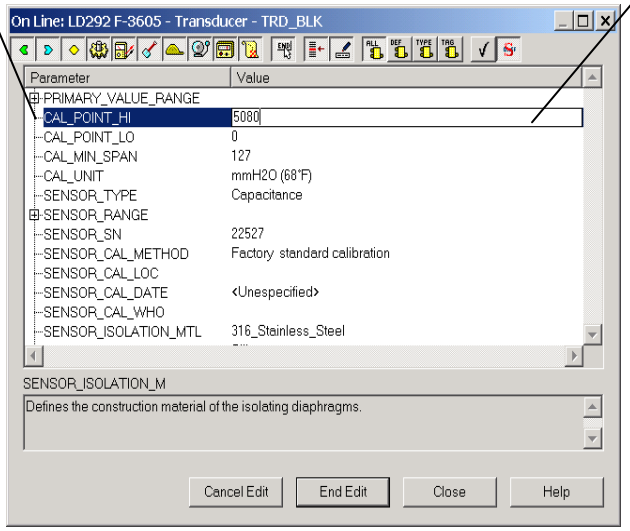


For its case, a sensor range 2 is used: The URL is 605.29846 mmH2O or 24.21193 inH2O.

Figure 3.3 - LD292 SYSCON - Transducer Configuration Screen

Let's take the upper value as an example:
Apply to the input as the upper value a pressure of 5,080mmH_2O and wait until the readout of parameter PRIMARY_VALUE stabilizes. Then, write the upper value as, for example, 5,000mmH_2O in parameter CAL_POINT_HI. For each value written a calibration is performed at the desired point.

The Upper Range Value should be entered. This value must be inside of the Sensor range limits allowed for each type of sensor.



For its case, a sensor range 2 is used: The URL is 5080 mmH2O or 200 inH2O.

Figure 3.4 - LD292 SYSCON - Transducer Configuration Screen

WARNING
It is recommendable that a convenient engineering unit be chosen by means of parameter XD_SCALE of the Analog Input Block, considering that the range limits of the sensor must be respected, these being 100% and 0%. It is also recommendable, for every new calibration, to save existing trim data in parameters CAL_POINT_LO_BACKUP and CAL_POINT_HI_BACKUP, by means of parameter BACKUP_RESTORE, using option LAST_TRIM_BACKUP.

Via Local Adjustment

In order to enter the local adjustment mode, place the magnetic tool in office “Z” until flag “MD” lights up in the display. Remove the magnetic tool from “Z” and place it in orifice “S”. Remove and reinsert the magnetic tool in “S” until the message “LOC ADJ” is displayed. The message will be displayed during approximately 5 seconds after the user removes the magnetic tool from “S”. Let’s take the upper value as an example:

Apply to the input a pressure of 5,000mmH_2O.
Wait until the pressure of readout of parameter P_VAL (PRIMARY_VALUE) stabilizes and then actuates parameter UPPER until it reads 5,000.

NOTE
Trim mode exit via local adjustment occurs automatically should the magnetic tool not be used during approximately 16 seconds. Keep in that even when parameters LOWER or UPPER already present the desired value, they must be actuated so that calibration is performed.

Limit Conditions for Calibration:
For every writing operation in the transducer blocks there is an indication for the operation associate with the waiting method. These codes appear in parameter XD_ERROR. Every time a calibration is performed. Code 0, for example, indicates a successfully performed operation.

Upper:
SENSOR_RANGE_EUO < NEW_UPPER < SENSOR_RANGE_EU100 * 1.25
Otherwise, XD_ERROR = 26.
(NEW_UPPER - PRIMARY_VALUE) < SENSOR_RANGE_EU100 * 0.1
Otherwise, XD_ERROR = 27.
(NEW_UPPER - CAL_POINT_LO) >CAL_MIN_SPAN * 0,75
Otherwise, XD_ERROR = 26.

NOTE
Codes for XD_ERROR: Default Value Set Out of Range. Invalid Calibration Request. Excessive Correction.

Characterization Trim

It is used to correct the sensor reading in several points.

Use an accurate and stable pressure source, preferably a dead-weight tester, to guarantee the accuracy must be at least three times better than the transmitter accuracy. Wait for the pressure to stabilize before performing trim.

The sensor characteristic curve at a certain temperature and for certain ranges may be slightly nonlinear. This eventual non-linearity may be corrected through the Characterization Trim.

The user may characterize the transmitter throughout the operating range, obtaining even better accuracy.

The characterization is determined from two up to five points. Just apply the pressure and tell the transmitter the pressure that is being applied.

WARNING
The characterization trim changes the transmitter characteristics. Read the instructions carefully and certify that a pressure standard with accuracy 0.03% or better is being used, otherwise the transmitter accuracy will be seriously affected.

Characterize a minimum of two points. These points will define the characterization curve. The maximum number of points is five. It is recommended to select the points equally distributed over the desired range or over a part of the range where more accuracy is required.

The Figure 3.5 - The Characterization Curve Configuration shows the window of SYSCON to characterize a new curve. Note that CURVE_X indicates the applied pressure according to standard pressure source and CURVEX_Y indicates measured pressure value to **LD292.**

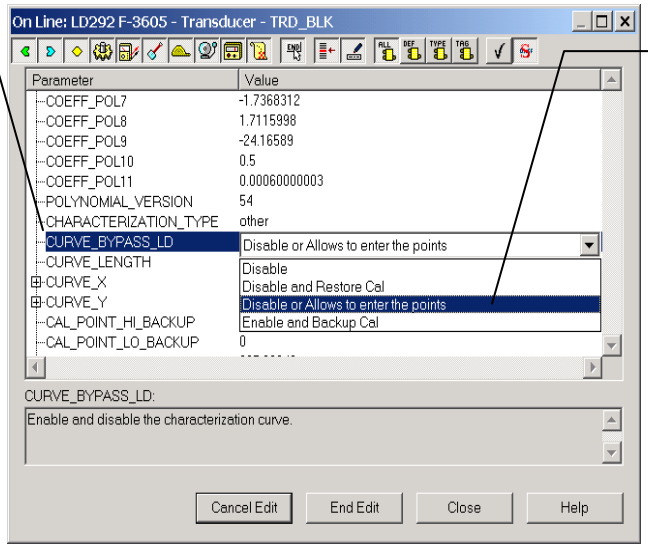
The number of points is configured in parameter CURVE_LENGTH, being in the maximum 5 points. The entry points will be configured in the CURVE_X and of output in the CURVE_Y.

The Parameter CURVE_BYPASS_LD controls the enabling/disabling of the curve and has the following options:

- "Enable and Restore Cal ",
- "Enable and Backup Cal " ,
- "Disable and Restore Cal " ,
- "Disable or Allows to enter the points"

To configure the points of the curve, the option "**Disable or Allows to enter the points** " must be choosen. Apply the desired pressure and wait that the same one stabilizes. When stabilizing to read the pressure normalized through parameter PRESS_NORMAL and then to write in CURVE_X and CURVE_Y, the normalized pressure and the applied pressure, respectively. Finally is necessary to write in the CURVE_LENGTH parameter, the number of configured points, from 2 to 5 points. In case you do not desire to qualify the curve, please, choose the option " Disable and Restore Cal". For enabling and save the calibration settings, please, choose "Enable and Backup Cal".

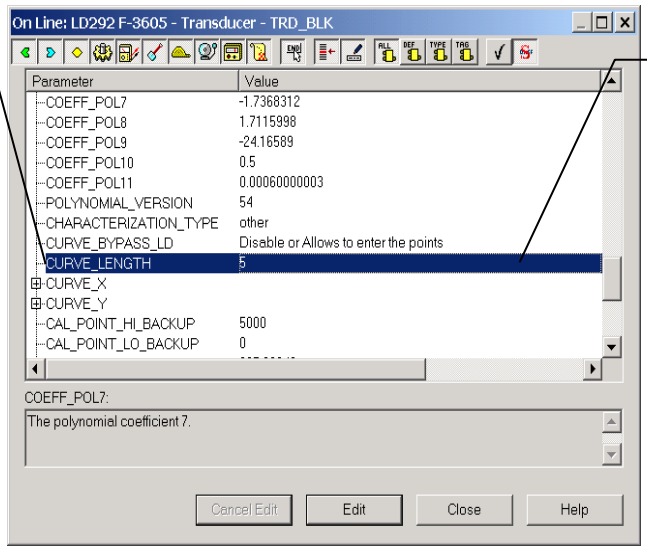
This parameter activates or deactivates the Characterization Curve after the points have been configured.



By the list box the user can enable or disable the Characterization Curve, enter the points, restore or backup the curve entered. This parameter should be used preferable by a method of calibration.

Figure 3.5 - The Characterization Curve Configuration

This parameter identifies the number of valid points.



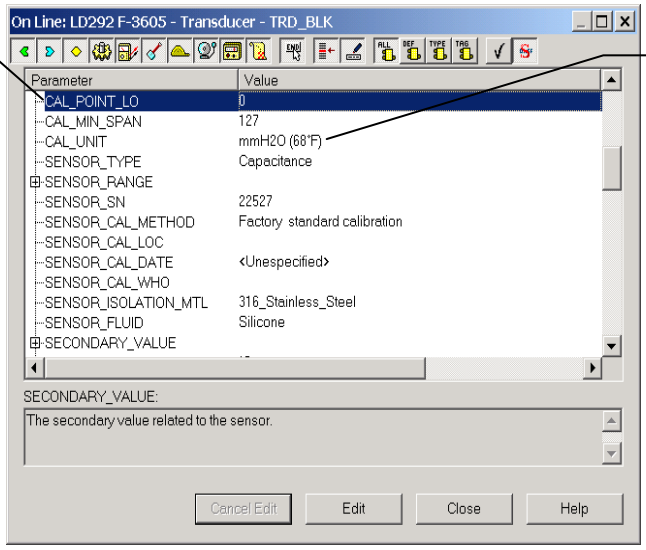
Its Characterization Curve can have a minimum of 2 and up to 5 points. These points should be between the calibrated range for better results.

Figure 3.6 - The Characterization Curve Configuration

Sensor Information

The main information about the transmitter can be accessed selecting the Transducer block icon option as shown on the *Figure 3.10 – Creating Transducers and Function Blocks*. The sensor information will be displayed as shown below.

This parameter assigns the E.U. for all parameters related to calibration methods. Normally, they start their names with CAL_



The appropriate calibration unit can be chosen by selecting the Engineering Units available for each type of Transducer Block

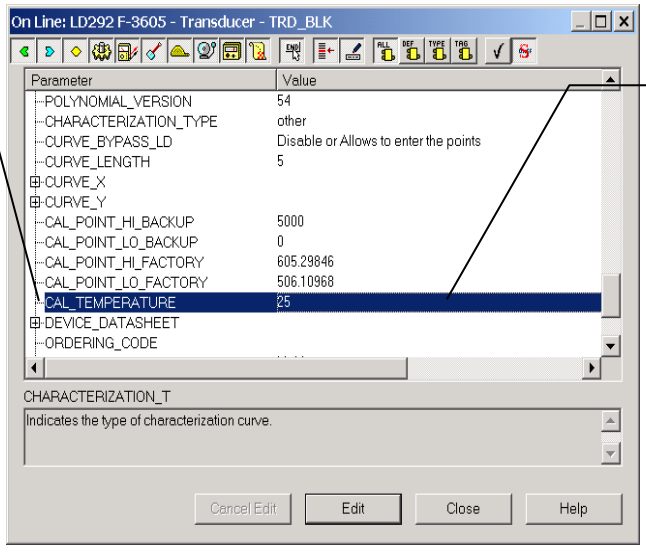
Figure 3.7 - Transducer Block - Sensor Information

Only application dependent options defined by combo boxes can be changed. (E.g. Flange Type, O' Ring Material, etc.) And the others are only factory configured (e.g. Sensor Isolating Diaphragm, Sensor Fluid, etc.).

Temperature Trim

Write in parameter TEMPERATURE_TRIM any value in the range -40°C to +85°C. After that, check the calibration performance using parameter SECONDARY_ VALUE.

By adjusting this parameter to the current temperature, the device's temperature indication is adjusted.



Normally, its operation is done by a method in the factory.

Figure 3.8 - The Temperature Trim Configuration

Sensor Data Reading

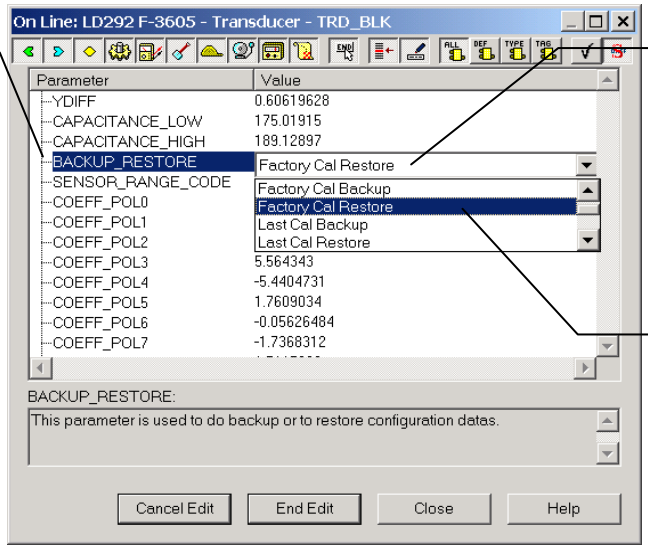
All time that transmitter **LD292** is on, is verified if the serial number of the sensor in the sensor board is the same that the recorded serial number in E2PROM in the main board. When these numbers are different (a swap of sensor set or main board was carried through) the data stored in the E2PROM of sensor board is copied to the E2PROM of the main board.

Through the parameter BACKUP_RESTORE, also this reading can be made, choosing the option "SENSOR_DATA_RESTORE". The operation, in this case, is made independent of the sensor serial number. Through the option "SENSOR_DATA_BACKUP", the sensor data stored in the main board Eeprom memory can be saved in the E2PROM of the sensor board. (This operation is done at factory).

