MANUAL

INSTALLATION | OPERATION | MAINTENANCE

Smart Pressure Transmitter
LD400WH WirelessHART

WirelessHART™

JUN/25 - VERSION 3

smar
Technology Company

LD400WH

Smart Pressure Transmitter

WirelessHART™

Consult our subsidiary

INMETRO ATEX IECEx

Rua Dr. Antônio Furlan Junior, 1028 - Sertãozinho, SP - CEP: 14170-480
insales@smar.com.br | +55 (16) 3946-3599 | www.smar.com

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NOTE
This manual is compatible with version 3.XX, where 3 denote 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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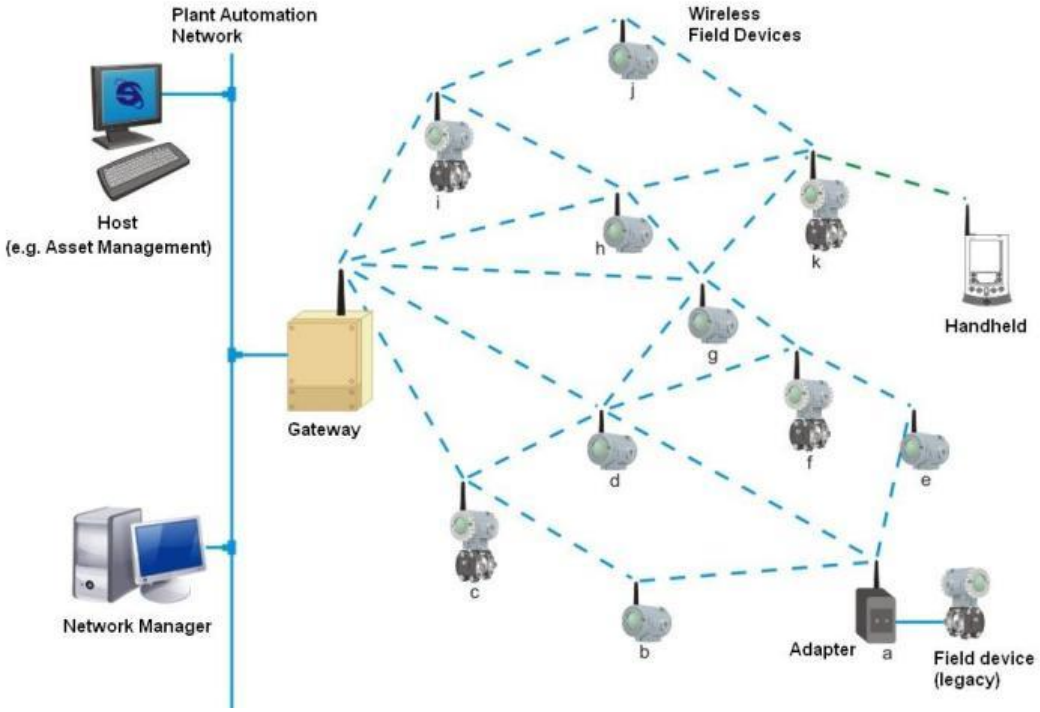
INTRODUCTION

*Wireless*HART technology overview

The *Wireless*HART technology is based on a wireless mesh network communication protocol used in process automation applications. It adds wireless capabilities to the HART protocol, while maintaining compatibility with existing HART devices, commands and already known and used tools.

***Wireless*HART network**
Basically, a *Wireless*HART network, defined in the HART specifications, consists of a host, a *Wireless*HART Gateway and one or more field devices and/or *Wireless*HART adapters. Together they compose a mesh network where the host and devices can communicate.



Host
The host, usually connected to the control network, is a workstation in which, e.g., can be installed an Human Machine Interface application, which allows an operator to interact with the process. Through the *Wireless*HART Gateway, the host can gather data from devices connected to the *Wireless*HART network. The host communicates with the *Wireless*HART Gateway using a communication protocol, for example, HSE, H1, Profibus or Modbus.

***Wireless*HART Gateway**
It is a "translator" equipment. Thus, it converts data from the host to the *Wireless*HART protocol, used by the devices connected to the *Wireless*HART network, and converts data from the devices to the host. In general, the *Wireless*HART Gateway incorporates the features of Network Manager and Access Point. Roughly, the access point can be understood as the *Wireless*HART radio installed at the gateway to communicate with devices connected to the wireless network.

Network Manager
The Network Manager is an application that can be embedded in the *Wireless*HART Gateway. On a *Wireless*HART network is only allowed to have one Network Manager. Among its responsibilities, the Network Manager distributes network identity (advertisement) publishing its existence, manages and authenticates the addition (joining) of devices to the network. It also distributes individual security keys (static or rotating) to the devices to ensure secure communication between it and the devices. The Network Manager assigns communication band to the devices already connected to

the network that requested services to it, as well as manages the routes between the devices on the mesh network.

Specifically, about the joining process of a *Wireless*HART device to the network, the Network Manager validates the Network ID and the Join Key attributes which are configured in the *Wireless*HART Gateway and *Wireless*HART devices.

The Network ID identifies a *Wireless*HART network in unique way. It is an unsigned integer attribute and must be configured on the *Wireless*HART Gateway and all *Wireless*HART devices. Considering a *Wireless*HART network installed in a plant, the permitted values for the Network ID ranges from 0 (hex 0x0000) to 32767 (0x7FFF hexadecimal).

The Join Key is a security key used to encrypt joining requests from *Wireless*HART devices that receive the advertisement with the Network Id identical to theirs. It may be single or each *Wireless*HART device may be configured with an individual Join Key. In the first case, the *Wireless*HART Gateway and all *Wireless*HART devices must be configured with the same Join Key. In the second case, which provides higher communication security level, (a) must be configured in the *Wireless*HART Gateway a list with individual Join Keys, i.e., a key for each *Wireless*HART device, and (b) you must configure each *Wireless*HART device with its individual Join Key. The Join Key is a hexadecimal string of 16 bytes. There is no restriction to the hexadecimal value of each byte. The table below shows examples of some join keys.

JOIN KEYS	16-BYTES HEXADECIMAL STRING
00000000000000000000000000000000	0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00
00000000000000000000000000000302	0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x03, 0x02
00000000FFFFFFFF0000000000000000	0x00, 0x00, 0x00, 0x00, 0xFF, 0xFF, 0xFF, 0xFF, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00
550000000000000000000000000000AA	0x55, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0xAA

***Wireless*HART device**
The *Wireless*HART field device is the device that connects to the process, being able to receive and/or transmit data on the *Wireless*HART network. It is a *Wireless*HART router (repeater) by nature, i.e., it is able to retransmit messages to/from other devices on the *Wireless*HART network.

***Wireless*HART Adapter**
It is a bridge-type device, because it is able to provide data of HART + 4 to 20mA field device, legacy, to the host via *Wireless*HART. The adapter uses HART FSK standard communication, wired, to access data from HART field devices. And the adapter also uses the *Wireless*HART communication to provide data of the field device to the host. The adapter thus enables a HART field device to work on *Wireless*HART network.

We recommend a visit to the HART Communication Foundation website for additional information about the *Wireless*HART protocol such as *Wireless*HART project planning, positioning of devices, commissioning and verification tools, and practices.

Planning a *Wireless*HART network

We recommend visiting https://www.fieldcommgroup.org/ on the Internet for additional information of the WirelessHART protocol such as planning a WirelessHART project, instrument placement, instrument commissioning and verification, and best practices.

The planning of a *Wireless*HART network is a task that is very similar to the activities that currently we perform with conventional wired devices. Furthermore, due to the simplicity of a mesh *Wireless*HART network, is exempt, in general, detailed field surveys, which are usually needed when we plan networks based on other wireless technologies.

Basically, a *Wireless*HART network involves planning, design, installation, and commissioning phases.

Planning
This phase requires the execution of the next steps:

Scope definition
Clearly define the scope of the network. Answer the question: why do we need the wireless network? To monitor process variables or to implement a non-critical control? The answer to this question will facilitate the understanding between the team members responsible for the network and determine one or more process units in the plant. For each process unit, allocate a gateway with unique and specific Network ID. Outline the main field devices.

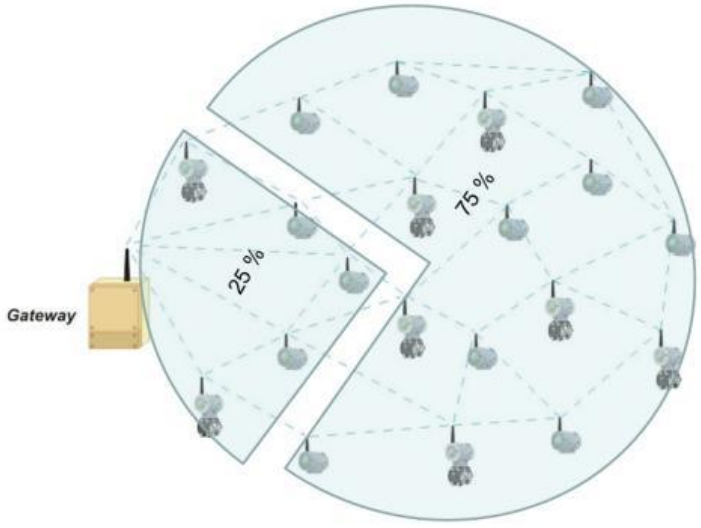
Identify potential sources of interference
Are there radio communications or other wireless networks in the plant? What protocols and frequencies do they use? Use high power? Although unlikely, given the robustness of the radios used by the *Wireless*HART technology, prior knowledge of the answers to these questions may identify potential sources of interference and to indicate the taking of preventive and/or limiting actions even before installation. For example, you can select a frequency channel as unavailable, adding it to the blacklist of frequencies that is under the *Wireless*HART Network Manager control.

Integration with the host
The gateway connects the *Wireless*HART field devices to the host system. Plan what devices and what data are needed. Also, the stations or applications which will process the data have to be clearly defined. From this set, among the protocols in the system, define which one will be used for integration with the host and with the existing tools for configuring the devices. After defining the protocol for integration, the user has to choose the gateway on the market that best meets your requirements.

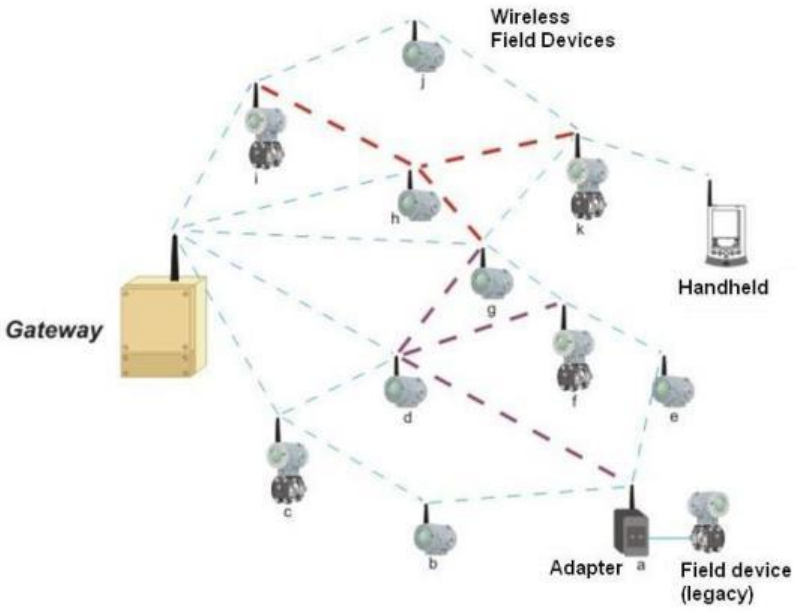
Project

In the project phase, it is recommended the adoption of the practices below. Although conservative, these practices ensure robustness and scalability to the network.

- Define the Network ID that will be used for all devices in the process unit;
- Define if the Join Key will be common to all devices or individual and dedicated;
- Define the policy to be used for the definition of devices (Long) Tags;
- Use a scale drawing of the process unit;
- Place the gateway in a strategic position in the process unit;
- Plan networks with at least five devices;
- Install at least five devices within the gateway coverage area;
- Ensure that 25 % of the devices are within the gateway coverage area;



- Reposition the gateway as needed;
- Check the coverage area of each device;
- Ensure that each device has three neighbors within its coverage area;



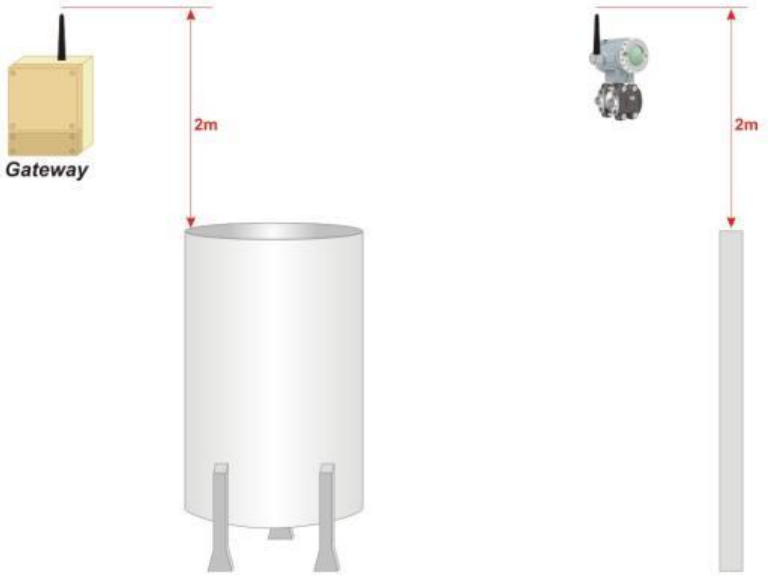
- Place the repeaters as needed. Smar offers the **RP400WH**, the best cost-benefit on the market.

Installation

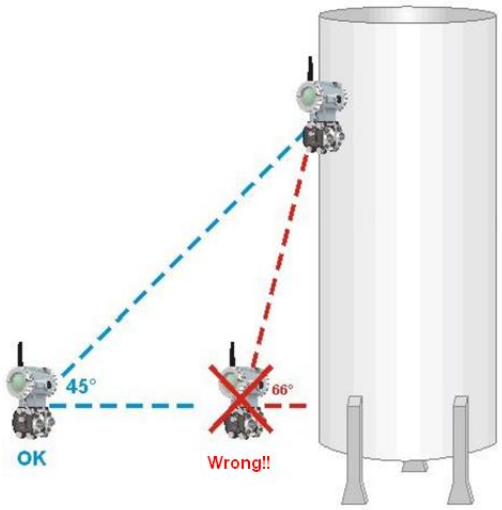
As mentioned before, *Wireless*HART devices should be connected to the process and configured the same way as conventional wired HART devices.

Handheld terminals can be used normally. Just be sure of having it properly uploaded with the latest DD files of the devices. However, it is known that the *Wireless*HART devices have characteristics inherent to the technology. Because of this, it is recommended the adoption of practices mentioned below for positioning the gateway and devices.

- Install the gateway and the devices so that their antennas are vertical;
- Ensure that the antennas are at 0.5 m minimum distance of large obstacles or surfaces;
- Ensure that the antennas of gateway and repeaters are 2 m above most obstacles within their coverage areas;



- If there are high devices, does not exceed 45° viewing angles between them;



- Make sure that the gateway is integrated to the host system as planned.

Commissioning

The commissioning of devices and gateway must be considered.

Commissioning on bench

Commissioning consists of testing the transmitter and verifying its configuration data. The LD400 WirelessHART can be commissioned either before or after installation. The commissioning of the transmitter on the bench before its installation using CONF401, HPC401 or some configurator that interprets DD, for example Smar's AssetView, which ensures that all transmitter components are working correctly.

To turn the transmitter on/off, use terminal SW1 (ON/OFF), as shown in Figure 1.4.

To connect the handheld configurator to the equipment, use the communication terminals "CN1 and CN2" on the terminal block. See Figure 1.4.

Instrument and gateway commissioning must be considered.

*Wireless*HART devices commissioning

a) Ensure that the gateway is installed and powered;
b) If not specified by customer at the time of ordering, the Network ID and Join Key values of the gateway and equipment will be the factory default value. Note: It is strongly recommended that both be changed! To change these parameters, install the gateway and all network equipment following the steps below. Once the network is fully functioning it will be more practical to change them.
c) Configure each device individually, starting with those closest to the gateway and moving away to the farthest distance so that communication is established correctly;
d) Always install the equipment with the antenna in the vertical direction. If the equipment is installed horizontally, consult Smar to purchase the antenna for horizontal mounts, so that it is 90° with the equipment. No Wireless equipment should be located at the highest point of the plant, preventing it from working as a possible lightning rod;
e) Turn on the equipment using the switch on the left of the display and wait until it connects to the network (this time can vary from 2 minutes to 20 minutes, depending on the network size). The status of the equipment on the network can be checked via display, maintenance port or gateway;

ATTENTION
If the equipment was not purchased together with the gateway, that is, if the gateway already has Network ID and Join Key values different from the factory values, it is necessary to configure these parameters in the equipment to connect correctly to the network: first configure Network ID and then Join Key, restarting the equipment after the settings.

f) Once these steps are performed for all network equipment and they are connected correctly, it is time to change the Network ID and Join Key values from the factory following the instructions at the end of step e) (if they have not already been changed). Network ID is any number between 0

and 32767 and identifies the network among others. Join Key is a 32-character hexadecimal key (0-9 or A-F) and works as the equipment's access key to the configured network;
g) Configure the Long Tag parameter that identifies the device on the network;
h) Check that the equipment engineering units are in accordance with those required by the process;
i) Configure Burst Mode parameters to publish the desired measurements and status:

- Burst message: up to 3 messages can be configured with different commands and times;
- Minimum Time: is the time for publishing the variables;
- Maximum Time: must be greater than the minimum time and is only used in trigger mode (check the operation of trigger mode in the equipment manual, if you want to receive the monitoring variables only when there is any change in their value);
- Command: command that sends the variables desired by the user (for example, command 3 sends PV, SV, TV, and QV values, when available);
- Burst Mode: once all the above parameters have been configured, activate Burst mode.
- Burst time-based acquisition: parameter that reduces equipment consumption by performing only one acquisition immediately before Burst transmission. If this parameter is disabled, the equipment will acquire every two seconds, regardless of the Minimum Burst Time.;

j) j. After a time of negotiation with the gateway, the equipment will start to publish the configured command at a configured minimum time rate. The ACK icon is shown on the display (if available) when the equipment is in Burst mode and the F(t) icon flashes when the Burst command is sent (see Status Indication on the Display topic).

ATTENTION
Burst mode settings will remain even after the equipment is turned off, that is, when turned on, the equipment will automatically connect to the network in Burst mode with the same time and command configured. The higher the refresh rate, the shorter the battery life and vice versa. Set an update rate that allows the equipment to last for a few years.

k) After the general configuration of the network, wait about one hour for the network to start working in a 100% optimized way. Attention: There is a battery life estimation parameter that indicates the expected duration, in days, of the equipment. This parameter is recalculated every 60 minutes and its value should only become valid after two or three hours of the equipment operating on the network (time required to optimize consumption). When this value is near the end, the user will receive an alarm on the equipment status and on the display (when available). When changing the Battery Module (code Smar 400-1209) the replacement must be configured through a configurator that will reset the counting of the estimated lifetime for the new module. ATTENTION: do not dispose of the Battery Module in common garbage. Use proper disposal for batteries or chemical waste.

Equipment Reach Verification
Identify the distance to be considered according to the type of environment in which the equipment will be installed:

- **Strong Obstruction** – about 30 m. Places with lots of equipment, cables, pipes, etc. Consider a place where you would normally not be able to travel.
- **Medium Obstruction** – about 75 m. Places that have equipment with space in relation to the rest of the plant.
- **Light Obstruction** – 150 m. Consider an open environment that has obstruction like a silo or tank. Although the obstruction is big, there is plenty of free space around for the RF waves to propagate.
- **Line of Sight** – up to 225 m. Consider that the equipment's antenna “sees” directly the antenna of other equipment on the network, without any obstacles between them. Furthermore, the difference in height between them must not cause an angle greater than 5 degrees.

Conditions that significantly reduce the equipment reach include mounting the equipment close to the ground, below ground level, or under water, as the RF signal is absorbed by the ground or water and does not propagate. In addition, installing the equipment outside the network area (gateway), for example, in an open environment. Install the equipment inside a closed room also contributes to signal attenuation, because it will not propagate very well through concrete, wood, etc.

Gateway commissioning

a) Make sure that the gateway is available to the host system;

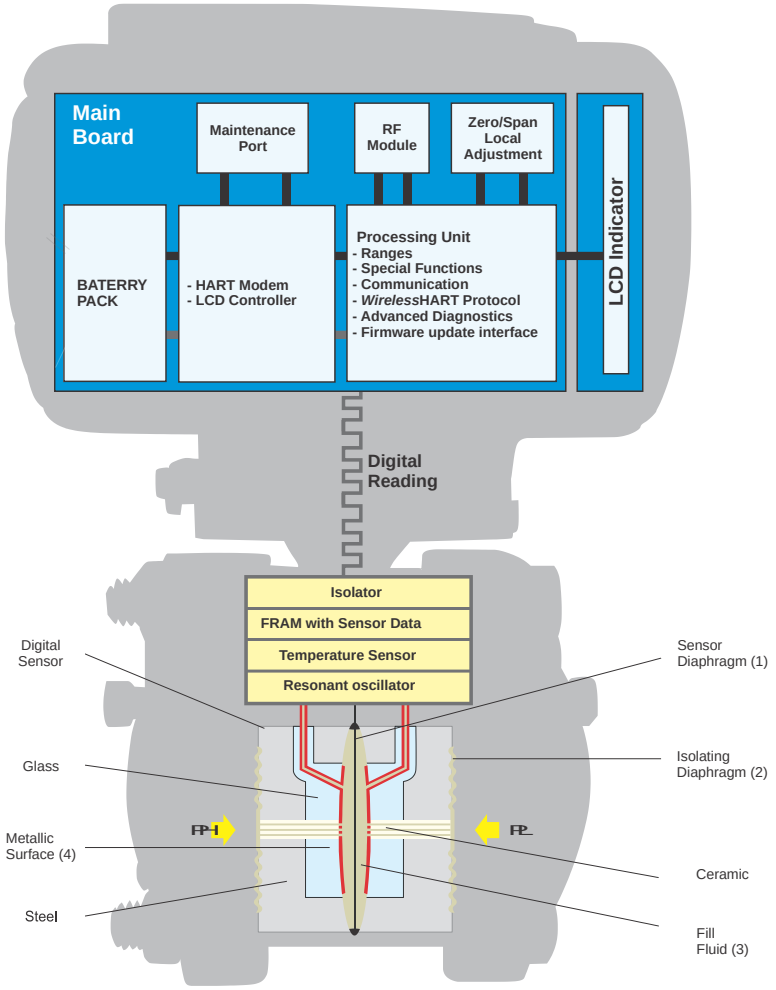
b) Check the gateway and make sure it has at least five devices directly connected to it;

c) Check if 25 % of the devices are connected directly to the gateway. If necessary, add repeaters;

The gateway connects the devices to the host system. Thus, check if the data of the devices are coming to the applications that subscribe them.

TRANSMITTER GENERAL VIEW

The **LD400 *Wireless*HART™** uses a highly proven technique for pressure measuring by capacitance reading. The block diagram of the **LD400 *Wireless*HART™** pressure transmitter is shown below.



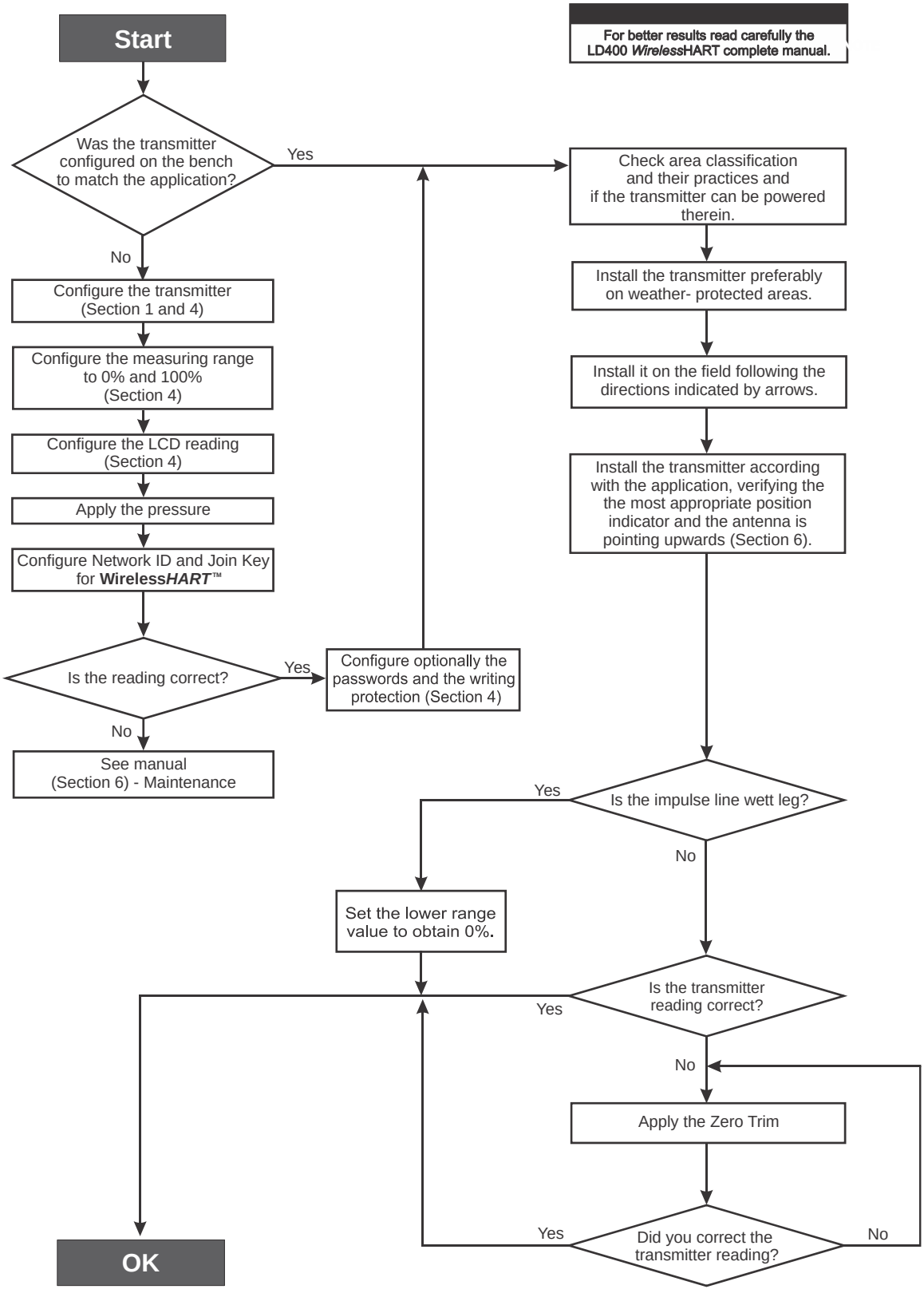
In the cell center is the sensor diaphragm **(1)**. This diaphragm flexes in response to the different pressures applied on the LOW and HIGH sides of the cell (PL and PH). These pressures are directly applied on the isolator diaphragms **(2)**, whose function is to isolate the sensor process and supply high resistance against corrosion caused by process fluids. The pressure is transmitted directly to the sensor diaphragm through the filling fluid **(3)** and causes its deflection. The sensor diaphragm is a mobile electrode whose two metal surfaces **(4)** are stable electrodes. A deflection on the sensor diaphragm is read by the capacitance variation between both stable and mobile electrodes.

The resonance oscillator reads the capacitance variations between the mobile and the stable boards and generates a pressure output equivalent to the detected capacitance variation. This pressure value is informed in compliance with the transmitter communication protocol. As the conversion process does not involve an A/D converter, any errors or deviations are eliminated during the process. Temperature compensation is done by a sensor, which combined with a precision sensor, results in high accuracy and range.

The process variable, as well as the diagnostic monitoring and information, are supplied by the digital communication protocol. The **LD400** is available in the *Wireless*HART™ communication protocol.

Read carefully these instructions for better use of the **LD400 *Wireless*HART™**. Smar pressure transmitters are protected by American patents n. **6,433,791 and 6,621,443.**

Installation Flowchart



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 a flow, level, or pressure measurement depends on several variables. Although the transmitter has an outstanding performance, proper installation is essential to maximize its efficiency. 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 **LD400 *Wireless*HART™** has a built-in temperature sensor to compensate for temperature variations. At the factory, each transmitter is submitted to a temperature cycle, and the characteristics under different temperatures are recorded in the transmitter memory. At the field, this feature minimizes the temperature variation effect.

Putting the transmitter in areas protected from extreme environmental changes can minimize temperature fluctuation effects. In warm environments, the transmitter should be installed to avoid, as much as possible, direct exposure to the sun. Installation close to lines and vessels subjected to high temperatures should also be avoided.

Use longer sections of impulse piping between tap and transmitter whenever the process fluid is at high temperatures. Use of sunshades or heat shields to protect the transmitter from external heat sources should be considered, if necessary.

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

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

Although the transmitter is virtually insensitive to vibration, installation close to pumps, turbines or other vibrating equipment should be avoided. If entirely innevitable, install the transmitter on a solid basis and use flexible vibration-proof hoses. Proper winterization (freeze protection) should be employed to prevent freezing within the measuring chamber, since this will result in an inoperative transmitter and could even damage the cell.

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

Mounting

The transmitter has been designed to be both rugged and lightweight at the same time. This makes its mounting easier. The mounting positions are shown in Figure 1.1, 1.2 and 1.3. Existing standards for the manifolds have also been considered, and standard designs fits perfectly to the transmitter flanges

Should the process fluid contain solids in suspension, install valves or rod-out fittings regularly 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).

Close the valves tightly after each drain or discharge operation.

