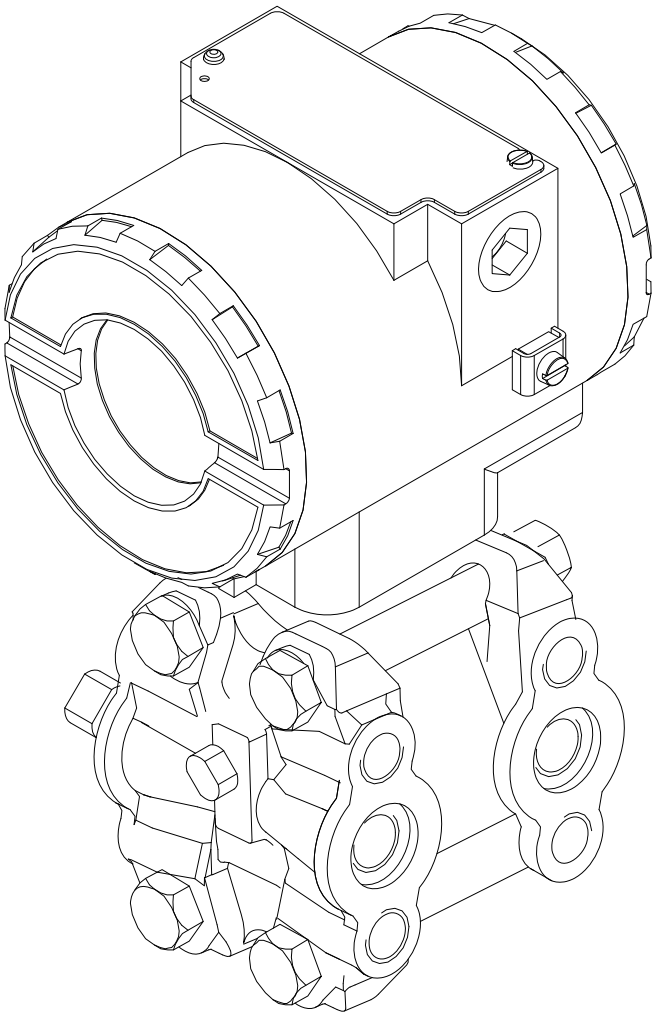
LD302 - smar FIRST IN FIELDBUS

OPERATION & MAINTENANCE
INSTRUCTIONS MANUAL

FIELDBUS PRESSURE TRANSMITTER



JAN / 12
LD302
VERSION 3

FOUNDATION™

LD302ME

smar

www.smar.com

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

web: www.smar.com/contactus.asp

INTRODUCTION

The **LD302** is part of first generation of Fieldbus devices. It is a transmitter for differential, absolute and gauge pressure, level and flow measurements. It is based on a field-proven capacitive sensor that provides reliable operation and high performance. The digital technology used in the **LD302** enables the choice of several types of transfer functions, and easy interface between the field and the control room. Also it has several interesting features that will considerably reduce the installation, operation and maintenance costs.
The **LD302** is part of Smar's complete 302 line of Fieldbus devices.

Fieldbus is not only a replacement for 4-20 mA or intelligent / smart transmitter protocols, it contains much more. Fieldbus is a complete system enabling distribution of the control function to equipment in the field.

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

These protocols are not intended to transfer control data, but maintenance information. Therefore they are slow and too inefficient to be used.

The main requirements for Fieldbus are to overcome these problems. Closed loop control with performance like a 4-20 mA system requires higher speed. Since higher speed means higher power consumption, this clashes with the need for intrinsic safety.
Therefore, a moderately high communication speed has been selected, and the system was designed to have a minimum of communication overhead. Using scheduling, the system controls variable sampling, algorithm execution, and communication so as to optimize the usage of the network, will not lose time. Thus, high closed loop performance is achieved.

Using Fieldbus technology, with its capability to interconnect several devices, very large control schemes can be constructed. In order to be user friendly, the function block concept was introduced (users of SMAR CD600 should be familiar with this, since it was implemented several years ago). The user may now easily build and overview complex control strategies. Another advantage was added: flexibility. The control strategy may be edited without having to rewire or change any hardware.

The **LD302**, like the rest of the 302 family, has several built-in Function Blocks, such as the PID controller, Input Selector and Splitter/Output Selector, therefore eliminating the need for a separate control device. This feature reduces communication, so there is less dead-time and tighter control, not to mention the reduction in cost.

Other function blocks are also available. They allow flexibility in control strategy implementation.

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

The **LD302** is available as a product of its own, but also replaces the circuit board for the LD301. They both use the same sensor board. Refer to the maintenance section of this manual for instructions on upgrading. The **LD302** is part of SMAR's **Series 302** of Fieldbus devices.

The **LD302**, like its predecessor LD301, has many built-in blocks, eliminating the need for a separate control device. The communication requirement is considerably reduced, and that means less dead-time and tighter control is achieved, not to mention the reduction in cost. They allow flexibility in control strategy implementation.

Get the best results of the LD302 by carefully reading these instructions.

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.

TABLE OF CONTENTS

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 performance.

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

The **LD302** has a built-in temperature sensor to compensate for temperature variations. At the factory, each transmitter is submitted to a temperature cycle process, and the characteristics under different pressures and temperatures are recorded in the transmitter memory. In the field, this feature minimizes the temperature variation effect.

Placing the transmitter in areas protected from extreme environmental changes can minimize temperature oscillation effects.

The transmitter should be installed a way as to avoid, as much as possible, direct exposure to the sun or any source of irradiated heat. Installation close to lines and vessels should also be avoided. Use longer sections of impulse piping between tap and transmitter whenever there is a high temperature process. The use of sunshades or heat shields to protect the transmitter from external heat sources should be considered.

Humidity is fatal for electronic circuits. In humidity exposed areas, the O-rings for the electronic housing covers must be correctly placed and the covers must be completely closed by tightening them by hand until the O-rings are compressed.

Do not use tools to close the covers. Removal of the electronics cover in the field should be reduced to the minimum necessary, as each time it is removed; the circuits are exposed to the humidity. The electronic circuit is protected by a humidity proof coating, but frequent exposure to humidity may affect the protection provided. It is also important to keep the covers tightened in place. Every time they are removed, the threads are exposed to corrosion, since painting cannot protect these parts. Code-approved sealing methods should be employed on the inlet conduit the transmitter. The unused outlet connection should be plugged accordingly.

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

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

Mounting

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

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

Existing standards for the manifolds have also been considered, and standard designs fit perfectly to the transmitter flanges.

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

The pipes should be internally cleaned by using steam or compressed air, or by draining the line with the process fluid, before such lines are connected to the transmitter (blow-down). Do not allow steam in the measuring chamber.

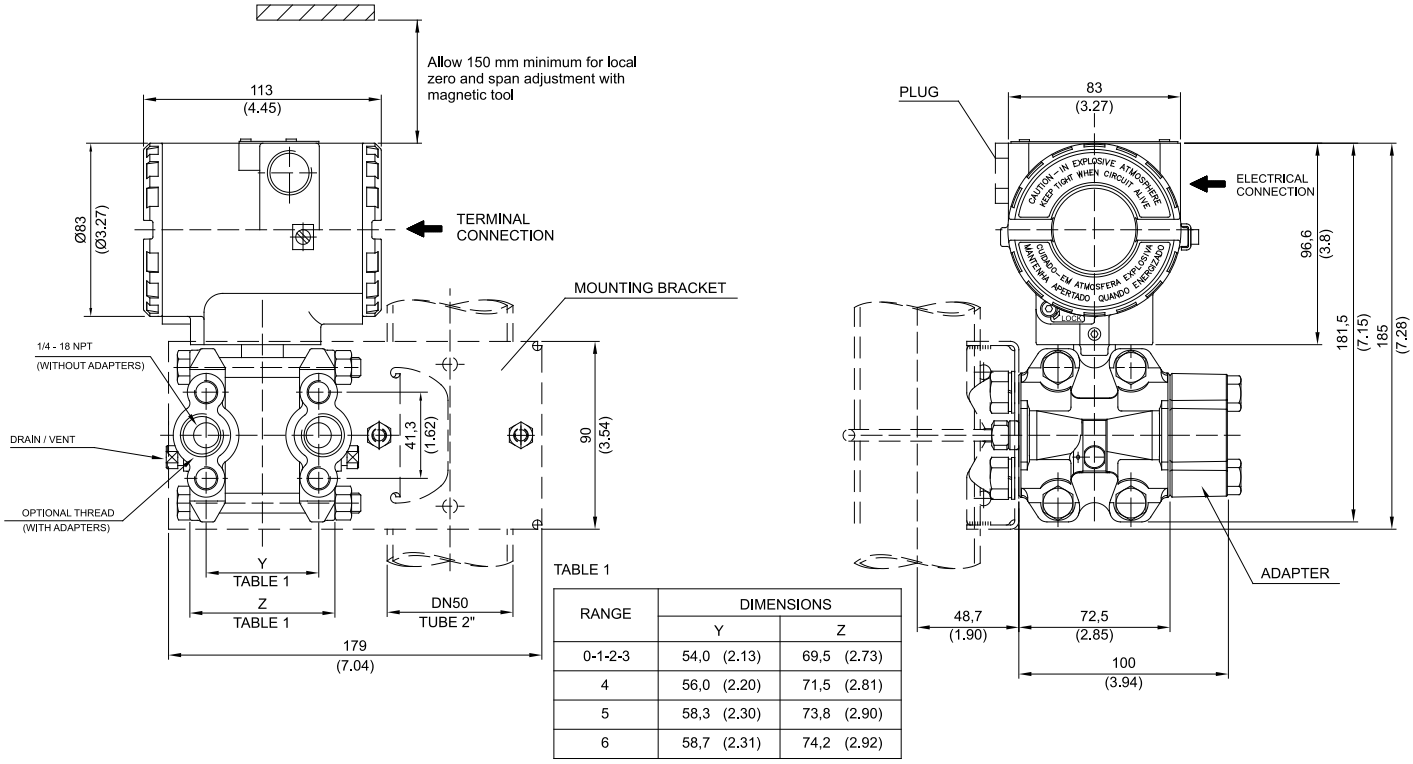
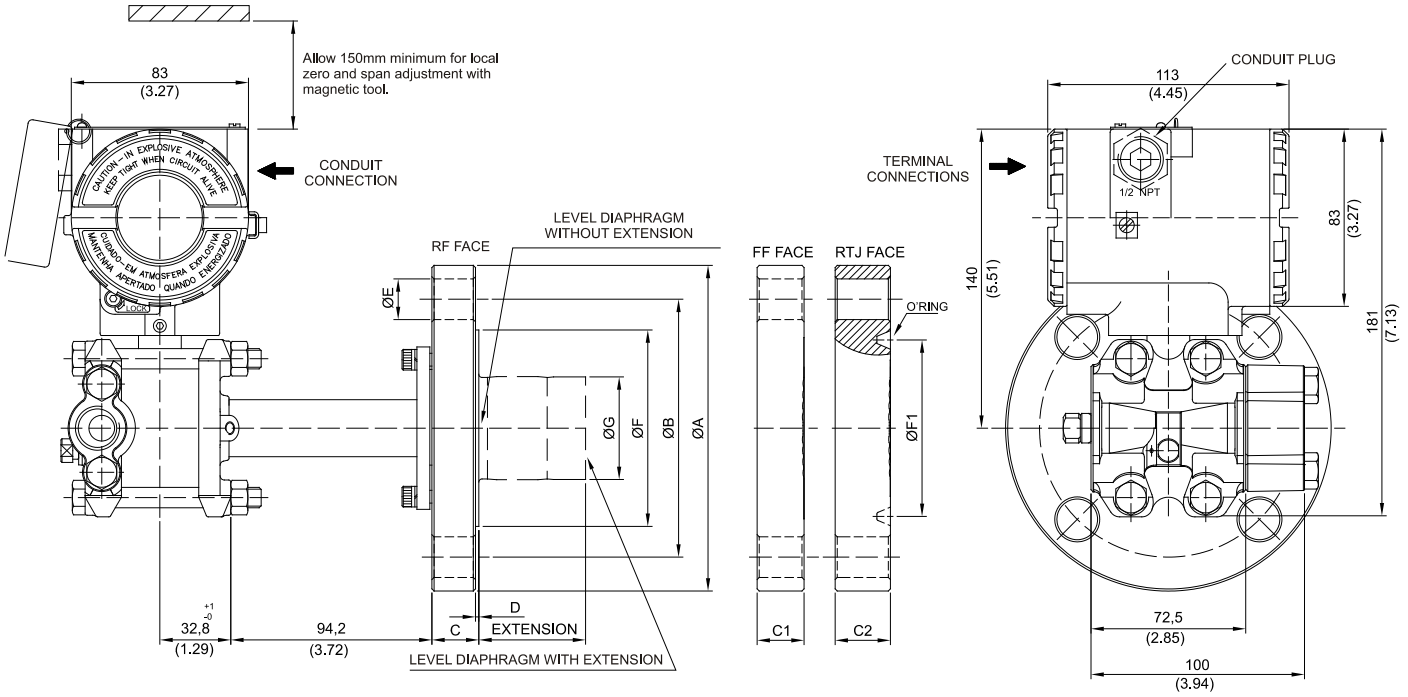


TABLE 1

RANGE	DIMENSIONS	
	Y	Z
0-1-2-3	54,0 (2.13)	69,5 (2.73)
4	56,0 (2.20)	71,5 (2.81)
5	58,3 (2.30)	73,8 (2.90)
6	58,7 (2.31)	74,2 (2.92)

Figure 1.1 (a) – Dimensional Drawing and Mounting Position - Differential, Flow, Gage, Absolute and High Static Pressure Transmitters with Mounting Bracket



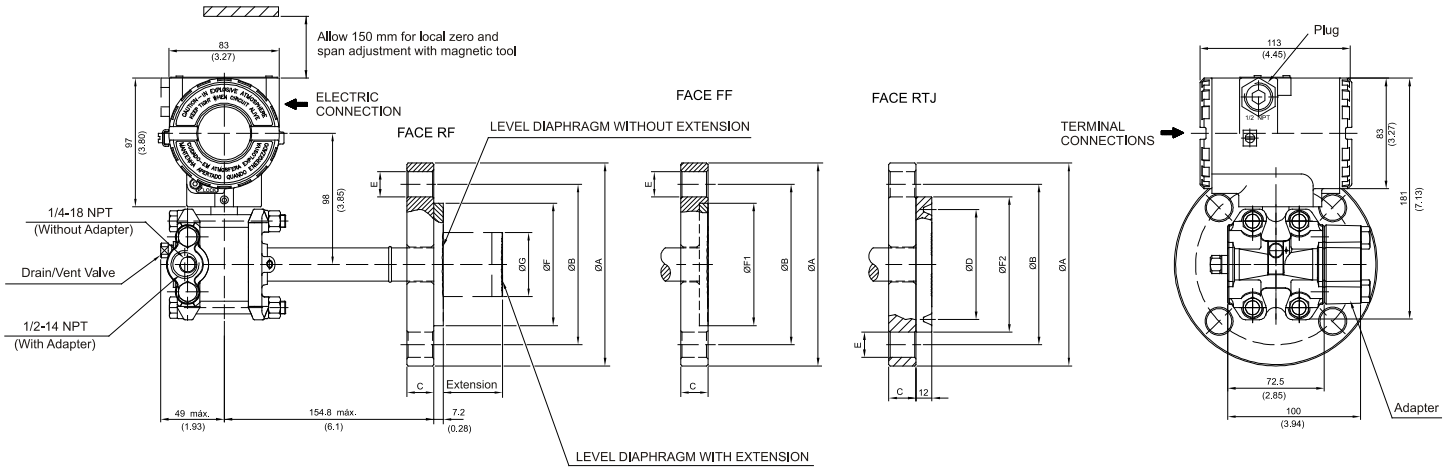
Notes:
- Extension lenght (mm): 0, 50, 100, 150 or 200
- Dimensions are mm (in)

ANSI-B 16.5 DIMENSIONS														
DN	CLASS	A	B	C (RF)	C1 (FF)	C2 (RTJ)	D (RF)	E	F (RF)	F1 (RTJ)	RTJ O`RING	G	HOLES	
1.1/2"	150	127 (5)	98.6 (3.88)	20 (0.78)	19 (0.75)	24.4 (0.96)	1.6 (0.06)	16 (0.63)	73.2 (2.88)	65.1 (2.56)	R19	40 (1.57)	4	
	300	155.4 (6.12)	114.3 (4.5)	21 (0.83)	21 (0.83)	27.4 (1.07)	1.6 (0.06)	22 (0.87)	73.2 (2.88)	68.3 (2.68)	R20	40 (1.57)	4	
	600	155.4 (6.12)	114.3 (4.5)	29.3 (1.15)	29.3 (1.15)	29.3 (1.15)	6.4 (0.25)	22 (0.87)	73.2 (2.88)	68.3 (2.68)	R20	40 (1.57)	4	
2"	150	152.4 (6)	120.7 (4.75)	22 (0.87)	20 (0.78)	25.9 (1.02)	1.6 (0.06)	19 (0.75)	91.9 (3.62)	82.6 (3.25)	R22	48 (1.89)	4	
	300	165.1 (6.5)	127 (5)	22.8 (0.9)	22.8 (0.89)	30.8 (1.21)	1.6 (0.06)	19 (0.75)	91.9 (3.62)	82.6 (3.25)	R23	48 (1.89)	8	
	600	165.1 (6.5)	127 (5)	32.3 (1.27)	32.3 (1.27)	32.3 (1.27)	6.4 (0.25)	19 (0.75)	91.9 (3.62)	82.6 (3.25)	R23	48 (1.89)	8	
3"	150	190.5 (7.5)	152.4 (6)	24.4 (0.96)	24.4 (0.96)	30.7 (1.21)	1.6 (0.06)	19 (0.75)	127 (5)	114.3 (4.50)	R29	73 (2.87)	4	
	300	209.5 (8.25)	168.1 (6.62)	29 (1.14)	29 (1.14)	36.9 (1.45)	1.6 (0.06)	22 (0.87)	127 (5)	123.8 (4.87)	R31	73 (2.87)	8	
	600	209.5 (8.25)	168.1 (6.62)	38.7 (1.52)	38.7 (1.52)	40.2 (1.58)	6.4 (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)	24.4 (0.96)	24.4 (0.96)	30.7 (1.21)	1.6 (0.06)	19 (0.75)	158 (6.22)	149.2 (5.87)	R36	96 (3.78)	8	
	300	254 (10)	200 (7.87)	32.2 (1.27)	32.2 (1.27)	40.2 (1.58)	1.6 (0.06)	22 (0.87)	158 (6.22)	149.2 (5.87)	R37	96 (3.78)	8	
	600	273 (10.75)	215.9 (8.5)	45 (1.77)	45 (1.77)	46.5 (1.83)	6.4 (0.25)	25 (1)	158 (6.22)	149.2 (5.87)	R37	96 (3.78)	8	

EN 1092-1 DIMENSIONS												
DN	PN	A	B	C (RF)	C1 (FF)		D	E	F (RF)		G	HOLES
DN40	10/40	150 (5.9)	110 (4.33)	20 (0.78)	20 (0.78)		3 (0.12)	18 (0.71)	88 (3.46)		40 (1.57)	4
DN50	10/40	165 (6.5)	125 (4.92)	20 (0.78)	22 (0.86)		3 (0.12)	18 (0.71)	102 (4.01)		48 (1.89)	4
DN80	10/40	200 (7.87)	160 (6.3)	24 (0.95)	24 (0.94)		3 (0.12)	18 (0.71)	138 (5.43)		73 (2.87)	8
DN100	10/16	220 (8.67)	180 (7.08)	20 (0.78)			3 (0.12)	18 (0.71)	158 (6.22)		96 (3.78)	8
	25/40	235 (9.25)	190 (7.5)	24 (0.95)			3 (0.12)	22 (0.87)	162 (6.38)		96 (3.78)	8