Through this parameter, we can recover default data from factory about sensor and last saved calibration settings, as well as making the rescue of calibrations. We have the following options:

- **Factory Cal Restore:** Recover last calibration settings made at factory;
- **Last Cal Restore:** Recover last calibration settings made by user and saved as backup;
- **Default Data Restore:** Restore all data as default;
- **Sensor Data Restore:** Restore sensor data saved in the sensor board and copy them to main board Eeprom memory.
- **Factory Cal Backup:** Copy the actual calibration settings to the factory ones;
- **Last Cal Backup:** Copy the actual calibration settings to the backup ones;
- **Sensor Data Backup:** Copy the sensor data at main board Eeprom memory to the Eeprom memory located at the sensor board;
- **None:** Default value, no action is done.

This parameter is used to save or restore the default, factory or user configuration stored at the sensor module.



By selecting the options contained in the list box, operations of backup and restore data in the sensor module can be selected.

Using its option, the user can save his last calibration settings.

Figure 3.9 - Transducer Block - Backup/Restore

Transducer Display – Configuration

Using the SYSCON is possible to configure the Display Transducer block. As the name described it is a transducer due the interfacing of its block with the LCD hardware.

The Transducer Display is treated as a normal block by **SYSCON**. It means, this block has some parameters and those ones can be configured according to customer's needs. (See the *Figure 3.10 – Creating Transducers and Function Blocks*).

The customer can choose the parameters to be shown at LCD display, they can be parameters just for monitoring purpose or for acting locally in the field devices by using a magnetic tool.

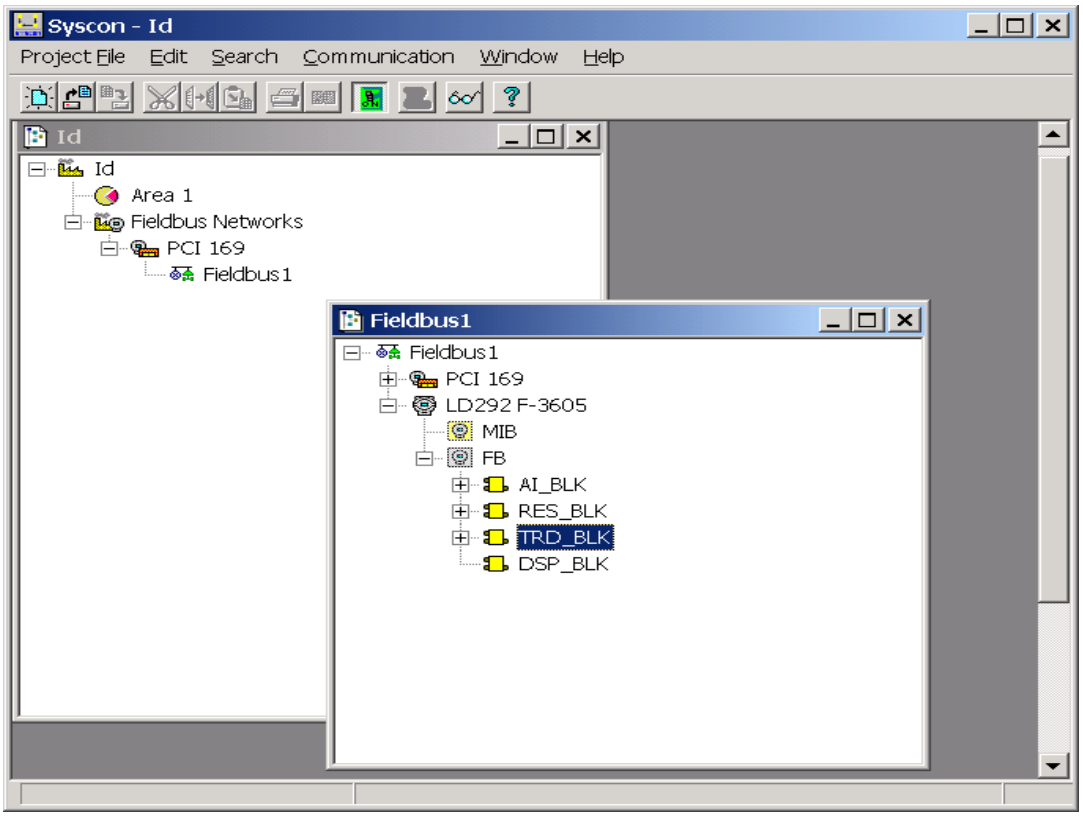


Figure 3.10 – Creating Transducers and Function Blocks

Display Transducer Block

The local adjustment is completely configured by **SYSCON**. It means, the user can select the best options to fit his application. From factory, it is configured with the options to set the Upper and Lower trim, for monitoring the input transducer output and check the Tag. Normally, the transmitter is much better configured by **SYSCON**, but the local functionality of the LCD permits an easy and fast action on certain parameters, since it does not rely on communication and network wiring connections. Among the possibilities by Local Adjustment, the following options can be emphasized: Mode block, Outputs monitoring, Tag visualization and Tuning Parameters setting.

The interface between the user is described very detailed on the "General Installation, Operation and Maintenance Procedures Manual". Please take a detailed look at this manual in the chapter related to "Programming Using Local Adjustment". It is significantly the resources on this transducer display, also all the **Series 302** field devices from SMAR has the same methodology to handle with it. So, since the user has learned once, he is capable to handle all kind of field devices from SMAR.

All function block and transducers defined according Foundation Fieldbus™ have a description of their features written on binary files, by the Device Description Language.

This feature permits that third parties configurator enabled by Device Description Service technology can interpret these features and make them accessible to configure. The Function Blocks and Transducers of Series 302 have been defined rigorously according the Foundation Fieldbus specifications in order to be interoperable to other parties.

In order to able the local adjustment using the magnetic tool, it is necessary to previously prepare the parameters related with this operation via SYSCON (System Configuration). The Figure 3.8 - The Temperature Trim Configuration and the Figure 3.9 - Transducer Block. All values shown on the display are default values.

There are seven groups of parameters, which may be pre-configured by the user in order to able, a possible configuration by means of the local adjustment. As an example, let's suppose that you don't want to show some parameters; in this case, simply write an invalid Tag in the parameter, Block_Tag_Param_X. Doing this, the device will not take the parameters related (indexed) to its Tag as a valid parameters.

Definition of Parameters and Values

Idx	Parameter	DataType (length)	Valid Range/ Options	Default Value	Units	Store	Description
7	BLOCK_TAG_PARAM	VisibleString			None	S	This is a tag of the block to which the parameter belongs to use up to a maximum of 32 characters.
8	INDEX_RELATIVE	Unsigned16	0-65535		None	S	This is the index related to the parameter to be actuated or viewed (1, 2...).
9	SUB_INDEX	Unsigned8	1-255		None	S	To visualize a certain tag, opt for the index relative equal to zero, and for the sub-index equal to one.
10	MNEMONIC	VisibleString			None	S	This is the mnemonic for the parameter identification (maximum of 16 characters). Choose the mnemonic, preferably with no more than 5 characters because, this way, it will not necessary to rotate it on display.
11	INC_DEC	Float			None	S	It is the increment and decrement in decimal units when the parameter is Float or Float Status time, or integer, when the parameter is in whole units.
12	DECIMAL_POINT_NUMBER	Unsigned8	0-4		None	S	This is the number of digits after the decimal point (0 to 3 decimal digits)
13	ACCESS	Unsigned8	Monit/Action		None		The access allows the user to read, in the case of the "Monitoring" option, and to write when "action" option is selected, and then the display will show the increment and decrement arrows.
14	ALPHA_NUM	Unsigned8	Mnem/Value		None	S	These parameters include two options: value and mnemonic. In option value it is possible to display data both in the alphanumeric and in the numeric fields, this way, in the case of a data higher than 10000, it will be shown in the alphanumeric field.
63	DISPLAY_REFRESH	Unsigned8	1		None	D	

In option mnemonic, the display may show the data in the numeric field and the mnemonic in the alphanumeric field.

In case you wish to visualize a certain tag, opt for the index relative equal to zero, and for the sub-index equal to one (refer to paragraph Structure Block in the Function Blocks Manual).

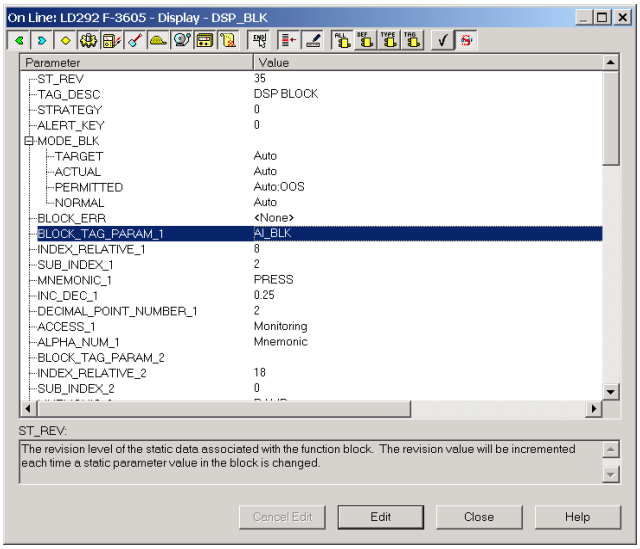


Figure 3.11 - Parameters for Local Adjustment Configuration

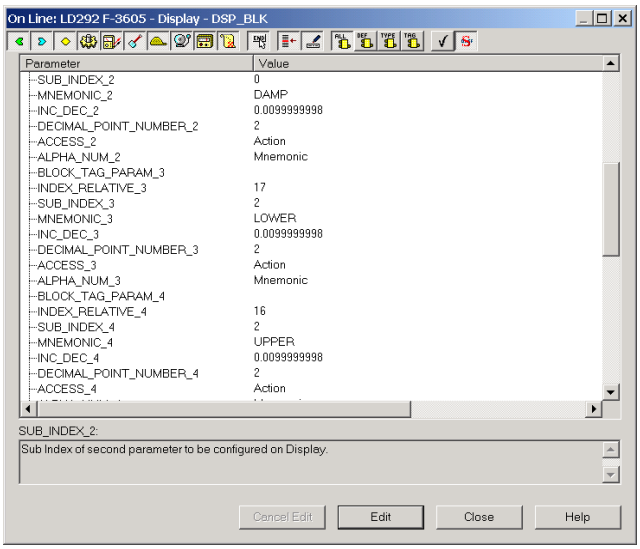


Figure 3.12 - Parameters for Local Adjustment Configuration

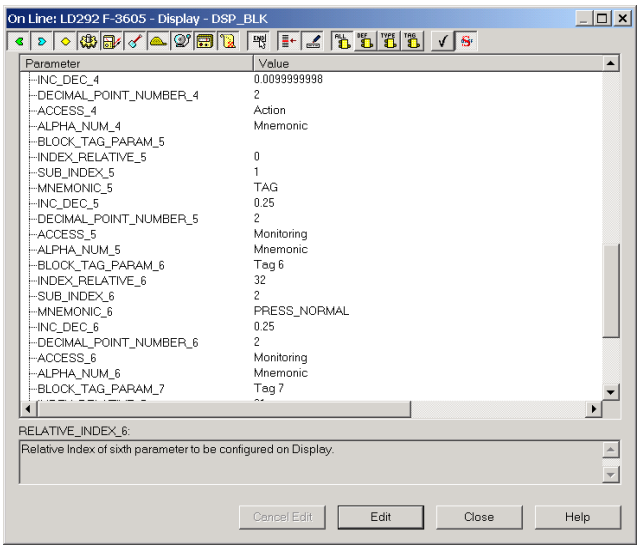
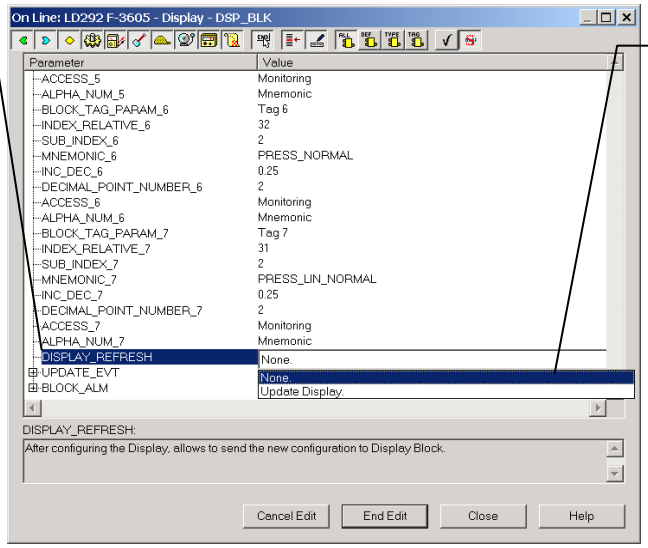


Figure 3.13 - Parameters for Local Adjustment Configuration

This parameter updates the local adjustment programming tree configured on each device.



The option "update" should be selected in order to execute the upgrade of local adjustment programming tree. After its step all the parameters selected will be shown on the LCD display.

Figure 3.14 - Parameters for Local Adjustment Configuration

Programming Using Local Adjustment

The local adjustment is completely configured by **SYSCON**. It means, the user can select the best options to fit his application. From factory, it is configured with the options to set the Upper and Lower trim and for monitoring the input transducer value. Normally, the transmitter is much better configured by **SYSCON**, but the local functionality of the LCD permits an easy and fast action on certain parameters, since it does not rely on communication and network wiring connections. Among the possibilities by Local Adjustment, the following options can be emphasized: Mode block, Outputs, Tag visualization and Tuning Parameters setting.

The interface between the user is also described very detailed on the "General Installation, Operation and Maintenance Procedures Manual" Please take a detailed look at this manual in the chapter related to "Programming Using Local Adjustment". It is significantly the resources on this transducer display, also all the Series 302 field devices from **SMAR** has the same methodology to handle with it. So, since the user has learned once, he is capable to handle all kind of field devices from **SMAR**.

All function block and transducers defined according Foundation Fieldbus™ have a description of their features written on binary files, by the Device Description Language. This feature permits that third parties configurator enabled by Device Description Service technology can interpret these features and make them accessible to configure. The Function Blocks and Transducers of Series 302 have been defined rigorously according the Foundation Fieldbus specifications in order to be interoperable to other parties.

The jumper W1 on top of the main circuit board must be in place and the main board must be fitted with digital display for access to the local adjustment. Without display, the local adjustment is not possible.