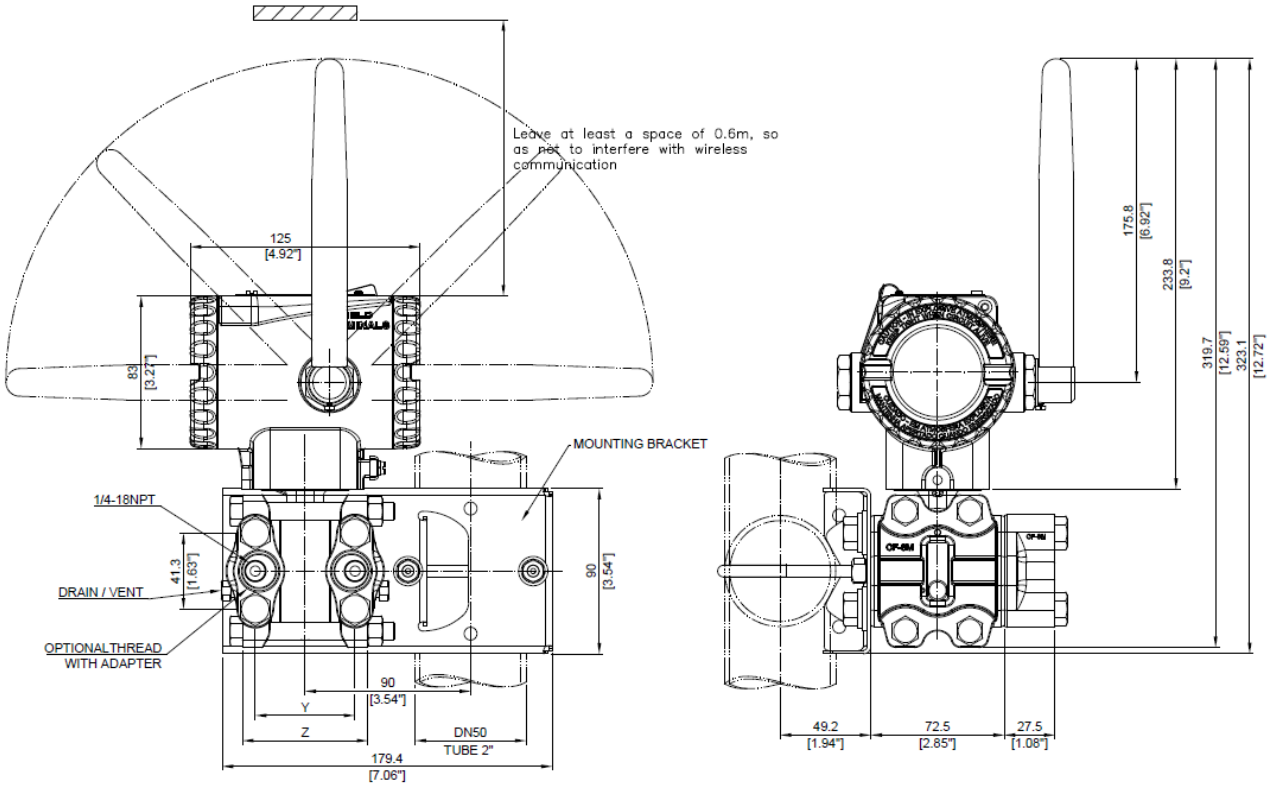
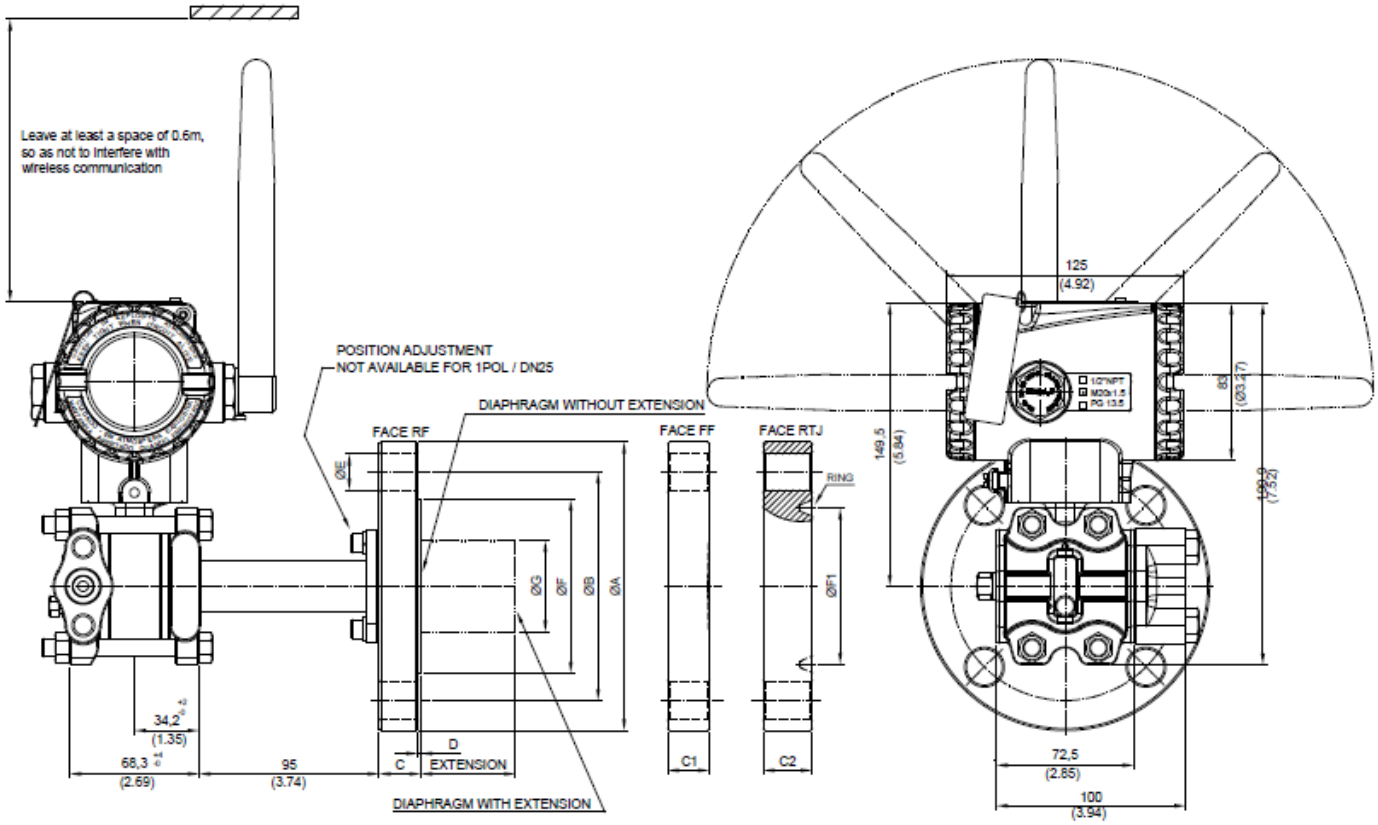


TABLE 1

RANGE	DIMENSIONS	
	Y	Z
0-1-2-3	54,0 (2.13)	69,6 (2.74)
4	56,0 (2.20)	71,6 (2.82)
5	58,3 (2.30)	73,9 (2.91)
6	58,7 (2.31)	74,3 (2.93)

Figure 1.1 (a) – Dimensional Drawing and Mounting Position for the LD400 WirelessHART™ – Differential Pressure, Flow, Gage, Absolute and High Static Pressure Transmitter with Mounting Bracket



DIMENSIONS IN mm (INCH)
EXTENSION LENGHTS: 0 , 50 , 100 , 150 ou 200
ONLY AVAILABLE IN RF FLANGES

ASME-B 16.5 - 2017 DIMENSIONS

DN	CLASS	A	B	C	C1 (FF)	C2 (RTJ)	D	E	F	F1 (RTJ)	ANEL RTJ	G	N° FUROS
1"	150	110 (4.33)	79,2 (3.12)	15 (0.59)	13 (0.59)	19 (0.75)	2 (0.06)	16 (0.63)	50,8 (2)	47,6 (1.87)	R15		4
	300	125 (4.92)	88,9 (3.50)	18 (0.71)	16 (0.63)	23,9 (0.94)	2 (0.06)	19 (0.75)	50,8 (2)	50,8 (2)	R16		4
	600	125 (4.92)	88,9 (3.50)	24,5 (0.96)		23,9 (0.94)	7 (0.25)	19 (0.75)	50,8 (2)	50,8 (2)	R16		4
1.1/2"	150	125 (4.92)	98,6 (3.88)	20 (0.78)	20 (0.79)	24,4 (0.96)	2 (0.06)	16 (0.63)	73,2 (2.88)	65,1 (2.56)	R19	40 (1.57)	4
	300	155 (6.10)	114,3 (4.5)	21 (0.83)	20 (0.79)	28,7 (1.13)	2 (0.06)	22 (0.87)	73,2 (2.88)	68,3 (2.68)	R20	40 (1.57)	4
	600	155 (6.10)	114,3 (4.5)	29,3 (1.15)		28,7 (1.13)	7 (0.25)	22 (0.87)	73,2 (2.88)	68,3 (2.68)	R20	40 (1.57)	4
2"	150	150 (5.90)	120,7 (4.75)	20 (0.79)	20 (0.79)	23,9 (0.94)	2 (0.06)	19 (0.75)	92 (3.62)	82,6 (3.25)	R22	48 (1.89)	4
	300	165 (6.50)	127 (5)	22,7 (0.89)	20,7 (0.81)	28,6 (1.13)	2 (0.06)	19 (0.75)	92 (3.62)	82,6 (3.25)	R23	48 (1.89)	8
	600	165 (6.50)	127 (5)	32,3 (1.27)		33,3 (1.31)	7 (0.25)	19 (0.75)	92 (3.62)	82,6 (3.25)	R23	48 (1.89)	8
3"	150	190 (7.48)	152,4 (6)	24,3 (0.96)	22,3 (0.88)	28,7 (1.13)	2 (0.06)	19 (0.75)	127 (5)	114,3 (4.5)	R29	73 (2.87)	4
	300	210 (8.27)	168,1 (6.62)	29 (1.14)	27 (1.06)	34,9 (1.37)	2 (0.06)	22 (0.87)	127 (5)	123,8 (4.87)	R31	73 (2.87)	8
	600	210 (8.27)	168,1 (6.62)	38,8 (1.53)		39,7 (1.56)	7 (0.25)	22 (0.87)	127 (5)	123,8 (4.87)	R31	73 (2.87)	8
4"	150	228,6 (9)	190,5 (7.5)	24,3 (0.96)	22,3 (0.88)	28,7 (1.13)	2 (0.06)	19 (0.75)	157 (6.19)	149,2 (5.87)	R36	89 (3.50)	8
	300	255 (10)	200 (7.87)	32,2 (1.27)	30,2 (1.19)	36,1 (1.50)	2 (0.06)	22 (0.87)	157 (6.19)	149,2 (5.87)	R37	89 (3.50)	8
	600	275 (10.83)	215,9 (8.5)	45,1 (1.77)		46 (1.81)	7 (0.25)	25 (1)	157 (6.19)	149,2 (5.87)	R37	89 (3.50)	8

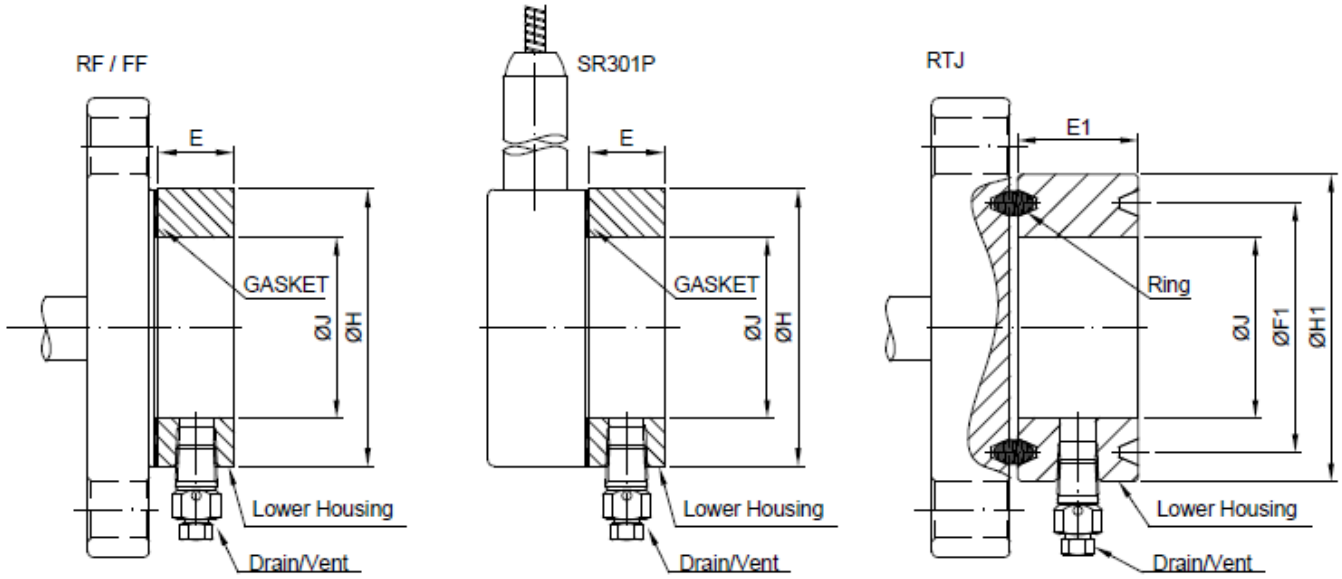
EN 1092-1-2008 DIMENSIONS

DN	PN	A	B	C	C1 (FF)	D	E	F	G	N° FUROS
25	10/40	115 (4.53)	85 (3.35)	18 (0.71)	18 (0.71)	2 (0.08)	14 (0.55)	68 (2.67)		4
40	10/40	150 (5.91)	110 (4.33)	20 (0.78)	20 (0.78)	3 (0.12)	18 (0.71)	88 (3.46)	40 (1.57)	4
50	10/40	165 (6.50)	125 (4.92)	20 (0.78)	20 (0.78)	3 (0.12)	18 (0.71)	102 (4.01)	48 (1.89)	4
80	10/40	200 (7.87)	160 (6.3)	24 (0.95)	24 (0.95)	3 (0.12)	18 (0.71)	138 (5.43)	73 (2.87)	8
100	10/16	220 (8.67)	180 (7.08)	20 (0.78)		3 (0.12)	18 (0.71)	158 (6.22)	89 (3.50)	8
	25/40	235 (9.25)	190 (7.5)	24 (0.95)		3 (0.12)	22 (0.87)	162 (6.38)	89 (3.50)	8

JIS B 2220 DIMENSIONS

	CLASS	A	B	C	D	E	F	G	N° FUROS
40A	20K	140 (5.5)	105 (4.13)	20 (0.78)	2 (0.08)	19 (0.75)	81 (3.2)	40 (1.57)	4
50A	10K	155 (6.1)	120 (4.72)	20 (0.78)	2 (0.08)	15 (0.59)	96 (3.78)	48 (1.89)	4
	20K	155 (6.1)	120 (4.72)	20 (0.78)	2 (0.08)	19 (0.75)	96 (3.78)	48 (1.89)	8
	40K	165 (6.5)	130 (5.12)	26 (1.02)	2 (0.08)	19 (0.75)	105 (4.13)	48 (1.89)	8
80A	10K	185 (7.28)	150 (5.9)	22 (0.87)	2 (0.08)	19 (0.75)	126 (4.96)	73 (2.87)	8
	20K	200 (7.87)	160 (6.3)	22 (0.87)	2 (0.08)	19 (0.75)	132 (5.2)	73 (2.87)	8
100A	10K	210 (8.27)	175 (6.89)	20 (0.78)	2 (0.08)	19 (0.75)	151 (5.95)	89 (3.50)	8

Figure 1.1 (b) – Dimensional Drawing and Mounting Position for the LD400 WirelessHART™ – Flanged Pressure Transmitter (Integral Flange)

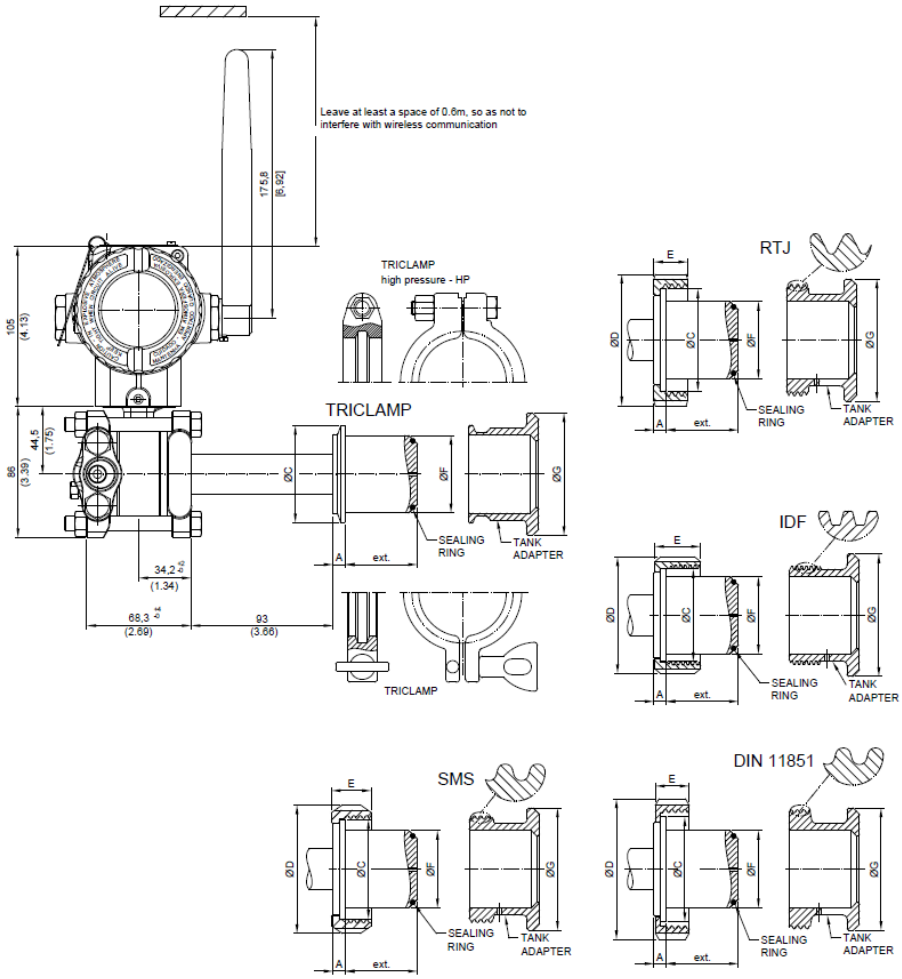


DIMENSIONS - RF / FF - mm (inch)						
STANDARD	DN	CLASS	H	J	E	
					1/4"NPT	1/2"NPT
ASME B16.5	1"	ALL	50,8 (2,00)	35 (1,38)	25	
	1.1/2"		73,2 (2,88)	48 (1,89)	25	35
	2"		91,9 (3,62)	60 (2,36)	25	35
	3"		127 (5,00)	89 (3,50)	25	35
	4"		158 (6,22)	115 (4,53)	25	35
DIN EN 1092-1	25	ALL	68 (2,68)	35 (1,38)	25	35
	40		88 (3,46)	48 (1,89)	25	35
	50		102 (4,02)	60 (2,36)	25	35
	80		138 (5,43)	89 (3,50)	25	35
	100		158 (6,22)	115 (4,53)	25	35
JIS B 2220	40A	20K	81 (3,19)	48 (1,89)	25	35
	50A	10K	96 (3,78)	60 (1,36)	25	35
		40K	105 (4,13)	60 (1,36)	25	35
	80A	10K	126 (4,96)	89 (3,50)	25	35
		20K	132 (5,20)	89 (3,50)	25	35
	100A	10K	151 (5,94)	115 (4,53)	25	35

DIMENSIONS - RTJ - mm (inch) - ASME B16.5							
DN	CLASS	F1	RING	H1	J	E1	
						1/4"NPT	1/2"NPT
1"	150	47,6 (1,87)	R15	63,5 (2,50)	35 (1,38)	40	45
	300	50,8 (2,00)	R16	70 (2,75)	35 (1,38)	40	45
	600	50,8 (2,00)	R16	70 (2,75)	35 (1,38)	40	45
	1500	50,8 (2,00)	R16	71,5 (2,81)	35 (1,38)	40	45
	2500	60,3 (2,37)	R18	73 (2,88)	35 (1,38)	40	45
1.1/2"	150	65,1 (2,56)	R19	82,5 (3,25)	48 (1,89)	40	45
	300	68,3 (2,69)	R20	90,5 (3,56)	48 (1,89)	40	45
	600	68,3 (2,69)	R20	90,5 (3,56)	48 (1,89)	40	45
	1500	68,3 (2,69)	R20	92 (3,62)	48 (1,89)	40	45
	2500	82,6 (3,25)	R23	114 (4,50)	48 (1,89)	40	45
2"	150	82,6 (3,25)	R22	102 (4,00)	60 (2,36)	40	45
	300	82,6 (3,25)	R23	108 (4,25)	60 (2,36)	40	45
	600	82,6 (3,25)	R23	108 (4,25)	60 (2,36)	40	45
	1500	95,3 (3,75)	R24	124 (4,88)	60 (2,36)	40	45
	2500	101,6 (4,00)	R26	133 (5,25)	60 (2,36)	40	45
3"	150	114,3 (4,50)	R29	133 (5,25)	89 (3,50)	40	45
	300	123,8 (4,87)	R31	146 (5,75)	89 (3,50)	40	45
	600	123,8 (4,87)	R31	146 (5,75)	89 (3,50)	40	45
4"	150	149,2 (5,87)	R36	171 (6,75)	115 (4,53)	40	45
	300	149,2 (5,87)	R37	175 (6,88)	115 (4,53)	40	45
	600	149,2 (5,87)	R37	175 (6,88)	115 (4,53)	40	45

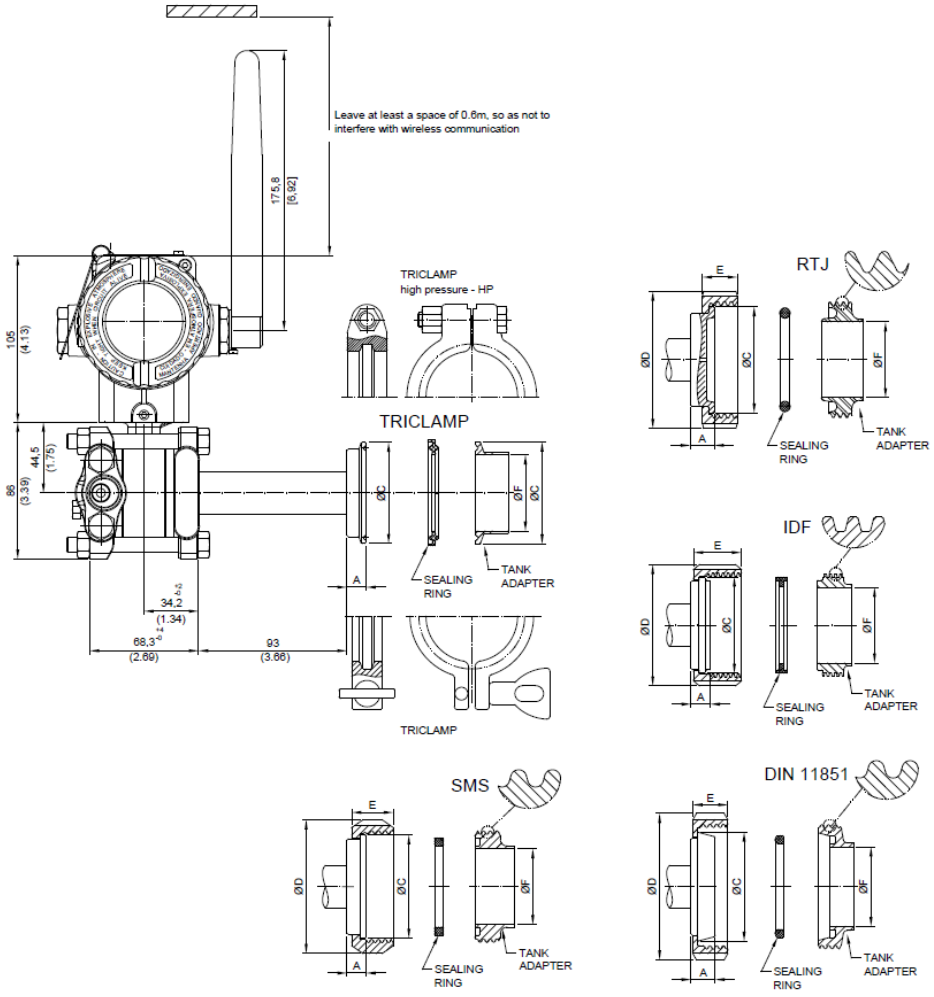
LOWER HOUSING 1/2NPT SUPPLIED WITH PLASTIC PROTECTION
NOT LOWER HOUSING 1/2 NPT FOR 1 INCH

Figure 1.1 (c) – Dimensional Drawing and Mounting Position for the LD400 WirelessHART™ – Flanged Pressure Transmitter with Housing



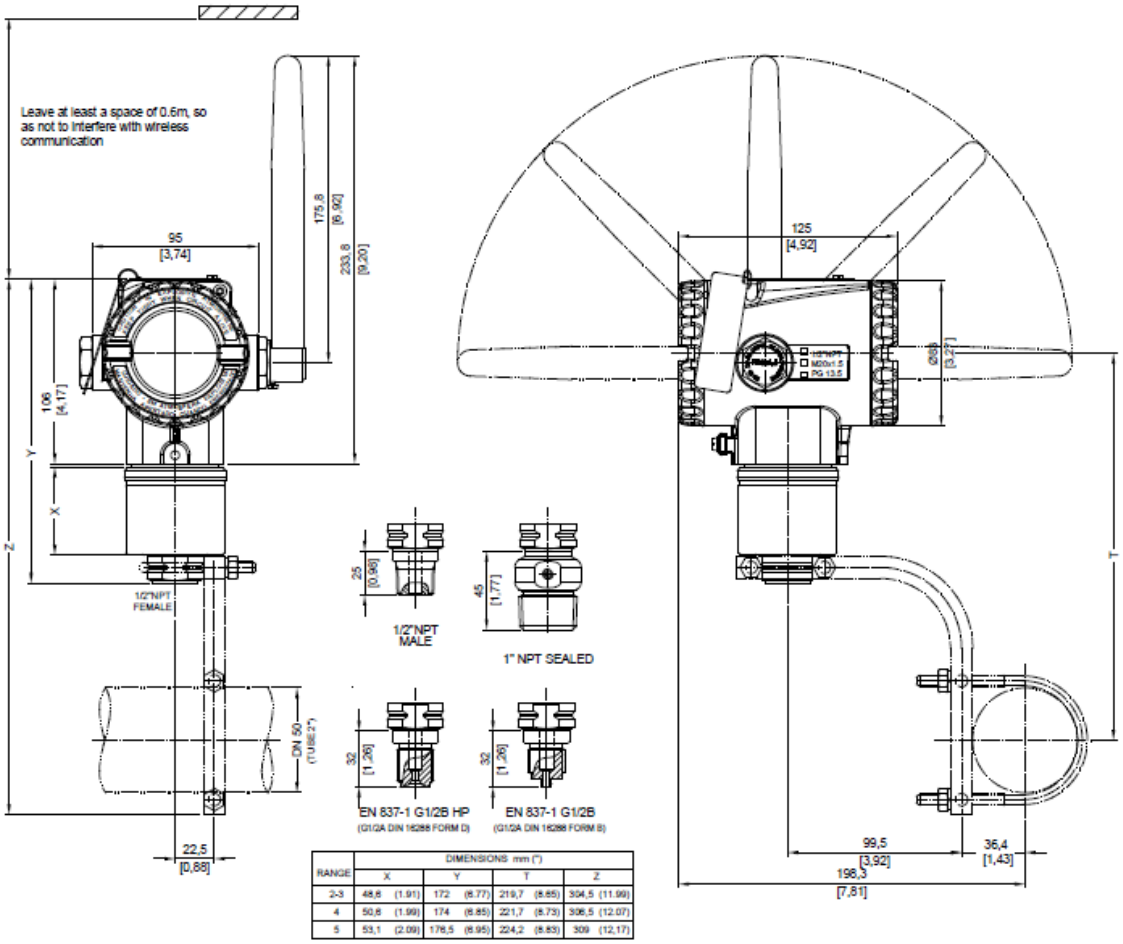
SR301S / LD30XS / LD400S							
CONNECTIONS WITH EXTENSION	Dimensions in mm (inch)						
	A	ØC	ØD	E	ØF	ØG	EXT.
Tri-Clamp DN50 - with extension	8 (0.315)	64 (2.52)	---	---	50,5 (1.99)	80 (3.15)	48 (1.89)
Tri-Clamp DN50 HP - with extension	8 (0.315)	64 (2.52)	---	---	50,5 (1.99)	80 (3.15)	48 (1.89)
Tri-Clamp - 2" - with extension	8 (0.315)	64 (2.52)	---	---	50,5 (1.99)	80 (3.15)	48 (1.89)
Tri-Clamp - 2" HP -with extension	8 (0.315)	64 (2.52)	---	---	50,5 (1.99)	80 (3.15)	48 (1.89)
Tri-Clamp - 3" - with extension	8 (0.315)	91 (3.58)	---	---	72,5 (2.85)	100 (3.94)	50 (1.96)
Tri-Clamp - 3" HP - with extension	8 (0.315)	91 (3.58)	---	---	72,5 (2.85)	100 (3.94)	50 (1.96)
Thread DN25 - DIN 11851 - with extension	6 (0.24)	47,5 (1.87)	63 (2.48)	21 (0.83)	43,2 (1.7)	80 (3.15)	26,3 (1.03)
Thread DN40 - DIN 11851 - with extension	8 (0.315)	56 (2.2)	78 (3.07)	21 (0.83)	50,5 (1.99)	80 (3.15)	48 (1.89)
Thread DN50 - DIN 11851 - with extension	8 (0.315)	68,5 (2.7)	92 (3.62)	22 (0.86)	50,5 (1.99)	80 (3.15)	48 (1.89)
Thread DN80 - DIN 11851 - with extension	8 (0.315)	100 (3.94)	127 (5)	29 (1.14)	72,5 (2.85)	100 (3.94)	50 (1.96)
Thread SMS - 2" - with extension	8 (0.315)	65 (2.56)	84 (3.3)	26 (1.02)	50,5 (1.99)	80 (3.15)	48 (1.89)
Thread SMS - 3" - with extension	8 (0.315)	93 (3.66)	113 (4.45)	32 (1.26)	72,5 (2.85)	100 (3.94)	50 (1.96)
Thread RJT - 2" - with extension	8 (0.315)	66,7 (2.63)	86 (3.38)	22 (0.86)	50,5 (1.99)	80 (3.15)	48 (1.89)
Thread RJT - 3" - with extension	8 (0.315)	92 (3.62)	112 (4.41)	22,2 (0.87)	72,5 (2.85)	100 (3.94)	50 (1.96)
Thread IDF - 2" - with extension	8 (0.315)	60.5 (2.38)	76,2 (3)	30 (1.18)	50,5 (1.99)	80 (3.15)	48 (1.89)
Thread IDF - 3" - with extension	8 (0.315)	87,5 (3.44)	101,6 (4)	30 (1.18)	72,5 (2.85)	100 (3.94)	50 (1.96)

Figure 1.1 (d) – Dimensional Drawing and Mounting Position for the LD400 WirelessHART™ – Sanitary Transmitter with Extension