JIS B 2202 DIMENSIONS												
DN	CLASS	A	B	C		D	E	F (RF)		G	HOLES	
40A	20K	140 (5.5)	105 (4.13)	26 (1.02)		2 (0.08)	19 (0.75)	81 (3.2)		40 (1.57)	4	
50A	10K	155 (6.1)	120 (4.72)	26 (1.02)		2 (0.08)	19 (0.75)	96 (3.78)		48 (1.89)	4	
	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)	26 (1.02)		2 (0.08)	19 (0.75)	126 (4.96)		73 (2.87)	8	
	20K	200 (7.87)	160 (6.3)	26 (1.02)		2 (0.08)	19 (0.75)	132 (5.2)		73 (2.87)	8	
100A	10K	210 (8.27)	175 (6.89)	26 (1.02)		2 (0.08)	19 (0.75)	151 (5.95)		96 (3.78)	8	

Figure 1.1 (b) – Dimensional Drawing and Mounting Position - Flanged Pressure Transmitter with Integral Flange

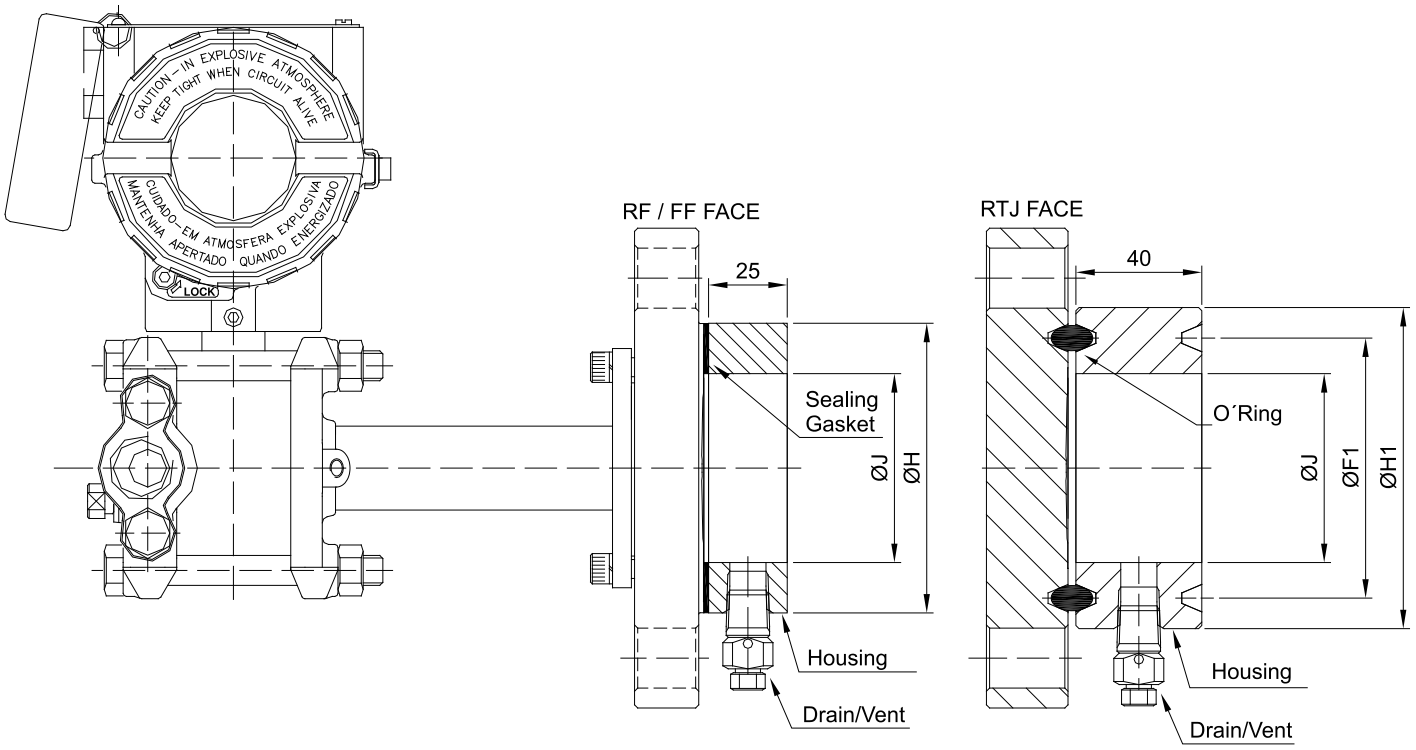


ANSI-B 16.5 DIMENSIONS																					
DN	CLASS	A		B		C		D		E		F (RF)		F1 (FF)		F2 (RTJ)		G		HOLES	
1"	150	108	(4.25)	79.4	(3.16)	14.3	(0.56)	-		16	(0.63)	50.8	(2)	50.8	(2)	-		-		4	
	300/600	124	(4.88)	88.9	(3.5)	17.5	(0.69)	-		19	(0.75)	50.8	(2)	50.8	(2)	-		-		4	
1 1/2"	150	127	(5)	98.4	(3.87)	17.5	(0.69)	-		16	(0.63)	73	(2.87)	73	(2.87)	-		40	(1.57)	4	
	300/600	156	(6.14)	114.3	(4.5)	22.2	(0.87)	-		22	(0.87)	73	(2.87)	73	(2.87)	-		40	(1.57)	4	
2"	150	152.4	(6)	120.7	(4.75)	17.5	(0.69)	82.6	(3.25)	19	(0.75)	92	(3.62)	92	(3.62)	101.6	(4.00)	48	(1.89)	4	
	300	165.1	(6.5)	127	(5)	20.7	(0.8)	82.6	(3.25)	19	(0.75)	92	(3.62)	92	(3.62)	107.9	(4.25)	48	(1.89)	8	
	600	165.1	(6.5)	127	(5)	25.4	(1)	82.6	(3,25)	19	(0.75)	92	(3.62)	92	(3.62)	107.9	(4.25)	48	(1.89)	8	
3"	150	190.5	(7.5)	152.4	(6)	22.3	(0.87)	114.3	(4.50)	19	(0.75)	127	(5)	127	(5)	133.4	(5.25)	73	(2.87)	4	
	300	209.5	(8.25)	168.1	(6.62)	27	(1.06)	123.8	(4.87)	22	(0.87)	127	(5)	127	(5)	146.1	(5.75)	73	(2.87)	8	
	600	209.5	(8.25)	168.1	(6.62)	31.8	(1.25)	123.8	(4.87)	22	(0.87)	127	(5)	127	(5)	146.1	(5.75)	73	(2.87)	8	
4"	150	228.6	(9)	190.5	(7.5)	22.3	(0.87)	149.2	(5.87)	19	(0.75)	158	(6.22)	158	(6.22)	171.5	(6.75)	89	(3.5)	8	
	300	254	(10)	200	(7.87)	30.2	(1.18)	149.2	(5.87)	22	(0.87)	158	(6.22)	158	(6.22)	174.6	(6.87)	89	(3.5)	8	
	600	273	(10.75)	215.9	(8.5)	38.1	(1.5)	149.2	(5.87)	25	(1)	158	(6.22)	158	(6.22)	174.6	(6.87)	89	(3.5)	8	

EN 1092-1 / DIN2501 DIMENSIONS - RF/ FF																
DN	PN	A		B		C		E		F		G		HOLES		
25	10/40	115	(4.53)	85	(3.35)	18	(0.71)	14	(0.55)	68	(2.68)	-		4		
40	10/40	150	(5.91)	110	(4.33)	18	(0.71)	18	(0.71)	88	(3.46)	73	(2.87)	4		
50	10/40	165	(6.50)	125	(4.92)	20	(0.78)	18	(0.71)	102	(4.01)	48	(1.89)	4		
80	10/40	200	(7.87)	160	(6.30)	24	(0.95)	18	(0.71)	138	(5.43)	73	(2.87)	8		
100	10/16	220	(8.67)	180	(7.08)	20	(0.78)	18	(0.71)	158	(6.22)	89	(3.5)	8		
	25/40	235	(9.25)	190	(7.50)	24	(0.95)	22	(0.87)	162	(6.38)	89	(3.5)	8		

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

Figure 1.1 (c) – Dimensional Drawing and Mounting Position - Flanged Pressure Transmitter with Slip-on Flange



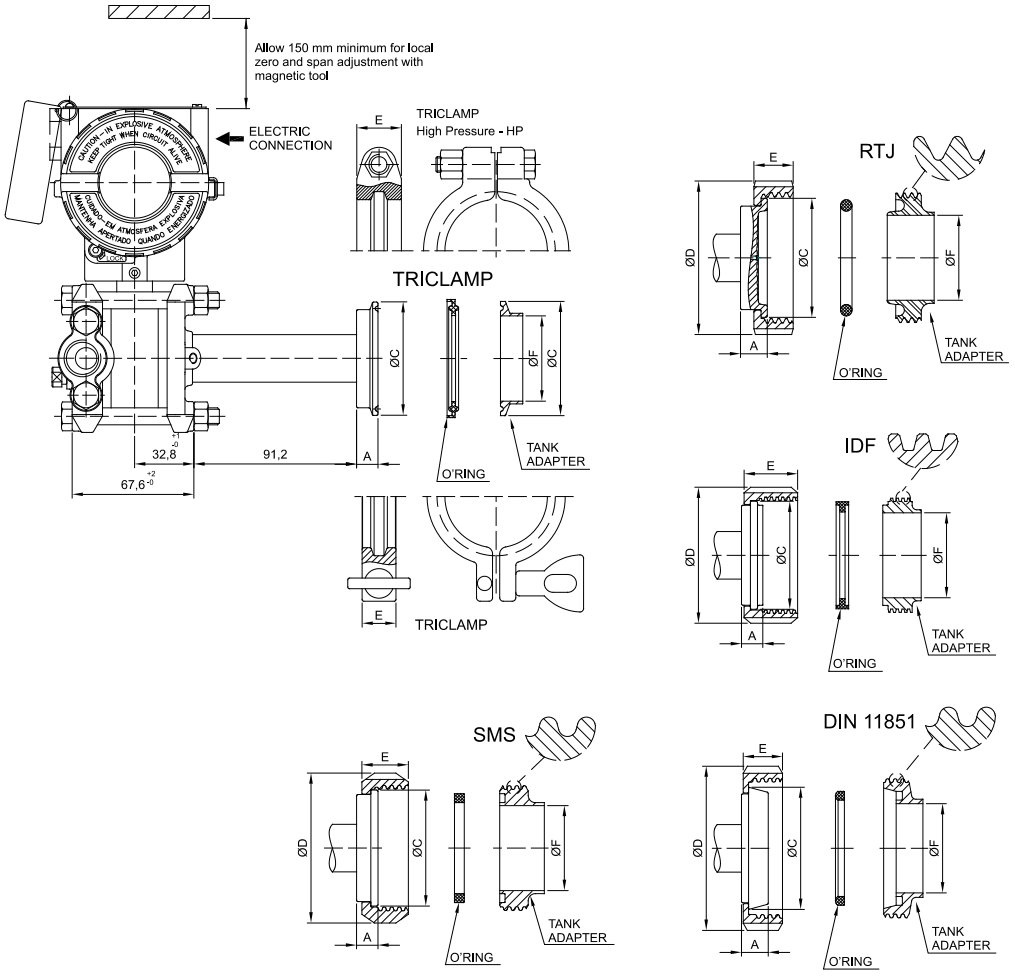
DIMENSIONS IN mm (")

ANSI-B 16.5 DIMENSIONS			
DN	CLASS	H	J
1.1/2"	ALL	73,2 (2,88)	48 (1,89)
2"		91,9 (3,62)	60 (2,36)
3"		127 (5,00)	89 (3,50)
4"		158 (6,22)	115 (4,53)
DIN EN1092-1/ DIN2501/2526 FORM D DIMENSIONS			
DN	PN	H	J
40	ALL	88 (3,46)	48 (1,89)
50		102 (4,02)	60 (2,36)
80		138 (5,43)	89 (3,50)
100		158 (6,22)	115 (4,53)
JIS B 2202 DIMENSIONS			
DN	CLASS	H	J
40A	20K	81 (3,19)	48 (1,89)
50A	10K	96 (3,78)	60 (1,36)
	40K	105 (4,13)	60 (1,36)
80A	10K	126 (4,96)	89 (3,50)
	20K	132 (5,20)	89 (3,50)
100A	10K	151 (5,94)	115 (4,53)

DIMENSIONS IN mm (")

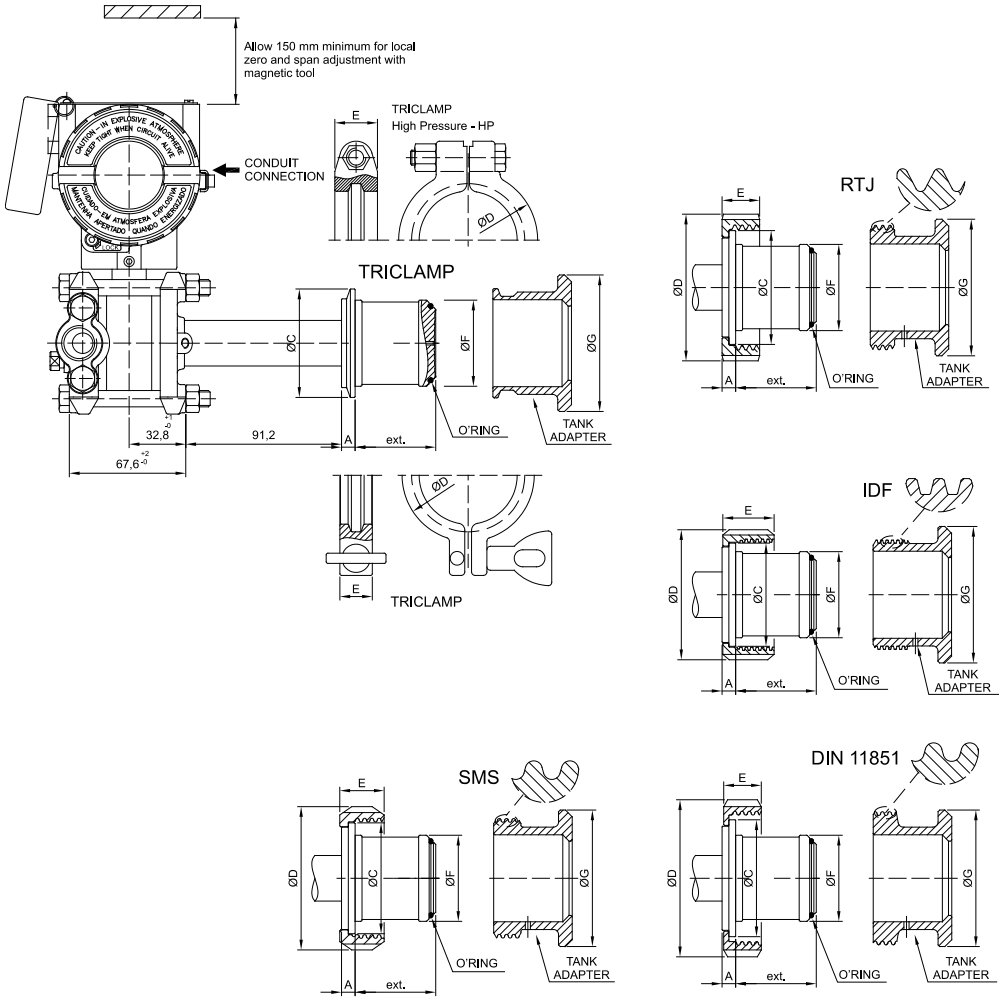
ANSI-B 16.5 DIMENSIONS - RTJ FACE					
DN	CLASS	F1	O`RING	H1	J
1.1/2"	150	65,1 (2,56)	R19	82,5 (3,25)	48 (1,89)
	300	68,3 (2,69)	R20	90,5 (3,56)	48 (1,89)
	600	68,3 (2,69)	R20	90,5 (3,56)	48 (1,89)
	1500	68,3 (2,69)	R20	92 (3,62)	48 (1,89)
	2500	82,6 (3,25)	R23	114 (4,50)	48 (1,89)
2"	150	82,6 (3,25)	R22	102 (4,00)	60 (2,36)
	300	82,6 (3,25)	R23	108 (4,25)	60 (2,36)
	600	82,6 (3,25)	R23	108 (4,25)	60 (2,36)
	1500	95,3 (3,75)	R24	124 (4,88)	60 (2,36)
	2500	101,6 (4,00)	R26	133 (5,25)	60 (2,36)
3"	150	114,3 (4,50)	R29	133 (5,25)	89 (3,50)
	300	123,8 (4,87)	R31	146 (5,75)	89 (3,50)
	600	123,8 (4,87)	R31	146 (5,75)	89 (3,50)
4"	150	149,2 (5,87)	R36	171 (6,75)	115 (4,53)
	300	149,2 (5,87)	R37	175 (6,88)	115 (4,53)
	600	149,2 (5,87)	R37	175 (6,88)	115 (4,53)

Figure 1.1 (d) – Dimensional Drawing and Mounting Position - Flanged Pressure Transmitter with Housing



LD300S							
CONNECTION WITHOUT EXTENSION	Dimensions in mm (")						
	A	ØC	ØD	E	ØF	ØG	EXT.
Tri-Clamp DN50	8 (0.315)	63.5 (2.5)	76.5 (3.01)	18 (0.71)	47.5 (1.87)	---	---
Tri-Clamp - 1 1/2"	12 (0.47)	50 (1.96)	61 (2.4)	18 (0.71)	35 (1.38)	---	---
Tri-Clamp - 1 1/2" HP	12 (0.47)	50 (1.96)	66 (2.59)	25 (0.98)	35 (1.38)	---	---
Tri-Clamp - 2"	12 (0.47)	63.5 (2.5)	76.5 (3.01)	18 (0.71)	47.6 (1.87)	---	---
Tri-Clamp - 2" HP	12 (0.47)	63.5 (2.5)	81 (3.19)	25 (0.98)	47.6 (1.87)	---	---
Tri-Clamp - 3"	12 (0.47)	91 (3.58)	110 (4.33)	18 (0.71)	72 (2.83)	---	---
Tri-Clamp - 3" HP	12 (0.47)	91 (3.58)	115 (4.53)	25 (0.98)	72 (2.83)	---	---
Threaded DN40 - DIN 11851	13 (0.51)	56 (2.2)	78 (3.07)	21 (0.83)	38 (1.5)	---	---
Threaded DN50 - DIN 11851	15 (0.59)	68.5 (2.7)	92 (3.62)	22 (0.86)	50 (1.96)	---	---
Threaded DN80 - DIN 11851	16 (0.63)	100 (3.94)	127 (5)	29 (1.14)	81 (3.19)	---	---
Threaded SMS - 1 1/2"	12 (0.47)	55 (2.16)	74 (2.91)	25 (0.98)	35 (1.38)	---	---
Threaded SMS - 2"	12 (0.47)	65 (2.56)	84 (3.3)	26 (1.02)	48.6 (1.91)	---	---
Threaded SMS - 3"	12 (0.47)	93 (3.66)	113 (4.45)	32 (1.26)	73 (2.87)	---	---
Threaded RJT - 2"	15 (0.59)	66.7 (2.63)	86 (3.38)	22 (0.86)	47.6 (1.87)	---	---
Threaded RJT - 3"	15 (0.59)	92 (3.62)	112 (4.41)	22.2 (0.87)	73 (2.87)	---	---
Threaded IDF - 2"	12 (0.47)	60.5 (2.38)	76 (2.99)	30 (1.18)	47.6 (1.87)	---	---
Threaded IDF - 3"	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 - Sanitary Transmitter without Extension