Figure 3.15 - Local Adjustment Holes

Table 3.4 shows the actions on the **Z** and **S** holes on the IF303 when Local Adjustment is enabled.

HOLE	ACTION
Z	Inicializes and rotates through the available functions.
S	Selects the function shown in the display.

Table 3.4 - Purpose of the holes on the Housing

J1 Jumper Connections

If J1 (see figure 3.16) is connected to ON, then simulation mode in the AI block is enabled.

W1 Jumper Connections

If W1 is connected to ON, the local adjustment programming tree is enabled and then important block parameters can be adjusted.

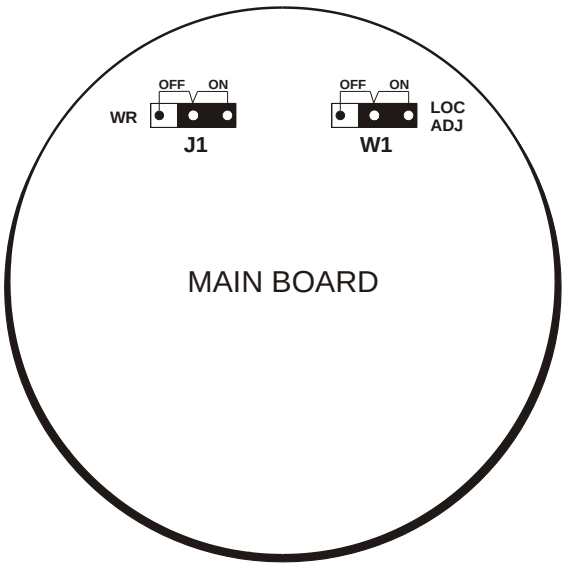
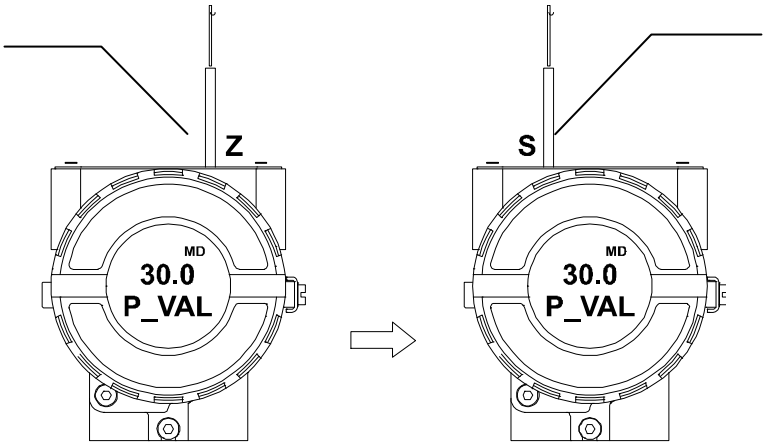


Figure 3.16 - J1 and W1 Jumpers

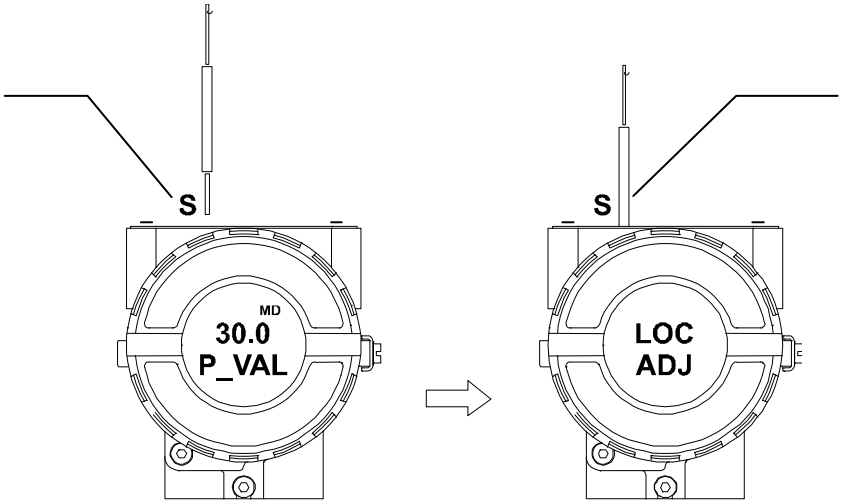
In order to start the local adjustment, place the magnetic tool in orifice **Z** and wait until letters **MD** are displayed.



Place the magnetic tool in orifice **S** and wait during 5 seconds.

Figure 3.17 - Step 1 - LD292

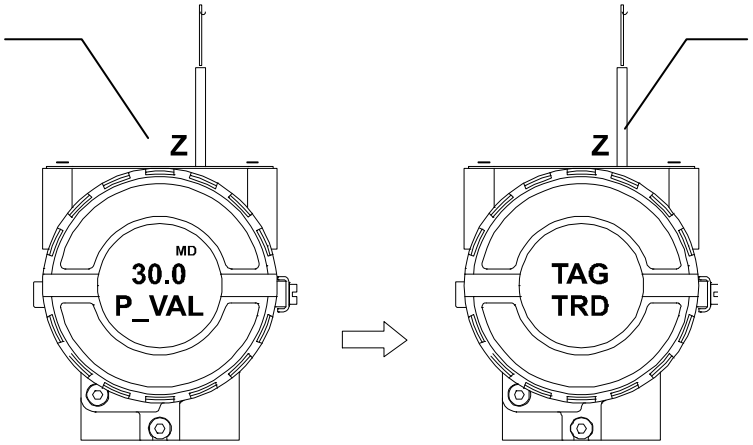
Remove the magnetic tool from orifice **S**.



Insert the magnetic tool in orifice **S** once more and **LOC ADJ** should be displayed.

Figure 3.18 - Step 2 - LD292

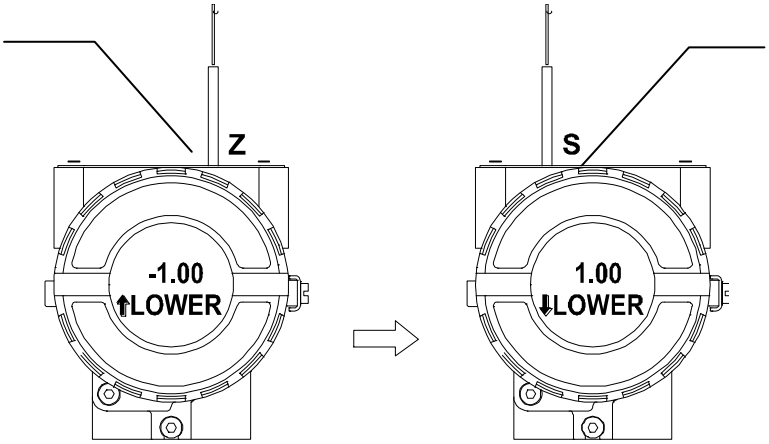
Place the magnetic tool in orifice **Z**. In case this is the first configuration, the option shown on the display is the **TAG** with its corresponding mnemonic configured by the SYSCOM. Otherwise, the option shown on the display will be the one configured in the prior operation. By keeping the tool inserted in this orifice, the local adjustment menu will rotate.



In this option the first variable (**P_VAL**) is showed with its respective value (if you to want that it keeps static, put the tool in **S** orifice and stay there.

Figure 3.19 - Step 3 - LD292

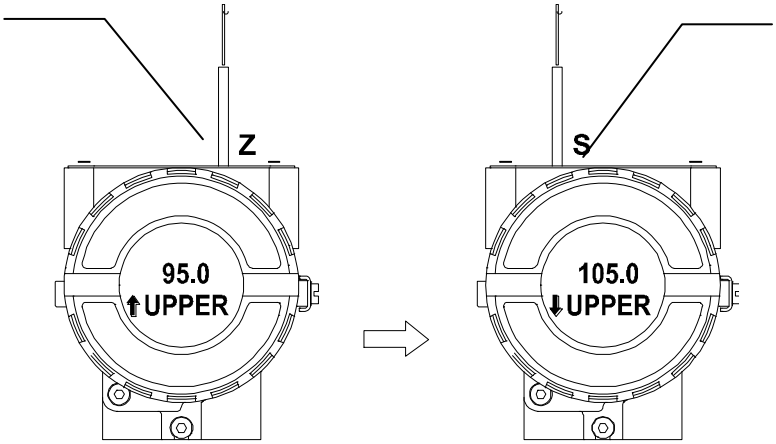
In order to range the lower value(lower), simply insert the magnetic tool in orifice **S** as soon as LOWER is shown on the display. An arrow pointing upward (↑) increments the valve and an arrow pointing downward (↓) decrements the value. In order to increment the value, keep the tool inserted in **S** up to set the value desired.



In order to decrement the lower value, place the magnetic tool in orifice **Z** to shift the arrow to the downward position and then, by inserting and keeping the tool in orifice **S**, it is possible to decrement the lower value.

Figure 3.20 - Step 4 - LD292

In order to range the upper value(upper), simply insert the magnetic tool in orifice **S** as soon as upper is shown on the display. An arrow pointing upward (↑) increments the valve and an arrow pointing downward (↓) decrements the value. In order to increment the value, keep the tool inserted in **S** up to set the value desired.



In order to decrement the upper value, place the magnetic tool in orifice **Z** to shift the arrow to the downward position an then, by insetting and keeping the tool in orifice **S**, it is possible to decrement the upper value.

Figure 3.21 - Step 5 - LD292

NOTE
This Local adjustment configuration is a suggestion only. The user may choose his preferred configuration via SYSCON, simply configuring the display block (See Programming Using Local Adjustment)

Section 4

MAINTENANCE PROCEDURES

General

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

SMAR Series 302 devices are extensively tested and inspected before delivery to the end user. Nevertheless, during their design and development, consideration was given to the possibility of repairs being made by the end user, if necessary.

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. Refer to the item "Returning Materials" at the end of this Section.

The table 4.1 shows the messages of errors and potential cause.

SYMPTOM	PROBABLE SOURCE OF PROBLEM
NO COMMUNICATION	*** Transmitter Connections** Check wiring polarity and continuity. Check for shorts or ground loops. Check if the power supply connector is connected to main board. Check if the shield is not used as a conductor. It should be grounded at one end only.
	*** Power Supply** Check power supply output. The voltage must be between 9 - 32 VDC at the **LD292** terminals. Noise and ripple should be within the following limits: a) 16 mV peak to peak from 7.8 to 39 KHz. b) 2 V peak to peak from 47 to 63 Hz for non-intrinsic safety applications and 0.2 V for intrinsic safety applications. c) 1.6 V peak to peak from 3.9 MHz to 125 MHz.
	*** Network Connection** Check that the topology is correct and all devices are connected in parallel. Check that two Terminators are OK and correctly positioned. Check length of trunk and spurs. Check spacing between couplers.
	*** Electronic Circuit Failure** Check the main board for defect by replacing it with a spare one.
INCORRECT READING	*** Transmitter Connections** Check for intermittent short circuits, open circuits and grounding problems. Check if the sensor is correctly connected to the **LD292** terminal block.
	*** Noise, Oscillation** Adjust damping Check grounding of the transmitters housing. Check that the shielding of the wires between transmitter / panel is grounded only in one end.
	*** Sensor** Check the sensor operation; it shall be within its characteristics. Check sensor type; it shall be the type and standard that the **LD292** has been configured to. Check if process is within the range of the sensor and the **LD292**.

Table 4.1 - Messages of Errors and Potential Cause

If the problem is not presented in the table above follow the Note below:

NOTE
The Factory Init should be tried as a last option to recover the equipment control when the equipment presents some problem related to the function blocks or the communication. **This operation must only be carried out by authorized technical personnel and with the process offline, since the equipment will be configured with standard and factory data.** This procedure resets all the configurations run on the equipment, after which a partial download should be performed. Two magnetic tools should be used to this efect,. On the equipment, withdraw the nut that fixes the identification tag on the top of the housing, so that access is gained to the "S" and "Z" holes. The operations to follow are: 1) Switch off the equipment, insert the magnetic tools and keep them in the holes (the magnetic end in the holes); 2) Feed the equipment; 3) As soon as Factory Init is shown on the display, take off the tools and wait for the "5" symbol on the right upper corner of the display to unlit, thus indicating the end of the operation. *This procedure makes effective all the factory configuration and will eliminate eventual problems with the function blocks or with the equipment communication.*

Disassembly Procedure

WARNING
Do not disassemble with power on.

The Figure 4.3 an exploded view of the transmitter and will help to visualize the following:

Sensor

To remove the sensor from the electronic housing, the electrical connections (in the field terminal side) and the main board connector must be disconnected.

Loosen the hex screw (**6**) and carefully unscrew the electronic housing from the sensor, observing that the flat cable is not excessively twisted.

WARNING
To avoid damage do not rotate the electronic housing more than 270º 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 (**5**), loosen the two screws (**3**) that anchor the board.

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.

Reassemble Procedure

WARNING
Do not assemble the main board with power on.

Sensor

The fitting of the sensor must be done with the main board out of the electronic housing. Mount the sensor to the housing turning clockwise until it stops. Then turn it counterclockwise until it faces the protective cover (**1**). Tighten the hex screw (**6**) to lock the housing to the sensor.

Electronic Circuit

Plug sensor connector and power supply connector to main board.

Attach the display to the main board. Observe the four possible mounting positions. (Figure 4.2). The **SMAR** mark indicates up position.