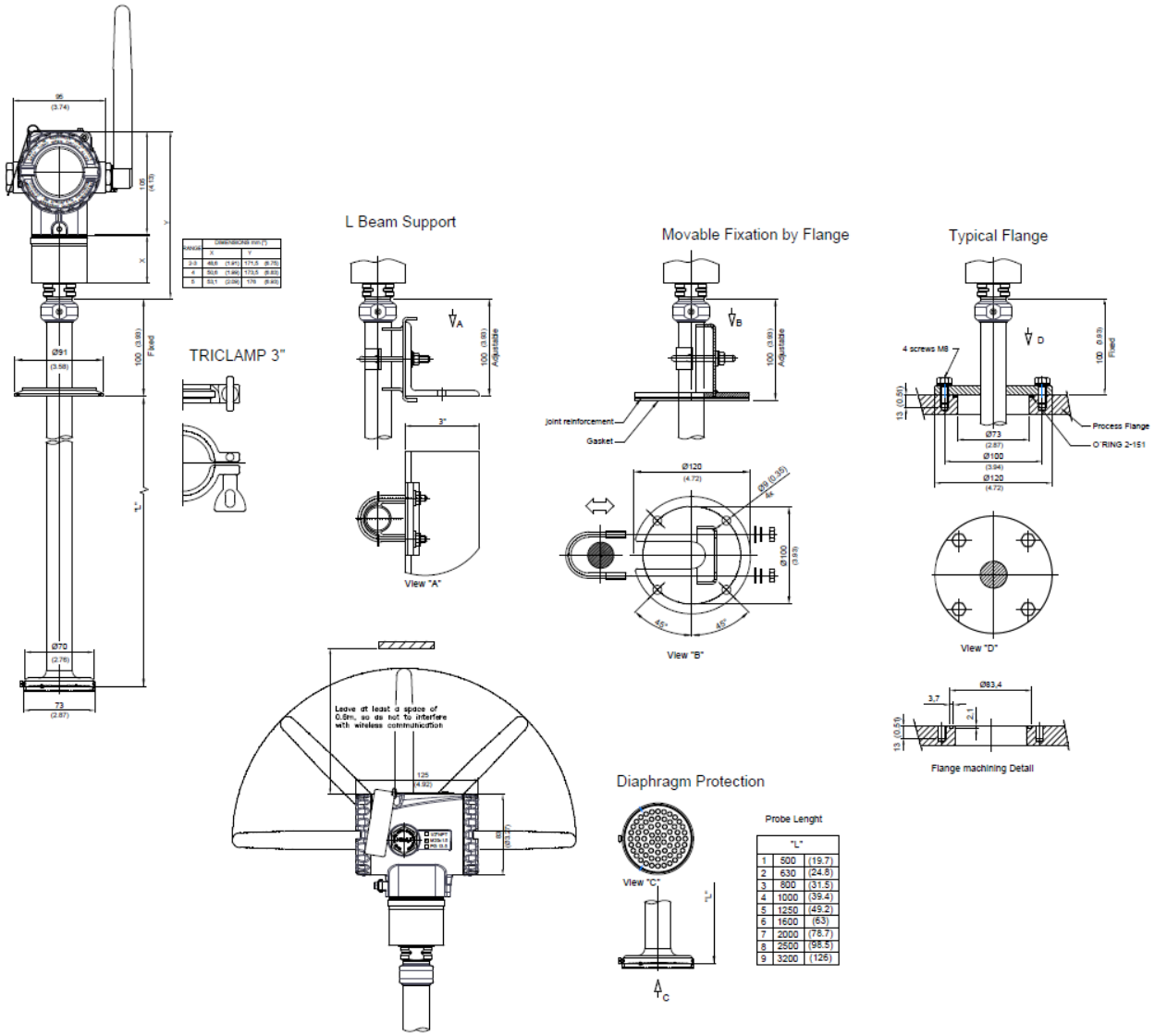
SR301S / LD30xS / LD400S							
CONNECTIONS WITHOUT EXTENSION	Dimensions in mm (inch)						
	A	ØC	ØD	E	ØF	ØG	EXT.
Tri-Clamp - 1 1/2" - without extension	12 (0.47)	50 (1.96)	---	---	35 (1.38)	---	---
Tri-Clamp - 1 1/2" HP - without extension	12 (0.47)	50 (1.96)	---	---	35 (1.38)	---	---
Tri-Clamp - 2" - without extension	12 (0.47)	63,5 (2.5)	---	---	47,6 (1.87)	---	---
Tri-Clamp - 2" HP - without extension	12 (0.47)	63,5 (2.5)	---	---	47,6 (1.87)	---	---
Tri-Clamp - 3" - without extension	12 (0.47)	91 (3.58)	---	---	72 (2.83)	---	---
Tri-Clamp - 3" HP - without extension	12 (0.47)	91 (3.58)	---	---	72 (2.83)	---	---
Thread DN40 - DIN 11851 - without extension	13 (0.51)	56 (2.2)	78 (3.07)	21 (0.83)	38 (1.5)	---	---
Thread DN50 - DIN 11851 - without extension	15 (0.59)	68,5 (2.7)	92 (3.62)	22 (0.86)	50 (1.96)	---	---
Thread DN80 - DIN 11851 - without extension	16 (0.63)	100 (3.94)	127 (5)	29 (1.14)	81 (3.19)	---	---
Thread SMS - 1 1/2" - without extension	12 (0.47)	55 (2.16)	74 (2.91)	25 (0.98)	35 (1.38)	---	---
Thread SMS - 2" - without extension	12 (0.47)	65 (2.56)	84 (3.3)	26 (1.02)	48,6 (1.91)	---	---
Thread SMS - 3" - without extension	12 (0.47)	93 (3.66)	113 (4.45)	32 (1.26)	73 (2.87)	---	---
Thread RJT - 2" - without extension	15 (0.59)	66,7 (2.63)	86 (3.38)	22 (0.86)	47,6 (1.87)	---	---
Thread RJT - 3" - without extension	15 (0.59)	92 (3.62)	112 (4.41)	22,2 (0.87)	73 (2.87)	---	---
Thread IDF - 2" - without extension	12 (0.47)	60.5 (2.38)	76 (2.99)	30 (1.18)	47,6 (1.87)	---	---
Thread IDF - 3" - without extension	12 (0.47)	87,5 (3.44)	101,6 (4)	30 (1.18)	73 (2.87)	---	---

Figure 1.1 (e) – Dimensional Drawing and Mounting Position for the LD400 WirelessHART™ – Sanitary Transmitter without Extension



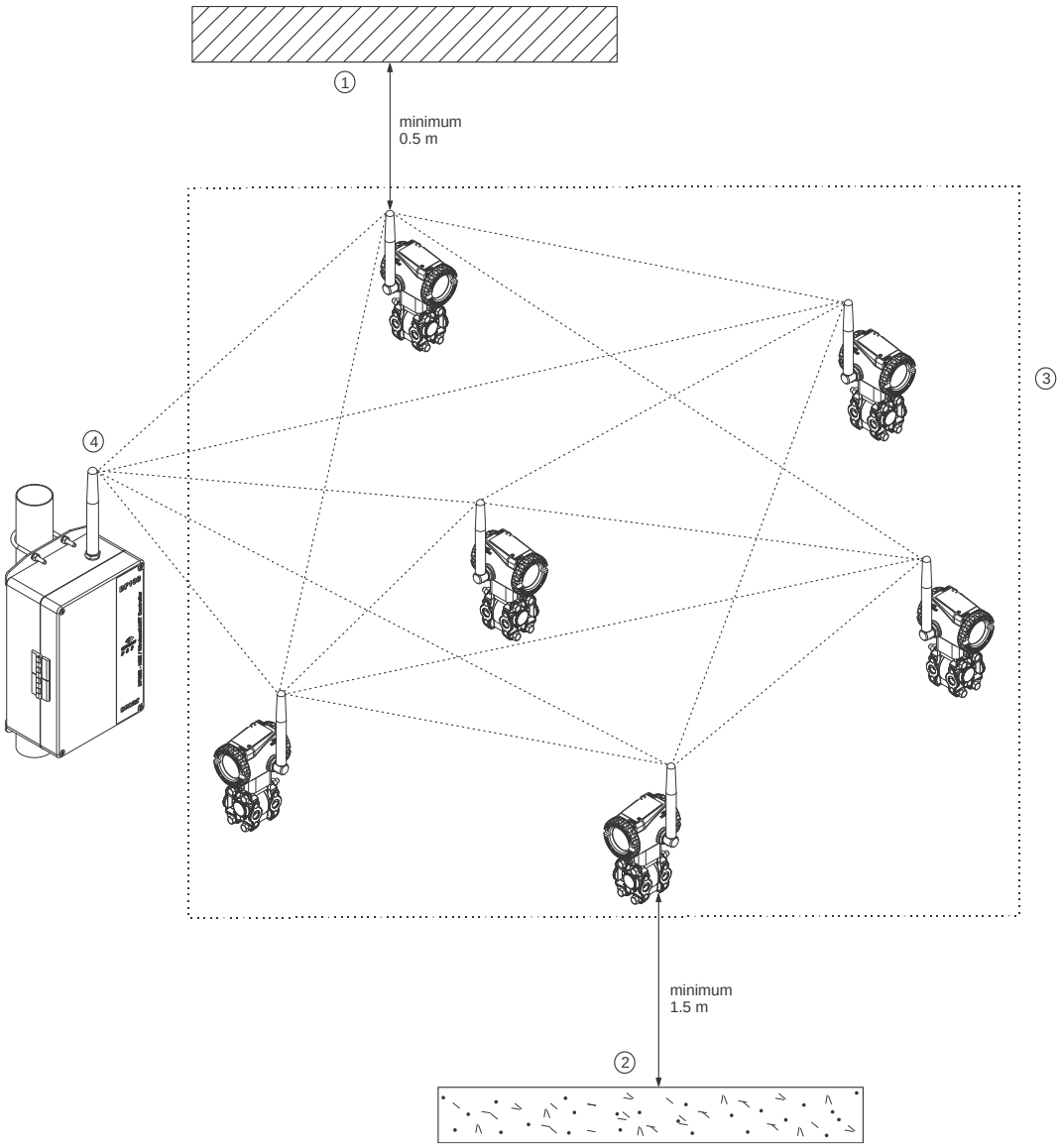
RANGE	DIMENSIONS mm (")							
	X		Y		T		Z	
2-3	48,6	(1.91)	172	(6.77)	219,7	(8.65)	304,5	(11.99)
4	50,8	(1.99)	174	(6.85)	221,7	(8.73)	306,5	(12.07)
5	53,1	(2.09)	176,5	(6.95)	224,2	(8.83)	309	(12,17)

Figure 1.1 (f) – Dimensional Drawing and Mounting Position for the LD400 WirelessHART™ – Gage Inline Pressure Transmitter



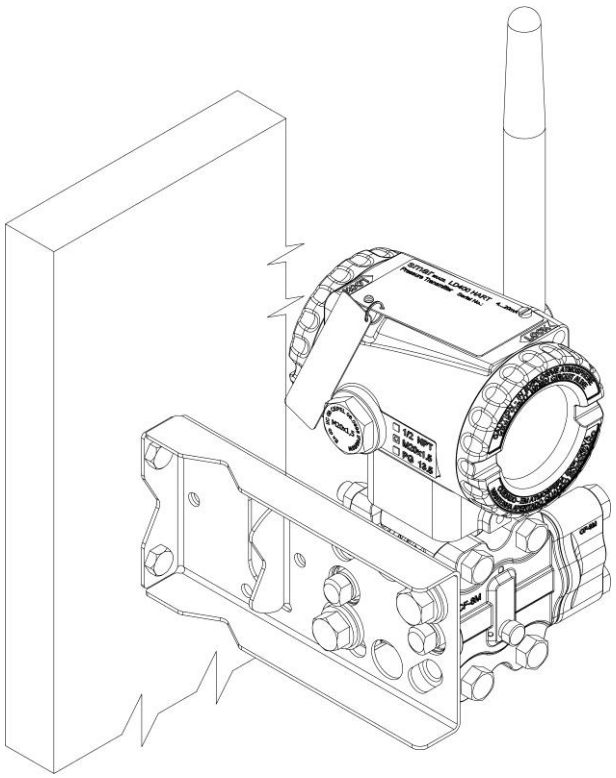
	"L"	
1	500	(19.7)
2	630	(24.8)
3	800	(31.5)
4	1000	(39.4)
5	1250	(49.2)
6	1600	(63)
7	2000	(78.7)
8	2500	(98.5)
9	3200	(126)

Figure 1.1 (g) – Dimensional Drawing and Mounting Position for the LD400 WirelessHART™ – Pressure Transmitter with Extended Probe



Notes:
1- Vertical obstacle
2- Floor
3- Minimum 3 equipment neighbors
4- Recommended 5 equipment neighbors

Figure 1.2 – Wiring for Wireless Transmitter



MOUNTING ON THE PANEL OR WALL
(See Section 6 –spare parts for mounting brackets available)

Figure 1.3 – Drawing of LD400 WirelessHART™ Mounted on the Panel or Wall

Some examples of installation, illustrating the transmitter position in relation to the taps, are shown in Figure 1.3. The pressure taps location and the relative positions of the transmitter are indicated in Table 1.1.

Process Fluid	Location of Taps	Location of LD400 *Wireless*HART™ in Relation to the Taps
Gas	Top or Side	Above the taps.
Líquid	Side	Below the taps or at the piping centerline.
Steam	Side	Below the taps using Sealing (condensate) Pots.

Table 1.1 – Location of Pressure Taps

NOTE
For liquids, condensates, wet vapors, and gases the impulse lines must be bent on the ratio 1:10 to prevent bubbles from accumulating.

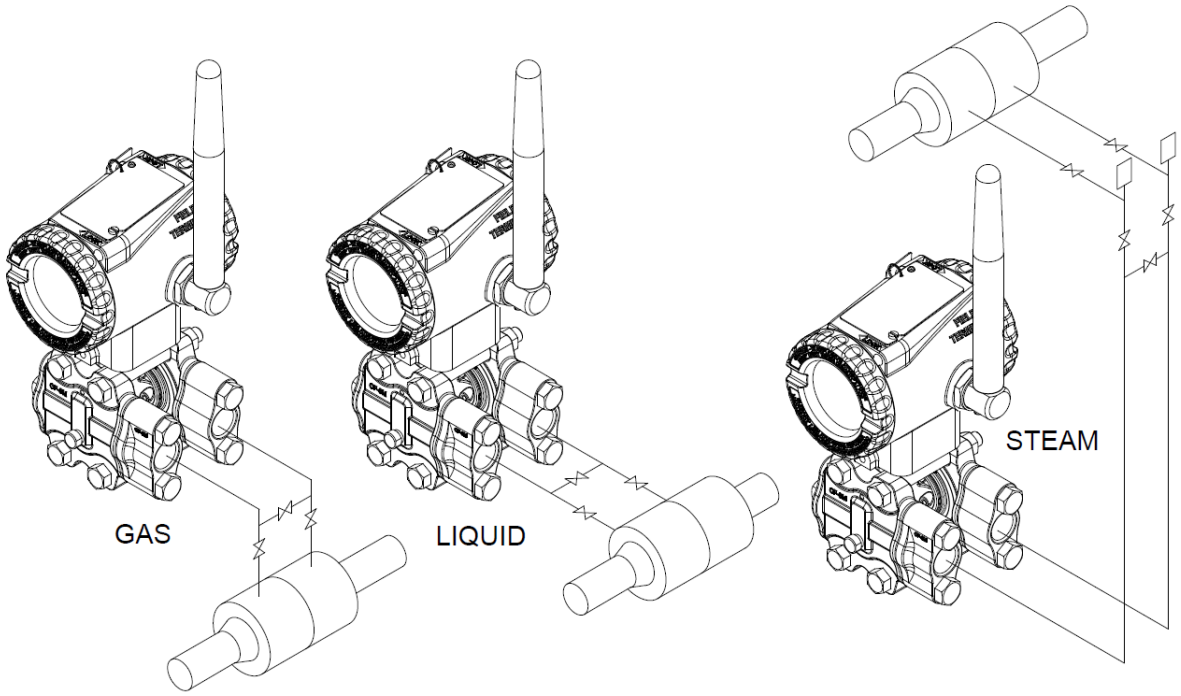


Figure 1.4 – Position of the Transmitter and Taps

When the sensor is in the horizontal position, the fluid weight pushes the diaphragm down and then the lower pressure trim must be applied. See Figure 1.5.

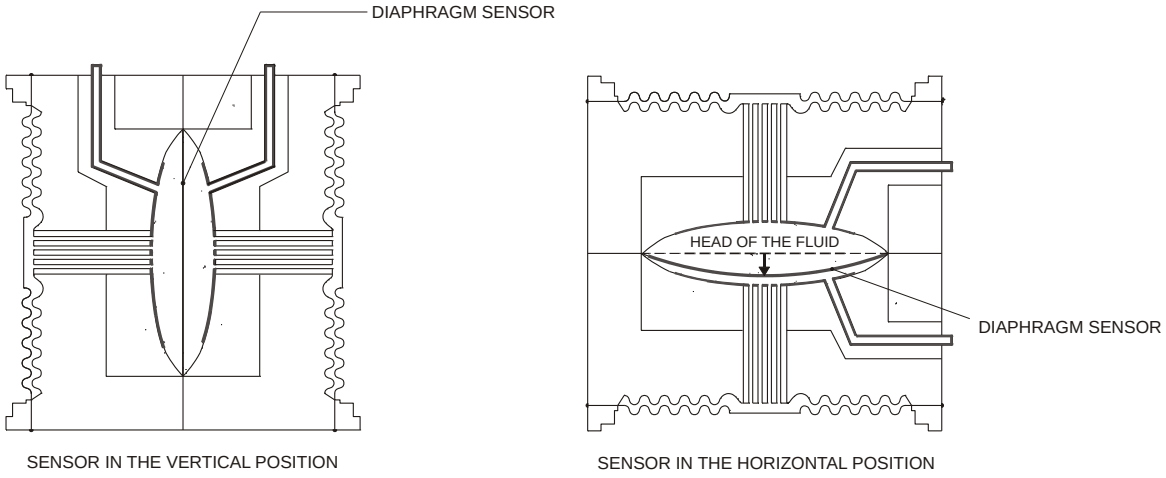


Figure 1.5 – Position of Sensor

NOTES
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 compensates 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

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 1.6.

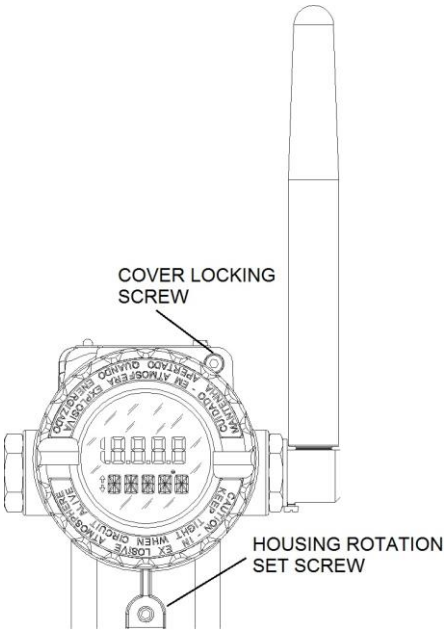


Figure 1.6 – Cover Locking and Housing Rotating Set Screw

NOTES
LD400 *Wireless*HART™ must always be installed on the antenn positioned upward. 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 6, Figure 6.2. The process flange on the level transmitter may be rotated ± 45º. Just loosen the two screws and rotate the flange. Do not remove the screw, according to a tag in the transmitter. To prevent the ingress of humidity or corrosive gases, tighten the covers until you feel the O-ring sit against the housing and give an additional third of a turn (120°) to ensure a seal. Lock the covers using the locking screws. The external ground is designed to accept wiring up to 10 mm² in cross-section (S= 12 mm²). See exertno ground screw in Figure 1.7.

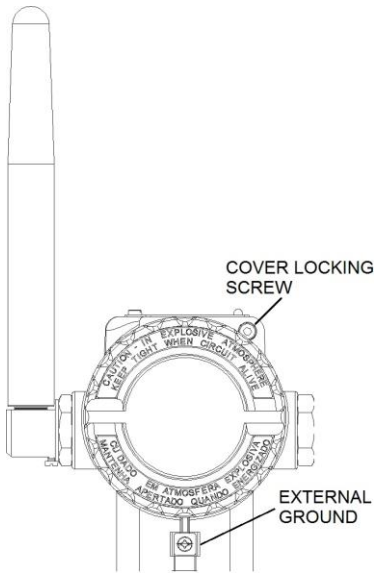


Figure 1.7 – External Ground Screw

Wiring

The equipment comes from the factory with the Battery Module turned off, for safety reasons and shipping regulations. To turn it on using the front switch, it is necessary to previously connect the Battery Module connector to the main board, terminal “CN3”.

The maintenance port allows local configuration of the transmitter. To this end, should be connected a HART configurator to the communication terminals "CN1" and "CN2" which is shown in next figure.

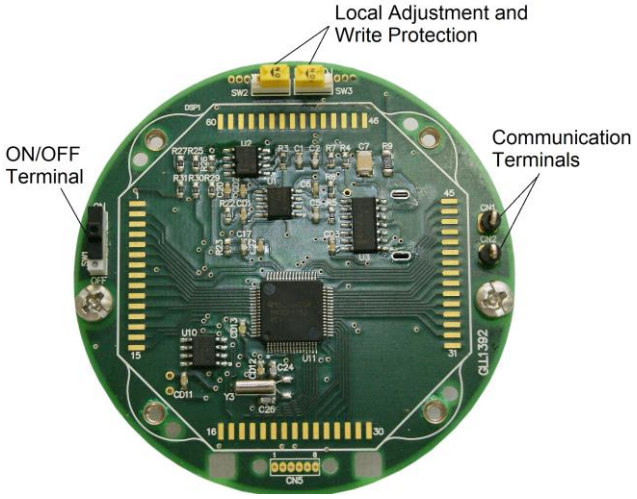


Figure 1.8 – Transmitter Terminals

Figure 1.9 shows the **LD400 *Wireless*HART™** wiring diagram to work as transmitter.

A configurator can be connected to communication terminals of the transmitter or at any point of the line from its connection terminals.

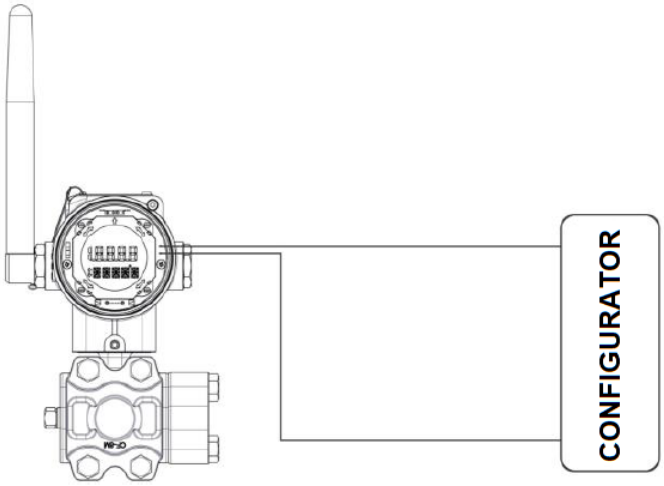


Figure 1.9 – Wiring Diagram of LD400 WirelessHART™

Installation in Hazardous Locations

WARNING
Explosions could result in death or serious injury, besides financial damage. Installation of this transmitter in explosive areas must be carried out in accordance with the local standards and the protection type adopted. Before continuing the installation make sure the certificate parameters are in accordance with the classified area where the equipment will be installed. The instrument modification or parts replacement supplied by other than authorized representative of Smar is prohibited and will void the certification. The transmitters are marked with options of the protection type. The certification is valid only when the protection type is indicated by the user. Once a particular type of protection is selected, any other type of protection cannot 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 1.6). 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 1.7).

Intrinsically Safe

WARNING
In hazardous areas with intrinsically safe or non-incendive requirements, the circuit entity parameters and applicable installation procedures must be observed. The configurator data to guarantee the intrinsically safe parameters are: **Uo(max.) = 5 V** **Io(max.) = 100 µA** For free access to the HART bus in the explosive environment, ensure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices. It is not recommended to remove the transmitter cover when the power is ON.

FUNCTIONAL DESCRIPTION

Functional Description – Sensor

The **LD400 *Wireless*HART™** Smart Pressure Transmitters use capacitive sensors (capacitive cells) as pressure sensing elements, as shown in Figure 2.1

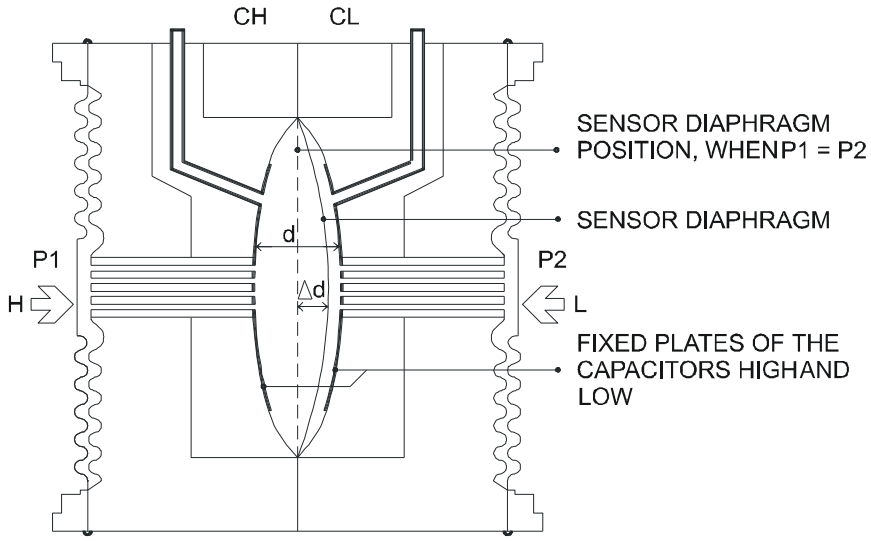


Figure 2.1 – Capacitive Cell

Where:

P_1 and **P_2** are the pressures in chambers H and L.
CH = capacitance between the fixed plate on P_1 side and the sensing diaphragm.
CL = capacitance between the fixed plate on the P_2 side and the sensing diaphragm.
d = distance between CH and CL fixed plates.
Δd = sensing diaphragm's deflection due to the differential pressure $\Delta P = P_1 - P_2$.

Knowing that the capacitance of a capacitor with flat, parallel plates may be expressed as a function of plate area (A) and distance (d) between the plates as. See equation 1:

$$C = \frac{\varepsilon A}{d} \quad \textbf{(1)}$$

Where:
ε = dielectric constant of the medium between the capacitor's plates.

Should *CH* and *CL* be considered as capacitances of flat and parallel plates with identical areas, when $P_1 > P_2$ then:

$$CH = \frac{\varepsilon . A}{(d/2) + \Delta d} \quad \textbf{(2)}$$

and

$$CL = \frac{\varepsilon \cdot A}{(d/2) - \Delta d} \quad \textbf{(3)}$$

However, should the differential pressure (ΔP) apply 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:

$$\frac{CL - CH}{CL + CH} \quad \textbf{(4)}$$

It follows that:

$$\Delta P = \frac{CL - CH}{CL + CH} = \frac{2\Delta d}{d} \quad \textbf{(5)}$$

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 capacitances vary according to the applied differential pressure.

Functional Description – Hardware

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

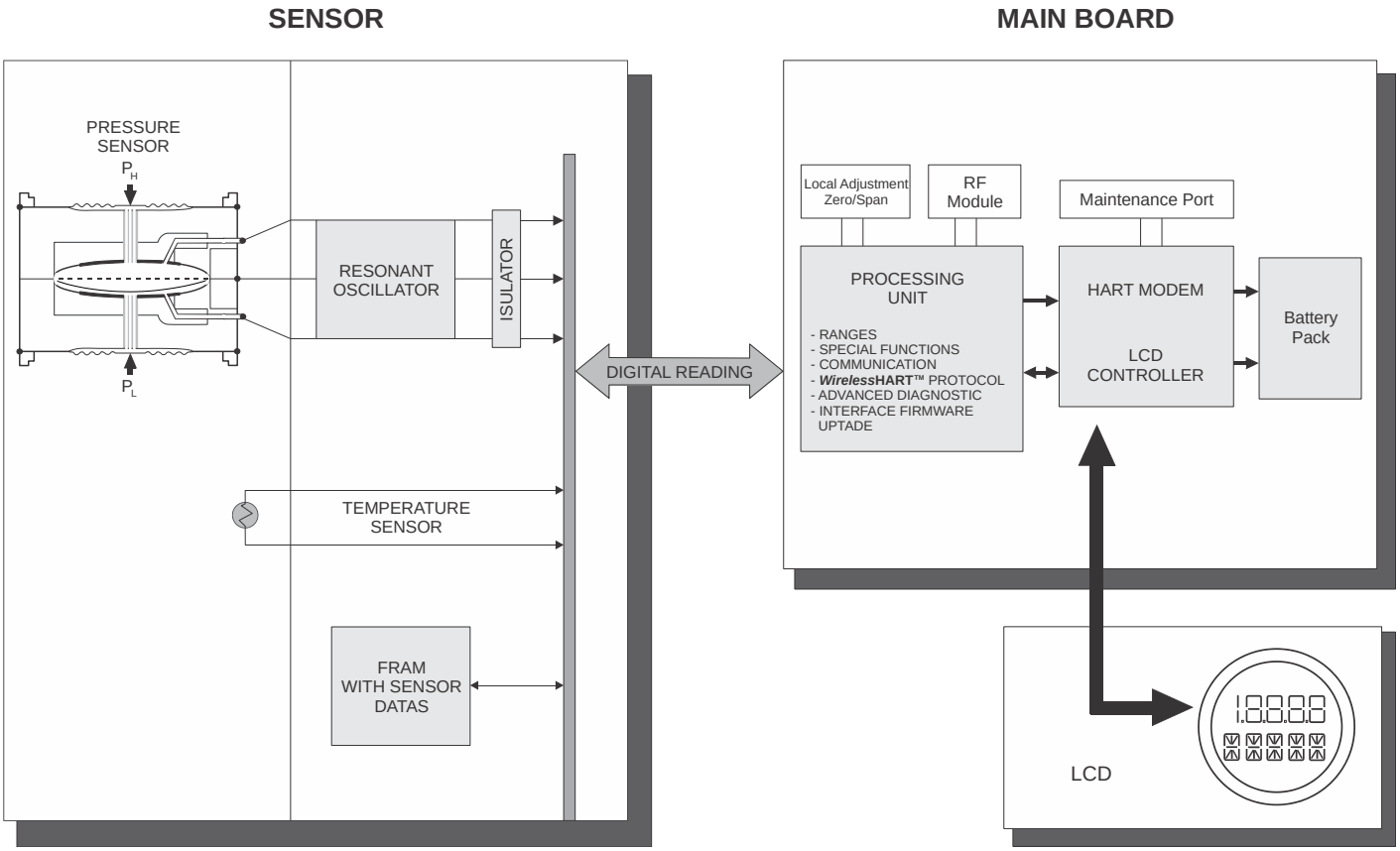


Figure 2.2 – LD400 WirelessHART™ Block Diagram Hardware

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

FRAM
The FRAN is located in the sensor board and contains data pertaining to the characteristics of the sensor to different pressures and temperatures. As each sensor is characterized in the factory, the recorded data are specific to each sensor.