LD300S							
CONNECTION WITH EXTENSION	Dimensions in mm (")						
	A	ØC	ØD	E	ØF	ØG	EXT.
Tri-Clamp DN50	8 (0.315)	63.5 (2.5)	76.5 (3.01)	18 (0.71)	50.5 (1.99)	80 (3.15)	48 (1.89)
Tri-Clamp DN50 HP	8 (0.315)	63.5 (2.5)	81 (3.19)	25 (0.98)	50.5 (1.99)	80 (3.15)	48 (1.89)
Tri-Clamp - 2"	8 (0.315)	63.5 (2.5)	76.5 (3.01)	18 (0.71)	50.5 (1.99)	80 (3.15)	48 (1.89)
Tri-Clamp - 2" HP	8 (0.315)	63.5 (2.5)	81 (3.19)	25 (0.98)	50.5 (1.99)	80 (3.15)	48 (1.89)
Tri-Clamp - 3"	8 (0.315)	91 (3.58)	110 (4.33)	18 (0.71)	72.5 (2.85)	100 (3.94)	50 (1.96)
Tri-Clamp - 3" HP	8 (0.315)	91 (3.58)	115 (4.53)	25 (0.98)	72.5 (2.85)	100 (3.94)	50 (1.96)
Threaded DN25 - DIN 11851	6 (0.24)	47.5 (1.87)	63 (2.48)	21 (0.83)	43.2 (1.7)	80 (3.15)	26.3 (1.03)
Threaded DN40 - DIN 11851	8 (0.315)	56 (2.2)	78 (3.07)	21 (0.83)	50.5 (1.99)	80 (3.15)	48 (1.89)
Threaded DN50 - DIN 11851	8 (0.315)	68.5 (2.7)	92 (3.62)	22 (0.86)	50.5 (1.99)	80 (3.15)	48 (1.89)
Threaded DN80 - DIN 11851	8 (0.315)	100 (3.94)	127 (5)	29 (1.14)	72.5 (2.85)	100 (3.94)	50 (1.96)
Threaded SMS - 2"	8 (0.315)	65 (2.56)	84 (3.3)	26 (1.02)	50.5 (1.99)	80 (3.15)	48 (1.89)
Threaded SMS - 3"	8 (0.315)	93 (3.66)	113 (4.45)	32 (1.26)	72.5 (2.85)	100 (3.94)	50 (1.96)
Threaded RJT - 2"	8 (0.315)	66.7 (2.63)	86 (3.38)	22 (0.86)	50.5 (1.99)	80 (3.15)	48 (1.89)
Threaded RJT - 3"	8 (0.315)	92 (3.62)	112 (4.41)	22.2 (0.87)	72.5 (2.85)	100 (3.94)	50 (1.96)
Threaded IDF - 2"	8 (0.315)	60.5 (2.38)	76.2 (3)	30 (1.18)	50.5 (1.99)	80 (3.15)	48 (1.89)
Threaded IDF - 3"	8 (0.315)	87.5 (3.44)	101.6 (4)	30 (1.18)	72.5 (2.85)	100 (3.94)	50 (1.96)

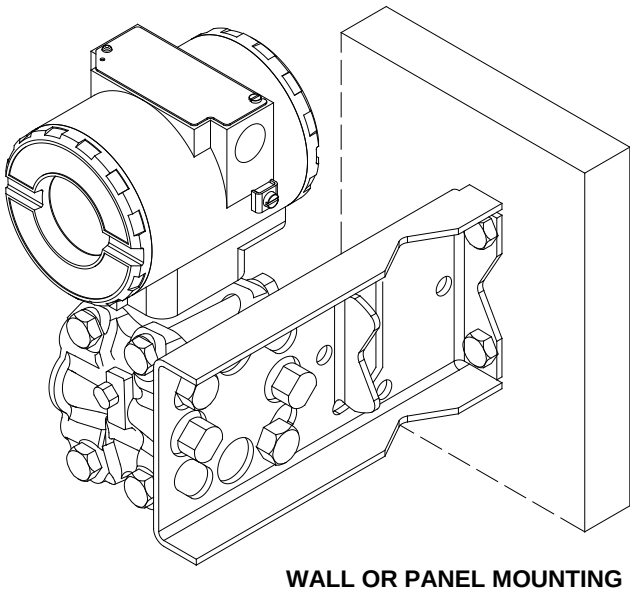
Figure 1.1 (f) – Dimensional Drawing and Mounting Position - Sanitary Transmitter with Extension

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

Some examples of installation, illustrating the position of the transmitter according to the taps, are shown in Figure 1.3 - Position of the Transmitter and Taps. The location of pressure taps and the relative position of the transmitter are indicated in Table 1.1 - Location of Pressure Taps.

Process Fluid	Location of Taps	Best Location for the LD302 in Relation to the Taps
Gas	Top or Side	Above the Taps
Liquid	Side	Below the Taps or at the Piping Centerline
Steam	Side	Below the Taps using Sealing (Condensate) Pots

Table 1.1 - Location of Pressure Taps



WALL OR PANEL MOUNTING
(See section 5 – spare parts list
for mounting brackets available)

Figure 1.2 - Dimensional Drawing and Mounting Position for LD302

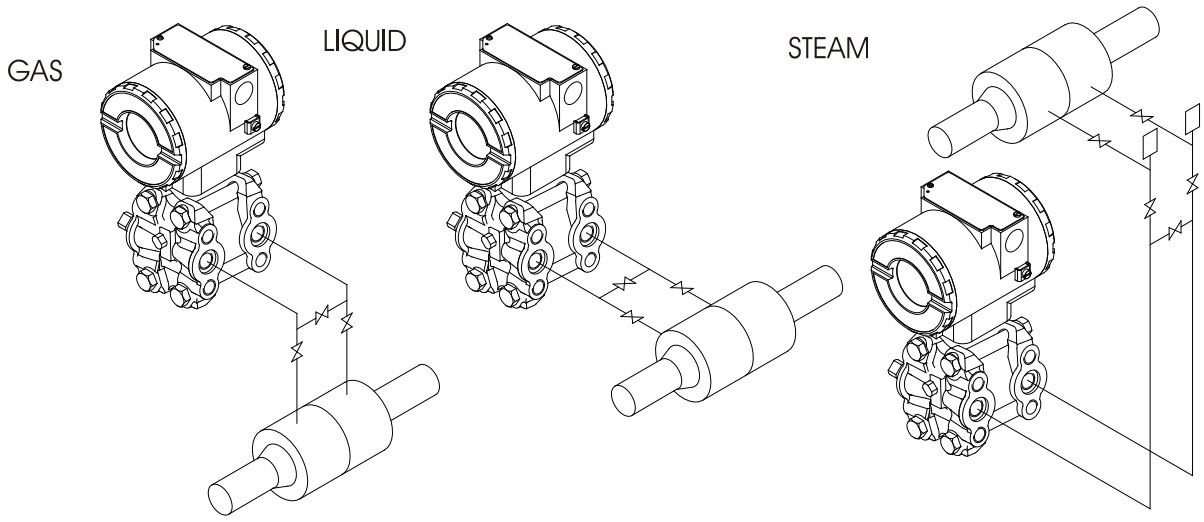


Figure 1.3 - Position of the Transmitter and Taps

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

Housing Rotation

The housing can be rotated in order to get the digital display in better position. To rotate it, releases the Housing Rotation Set Screw see Figure 1.4. The digital display itself can also be rotated. See Figure 4.3

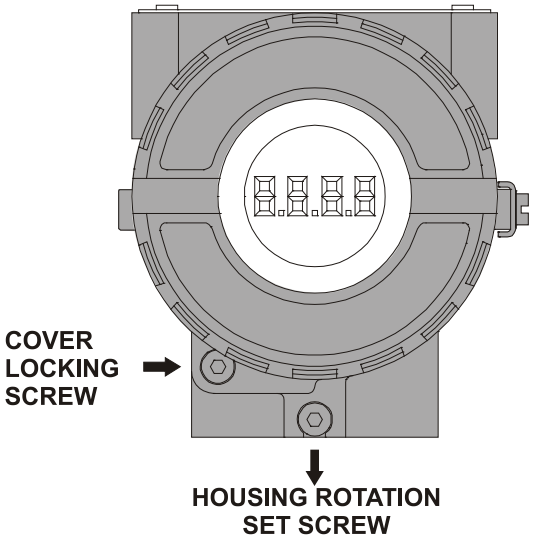


Figure 1.4 - Housing Rotation Set Screw

Reach the wiring block by removing the Electrical Connection Cover. This cover can be locked closed by the cover locking screw. See Figure 1.5. To release the cover, rotate the locking screw clockwise.

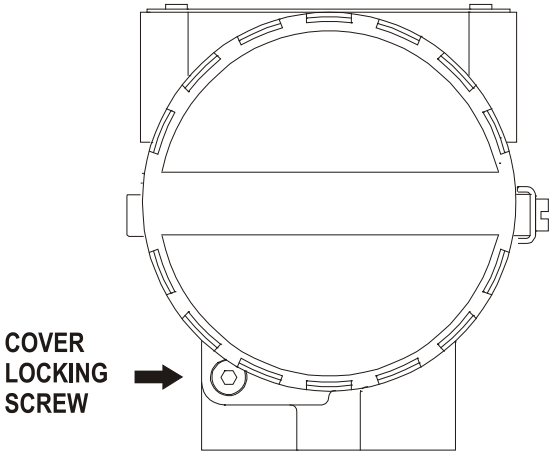


Figure 1.5 - Housing Rotation Set Screw

The wiring block has screws on which fork or ring-type terminals can be fastened. Also, for convenience there are three ground terminals: one inside the cover and two externals, located close to the conduit entries. See Figure 1.6.

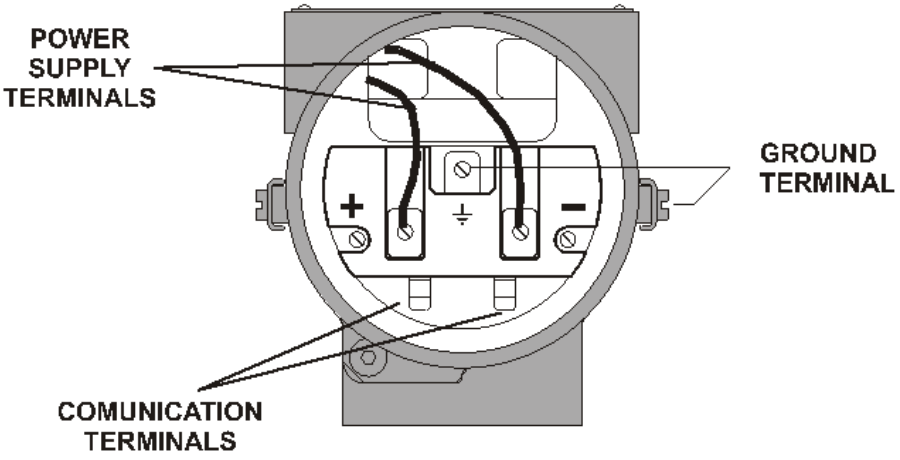


Figure 1.6 - Terminal Block

NOTE
Please refer to the General Installation, Operation and Maintenance Manual for more details.

The Figure 1.7 shows the correct installation of the conduit, in order to avoid penetration of water, or other substance, which may cause malfunctioning of the equipment.

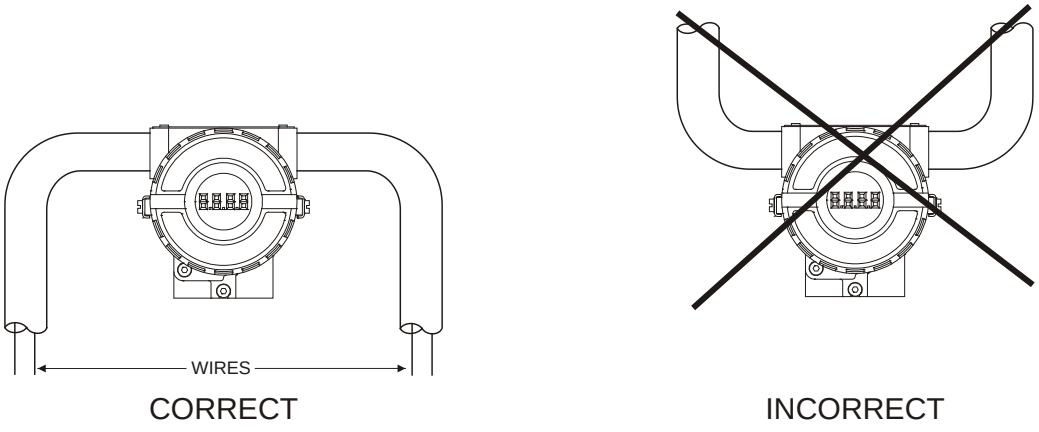


Figure 1.7 - Conduit Installation Diagram

NOTE
The transmitters are calibrated in the vertical position and a different mounting position displaces the zero point. In these conditions, it is recommended to do the zero pressure trim. The zero trim is to compensate the final assembly position and its performance, when the transmitter is in its final position. When the zero trim is executed, make sure the equalization valve is open and the wet leg levels are correct. For the absolute pressure transmitter, the assembly effects correction should be done using the Lower trim, due to the fact that the absolute zero, is the reference for these transmitters, so there is no need for a zero value for the Lower trim.

When the sensor is in the horizontal position, the weight of the fluid pushes the diaphragm down, making it necessary a Lower Pressure. Trim see figure 1.8.

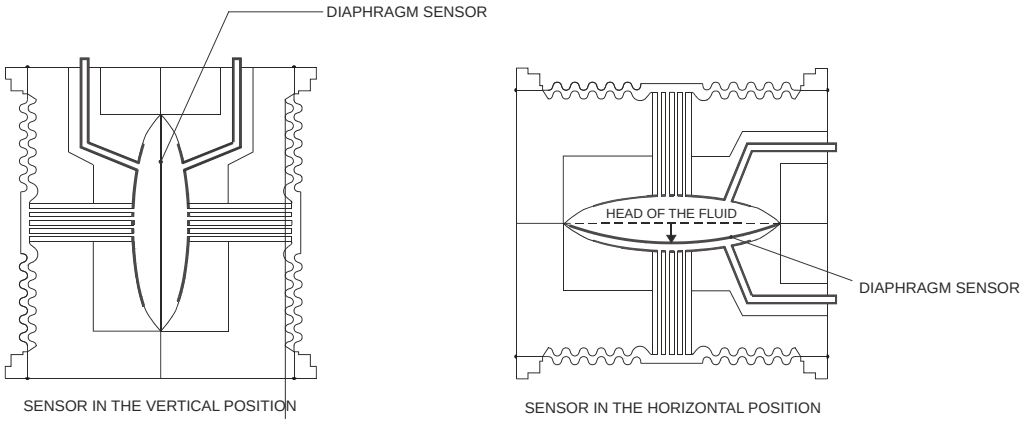


Figure 1.8 - Sensor Positions

Bus and Tree Topology and Network Configuration

The **LD302** uses the 31.25 kbit/s voltage mode option for the physical signaling. All other devices on the same bus must use the same signaling. All devices are connected in parallel along the same pair of wires.

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

The **LD302** is powered via the bus. The limit for such devices is 16 for one bus for non-intrinsically safe requirement.

In hazardous area, the number of devices may be limited by intrinsically safe restrictions.

The **LD302** is protected against reverse polarity, and can withstand ±35 V_{dc} without damage. However it will not work in this situation.

Connection of the **LD302** working in bus topology is in Figure 1.9.

Connection of the **LD302** working in tree topology is in Figure 1.10.

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

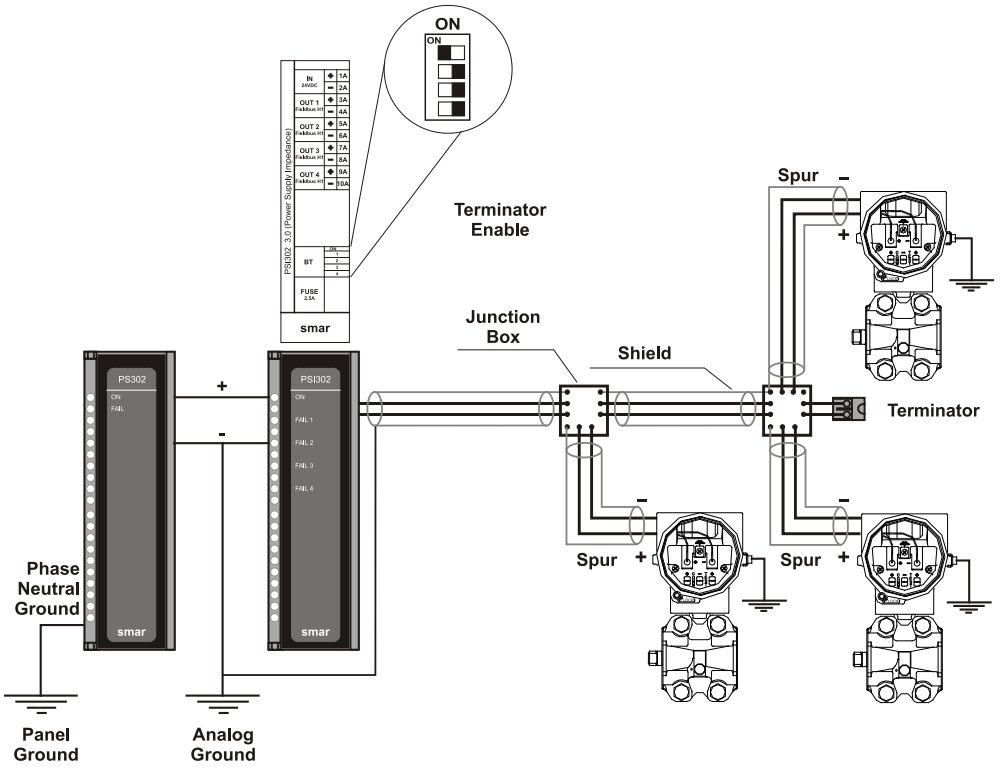


Figure 1.9 - Bus Topology

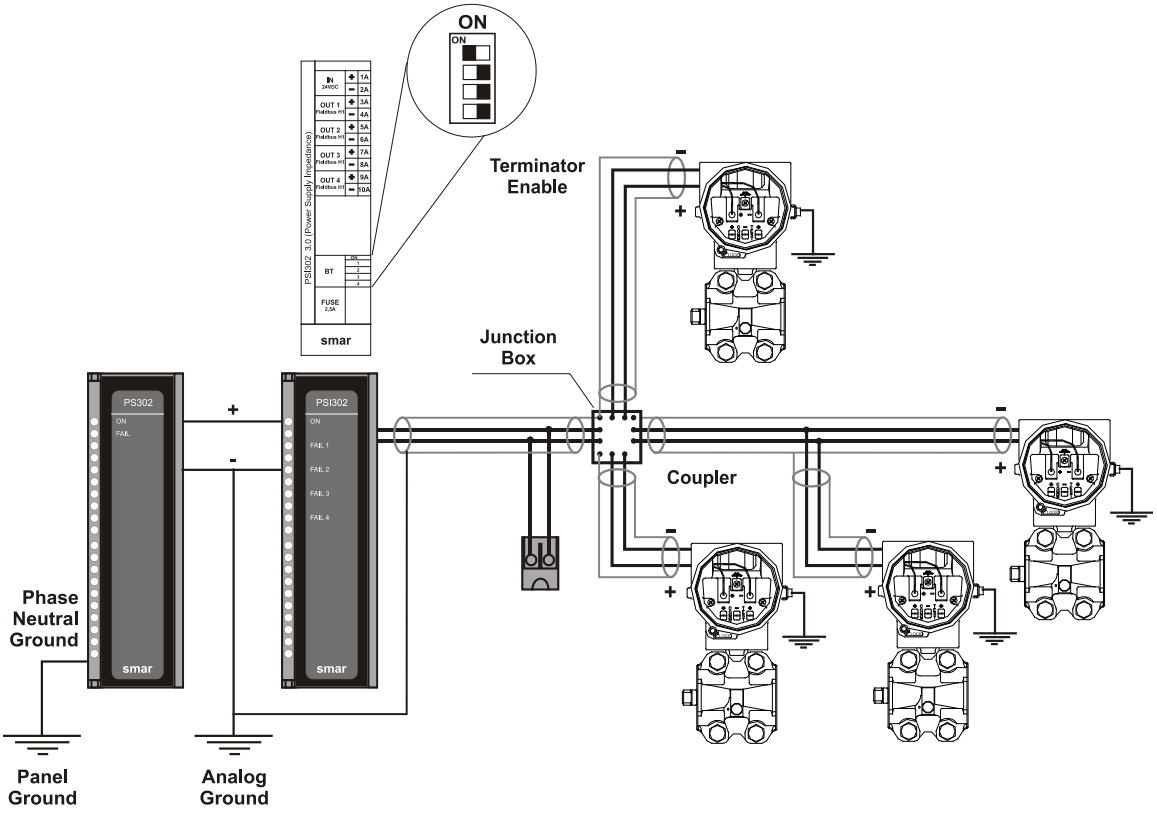


Figure 1.10 -Tree Topology

Installation in Hazardous Areas

WARNING
Explosions could result in death or serious injury, besides financial damage. Installation of this transmitter in explosive areas must be carried out in accordance with the local standards and the protection type adopted .Before continuing the installation make sure the certificate parameters are I n accordance with the classified area where the equipment will be installed. The instrument modification or parts replacement supplied by other than authorized representative of Smar is prohibited and will void the certification. The transmitters are marked with options of the protection type. The certification is valid only when the protection type is indicated by the user. Once a particular type of protection is selected, any other type of protection can not be used. The electronic housing and the sensor installed in hazardous areas must have a minimum of 6 fully engaged threads. Lock the housing using the locking screw (Figure 1.4). The cover must be tighten with at least 8 turns to avoid the penetration of humidity or corrosive gases. The cover must be tighten until it touches the housing. Then, tighten more 1/3 turn (120°) to guarantee the sealing. Lock the covers using the locking screw (Figure 1.4). Consult the Appendix A for further information about certification.