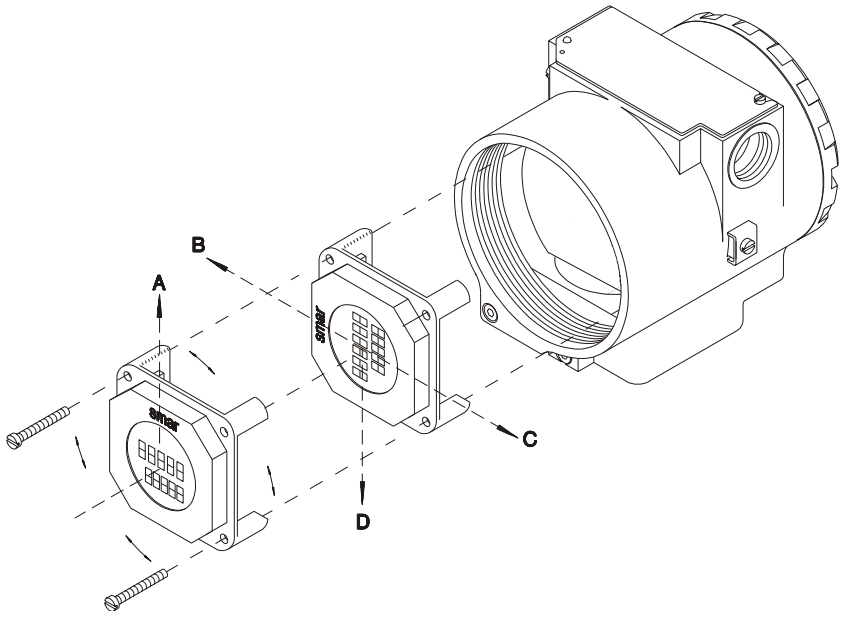


Figure 4.2 - Four Possible Positions of the Display

Anchor the main board and display with their screws (**3**).

After tightening the protective cover (**1**), mounting procedure is complete. The transmitter is ready to be energized and tested. It is recommended to open the transmitter's pressure taps to atmosphere and adjust the 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.

Every time the power is turned on, the main circuit reads the sensor serial number, should it differ from the number stored in the memory. The circuit understands that there is a new sensor and the following information is transferred from the sensor to the main circuit.

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

The other transmitter characteristics are stored in the main circuit memory and are not affected by sensor change.

Upgrading LD291 to LD292

The sensor and casing of the LD291 is exactly the same as the **LD292**. By changing the circuit board of the LD291 it becomes a **LD292**. The display on LD291 version **3.XX**, is the same as on **LD292** and can therefore be used with the **LD292** upgrade circuit board. With a **LD292** version three or earlier, that display can not be used.

Upgrading the LD291 to a **LD292** is therefore very much the same as the procedure for replacing the main board described above.

To remove the circuit board (**5**), loosen the two screws (**3**) that anchor the board.

Caution with the circuit boards must be taken as mentioned above.

Pull the LD291 main board out of the housing and disconnect the power supply and the sensor connectors.

Put in the **LD292** main board reversing the procedure for removing the LD291 circuit.

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.

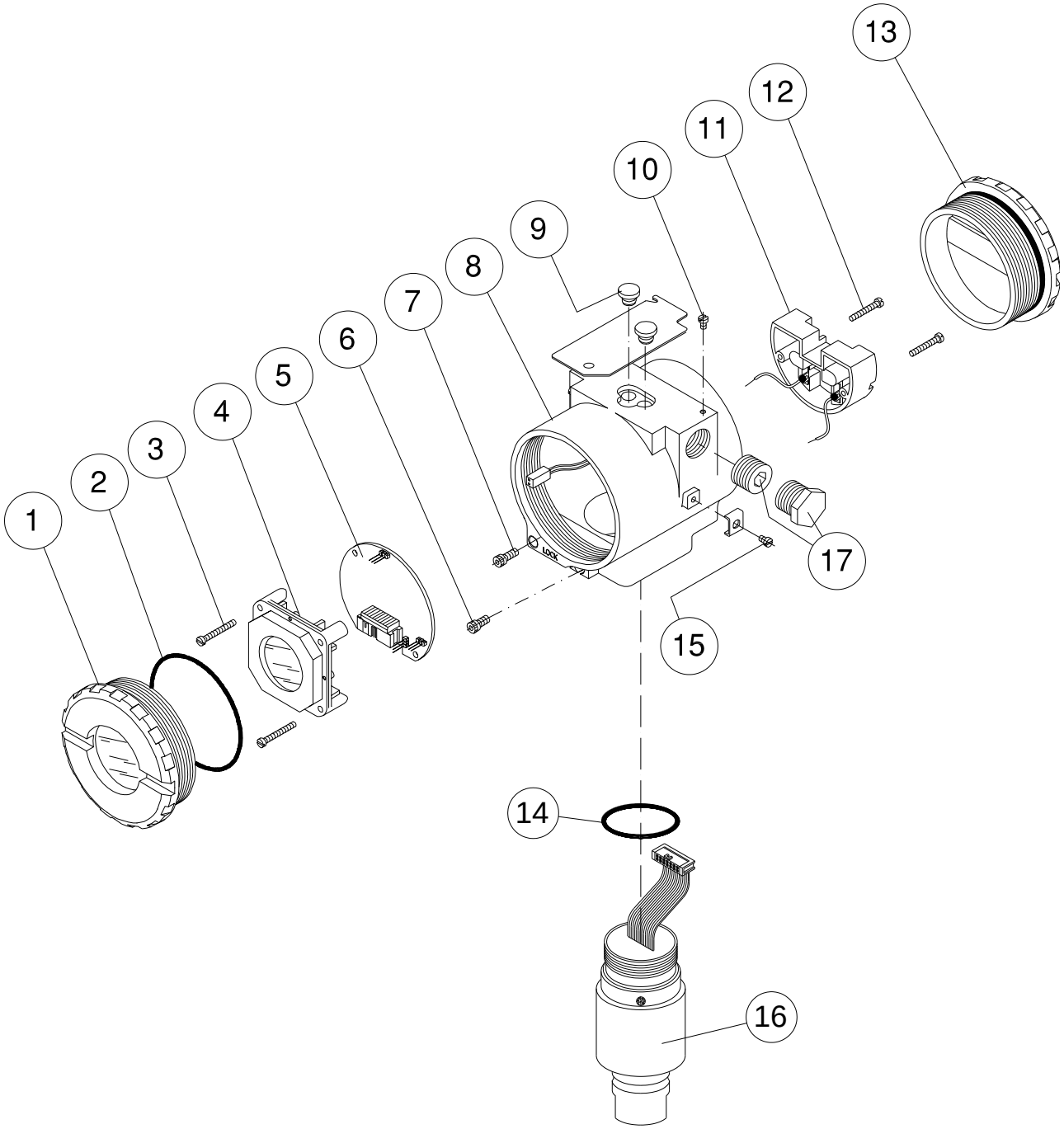


Figure 4.3 – Exploded View

ACCESSORIES	
ORDERING CODE	**DESCRIPTION**
SD1	Magnetic Tool for Local Adjustment
BC1	Fieldbus/RS232 Interface
SYSCON	System Configurator
PS302	Power Supply
BT302	Terminator
PCI	Process Control Interface

SPARE PARTS LIST				
DESCRIPTION OF PARTS		**POSITION**	**CODE**	**CATEGORY (NOTE 1)**
HOUSING (**NOTE 2**)		8	(**NOTE 7**)	
COVER WITHOUT WINDOW (INCLUDES O'RING)	. Aluminum	1 and 13	204-0102	
	. 316 SS	1 and 13	204-0105	
COVER WITH WINDOW (INCLUDES O'RING)	. Aluminum	1	204-0103	
	. 316 SS	1	204-0106	
COVER LOCKING SCREW		7	204-0120	
SENSOR LOCKING SCREW	. Without Head M6 Screw	6	400-1121	
EXTERNAL GROUND SCREW		15	204-0124	
IDENTIFICATION PLATE FIXING SCREW		10	204-0116	
DISPLAY DIGITAL		4	214-0108	
TERMINAL BLOCK		11	400-0059	
MAIN ELECTRONIC CIRCUIT BOARD		5	400-0348	A
O'RING (NOTE 3)	. Cover, BUNA-N	2	204-0122	B
	. Neck, BUNA-N	14	204-0113	
TERMINAL HOLDING SCREW	. Housing, 316 SS	12	204-0119	
	. Housing, Aluminum	12	304-0119	
MAIN BOARD SCREW FOR HOUSING, aluminum.	Units With indicator	3	304-0118	
	Units Without indicator	3	304-0117	
MAIN BOARD SCREW FOR HOUSING, 316 SS.	Units With indicator	3	204-0118	
	Units Without indicator	3	204-0117	
MOUNTING BRACKET FOR 2" PIPE MOUNTING (NOTE 5)	. Carbon Steel	-	209-0801	
	. 316 SS	-	209-0802	
	. Carbon Steel with bolts, nuts, washers and U-clamp in 316SS	-	209-0803	
LOCAL ADJUSTMENT PROTECTION CAP		9	204-0114	
SENSOR		16	(**NOTE 4**)	B
PLUG	1/2 NPT Internal Hexagon Plug in Plated CS BR Ex d. 1/2 NPT Internal Hexagon Plug in 304 SST BR Ex d. M20 X 1.5 External Hexagon Plug in 316 SST BR Ex d. PG13.5 External Hexagon Plug in 316 SST BR Ex d.	17 17 17 17	400-0808 400-0809 400-0810 400-0811	

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, Bolts, caps and Identification plate without certification.
3- 0-Rings and Backup Rings are packaged in packs of 12 units.
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: LD292

Option	Communication Protocol
F	FOUNDATION Fieldbus

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	F	0	H0	P0

Ordering Code for Sensor

209-0241	SPARE PART NUMBER FOR PRESSURE GAGE SENSOR

CODE	Type	Range Limits			Range Limits		
		Min.	Max.	Unit	Min.	Max.	Unit
M2	Gage	12.5	500	mbar	5.02	201.09	inH_2O
M3	Gage	62.5	2500	mbar	25.13	1005.45	inH_2O
M4	Gage	0.625	25	bar	157.1	10054.5	inH_2O
M5	Gage	6.25	250	bar	90.65	3625.94	psi

CODE	Diaphragm Material and Fill Fluid
1	316L SST - Silicone Oil
2	316L SST – Inert Fluorolube Oil **(2)**
3	Hastelloy C276 - Silicone Oil **(1)**
4	Hastelloy C276 – Inert Fluorolube Oil **(2)**
D	316L SST – Inert Krytox Oil **(2)**
E	Hastelloy C276 – Inert Krytox Oil **(2)**
Q	316L SST – Inert Halocarbon 4.2 Oil **(2)**
R	Hastelloy C276 – Inert Halocarbon 4.2 Oil **(2)**

CODE	Process Connections Material
H	Hastelloy C276 **(1)**
I	316L SST
Z	User's specifications

CODE	Process Connections	CODE	
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 Min.	Max.	Unit	Range Limits Min.	Max.	Unit
2	Sanitary	12.5	500	mbar	5.02	201.09	inH_2O
3	Sanitary	62.5	2500	mbar	25.13	1005,45	inH_2O
4	Sanitary	0.625	25	bar	157.1	10054.5	inH_2O
5	Sanitary	6.25	55.15	bar	90.65	799.89	psi

CODE	Diaphragm Material	CODE	Diaphragm Material
H	Hastelloy C276	M	Monel
I	316L SST	T	Tantalum

CODE	Fill Fluid (Low Side)	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	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

*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_2) or Chlorine service.
(3) Compliant with 3A-7403 standard for food and other applications where sanitary connections are required:
- Neobee M2O 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.	Range Limits Max.	Min. Span	Unit	Range Limits Min.	Range Limits Max.	Min. Span	Unit	
L2	Level	-50	50	1,25	kPa	-200	200	5	inH_2O	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	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	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 Lenght	COD.	Extension Lenght
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)	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)	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	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	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_2) 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 6 mm.
(4) Fluorolube fill fluid is not available for Monel diaphragm.
(5) Inert Fluid: Safe for oxygen service.

TECHNICAL CHARACTERISTICS

Functional Specifications		
Process Fluid	Liquid, gas or steam.	
Output Signal	Digital only. Fieldbus Foundation™, 31.25 kbit/s voltage mode with bus power.	
Power Supply	Bus power 9 - 32 VDC. Current consumption quiescent 12 mA. Output impedance: nonintrinsic safety from 7.8 kHz - 39 kHz should be greater or equal to 3 kOhm. Intrinsic safety output impedance (assuming an IS barrier in the power supply) from 7.8 kHz - 39 kHz should be greater or equal to 400 Ohm.	
Indicator	Optional 4½-digit numerical and 5-character alphanumerical LCD indicator.	
Hazardous Area Certifications	Explosion proof (FM, NEMKO, CEPEL), dust ignition proof and non-incendive (FM) and intrinsic safety (FM, CSA, NEMKO, EXAM, CEPEL, NEPSI).	
European Directive Information	**Authorized representative in European Community** Smar Gmbh-Rheingaustrasse 9-55545 Bad Kreuzanach **PED Directive (97/23/EC) – Pressure Equipment Directive** This product is in compliance with the directive and it was designed and manufactured in accordance with sound engineering practice using several standards from ANSI, ASTM, DIN and JIS. **EMC Directive (2004/108/EC) - Eletromagnetic Compatibility** The EMC test was performed according to IEC standard: IEC61326-1:2006, IEC61326-2-3:2006, IEC61000-6-4:2006, IEC61000-6-2:2005. For use in environment only. Keep the shield insulated at the instrument side, connecting the other one to the ground if necessary to use shielded cable. **ATEX Directive (94/9/EC) – Equipment and protective systems intended for use in potentially explosive atmospheres.** This product was certified according European Standards at NEMKO and EXAM (old DMT). The certified body for manufacturing quality assessment is EXAM (number 0158). **LVD Directive 2006/95/EC – Electrical Equipment designed for use within certain voltage limits** According the LVD directive Annex II the equipment under ATEX "Electrical equipment for use in an explosive atmosphere" directive are excluded from scope from this directive. The EC declarations of conformity for all applicable European directives for this product can be found at **www.smar.com**.	
Temperature Limits	Ambient:	-40 to 85 °C (-40 to 185 °F) -15 to 85 ºC (-59 to 185 ºF) **LD290I**
	Process:	-40 to 100 °C (-40 to 212 °F) Silicone Oil 0 to 85 °C (-32 to 185 °F) Inert Fluorolube Oil -25 to 85 ºC (-13 to 185 ºF) Viton O'ring -40 to 150 °C (-40 to 302 °F) **LD290L** -15 to 150 °C (-59 to 302 °F) **LD290I**
	Storage:	40 to 100 °C (-40 to 212 °F)
	Display	-20 to 80 ºC (-4 to 176 ºF) -40 to 85 °C (-40 to 185 °F) without damage
Turn-on Time	Performs within specifications of less than 10 seconds after power is applied to the transmitter.	
Configuration	Basic configuration may be done using local adjustment magnetic tool if device is fitted with display. Complete configuration is possible using Syscon.	
Volumetric Displacement	Less than 0.15 cm^3 (0.01 in^3).	
Overpressure and Static Pressure Limits (MWP – Maximum Working Pressure)	14 MPa (138 bar) for ranges 2, 3, 4. 31 MPa (310 bar) for range 5. For Level Ranges ANSI/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.	