Temperature Sensor
Temperature Sensor used to compensate temperature variations.

Processing Central Unit (CPU), RAM, FLASH and FRAM
The central processing unit (CPU) is the intelligent part of the transmitter responsible for the management and operation of measurement, execution block, self-test and communication.

The program is stored in FLASH memory. For temporary storage of data, the CPU has an internal RAM. If you lose power, data stored in RAM is lost.

For data storage that requires persistence, such as configuration data, startup and aggregation, we use a non-volatile memory type FRAM for **LD400 *Wireless*HART™**. It has an access time consistent with the RAMs normal and there is no limitation in terms of write cycles.

Modem
The function of this system is to make possible the exchange of information between the configurator and the transmitter, through digital communications Master-Slave type.

Therefore, the transmitter makes the demodulation of the received signal serially configurator, for the current line, and after treating it appropriately modulates the response to be sent. The HART® technology uses FSK for modulation of the signal.

Battery
The Battery Module consists of 2 primary lithium batteries (Li-SOCl2) of 3.6 Volts, totaling 7.2 Volts. Each battery has 2.5 grams of lithium, totaling 5.0 grams Battery Module.

WARNING
By no means should be used other than the power supplied by batteries Module Smar (code 400-1209). When you replace the Battery Module (code Smar 400-1209) to set up the replacement via a configurator that will cause the device to reboot count the estimated lifespan for the new module. Under normal use, the batteries offer no risk of spontaneous reaction if they are handled properly. You should exercise caution in relation to falls, high temperature and short-circuit the Battery Module, so that it does not offer any risk or malfunction. Even with low batteries should keep the same care, they still offer dangers. Never attempt to disassemble, modify or recharge the batteries as this may result in leakage or explosion. **STORAGE** - the battery module should preferably be stored in an environment below 30 ° C, dry, ventilated subject to less variation in temperature. Do not dispose of batteries in Module trash. Use a battery for proper disposal or chemical waste. When you replace the Battery Module (code Smar 400-1209) to set up the replacement via a configurator that will cause the device to reboot count the estimated lifespan for the new module. For Additional Information and First Aid, see Appendix B - "Safety Datasheet Battery" or consult the manufacturer's website: http://www.tadiranbat.com/index.php/shipping-and-information.

Display Controller
It receives the data from the CPU and actives the LCD segments. It also activates the back plane and the control signals for each segment.

Local Adjustment
There are two magnetic switches the effect HALL activated by inserting the cable magnetic screwdriver in one of the holes in the top of the shell, see Figure 2.3. This type of operation performs external drives without any contact with the electronic board, fully sealed keeping the inner chamber of the transmitter.

Figure 2.3 – Local Adjustment

Functional Description – LD400 WirelessHART™ Software

Refer to the block diagram Figure 2.4. The function of each block is described below.

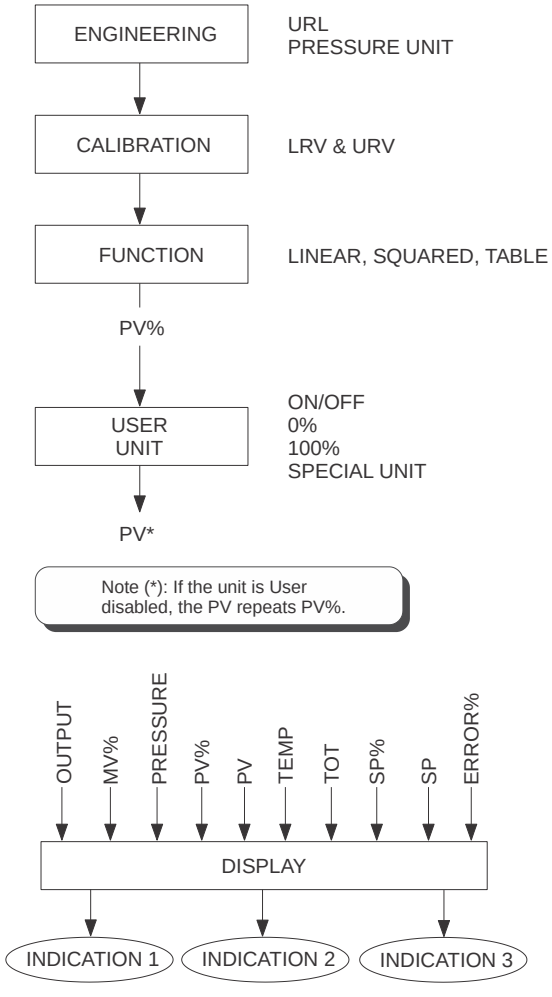


Figure 2.4 – LD400 WirelessHART™ Block Diagram Software

Engineering
The pressure value normalized it is converted for the engineering unit, considering the unit of selected pressure and the Upper Range Limit (URL).

Calibration
The pressure value is calculated in percents taking in consideration the work range provided by the Lower Range Value (LRV) and the Upper Range Value (URV).

Function
Depending on the application, the transmitter output or controller PV may have the following characteristics according to the applied pressure: *Linear* (for pressure, differential pressure and level measurement); *Square-root* (for flow measurement with differential pressure producers) and *Square-root of the Third and Fifth power* (for flow measurements in open channels). The function is selected with FUNCTION.

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

Display
The three indications configured in the DISPLAY can be alternated in proximally three seconds.

Units extensive with more than 5 letters are rotated.

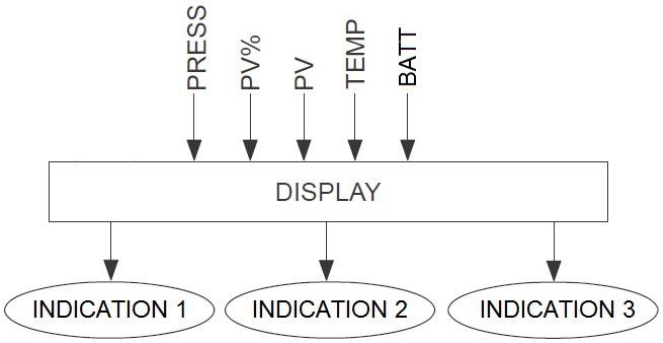


Figure 2.5 – LD400 WirelessHART® – Display Block Diagram

Functional Description - Display (LCD)

The local indicator is able to display three variables, which are user-selected. When multiples variables are chosen, the display will alternate between both 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 2.6.

When the totalization is displayed, the most significant part appears in the unit and function field (upper) and the least significant part in the variable field (lower). See Total Value in Section 3.

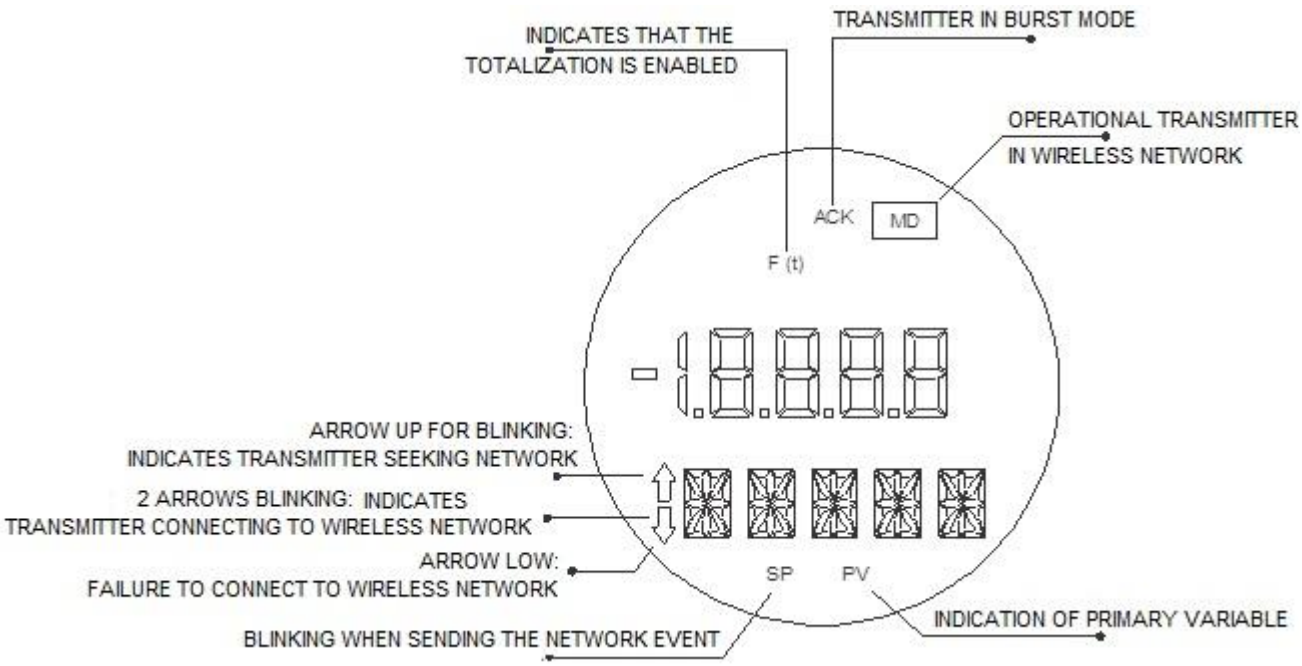


Figure 2.6 – Display for LD400 WirelessHART™

Monitoring

During normal operation, the **LD400 *Wireless*HART™** is in the monitoring mode. In this mode, indication alternates between the three variables (LCD_1, LCD_2, LCD_3) as configured by the user. See Figure 2.7.

The display indicates engineering units, values and parameters simultaneously with most status indicators.

Figure 2.7 – Typical Monitoring Mode Display Showing PV, in this case 25.00 mmH$_2$0

The monitoring mode is interruped when the user applies the complete local adjustment.

The **LD400 *Wireless*HART™** display may also exhibit messages and errors. A few examples of these messages are found on Table 2.1. For a complete list, see Section 6 – Maintenance.

Section 3

TECHNICAL CHARACTERISTICS

Functional Specifications	
Process Fluid	Liquid, gas or steam.
Power Supply	- Composed of 2 primary Lithium batteries (Li-SOCl2) of 3.6 V, totaling 7.2 V of nominal voltage and nominal capacity @3 mA, at 2V 8.5Ah. Not rechargeable. - Battery Life: Burst mode to 8s, @25 ºC, network with at least 3 neighbor devices: 4 years **Notes:** The batteries module used in the transmitters must be provided exclusively by Smar (PACK BATTERY - Code 400-1209) and must be replaced in full when necessary. For specific battery composition details see Appendix B.
Communication Protocol	HART Protocol Version 7, with set of commands **LD400 *Wireless*HART™**. A specific review of the HART transmitter must be managed according to the transmitter **LD400 *Wireless*HART™**.
Indicator	4 1/2 -digit numerical and 5-character alphanumerical LCD indicator (optional). Function and status icon.
Zero and Span Adjustments	No interactive, via local adjustment and digital communication. Jumper for local adjustment with two positions: Enable and disable.
Failure Alarm (Diagnostics)	Detailed diagnostics via HART® communicator. Sensor failure and overpressure indication.
Temperature Limits	Ambient: -40 to 85 °C (-40 to 185 °F) Process: -40 to 100 °C (-40 to 212 °F) (Silicon Oil) -40 to 85 °C (-40 to 185 °F) (Inert Halocarbon Oil) 0 to 85 °C (32 to 185 °F) (Inert Fluorolube Oil) -20 to 85 °C (-4 to 185 °F) (Inert Krytox and Fomblim Oil) -25 to 100 °C (-13 to 212 °F) (Viton O´Ring) -40 to 150 °C (-40 to 302 °F) (Level Model) Storage: -40 to 100 °C (-40 to 212 °F) Digital Display: -20 to 80 °C (-4 to 176 °F) -40 to 85 °C (-40 to 185 °F) (Without damage)
Configuration	By digital communication (HART protocol) using configuration DD and FDT/DTM tools, and can be partially configured through local adjustment In order to maintain the integrity of the equipment configuration, the **LD400 *Wireless*HART™** has a mechanism of writing protection into memory configuration, both hardware and software. The mechanism by hardware, selectable via H-H key, has priority over software.
Static Pressure Limits	5 bar (70 psi) for range 0 80 bar (1200 psi) for range 1 160 bar (2300 psi) for ranges 2, 3 and 4 320 bar (4600 psi) for models H2 to H4 ***Except for LD400A and LD400M models*** *Static pressure, in differential pressure measurement, is the pressure applied on both measuring chambers, simultaneously. For example, in flow measurement with restriction elements, the static pressure is the line pressure, present in both measuring chambers, simultaneously.*
Overpressure Limits	From 3.45 kPa abs. (0.5 psia) to: 5 bar (70 psi) for range 0 80 bar (1200 psi) for range 1 160 bar (2300 psi) for ranges 2, 3 and 4 400 bar (5800 psi) for range 5 520 bar (7500 psi) for range 6 Flange Test Pressure: 68.95 MPa (10000 psi) *Flange test is the maximum pressure applied to the transmitter without damage to the measuring set.* Overpressures above will not damage the transmitter, but a new calibration may be necessary. *Overpressure is the pressure applied to only one of the transmitter chambers when this pressure is higher than the sensor's reading pressure limit (URL). The concept applies to differential, gauge or absolute pressure transmitters.*

Functional Specifications

Pressure Limits for Flanges

WARNING
It is described here only the maximum pressures of some materials referenced in each standard, other materials 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	54,3	48,6	44,1	41,1	38,1	36,3
	PN 100	100	86.1	77.1	70	65.2	60.4	57.6
	PN 160	160	137.9	123.4	112	104.3	96.7	92.1
	PN 250	250	215.4	192.8	175	163	151.1	144

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

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

**RT = Reference Temperature (-10 to 50 ºC)*

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

Material Group	Pressure Class	Maximum Temperature Allowed								
		-29 to 38	50	100	150	200	250	300	325	350
		Maximum Pressure Allowed (bar)								
Hastelloy C276	150	20	19.5	17.7	15.8	13.8	12.1	10.2	9.3	8.4
	300	51.7	51.7	51.5	50.3	48.3	46.3	42.9	41.4	40.3
	600	103.4	103.4	103	100.3	96.7	92.7	85.7	82.6	80.4
	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
	600	103.4	103.4	101.3	91.9	85.3	80.9	77.7	76.3	75.3
	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

Functional Specifications

Pressure Limits for Flanges (Continuation)

Material Group	Pressure Class	Maximum Temperature Allowed								
		-29 a 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
	600	82.7	80	69.6	62.8	58.3	54.9	52.1	51	50.1
	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
	600	99.3	96.2	84.4	77	71.3	66.8	63.2	61.8	60.7
	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

PRESSURES TABLE FOR SEAL AND LEVEL FLANGES JIS 2220 – 2012 STANDARD

Material Group	Pressure Class	Maximum Temperature Allowed			
		Tamb 120º	220º	300º	350º
		Maximum Pressure Allowed (bar)			
AISI316L	10k	14	12	10	--
	20k	34	31	29	26
	40k	68	62	57	52

Pressure Limits for Sanitary connections

PRESSURES TABLE FOR TRICLAMP CONNECTIONS BS4825 P3

DN	PN normal		HP High Pressure	
	20ºC (68ºF)	120ºC (248ºF)	20ºC (68ºF)	120ºC (248ºF)
	Maximum Pressure Allowed (bar)			
1.1/2”	34	20	100	60
2” – DN50	28	17	70	42
3”	22	13	70	42

PRESSURES TABLE FOR THREADED CONNECTIONS

Sanitary Threads – Temperature Limits				
DN	RJT	IDF	SMS	DIN
	120ºC (248ºF)	120ºC (248ºF)	120ºC (248ºF)	120ºC (248ºF)
	BS4825 P5	**BS4825 P4**	**SMS1145**	**DIN11851**
	Maximum Pressure Allowed (bar)			
DN25	--	--	--	40
1.1/2”-DN40	10	16	40	40
2–DN50	10	16	25	25
3-DN80	10	16	25	25

Time to Start Operation	Operates within specifications in less than 10 seconds after power up the transmitter.
Humidity Limits	0 to 100% UR (Relative Humidity).
Volumetric Displacement	Less than 0.15 cm^3 (0.01 in^3)

Performance Specifications	
Reference Conditions	Span starting at zero, temperature of 25°C (77°F), atmospheric pressure, power supply of 24 Vcc, silicone or halocarbon oil fill fluid, isolating diaphragms in 316L SST and digital trim equal to lower and upper range values.
Accuracy	**Standard Class:** **For range 0 and gage or differential model:** **0.16 URL ≤ span ≤ URL:** ± 0.1 % span **0.05 URL ≤ span < 0.16 URL:** ± [0.0545 + 0.00728 URL/span] % span **For range 1 and differential or gage model:** **0.16 URL ≤ span ≤ URL:** ± 0.06% span **0.025 URL ≤ span < 0.16 URL:** ± [0.0364 + 0.003776 URL/span] % span **For range 2, 3 or 4 and differential, high static pressure or gage models:** **0.16 URL ≤ span ≤ URL:** ± 0.06% span **0.025 URL ≤ span < 0.16 URL:** ± [0.0364 + 0.003776 URL/span] % span **0.005 URL ≤ span < 0.025 URL:** ± [0,00024 + 0,00468 URL/span] % span **For range 5 and gage or high static pressure or any sanitary model:** **0.16 URL ≤ span ≤ URL:** ± 0.065 % span **0.025 URL ≤ span < 0.16 URL:** ± [0.0326 + 0.005184 URL/span] % span **0.00833 URL ≤ span < 0.025 URL:** ± [0,00636 + 0,00584] % span **For range 6 and gage model:** **0,16 URL ≤ span ≤ URL:** ± 0.08 % span **0.025 URL ≤ span < 0.16 URL:** ± [0.0504 + 0.004736 URL/span] % span **0.00833 URL ≤ span < 0.025 URL:** ± [0,00304 + 0,00592 URL/span] % span **For range 1 and absolute model:** ± [0.0667 + 0.0333 URL/span] % span **For range 2 and absolute model:** **0.16 URL ≤ span ≤ URL:** ± 0.08 % span **0.05 URL ≤ span < 0.16 URL:** ± [0.0482 + 0.005088 URL/span] % span **For range 3 or 4 and absolute model:** **0.16 URL ≤ span ≤ URL:** ± 0.065 % span **0.025 URL ≤ span < 0.16 URL:** ± [0.0326 + 0.005184 URL/span] % span **0.00833 URL ≤ span < 0.025 URL:** ± [0,00636 + 0,00584 URL/span] % span **For range 5 and absolute model:** **0.16 URL ≤ span ≤ URL:** ± 0.075 % span **0.025 URL ≤ span < 0.16 URL:** ± [0.0443 + 0.004912 URL/span] % span **0.00833 URL ≤ span < 0.025 URL:** ± [0,00406 + 0,005918 URL/span] % span **For range 6 and absolute model or for range 2, 3, 4 or 5 and level model:** **0.16 URL ≤ span ≤ URL:** ± 0.08 % span **0.025 URL ≤ span < 0.16 URL:** ± [0.0504 + 0.004736 URL/span] % span **0.0083 URL ≤ span < 0.025 URL:** ± [0,00616 + 0,005842 URL/span] % span **For ranges 2, 3 or 4 of Inline model (G):** ***0.16 URL ≤ span ≤ URL:*** ± 0.06% span ***0.025 URL ≤ span < 0.16 URL:*** ± [0.0364 + 0.0038 URL/span] % span ***0.005 URL ≤ span < 0.025 URL:*** ± [0.0015 + 0.0047 URL/span] % span **For range 5 Inline model (G):** ***0.16 URL ≤ span ≤ URL:*** ± 0,065 % span ***0.025 URL ≤ span < 0.16 URL:*** ± [0.0326 + 0.0052 URL/span] % span ***0.0083 URL ≤ span < 0.025 URL:*** ± [0.01 + 0.0058 URL/span] % span **Performance High Class:** **For range 0 and differential or gage models:** **0.16 URL ≤ span ≤ URL:** ± 0.06% span **0.05 URL ≤ span < 0.16 URL:** ± [0,0145 + 0,00728 URL/span] % span **For range 1 and differential or gage models:** **0.16 URL ≤ span ≤ URL:** ± 0.05 % span **0.025 URL ≤ span < 0.16 URL:** ± [0.0264 + 0.003776 URL/span] % span **For ranges 2, 3 or 4 and differential or gage models:** **0.16 URL ≤ span ≤ URL:** ± 0.045 % do span **0.025 URL ≤ span < 0.16 URL:** ± [0.021 + 0.00384 URL/span] % span **0.005 URL ≤ span < 0.025 URL:** ± [0.0002 + 0.00436 URL/span] % span

Accuracy (Continuation)	**For range 5 and gage model or high static pressure model:** **0.16 URL ≤ span ≤ URL:** ± 0.055 % do span **0.025 URL ≤ span < 0.16 URL:** ± [0.0263 + 0.004688 URL/span] % span **0.00833 URL ≤ span < 0.025 URL:** ± [0,00466 + 0,005214 URL/span] % span **For range 6 and gage model:** **0.16 URL ≤ span ≤ URL:** ± 0.075 % span **0.025 URL ≤ span < 0.16 URL:** ± [0.0454 + 0.004736 URL/span] % span **0.00833 URL ≤ span < 0.025 URL:** ± [0,00316 + 0,005792 URL/span] % span
Stability	**For ranges 2, 3, 4, 5 or 6:** **Performance High Class:** ± 0.2% URL per 12 years **Standard Class:** ± 0.15% URL per 7 years At 20 ºC temperature change and up to 7 MPa (1000 psi) of static pressure. **For range 1:** **Performance High Class:** ± 0.3% URL per 12 years **Standard Class:** ± 0.3% do URL per 7 years At 20 ºC temperature change and up to 3.5 MPa (500 psi) of static pressure. **For range 0:** **Performance High Class:** ± 0.4% URL per 12 years **Standard Class:** ± 0.4% do URL per 7 years At 20 ºC temperature change and up to 100 kPa (14.5 psi) of static pressure. **For ranges 2, 3, 4 or 5 Inline model (G):** ± 0,15% URL per 7 years, at ±20 ºC temperature change and 0 -100% RH **Note:** Installation complying with the best process practices and adequacy may be generated (hydrogen migration).
Temperature Effect	**For any model range 2, 3, 4, 5 or 6, except level or sanitary models:** **0.1 URL ≤ span ≤ URL:** ± [0.0205% URL + 0.0795% span] per 20 ºC (68 ºF) **span < 0.1 URL:** ± [0.025% URL + 0.0345% span] per 20 ºC (68 ºF) **For any model range 1:** **0.1 URL ≤ span ≤ URL:** ± [0.05% URL + 0.08% span] per 20 ºC (68 ºF) **span < 0.1 URL:** ± [0.052% URL + 0.06% span] per 20 ºC (68 ºF) **For any model range 0:** **0.1 URL ≤ span ≤ URL:** ± [0.1% URL + 0.1% span] per 20 ºC (68 ºF) **span < 0.1 URL:** ± [0.105% URL + 0.05% span] per 20 ºC (68 ºF) **For any level or sanitary model:** 6 mmH2O per 20 ºC for flange 4" and DN100 17 mmH2O per 20 ºC for flange 3" and DN80 Consult for other flange dimensions and fill fluid. **For ranges 2, 3, 4 or 5 Inline model:** 0.1 URL ≤ span ≤ URL: ± [0.0205% URL + 0.0795% span] per 20 ºC (68 ºF) span < 0.1 URL: ± [0.021% URL + 0.075% span] per 20 ºC (68 ºF)
Static Pressure Effect	**Zero Error:** **For range 5*:** ± 0.05% URL (± 0.1% for Tantalum diaphragm) per 7 MPa (1000 psi) **For ranges 2, 3 or 4*: ±0.025% URL (± 0.1% for Tantalum diaphragm) per 7 MPa (1000 psi)** **For range 1:** ± 0.05% URL per 1.7 MPa (250 psi) **For range 0:** ± 0.1% URL por 0.5 MPa (73 psi) **For any level or sanitary models:** ± 0.1% URL per 3.5 MPa (500 psi) The zero error is a systematic error that can be eliminated by calibrating at the operating static pressure. **Span Error:** **For ranges 2,3,4 or 5*:** correctable to ± 0.1% of reading per 7MPa (1000 psi) **For range 1:** correctable to ± 0.1% of reading per 1.7 MPa (250 psi) **For range 0:** correctable to ± 0.2% of reading per 0.5 MPa (72 psi) **For level or sanitary models:** correctable to ± 0.1% of reading per 3.5 MPa (500 psi) * Except level or sanitary model.
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.
Vibration Effect	All models: URL ±0.1% in plants with high vibration levels or piping with too much vibration, according to the following specification by IEC 60770-1: 10-60 Hz, 0.21 mm peak displacement standard / 60-2000 Hz, 29.4 m/s2 acceleration.

Note: URL = Upper Range Limit
LRL = Low Range Limit

Physical Specifications	
Wetted Parts	**Isolating Diaphragms:** 316L SST, Hastelloy C276, Monel 400 or Tantalum **Drain/Vent Valves and Plug:** 316 SST, Hastelloy C276 or Monel 400 **Flanges:** Plated Carbon Steel, 316 SST (ASTM - A351 CF8M), Hastelloy C276 (ASTM - A494 CW-12MW) or Monel 400 **O-Rings (For Flanges and Adapters):** Buna-N, Viton™ PTFE or Ethylene-Propylene. **Level Flanges (ASME / DIN / JIS)** 316L SST; 304L SST; Hastelloy C276; Duplex UNS S31803 / S32205; Super Duplex UNS S32750 / S32760 **Flanges Isolating Diaphragms** 316L SST; 304L SST; Hastelloy C276; Super Duplex UNS S32750 / S32760; 316L SST with Halar coating; 316L SST gold plated; Monel gold plated **Flange's Gaskets** PTFE; Grafoil **Sanitary connections (TC, SMS, RTJ, IDF, DIN 11851):** 316L SST (without extension) 316L SST; Hastelloy C276 (extension end of connection) **Sanitary Diaphragms** 316L SST; Hastelloy C276 **Sanitary connections - Sealing rings** Buna N; PTFE; Viton The **LD400 *Wireless*HART™** is available in NACE MR-01-75/ISO 15156 compliant materials.
Nonwetted Parts	**Electronic Housing:** Injected aluminum with polyester painting, epoxy painting or 316 SST (CF8M ASTM - A351) housing. Complies with NEMA 4X/6P, IP66/68* or IP66W/68W**. **The IP68 sealing test (immersion) was performed at 10m for 24 hours.* ***The W condition or 4X was tested for 200h and refer to saline atmosphere.* **Absolute/Gage Flange; reduced volume flange and Plug Flange** 316 SST - CF8M (ASTM - A351 CF8M) **Level Flange (LD400L):** 316 L SST **Fill Fluid:** Silicone, Fluorolube (Inert), Krytox, Halocarbon 4.2 or Fomblim oils **Cover O-Rings:** Buna-N **Mounting Bracket:** Plated Carbon Steel or 316 SST Accessories (bolts, nuts, washers and U-clamps) in Carbon Steel or 316 SST **Flange Bolts and Nuts:** 316 SST For NACE applications: Carbon Steel ASTM A193B7M, Hastelloy and Super duplex **Identification Plate:** 316 SST The **LD400 *Wireless*HART™** is available in NACE MR-01-75/ISO 15156 compliant materials.
Mounting	a) Flange mounted for Level models. b) Optional universal mounting bracket for surface or vertical/horizontal 2"- pipe (DN 50). c) Manifold Valve integrated to the transmitter. d) Directly on piping for closely coupled transmitter/orifice flange combinations.
Approximate Weights	3.15 kg (7 lb): all models, except L models. 4.6 to 23.5 kg (10 lb to 52 lb): L models depending of diameter; class and material flanges and extension.

Humam Machine Interface Specifications

Indication of the State in the Display

Item	Ícon	Definition
1	PV	Indication of Primary Variable
2	⇧	Blinking when the transmitter is seeking wireless network**.**
3	⇧⇩	Blinking when the transmitter is connected to wireless network
4	MD	Operational transmitter in the wireless network
5	⇩	Failed to connect to the wireless.
6	ACK	Transmitter in burst mode.
7	F(t)	Blinking when sending command in burst mode
8	SP	Lights when an event is sent by the device to the wireless network.

Ordering Code

MODEL	DIFFERENTIAL PRESSURE, FLOW, GAGE, ABSOLUTE AND HIGH STATIC PRESSURE TRANSMITTER
LD400	Smart Pressure Transmitter

COD	Tipo	RANGE LIMITS Min.	Max.	Unit	Min.	Max.	Unit	Turn Down Máx.
D0	Differential **(23)**	-1	1	kPa	-10	10	mbar	20
D1	Differential and Flow	-5	5	kPa	-50	50	mbar	40
D2	Differential and Flow	-50	50	kPa	-500	500	mbar	200
D3	Differential and Flow	-250	250	kPa	-2500	2500	mbar	200
D4	Differential and Flow	-2500	2500	kPa	-25	25	bar	200
M0	Gage	-1	1	kPa	-10	10	mbar	20
M1	Gage	-5	5	kPa	-50	50	mbar	40
M2	Gage	-50	50	kPa	-500	500	mbar	200
M3	Gage	-100	250	kPa	-1000	2500	mbar	200
M4	Gage	-100	2500	kPa	-1	25	bar	200
M5	Gage	-0,1	25	MPa	-1	250	bar	120
M6	Gage	-0,1	40	MPa	-1	400	bar	120
A0	Absolute	0	1	kPa	0	7,5	mmHga	20
A1	Absolute	0	5	kPa	0	37	mmHga	4
A2	Absolute	0	50	kPa	0	500	mbar	20
A3	Absolute	0	250	kPa	0	2500	mbar	120
A4	Absolute	0	2500	kPa	0	25	bar	120
A5	Absolute	0	25	MPa	0	250	bar	120
A6	Absolute	0	40	MPa		400	bar	120
H2	Differential – High Static Pressure	-50	50	kPa	-500	500	mbar	120
H3	Differential – High Static Pressure	-250	250	kPa	-2500	2500	mbar	120
H4	Differential – High Static Pressure	-2500	2500	kPa	-25	25	bar	120
H5	Differential – High Static Pressure	-25	25	MPa	-250	-250	bar	120

NOTE: The range can be extended up to 0.75 LRL* and 1.2 URL* with small degradation of accuracy.

*LRL = Lower Range Limit.
*URL = Upper Range Limit

Due to differences in mechanical project, A1 range has turn-down lower than A0 range.