Explosion/Flame Proof

WARNING
In Explosion-Proof installations the cable entries must be connected or closed using metal cable gland and metal blanking plug, both with at least IP66 and Ex-d certification. As the transmitter is non-ignition capable under normal conditions, the statement “Seal not Required” could be applied for Explosion Proof Version. (CSA Certification). The standard plugs provided by Smar are certified according to the standards at FM, CSA and CEPEL. If the plug needs to be replaced, a certified plug must be used. The electrical connection with NPT thread must use waterproofing sealant. A non-hardening silicone sealant is recommended. Do not remove the transmitter covers when power is ON.

Intrinsically Safe

WARNING
In hazardous zones with intrinsically safe or non-incendive requirements, the circuit entity parameters and applicable installation procedures must be observed. To protect the application the transmitter must be connected to a barrier. Match the parameters between barrier and the equipment (Consider the cable parameters). Associated apparatus ground bus shall be insulated from panels and mounting enclosures. Shield is optional. If used, be sure to insulate the end not grounded. Cable capacitance and inductance plus Ci and Li must be smaller than Co and Lo of the associated Apparatus. It is not recommended to remove the transmitter cover when the power is ON.

OPERATION

The **LD302** Series Pressure Transmitters use capacitive sensors (capacitive cells) as pressure sensing elements, as shown in Figure 2.1. This is the same sensor that is used in the LD301 series, the sensor modules are therefore interchangeable.

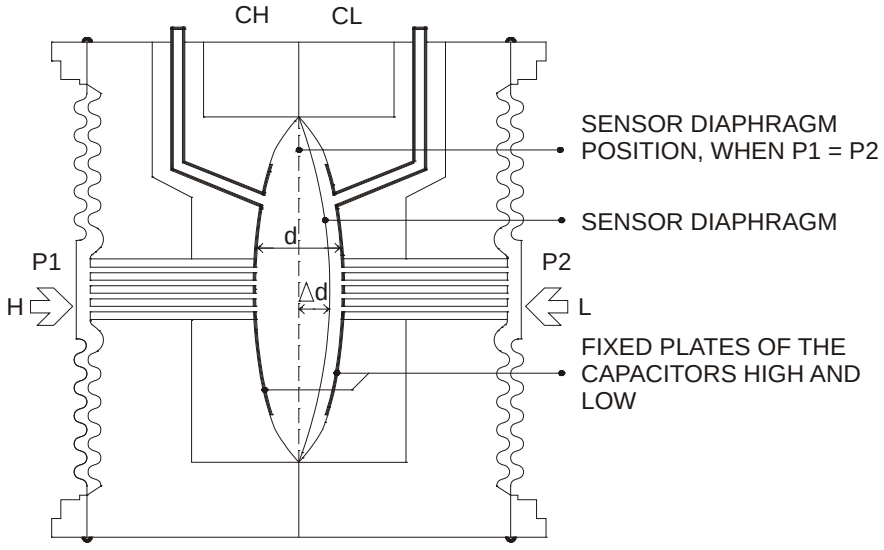


Figure 2.1 - Capacitive Cell

Functional Description - Sensor

Where,
P_1 and P_2 are the pressures and $P_1 \geq P_2$
CH = Capacitance between the fixed plate on P_1 side and the sensing diaphragm.
CL = Capacitance between the fixed plate on the P_2 side and the sensing diaphragm.
d = Distance between CH and CL fixed plates.
Δd = Sensing diaphragm's deflection due to the differential pressure $\Delta P = P_1 - P_2$.

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

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

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

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

The *CH* and *CL* should be considered as capacitances of flat and parallel plates with identical areas, however, should the differential pressure (ΔP) applied to the capacitive cell not deflect the sensing diaphragm beyond d/4, it is possible to assume ΔP as proportional to Δd, that is:

$$\Delta P \propto \Delta d$$

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

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

Though 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 – Electronics

Refer to the block diagram Figure 2.2 - LD302 Block Diagram Hardware.
The function of each block is described below.

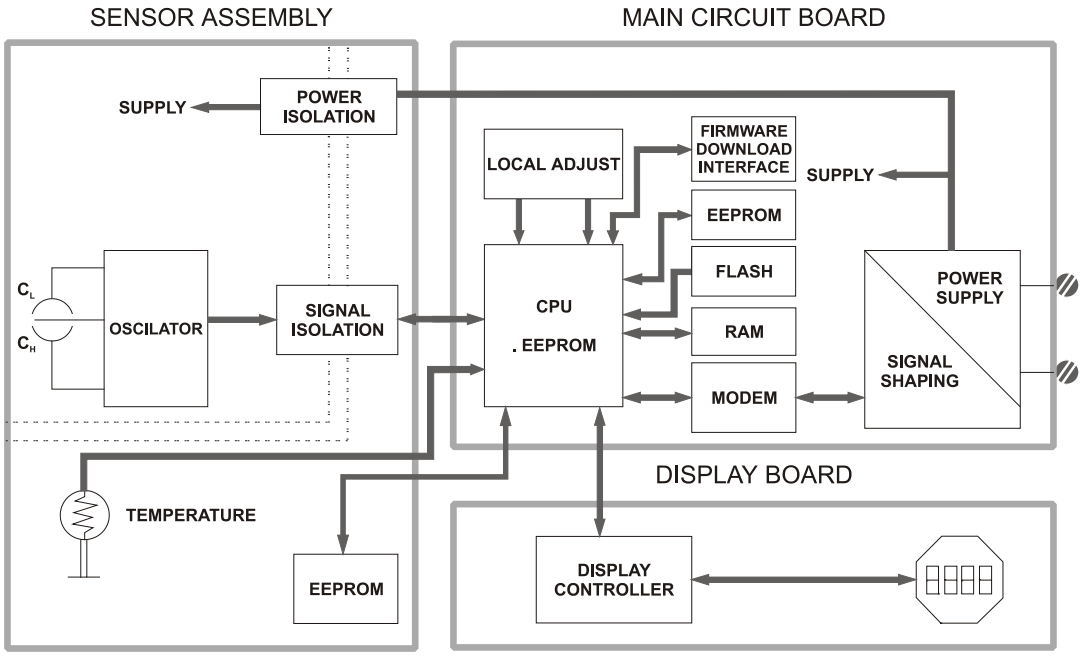


Figure 2.2 - LD302 Block Diagram Hardware

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

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

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

Sensor EEPROM
Another EEPROM is located within the sensor assembly. It contains data pertaining to the sensor's characteristics at different pressures and temperatures. This characterization is done for each sensor at the factory. It also contains the factory settings; they are useful in case of main board replacement, when its does an automatic upload of data from the sensor board to main board.

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

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

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

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

Local Adjustment
There are two switches that are magnetically activated. A magnetic tool without mechanical or electrical contact can activate them.

The Display

The integral indicator can display one or two variables, which are user selectable. When two variables are chosen, the display will alternate within an interval of 3 seconds.

The liquid crystal display includes a 4 ½ numeric digits field, a 5 alphanumeric digits field and an information field, as shown in Figure 2.3.

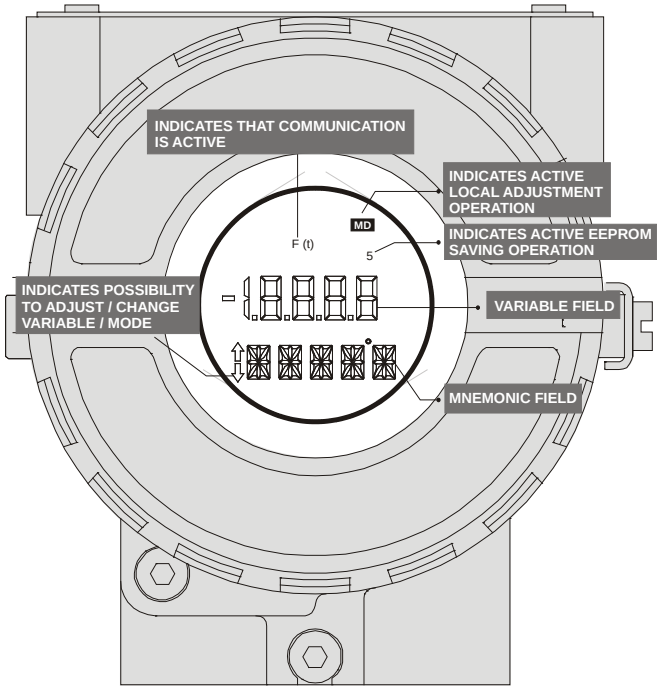


Figure 2.3 - LCD Indicator

Section 3

CONFIGURATION

One of the many advantages of Fieldbus is that device configuration does not depend on the configurator since the technology works with device descriptions and the interoperability concepts. The **LD302** may be configured from a third party terminal or an operator console. A particular configurator is therefore not addressed here.

This section describes the characteristics of the blocks in the **LD302**. They follow the Fieldbus specifications, but as for of transducer blocks, the input transducer block and display, they have other special features.

Transducer Block

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

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

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

Pressure Transmitter Block Parameter Description

Parameter	Description
ST_REV	Indicates the level of static data.
TAG_DESC	Description of Transducer Block.
STRATEGY	This parameter is not checked and processed by Transducer Block.
ALERT_KEY	Number of identification in the plant.
MODE_BLK	Indicates the operation mode of Transducer Block.
BLOCK_ERR	Indicates the status associated with hardware or software in the Transducer.
UPDATE_EVT	It is the alert for any static data.
BLOCK_ALM	It is used for configuration, hardware and others fail.
TRANSDUCER_DIRECTORY	It is used to select several Transducer Blocks.
TRANSDUCER_TYPE	Indicates the type of Transducer according to its class.
XD_ERROR	It is used to indicate calibration status.
COLLECTION_DIRECTORY	Specifies the number of transducer index into Transducer Block.
PRIMARY_VALUE_TYPE	Defines the calculation type for Transducer Block.
PRIMARY_VALUE	It is the value and status used by channel.
PRIMARY_VALUE_RANGE	The High and Low range limit values, the engineering unit code and the number of digits to the right of the decimal point to be used for Primary Value.
CAL_POINT_HI	The highest calibrated value.
CAL_POINT_LO	The lowest calibrated value.
CAL_MIN_SPAN	The minimum calibration span value allowed. This minimum span information is necessary to ensure that when calibration is done, the two calibrated points (high and low) are not too close together.
CAL_UNIT	The Device Description engineering units code index for the calibration values.
SENSOR_TYPE	The type of sensor.
SENSOR_RANGE	The range of sensor.
SENSOR_SN	The serial number of sensor.

Parameter	Description
SENSOR_CAL_METHOD	The method of last sensor calibration. ISO defines several standard methods of calibration. This parameter is intended to record that method, or if some other method was used.
SENSOR_CAL_LOC	The location of last sensor calibration. This describes the physical location at which the calibration was performed.
SENSOR_CAL_DATE	The date of the last sensor calibration.
SENSOR_CAL_WHO	The name of person who is in charge of last calibration.
SENSOR_ISOLATION_MTL	Defines the construction material of the isolating diaphragms.
SENSOR_FLUID	Defines the type of fill fluid used in the sensor
SECONDARY_VALUE	The secondary value (temperature value), related to the sensor.
SECONDARY_VALUE_UNIT	The engineering units to be used with SECONDARY_VALUE.
PRESS_LIN_NORMAL	The Linear Normalized Pressure value.
PRESS_NORMAL	The Normalized Pressure value.
PRESS_CUTOFF	The Cutoff Pressure value.
CUTOFF_FLAG	The bypass flag for Pressure value.
DIGITAL_TEMPERATURE	The digital temperature value.
DIFF	The differential pressure value.
YDIFF	The y differential pressure value.
CAPACITANCE_LOW	The low capacitance value.
CAPACITANCE_HIGH	The high capacitance value.
BACKUP_RESTORE	This parameter is used to do backup or to restore configuration data.
SENSOR_RANGE_CODE	Indicates the sensor range code.
COEFF_POL0	The polynomial coefficient 0.
COEFF_POL1	The polynomial coefficient 1.
COEFF_POL2	The polynomial coefficient 2.
COEFF_POL3	The polynomial coefficient 3.
COEFF_POL4	The polynomial coefficient 4.
COEFF_POL5	The polynomial coefficient 5.
COEFF_POL6	The polynomial coefficient 6.
COEFF_POL7	The polynomial coefficient 7.
COEFF_POL8	The polynomial coefficient 8.
COEFF_POL9	The polynomial coefficient 9.
COEFF_POL10	The polynomial coefficient 10.
COEFF_POL11	The polynomial coefficient 11.
POLYNOMIAL_VERSION	Indicates the polynomial version.
CHARACTERIZATION_TYPE	Indicates the type of characterization curve.
CURVE _BYPASS_LD	Enable and disable the characterization curve.
CURVE_LENGTH	Indicates the length of characterization curve.
CURVE_X	Input points of characterization curve.
CURVE_Y	Output points of characterization curve.
CAL_POINT_HI_BACKUP	Indicates the backup for high calibration point.
CAL_POINT_LO_ BACKUP	Indicates the backup for low calibration point.
CAL_POINT_HI_FACTORY	Indicates the factory high calibration point.
CAL_POINT_LO_FACTORY	Indicates the factory low calibration point.
CAL_TEMPERATURE	Defines the temperature calibration point.
DATASHEET	Indicates information about the sensor.
ORDERING_CODE	Indicates information about the sensor and control from factory production.
MAXIMUM_MEASURED_PRESSURE	Indicates the maximum pressure measured
MAXIMUM_MEASURED_TEMPERATURE	Indicates the maximum temperature measured
ACTUAL_OFFSET	Indicates the actual calibrated offset
ACTUAL_SPAN	Indicates the actual span offset

Parameter	Description
MAXIMUM_OFFSET_DEVIATION	Defines the maximum offset before an alarm is generate
MAXIMUM_GAIN_DEVIATION	Defines the maximum gain before an alarm is generate
OVERPRESSURE_LIMIT	Defines the maximum overpressure limit before an alarm is generate
MAXIMUM_NUMBER_OF_OVERPRESSURE	Defines the maximum number of overpressure before an alarm is generate

Table 3.1 – Pressure Transmitter Block Parameter Description

Pressure Transmitter Block Parameter Attributes

Rel. Index	Parameter	Obj. Type	Data Type	Storage	Size	Valid Range	Initial/Default Value	Units	Class	View
1	ST_REV	S	Unsigned16	S	2	Positive	0	none	R/W	1, 2, 3, 4
2	TAG_DESC	S	VisibleString	S	32		Null	na	R/W	
3	STRATEGY	S	Unsigned16	S	2		0	none	R/W	4
4	ALERT_KEY	S	Unsigned8	S	1	1-255	0	na	R/W	4
5	MODE_BLK	R	DS-69	S	4	OOS,AUTO	OOS	none	R/W	1
6	BLOCK_ERR	S	Bit String	D	2		Out of Service	E	R	1
7	UPDATE_EVT	R	DS-73	D	5		*	na	R	
8	BLOCK_ALM	R	DS-72	D	13		*	na	R	
9	TRANSDUCER_DIRECTORY	S	Array of Unsigned16	N	Variable		0	none	R	
10	TRANSDUCER_TYPE	S	Unsigned16	N	2		Pressure	none	R	1, 2, 3, 4
11	XD_ERROR	S	Unsigned8	D	1		Default value set	none	R	
12	COLLECTION_DIRECTORY	S	Array of Unsigned 32	S	Variable		0	None	R	3
13	PRIMARY_VALUE_TYPE	S	Unsigned16	S	2		Diff Pressure	None	R	2, 3
14	PRIMARY_VALUE	R	DS-65	D	5		*	XD_SCALE	R	1
15	PRIMARY_VALUE_RANGE	R	DS-68	S	11		*	XD_SCALE	R	4
16	CAL_POINT_HI	S	Float	S	4		*	CAL_UNIT	R/W	2, 3
17	CAL_POINT_LO	S	Float	S	4		*	CAL_UNIT	R/W	2, 3
18	CAL_MIN_SPAN	S	Float	S	4	URL/40 to URL	*	CAL_UNIT	R	3, 4
19	CAL_UNIT	S	Unsigned16	S	2		*	E	R	3, 4
20	SENSOR_TYPE	S	Unsigned16	S	1		Capacitance	na	R/W	3, 4
21	SENSOR_RANGE	R	DS-68	S	11		*	XD_SCALE	R	4
22	SENSOR_SN	S	Unsigned32	S	4	0 to 2^{32}	*	None	R/W	4
23	SENSOR_CAL_METHOD	S	Unsigned8	S	1		Factory Cal.	none	R/W	4
24	SENSOR_CAL_LOC	S	VisibleString	S	32		NULL	none	R/W	
25	SENSOR_CAL_DATE	S	Time of Day	S	7		Unspecified	none	R/W	
26	SENSOR_CAL_WHO	S	VisibleString	S	32		NULL	none	R/W	
27	SENSOR_ISOLATION_MTL	S	Unsigned16	S	2		Unspecified	none	R/W	4
28	SENSOR_FLUID	S	Unsigned16	S	2		Inert	none	R/W	4
29	SECONDARY_VALUE	R	DS-65	D	5		*	SVU	R	1
30	SECONDARY_VALUE_UNIT	S	Unsigned16	S	2		Celsius	E	R	2
31	PRESS_LIN_NORMAL	R	DS-65	D	5	± 1	*	none	R	
32	PRESS_NORMAL	R	DS-65	D	5	± 1	*	none	R	
33	PRESS_CUTOFF	R	DS-65	D	5	± 1	*	none	R	
34	PRESS_CUTOFF	S	Unsigned8	S	1	True/False	False	none	R/W	
35	DIGITAL_TEMPERATURE	R	DS-65	D	5	0-255	*	none	R	
36	DIFF	S	Float	D	4		*	none	R	
37	YDIFF	S	Float	D	4		*	none	R	
38	CAPACITANCE_LOW	S	Float	D	4		*	none	R	
39	CAPACITANCE_HIGH	S	Float	D	4		*	none	R	

Rel. Index	Parameter	Obj. Type	Data Type	Storage	Size	Valid Range	Initial/Default Value	Units	Class	View
40	BACKUP_RESTORE	S	Unsigned8	S	1		None	none	R/W	4
41	SENSOR_RANGE_CODE	S	Unsigned16	S	2		*	none	R/W	4
42	COEFF_POL0	S	Float	S	4	± INF	*	none	R/W	4
43	COEFF_POL1	S	Float	S	4	± INF	*	none	R/W	4
44	COEFF_POL2	S	Float	S	4	± INF	*	none	R/W	4
45	COEFF_POL3	S	Float	S	4	± INF	*	none	R/W	4
46	COEFF_POL4	S	Float	S	4	± INF	*	none	R/W	4
47	COEFF_POL5	S	Float	S	4	± INF	*	none	R/W	4
48	COEFF_POL6	S	Float	S	4	± INF	*	none	R/W	4
49	COEFF_POL7	S	Float	S	4	± INF	*	none	R/W	4
50	COEFF_POL8	S	Float	S	4	± INF	*	none	R/W	4
51	COEFF_POL9	S	Float	S	4	± INF	*	none	R/W	4
52	COEFF_POL10	S	Float	S	4	± INF	*	none	R/W	4
53	COEFF_POL11	S	Float	S	4	± INF	*	none	R/W	4
54	POLYNOMIAL_VERSION	S	Unsigned8	S	1	30h to FFh	*	None	R/W	4
55	CHARACTERIZATION_TYPE	S	Unsigned8	S	1		Other	None		2
56	CURVE _BYPASS_LD	S	Unsigned16	S	2		Disable or allow enter points	None	R/W	2, 3
57	CURVE_LENGTH	S	Unsigned8	S	1	2 to 5	5	None	R/W	2
58	CURVE_X	R	Array of Float	S	20		*	None	R/W	2
59	CURVE_Y	R	Array of Float	S	20		*	None	R/W	2
60	CAL_POINT_HI_BAKUP	S	Float	S	4		*	CAL_UNIT	R	2
61	CAL_POINT_LO_BAKUP	S	Float	S	4		*	CAL_UNIT	R	2
62	CAL_POINT_HI_FACTORY	S	Float	S	4		*	CAL_UNIT	R	
63	CAL_POINT_LO_FACTORY	S	Float	S	4		*	CAL_UNIT	R	
64	CAL_TEMPERATURE	S	Float	S	4	-40 a 85 °C	*	°C	R/W	
65	DATASHEET	R	Array of Unsigned8	S	10		*	None	R/W	
66	ORDERING_CODE	S	VisibleString	S	50		Null	None	R/W	
67	MAXIMUM_MEASURED_ PRESSURE	S	Float	S	4	± INF	- Inf	none	R/w	
68	MAXIMUM_MEASURED_ TEMPERATURE	S	Float	S	4	± INF	- Inf	none	R/W	
69	ACTUAL_OFFSET	S	Float	S	4	± INF	*	none	R	
70	ACTUAL_SPAN	S	Float	S	4	± INF	*	none	R	
71	MAXIMUM_OFFSET_DEVIATION	S	Float	S	4	± INF	0.5	none	R/W	
72	MAXIMUM_GAIN_DEVIATION	S	Float	S	4	± INF	2.0	none	R/W	
73	OVERPRESSURE_LIMIT	S	Float	S	4	± INF	+ Inf	none	R/W	
74	MAXIMUM_NUMBER_OF_ OVERPRESSURE	S	Float	S	4	± INF	0	none	R/W	

Table 3.2 – Pressure Transmitter Blocks Parameter Attributes

How to Configure a Transducer Block

Each time a field device is selected on the SYSCON by instantiating them on the Operation menu, automatically a transducer block appears on the screen.