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

WARNING
It is described here only the maximum pressures of the materials referenced in each rule, it can not 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

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	63	57.3	53.1	50.1	46.8	45
	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	-	-

PRESSURES TABLE FOR SEAL AND LEVEL FLANGES ASME B16.5 2009 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

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

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

Material Group	Pressure Class	Maximum Temperature Allowed								
		-29 to 38	50	100	150	200	250	300	325	350
		Maximum Pressure Allowed (bar)								
AISI304	150	19	18.3	15.7	14.2	13.2	12.1	10.2	9.3	8.4
	300	49.6	47.8	40.9	37	34.5	32.5	30.9	30.2	29.6
	600	99.3	95.6	81.7	74	69	65	61.8	60.4	59.3
	1500	248.2	239.1	204.3	185	172.4	162.4	154.6	151.1	148.1
	2500	413.7	398.5	340.4	308.4	287.3	270.7	257.6	251.9	246.9

Humidity Limits	0 to 100% RH.

Performance Specifications

Reference conditions	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.
Accuracy	For ranges 2, 3, 4 and 5: ±0.075% of span (for span >= 0.1 URL) ±[0.0375 + 0.00375 URL/SPAN] % of span (for span < 0.1 URL) For Level Transmitter: ± 0.08 % of span (for span ≥ 0.1 URL) ± [0.0504 + 0.0047 URL/span] % of span (for span < 0.1 URL) For Insertion Transmitter: ±0.2% of span
Stability	±0.15% of URL for 5 years.
Temperature Effect	± [0.02 URL + 0.06% of span], per 20 ºC (68 ºF) for span >= 0.2 URL ± [0.023 URL+0.045% of span], per 20ºC (68 ºF) for span < 0.2 URL For Level Transmitter: 6 mmH_2O per 20 °C for 4” and DN100 17 mmH_2O per 20 °C for 3” and DN80
Power Supply Effect	±0.005% of calibrated span per volt.
Mounting Position Effect	Zero shift of up to 250 Pa (1 inH_2O) which can be calibrated out. No span effect.
Electromagnetic Interference Effect	Designed to comply with, Approved according to IEC61326-1:2006, IEC61326-2-3:2006, IEC61000-6-4:2006, IEC61000-6-2:2005.

Physical Specifications

Electrical Connection	1/2 -14 NPT, PG 13.5, or M20 × 1.5. Other connections or request.
Process Connection	1/2 - 14 NPT - (Female or Male), G ½ A DIN 16288 Form B - Male or G ½ DIN 16288 Form D - Male.

Wetted Parts	**Isolating Diaphragms** 316L SST or Hastelloy C276.
Nonwetted Parts	**Electronic Housing** Injected aluminum with polyester painting or 316 SST. 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. **Level Flange (LD290L)** 316L SST, 304 SST and Plated Carbon Steel. **Cover O-Rings** Buna-N.
Nonwetted Parts (continuation)	**Mounting Bracket** Optional universal mounting bracket for surface or vertical/horizontal 2" - pipe (DN50) Carbon Steel with polyester painting or 316 SST. Accessories (bolts, nuts, washers and U-clamp) in Carbon Steel or 316 SST. **Identification Plate** 316 SST. **Approximate Weight** <2.0Kg (4lb): Aluminium housing without mountatin bracket.

Ordering Code

MODEL	GAGE PRESSURE TRANSMITTERS
LD292M	FOUNDATION™ fieldbus

CODE	Type	Range Limits Min.	Range Limits Max.	Unit	Range Limits Min.	Range Limits Max.	Unit
2	Gage	12.5	500	mbar	5.02	201.09	inH_2O
3	Gage	62.5	2500	mbar	25.13	1005.45	inH_2O
4	Gage	0.625	25	bar	157.1	10054.5	inH_2O
5	Gage	6.25	250	bar	90.65	3625.94	psi

CODE	Diaphragm Material and Fill Fluid
1	316L SST - Silicone Oil
2	316L SST – Inert Fluorolube Oil **(2)**
3	Hastelloy C276 - Silicone Oil **(1)**
4	Hastelloy C276 – Inert Fluorolube Oil **(2)**
D	316L SST – Inert Krytox Oil **(2)**
E	Hastelloy C276 – Inert Krytox Oil **(2)**
Q	316L SST – Inert Halocarbon 4.2 Oil **(2)**
R	Hastelloy C276 – Inert Halocarbon 4.2 Oil **(2)**

CODE	Process Connections Material
H	Hastelloy C276 **(1)**
I	316L SST
Z	User's specifications

CODE	Local Indicator
0	Without Indicator
1	With Indicator

CODE	Process Connections	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	X	1" NPT Sealed
H	G 1/2 DIN 16288 - Form D	Z	User's specifications
M	1/2 - 14 NPT - Male		

CODE	Electrical Connections	CODE	Electrical Connections
0	1/2 - 14 NPT **(3)**	A	M20 X 1.5 **(5)**
1	1/2 - 14 NPT X 3/4 NPT (316 SST) - with adapter **(4)**	B	PG 13.5 DIN **(5)**
2	1/2 - 14 NPT X 3/4 BSP (316 SST) - with adapter **(6)**	Z	User's specifications
3	1/2 - 14 NPT X 1/2 BSP (316 SST) - with adapter **(6)**		
4	1/2 - 1/2 NPTF (316 SST) - with adapter		
5	1/2 - 3/4 NPTF (316 SST) - with adapter		

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
A	304 SST Mounting Bracket with 316 SST accessories

CODE	Optional Items

LD292M	2	1	I	1	1	A	0	*	TYPICAL MODEL NUMBER

* Leave blank for no optional items.

MODEL	GAGE PRESSURE TRANSMITTER (CONTINUATION)					
COD.	**Housing Material (8) (9)**					
H0	Aluminium (IP/TYPE)		**H3**	316 SST for saline atmosphere (IPW/TYPEX) **(7)**		
H1	316 SST (IP/TYPE)		**H4**	Copper Free Aluminium (IPW/TYPEX) **(7)**		
H2	Aluminium for saline atmosphere (IPW/TYPEX) **(7)**					
COD.	**Identification Plate**					
I1	FM: XP, IS, NI, DI		**I5**	CEPEL: Ex-d, Ex-ia	**I7**	EXAM (DMT) Grupo I, M1 Ex-ia
I3	CSA: XP, IS, NI, DI		**I6**	Without Certification	**ID**	NEPSI: Ex-ia, Ex-d
I4	EXAM (DMT): Ex-ia; NEMKO: Ex-d					
COD.	**Painting**					
P0	Munsell N 6,5 Gray		**P5**	Polyester Yellow		
P3	Polyester Black		**P8**	Without Painting		
P4	Epoxy White		**P9**	Blue Safety Base Epoxy –Eletrostatic Painting		
COD.	**Tag Plate**					
J0	With TAG		**J2**	User's specification		
J1	Without TAG					

LD292M	H0	I1	P0	J0	← TYPICAL MODEL NUMBER

Optional Items

Special Procedures	**C1** –Degrease Cleaning (Oxygen or Chlorine Service)
Burnout	**BD** – Down Scale **BU** – Up Scale
Características Especiais	**ZZ** – User Specification

NOTES

(1) Meets NACE material recommendation per MR-01-75.
(2) Inert fluid: safe for oxygen service.
(3) Certificate for use in Hazardous Locations (CEPEL, NEPSI, NEMKO, EXAM, FM, CSA).
(4) Certificate for use in Hazardous Locations (CEPEL, CSA).
(5) Certificate for use in Hazardous Locations (CEPEL, NEPSI, NEMKO, EXAM).
(6) Not certified for use in hazardous locations.
(7) IPW/TYPEX was tested for 200 hours according to NBR 8094 / ASTM B 117 standard.
(8) IPX8 tested for 10 meters of water column for 24 hours.
(9) Ingress Protection:

Products	CEPEL	NEMKO/EXAM	FM	CSA	NEPSI
LD29X	IP66/W	IP66/68/W	Type 4X/6/6P	Type 4X	IP67

MODEL	SANITARY PRESSURE TRANSMITTERS
LD292S	FOUNDATION™ fieldbus

CODE	Type	Range Limits			Range Limits		
		Min.	Max.	Unit	Min.	Max.	Unit
2	Sanitary	12.5	500	mbar	5.02	201.09	inH_2O
3	Sanitary	62.5	2500	mbar	25.13	1005,45	inH_2O
4	Sanitary	0.625	25	bar	157.1	10054.5	inH_2O
5	Sanitary	6.25	55.15	bar	90.65	799.89	psi

CODE	Diaphragm Material
I	316L SST

CODE	Fill Fluid
S	Silicone DC-200/20 Oil

CODE	Local Indicator
0	Without Indicator
1	With Indicator

CODE	Process Connections	CODE	
B	Thread IDF - 2” 300# **(2)**	H	DN40 300# - DIN 11851
C	Thread RJT - 2” 300#	P	Tri-Clamp - 2” 800# **(2)**
D	Tri-Clamp - 2” 300# **(2)**	Q	Tri-Clamp - 1 1/2” 800# **(2)**
E	Thread SMS - 2” 300# **(2)**	Z	User’s specifications
F	Tri-Clamp - 1 1/2” 300# **(2)**		

CODE	Electrical Connections	CODE	
0	1/2 - 14 NPT **(3)**	A	M20 X 1.5 **(5)**
1	1/2 - 14 NPT X 3/4 NPT (316 SST) - with adapter **(4)**	B	PG 13.5 DIN **(5)**
2	1/2 - 14 NPT X 3/4 BSP (316 SST) - with adapter **(8)**	Z	User’s specifications
3	1/2 - 14 NPT X 1/2 BSP (316 SST) - with adapter **(8)**		
4	1/2 - 1/2 NPTF (316 SST) - with adapter		
5	1/2 - 3/4 NPTF (316 SST) - with adapter		

CODE	O’Ring Material	CODE	
0	Without O’Ring	V	Viton **(2)**
B	Buna-N **(2)**	Z	User´s specifications
T	Teflon **(2)**		

CODE	Adaptation Sleeve
0	Without Sleeve
1	With Adaptation Sleeve in 316 SST

CODE	Tri-Clamp Connection
0	Without Clamp
2	With Tri-Clamp in 304 SST

CODE	Diaphragm Material (Sanitary Connection)
H	Hastelloy C276
I	316L SST

CODE	Fill Fluid (Sanitary Connection)
D	Silicone DC-704 Oil
F	Fluorolube MO-10 Oil **(1)**
N	Propilene Glicol (Neobee) Oil **(2)**
S	Silicone DC-200/20 Oil
T	Syltherm 800 Oil
Z	User’s specifications

CODE	Optional Items

LD292S	2	I	N	1	D	0	V	1	2	I	D	*	← Typical Model Number

*Leave blank for no optional items.

MODEL	SANITARY PRESSURE TRANSMITTERS (CONTINUATION)				
	COD.	Housing Material (6) (7)			
	H0	Aluminium (IP/TYPE)			
	H1	316 SST (IP/TYPE)			
		COD.	Identification Plate		
		I1	FM: XP, IS, NI, DI	I5	CEPEL: Ex-d, Ex-ia
		I3	CSA: XP, IS, NI, DI	I6	Without Certification
		I4	EXAM (DMT): Ex-ia; NEMKO: Ex-d		
			COD.	Painting	
			P0	Munsell N 6,5 Gray	P5 Polyester Yellow
			P3	Polyester Black	P6 Epoxy Yellow
			P4	Epoxy White	
				COD.	Tag Plate
				J0	With TAG
				J1	Without TAG
				J2	User's specification

LD292S **H0** **I1** **P0** **J0** ← TYPICAL MODEL NUMBER

Optional Items

Special Procedures	**C1** –Degrease Cleaning (Oxygen or Chlorine Service) **C4** - Polishing of the sanitary connections according to 3A Certification **(2)**
Burnout	**BD** – Down Scale **BU** – Up Scale

NOTE

(1) Inert Fluid: safe for oxygen service.
(2) Compliant with 3A-7403 standard for food and other applications where sanitary connections are required:
- Neobee M2O Fill Fluid
- Finishing wet Face: 0.8 µm Ra (32 µ" AA)
- Wet O-Ring: Viton, Teflon and Buna-N

(3) Certificate for use in Hazardous Locations (CEPEL, NEPSI, NEMKO, EXAM, FM, CSA).
(4) Certificate for use in Hazardous Locations (CEPEL, CSA).
(5) Certificate for use in Hazardous Locations (CEPEL, NEPSI, NEMKO, EXAM).
(6) IPX8 tested for 10 meters of water column for 24 hours.
(7) Ingress Protection:

Produtos	CEPEL	NEMKO/EXAM	FM	CSA	NEPSI
LD29X	IP66/W	IP66/68/W	Type 4X/6/6P	Type 4X	IP67

(8) Not certified for use in hazardous locations.