COD	Diaphragm Material and Fill Fluid
1	316L SST Silicone Oil **(9)**
2	316L SST Inert (Fluorolube Oil) **(2) (4) (19)**
3	Hastelloy C276 Silicone Oil **(1) (9)**
4	Hastelloy C276 Inert (Fluorolube Oil) **(1) (2) (4) (19)**
5	Monel 400 Silicone Oil **(1) (3) (9)**
7	Tantalum Silicone Oil **(3) (9)**
8	Tantalum Inert (Fluorolube Oil) **(2) (3) (4) (19)**
9	316L SST Fomblim Oil **(12)**
A	Monel 400 Fomblim Oil **(1) (3)**
D	316 L SST Inert (Krytox Oil) **(12) (19)**
E	Hastelloy C276 Inert (Krytox Oil) **(1) (12) (19)**
G	Tantalum Inert (Krytox Oil) **(3) (19)**
K	Monel 400 Inert (Krytox Oil) **(1) (3) (19)**
M	Monel 400 Gold Plated Silicone Oil **(1) (3) (9)**
P	Monel 400 Gold Plated Inert (Krytox Oil) **(1) (3) (19)**
Q	316L SST Inert (Halocarbon 4.2 Oil) **(19)**
R	Hastelloy C276 Inert (Halocarbon 4.2 Oil) **(19)**
S	Tantalum Inert (Halocarbon 4.2 Oil) **(3) (19)**
I	316L SST, L.I. Gold Plated Silicone Oil **(3) (9) (18)**
J	316L SST, L.I. Gold Plated Inert (Fluorolube Oil) **(2) (3) (4) (18) (19)**
L	316L SST, L.I. Gold Plated Inert (Krytox Oil) **(3) (18) (19)**
T	316L SST, L.I. Gold Plated Inert (Halocarbon 4.2 Oil) **(3) (18) (19)**
U	316L SST, L.I. Silicone Oil **(3) (9)**
V	316L SST, L.I. Inert (Fluorolube Oil) **(3) (4) (19)**
W	316L SST, L.I. Inert (Krytox Oil) **(3) (19)**
X	316L SST, L.I. Inert (Halocarbon 4.2 Oil) **(3) (19)**

Note: L.I. = integral sheet

COD	Performance Class		
0	Default	1	High Performance **(14)**

COD	Communication Protocol
W	WirelessHART™

COD	Security Option
0	Default– For use in mesurement and control

COD	Flange(s), Adapter(s) and Drain/Vent Valves Material		
0	Without Flanges, Adapters and Drain/Vent Valves	I	316 SST - CF8M (ASTM A351)
1	316 SST - CF8M (ASTM A351) (Drain/Vent in Hastelloy C276) **(1)**	F	Monel 400 - Laminatged bar (for HF application) **(1)**
2	316 SST - CF8M (ASTM A351) Flange with PVDF (Kynar) Insert **(5) (7) (11)**	3	316 SST CF8M (Drain/Vent and Plug in Monel) NACE
P	Carbon Steel with superficial treatmente (Stainless Steel Drain/Vent) **(20)**		
H	Hastelloy C276 (CW-12MW, ASTM - A494) **(1)**		

COD	O´Ring Material		
0	Without O´Ring	K	Kalrez **(3)**
B	Buna-N	T	Teflon
E	Etileno-Propileno	V	Viton

Note: O´Rings are not available on the side with Remote Seals.

COD	Drain/Vent Position
0	Without Drain/Vent
A	Drain/Vent (Opposite to Process Connection)
D	Botton
U	Top

Note: For better drain/vent operation, vent valves are strongly recommended.
Drain/Vent valve are not available on the sides with remote seals.

COD	Process Connections
0	1/4 - 18 NPT (Without Adapter)
1	1/2- 14 NPT (With Adapter)
2	CF 16 (Without Adapter)
3	Remote Seal (With Plug) **(3) (8)**
5	1/2 - 14 NPT Axial (with PVDF Insert PVDF) **(5) (7) (16)**
9	Remote Seal (Low Volume Flange) **(3) (4) (8)**
A	High Side: 1/4 NPT/ Low Side: Remote Seal (With Plug)
B	High Side: 1/2 - 14 NPT Low Side: Remote Seal (With Plug) **(3) (10)**
D	High Side: Remote Seal (With Plug) and Low Side: 1/2 14 NPT **(3) (10)**
F	High Side: 1/2 - 14 NPT and Low Side: Low volume flange for remote seal **(3) (10)**
H	High Side: Low volume flange for remote seal and Low Side: 1/2 - 14 NPT **(3) (10)**
Q	8mm hole without thread. According to DIN 19213 **(13)**
T	1/2 - 14 BSP (With adapter)
V	Manifold Valve Integrated to the Transmitter
Z	User's specification

COD	Special Aplications
0	Without special cleaning
1	Degrease Cleaning (Oxygen or Chlorine Service) **(15)**

LD400	-	D2	1	0	-	W	0	-	I	B	D	1	1

CONTINUE IN THE NEXT PAGE

LD400-D210-W0-IBD11 — DIFFERENTIAL PRESSURE, FLOW, GAGE, ABSOLUTE AND HIGH STATIC PRESSURE TRANSMITTER (CONTINUATION)

Flanges Bolts and Nuts Material

COD	
I	316 SST
C	Carbon Steel (ASTM A193 B7M) (**1**) **(20)**
H	Hastelloy C276
A	Super Duplex 316 SST according to NACE MR0175 / MR0103 **(1a)**

Flange thread for fixing accessories (adapters, manifolds, mounting brackets, etc)

COD	
0	7/16 UNF
1	M10 X 1.5
2	M12 X 1.75

Local Indication

COD	
0	Without Indicator
1	With Digital Indicator

Electrical Connections

COD	
A	M20 X 1.5 **(22)**

Blanket Plug

COD	
I	316 SST

Mounting Bracket for 2" Pipe or Surface Mounting

COD	
0	Without Bracket
1	Carbon steel bracket and accessories **(20)**
2	316 SST bracket and accessories
5	L type, carbon steel bracket and accessories **(20)**
6	L type, 316 SST bracket and accessories
7	Carbon steel bracket. Accessories: 316 SST **(20)**
9	L Type, carbon steel bracket. Accessories: 316 SST **(20)**
A	Flat, 304 SST bracket and 316 SST accessories
Z	User's specification

Housing Material (24) (6)

COD		COD	
A	Aluminum (Default)	J	316 SST - saline atmospheres **(21)**
I	316 SST – CF8M (ASTM – A351)	B	Aluminum - saline atmospheres **(21)**

Painting

COD	
0	Gray Munsell N 6.5 Polyester
8	Without Painting **(17)**
9	Safety Blue Epoxy – Electrostatic Painting
C	Safety Blue Polyesters – Electrostatic Painting
Z	Special Painting

Certification Type for Hazardous Locations

COD	
N	Without Certification

Certifying Body for Hazardous Locations

COD	
0	Without Certification
8	INMETRO

Tag Plate

COD	
0	With tag, when specified (Default)
1	Blank
2	User's specification

HART® Configuration

COD	

TYPICAL MODEL NUMBER

LD400-D210-W0-IBD11	-	I	0	1	-	A	I	0	-	A	0	N	0	0	/	**

**** Fill out with HART® Optional Configuration (see page 3.20)**

Notes:

(1) Meets NACE MR – 01 – 75/ISO 15156 recommendations.
(1a) Meets NACE MR – 0103
(2) Not available for absolute models nor vacuum applications.
(3) Not aplicable for ranges 0 and 1.
(4) Not applicable for vacuum service.
(5) Pressure maximum: 24 bar.
(6) IPX8 tested in 10 meters of water column for 24 hours.
(7) Drain/Vent not applicable.
(8) For Remote Seal only 316 SST CF8M (ASTM A351) flange is available (thread 7/16 UNF).
(9) Silicone Oil is not recommended for Oxygen (O2) or Chlorine service.
(10) Only available for differential pressure transmitter.
(11) O´Ring material must be of Viton or Kalrez.
(12) Not aplicable for ranges 0.
(13) Only available for pressure transmitters D4 or H4 and 7/16 UNF or M10x1.5 flange thread for fixing accessories.
(14) Only available for **LD400D** and **LD400M**.
(15) Degrease cleaning not available for carbon steel flanges.
(16) Only available for Flange with PVDF (Kynar) Insert.
(17) Not available for alumunium housing.
(18) Efective for hydogen migration processes.
(19) Inert Fluid: Oxygen Compatibility, safe for oxygen service.
(20) Not applicable for saline atmosphere.
(21) IPW/TYPEX tested for 200h to according NBR 8094 / ASTM B 117 standard.
(22) Certificate for use in Explosion Proof (CEPEL).
(23) The D0 range should not be used for flow measurement.
(24) Ingress Protection:

Product	CEPEL	NEMKO / EXAM	FM
LD400	IP66/68W	IP66/68W	Type4X/6P

MODEL	FLANGED PRESSURE TRANSMITTER
LD400L	Smart Pressure Transmitter

COD	TYPE	RANGE LIMIT Min.	Max.	Unit.	Min.	Max.	Unit.	Turn Down Max.
2	Level	-50	50	kPa	-500	500	mbar	120
3	Level	-250	250	kPa	-2500	2500	mbar	120
4	Level	-2500	2500	kPa	-25	25	bar	120
5	Level	-25	25	MPa	-250	250	bar	120

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.

COD.	Diaphragm material and Fill Fluid (Low Side)
1	316L SST — Silicone Oil **(2)**
2	316L SST — Inert (Fluorolube Oil) **(3) (16)**
3	Hastelloy C276 — Silicone Oil **(1) (2)**
4	Hastelloy C276 — Inert (Fluorolube Oil) **(1) (3) (16)**
5	Monel 400 — Silicone Oil **(1) (2)**
7	Tantalum — Silicone Oil **(2)**
8	Tantalum — Inert (Fluorolube Oil) **(3) (16)**
9	316L SST — Fomblim Oil
A	Monel 400 — Fomblim Oil **(1)**
D	316 L SST — Inert (Krytox Oil) **(16)**
E	Hastelloy C276 — Inert (Krytox Oil) **(1) (16)**
G	Tantalum — Inert (Krytox Oil) **(16)**
K	Monel 400 — Inert (Krytox Oil) **(1) (16)**
M	Monel 400 Gold Plated — Silicone Oil **(1) (2)**
P	Monel 400 Gold Plated — Inert (Krytox Oil) **(1) (16)**
Q	316L SST — Inert (Halocarbon 4.2 Oil) **(16)**
R	Hastelloy C276 — Inert (Halocarbon 4.2 Oil) **(1) (16)**
S	Tantalum — Inert (Halocarbon 4.2 Oil) **(16)**
I	316L SST, L.I. Gold Plated — Silicone Oil **(2) (15)**
J	316L SST, L.I. Gold Plated — Inert (Fluorolube Oil) **(3) (15) (16)**
L	316L SST, L.I. Gold Plated — Inert (Krytox Oil) (15) **(16)**
T	316L SST, L.I. Gold Plated — Inert (Halocarbon 4.2 Oil) **(15) (16)**
U	316L SST, L.I. — Silicone Oil **(2)**
V	316L SST, L.I. — Inert (Fluorolube Oil) **(3) (16)**
W	316L SST, L.I.. — Inert (Krytox Oil) **(16)**
X	316L SST, L.I. — Inert (Halocarbon 4.2 Oil) **(16)**

Note: L.I = Integral Steel

COD.	Performance Class
0	Default

COD.	Communication Protocol
W	WirelessHART™

COD.	Security Option
0	Default- For use in measurement and control

COD.	Flange, Adapter and Drain/Vent Valves material
A	304L SST
P	Plated CS (Drain/Vent in Stainless Steel) **(17)**
H	Hastelloy C276 (CW-12MW, ASTM - A494) **(1)**
I	316 SST - CF8M (ASTM A351)
F	Monel 400 - Laminatged bar (Aplication in HF)
1	316 SST - CF8M (ASTM A351) (Drain/Vent in Hastelloy C276) **(1)**
2	316 - CF8M (ASTM A351) Flange with PVDF (Kynar) Insert **(3) (4) (5)**

COD.	O'Ring Material
O	Without O´Ring
B	Buna-N
E	Ethylene - Propylene
K	Kalrez
T	Teflon
V	Viton

Note: O'rings are not available on the sides with remote seals.

COD.	Drain/Vent Position (Low Side)
0	Without Drain/Vent
A	Drain/Vent (Opposite to Process onnection)
D	Botton
U	Top

Note: For better Drain/Vent operation, vent valves are strongly recommended.
Drain/Vent valve are not available on the sides with remote seals.

COD.	Process Connection (Low Side)
0	1/4 - 18 NPT (Without adapter)
1	1/2- 14 NPT (With adapter)
3	Remote Seal (With Plug) **(7)**
5	1/2- 14 NPT Axial with PVDF Insert **(3) (4) (6)**
9	Remote Seal (Low Volume Flange **(3) (4)**
T	1/2 - 14 BSP (With adapter)
U	Flange for level with solded plug **(4)**
Z	User´s specifications

COD.	Special Aplications
0	Without Special Aplications
1	Degrease Cleaning (Oxygen or Chlorine Service) **(10)**
2	For vacuum aplications

COD.	Flanges Bolts and Nuts Material
I	316 SST
C	Carbon Steel (ASTM A193 B7M) **(1) (17)**
H	Hastelloy C276
A	Super Duplex SST according to NACE MR0175 / MR0103 **(1a)**

COD.	Flange thread for fixing accessories (adapters)
0	7/16UNF (Default)

LD400L	-	2	1	0	-	W	0	-	P	B	D	0	0	-	I	0

CONTINUE IN THE NEXT PAGE

LD400-L210-W0-PBD00-I0	FLANGED PRESSURE TRANSMITTER (CONTINUATION)

Process Connection (High Side)

COD.	
U	1" 150 # (ANSI B16.5) **(28)**
V	1" 300 # (ANSI B16.5) **(28)**
W	1" 600 # (ANSI B16.5) **(28)**
O	1 1/2" 150 # (ANSI B16.5)
P	1 1/2" 300 # (ANSI B16.5)
Q	1 1/2" 600 # (ANSI B16.5)
9	2" 150 # (ANSI B16.5)
A	2" 300 # (ANSI B16.5)
B	2" 600 # (ANSI B16.5)
1	3" 150 # (ANSI B16.5)
2	3" 300 # (ANSI B16.5)
C	3" 600 # (ANSI B16.5)
3	4" 150 # (ANSI B16.5)
4	4" 300 # (ANSI B16.5)
D	4" 600 # (ANSI B16.5)
5	DN 25 PN10/40 (DIN EN 1092-1)
R	DN 40 PN10/40 (DIN EN 1092-1)
E	DN 50 PN 10/40 (DIN EN 1092-1)
6	DN 80 PN 10/40 (DIN EN 1092-1)
7	DN 100 PN 10/16 (DIN EN 1092-1)
8	DN 100 PN 25/40 (DIN EN 1092-1)
H	10K 100A (JIS 2202)
F	10K 50A (JIS 2202)
G	10K 80A (JIS 2202)
S	20K 40A (JIS 2202)
L	20K 80A (JIS 2202)
T	40K 50A (JIS 2202)
Z	Especificação do usuário

Type and Flange Material (High Side)

COD.	
I	316L SST (Integral Flange)
H	Hastelloy C276 (Integral Flange)
Z	User's specification

Flange Facing Finish

COD.	
0	Raised Face – RF (Default))
1	Flat Face – FF **(12)**
2	Ring Joint Face – RTJ (Only available for ANSI standard flange) **(11)**

Extension Length

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

Note: Extension Material 316L SST

Diaphragm / Extension Material (Tap Level)

COD.		COD.	
A	304L SST / 304L SST	X	Titanium / 316 SST **(9)**
L	316 L SST / 316 SST	1	316L SST with Teflon Lining (For 2"and 3")
H	Hastelloy C276 / 316 SST	2	316L SST Gold plated
M	Monel 400 / 316 SST **(9)**	3	Tantalum with Teflon Lining
T	Tantalum / 316 SST **(9)**		

Fill Fluid (Tap Level)

COD.	
1	Silicone DC-200/20 Oil **(2)**
2	Inert (Fluorolube MO-10 Oil) **(3) (7) (16)**
3	Silicone DC704 Oil **(2)**
4	Inert (Krytox Oil) **(16)**
N	Neobee M20 Propylene Glycol Oil
T	Sylltherm 800 Oil
Z	User´s specifications

Local Indicator

COD.	
0	Without indicator
1	With digital indicator

Electrical Connection

COD.	
A	M20 X 1.5 **(19)**

Blanket Plug

COD	
I	316 SST

LD400L-210-W0-PBD00-I0	1	-	I	0	1	-	L	1	1	A	I

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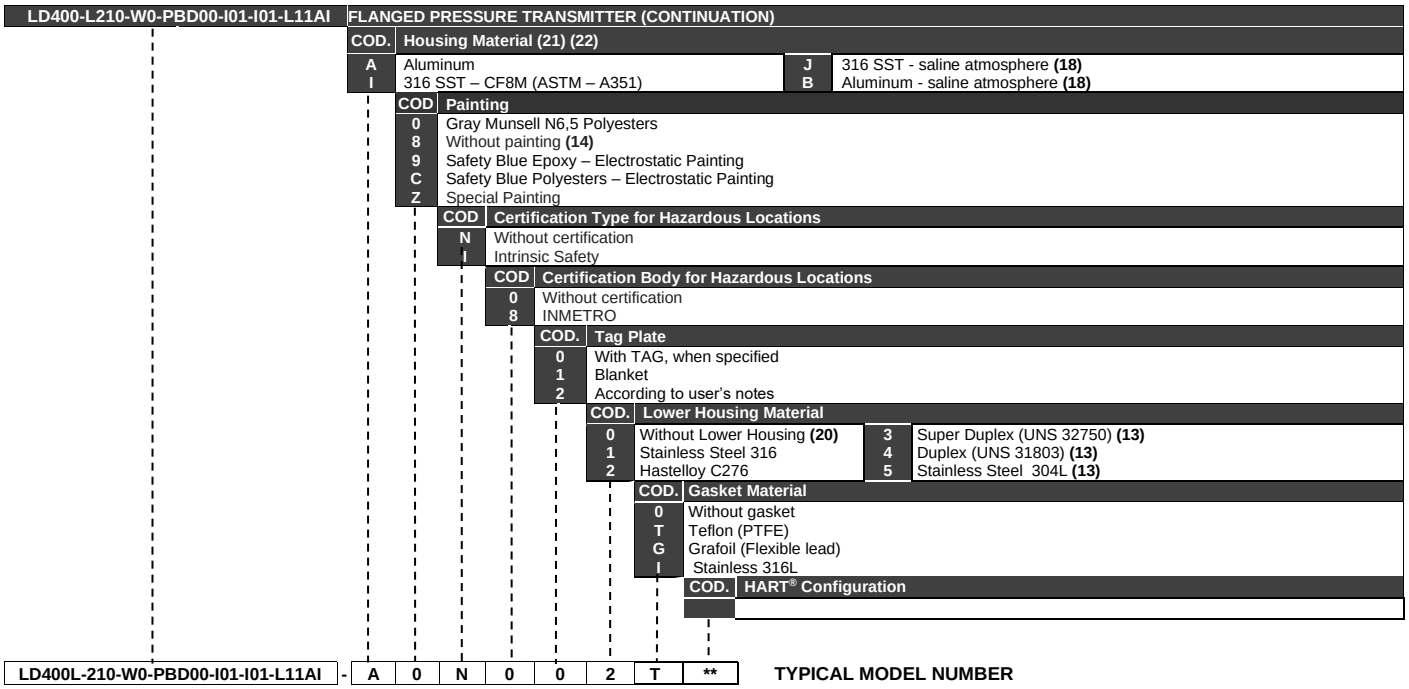


**** Fill out with HART® Optional Configuration (see page 3.20)**

Notes:

(1) Meets NACE MR – 01 – 75/ISO 15156 recommendations.
(1a) Meets NACE MR103
(2) Silicone Oil is not recommended for Oxygen (O_2) or Chlorine service.
(3) Not applicable for vacuum service**.**
(4) Drain/Vent not applicable.
(5) O'Ring should be Viton or Kalrez.
(6) Maximum pressure 24 bar.
(7) Inert fill fluid (Fluorolube) is not available for Monel diaphragm.
(8) Only available for RTJ Face
(9) Attention, check corrosion rate for the process, tantalum plate 0.1 mm, AISI 316L extension 3 to 6 mm.
(10) Degrease cleaning not available for carbon steel flanges.
(11) Only available for ASME B16.5 flange.
(12) Don´t available for JIS 2202 flange.
(13) For this option consult Smar.
(14) Don´t available for aluminum housing.
(15) Efective for hydrogen migration processes.
(16) Inert Fluid: Oxygen Compatibility, safe for oxygen service.
(17) Not applicable for saline atmosphere.
(18) IPW/TYPEX tested for 200h to according with standard NBR 8094 / ASTM B 117.
(19) Certificate for use in Explosion Proof (CEPEL).
(20) Supplied without Gasket.
(21) IPX8 tested in 10 meters of water column for 24 hours.
(22) Ingress Protection:

Product	CEPEL	NEMKO / EXAM	FM
LD400	IP66/68W	IP66/68W	Type4X/6P

MODEL0	SANITARY PRESSURE TRANSMITTER
LD400S	Smart Pressure Transmitter

COD	TYPE	RANGE LIMIT Min.	Max.	Unit	Min.	Max.	Unit	Turn Down Max.
2	Sanitary	-50	50	kPa	-500	500	mbar	200
3	Sanitary	-250	250	kPa	-2500	2500	mbar	200
4	Sanitary	-2500	2500	kPa	-25	25	bar	200
5	Sanitary	-25	25	MPa	-250	250	bar	120

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.

COD.	Diaphragm material and Fill Fluid (Low Side)	
1	316L SST	Silicone Oil **(2)**
2	316L SST	Inert (Fluorolube Oil) **(3) (9)**
3	Hastelloy C276	Silicone Oil **(1) (2)**
4	Hastelloy C276	Inert (Fluorolube Oil) **(1) (3) (9)**

COD.	Performance Class
0	Default

COD.	Communication Protocol
W	WirelessHART™

COD.	Secutity Option
0	Default – For use in measurenment and control

COD.	Flange, Adapter and Drain/Vent Valves material (Low Side)
I	316 SST

COD.	O´Ring Material		
O	Without O´Ring	K	Kalrez
B	Buna-N	T	Teflon
E	Ethylene – Propylene	V	Viton

Note: O'rings is not available on the sides with remote seals.

COD.	Drain/Vent Position (Low Side)
0	Without drain/vent
A	Drain/Vent (Opposite to Process Connection)
D	Botton
U	Top

Note: For better Drain/Vent operation, vent valves are strongly recommended.
Drain/Vent valve are not available on the sides with remote seals.

COD.	Process Connection (Low Side)
0	1/4 - 18 NPT (Without adapter)
1	1/2 - 14 NPT (With adapter)
3	Selo Remoto (With Plug) **(4)**
9	Remote Seal (Low Volume Flange) **(3) (4)**
T	1/2 – 14 BSP (With adapter)
U	Flange for level with Solded Plug
Z	User´s specifications

COD.	Special Aplications
0	Without special cleaning
1	Degrease Cleaning (Oxygen or Chlorine Service) **(6)**
2	For aplication in vacuum

COD.	Flanges Bolts and Nuts Material
I	316 SST
C	Carbon Steel (ASTM A193 B7M) **(1) (19)**
H	Hastelloy C276
A	Super Duplex SST according to NACE MR0175 / MR0103 **(1a)**

COD.	Flange thread for fixing accessories (adapters)
0	7/16UNF

LD400S	-	2	1	0	-	W	0	-	I	B	D	U	0	-	I	0

CONTINUE IN THE NEXT PAGE

LD400-S210-W0-IBDU0-I0	SANITARY PRESSURE TRANSMITTER (CONTINUATION)
COD.	Process Connection (High Side)
8	DN25 DIN 11851 – WITH EXTENSION/316L SST
9	DN40 DIN 11851 - WITH EXTENSION/316L SST
H	DN40 DIN 11851 – 316L SST
V	THREAD DN50 DIN 11851 - WITH EXTENSION/316L SST
U	THREAD DN50 DIN 11851 - WITHOUT EXTENSION/316L SST
X	THREAD DN80 DIN 11851 - WITH EXTENSION/316L SST
W	THREAD DN80 DIN 11851 - WITHOUT EXTENSION/316L SST
4	THREAD IDF 2" - WITH EXTENSION/316L SST
B	THREAD IDF 2" - 316L SST
K	THREAD IDF 3" - WITH EXTENSION/316L SST
3	THREAD IDF 3" - WITHOUT EXTENSION/316L SST
5	THREAD RJT 2" - - WITH EXTENSION/316L SST
C	THREAD RJT 2" - 316L SST
L	THREAD RJT 3" - WITH EXTENSION/316L SST
2	THREAD RJT 3" - WITHOUT EXTENSION/316L SST
S	THREAD SMS 1 1/2" - 316L SST
7	THREAD SMS 2" - - WITH EXTENSION/316L SST
E	THREAD SMS 2" - 316L SST
M	THREAD SMS 3" - - WITH EXTENSION/316L SST
1	THREAD SMS 3" - - WITHOUT EXTENSION/316L SST
F	TRI CLAMP 1 1/2" - 316L SST
Q	TRI CLAMP 1 1/2" HP (High Pressure) - 316L SST
6	TRI CLAMP 2" - - WITH EXTENSION/316L SST
D	TRI CLAMP 2" - 316L SST
N	TRI CLAMP 2" HP (High Pressure) - - WITH EXTENSION/316L SST
P	TRI CLAMP 2" HP (High Pressure) - 316L SST
I	TRI CLAMP 3" - - WITH EXTENSION/316L SST
G	TRI CLAMP 3" - 316L SST
J	TRI CLAMP 3" HP (High Pressure) - - WITH EXTENSION/316L SST
R	TRI CLAMP 3" HP (High Pressure) - 316L SST
A	TRI-CLAMP DN50 - WITH EXTENSION
O	TRI-CLAMP DN50 HP (High Pressure) - WITH EXTENSION
Z	User´s specifications

COD.	O´Ring Material (High Side)
0	Without O´Ring ((Client supplied)
B	Buna-N
T	Teflon
V	Viton
Z	User´s specifications

COD.	Tank Adaptater
0	Without adapter (Client supplied)
1	With tank, 316 SST adapter
Z	User´s specifications

COD.	Clamp TRI-CLAMP
0	Without TRI-CLAMP (Client supplied)
2	With 304 SST TRI-CLAMP **(7)**
Z	User´s specifications

COD.	Diaphragm material (High Side)
I	316 L SST
H	Hastelloy C276

COD.	Fill Fluid (High Side)
1	DC – 200/20 Silicone Oil
2	Inert (Fluorolube MO-10 Oil) **(3)**
3	Silicone Óil DC704
N	Neobee M20 Propylene Glycol Oil
Z	User´s specifications

COD.	Local Indicator
0	Without indicator
1	With digital indicator

COD.	Electrical Connection
A	M20 X 1.5 **(12)**

COD.	Blanket Plug
I	316 SST

LD400-S210-W0-IBDU0-I0	4	-	B	1	0	-	I	1	1	A	I

CONTINUE IN THE NEXT PAGE

LD400-S210-W0-IBDU0-I04-B10-I11AI	SANITARY PRESSURE TRANSMITTER (CONTINUATION)			
	COD	**Housing Material (5) (13)**		
	A	Aluminum (IP/TYPE)	**J**	316 SST - salines atmospheres (IPW/TYPEX) **(11)**
	I	316 SST – CF8M (ASTM – A351) (IP/TYPE)	**B**	Aluminum - salines atmospheres (IPW/TYPEX) **(11)**
	COD	**Painting**		
	0	Gray Munsell N6,5 Polyesters		
	8	Without painting **(8)**		
	9	Blue Safety Epoxy – Electrostatic Painting		
	C	Blue Safety Poliéster - Electrostatic Painting		
	Z	Special Painting		
	COD	**Certification Type for Hazardous Locations**		
	N	Without Certification		
	I	Intrinsic Safety		
	COD	**Certification Body for Hazardous Locations**		
	0	Without certification		
	8	INMETRO		
	COD	**TAG Plate**		
	0	With TAG, when specified		
	1	Blanket		
	2	According to user notes		
	COD	**HART Configuration**		
	******			

LD400-S210-W0-IBDU0-I04-B10-I11AI	-	A	0	N	0	0	/	**

TYPICAL MODEL NUMBER

**** Fill out with HART® Optional Configuration (see page 3.20)**

Notes:

(1) Meets NACE MR – 01 – 75/ISO 15156 recommendations.
(1a) Meets NACE MR103
(2) Silicone Oil is not recommended for Oxygen (O2) or Chlorine service.
(3) Not applicable for vacuum service**.**
(4) Drain/Vent not applicable.
(5) IPX8 tested in 10 meters of water column for 24 hours.
(6) Degreaser's cleaning is not available for carbon steel flanges.
(7) Only available for TRI-CLAMP connections.
(8) Don´t available for housing aluminum.
(9) Inert Fluid: Oxygen Compatibility, safe for oxygen service
(10) Not applicable for saline atmosphere.
(11) IPW/TYPEX tested for 200h in 5% NaCl saturated solution at 35ºC
(12) Certificate for use in Explosion Proof (CEPEL).
(13) Ingress Protection:

Product	CEPEL	NEMKO / EXAM	FM
LD400	IP66/68W	IP66/68W	Type4X/6P

MODEL	GAGE INLINE PRESSURE TRANSMITTER
LD400	Smart Pressure Transmitter

COD	Type	RANGE LIMITS Min.	Max.	Unit	Min.	Max.	Unit
G2	Gage Inline	-50	50	KPa	-500	500	mbar
G3	Gage Inline	-100	250	KPa	-1000	2500	mbar
G4	Gage Inline	-100	2500	KPa	-1	25	bar
G5	Gage Inline	-0,1	25	MPa	-1	2500	bar

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

COD	Performance Class		
0	Default	1	High Performance

COD	Communication Protocol
W	*Wireless* HART™

COD	Security Option
0	Default - For use in measurement and control

COD	Process Connection
1	1/2- 14 NPT - Female
A	M20x1,5 - Male
G	DIN EN 837-1 G1/2B Male **(6)**
H	DIN EN 837-1 G1/2B HP Male **(6)**
M	1/2- 14 NPT Male
R	Remote Seal
U	½ BSP Male
V	Valve Manifold Integrated with Transmitter
X	1" NPT Sealed (Diaphragm in 316L SST, Silicon Fluid DC200/20)
Z	User's Specification

COD	Process Connection Material				
H	Hastelloy C276 **(1)**	I	316L SST	Z	User's Specification

COD	Special Applications
0	Without Special Aplications
1	Degrease Cleaning (Oxygen or Chlorine Service)

COD	Local Indicator		
0	Without Local Indicator	1	With Local Indicator

COD	Electrical Connection
A	M20 X 1.5 **(7)**

COD	Plug
I	316 SST

COD	Mouting Bracket
0	Without Bracket
1	Carbon steel bracket and accessories
2	316 SST bracket and accessories
7	Carbon steel bracket. Accessories: 316 SST