The icon indicates that a transducer block has been created, and by clicking twice on the icon, it can be accessed.

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

The algorithm describes the behavior of the transducer as a data transfer function between the I/O hardware and other function blocks. The set of contained parameters are unable to link to other blocks. These contained parameters define the user interface to the transducer block. They can be divided into Standard and Manufacturer Specific.

The standard parameters will be present for pressure, temperature, actuation devices, etc., regardless of the manufacturer. Oppositely, the manufacturers' specific ones are defined by themselves for their own purposes. As common manufacturer specific parameters, there are calibration settings, material information, linearization curve, etc.

When a standard routine calibration is performed, the user conducts a step by step method. The method is generally defined as a guideline to help the user with common tasks. The SYSCON identifies each method associated with the parameters and enables the interface to it.

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

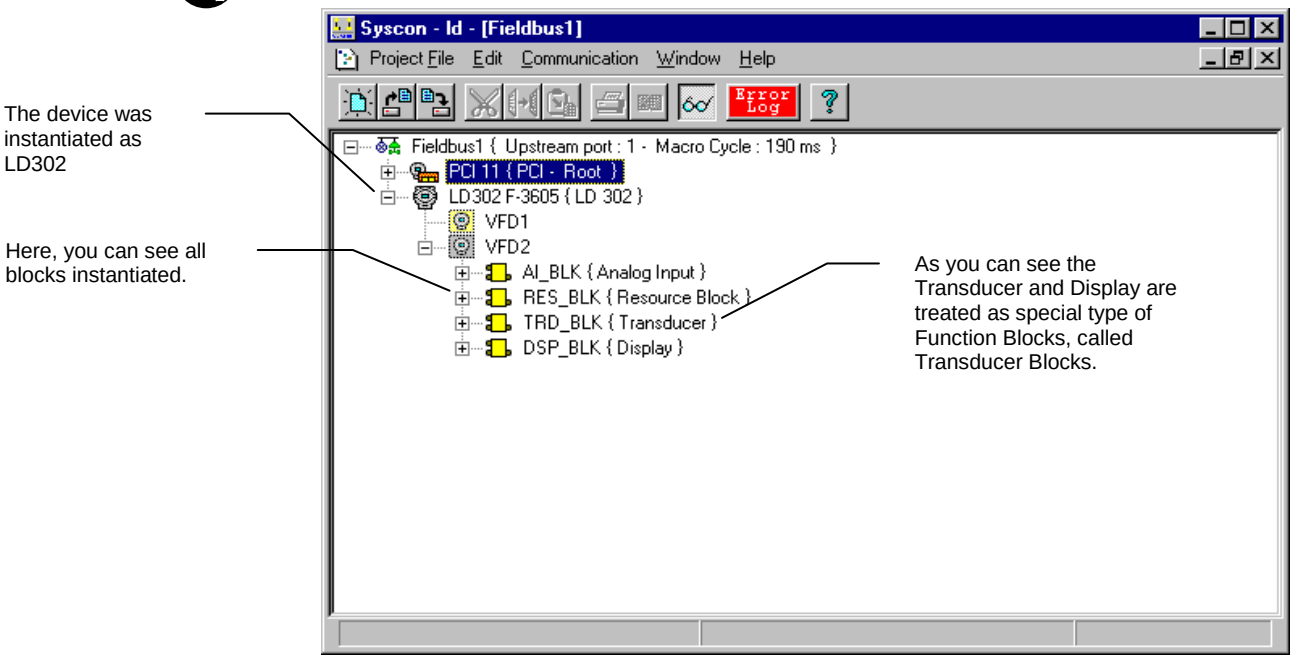


Figure 3.1 - Function and Transducer Blocks

Lower and Upper Trim

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

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

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

The TRIM is used to match the reading with the applied pressure. There are two types of trim available:

Lower Trim: It is used to trim the reading at the lower range. The operator informs the **LD302** of the correct reading for the applied pressure. The most common discrepancy is the lower reading.

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

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

For accuracy, trim should be done within the operating range. The Figures 3.2, 3.3 and 3.4 shows the trim adjustment operation into SYSCON.

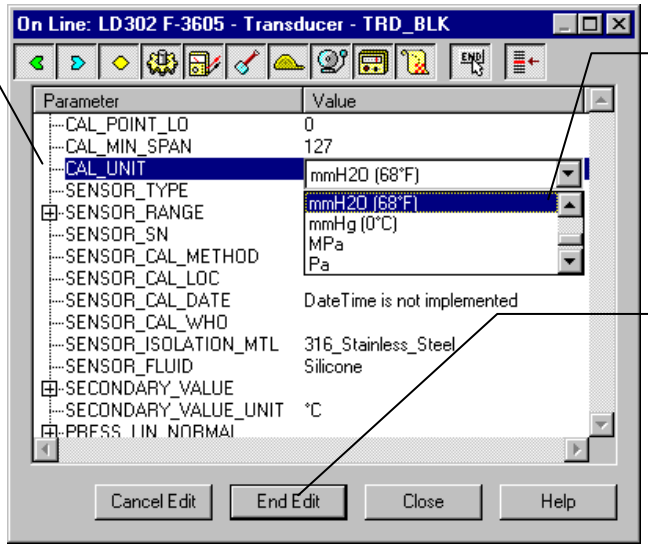
Pressure Trim - LD302

Via SYSCON

It is possible to calibrate the transmitter through the parameters CAL_POINT_LO and CAL_POINT_HI.

A convenient engineering unit should be chosen before starting the calibration. This engineering unit is configured by the CAL_UNIT parameter. After its configuration the parameters related to calibration will be converted to this unit.

The parameter CAL_UNIT should be configured according to the desired Engineering Unit in the device calibration process



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

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

Figure 3.2 - LD302 SYSCON - Transducer Configuration Screen

The following engineering unit's codes are defined for pressure according to Fieldbus Foundation ® standard:

UNIT	CODES
InH_2O to 68°F	1148
InHg to 0°C	1156
ftH_2O to 68°F	1154
mmH_2O to 68°F	1151
mmHg to 0°C	1158
Psi	1141
Bar	1137
mbar	1138
g/cm^2	1144
kg/cm^2	1145
Pa	1130
KPa	1133
Torr	1139
Atm	1140
MPa	1132
inH_2O to 4°C	1147
mmH_2O to 4°C	1150

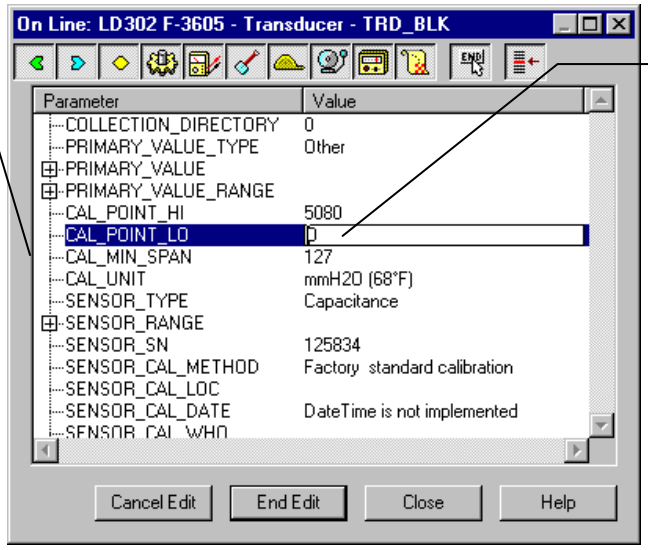
Table 3.3 - Engineering Units for Pressure

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

Let's take the lower value as an example:
Apply the input zero or the lower pressure value in an engineering unit, (the same used in parameter CAL_UNIT), and wait for the readout of the parameter PRIMARY_VALUE to stabilize.

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

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

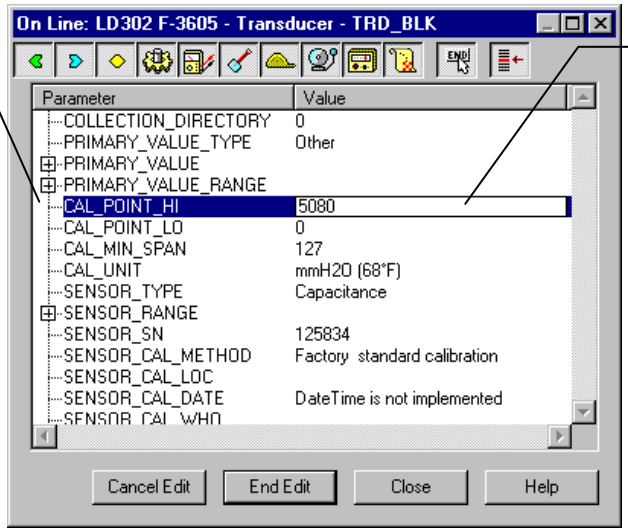


In this case, a range 2 sensor is used: The URL is 0 mmH2O or 0 inH2O.

Figure 3.3 - LD302 SYSCON - Transducer Configuration Screen

Let's take the upper value as an example:
Apply the input to the upper value of 5,000mmH2O of pressure and wait for the readout of the parameter PRIMARY_VALUE to stabilize. Then, write the upper value, (5,000mmH2O) in the parameter CAL_POINT_HI. For each value written a calibration is performed at the desired point.

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



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

Figure 3.4 - LD302 SYSCON - Transducer Configuration Screen

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

Through Local Adjustment

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

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

NOTE
The exit of the trim mode on the local adjustment occurs automatically when the magnetic tool is not used for 15 seconds Even when parameters LOWER or UPPER already present the desired value, they must be actuated so that calibration is performed.

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

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

NOTE
Codes for XD_ERROR: 16: Default Value Set 22: Out of Range. 26: Invalid Calibration Request. 27: Excessive Correction.

Characterization Trim

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

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

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

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

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

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

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

The Figure 3.5 shows the SYSCON window to characterize a new curve. Note that CURVE_Y indicates the applied pressure according to the standard pressure source. CURVE_X indicates measured pressure value to **LD302**.

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

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

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

To configure the points of the curve, the option "Disable or Allows to enter the points " must be chosen. Apply the desired pressure and wait until it stabilizes. (During stabilization, read the normalized pressure through PRESS_NORMAL parameter and with the pressure being applied, write in the parameters CURVE_X and CURVE_Y respectively). Finally it is necessary to write in the CURVE_LENGTH parameter, the number of configured points, from 2 to 5 points. In case the curve is not to be confirmed, choose the option " Disable and Restore Cal". For enabling and saving the calibration settings, choose "Enable and Backup Cal".

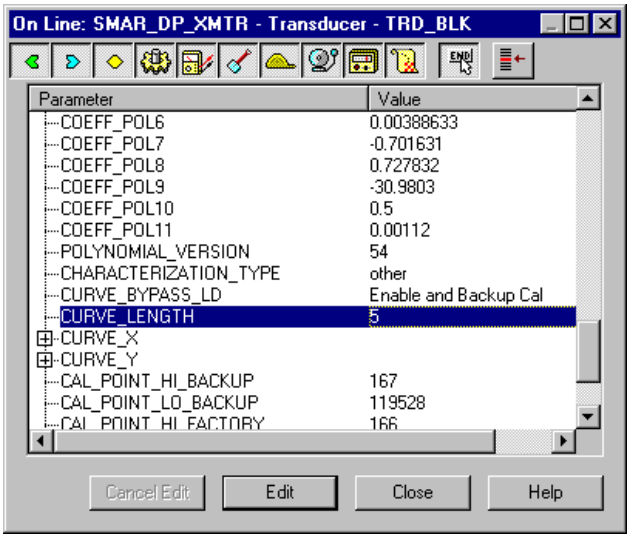
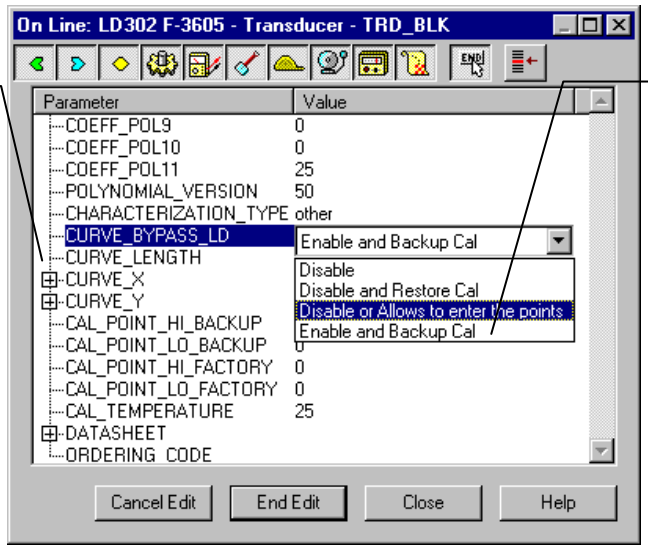


Figure 3.5 - The Characterization Curve Configuration

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



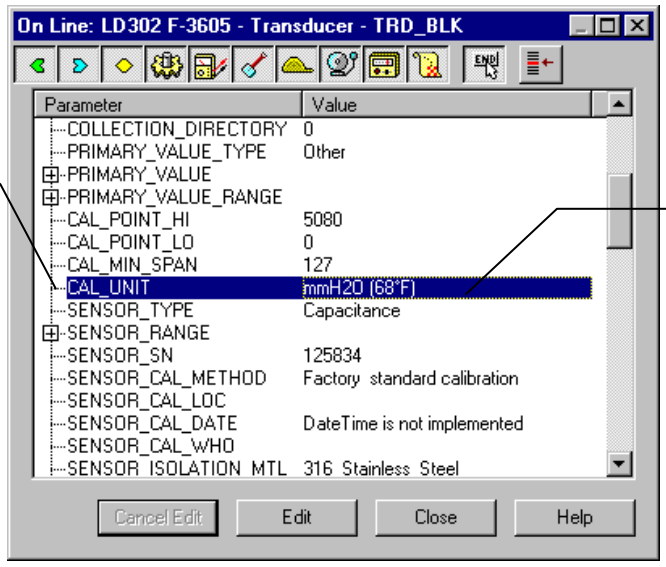
By the list box the user can enable or disable the Characterization Curve, enter the points, restore or backup the curve entered. This parameter should be used preferably by a calibration method.

Figure 3.6 - The Characterization Curve Configuration

Sensor Information

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

This parameter assigns the Engineering Units for all parameters related to calibration methods. Usually, they start their names with CAL_UNIT.



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

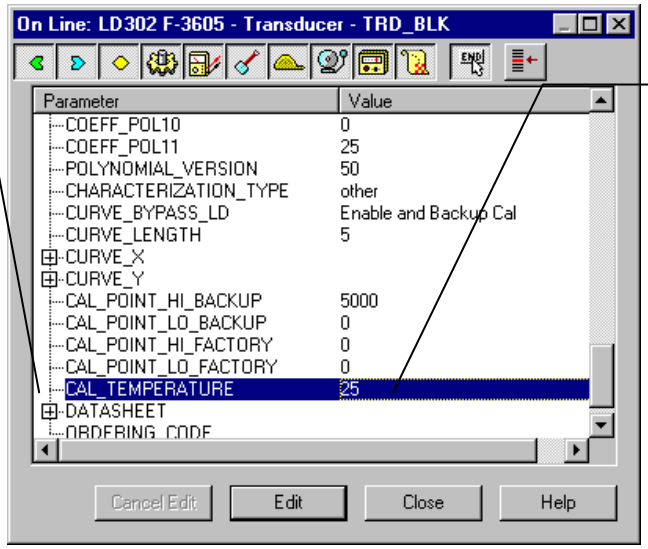
Figure 3.7 - Transducer Block - Sensor Information

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

Temperature Trim

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

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



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

Figure 3.8 - The Temperature Trim Configuration

Sensor Data Reading

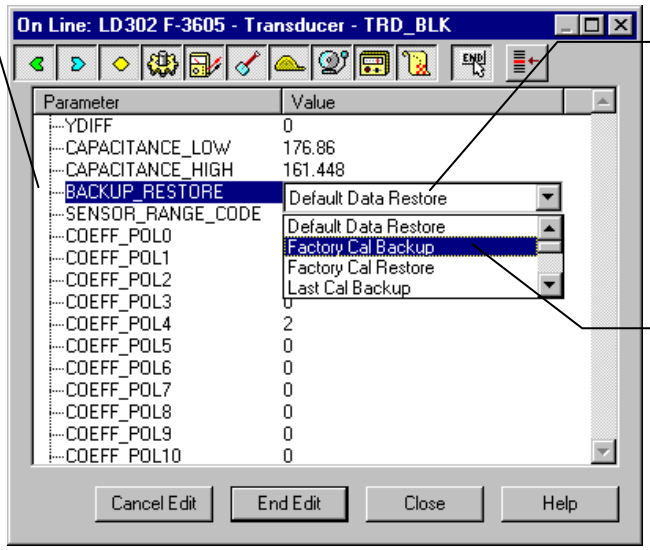
When the transmitter **LD302** is on, it is verified that the serial number of the sensor in the sensor board is the same as the recorded serial number in the E2PROM in the main board. When these numbers are different (a swap of sensor set or main board was carried through) the data stored in the E2PROM of the sensor board is copied to the E2PROM of the main board.