MODEL	LOW COST FLANGED PRESSURE TRANSMITTER
LD292L	FOUNDATION™ fieldbus

COD.	Type	Range Limits Min.	Max.	Unit	Range Limits Min.	Max.	Unit
2	Level	12.5	500	mbar	5.02	201.09	inH_2O
3	Level	62.5	2500	mbar	25.13	1005.45	inH_2O
4	Level	0.625	25	bar	157.1	10054.5	inH_2O
5	Level	6.25	250	bar	90.65	3625.94	psi

COD.	Diaphragm Material (Sensor) and Fill Fluid (Sensor)
1	316L SST - Silicone Oil

COD.	Local Indicator		
0	Without Indicator	1	With Digital Indicator

COD.	Process Connection	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.	Electrical Connection	COD.	Electrical Connection
0	1/2 - 14 NPT **(3)**	5	1/2 - 3/4 NPTF (AI 316) - with adapter
1	1/2 - 14 NPT X 3/4 NPT (AI 316) - with adapter **(4)**	A	M20 X 1.5 **(5)**
2	1/2 - 14 NPT X 3/4 BSP (AI 316) - with adapter **(12)**	B	PG 13.5 DIN **(5)**
3	1/2 - 14 NPT X 1/2 BSP (AI 316) - with adapter **(12)**	Z	User´s specifications
4	1/2 - 1/2 NPTF (AI 316) - with adapter		

COD.	Type and Material Flange	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 Lenght				
0	0 mm (0")	2	100 mm (4")	4	200 mm (8")
1	50 mm (2")	3	150 mm (6")	Z	User´s specifications

COD.	Diaphragm Material / Extension (Process Connection)	COD.	Diaphragm Material / Extension (Process Connection)
1	316 L SST / 316 SST	5	Titanium / 316 SST **(6)**
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 **(6)**	Z	User´s specifications

COD.	Fill Fluid (Process Connection)	COD.	Fill Fluid (Process Connection)
S	Silicone DC-200/20 Oil	H	Halocarbon 4.2 Oil
F	Inert Fluorolube MO-10 Oil **(7)**	N	Propileno Glicol (Neobee) Oil
D	Silicone DC-704 Oil	T	Sytherm 800 Oil
K	Krytox Oil	Z	User´s specifications

COD.	Lower Housing Material	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	COD.	Gasket Material
0	Without Gasket	I	316L SST
C	Copper	T	Teflon (PTFE)
G	Grafoil (Flaxible Lead)	Z	User´s specifications

COD.	Optional Items

TYPICAL MODEL NUMBER

LD292L	2	1	1	1	0	6	2	1	S	1	T	*

*Leave it blank when there are not optional items.

MODEL	LOW COST FLANGED PRESSURE TRANSMITTER (CONTINUATION)			
COD.	**Housing Material (10) (11)**			
H0	Aluminium (IP/TYPE)		**H3**	316 SST for saline atmosphere (IPW/TYPEX) **(9)**
H1	316 SST (IP/TYPE)		**H4**	Copper Free Aluminium (IPW/TYPEX) **(9)**
H2	Aluminium for saline atmosphere (IPW/TYPEX) **(9)**			
COD.	**Identification Plate**			
I1	FM: XP, IS, NI, DI		**I5**	CEPEL: Ex-d, Ex-ia
I3	CSA: XP, IS, NI, DI		**I6**	Without Certification
I4	EXAM (DMT): Ex-ia; NEMKO: Ex-d		**I7**	EXAM (DMT) Grupo I, M1 Ex-ia
COD.	**Painting**			
P0	Munsell N 6,5 Gray		**P6**	Epoxy Yellow
P3	Polyester Black		**P8**	Without Painting
P4	Epoxy White		**P9**	Blue Safety Base Epoxy – Eletrostatic Painting
P5	Polyester Yellow		**PC**	Safety Base Polyester – Eletrostatic Painting
COD.	**Tag Plate**			
J0	With TAG		**J2**	User's specification
J1	Without TAG			

LD292L	**H0**	**I1**	**P0**	**J0**	← TYPICAL MODEL NUMBER

Optional Items

Special Procedures	**C1** –Degrease Cleaning (Oxygen or Chlorine Service)
Burnout	**BD** – Down Scale **BU** – Up Scale
Lower Housing Connection	**U0** – With 1 Flush Connection 1/4" NPT (if supplied with lower housing) **U1** – With 2 Flush Connections 1/4" NPT per 180º **U2** – With 2 Flush Connections 1/4" NPT per 90º **U3** – With 2 Flush Connections 1/2" - 14 NPT per 180º (with cover) **U4** – Without Flush Connection

NOTES

(1) Silicone Oils not recommendations for Oxygen (O_2) or Chlorine service.
(2) Not applicable for vacuum service.
(3) Certificate for use in Hazardous Locations (CEPEL, NEPSI, NEMKO, EXAM, FM, CSA).
(4) Certificate for use in Hazardous Locations (CEPEL, CSA).
(5) Certificate for use in Hazardous Locations (CEPEL, NEPSI, NEMKO, EXAM).
(6) Attention, check corrosion rate for the process, tantalum plate 0.1 mm, AISI 316L extension 3 to 6mm.
(7) Fluorolube fill fluid is not available for Monel diaphragm.
(8) Inert Fluid: Safe for oxygen service.
(9) IPW/TYPEX was tested for 200 hours according to NBR 8094 / ASTM B 117 standard.
(10) IPX8 tested for 10 meters of water column for 24 hours.
(11) Ingress Protection:

Products	CEPEL	NEMKO/EXAM	FM	CSA	NEPSI
LD29X	IP66/W	IP66/68/W	Type 4X/6/6P	Type 4X	IP67

(12) Not certified for use in hazardous locations.

MODEL	PRESSURE TRANSMITTER WITH EXTENDED PROBE
LD292I	FOUNDATION™ fieldbus

COD.	Type	Range Limits		
		Min.	Max.	Unit
2	Level	12.5	500	mbar

COD.	Diaphragm Material and Fill Fluid
1	316L SST – Silicon Oil **(1)**

COD.	Local Indicator
0	Without Indicator
1	With Indicator

COD.	Fixing Transmitter		
1	Bracket in L	Z	User's specification
2	Flanged Bracket		
3	Triclamp 3" **(9)**		

COD.	Electrical Connection		
0	1/2 - 14 NPT **(2)**	A	M20 X 1.5 **(4)**
1	1/2 - 14 NPT X 3/4 NPT (316 SST) – with adapter **(3)**	B	PG 13.5 DIN **(4)**
2	1/2 - 14 NPT X 3/4 BSP (316 SST) - with adapter **(5)**	Z	User's specification
3	1/2 - 14 NPT X 1/2 BSP (316 SST) - with adapter **(5)**		
4	1/2 - 1/2 NPTF (316 SST) - with adapter		
5	1/2 - 3/4 NPTF (316 SST) - with adapter		

COD.	Probe Material/Diaphragm (Wetted Parts)
A	304L SST / 316L SST
I	316L SST / 316L SST
U	316L SST / Hastelloy C276
Z	User's specification

COD.	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

COD.	Probe Fill Fluid
N	Propileno Glicol Oil (Neobee M20) **(9)**
Z	User's specification

COD.	Optional Items

LD292I	2	1	1	3	A	I	1	N	*	← TYPICAL MODEL

*Leave blank for no optional items.

MODEL	PRESSURE TRANSMITTER WITH EXTENDED PROBE (CONTINUATION)		
COD.	Housing Material (7) (8)		
H0	Aluminium (IP/TYPE)	H3	316 SST for saline atmosphere (IPW/TYPEX) **(6)**
H1	316 SST (IP/TYPE)	H4	Copper Free Aluminium (IPW/TYPEX) **(6)**
H2	Aluminium for saline atmosphere (IPW/TYPEX) **(6)**		
COD.	Identification Plate		
IN	CEPEL: Ex-ia		
COD.	Painting		
P0	Munsell N 6,5 Gray	P6	Epoxy Yellow
P3	Polyester Black	P8	Without Painting
P4	Epoxy White	P9	Blue Safety Base Epoxy – Eletrostatic Painting
P5	Polyester Yellow	PC	Safety Base Polyester – Eletrostatic Painting
COD.	Tag Plate		
J0	With TAG	J2	User's specification
J1	Without TAG		

LD292I	H0	IN	P0	J0	← TYPICAL MODEL NUMBER

Optional Items

Special Procedures	**C1** –Degrease Cleaning (Oxygen or Chlorine Service) **C4** - Polishing of the sanitary connections according to 3A Certification **(9)**
Burnout	**BD** – Down Scale **BU** – Up Scale
Special Characteristics	**ZZ** – User's specifications

NOTES

(1) Silicone Oils not recommendations for Oxygen (O_2) or Chlorine service.
(2) Certificate for use in Hazardous Locations (CEPEL, NEPSI, NEMKO, EXAM, FM, CSA).
(3) Certificate for use in Hazardous Locations (CEPEL, CSA).
(4) Certificate for use in Hazardous Locations (CEPEL, NEPSI, NEMKO, EXAM).
(5) Not certified for use in hazardous locations.
(6) IPW/TYPEX was tested for 200 hours according to NBR 8094 / ASTM B 117 standard.
(7) IPX8 tested for 10 meters of water column for 24 hours.
(8) Ingress Protection:

Products	CEPEL	NEMKO/EXAM	FM	CSA	NEPSI
LD29X	IP66/W	IP66/68/W	Type 4X/6/6P	Type 4X	IP67

(9) Compliant with 3A-7403 standard for food and other applications where sanitary connections are required.
- Neobee M2O Fill Fluid
- Finishing wet Face: 0.8 µm Ra (32 µ" AA)
- Wet O-Ring: Viton, Teflon and Buna-N

Appendix A

CERTIFICATIONS INFORMATIONS

European Directive Information

Authorized representative in European Community
Smar Gmbh-Rheingaustrasse 9-55545 Bad Kreuzanach

PED Directive (97/23/EC) – Pressure Equipment Directive
This product is in compliance with the directive and it was designed and manufactured in accordance with sound engineering practice using several standards from ANSI, ASTM, DIN and JIS.

EMC Directive (2004/108/EC) - Eletromagnetic Compatibility
The EMC test was performed according to IEC standard: IEC61326-1:2006, IEC61326-2-3:2006, IEC61000-6-4:2006, IEC61000-6-2:2005. For use in environment only.
Keep the shield insulated at the instrument side, connecting the other one to the ground if necessary to use shielded cable.

ATEX Directive (94/9/EC) – Equipment and protective systems intended for use in potentially explosive atmospheres.
This product was certified according European Standards at NEMKO and EXAM (old DMT). The certified body for manufacturing quality assessment is EXAM (number 0158).

LVD Directive 2006/95/EC – Electrical Equipment designed for use within certain voltage limits
According the LVD directive Annex II the equipment under ATEX “Electrical equipment for use in an explosive atmosphere” directive are excluded from scope from this directive.

The EC declarations of conformity for all applicable European directives for this product can be found at **www.smar.com.**

Hazardous Locations General Information

Ex Standards:
Ex Standards:
IEC 60079-0: 2008 General Requirements
IEC 60079-1:2009 Flameproof Enclosures “d”
IEC 60079-11:2009 Intrinsic Safety “i”
IEC 60079-26:2008 Equipment with equipment protection level (EPL) Ga
IEC 60529:2005 Classification of degrees of protection provided by enclosures (IP Code)

Customer responsibility:
IEC 60079-10 Classification of Hazardous Areas
IEC 60079-14 Electrical installation design, selection and erection
IEC 60079-17 Electrical Installations, Inspections and Maintenance

Warning:
Explosions could result in death or serious injury, besides financial damage. Installation of this instrument in an explosive environment must be in accordance with the national standards and according to the local environmental protection method. Before proceeding with the installation match the certificate parameters according to the environmental classification.

General Notes:

- **Maintenance and Repair**

The instrument modification or replaced parts supplied by any other supplier than authorized representative of Smar Equipamentos Industriais Ltda is prohibited and will void the Certification.

- **Marking Label**

Once a device labeled with multiple approval types is installed, do not reinstall it using any other approval types. Scratch off or mark unused approval types on the approval label.

- **For Ex-i protection application**

- Connect the instrument to a proper intrinsically safe barrier.
- Check the intrinsically safe parameters involving the barrier, equipment including the cable and connections.

- Associated apparatus ground bus shall be insulated from panels and mounting enclosures.
- When using shielded cable, isolate the not grounded cable end.
- Cable capacitance and inductance plus C_i and L_i must be smaller than C_o and L_o of the Associated Apparatus.

- **For Ex-d protection application**

- Only use Explosion Proof/Flameproof certified Plugs, Adapters and Cable glands.
- As the instrument is non-ignition capable under normal conditions, the statement “Seal Not Required” could be applied for Explosion Proof version regarding to electric conduits connection. (CSA Approved)
- In an Explosion-Proof/Flame-Proof installation, do not remove the instrument housing covers when powered on.

- Electrical Connection

In Explosion-Proof installations the cable entries must be connected through conduit with sealed unit or closed using metal cable gland or closed using metal blanking plug, all with at least IP66 and Ex-d certification. For enclosure with saline environment protection (W) and ingress protection (IP) applications, all NPT thread parts must apply a proper water-proof sealant (a non-hardening silicone group sealant is recommended).

- **For Ex-d and Ex-i protection application**

- The transmitter has a double protection. In this case the transmitter shall be fitted with appropriate certified cable entries Ex-d and the electric circuit supplied by a certified diode safety barrier as specified for the protection Ex-ia.

- **Environmental Protection**

- Enclosure Types (Type X): Supplementary letter X meaning special condition defined as default by Smar the following: Saline Environment approved - salt spray exposed for 200 hours at 35ºC. (Ref: NEMA 250).
- Ingress protection (IP W): Supplementary letter W meaning special condition defined as default by Smar the following: Saline Environment approved - salt spray exposed for 200 hours at 35ºC. (Ref: IEC60529).
- Ingress protection (IP x8): Second numeral meaning continuous immersion in water under special condition defined as default by Smar the following: 1 Bar pressure during 24hours. (Ref: IEC60529).

Hazardous Locations Certifications

NOTE
The IP68 sealing test (immersion) was performed at 1 bar for 24 hours. For any other situation, please consult Smar.