COD	Housing Material (10)
A	Aluminum (Default)
I	316 SST – CF8M (ASTM – A351) (IP/TYPE)
J	316 SST - saline atmospheres (IPW/TYPEX) **(5)**
B	Aluminum - saline atmospheres (IPW/TYPEX) **(5)**

COD	Painting
0	Gray Munsell N 6.5 Polyester
1	Safety Blue Epoxy – Immersion Condition-Petrobras N1021
2	Safety Blue Epoxy – Atmospheric Zone - Petrobras N1021
8	Without Painting **(9)**
9	Safety Blue Epoxy
C	Safety Blue Polyester
G	Orange Safety Epoxy
Z	Special Painting

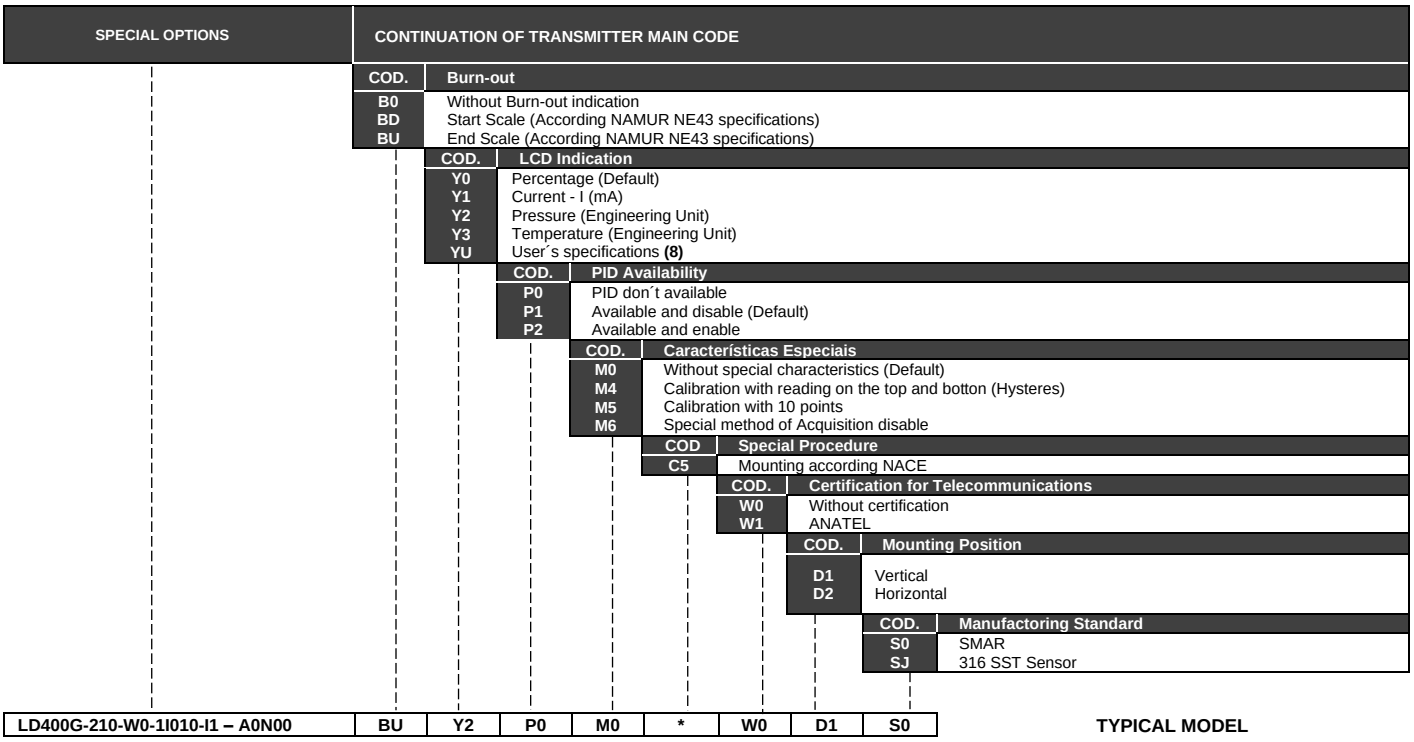
COD	Certification Type for Hazardous Locations
N	Without Certification
I	Intrinsic Safety

COD	Certification Body for Hazardous Locations
0	Without Certification
8	INMETRO

COD	Tag Plate
0	With tag, when specified
1	Blank
2	User's Specification

LD400	-	G2	1	0	-	W	0	-	1	I	0	1	-	0	I	1	-	A	0	N	0	0

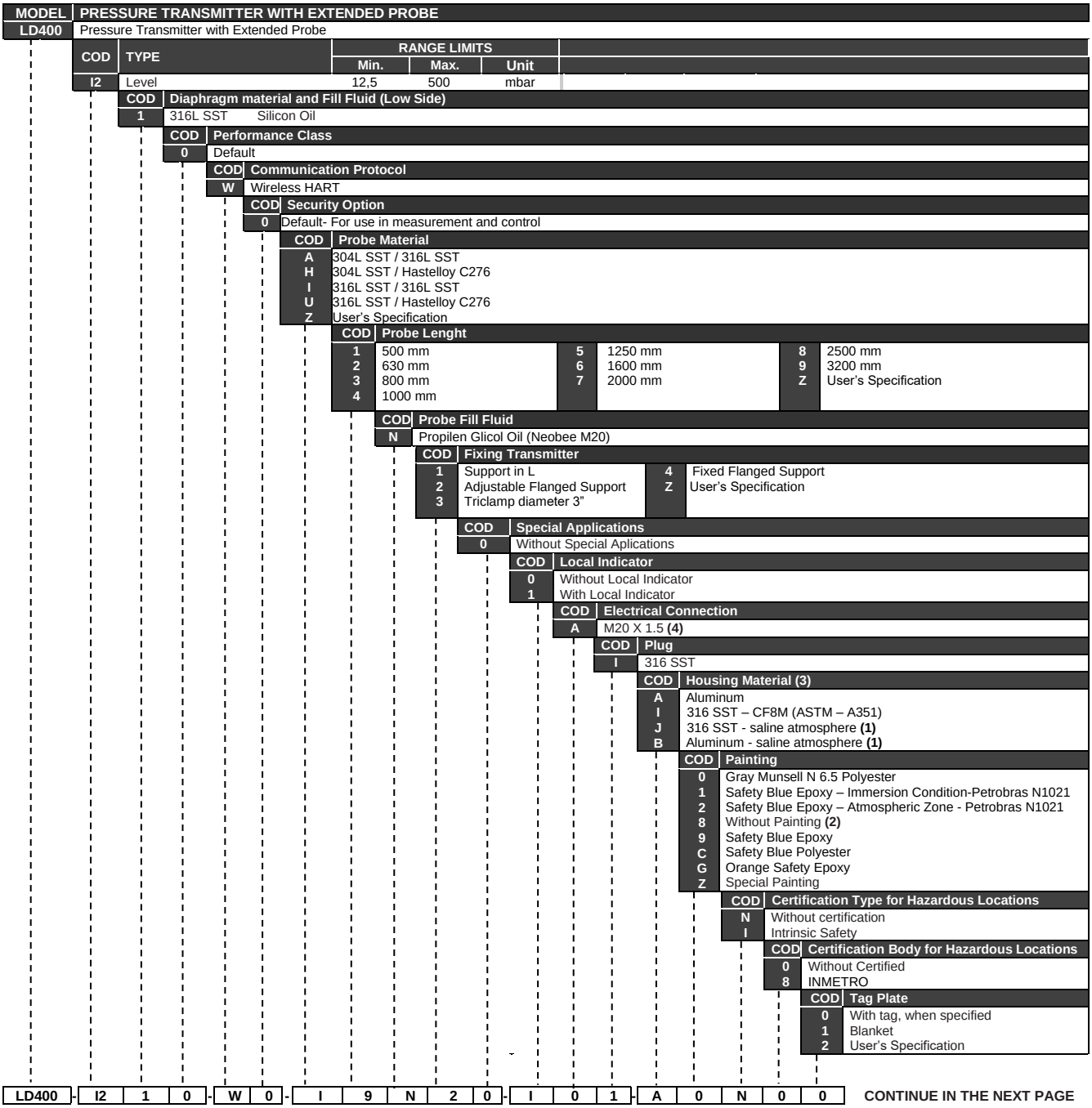
CONTINUE IN THE NEXT PAGE



Notes:

(1) Meets NACE MR – 01 – 75/ISO 15156 recommendations.
(2) Inert Fluid: Oxygen Compatibility, safe for oxygen service.
(3) Silicone Oil is not recommended for Oxygen (O2) or Chlorine service.
(4) Not applicable for vacuum service.
(5) IPW/TYPEX tested for 200h in 5% NaCl saturated solution at 35ºC.
(6) The standard DIN16288 has been replaced by DIN EN 837-1.
(7) Certification Ex-d for FM / ATEX / IECEx / INMETRO
(8) Limited values to 4 ½ digits; limited units to 5 characteres.
(9) Don´t available for Aluminum housing.
(10) Ingress Protection:

Product	CEPEL	NEMKO / EXAM	FM
LD400	IP66/68W	IP66/68W	Type4X/6P



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Notes:

(1) IPW/TYPEX tested for 200h according to NBR 8094 / ASTM B 11 standard.
(2) Not applicable for aluminum housing.
(3) Ingress Protection:

Product	CEPEL	NEMKO / EXAM	FM
LD400	IP66/68W	IP66/68W	Type4X/6P

(4) Certification Ex-d for FM / ATEX / IECEx / INMETRO
(5) Limited values to 4 ½ digits; limited units to 5 characteres.

SPECIAL OPTIONS	CONTINUATION OF TRANSMITTER MAIN CODE

COD.	Burn-out
B0	Without Burn-out indication
BD	Start Scale (According NAMUR NE43 specifications)
BU	End Scale (According NAMUR NE43 specifications)

COD.	LCD Indication
Y0	Percentage (Default)
Y1	Current - I (mA)
Y2	Pressure (Engineering Unit)
Y3	Temperature (Engineering Unit)
YU	User´s specifications **(5)**

COD.	PID Availability
P0	PID don´t available
P1	Available and disable (Default)
P2	Available and enable

COD.	Características Especiais
M0	Without special characteristics (Default)
M4	Calibration with reading on the top and botton (Hysteres)
M5	Calibration with 10 points
M6	Special method of Acquisition disable

COD	Special Procedure
C5	Mounting according NACE

COD.	Certification for Telecommunications
W1	ANATEL

COD.	Special
ZZ	See notes

LD400I-210-W0-I9N20-I01-A0N00	BU	Y2	P0	M0	C5	W1	ZZ

TYPICAL MODEL

****HART OPTIONAL CONFIGURATION (1)**

LD400-D210-W0-IBD11-I01-AI1-A0N00 LD400-L210-W0-PBD00-I01-I01-L11AI-A0N002T / LD400-S210-W0-IBDU0-I04-B10-I11AI-A0N00	MAIN CODE OF HART TRANSMITTER (CONTINUATION)

COD.	Burn-out
BD	Start Scale (According NAMUR NE43 specifications) (Default)
BU	End Scale (According NAMUR NE43 specifications)

COD.	LCD1 Indication
Y0	LCD1: Percentage (Default)
Y1	LCD1: Current - I (mA)
Y2	LCD1: Pressure (Engineering Unit)
Y3	LCD1: Temperature (Engineering Unit)
YU	LCD1: User´s specifications **(2)**

COD.	LCD2 Indication
Y0	LCD2: Porcentage (Default)
Y1	LCD2: Current - I (mA)
Y2	LCD2: Pressure (Engineering Unit)
Y3	LCD2: Temperature (Engineering Unit)
YU	LCD2: User´s specifications **(2)**

COD.	LCD 3 Indication
Y0	LCD3: Porcentage (Default)
Y1	LCD3: Current - I (mA)
Y2	LCD3: Pressure (Engineering Unit)
Y3	LCD3: Temperature (Engineering Unit)
YU	LCD3: User´s specifications **(2)**

COD.	PID Availability
P0	PID don´t available
P1	Available and disable (Default)
P2	Available and enable

COD.	Transfer Function for Flow Measurenment
F0	**Linear** (Default)
F1	**SQRT -** Square Root. Considering the pressure input **X** varying between 0 and 100%, the output will be $10\sqrt{x}$. This function is used in flow measurement with, e.g., orifice or Venturi tube etc**. (3)**
F2	**SQRT**3 -** Square Root of the Third Power; The output will be $0{,}1\sqrt{X^3}$. This function is used in open channel Flow measurement with weirs or flumes. **(3)**
F3	**SQRT**5** –Square Root of the Fifth Power. The output will be $0{,}001\sqrt{X^5}$. This function is used in open channel Flow measurement with V-notch weirs. **(3)**
F4	**TABLE** - The output is a curve formed by **16** points. These points may be edited directly on the **XY** Table of the **LD400**. For example, it may be used as a camber table for tanks in applications where the tank volume is not linear in relation to the measured pressure. **(3)**
F5	**SQRT & TABLE** - Square root and Table. Same application as square roots, but also allows additional compensation of, e.g., varying Reynolds number. **(3)**
F6	**SQRT**3 & TABLE** - Square Root of the Third Power AND TABLE. **(3)**
F7	**SQRT**5 & TABLE** - Square Root of the Fifth Power AND TABLE. **(3)**
F8	**TABLE & SQRT –** This function provides bidirectional flow measurement (piping flow measurement in both ways). This function is available for version 6.05 or above firmware. **(3)**

COD.	Special Characteristics
M0	Without special characteristics (Default)
M4	Calibration with reading on the top and botton (Hysteres)
M5	Calibration with 10 points
M6	Special method of Acquisition disable

COD.	Special Characteristics
ZZ	User´s specifications

LD400-D210-W0-IBD11-I01-AI1-A0N00	/	BU	Y2	Y3		P2	F1		
LD400-L210-W0-PBD00-I01-I01-L11AI-A0N002T	/	BD	Y2	Y3		P2			
LD400-S210-W0-IBDU0-I04-B10-I11AI-A0N00	/	BD	Y2	Y3		P2			

TYPICAL MODEL NUMBER

Notes:

(1) Fill out with optional codes only if different from default.
(2) Limited values to 4 ½ digits; limited units to 12 characters.
(3) Only available for differential, gage, absolute and high static pressure differential models.

Section 4

PROGRAMMING USING LOCAL ADJUSTMENT

The Magnetic Tool

With the Magnetic Tool it is possible to configure locally the **LD400 *Wireless*HART™** and eliminate the need for additional configurators in many basic applications.

There are two ways to adjust the **LD400 *Wireless*HART™** locally according to the jumper configuration (see Table 4.1):

- Simple Local Adjustment
- Complete Local Adjustment

For the configuration with the magnetic tool to be possible:

- The display must be connected;
- The writing protection jumper must be disabled;
- The local adjustment jumper must be enabled on simple mode or complete mode.

See on Figure 4.1 the jumper positions for Local Adjustment and Writing Protection on the main board. If the option chosen is Complete Adjustment, with a disabled writing protection and without the display connected, the transmitter will redirect automatically the local adjustment for Simple mode. This happens because the Complete Local Adjustment needs an interaction with the display, and Simple Local Adjustment does not.

Local Adjustment in the transmitter mode, the simple local adjustment is used for Zero and Span Calibration.

On the other hand, the Complete Local Adjustment makes possible to use the transmitter for several operations.

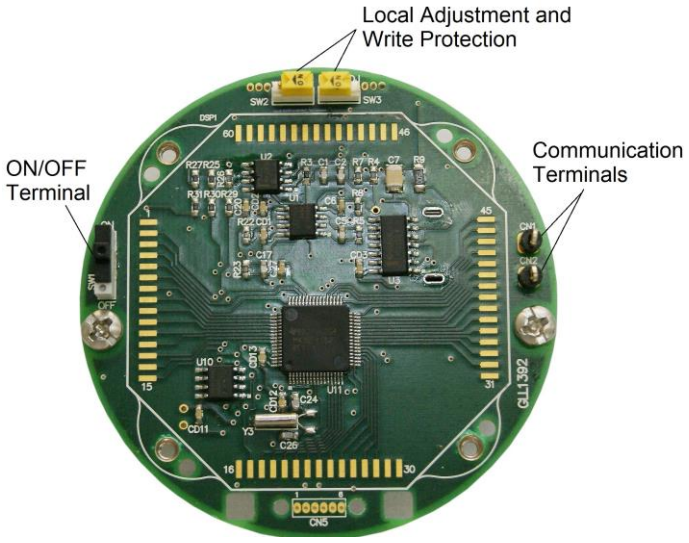


Figure 4.1 – Main Board

Local Adjustment

For configuration via local adjustment to be possible:

- ✓ The display must be connected.
- ✓ The write protection jumper must be disabled.
- ✓ The local adjustment must be enabled in simple or remote way.

See Figure 4.1 for the positions of the Local Adjustment and Write Protection jumpers on the main board.

The transmitter has, under the identification plate, two holes that allow inserting the magnetic tool to perform the Local Adjustment. See Figure 4.2.

Figure 4.2 – Zero and Span Local Adjustment

The holes are marked with Z (Zero) and S (Span) and from now on will be designated only as (**Z**) and (**S**).

This is how to move through the functions and their spurs:

- Inserting the magnetic tool handle in (**Z**), the transmitter moves from the normal measuring way to the transmitter configuring way. The transmitter software begins automatically and cyclically to indicate the functions available on the display.
- Leave the magnetic tool in (**Z**) to move through every possible configuring way.
- As soon as the chosen option is displayed, insert the magnetic tool on (**S**) to select this option and return to (**Z**) to move within the selected option.

Simple Local Adjustment

The Simple Local Adjustment is done as follows:

- Zero Calibration: Insert the magnetic tool in the hole marked with **(Z)** to get the adequate pressure.
- Span Calibration: Insert the magnetic tool in the hole marked with **(S)** to get the adequate pressure.

NOTE
To set the adequate calibration, verify the minimum span for each range and type of measurement as defined at the Technical Specification (Sec. 3).

The zero calibration, with a reference, must be done as follows:

- Apply the pressure that corresponds to the lower value.
- Wait until the pressure stabilizes.
- Insert the magnetic tool in **(Z)** (see Figure 4.2).
- Wait for 2 seconds and the transmitter will indicate 4 mA.
- Remove the magnetic tool.

The zero calibration, with a reference, keeps the span unaltered. To alter the span, proceed as follows:

- Apply the pressure with the upper value.
- Wait until the pressure stabilizes.
- Insert the magnetic tool in (S).
- Wait for 2 seconds and the transmitter will indicate 20 mA.
- Remove the magnetic tool.

When zero adjustment is performed, a new upper value (URV) is calculated according to the current span. If the resulting URV exceeds the upper value limit (URL), the URV will be limited to the URL value and the span will be automatically affected.

Complete Local Adjustment

The configuring tree on the figure below shows how the Complete Local Adjustment works.

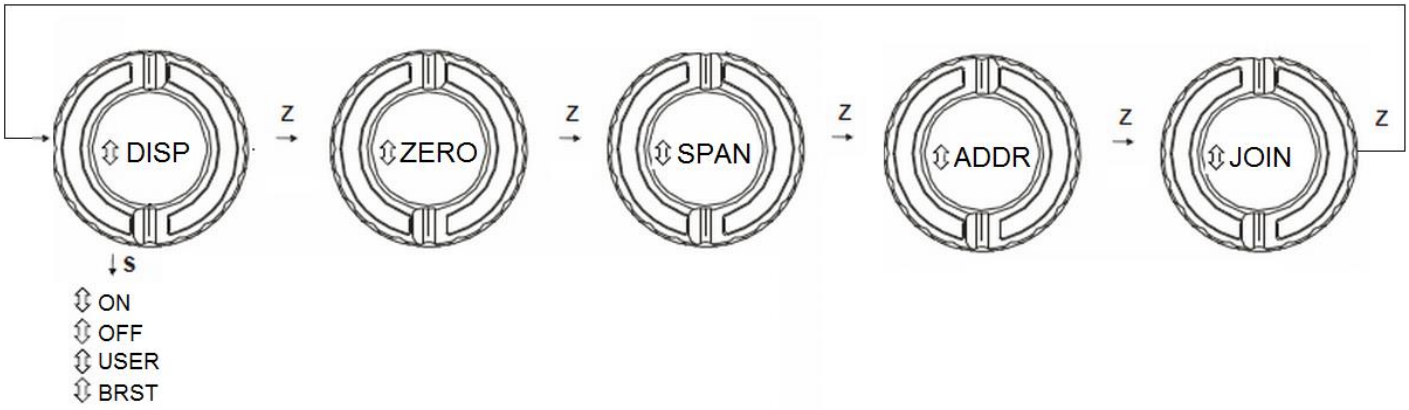


Figure 4.3 – Main Menu Programming Tree via Complete Local Adjustment

CAUTION
When the configuration is done via local adjustment, the transmitter does not show the message "the loop control must be on manual!" as shown on the HART configurator. Therefore, before configurating, set the transmitter circuit on manual. And do not forget to return to auto after the configuration is completed.

The main spur on the **LD400 *Wireless*HART™** complete adjustment configuration tree begins with the "SIMUL" option.

DISPLAY (DISP) – configuration on the transmitter display mode. It can be on, off and burst.

- The user display is activated when the magnetic tool is adjusted.
- Burst is activated when a burst message is sent.
- User and burst stay turned on for some time and then turn off.

ZERO (ZERO) – is the option that allows the zero calibration on the transmitter band.

SPAN (SPAN) – is the option used to characterize the transmitter band span.

ADDRESS (ADDR) – is the option that shows the address being configured on the transmitter.

JOIN (JOIN) – is the option that shows the join status.

The Address and Join parameters are only informative. The other parameters actuate.

Section 5

MAINTENANCE

General

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

The LD400 WirelessHART Smart Pressure Transmitters Series are extensively tested and inspected before being shipped to the user. Despite this, they have features for diagnosis to facilitate the detection of the fault and, consequently, facilitate their maintenance.

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

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

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

Diagnostic via Transmitter

Symptom: ***WITHOUT COMMUNICATION***

Probable Source of Error:

✓ **Terminal Connection**
- Check the configurator interface connection.
- Check if the interface is compatible with the HART protocol.

✓ **Electronic Circuit Fault**
- • Check if the fault is in the transmitter circuit or in the interface, using sets spares.

✓ **Transmitter Address**
• Check if the address of the transmitter is compatible with the expected configurator. The communication address default is 1.

Symptom: ***IT DOES NOT CONNECT TO WIRELESS NETWORK***

Probable Source of Error:

• The power is off;
• Manager / Network Gateway is off;
• The equipment is far from the Network Manager / Gateway or other equipment connected to it;
• Security key (Join Key) and Access Key (Network Id) are not configured correctly;
• The antenna is not connected to the Network Manager / Gateway or equipment;
• There is a list of the Access Control Manager Network / Gateway and the device is not on this list;
• Maximum number of devices configured in Network Manager / Gateway has been reached.

Symptom: ***EQUIPMENT CONTINUOUSLY DISCONNECTING AND CONNECTING TO WirelessHART NETWORK***

Probable Source of Error:

• Weak battery or bad contact in supply causing a restart of equipment;

• The connectivity towards neighbors is unstable (or moving obstacles in the distance limit).

Symptom: ***EQUIPMENT INSIDE RANGE OPERATION, BUT THE STABILITY OF COMMUNICATION IS NOT GOOD***

Probable Source of Error:

✓ **Interference**
- Approach equipment to obtain a better stability.

Symptom: ***WRONG OUTPUT***

✓ **Pressure Tap**
- Check for gas in impulse lines with liquid and liquid lines boost with gas or steam;
- Check the integrity of the circuit by replacing it by a spare.

✓ **Calibration**
- Check the transmitter calibration

Symptom: ***DISPLAY INDICATING "FAIL RADIO"***

✓ **Radio Board**
- Check the integrity of the board and replace it by a spare.

Symptom: ***DISPLAY INDICATING "FAIL BATT"***

✓ **Battery**
- Check the voltage measured for battery.

✓ **Electronic Circuit Fault**
- Check the integrity of the main board and replace it with a spare.

Symptom: ***DISPLAY INDICATING "FAIL MFUNC"***

Probable Source of Error:

✓ **Sensor Connection to Main Board**
- Check connection (flat cable, male and female connectors).

✓ **Type Sensor Connected to the Main Board**
- Check if the sensor is connected to the main board that specified for the model **LD400** ***Wireless*HART™**.

✓ **Electronic Circuit Fault**
- Check if the sensor assembly was damaged, replacing it with a spare.

✓ **Battery**
- Check the voltage supplied by the battery transmitter.

Symptom: ***DISPLAY INDICATING "FAIL MAINT"***

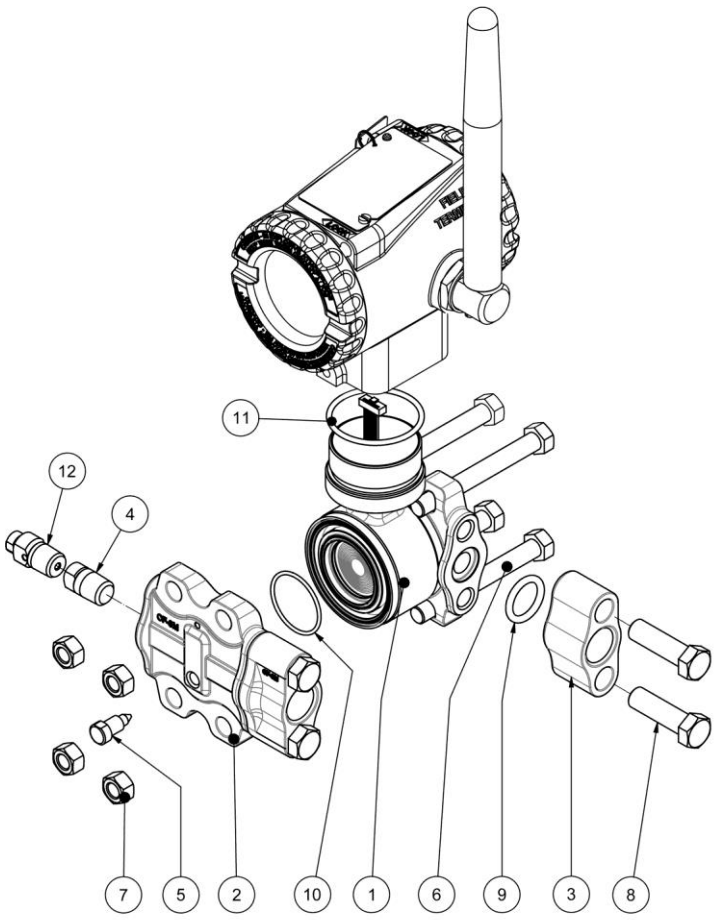
Probable Source of Error:

✓ **Type of Sensor Connected to the Main Board**
- Check if the sensor connected to the main board is the one specified for the **LD400** ***Wireless*HART™** model.

✓ **Pressure Measurement**
- Transmitter subject to an overpressure value outside acceptable limits.
- Transmitter subject to an overpressure value many times.

Disassembly Procedure

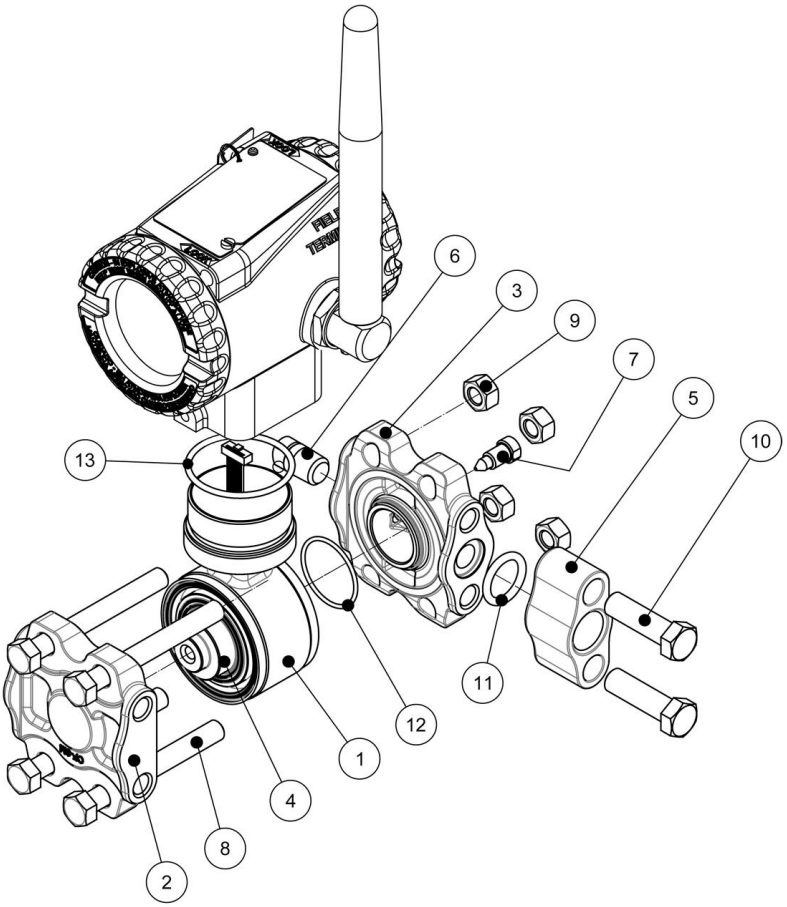
Figure 5.1 shows a transmitter exploded view and will help you to visualize the following.



The letters x after codes see complete code in manual
the parbak rings 203-0710 are use only flanges with sealing 45°,
This new version use radial sealing, not use parbak rings.
A drain valve can be used with flanges without drain, in place of 1/4NPT plug.