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

Through this parameter, we can recover default data from the factory about sensor and last saved calibration settings, as well as calibrations. These are the following options:

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

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



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

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

Figure 3.9 - Transducer Block - Backup/Restore

Transducer Display - Configuration

Using the SYSCON it is possible to configure the Display Transducer block. The Transducer Display is treated as a normal block by SYSCON. It means, this block has some parameters and those can be configured according to the customer's needs. See the Figure 3.10.

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

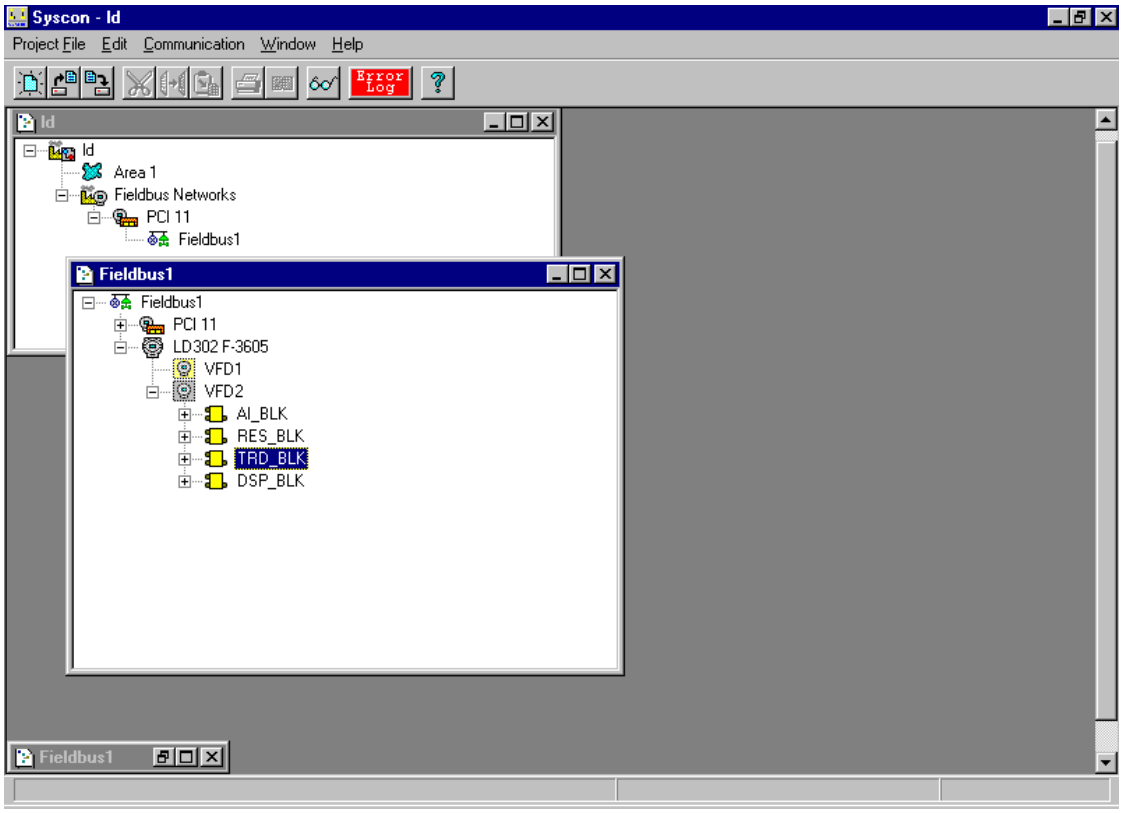


Figure 3.10 - Creating Transducers and Function Blocks

Display Transducer Block

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

The interaction between the user, is described in detail on the "General Installation, Operation and Maintenance Procedures Manual". Take a detailed look at this manual in the chapter related to "Programming Using Local Adjustment". The resources on this transducer display as well as all of the Series 302 Field Devices from Smar, have the same methodology.

Once trained, the user can handle any kind of field devices from Smar.

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

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

In order to enable the local adjustment using the magnetic tool, it is necessary to prepare the parameters concerning this operation via SYSCON (System Configuration). Figures 3.8 and 3.9 shows all parameters and their respective values, which should be configured to enable local adjustment through the magnetic screwdriver according to the user's unit. All values shown on the display are default values.

There are seven groups of parameters, which may be pre-configured by the user in order to enable, a possible configuration by means of the local adjustment. As an example, suppose some parameters are not to be shown; in this case, simply write an invalid Tag in the parameter, Block_Tag_Param_X. By doing this, the device will not take the parameters related (indexed) to its Tag as valid parameters.

Definition of Parameters and Values

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

Idx	Parameter	DataType (length)	Valid Range/ Options	Default Value	Units	Store	Description
14	**ALPHA_NUM**	**Unsigned8**	**Mnem/Value**		**None**	**S**	These parameters include two options: value and mnemonic. In option value it is possible to display data both in the alphanumeric and in the numeric fields, this way, in the case of a data higher than 10000, it will be shown in the alphanumeric field.
63	**DISPLAY_REFRESH**	**Unsigned8**	**1**		**None**	**D**	

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

In case the user wants to see a certain tag, chose the index relative equal to zero, and for the sub-index equal to one (refer to paragraph Structure Block in the Function Blocks Manual).

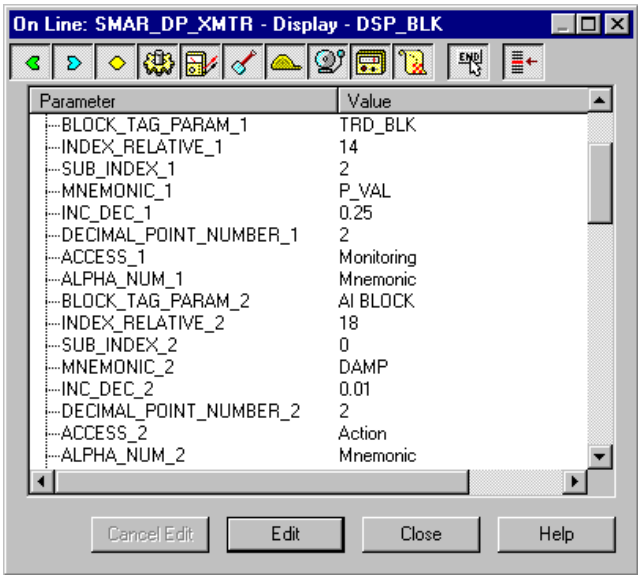


Figure 3.11 - Parameters for Local Adjustment Configuration

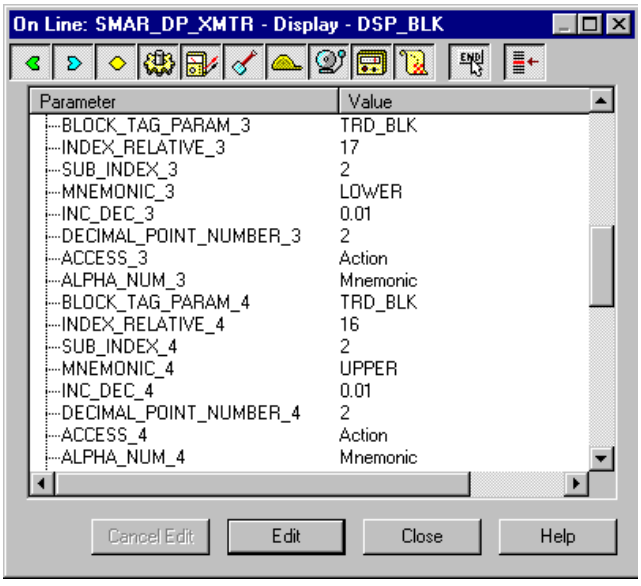


Figure 3.12 - Parameters for Local Adjustment Configuration

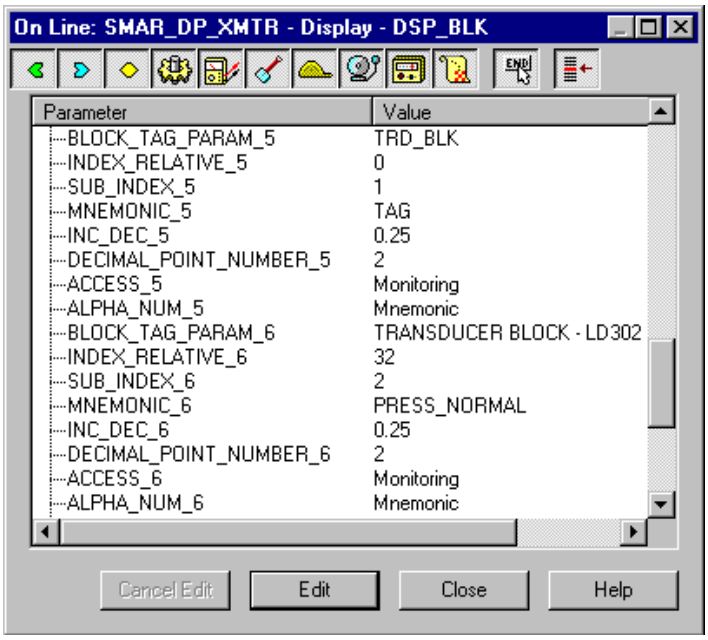


Figure 3.13 - Parameters for Local Adjustment Configuration

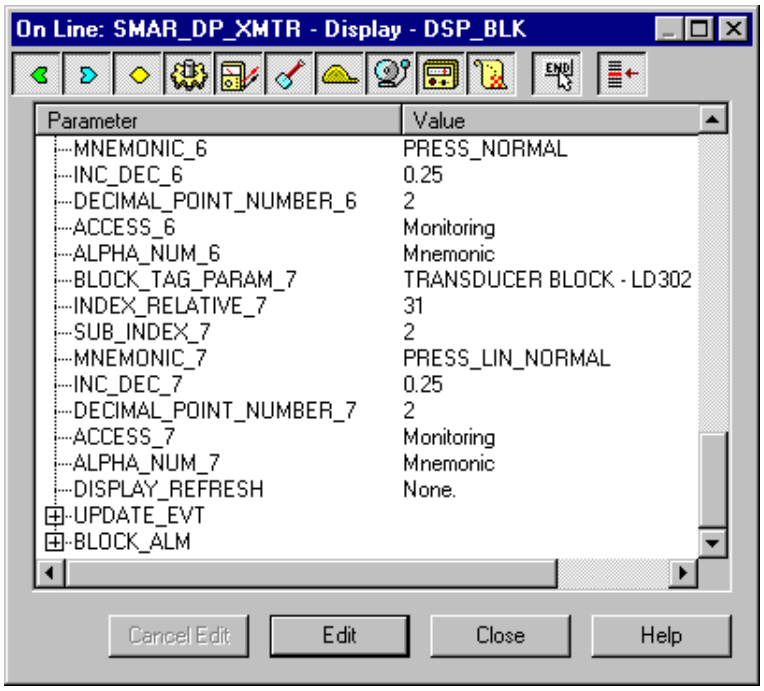
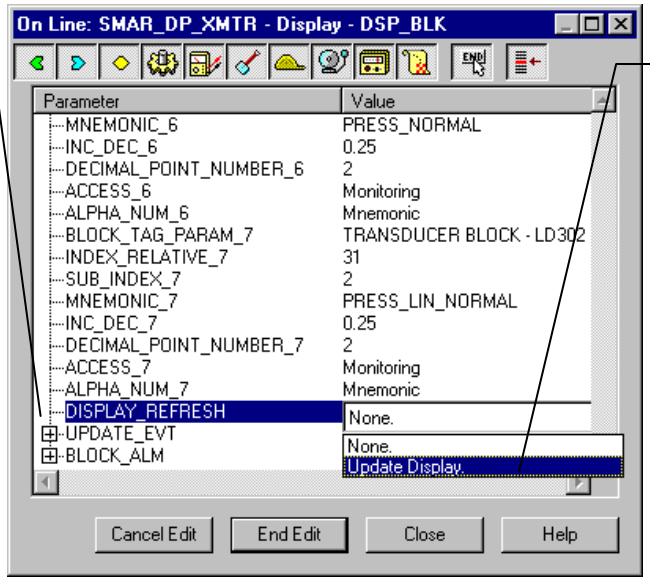


Figure 3.14 - Parameters for Local Adjustment Configuration

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



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

Figure 3.15 - Parameters for Local Adjustment Configuration

Programming Using Local Adjustment

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

The interaction between the user is also described in detail on the "General Installation, Operation and Maintenance Procedures Manual". Take a look at this manual in the chapter related to "Programming Using Local Adjustment".

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

This magnetic tool enables adjustment of the most important parameters of the blocks.

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

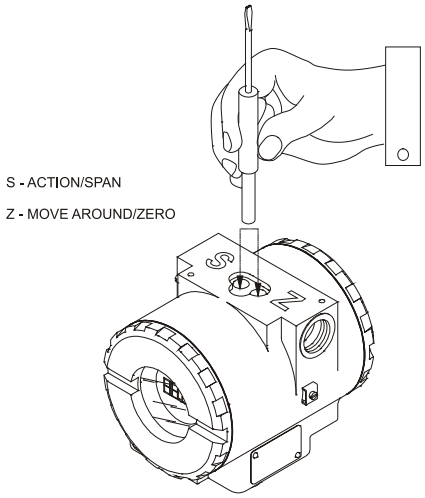


Figure 3.16 - Local Adjustment Holes

Table 3.4 shows the actions on the Z and S holes on the **LD302** when Local Adjustment is enabled.

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

Table 3.5 - Purpose of the holes on the Housing

J1 Jumper Connections

If J1 (see figure 3.17) is connected to ON, it is possible to simulate values and status through the SIMULATE parameter, from the function blocks.

W1 Jumper Connections

If W1 is connected to ON, the local adjustment programming tree is enabled, the block parameters can be adjusted and the communication can be pre-configured via local adjustment.

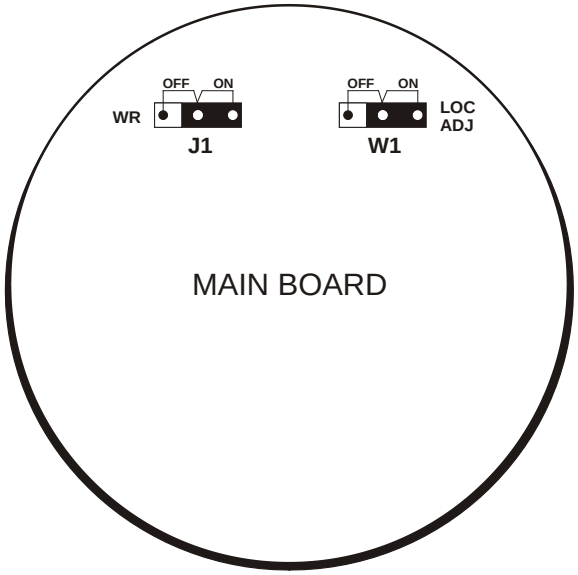


Figure 3.17 - J1 and W1 Jumpers

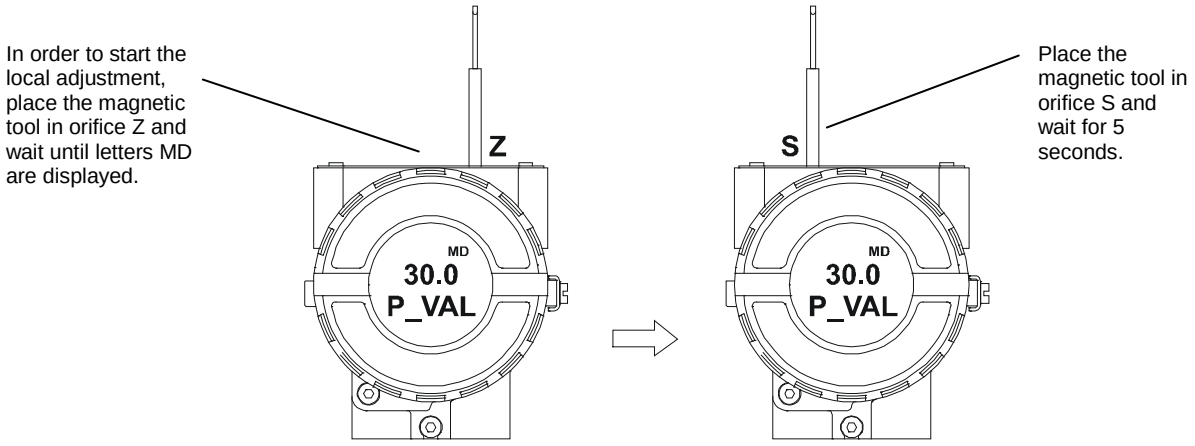


Figure 3.18 - Step 1 - LD302

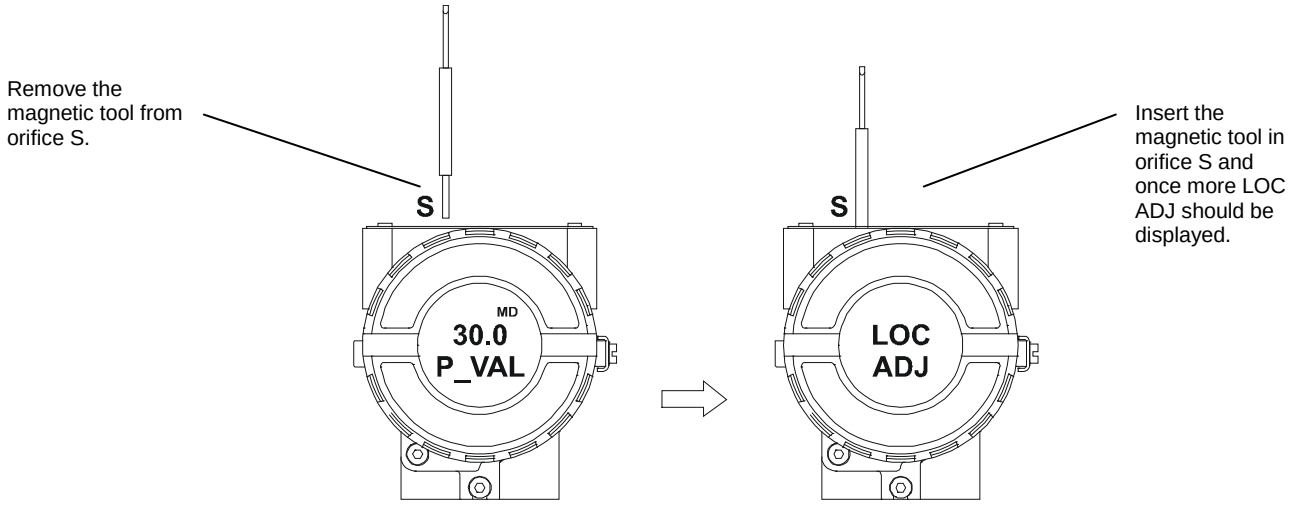


Figure 3.19 - Step 2 - LD302

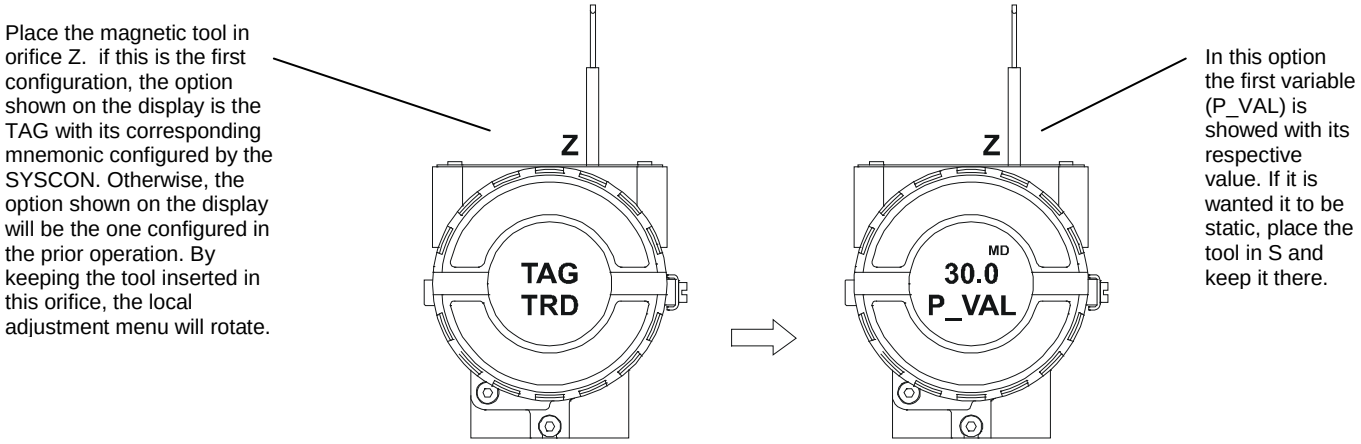
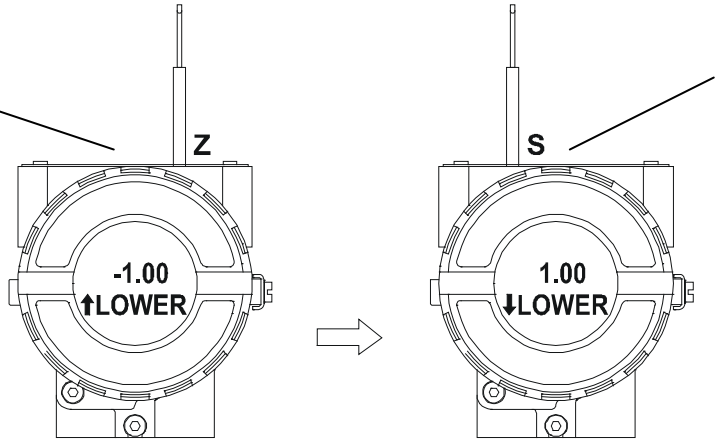