North American Certifications

FM Approvals

Intrinsic Safety (FM 3014713)
IS Class I, Division 1, Groups A, B, C and D
IS Class II, Division 1, Groups E, F and G
IS Class III, Division 1

Explosion Proof (FM 3014713)
XP Class I, Division 1, Groups A, B, C and D

Dust Ignition Proof (FM 3014713)
DIP Class II, Division 1, Groups E, F and G
DIP Class III, Division 1

Non Incendive (FM 3014713)
NI Class I, Division 2, Groups A, B, C and D

Environmental Protection (FM 3014713)
Option: Type 4X/6/6P or Type 4/6/6P

Special conditions for safe use:
Entity Parameters Fieldbus Power Supply Input (report 3015629):
Vmax = 24 Vdc, Imax = 250 mA, Pi = 1.2 W, Ci = 5 nF, Li = 12 uH
Vmax = 16 Vdc, Imax = 250 mA, Pi = 2 W, Ci = 5 nF, Li = 12 uH

Temperature Class T4
Maximum Ambient Temperature: 60ºC (-20 to 60 ºC)
Overpressure Limits:
2000 psi for ranges 2, 3 and 4
4500 psi for range 5

CSA International (Canadian Standards Association)

Class 2258 02 – Process Control Equipment – For Hazardous Locations (CSA1111005)
Class I, Division 1, Groups B, C and D
Class II, Division 1, Groups E, F and G
Class III, Division 1
Class I, Division 2, Groups A, B, C and D
Class II, Division2, Groups E, F and G.
Class III
Dual Seal

Class 2258 04 – Process Control Equipment – Intrinsically Safe Entity – For Hazardous Locations (CSA 1111005)
Class I, Division 1, Groups A, B, C and D
Class II, Division 1, Groups E, F and G
Class III, Division 1
FISCO Field Device

Model LD292 Series Pressure Transmitter; supply 12-42V dc, 4-20mA; Maximum pressure 3600 PSI; Enclosure Type 4/4X; intrinsically safe with Fieldbus/FISCO Entity parameters:
Vmax = 24V, Imax = 380mA, Pmax = 5.32W, Ci = 5nF, Li = 0,
when connected through CSA Certified Safety Barriers as per Smar Installation Drawing 102A0608; Temp Code T3C; Dual Seal.
Note: Only models with stainless steel external fittings are Certified as Type 4X.

Special conditions for safe use:
Temperature Class: T3C
Maximum Ambient Temperature: 40ºC (-20 to 40 ºC)
Maximum Working Pressure: 3600 psi
Dual Seal (process)

European Certifications

Certificate No.: NEMKO 13 ATEX 1574X
Explosion Proof: Group II, Category 2 G, Ex d, Group IIC, Temperature Class T6, EPL Gb

Ambient Temperature: -20 to 60 ºC

Certificate No: NEMKO 13 ATEX 1574X
Environmental Protection: IP66W/68W

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 60079-0:2012 General Requirements
EN 60079-1:2007 Flameproof Enclosures “d”

Certificate No: DMT 02 ATEX E 084) - In Progress
Intrinsic Safety
Group I, Category I M1, Ex ia, Group I, EPL Mb
Group II, Category 1/2 G, Ex ia, Group IIC, Temperature ClassT6, EPL Ga
FISCO Field Device

Supply circuit for the connection to an intrinsically safe for FISCO fieldbus circuit:
Ui = 24 Vdc, Ii = 380 mA, Pi = 5.32 W, Ci ≤ 5nF, Li = Neg
Parameter of the supply circuit comply with FISCO model according to EN 60079-27:2008

Ambient Temperature: -40ºC ≤ Ta ≤ + 60ºC

The Essential Health and Safety Requirements are assured by compliance with:
EN 60079-0:2009 General Requirements
EN 60079-11:2007 Intrinsic Safety “i”
EN 60079-26:2007 Equipment with equipment protection level (EPL) Ga
EN 60079-27:2008 Fieldbus intrinsically safe concept (FISCO)

South American Certifications

Certificate No: CEPEL 96.0075X
Intrinsic Safe - Ex-ia IIC T4/T5 EPL Ga
FISCO Field Device
• Parameterss: Ui = 30 Vdc Ii = 380 mA Ci =5 nF Li = neg Pi = 5.32 W
Ambient Temperature: -20 ºC < T_{amb} <+65 ºC for T4
-20 ºC < T_{amb} <+50 ºC for T5

Certificate No: CEPEL 98.0054
Explosion Proof - Ex-d IIC T6 EPL Gb
Maximum Ambient Temperature: 40 ºC (-20 a 40ºC).

Environment Protection: IP66 or IP66W.

Special conditions for safe use:
The certificate number ends with the letter "X" to indicate that for the version of Pressure Transmitter model LD292 equipped with housing made of aluminum alloy, only can be installed in "Zone 0" if is excluded the risk of occurs impact or friction between the housing and iron/steel itens.

The Essential Health and Safety Requirements are assured by compliance with:
ABNT NBR IEC 60079-0:2008 General Requirements
ABNT NBR IEC 60079-1:2009 Flameproof Enclosures “d”
ABNT NBR IEC 60079-11:2009 Intrinsic Safety “i”
ABNT NBR IEC 60079-26:2008 Equipment with equipment protection level (EPL) Ga
IEC 60079-27:2008 Fieldbus intrinsically safe concept (FISCO)
ABNT NBR IEC 60529:2005 Classification of degrees of protection provided by enclosures (IP Code)

Asian Certifications

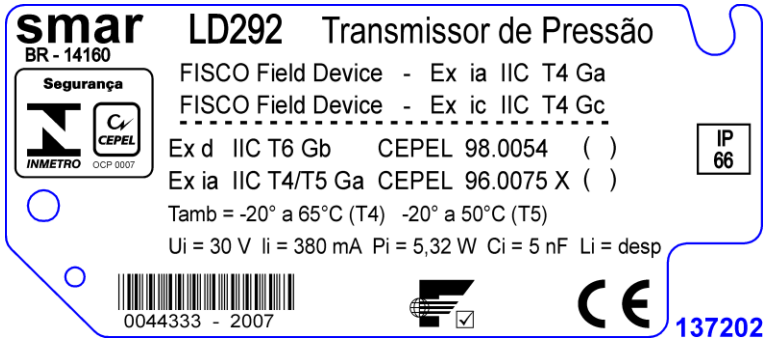
Certificate No: Nepsi GYJ071320
Intrinsically safe - Ex ia, IIC T4/T5/T6
Maximum Ambient Temperature: 85 ºC
Entity Parameters: Ui = 24 Vdc Ii = 380 mA Ci = 5 nF Li = 0 Pi = 5.32 W
FISCO Field Device Ex ia IIC T4

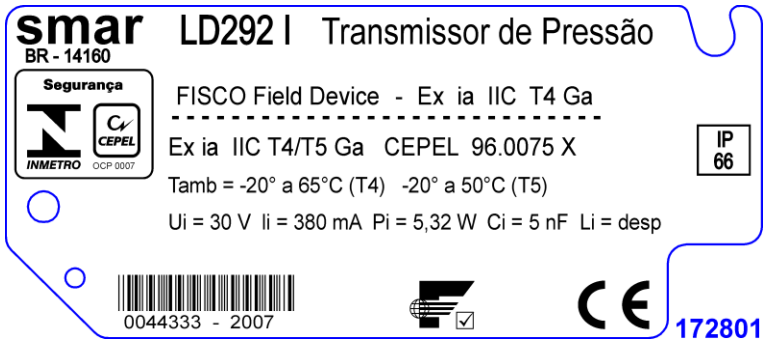
Identification Plates and Control Drawings

Identification Plate

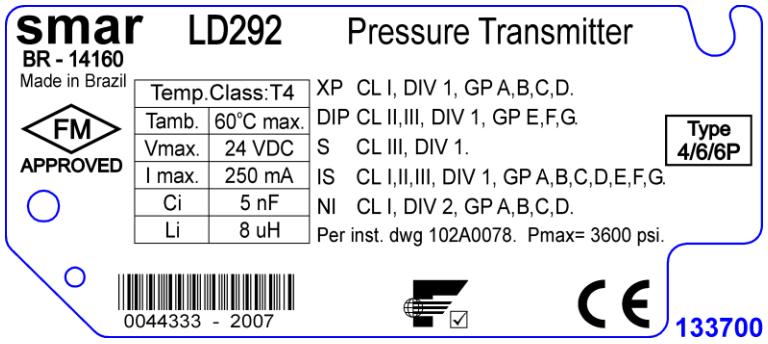
- Identification of Intrinsically Safe and Explosion Proof for gas and steam:

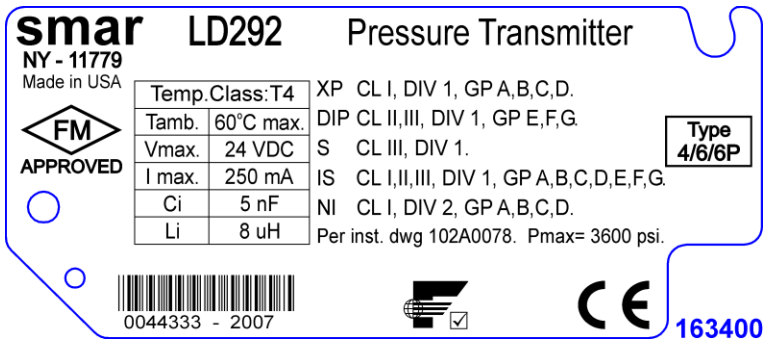
CEPEL



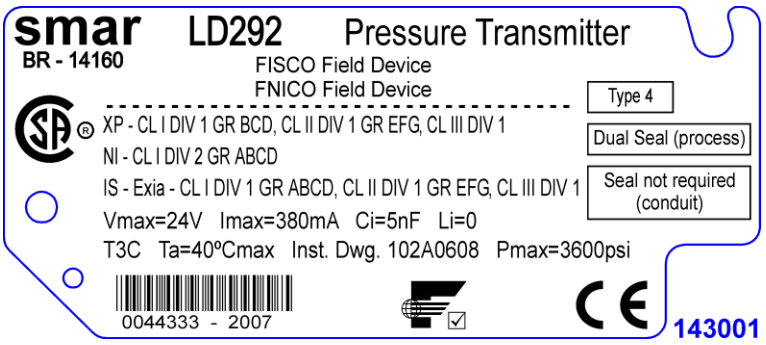


FM

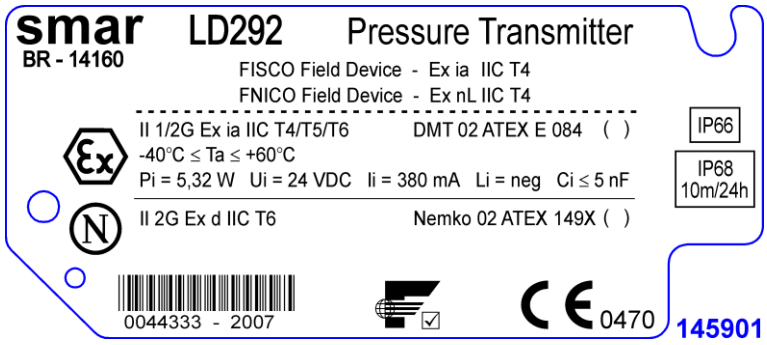




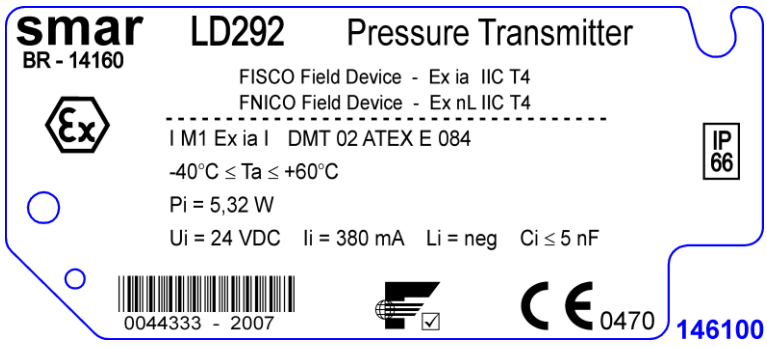
CSA



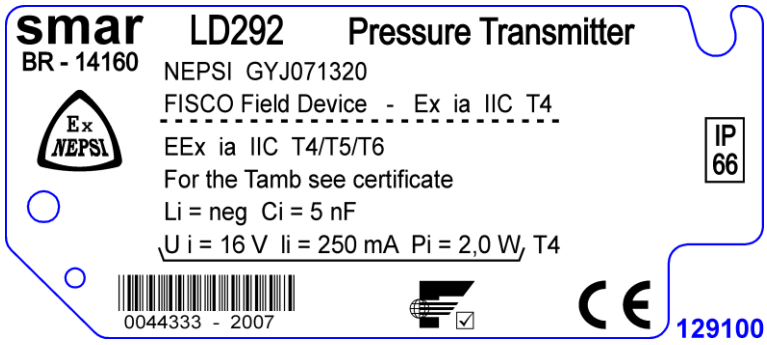
NEMKO and DMT



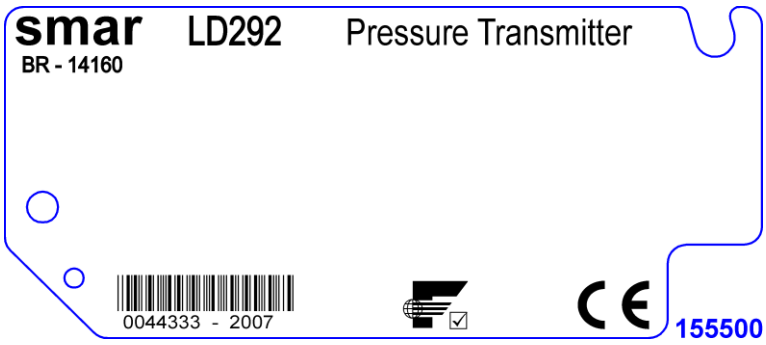
DMT



NEPSI

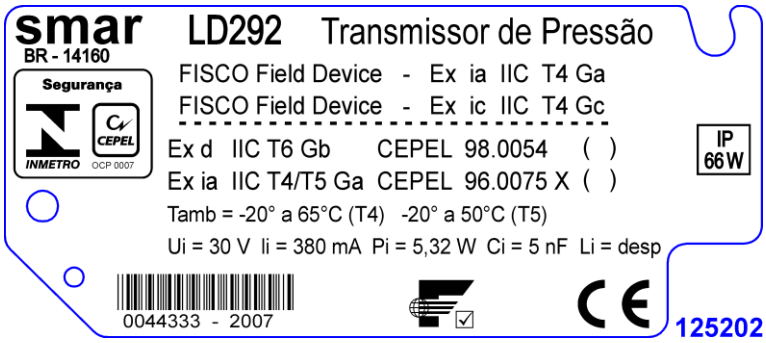


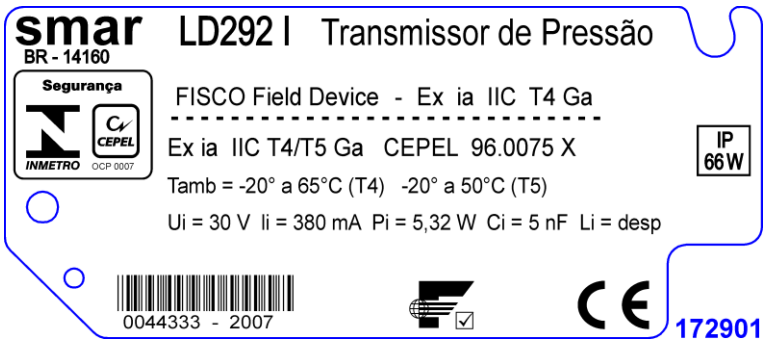
WITHOUT APPROVAL



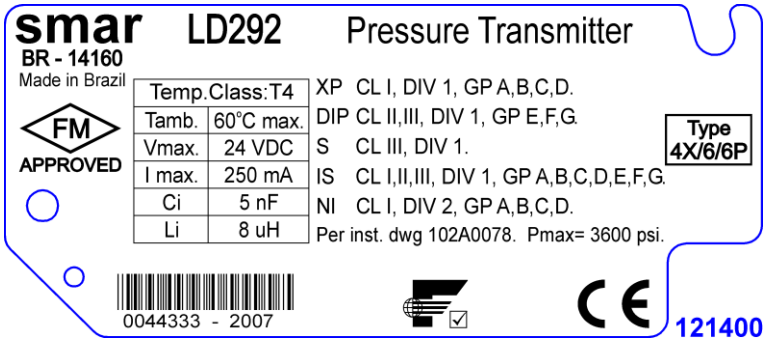
- Identification if Intrinsically Safe and Explosion Proof for saline atmospheres:

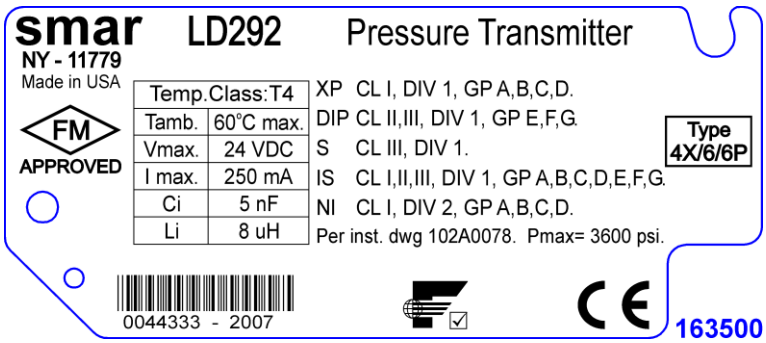
CEPEL



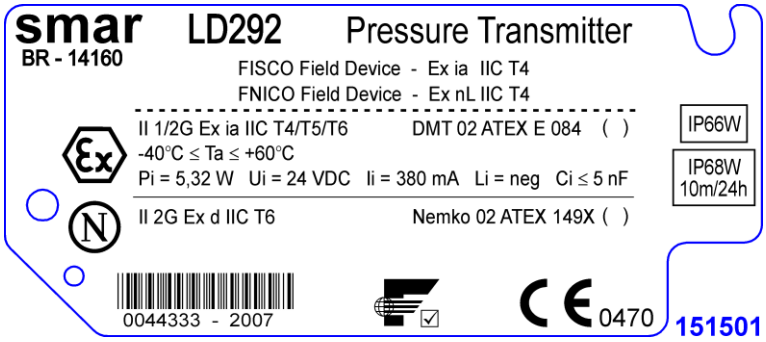


FM

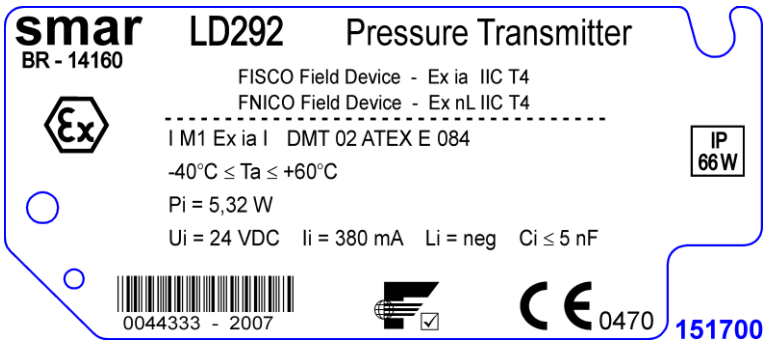




NEMKO and DMT

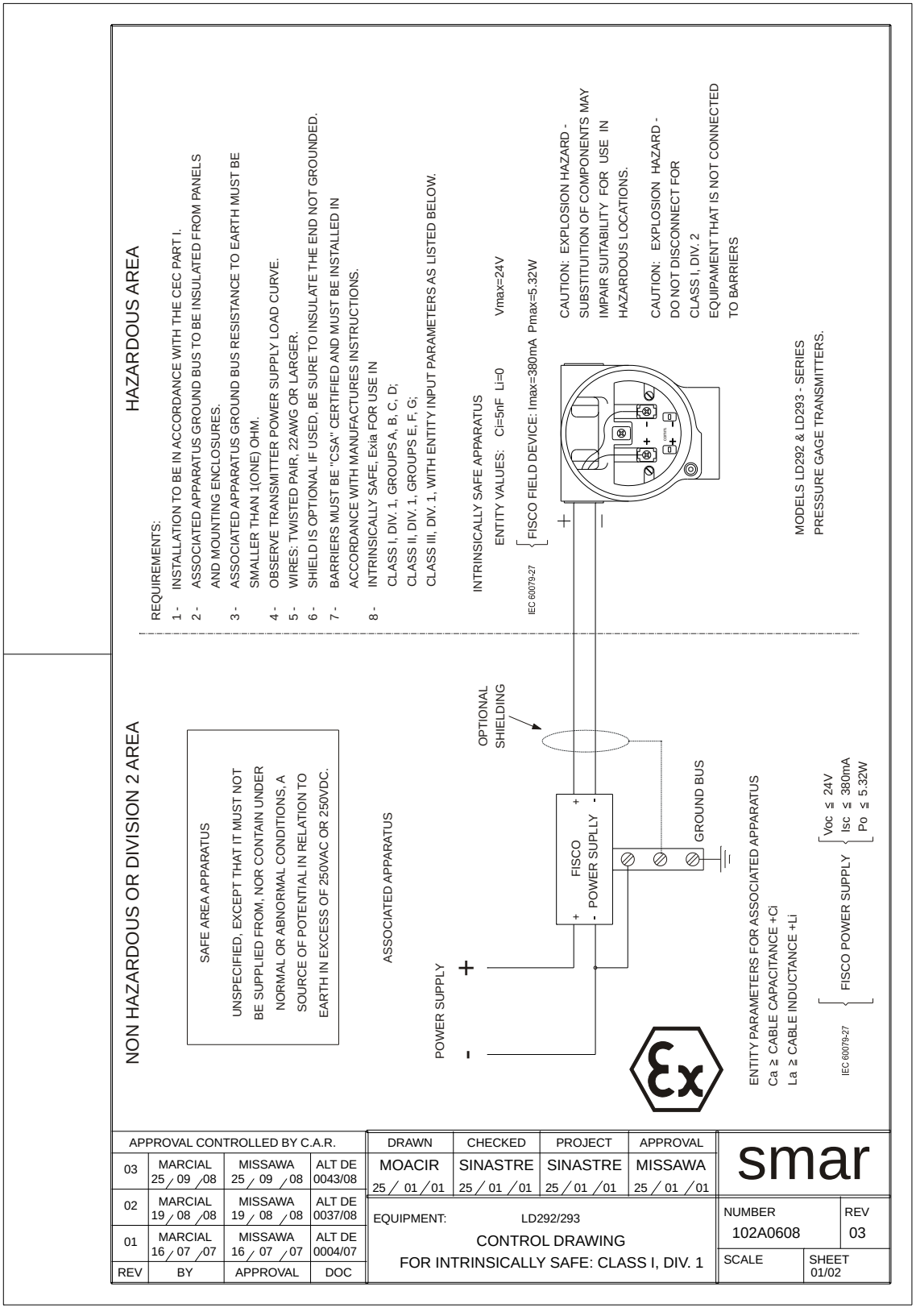


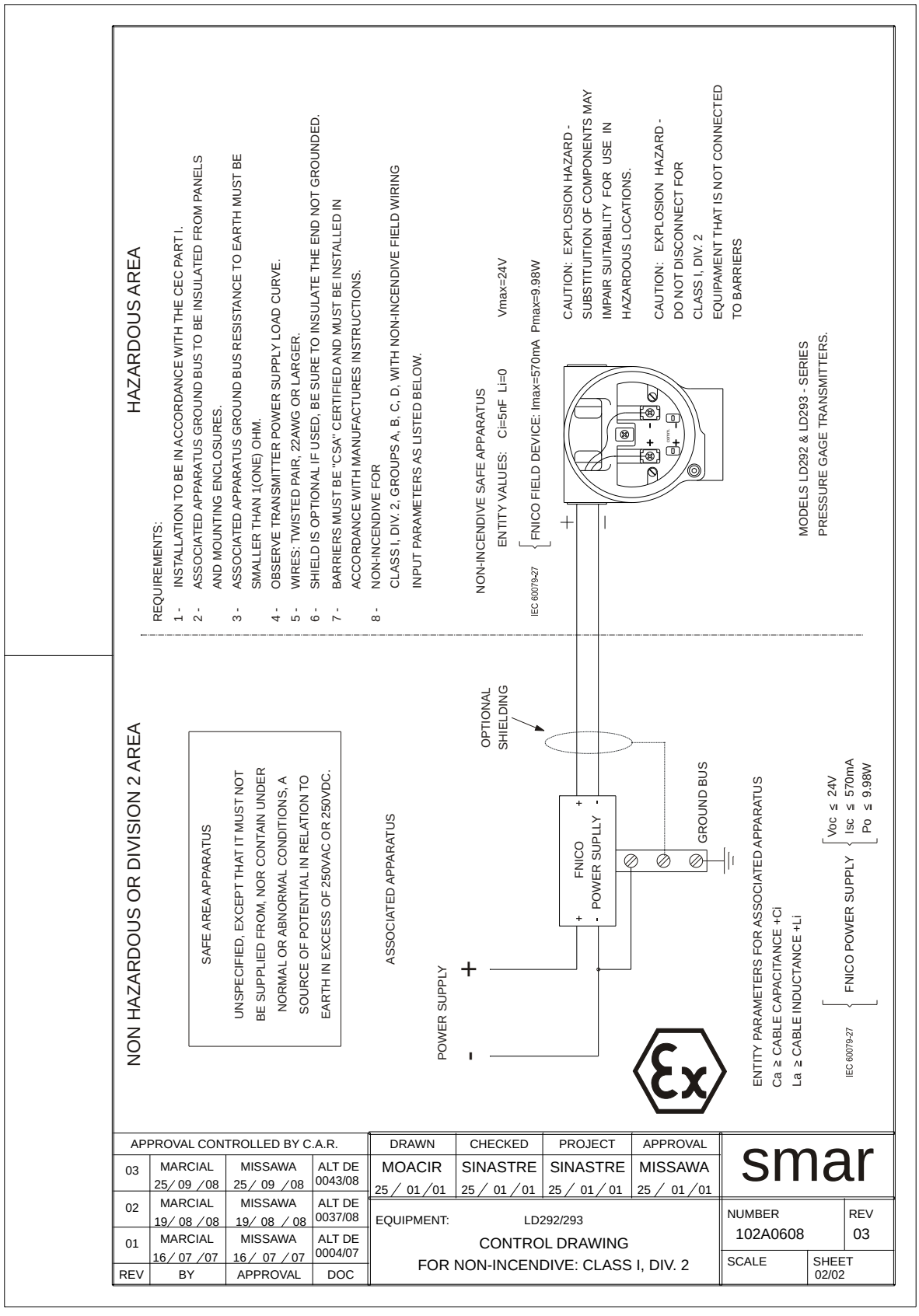
DMT



Control Drawing

CSA





APPROVAL CONTROLLED BY C.A.R.			
03	MARCIAL 25/ 09 /08	MISSAWA 25/ 09 /08	ALT DE 0043/08
02	MARCIAL 19/ 08 /08	MISSAWA 19/ 08 / 08	ALT DE 0037/08
01	MARCIAL 16/ 07 /07	MISSAWA 16/ 07 / 07	ALT DE 0004/07
REV	BY	APPROVAL	DOC

DRAWN	CHECKED	PROJECT	APPROVAL
MOACIR 25 / 01 /01	SINASTRE 25 / 01 / 01	SINASTRE 25 / 01 / 01	MISSAWA 25 / 01 /01

EQUIPMENT: LD292/293

CONTROL DRAWING
FOR NON-INCENDIVE: CLASS I, DIV. 2

smar

NUMBER	REV
102A0608	03
SCALE	SHEET 02/02

Appendix B

smar	SRF – Service Request Form Pressure Transmitters	Proposal No.:

Company:	Unit:	Invoice:

COMMERCIAL CONTACT	TECHNICAL CONTACT
Full Name:	Full Name:
Function:	Function:
Phone: Extension:	Phone: Extension:
Fax:	Fax:
Email:	Email:

EQUIPMENT DATA

Model:	Serial Number:	Sensor Number:
Technology: ( ) 4-20 mA ( ) HART® ( ) FOUNDATION fieldbus™ ( ) PROFIBUS PA		Version Firmware:

PROCESS DATA

Process Fluid:

Calibration Range		Ambient Temperature (ºF)		Process Temperature (ºF)		Process Pressure	
Min.:	Max.:	Min.:	Max.:	Min.:	Max.:	Min.:	Max.:
Static Pressure		Vacuum					
Min.:	Max.:	Min.:	Max.:				

Normal Operation Time:	Failure Date:

FAILURE DESCRIPTION
(Please, describe the observed behavior, if it is repetitive, how it reproduces, etc.)

OBSERVATIONS

USER INFORMATION

Company:

Contact: Title: Section:

Phone: Extension: E-mail:

Date: Signature:

For warranty or non-warranty repair, please contact your representative.
Further information about address and contacts can be found on www.smar.com/contactus.asp.