ITEM	QTY	DESCRIPTION	PART NUMBER
12	1	drain valve monel	400-0794
12	1	drain valve hastelloy	400-0793
12	2	drain valve SS 316	400-0792
11	1	oring sensor / housing buna N	204-0113
10	2	oring sensor etileno	203-0404
10	2	oring sensor teflon	203-0403
10	2	oring sensor viton	203-0402
10	2	oring sensor buna N	203-0401
9	1	oring adapter etileno	203-0704
9	2	oring adapter teflon	203-0703
9	2	oring adapter viton	203-0702
9	2	oring adapter buna N	203-0701
8	4	Adapter's screw SS316	203-0351
7	4	Flange's Nut SS316	203-0312
6	4	Flange's screw SS316	203-0310
5	2	Drain Screw Monel	203-1403
5	2	Drain Screw Hastelloy	203-1402
5	4	Drain Screw SS 316	203-1401
4	2	Plug 1-4NPT monel	203-0554
4	2	Plug 1-4NPT hastelloy	203-0553
4	2	Plug 1-4NPT SS 316	203-0552
3	2	Adapter 1/2NPT monel 400 bar	203-0604
3	2	Adapter 1/2NPT HS CW-12MW (hast)	203-0603
3	2	Adapter 1/2NPT SS CF-8M (316)	203-0602
3	2	Adapter 1/2NPT carbon steel	203-0601
2	2	differential Flange Standard	400-1330-xxx
1	1	Sensor	400-0837-Dxxxxx

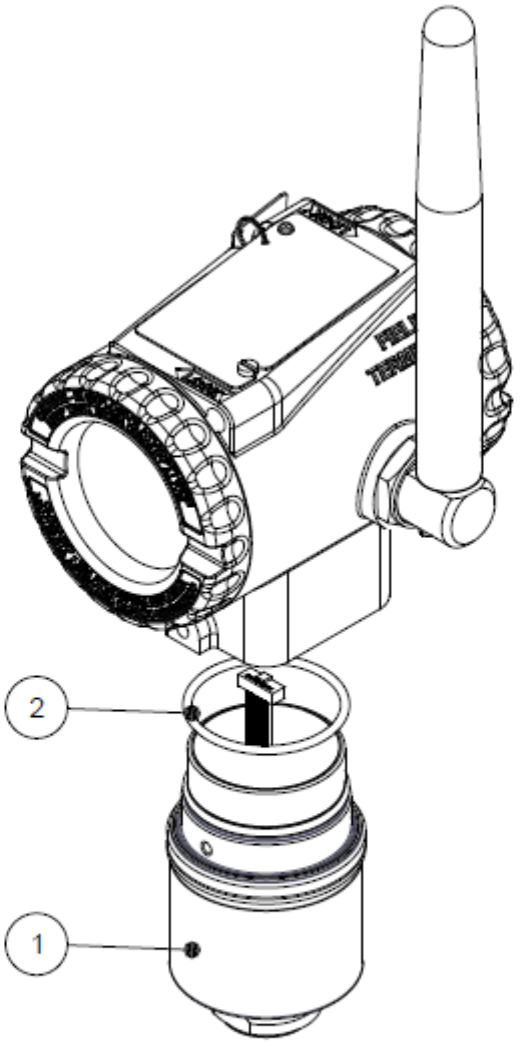
Figure 5.1 (a) – Exploded View - Differential Pressure Transmitter



the campanula ID 4 only used in absolute model, welded on the sensor.
the letter "x" in codes, see complete code in manual.
The part numbers of electronic housing are in other figure

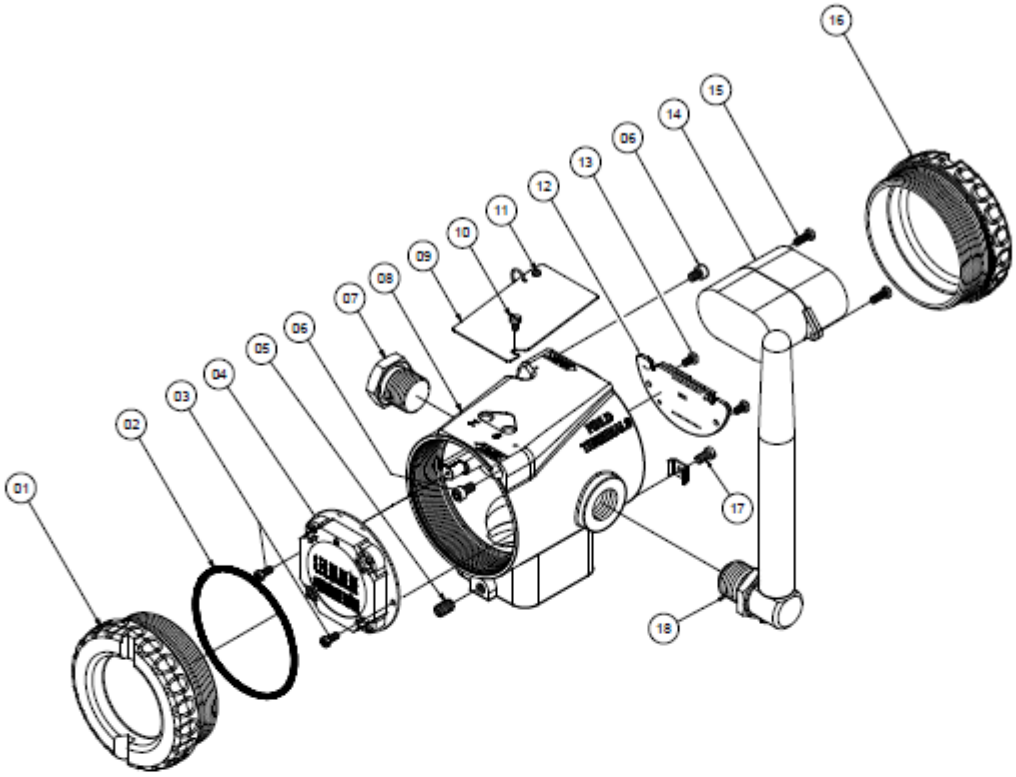
ID	QTY	DESCRIPTION	CÓDIGO
13	1	oring sensor / housing buna N	204-0113
12	1	oring sensor etileno	203-0404
12	1	oring sensor teflon	203-0403
12	1	oring sensor viton	203-0402
12	1	oring sensor buna N	203-0401
11	1	oring adapter etileno	203-0704
11	1	oring adapter teflon	203-0703
11	1	oring adapter viton	203-0702
11	1	oring adapter buna N	203-0701
10	2	Adapter's screw SS316	203-0351
9	4	Flange's Nut SS316	203-0312
8	4	Flange's screw SS316	203-0310
7	1	Drain Screw Monel	203-1403
7	1	Drain Screw Hastelloy	203-1402
7	1	Drain Screw SS 316	203-1401
6	1	Plug 1-4NPT monel	203-0554
6	1	Plug 1-4NPT hastelloy	203-0553
6	1	Plug 1-4NPT SS 316	203-0552
5	1	Adapter 1/2NPT monel 400 bar	203-0604
5	1	Adapter 1/2NPT HS CW-12MW (hast)	203-0603
5	1	Adapter 1/2NPT SS CF-8M (316)	203-0602
5	1	Adapter 1/2NPT carbon steel	203-0601
4	1	Absolute Campanula	
3	1	Differential Flange	400-1330-xxx
2	1	Absolute/Gage Flange SS	204-1102
1	1	Gage Sensor (without campanula)	400-0837-M-xxx
1	1	Absolute Sensor	400-0837-A-xxx

Figure 5.1 (b) – Exploded View – Gage, Flow, Absolute and High Static Pressure Transmitter



ID	QTY	DESCRIPTION	CODE
2	1	buna N Housing o-ring	204-0113
1	1	Sensor	400-0837-GxxxxW

Figure 5.1 (c) – Exploded View – Gage Pressure Transmitter - Inline



The letters x, after the codes indicate continuation, see complete code in the manual.

ID	QTY	DESCRIPTION	PART NUMBER
18	1	Antenna wireless	400-1214
17	1	Ground terminal and screw	400-0904
16	1	Cover 400 wireless without window	400-1208
15	1	Screw fixing Pack battery	400-1210
14	1	Pack battery	400-1209
13	1	Screw fixing Radio electronic board	400-1212
12	1	Radio electronic board	400-1211
11	1	Rivet Fixing Plate	400-0834
10	1	Screw Fixing Plate	204-0116
9	1	Identification Plate	
8	1	Housing 400 wireless	400-1368-xxxxx
7	1	Plug M20 316 BR-Exd	400-0810
6	2	Screw lock cover	204-0120
5	1	Screw lock sensor	400-1121
4	1	etectronic board GLL1392 (with display/fixing kit) LD400 W.Hart	400-1213
3	2	Screw fixing electronic board	400-0832
2	1	cover oring	204-0122
1	1	cover 400 with window	400-0822-xx

Figure 5.1 (d) – Exploded View – LD400 Housing

a) Remove the front and rear covers;

b) Remove the main board at the front of the housing, disconnecting the cables of sensor, radio and battery;

c) Disconnect the sensor from the bottom, as in the photo, unscrewing it carefully to not wrap the cord;

d) Disconnect the Battery Module from the housing and remove it. For further details, refer to Battery Module Replacement Procedure topic.

Table 5.1 – Quick Transmitter Disassembly Procedure

Sensor

In order to have access to the sensor for cleaning purposes, the transmitter should be removed from its process connections. The transmitter should be isolated from the process by means of manifolds or valves; then, the drain must be opened to vent any remaining pressure.

After this, the transmitter may be removed from the bracket. Flange bolts can now be released one by one, crosswise. After removing bolts and flanges, the isolating diaphragms will be easily accessible for cleaning.

Cleaning should be done carefully in order to avoid damaging the delicate isolating diaphragms. Use of a soft cloth and a nonacid solution is recommended.

The oscillator circuit is part of the sensor. If the former is replaced, the latter should also be replaced. The oscillating circuit is a part of the sensor and the replacement of one implies replacing the other. 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 and carefully unscrew the electronic housing from the sensor, observing if the flat cable is not excessively twisted.

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

Figure 5.2 – Housing Safe Rotation

Antenna

If it is necessary to disassemble the antenna assembly, must necessarily remove the rear cover of the device to disconnect the antenna cable from the radio plate.

WARNING
This procedure is required for the antenna cable is not damaged during its rotation in the disassembly process. After disconnecting the cable, one must hold the antenna assembly through the set screw with the aid of a wrench, by turning it counterclockwise. To avoid equipment damage, do not rotate the antenna below the imaginary line through 180 ° relative to the base of the machine. If there is the need to rotate the antenna, loosen the locking screw and the bottom Tour just above this line. See Figure 1.7.

Figure 5.3 – Safe Antenna Rotation

SPECIAL CONDITION FOR SAFE USE (X)
The plastic antenna housing can be considered a potential source of electrostatic ignition and should not be rubbed or cleaned with a dry cloth. The plastic antenna housing has a surface resistance greater than 1GΩ and care should be taken to touch it only with insulating equipment and take precautions to continuously drain electrostatic charges.

Electronic Circuit

For the steps below, make sure to leave the terminal On / Off (Figure 1.9) in the off position (Off).

To remove the radio board (**12**) and the battery module (**14**), remove the rear cover (**16**), by turning it counterclockwise. To remove the main board (4), release its two screws **(3),** disconnect the cables, and carefully remove it.

To remove the radio board (**12**), first disconnect it from the main board **(4)**. This procedure is performed more easily by removing the main board from housing, as explained above. After disconnecting the boards, loosen the two screws from the radio board **(13)** and carefully remove. To remove the battery module (**14**), release their two screws (**15**) and carefully remove it.

WARNING
The board has CMOS components, which may be damaged by electrostatic discharges. Make sure that these components will be handled by trained people that know the right handling procedures. The operator and the bench must be grounded during the entire process. Also the circuit boards should be stored in electric-charge proof packages.

Reassembly Procedure

This type of operation should be done in a safe area and cleared the transmitter. Table 5.2 shows an expeditious assembly.

a) First, to make the antenna assembly on the housing indicated by "Field Terminals." Keep the antenna in an vertical position.

b) Tighten the antenna with a wrench. Use the key to how the picture is being displayed, always below the antenna. Finally, keep the antenna upright;

c) Screw radio plate on the back of the housing. Pass the antenna cable to the mark indicated in the picture and connect it to the radio plate as shown in photo;

d) Screw the Battery Module in the housing with the connector facing the main board;

e) Connect the sensor from the bottom, as shown in the photo, threading it with care not to wrap the cable;

f) Place the main board on the front of the housing and connect the cables of sensor, radio and battery to it. After connection, screw the board to the housing;

g) Finalize threading the front and rear covers.

Table 5.2 – Fast Procedure for Transmitter Mounting

The complete assembly of the device must be initiated by antenna assembly. To mount the antenna set (**18**) just screw it on the equipment side with the aid of a wrench, as shown in Table 5.2b. To mount the radio board (**12**) first connect it to the main board (**4**) and then attach to the housing through its screws (**13**). Connect the antenna cable to the connector on the radio. To assemble the battery module (**14**) just screw it to the housing using their screws (**15**).

To mount the main board (**4**) make sure that the cables of the radio board (**12**), sensor, and battery are connected. Attach the main board to the housing through its screws (**4**) and be sure to leave the terminal On / Off (Figure 1.4) in the off position (Off). To fix the display (**3**) on the main board (**4**) just mount it in the correct position (up arrow) using its four screws (**3**). To finish assembling the equipment, screw the frontal (**1**) and rear (**16**) covers clockwise

The transmitter is ready to be powered and tested. It is recommended to make the adjustment of ZERO TRIM and UPPER PRESSURE TRIM.

Battery Module Replacement Procedure

Follow the steps below to replace the battery module:

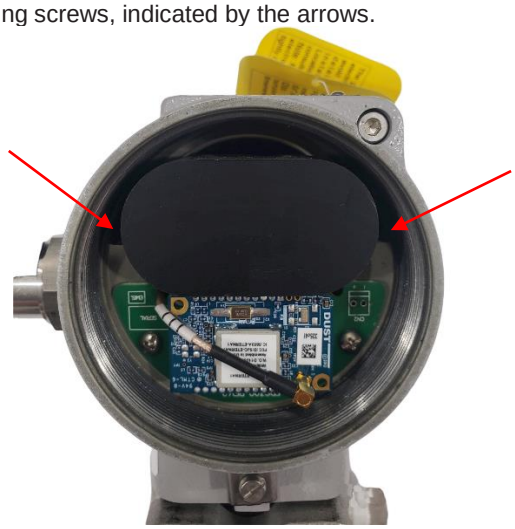
1 – Remove the front and rear covers of the equipment.

2 – Turn off the equipment.

3 – Remove the digital board fixing screws.

4 – Disconnect the power cable from the digital board.

5 – Remove the battery fixing screws, indicated by the arrows.



6 – Remove the old battery and insert a new Smar battery pack (code 400-1209).

7 – Insert the fixing screws of the new battery.

8 – Connect the battery power cable to the digital board.

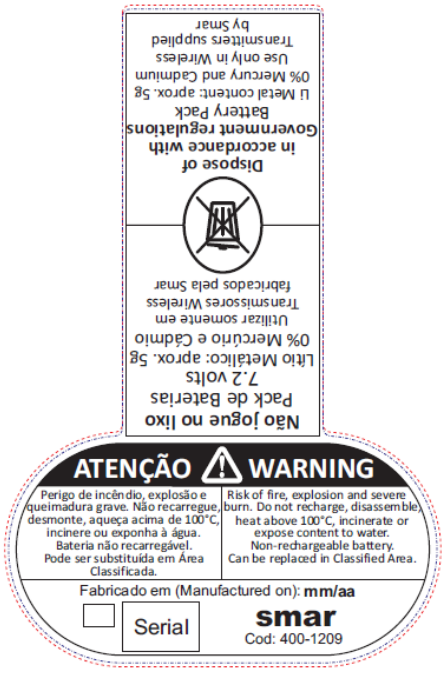
9 – Place the digital board fixing screws in the equipment housing.

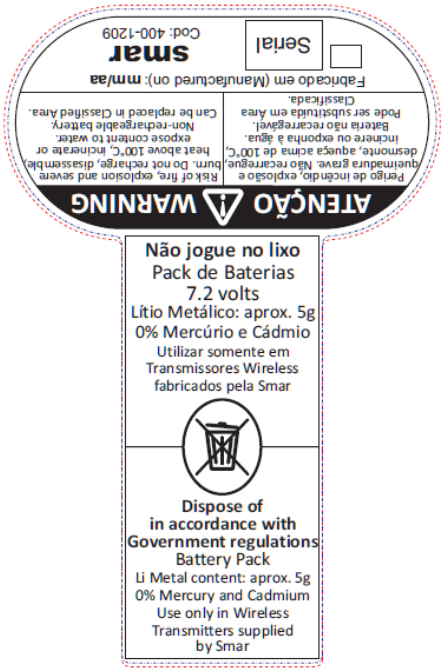
10 – Turn on the equipment and insert the front and rear covers.

Carefully read the warnings placed on the battery module and on the equipment housing to avoid damage to the environment and people.

ATENÇÃO
Use somente módulo de Baterias substituíveis fornecidas exclusivamente pela Smar (Cod: 400-1209)

CAUTION
Use only replaceable Battery module supplied exclusively by Smar (Cod: 400-1209)





SPECIAL CONDITION FOR SAFE USE (X)

The plastic battery housing can be considered a potential source of electrostatic ignition and should not be rubbed or cleaned with a dry cloth.

The SMAR battery module can constitute a potential source of electrostatic ignition, it must be handled by a qualified person and only removed from the appropriate packaging at the time of installation.

The SMAR battery module can be replaced in a hazardous area. The module has a surface resistance greater than 1 GΩ and must be installed in wireless equipment by a qualified person.

Care must be maintained even during transport to and from the installation site and should only be removed from the antistatic packaging at the time of installation.

Interchangeability

To obtain an accurate, temperature-compensated response, sensor data must be transferred to the mainboard FRAM. This is done automatically when the transmitter is powered up.

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

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

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

Data transference from the main board to the sensor or vice versa can also be forced by function MAINT/BACKUP/READ FROM SENSOR.

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.

The equipment must have its Battery Module disconnected before being shipped, for safety reasons and shipping regulations. To do so, first turn it off using the front switch and disconnect the Battery Module from the main board.

In order to speed up analysis and solution of the problem, the defective item should be returned with the Service Request Form (SRF – Appendix A) 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 warranty should be accompanied by a purchase order or a quote request.

Spare Parts List

SPARE PARTS LIST FOR TRANSMITTER		
DESCRIPTION		**CODE**
MOUNTING BRACKET FOR 2" PIPE MOUNTING (NOTE 1)	. CS . 316 SST . CS with accessories in 316 SST	203 0801 203 0802 203 0803
MOUNTING BRACKET IN L FOR LD400G (NOTE 1)	. CS . 316 SST . CS with accessories in 316 SST	209-0801 209-0802 209-0803

NOTE

(1) Including U-Clamp, nuts, bolts, and washers.

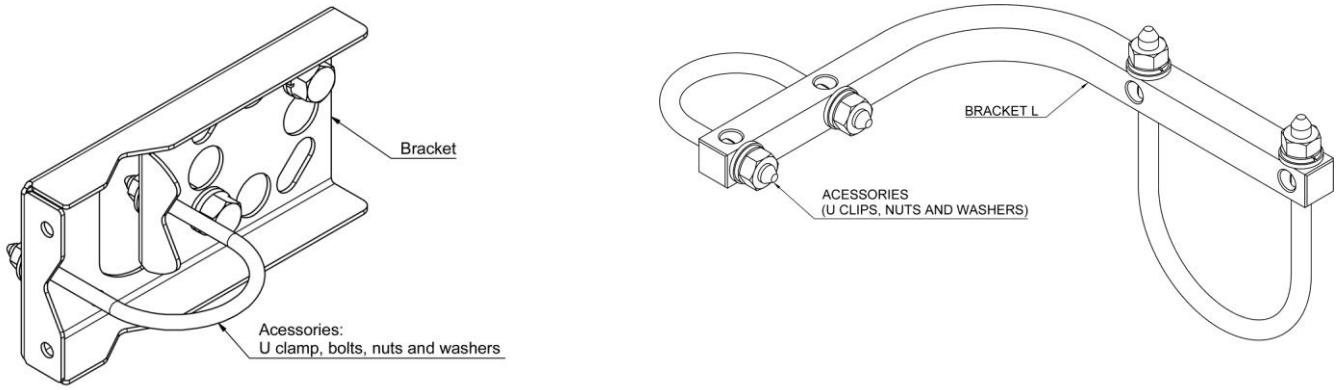


Figure 5.3 – Mounting brackets

Detailed Spare Parts Ordering Code

CODE	DESCRIPTION
400-1368	400 HOUSING

Option	Product
1	LD400

Option	Communication Protocol
W	WirelessHART

Option	Electrical Connection
A	M20 X 1,5

400-1368	1	W	*	*	TYPICAL MODEL

Special Options

COD.	Material
H0	Aluminum (IP/Type)
H1	SST (IP/Type)
H2	Aluminum - saline atmospheres (IPW/Type X)

COD.	Painting
P0	Gray Munsell N 6.5 Polyester
P1	Safety Blue Epoxy – Immersion Condition-Petrobras N1021
P2	Safety Blue Epoxy – Atmospheric Zone - Petrobras N1021
P3	Black Polyester
P7	Beige Epoxy
P8	Without painting
P9	Safety Blue Epoxy
PD	Bright Plain Blue RAL5010 – Epoxy
PG	Safety Orange Epoxy

CODE	DESCRIPTION
400-0822	Cover with window

Special Options

COD.	Material
H0	Aluminum (IP/Type)
H1	SST (IP/Type)

COD.	Painting
P0	Gray Munsell N 6.5 - Polyester
PJ	Textured White - Polyester

CODE	DESCRIPTION
400-1330	STANDARD DIFFERENTIAL FLANGE 1/4 NPT CONNECTION;

Option	Drain/Vent
0	Without drain/vent
1	With drain/vent

Option	Flange thread for fixing
0	7/16 - 20 UNF
1	M10 X 1.5
2	M12 X 1.75

Option	Flange Material
A	304L SST / CF-3
H	Hastelloy C276 / CW-12MW
I	316 SST / CF-8M

400-1330	1	0	I

Ordering Code

MODEL	DIFFERENTIAL, FLOW, GAGE, ABSOLUTE AND HIGH STATIC PRESSURE SENSOR
400-0837	Sensor Module

COD	Type	Range LIMITS Min	Max	Unit	Min	Max	Unit3	Turn Down Max
D0	Differential **(10)**	-1	1	kPa	-10	10	mbar	20
D1	Differential and Flow	-5	5	kPa	-50	50	mbar	40
D2	Differential and Flow	-50	50	kPa	-500	500	mbar	200
D3	Differential and Flow	-250	250	kPa	-2500	2500	mbar	200
D4	Differential and Flow	-2500	2500	kPa	-25	25	bar	200
M0	Gage	-1	1	kPa	-10	10	mbar	20
M1	Gage	-5	5	kPa	-50	50	mbar	40
M2	Gage	-50	50	kPa	-500	500	mbar	200
M3	Gage	-100	250	kPa	-1000	2500	mbar	200
M4	Gage	-100	2500	kPa	-1	25	bar	200
M5	Gage	-0.1	25	MPa	-1	250	bar	120
M6	Gage	-0.1	40	MPa	-1	400	bar	120
A0	Absolute	0	1	kPa	0	7.5	mmHga	20
A1	Absolute	0	5	kPa	0	37	mmHga	4
A2	Absolute	0	50	kPa	0	500	mbar	20
A3	Absolute	0	250	kPa	0	2500	mbar	120
A4	Absolute	0	2500	kPa	0	25	bar	120
A5	Absolute	0	25	MPa	0	250	bar	120
A6	Absolute	0	40	MPa	0	400	bar	120
H2	Differential – High Static Pressure	-50	50	kPa	-500	500	mbar	120
H3	Differential – High Static Pressure	-250	250	kPa	-2500	2500	mbar	120
H4	Differential – High Static Pressure	-2500	2500	kPa	-25	25	bar	120
H5	Differential – High Static Pressure	-25	25	MPa	-250	-250	bar	120

NOTE: The range can be extended up to 0.75 LRL* and 1.2 URL* with small degradation of accuracy.

*LRL = Lower Range Limit.
*URL = Upper Range Limit.

Due to differences in mechanical project, A1 range has turn-down lower than A0 range.

COD	Diaphragm Material and Fill Fluid		COD		
1	316L SST	Silicone Oil **(5)**	M	Monel 400 Gold Plated	Silicone Oil **(1) (3) (5)**
2	316L SST	Inert (Fluorolube Oil) **(2) (4) (9)**	P	Monel 400 Gold Plated	Inert (Krytox Oil) **(1) (3) (9)**
3	Hastelloy C276	Silicone Oil **(1) (5)**	Q	316 L SST	Inert (Halocarbon 4.2 Oil) **(9)**
4	Hastelloy C276	Inert (Fluorolube Oil) **(1) (2) (4) (9)**	R	Hastelloy C276	Inert (Halocarbon 4.2 Oil) (1)**(9)**
5	Monel 400	Silicone Oil **(1)(3)(5)**	S	Tantalum	Inert (Halocarbon 4.2 Oil) **(3) (9)**
7	Tantalum	Silicone Oil **(3) (5)**	I	316L SST, L.I. Gold Plated	Silicone Oil **(3) (5) (8)**
8	Tantalum	Inert (Fluorolube Oil) **(2) (3) (4) (9)**	J	316L SST, L.I. Gold Plated	Inert (Fluorolube Oil) (2) **(3) (4) (8) (9)**
9	316L SST	Fomblim Oil **(6)**	L	316L SST, L.I. Gold Plated	Inert (Krytox Oil) **(3) (8) (9)**
A	Monel 400	Fomblim Oil **(1) (3)**	T	316L SST, L.I. Gold Plated	Inert (Halocarbon 4.2 Oil) **(3) (8) (9)**
D	316 L SST	Inert (Krytox Oil) **(6) (9)**	U	316L SST, L.I.	Silicone Oil **(3) (5)**
E	Hastelloy C276	Inert (Krytox Oil) **(1) (6) (9)**	V	316L SST, L.I.	Inert (Fluorolube Oil) **(3) (4) (9)**
G	Tantalum	Inert (Krytox Oil) **(3) (9)**	W	316L SST, L.I.	Inert (Krytox Oil) **(3) (9)**
K	Monel 400	Inert (Krytox Oil) **(1) (3) (9)**	X	316L SST, L.I.	Inert (Halocarbon 4.2 Oil) **(3) (9)**
				Note: L.I = Integral Steel	

COD	Performance Class		
0	Default	1	High Performance **(7)**

COD	Communication Protocol
W	*Wireless*HART™

COD	Safety Instrumented
0	Default – For use in measurement and control

400-0837	D2	1	1	W	0

NOTES

(1) Meets NACE MR – 01 – 75/ISO 15155 recommendations.
(2) Not available for absolute models nor for vacuum applications.
(3) Not available for ranges 0 and 1.
(4) Not recommended for vacuum applications.
(5) Silicone Oil is not recommended for oxygen (O_2) or Chlorine service.
(6) Not available for range 0.
(7) Only available for differential pressure and gage transmitters.
(8) Effective for hydrogen migration processes.
(9) Inert Fluid: Oxygen Compatibility, safe for oxygen service.
(10) The D0 range should not be used for flow measurement.

MODEL	FLANGED PRESSURE TRANSMITTER SENSOR
400-0837	Smart Pressure Transmitter

COD	TYPE	RANGES LIMIT Min	Max	Unit	Min	Max	Unit	Turn Down Max
L2	Level	-50	50	kPa	-500	500	mbar	120
L3	Level	-250	250	kPa	-2500	2500	mbar	120
L4	Level	-2500	2500	kPa	-25	25	bar	120
L5	Level	-25	25	MPa	-250	250	bar	120

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.

COD	Diaphragm material and Fill Fluid	
1	316L SST	Silicone Oil **(2)**
2	316L SST	Inert (Fluorolube Oil) **(3) (14)**
3	Hastelloy C276	Silicone Oil **(1) (2)**
4	Hastelloy C276	Inert (Fluorolube Oil) **(1) (3) (14)**
5	Monel 400	Silicone Oil **(1) (2)**
7	Tantalum	Silicone Oil **(2)**
8	Tantalum	Inert (Fluorolube Oil) **(3) (14)**
9	316L SST	Fomblim Oil
A	Monel 400	Fomblim Oil **(1)**
D	316 L SST	Inert (Krytox Oil) **(14)**
E	Hastelloy C276	Inert (Krytox Oil) **(1) (14)**
G	Tantalum	Inert (Krytox Oil) **(14)**
K	Monel 400	Inert (Krytox Oil) **(1) (14)**
M	Monel 400 Gold Plated	Silicone Oil **(1) (2)**
P	Monel 400 Gold Plated	Inert (Krytox Oil) **(1) (14)**
Q	316 L SST	Inert (Halocarbon 4.2 Oil) **(14)**
R	Hastelloy C276	Inert (Halocarbon 4.2 Oil) **(1) (14)**
S	Tantalum	Inert (Halocarbon 4.2 Oil) **(14)**
I	316L SST, L.I. Gold Plated	Silicone Oil (**2**) (**13**)
J	316L SST, L.I. Gold Plated	Inert (Fluorolube Oil) (**3**) (**13**) **(14)**
L	316L SST, L.I. Gold Plated	Inert (Krytox Oil) (**13**) **(14)**
T	316L SST, L.I. Gold Plated	Inert (Halocarbon 4.2 Oil) (**13**) **(14)**
U	316L SST, L.I.	Silicone Oil (**2**)
V	316L SST, L.I.	Inert (Fluorolube Oil) (**3**) **(14)**
W	316L SST, L.I.	Inert (Krytox Oil) (14)
X	316L SST, L.I.	Inert (Halocarbon 4.2 Oil) **(14)**

Note: L.I. = Integral Steel

COD.	Performance Class
0	Standard

COD.	Communication Protocol
W	*Wireless*HART™

COD.	Safety Instrumented
0	Default – For use in measurement and control

COD.	Flange, Adapter and Drain/Vent Valves Material
A	304L SST
P	Plated CS (Drain/Vent in Stainless Steel) **(15)**
H	Hastelloy C276 (CW-12MW, ASTM - A494) **(1)**
I	316 SST - CF8M (ASTM A351)
F	Monel 400 - Laminated bar (HF applications)
1	316 SST - CF8M (ASTM A351) (Drain/vent in Hastelloy C276) **(1)**
2	316 SST - CF8M (ASTM A351) Flange with PVDF (Kynar) insert **(3) (4) (5) (6)**

COD.	O'Ring Material
0	Without O`Ring
B	Buna-N
E	Ethylene – Propylene
K	Kalrez
T	Teflon
V	Viton

Note: O'rings are not available on the sides with remote seals

COD.	Drain/Vent Position (Low Side)
0	Without drain/vent
A	Drain/Vent (Opposite to Process Connection)
D	Bottom
U	Top

Note: For better Drain/Vent operation, vent valves are strongly recommended. Drain/Vent valve not available on the sides with remote seals.