Figure 3.20 – Step 3 – LD302

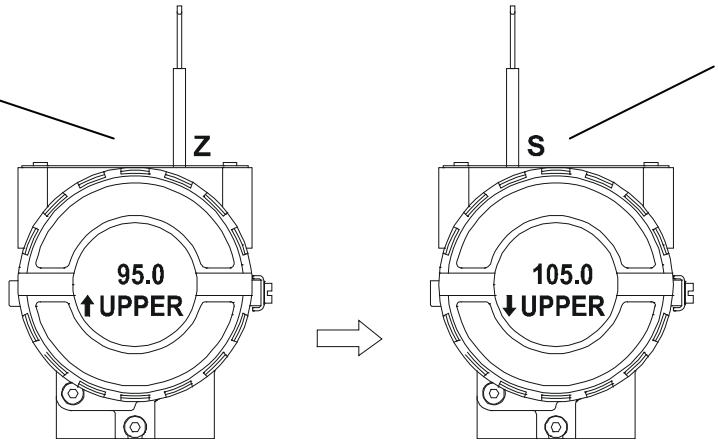
In order to calibrate the lower value(LOWER), insert the magnetic tool in orifice S as soon as LOWER is shown in the display. An arrow pointing upward (↑) increments the value and an arrow pointing downward (↓) decrements the value. In order to increment the value, keep the tool inserted in S until the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



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

Figure 3.21 - Step 4 - LD302

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



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

Figure 3.22 - Step 5 - LD302

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

Section 4

MAINTENANCE PROCEDURES

General

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

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

In general, it is recommended that end users do not try to repair printed circuit boards. Spare circuit boards may be ordered from **SMAR** when necessary. Refer to the item "Returning Materials" at the end of this Section.

The table 4.1 will show the messages of errors and potential causes.

SYMPTOM	POSSIBLE SOURCE OF PROBLEM
NO COMMUNICATION	**** Transmitter Connections*** Check wiring polarity and continuity. Check for short circuit or ground loops. Check if the power supply connector is connected to the main board. Check if the shield is not being used as a conductor. It should be grounded at one end only.
	**** Power Supply*** Check power supply output. The voltage must be between 9 - 32 VDC at the **LD302** terminals. Noise and ripple should be within the following limits: a) 16 mV peak to peak from 7.8 to 39 KHz. b) 2 V peak to peak from 47 to 63 Hz for non-intrinsic safety applications and 0.2 V for intrinsic safety applications. c) 1.6 V peak to peak from 3.9 MHz to 125 MHz.
	**** Network Connection*** Check that the topology is correct and all devices are connected in parallel. Check that two Terminators are OK and correctly positioned. Check length of trunk and spurs. Check spacing between couplers.
	**** Electronic Circuit Failure*** Check the main board for defect by replacing it with a spare.
INCORRECT READING	**** Transmitter Connections*** Check for intermittent short circuits, open circuits and grounding problems. Check if the sensor is correctly connected to the **LD302** terminal block.
	**** Noise, Oscillation*** Adjust damping Check grounding of the transmitters housing. Check that the shielding of the wires between transmitter / panel is grounded only in one end.
	**** Sensor*** Check the sensor operation; it should be within its characteristics. Check sensor type; it should be configured to the LD302 affixes. Check if process is within the range of the sensor and the **LD302**.

Table 4.1 - Error Messages and Potential Causes

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

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

Disassembly Procedure

WARNING
Do not disassemble with power on.

The Figure 4.4 shows an exploded view of the transmitter and will help to visualize the following.

Sensor Cleaning

In order to have access to the sensor **(19)** 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 **(13)** must be opened to exhaust any remaining pressure.

Figure 4.1 - Sensor Safety Rotation

After this, the transmitter may be removed from the standpipe. The flange bolts (16) may now be loosened crosswise, one at a time. After removing bolts and flanges (15), the isolating diaphragms will be easily accessible for cleaning.

Cleaning should be done carefully in order to avoid damaging the delicate isolating diaphragms. The use of a soft cloth and a non-acid solution is recommended.

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 (20) and carefully unscrew the electronic housing from the sensor, observing that the flat cable is not excessively twisted.

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

Electronic Circuit

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

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

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

Reassembly Procedure

WARNING
Do not assemble the main board with power on.

Sensor Mounting

When mounting the sensor **(19)**, it is recommended to make use of a new set of gaskets **(18 & 24)** compatible with the process fluid. The bolts, nuts, flanges and other parts should be inspected for corrosion or other eventual damage. Damaged parts should be replaced.

NOTE
Backup Rings High pressure transmitters **A5, A6, M5, M6** and High static pressure transmitters **H2, H3, H4, H5** and the sensors with tantalum diaphragm that use Buna-N or Viton O_Ring, must use a metallic backup Ring (17) to prevent extrusion of O_Ring. Do not use the backup O-Ring when the flange has an insert of **Kynar** (PVDF). Avoid bending the backup ring and inspect it for knots, cuts etc. Be careful when mounting it. The flat side, which shines more than the beveled side should be mounted against the O_Ring. **(*See Figure 4.2 – Backup Ring Mounting*)**. For these models, when teflon O-ring is used, it must be a special "SPRING LOADED" O_ring. See the spare parts list for the appropriate part number.

Gaskets should be lightly lubricated with silicone oil before they are fitted into their recesses. Use halogen grease for inert fill applications. The flanges should then be positioned in order to press them in place. With the flanges holding the O-Rings in place, insert the four bolts **(16)** and tighten the nuts **(23)** finger tight, making sure the flanges remain parallel all the time.

Tighten one nut until the flange seats.
Tighten the nut diagonally across with a torque of approximately 2.75 ±0.25 kgf.m.
Tighten the first nut with the same torque.
Verify the flange alignment.
Check torque on the four bolts.

If adapters **(25)** have been removed, it is recommended to replace gaskets **(24)** and to connect the adapters to the process flanges before coupling them to the sensor. Optimum torque is 2.75 ±0.25 Kgf.m.

The fitting of the sensor must be done with the main board out of the electronic housing. Mount the sensor to the housing turning clockwise until it stops. Then turn it counterclockwise until it faces the protective cover **(1)** parallel to the process flange. Tighten the hex screw **(20)** to lock the housing to the sensor.

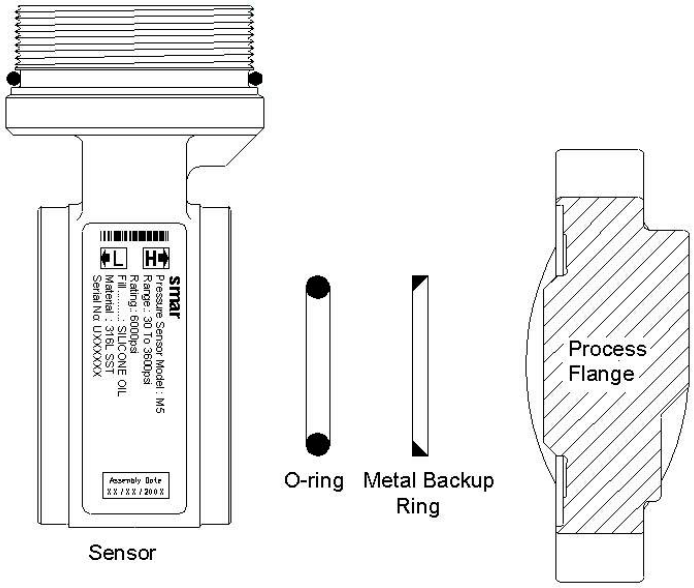


Figure 4.1 - Backup Ring Mounting

Electronic Circuit

Plug sensor connector and power supply connector to main board.

Attach the display to the main board. Observe the four possible mounting positions. The SMAR mark indicates the up position.

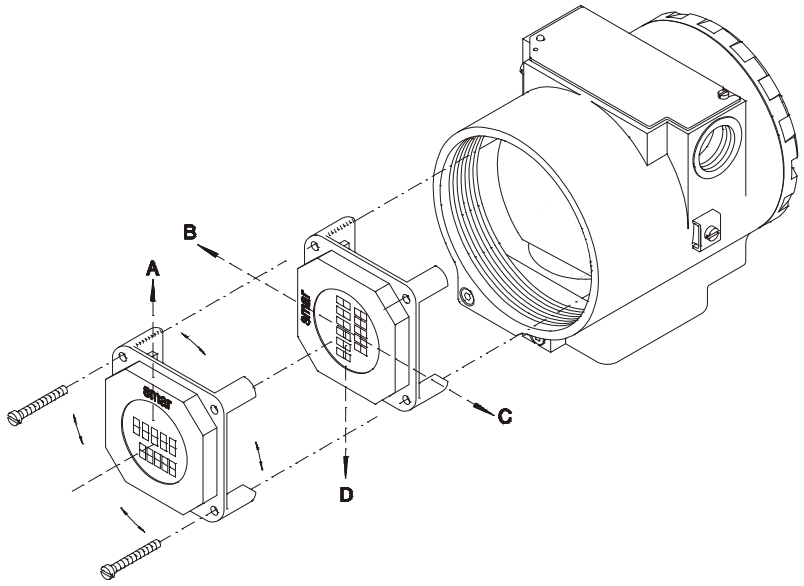


Figure 4.2 - Four Possible Positions of the Display

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

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

Interchangeability

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

Each time the power is turned on, the main circuit reads the sensor serial number. If it is different from the number stored in the memory, the circuit recognizes that there is a new sensor and the following information is transferred from the sensor to the main circuit;

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

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

Upgrading LD301 to LD302

The sensor and housing of the LD301 is exactly the same as the **LD302**. By changing the circuit board of the LD301 it becomes a **LD302**. The display on the LD301 version 5.XX is the same as on **LD302** and can therefore be used with the **LD302** upgrade circuit board. With an LD301 version three or earlier, that display cannot be used.

Upgrading the LD301 to a **LD302** is therefore very much the same as the procedure for replacing the main board described above.

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

Caution with the circuit boards must be as mentioned above.

Pull the LD301 main board out of the housing; disconnect the power supply and the sensor connectors.

Replace the **LD302** main board reversing the procedure for removing the LD301 circuit.

Returning Materials

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

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

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

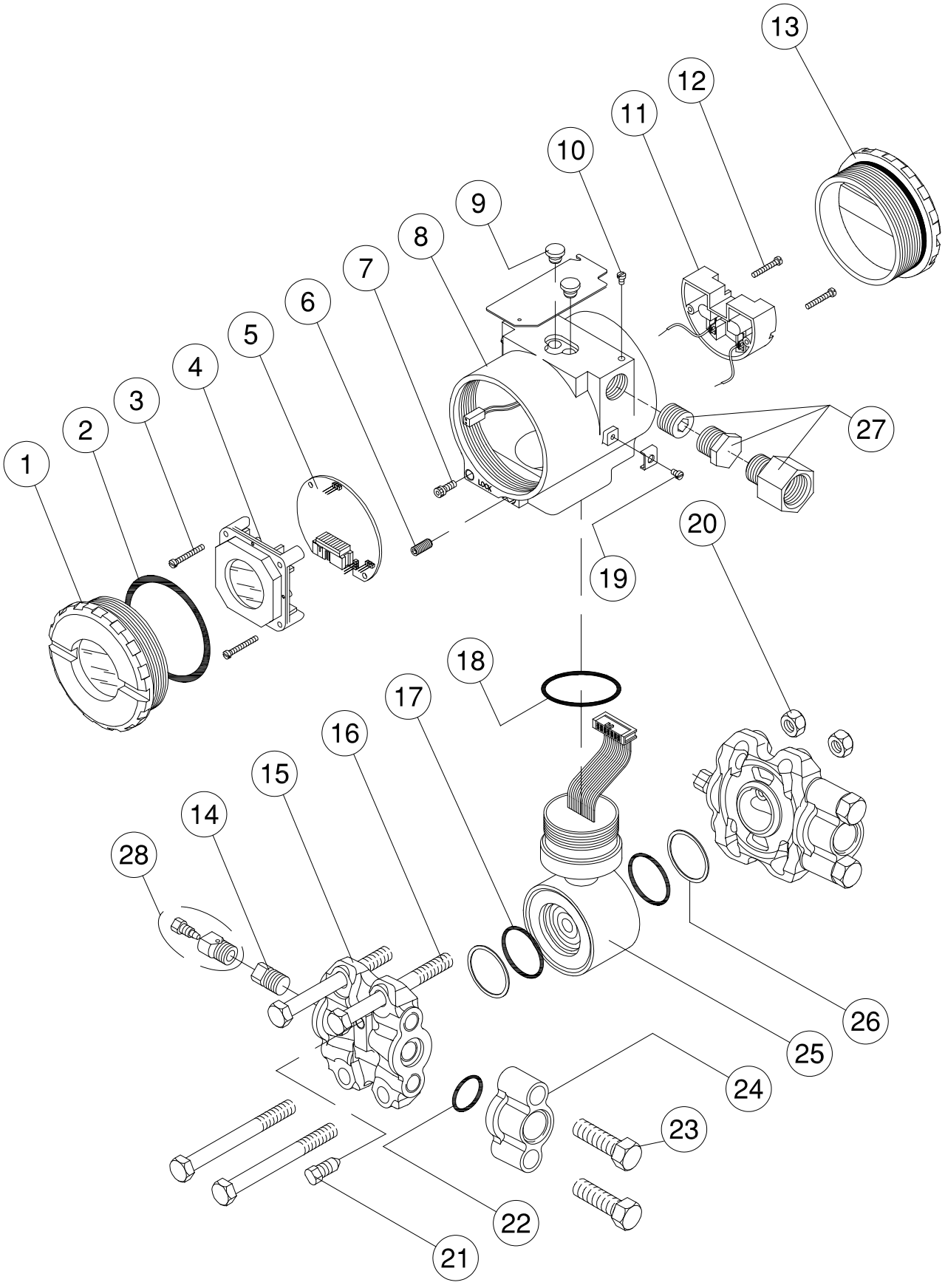


Figure 4.4 - Exploded View

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

SPARE PARTS LIST			
DESCRIPTION OF PARTS	**POSITION**	**CODE**	**CATEGORY (NOTE 1)**
HOUSING, Aluminum (NOTE 2)			
½ - 14 NPT	8	304-0130	
M20 x 1.5	8	304-0131	
PG 13.5 DIN	8	304-0132	
HOUSING, 316 SS (NOTE 2)			
½ - 14 NPT	8	304-0133	
M20 x 1.5	8	304-0134	
PG 13.5 DIN	8	304-0135	
COVER (INCLUDES O'RING)			
Aluminum	1 and 13	204-0102	
316 SS	1 and 13	204-0105	
COVER WITH WINDOW FOR INDICATION (INCLUDES O'RING)			
Aluminum	1	204-0103	
316 SS	1	204-0106	
COVER LOCKING SCREW	7	204-0120	
SENSOR LOCKING SCREW			
Without Head M6 Screw	6	400-1121	
EXTERNAL GROUND SCREW	22	204-0124	
IDENTIFICATION PLATE FIXING SCREW	10	204-0116	
DIGITAL INDICATOR	4	214-0108	
TERMINAL INSULATOR	11	400-0059	
MAIN ELECTRONIC CIRCUIT BOARD	5	400-0297	A
FLANGE (WITH HOLE FOR DRAIN/VENT)			
Plated Carbon Steel	15	204-0501	
Stainless Steel 316	15	204-0502	
Hastelloy C276	15	204-0503	
Monel 400	15	204-0504	
FLANGE (WITHOUT HOLE FOR DRAIN/VENT)			
Plated Carbon Steel	15	204-0511	
Stainless Steel 316	15	204-0512	
Hastelloy C276	15	204-0513	
Monel 400	15	204-0514	
BLANK FLANGE (FOR GAGE AND ABSOLUTE MODELS)			
Plated Carbon Steel	15	204-1101	

Stainless Steel 316	15	204-1102	
ADAPTER			
Plated Carbon Steel	24	203-0601	
Stainless Steel 316	24	203-0602	
Hastelloy C276	24	203-0603	
Monel 400	24	203-0604	
O'RINGS (NOTE 3)			
Cover, Buna-N	2	204-0122	B
Neck, Buna-N	21	204-0113	B
O'RINGS (NOTE 3)			
Flange, BUNA-N	17	203-0401	B
Flange, VITON	17	203-0402	B
Flange, TEFLON	17	203-0403	B
Flange, ETHYLENE/PROPYLENE	17	203-0404	B
Flange, TEFLON with spring LOADED **(NOTE 6)**	17	203-0405	B
Adapter, BUNA-N	22	203-0701	B
Adapter, VITON	22	203-0702	B
Adapter, TEFLON	22	203-0703	B
Adapter, ETHYLENE/PROPYLENE	22	203-0704	B
TERMINAL HOLDING SCREW			
Housing in Aluminum	12	304-0119	
Housing in 316 Stainless Steel	12	204-0119	
MAIN BOARD SCREW HOUSING IN ALUMINUM			
Units with indicator	3	304-0118	
Units without indicator	3	304-0117	
MAIN BOARD SCREW HOUSING IN 316 STAINLESS STEEL			
Units with indicator	3	204-0118	
Units without indicator	3	204-0117	
FLANGE BOLT			
Carbon Steel	16	203-0300	
Stainless Steel 316	16	203-0310	
FLANGE NUT			
Carbon Steel	20	203-0302	
Stainless Steel 316	20	203-0312	
ADAPTER BOLT			
Carbon Steel	23	203-0350	
Stainless Steel 316	23	203-0351	
DRAIN/VENT SCREW			
Stainless Steel 316	21	203-1401	A
Hastelloy C276	21	203-1402	A
Monel 400	21	203-1403	A
FLANGE PLUG (STOPPER)A			
Stainless Steel 316	14	203-0552	
Hastelloy C276	14	203-0553	
Monel 400	14	203-0554	

MOUNTING BRACKET FOR 2" PIPE MOUNTING (NOTE 5)			
Carbon Steel	-	203-0801	
Stainless Steel 316	-	203-0802	
Carbon Steel with bolts, nuts, washers and U-clamp in 316SS	-	203-0803	
LOCAL ADJUSTMENT PROTECTION CAP	9	204-0114	
SENSOR	25	(**NOTE 4**)	B
DRAIN/VENT VALVE			
316 SST	28		
PLUG			
1/2 NPT Internal Hexagon Plug in Plated CS (Ex d) 1/2 NPT Internal Hexagon Plug in 304 SST (Ex d) M20 X 1.5 External Hexagon Plug in 316 SST (Ex d) PG 13.5 External Hexagon Plug in 316 SST (Ex d) 1/2 NPT Internal Socket Set Plug in Plated CS 1/2 NPT Internal Socket Set Plug in 304 SST	27 27 27 27 27 27	400-0808 400-0809 400-0810 400-0811 400-0583-11 400-0583-12	
ADAPTER FOR ELECTRIC CONNECTION			
3/4 NPT female for 1/2 NPT male, SST 316	-	400-0812	

NOTE

1 - For category **A**, it is recommended to keep, in stock, 25 parts installed for each set, and for category **B**, 50.
2 - Includes Terminal Block, Screws, caps and Identification plate without certification.
3 - O-rings and Backup Rings are packaged in packs of 12 units, except for spring loaded.
4 - To specify sensors, use the following tables.
5 - Including U-Clamp, nuts, bolts and washers
6 - For this type, O-Ring pack has 1 piece.