COD.	Process Connection (Low Side)
0	1/4 - 18 NPT (Without adapter)
1	1/2- 14 NPT (With adapter) **(8)**
3	Remote Seal (With Plug) **(4)**
5	1/2- 14 NPT Axial with PVDF Insert **(3) (4) (5) (6)**
9	Remote Seal (Low Volume Flange) **(3) (4)**
T	1/2 - 14 BSP (With adapter) **(8)**
U	Reduced Volume Level Flange, Welded
Z	User´s specifications

COD.	Special Applications
0	Without special cleaning
1	Degrease Cleaning (Oxygen or Chlorine Service) **(10)**
2	Applicable for vacuum service

COD	Flanges Bolts and Nuts Material
I	316 SST
C	Carbon Steel (ASTM A193 B7M) **(1) (16)**
H	Hastelloy C276
A	Super Duplex SST according to NACE MR0175 / MR0103 **(1a)**

COD.	Flange, Adapter and Drain/Vent Valves Material (Low Side)
0	7/16" UNF (Default)

COD.	Process Connection (High Side)	COD.	Process Connection (High Side)
U	1" 150 # (ASME B16.5)	D	4" 600 # (ASME B16.5)
V	1" 300 # (ASME B16.5)	5	DN 25 PN10/40 (DIN EN 1092-1)
W	1" 600 # (ASME B16.5)	R	DN 40 PN10/40 (DIN EN 1092-1)
O	1 1/2" 150 # (ASME B16.5)	E	DN 50 PN 10/40 (DIN EN 1092-1)
P	1 1/2" 300 # (ASME B16.5)	6	DN 80 PN 10/40 (DIN EN 1092-1)
Q	1 1/2" 600 # (ASME B16.5)	7	DN 100 PN 10/16 (DIN EN 1092-1)
9	2" 150 # (ASME B16.5)	8	DN 100 PN 25/40 (DIN EN 1092-1)
A	2" 300 # (ASME B16.5)	H	10K 100A (JIS 2202)
B	2" 600 # (ASME B16.5)	F	10K 50A (JIS 2202)
1	3" 150 # (ASME B16.5)	G	10K 80A (JIS 2202)
2	3" 300 # (ASME B16.5)	S	20K 40A (JIS 2202)
C	3" 600 # (ASME B16.5)	L	20K 80A (JIS 2202)
3	4" 150 # (ASME B16.5)	T	40K 50A (JIS 2202)
4	4" 300 # (ASME B16.5)	Z	User's specification

400-0837	L2	1	0	W	0	I	B	A	0	1	I	0	1

CONTINUE IN THE NEXT PAGE

400-0837	L2	1	0	W	0	I	B	A	0	1	I	0	1	Continued from Sensor Main Code

COD	Type and Flange Material (High Side)
I	316L SST (Integral Flange)
H	Hastelloy C276 (Integral Flange)
Z	User's specification

COD	Flange Facing Finish
0	Raised Face – RF (Default)
1	Flat Face – FF
2	Ring Joint Face – RTJ (Only available for ASME standard flange) **(11)**

COD	Extension Length
0	0 mm (0")
1	50 mm (2")
2	100 mm (4")
3	150 mm (6")
4	200 mm (8")
Z	User´s specifications

Note: Extension Material 316L SST.

COD	Diaphragm Material
A	304L SST / 304L SST
L	316L SST /316 SST
H	Hastelloy C276 / 316 SST
M	Monel 400 / 316 SST (9)
T	Tantalum / 316 SST **(9)**
X	Titanium / 316 SST **(9)**
1	316L SST with Teflon Lining (For 2"and 3")
2	316L SST Gold plated
3	Tantalum with Teflon Lining

COD	Fill Fluid
1	Silicone DC-200/20 Oil (**2**)
2	Fluorolube MO-10 Oil **(3) (7) (14)**
3	Silicone DC704 Oil (2)
4	Krytox Oil **(14)**
N	Neobee M20 Propylene Glycol Oil
T	Syltherm 800 Oil
Z	User´s specifications

400-0837	L2	1	0	W	0	I	B	A	0	1	P	0	1	I	0	1	L	1

TYPICAL MODEL NUMBER

Notes:

(1) Meets NACE MR – 01 – 75/ISO 15156 recommendations.
(1a) Meets NACE MR103
(2) Silicone Oil is not recommended for Oxygen (O2) or Chlorine service.
(3) Not applicable for vacuum service**.**
(4) Drain/Vent not applicable.
(5) O'Ring should be Viton or Kalrez.
(6) Maximum pressure 24 bar.
(7) Inert fill fluid (Fluorolube) is not available for Monel diaphragm.
(8) Explosion proof approvals do not apply to adapter, only to transmitter.
(9) Attention, check corrosion rate for the process, tantalum plate 0.1 mm, AISI 316L extension 3 to 6mm.
(10) Degrease cleaning not available for carbon steel flanges.
(11) Only enable for flange ASME B16.5.
(12) For this option consult Smar.
(13) Effective for hydrogen migration processes
(14) Inert Fluid: Oxygen Compatibility, safe for oxygen service.
(15) Not applicable for saline atmosphere.
(16) Not available for flange JIS B2220.

MODEL	SENSOR FOR SANITARY PRESSURE TRANSMITTER
400-0837	Sensor Module

COD.	TYPE	Range Limits Min	Range Limits Max	Range Limits Unit	Min	Max	Unit	Turn Down Max
S2	Sanitary	-50	50	kPa	-500	500	mbar	120
S3	Sanitary	-250	250	kPa	-2500	2500	mbar	120
S4	Sanitary	-2500	2500	kPa	-25	25	bar	120
S5	Sanitary	-25	25	MPa	-250	250	bar	120

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.

COD.	Diaphragm material and Fill Fluid (Low Side)	
1	316L SST	Silicone Oil **(2)**
2	316L SST	Inert Fluorolube Oil **(3) (7)**
3	Hastelloy C276	Silicone Oil **(1) (2)**
4	Hastelloy C276	Inert Fluorolube Oil **(1) (3) (7)**

COD.	Performance Class
0	Default

COD.	Communication Protocol
W	WirelessHART®

COD.	Safety Instrumented
0	Default – For use in measurement and control

COD.	Flange, Adapter and Drain/Vent Valves material
I	316 SST

COD.	O'Ring Material
O	Without O´Ring
B	Buna-N
E	Ethylene – Propylene
K	Kalrez
T	Teflon
V	Viton

Note: O'rings are not available on the sides with remote seals.

COD.	Drain/Vent Position
0	Without drain/vent
A	Drain/Vent (Opposite to Process Connection)
D	Bottoms
U	Top

Note: For better Drain/Vent operation, vent valves are strongly recommended. Drain/Vent valve are not available on the sides with remote seals.

COD.	Process Connection (Low Side)
0	1/4 - 18 NPT (Without Adapter)
1	1/2 - 14 NPT (With Adapter) **(5)**
3	Remote Seal (With Plug) **(4)**
9	Remote Seal (Low Volume Flange) **(3) (4)**
T	1/2 – 14 BSP (With adapter) **(5)**
Z	User´s specifications

COD.	Specials Applications
0	Without special cleaning
1	Degrease Cleaning (Oxygen or Chlorine Service) **(6)**
2	Applicable for vacuum service

COD.	Flanges Bolts and Nuts Material
I	316 SST
C	Carbon Steel (ASTM A193 B7M) **(1) (8)**
H	Hastelloy C276
A	Super Duplex SST according to NACE MR0175 / MR0103 **(1a)**

COD.	Flange thread for fixing accessories (adapters)
0	7/16" UNF

400-0837	S2	1	0	W	0	I	B	D	0	0	I	0

CONTINUE IN THE NEXT PAGE

400-0837	S2	1	0	W	0	I	B	D	0	0	I	0

Continued from sanitary sensor main code

COD.	Process Connections
8	DN25 DIN 11851 – WITH EXTENSION/316L SST
9	DN40 DIN 11851 - WITH EXTENSION/316L SST
H	DN40 DIN 11851 – 316L SST
V	THREAD DN50 DIN 11851 - WITH EXTENSION/316L SST
U	THREAD DN50 DIN 11851 - WITHOUT EXTENSION/316L SST
X	THREAD DN80 DIN 11851 - WITH EXTENSION/316L SST
W	THREAD DN80 DIN 11851 - WITHOUT EXTENSION/316L SST
4	THREAD IDF 2" - WITH EXTENSION/316L SST
B	THREAD IDF 2" - 316L SST
K	THREAD IDF 3" - WITH EXTENSION/316L SST
3	THREAD IDF 3" - WITHOUT EXTENSION/316L SST
5	THREAD RJT 2" - - WITH EXTENSION/316L SST
C	THREAD RJT 2" - 316L SST
L	THREAD RJT 3" - WITH EXTENSION/316L SST
2	THREAD RJT 3" - WITHOUT EXTENSION/316L SST
S	THREAD SMS 1 1/2" - 316L SST
7	THREAD SMS 2" - - WITH EXTENSION/316L SST
E	THREAD SMS 2" - 316L SST
M	THREAD SMS 3" - - WITH EXTENSION/316L SST
1	THREAD SMS 3" - - WITHOUT EXTENSION/316L SST
F	TRI CLAMP 1 1/2" - 316L SST
Q	TRI CLAMP 1 1/2" HP (High Pressure) - 316L SST
6	TRI CLAMP 2" - - WITH EXTENSION/316L SST
D	TRI CLAMP 2" - 316L SST
N	TRI CLAMP 2" HP (High Pressure) - WITH EXTENSION/316L SST
P	TRI CLAMP 2" HP (High Pressure) - 316L SST
I	TRI CLAMP 3" - - WITH EXTENSION/316L SST
G	TRI CLAMP 3" - 316L SST
J	TRI CLAMP 3" HP (High Pressure) - - WITH EXTENSION/316L SST
R	TRI CLAMP 3" HP (High Pressure) - 316L SST
A	TRI-CLAMP DN50 - WITH EXTENSION / 316 SST
O	TRI-CLAMP DN50 HP (High Pressure) - WITH EXTENSION / 316 SST
Z	User´s specifications

COD.	O-Rings Materials (High Side)
0	Without O´Ring (Supplied by Client)
B	Buna N
K	Kalrez
T	Teflon
V	Viton
Z	User´s specifications

COD.	Diaphragm Material (High Side)
L	316L SST
H	Hastelloy C276

COD.	Fill Fluid (High Side)
1	Silicone DC-200/20 Oil
2	Fluorolube MO-10 Oil (**3**) (**7**)
3	Silicone Oil DC704
N	Neobee M20 Propylene Glycol Oil
T	Syltherm 800 Oil
Z	User´s specifications

400-0837	S2	1	0	W	0	I	B	D	0	0	I	0	4	B	L	1

TYPICAL MODEL NUMBER

Notes**:**

(1) Meets NACE MR – 01 – 75/ISO 15156 recommendations.
(1a) Meets NACE MR103
(2) Silicone Oil is not recommended for Oxygen or Chlorine service.
(3) Not applicable for vacuum service.
(4) Drain/Vent not applicable.
(5) Explosion proof approvals do not apply to adapter, only to transmitter.
(6) Degrease cleaning not available for carbon steel flanges.
(7) Inert Fluid: safe for oxygen service.
(8) Not applicable for saline atmosphere.

MODEL	GAGE INLINE PRESSURE TRANSMITTER
400-0837-G	Sensor Module

COD.	TYPE	Range Limits Min	Max	Unit	Min	Max	Unit
2	Gage Inline	-50	50	KPa	-500	500	mbar
3	Gage Inline	-100	250	KPa	-1000	2500	mbar
4	Gage Inline	-100	2500	KPa	-1	25	bar
5	Gage Inline	-0.1	25	MPa	-1	250	bar

COD.	Diaphragm material and Fill Fluid		COD.		
1	316L SST	Silicon Oil **(3)**	Q	316 L SST	Inert (Halocarbon 4.2 Oil) **(2)**
2	316L SST	Inert (Fluorolube Oil) **(2) (4)**	R	Hastelloy C276	Inert (Halocarbon 4.2 Oil) **(1) (2)**
3	Hastelloy C276	Silicon Oil **(1) (3)**	D	316 L SST	Inert (Krytox Oil) **(2)**
4	Hastelloy C276	Inert (Fluorolube Oil) **(1) (2) (4)**	E	Hastelloy C276	Inert (Krytox Oil) **(1) (2)**

COD.	Performance Class
0	Default

COD.	Security Option
0	Default - For use in measurement and control

COD.	Communication Protocol
W	*Wireless*HART™

COD.	Process Connection
1	1/2- 14 NPT - Female
A	M20x1,5 - Male
G	DIN EN 837-1 G1/2B Male (5)
H	DIN EN 837-1 G1/2B HP Male (5)
M	1/2- 14 NPT Male
R	Remote Seal
U	½ BSP Male
V	Valve Manifold Integrated with Transmitter
X	1" NPT Sealed (Diaphragm in 316L SST, Silicon Fluid DC200/20)
Z	User's Specification

COD.	Process Connection Material
H	Hastelloy C276 **(1)**
I	316L SST
Z	User's Specification

400-0837-G	2	1	0	0	W	H	I

CONTINUE IN THE NEXT PAGE

Notes:

(1) Meets NACE MR – 01 – 75/ISO 15156 recommendations.
(2) Inert Fluid: Oxygen Compatibility, safe for oxygen service.
(3) Silicone Oil is not recommended for Oxygen or Chlorine service.
(4) Not applicable for vacuum service.
(5) The standard DIN16288 has been replaced by DIN EN 837-1.
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HART® Special Units

VARIABLE	CODE	UNIT	DESCRIPTION
Pressure	1	inH_2O (68ºF)	inches of water at 68 degrees F
	2	inHg (0ºC)	inches of mercury at 0 degrees C
	3	ftH_2O (68ºF)	feet of water at 68 degrees F
	4	mmH_2O (68ºF)	millimeters of water at 68 degrees F
	5	mmHg (0ºC)	millimeters of mercury at 0 degrees C
	6	lb/in^2	pounds per square inch
	7	bar	bars
	8	mbar	millibars
	9	gf/cm^2	Gram force per square centimeter
	10	kgf/cm^2	Kilogram force per square centimeter
	11	Pa	pascals
	12	kPa	kilopascals
	13	torr	torr
	14	atm	atmospheres
	145	inH^2O (60ºF)	inches of water at 60 degrees F
	237	MPa	megapascals
	238	inH^2O (4ºC)	inches of water at 4 degrees C
	239	mmH^2O (4ºC)	millimeters of water at 4 degrees C
VOLUMETRIC FLOW	15	CFM	cubic feet per minute
	16	GPM	gallons per minute
	17	l/min	liters per minute
	18	ImpGal/min	imperial gallons per minute
	19	m^3/h	cubic meters per hour
	22	gal/s	gallons per second
	23	Mgal/d	million gallons per day
	24	l/s	liters per second
	25	Ml/d	million liters per day
	26	ft^3/s	cubic feet per second
	27	ft^3/d	cubic feet per day
	28	m^3/s	cubic meters per second
	29	m^3/d	cubic meters per day
	30	ImpGal/h	imperial gallons per hour
	31	ImpGal/d	imperial gallons per day
	121	Nm^3/h	normal cubic meters per hour
	122	Nl/h	normal liters per hour
	123	ft^3/min	standard cubic feet per minute
	130	CFH	cubic feet per hour
	131	m^3/h	cubic meters per hour
	132	bbl/s	barrels per second
	133	bbl/min	barrels per minute
	134	bbl/h	barrels per hour
	135	bbl/d	barrels per day
	136	gal/h	gallons per hour
	137	ImpGal/s	imperial gallons per second
	138	l/h	liters per hour
	235	gal/d	gallons per day

VARIABLE	CODE	UNIT	DESCRIPTION
VELOCITY	20	ft/s	feet per second
	21	m/s	meters per second
	114	in/s	inches per second
	115	in/min	inches per minute
	116	ft/min	feet per minute
	120	m/h	meters per hour
TEMPERATURE	32	°C	degrees Celsius
	33	°F	degrees Fahrenheit
	34	°R	degrees Rankine
	35	K	degrees Kelvin
ELECTROMAGNETIC FORCE	36	mV	millivolts
	58	V	volts
ELECTRIC RESISTANCE	37	ohm	ohms
	163	kohm	kilo ohms
ELECTRIC CURRENT	39	mA	milliamperes
VOLUME	40	gal	gallons
	41	l	liters
	42	ImpGal	imperial gallons
	43	m^3	cubic meters
	46	bbl	barrels
	110	bushel	bushels
	111	yd^3	cubic yards
	112	ft^3	cubic feet
	113	in^3	cubic inches
	124	bbl(liq)	liquid barrels
	166	Nm^3	normal cubic meter
	167	Nl	normal liter
	168	SCF	standard cubic feet
	236	hl	hectoliters
LENGTH	44	ft	feet
	45	m	meters
	47	in	inches
	48	cm	centimeters
	49	mm	millimeters
	151	$ftin^{16}$	feet in sixteenths
TIME	50	min	minutes
	51	s	seconds
	52	h	hours
	53	d	days
MASS	60	g	grams
	61	kg	kilograms
	62	t	metric tons
	63	lb	pounds
	64	Shton	short tons (2000 pounds)
	65	Lton	long tons (2240 pounds)
	125	oz	ounce

VARIABLE	CODE	UNIT	DESCRIPTION
VISCOSITY	54	cSt	centistokes
	55	cP	centipoises
ENERGY (INCLUDES WORK)	69	N-m	newton meter
	89	decatherm	deka therm
	126	ft-lb	foot pound force
	128	KWH	kilo watt hour
	162	Mcal	mega calorie
	164	MJ	mega joule
	165	Btu	british thermal unit
MASS FLOW	70	g/s	grams per second
	71	g/min	grams per minute
	72	g/h	grams per hour
	73	kg/s	kilograms per second
	74	kg/min	kilograms per minute
	75	kg/h	kilograms per hour
	76	kg/d	kilograms per day
	77	t/min	metric tons per minute
	78	t/h	metric tons per hour
	79	t/d	metric tons per day
	80	lb/s	pounds per second
	81	lb/min	pounds per minute
	82	lb/h	pounds per hour
	83	lb/d	pounds per day
	84	Shton/min	short tons per minute
	85	Shton/h	short tons per hour
	86	Lton/d	short tons per day
	87	Lton/h	long tons per hour
	88	Lton/d	long tons per day
MASS PER VOLUME	90	SGU	specific gravity units
	91	g/cm³	grams per cubic centimeter
	92	kg/m³	kilograms per cubic meter
	93	lb/gal	pounds per gallon
	94	lb/ft³	pounds per cubic foot
	95	g/ml	grams per milliliter
	96	kg/l	kilograms per liter
	97	g/l	grams per liter
	98	lb/in³	pounds per cubic inch
	99	ton/yd³	short tons per cubic yard
	100	degTwad	degrees twaddell
	102	degBaum hv	degrees Baume heavy
	103	degBaum lt	degrees Baume light
	104	deg API	degrees API
	146	µg/l	micrograms per liter
	147	µg/m³	micrograms per cubic meter
	148	%Cs	percent consistency

VARIABLE	CODE	UNIT	DESCRIPTION
ANGULAR VELOCITY	117	°/s	degrees per second
	118	rev/s	revolutions per second
	119	RPM	revolutions per minute
POWER	127	kW	kilo watt
	129	hp	horsepower
	140	Mcal/h	mega calorie per hour
	141	MJ/h	mega joule per hour
	142	Btu/h	British thermal unit per hour
MISCELLANEOUS	38	Hz	hertz
	56	µS	micro siemens
	57	%	percent
	59	pH	pH
	66	mS/cm	milli siemens per centimeter
	67	µS/cm	micro siemens per centimeter
	68	N	Newton
	101	degbrix	degrees brix
	105	%sol/wt	percent solids per weight
	106	%sol/vol	percent solids per volume
	107	degBall	degrees balling
	108	proof/vol	proof per volume
	109	proof/mass	proof per mass
	139	ppm	parts per million
	143	°	degrees
	144	rad	radian
	149	%vol	volume percent
	150	%stm qual	percent steam quality
	152	ft³/lb	cubic feet per pound
	153	pF	picofarads
	154	ml/l	milliliters per liter
	155	µl/l	microliters per liter
	160	% plato	percent plato
	161	LEL	percent lower explosion level
	169	ppb	parts per billion
GENERIC	240 to 249	-	May be used for manufacturer specific definitions
	250	-	Not Used
	251	-	None
	252	-	Unknown
	253	-	Special

Appendix A

CERTIFICATIONS INFORMATION

Hazardous locations general information

Ex Standards:
IEC 60079-0 General Requirements
IEC 60079-1 Flameproof Enclosures “d”
IEC 60079-11 Intrinsic Safety “i”
IEC 60079-26 Equipment with Separation Elements or combined Levels of Protection
IEC 60079-31 Equipment dust ignition protection by enclosure "t"
IEC 60529 Classification of degrees of protection provided by enclosures (IP Code)
IEC 60079-10 Classification of Hazardous Areas
IEC 60079-14 Electrical installation design, selection and erection
IEC 60079-17 Electrical Installations, Inspections and Maintenance
IEC 60079-19 Equipment repair, overhaul and reclamation
ISO/IEC 80079-34 Application of quality systems for equipment manufacture

Warning:
Explosions could result in death or serious injury, besides financial damage.
Installation of this instrument in hazardous areas must be in accordance with the local standards and type of protection. Before proceedings with installation make sure that the certificate parameters are in accordance with the classified hazardous area.

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

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

Intrinsic Safety / Non Incendive application
In hazardous areas with intrinsic safety or non-incendive requirements, the circuit entity parameters and applicable installation procedures must be observed.
The instrument must be connected to a proper intrinsic safety barrier. Check the intrinsically safe parameters involving the barrier and equipment including the cable and connections. Associated apparatus ground bus shall be insulated from panels and mounting enclosures. Shield is optional, when using shielded cable, be sure to insulate the end not grounded.
Cable capacitance and inductance plus Ci and Li must be smaller than Co and Lo of the Associated Apparatus.
It is recommended do not remove the housing covers when powered on.

Explosionproof / Flameproof application
Only use Explosionproof/Flameproof certified Plugs, Adapters and Cable glands.
The electrical connections entries must be connected using a conduit with sealed unit or closed using metal cable gland or metal blanking plug with at least IP66.
Do not remove the housing covers when powered on.

Enclosure
The electronic housing and sensor threads installed in hazardous areas must have a minimum of 6 fully engaged threads.
The covers must be tightening with at least 8 turns, to avoid the penetration of humidity or corrosive gases, and until it touches the housing. Then, tighten more 1/3 turn (120º) to guarantee the sealing.
Lock the housing and covers using the locking screw.
The enclosure contains aluminum and is considered to present a potential risk of ignition by impact or friction.
Care must be taken during installation and use to prevent impact or friction.

Degree of Protection of enclosure (IP)
IPx8: Second numeral meaning continuous immersion in water under special condition defined as 10m for a period of 24 hours (Ref: IEC60529).
IPW/ TypeX: Supplementary letter W or X meaning special condition defined as saline environment tested in saturated solution of NaCl 5% w/w at 35ºC for a period of 200 hours (Ref: NEMA 250/ IEC60529).
For enclosure with IP/IPW/TypeX applications, all NPT threads must apply a proper water-proof sealant (a non-hardening silicone group sealant is recommended).

Battery Pack
Composed of 2 primary Lithium batteries (Li-SOCl2) of 3.6 V, nominal voltage 7.2 V and nominal capacity @3 mA, at 2V 8.5Ah. For specific battery composition details see Appendix B.
The Battery Pack used in the transmitters must be supplied exclusively by Smar (BATTERY PACK – Code 400-1209) and must be fully replaced when necessary.
The plastic battery housing can be considered a potential source of electrostatic ignition and should not be rubbed or cleaned with a dry cloth.
The SMAR battery pack may constitute a potential source of electrostatic ignition, it must be handled by a qualified person and only removed from the appropriate packaging at the time of installation.
The SMAR battery pack can be replaced in a hazardous area.
The module has a surface resistance greater than 1 GΩ and must be installed in wireless equipment by a qualified person. Care must be maintained even during transport to and from the installation area and should only be removed from the antistatic packaging at the time of installation.
Properly follow the Battery Pack Replacement Procedure instructions in this manual.

Antenna (Wireless)
The plastic antenna housing can be considered a potential source of electrostatic ignition and should not be rubbed or cleaned with a dry cloth.
The plastic antenna housing has a surface resistance greater than 1GΩ and care should be taken to touch it only with insulating equipment and take precautions to continuously drain electrostatic charge.

Hazardous Locations Approvals

IECEx – UL
Intrinsic Safety (ULBR 22.0001X)
Ex ia IIC T6...T4 Ga
Tamb: -20 ºC to +85 ºC T4
Tamb: -20 ºC to +60 ºC T5
Tamb: -20 ºC to +40 ºC T6

Specific Conditions of Use:
Potential electrostatic charging hazard see instructions.
During installation take actions to prevent the equipment from mechanical impact or friction.
Use only battery pack code smar 400-1209

The Essential Health and Safety Requirements are assured by compliance with:
IEC 60079-0:2017 General Requirements
IEC 60079-11:2011 Intrinsic Safety “i”
Drawings 102A2219, 102A2220

ATEX – UL
Intrinsic Safety (UL 22 ATEX 2670X)
Ex ia IIC T6...T4 Ga
Tamb: -20 ºC to +85 ºC T4
Tamb: -20 ºC to +60 ºC T5
Tamb: -20 ºC to +40 ºC T6

Specific Conditions of Use:
Potential electrostatic charging hazard see instructions.
During installation take actions to prevent the equipment from mechanical impact or friction.
Use only battery pack code smar 400-1209

The Essential Health and Safety Requirements are assured by compliance with:
EN IEC 60079-0:2018 General Requirements
EN 60079-11:2012 Intrinsic Safety “i”
Drawings 102A2221, 102A2222

INMETRO - UL
Segurança Intrínseca (UL-BR 22.1098X)
Ex ia IIC T6...T4 Ga
Tamb: -20 ºC a +85 ºC T4
Tamb: -20 ºC a +60 ºC T5
Tamb: -20 ºC a +40 ºC T6

Condição Especifica de uso:
Durante a instalação tomar medidas para evitar no equipamento impacto mecânico ou atrito.

Normas Aplicáveis:
ABNT NBR IEC 60079-0:2020 Atmosferas explosivas - Parte 0: Equipamentos – Requisitos gerais
ABNT NBR IEC 60079-11:2013 Atmosferas explosivas - Parte 11: Proteção de equipamento por segurança intrínseca "i"
Desenhos 102A2223, 102A2224

Identification Plate

IECEx

ATEX

INMETRO

BATTERY SAFETY DATASHEET

Section 1 – Identification

Manufacturer: Tadiran
Model: TL-5920
US office address: 2001 Marcus Avenue, Suite 125E, Lake Success, NY 11040
Emergency Telephone: 1-800-424-9300
Information Telephone: 1-516-621-4980

Section 2 – Composition

Ingredients	%
Lithium Metal (Li)	<5%
Thionyl Chloride (SOCl2)	<47%
Carbon (C)	<6%
Aluminum Chloride (AlCl3)	<5%
Lithium Chloride (LiCl)	<2%
Glass	<1%
PVC	<1%
PTFE	<1%
Steel, nickel and inherent components	balance

Section 3 – Hazard Identification

The batteries described herein are hermetically sealed and are not hazardous when used according to the manufacturer's recommendations.

Batteries should not be exposed to short-circuit, recharged, punched, burned, crushed, immersed in water, forced to discharge or placed in temperatures above the range specified for the product. In these cases there is a risk of fire and explosion.

Section 4 – First aid

In case of rupture, explosion or leakage, remove personnel from the contaminated area and ventilate it to release smoke, corrosive gases and odor. Seek medical help immediately.

Eyes - flush with plenty of water for at least 15 minutes (remove contact lenses if possible) and then seek medical attention.

Skin - Remove contaminated clothing and flush affected skin with plenty of water for 15 minutes and then seek medical attention.

Inhalation - look for an area with fresh air, rest, use artificial respiration, if necessary, and seek medical attention.

Ingestion - rinse your mouth, do NOT induce vomiting, drink lots of water, and then seek medical attention.

Section 5 – Fire fighting

If the batteries are directly involved in fire DO NOT USE: WATER, SAND, CO2 and DRY CHEMICAL POWDER EXTINGUISHERS.

If the batteries are in a location adjacent to the fire, it can be combated according to the combustible material (paper or plastic, for example). In this case, the use of large quantities of cold water would be an effective way to combat.

To firefighting use equipment and protective clothing that prevent contact with battery solution. The fire must be fought at a safe distance and after evacuation of the area.

Batteries may explode when exposed to: excessive heat (above 150 °C), recharged, discharged below 0V, punched and crushed. Hydrogen Chloride (HCl) and sulfur dioxide (SO_2) can be formed during thermal decomposition of Cl_2.

Section 6 – Leakage

The material contained in the batteries will leak only if exposed to abusive conditions.

On the occasion of leakage: contain the leakage if using protective clothing and ventilate the area well. Cover with Sodium Carbonate (Na_2CO_3) and keep away from water, rain or snow. Put in a secure container and pour into proper trash, according to local regulatory standards.

Section 7 – Handling and storage

Never attempt to disassemble or modify the batteries as this may result in accident.

HANDLING – do not short-circuit the terminals or expose to temperatures above the range specified for the battery, overload, force discharge or thrown in fire. Do not punch, crush or immerse in water.

STORAGE – preferably store in an environment below 30 °C, dry and ventilated subject to less variation in temperature.

Do not store the batteries near heating equipment, nor expose to direct sunlight for long periods. Elevated temperatures may result in shortened batteries life and degrade their performance.

Do not store batteries in high humidity environment for long periods.

The batteries should not be recharged. High pressures can cause deformities and release of chemicals from the battery.

Ecological Information: When properly used or discarded, the batteries pose no danger to the environment. The batteries do not contain mercury, cadmium or lead. Do not let internal components exposed to the marine environment.

Disposal: Absolutely not incinerate batteries. Dispose of batteries according to local regulations.

Transportation: Batteries are considered "Dangerous Goods" when transported in or out of equipment.

For additional information, see the manufacturer's website
http://www.tadiranbat.com/index.php/shipping-and-information

Appendix C

smar	**SRF – SERVICE REQUEST FORM** **Pressure Transmitters**	**Proposal No.: (1)**

Company:	**Unit:**	**Invoice:**

COMMERCIAL CONTACT	**CUSTUMER 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® ( ) HART® SIS ( ) WIRELESS HART™ ( ) ISP ( ) FOUNDATION fieldbus ( ) PROFIBUS PA**	**Firmware Version:**

PROCESS DATA

Process Fluid:

Calibration Range (4)		**Ambient Temperature (ºF)**		**Process Temperature (ºF)**	
Min.:	**Max.:**	**Min.:**	**Max.:**	**Min.:**	**Max.:**

Process Pressure (4)		**Static Pressure (4)**		**Vacuum (4)**		**Application (3)**
Min.:	**Max.:**	**Min.:**	**Max.:**	**Min.:**	**Max.:**	**( ) Transmitter ( ) Repeater**

Normal Operation Time:	**Failure Date:**

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

Did device detect the fail? (2) **( ) Yes ( ) No**	**What is the final value of the current? (2)** **_____ mA**	**What is the message in the display? (2)**

MAINTENANCE INFORMATION

Did you allow the upgrade in the firmware? **( ) Yes ( ) No**	**Certification plate: Will it maintained the certification?** **( ) Yes ( ) No**

Main board configuration:
( ) Original factory configuration ( ) Default configuration
( ) Special configuration (should be informed by the client. Please, use the space below)

OBSERVATIONS

SUBMITTER INFORMATION

Company:

Submitted by: 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 https://www.smar.com/en/contact-us

NOTE

(1) This field should be filled out by the Smar.
(2) Required for SIS devices.
(3) Required for Wireless HART® devices.
(4) Required to specify the pressure unit.