Smar Insulator Kit

The Insulator Kit Smar prevents the generation of galvanic current between metals when in contact. The difference of potential between the metals generates this current that flows from the metal with higher potential to the other. This process in the presence of aqueous solution with salts, acids or bases can start the corrosion process, where the corroded metal is always the one with bigger potential (anode).

In the processes, when it is impossible to isolate the two potencialized metals, occurs the generation of galvanic current. This current will form free ions of hydrogen (H+) in one of the solutions, with tendency to start the corrosion and the migration of the Hydrogen to the diaphragm of the Remote Seal or of the Level Transmitter.

The figure 6.3 shows the following parts that constitute the Smar Insulator Kit: Teflon Gasket (**6**), Nonmetallic Insulating Sleeve (**4**), Mica Washers (**3**) and Steel Washers (**2**).

Smar Insulator Kit Mounting

Mounting step by step:

1 – Insert all the Nonmetallic Insulating Sleeve (**4**); in the holes of the Sealed Flange (**5**);
2 – Put the Teflon Gasket (6) between the Flanges (**5** e **7**);
3 – Insert the Steel Washers (**2**) and the Mica Washers (**3**) in the bolts (**1**)
4 – Join the Flanges positioning its holes (**5** and **7**);
5 – Introduce the bolts in the holes of the flanges (**5** and **7**) and tighten the flanges with the nuts (**8**)
6 – Measure the resistance between the Sealed Flange (**5**) and the Flange of Process (**7**) that should be tending to the infinite to check the efficiency of the Insulator Kit.

NOTE

If the studs are used instead of the bolts, obey the same mounting sequence for the items 2, 3 and 4. This Insulator Kit can be applied with raised and flat face flanges.
The Gasket must be made of Teflon when the Smar Insulator Kit is indicated.

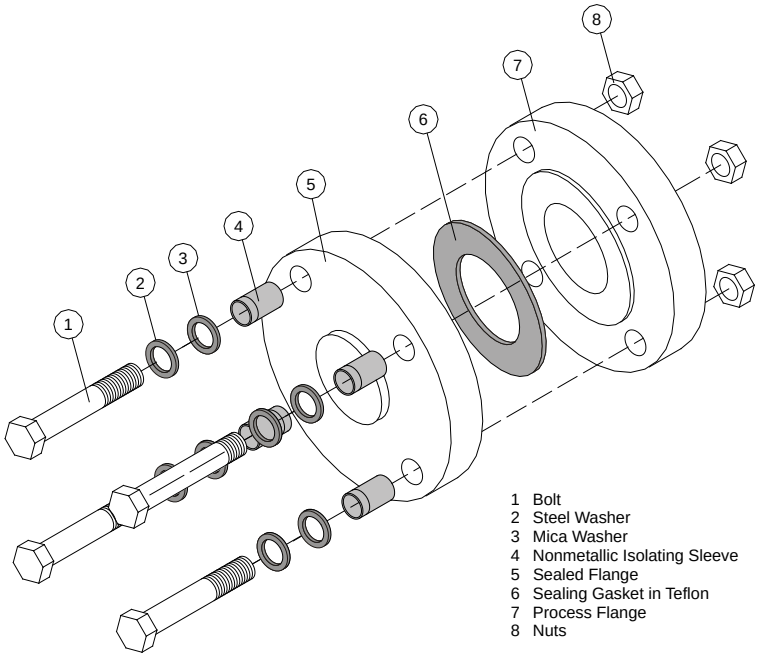


Figure 4.5 – Insulator Kit Mounting

INSULATOR KIT SPARE PARTS: LD300L				
ØN	GROUP	NORM	MODELS WITHOUT EXTENSION	MODELS WITH EXTENSION
			LD300L / SR301T	LD300L / SR301E
1”	150	ANSI B 16.5	400-0861-11X01	400-0861-11X11
	300		400-0861-12X01	400-0861-12X11
	600		400-0861-13X01	400-0861-13X11
1.1/2”	150		400-0861-21X01	400-0861-21X11
	300		400-0861-22X01	400-0861-22X11
	600		400-0861-23X01	400-0861-23X11
2”	150		400-0861-31X01	400-0861-31X11
	300		400-0861-32X01	400-0861-32X11
	600		400-0861-33X01	400-0861-33X11
3”	150		400-0861-41X01	400-0861-41X11
	300		400-0861-42X01	400-0861-42X11
	600		400-0861-43X01	400-0861-43X11
4”	150		400-0861-51X01	400-0861-51X11
	300		400-0861-52X01	400-0861-52X11
	600		400-0861-53X01	400-0861-53X11
DN25	PN10/40	DIN EN1092-1	400-0861-64X01	400-0861-64X11
DN40	PN10/40		400-0861-74X01	400-0861-74X11
DN50	PN10/40		400-0861-84X01	400-0861-84X11
DN80	PN10/40		400-0861-94X01	400-0861-94X11
DN100	PN16		400-0861-A8X01	400-0861-A8X11
	PN40		400-0861-A4X01	400-0861-A4X11
40A	20K	JIS B 2202	400-0861-B6X01	400-0861-B6X11
50A	10K		400-0861-C5X01	400-0861-C5X11
	40K		400-0861-C7X01	400-0861-C7X11
80A	10K		400-0861-D5X01	400-0861-D5X11
	20K		400-0861-D6X01	400-0861-D6X11
100A	10K		400-0861-E5X01	400-0861-E5X11

Table 4.2 – LD300L – Codes to the Spare parts of the Insulator Kit

See Figure 4.5.

SPARE PARTS: LD300L						
ØN	GROUP	NORM	GASKET			DRAIN VALVE
			TEFLON	COPPER	GRAFOIL	STAINLESS STEEL 316L
1”	ALL	ANSI-B16.5	400-0425	400-0426	400-0427	400-0792
1.1/2”	ALL		400-0428	400-0429	400-0430	
2”	ALL		400-0431	400-0432	400-0433	
3”	ALL		400-0434	400-0435	400-0436	
4”	ALL		400-0437	400-0438	400-0439	
DN25	ALL	EN 1092-1/2501	400-0440	400-0441	400-0442	
DN40	ALL		400-0443	400-0444	400-0445	
DN50	ALL		400-0446	400-0447	400-0448	
DN80	ALL		400-0449	400-0450	400-0451	
DN100	PN10/16		400-0452	400-0453	400-0454	
DN100	PN25/40		400-0455	400-0456	400-0457	

Table 4.3– LD300L – Codes to the Spare parts of the Gasket

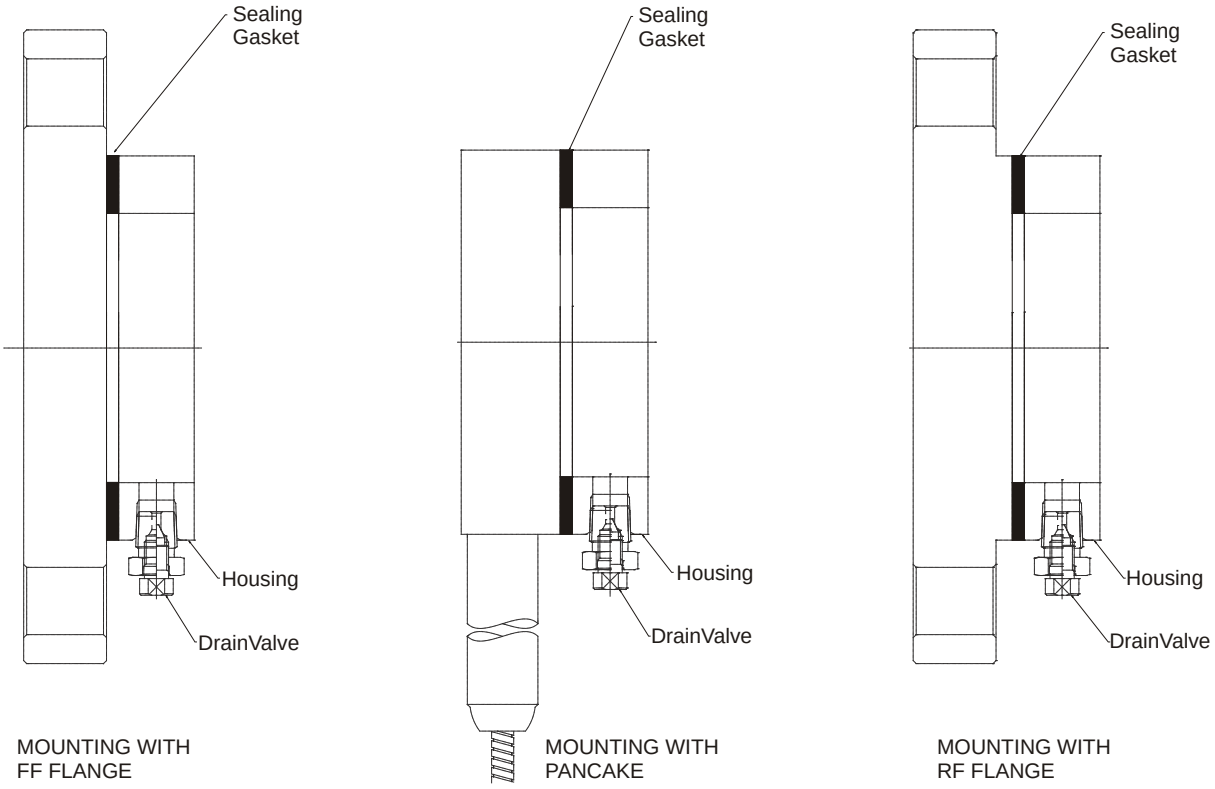


Figure 4.6 – LD300L- Sealing Gasket

RTJ SPARE PARTS: LD300L (without Extension)					
ØN	GROUP	NORM	RING	METALLIC RING	DRAIN VALVE
				STAINLESS STEEL 316L	STAINLESS STEEL 316L
1”	150	ANSI B 16.20 RTJ	R15	400-0887	400-0792
	300		R16	400-0888	
	600		R16	400-0888	
	1500		R16	400-0888	
	2500		R18	400-0889	
1.1/2”	150		R19	400-0890	
	300		R20	400-0891	
	600		R20	400-0891	
	1500		R20	400-0891	
	2500		R23	400-0893	
2”	150		R22	400-0892	
	300		R23	400-0893	
	600		R23	400-0893	
	1500		R24	400-0894	
	2500		R26	400-0895	
3”	150		R29	400-0896	
	300		R31	400-0897	
	600		R31	400-0897	
4”	150		R36	400-0900	
	300		R37	400-0901	
	600		R37	400-0901	

Table 4.4 – LD300L – Codes to the SST Metallic O-Ring

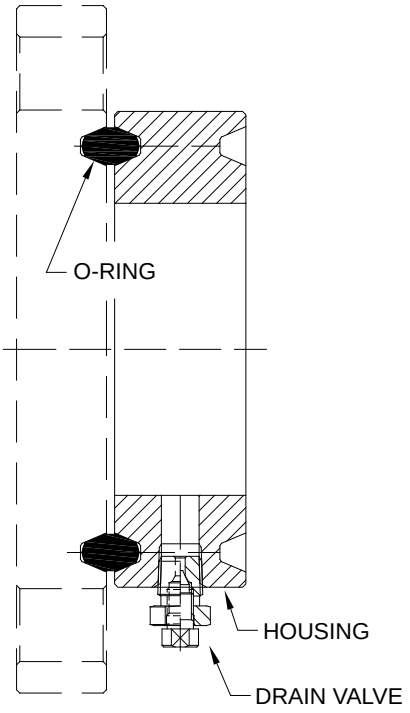


Figure 4.7 – SST Metallic O’Ring

ØN	CLASS	NORM	Ring	METALLIC RING
				316L SST
3”	1500	ANSI B 16.20 RTJ	R35	400-0899
	2500		R32	400-0898
4”	1500		R39	400-0903
	2500		R38	400-0902

Table 4.5 - LD300L – Special models for Gasket in Steel – Without Extension

Application with Halar

Technical Specification

Halar® is chemically one of the most resistant fluoropolymer. It is a thermoplastic of the melting process manufactured by Solvay Solexis, Inc. For its chemical structure, a 1:1 alternating ethylene copolymer and chlorinetrifluoroethylene, Halar® offers an only combination of useful properties.

The diaphragms in 316L Stainless Steel covered with Halar®, are ideal for applications in contact with aggressive liquids. They offer excellent resistance to the chemic and abrasion with a wide temperature range. Halar® does not contaminate liquids of high purity and it is not affected by most of corrosive chemists, usually found in the industries, including strong minerals, oxidant acids, alkalis, liquid oxygen and some organic solvents.

Halar® is trademark of *Solvay Solexis, Inc*.

Performance Specification

For the performance specification see the equation below:

[1% SPAN x (URL/SPAN)] - Included temperature error*****

Diameters/Capillary Length:

- 2” ANSI B 16.5, DN 50 DIN, JIS 50 A, for seals up to 3 meters of capillary and level models (by inquiry).
- 3” ANSI B 16.5, DN 80 DIN, JIS 80 A, for seals up to 5 meters of capillary and level models.
- 4” ANSI B 16.5, DN 100 DIN, JIS 100 A, for seals up to 8 meters of capillary and level models.

*Temperature Limits:
+10 to 100°C;
+101 to 150°C (by inquiry).

TPE – Total Probable Error (Software)

Software to calculate the assembly error of the Pressure Transmitters with the possible connections to the process.

TPE was developed to a fast and effective aid of the products related the pressure measurement. The users are the Applications Engineer and Commercial Areas. The customer can request a report of performance estimate to Smar.

This product allows doing simulations of possible assemblies, verifying important data as the error estimates of the response time, of capillary length analysis and mechanical resistance of diaphragms with temperature variation. See an example in the Figure 5.8.

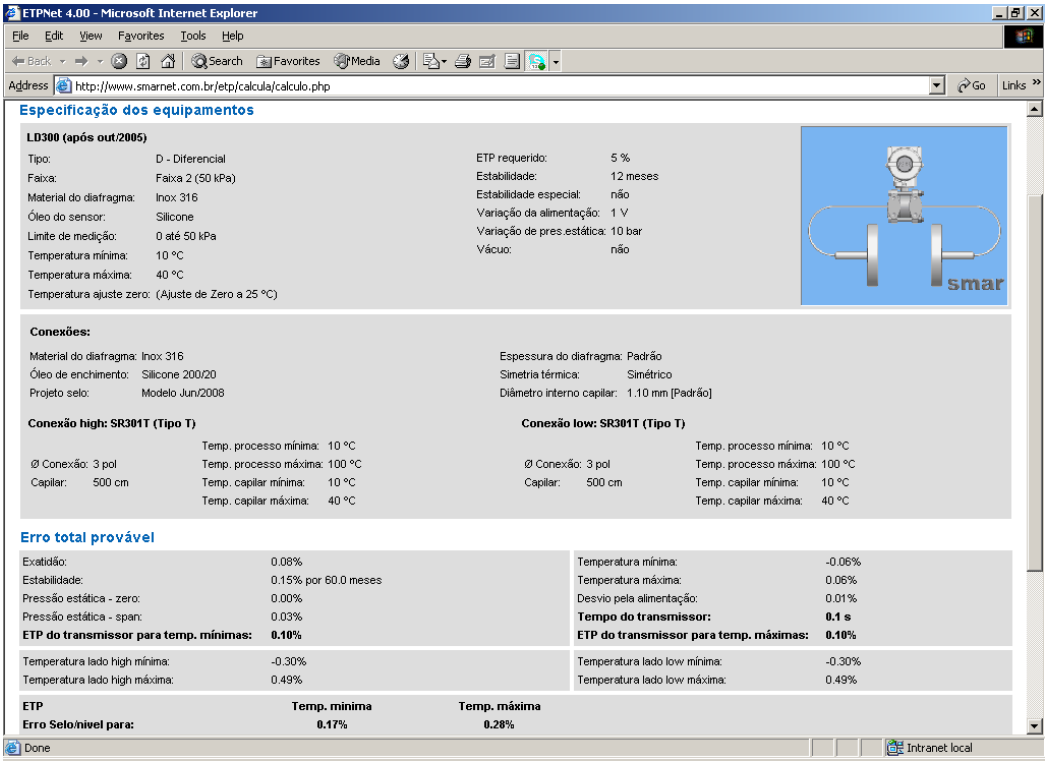


Figure 4.8 – TPE Software Screen

Ordering Code for the Sensor

204 – 0301 SENSOR FOR DIFFERENTIAL , FLOW, GAGE, ABSOLUTE AND HIGH STATIC PRESSURE TRANSMITTER

COD	Type	Range Limits Min.	Range Limits Max.	Min. Span	Unit	Range Limits Min.	Range Limits Max.	Min. Span	Unit
D0	Differential and Flow	-1	1	0.05	kPa	-4	4	0.2	inH_2O
D1	Differential and Flow	-5	5	0.13	kPa	-20	20	0.5	inH_2O
D2	Differential and Flow	-50	50	0.42	kPa	-200	200	1.67	inH_2O
D3	Differential and Flow	-250	250	2.08	kPa	-36	36	0.3	psi
D4	Differential and Flow	-2500	2500	20.83	kPa	-360	360	3	psi
M0	Gage	-1	1	0.05	kPa	-4	4	0.2	inH_2O
M1	Gage	- 5	5	0.13	kPa	-20	20	0.5	inH_2O
M2	Gage	- 50	50	0.42	kPa	-200	200	1.67	inH_2O
M3	Gage	-100	250	2.08	kPa	-14.50	36	0.3	psi
M4	Gage	-100	2500	20.83	kPa	-14.50	360	3	psi
M5	Gage	- 0.1	25	0.21	Mpa	-14.50	3600	30	psi
M6	Gage	- 0.1	40	0.33	Mpa	-14.50	5800	48.3	psi
A1	Absolute	0	5	2.00	kPa	0	37	14.8	mmHga
A2	Absolute	0	50	2.50	kPa	0	7.2	0.36	psia
A3	Absolute	0	250	5.00	kPa	0	36	0.73	psia
A4	Absolute	0	2500	20.83	kPa	0	360	3	psia
A5	Absolute	0	25	0.21	Mpa	0	3600	30	psia
A6	Absolute	0	40	0.33	Mpa	0	5800	48.3	psia
H2	Differential – High Static Pressure	-50	50	0.42	kPa	-200	200	1.67	inH_2O
H3	Differential – High Static Pressure	-250	250	2.08	kPa	-36	36	0.3	psi
H4	Differential – High Static Pressure	-2500	2500	20.83	kPa	-360	360	3	psi
H5	Differential – High Static Pressure	-25	25	0.21	Mpa	-3600	-3600	30	psi

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.

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

204 – 0301	D2	1	⬅ TYPICAL MODEL NUMBER

NOTES

(1) Meets NACE MR – 01 – 75/ISO 15156 recommendations.
(2) Not available for absolute models nor for vacuum applications.
(3) Not available for range 0 and 1.
(4) Silicone Oil is not recommended for oxygen (O_2) or Chlorine service.
(5) Inert Fluid: Oxygen Compatibility, safe for oxygen service.

204-0301 SENSOR FOR FLANGED PRESSURE TRANSMITTER

COD.	Range Limits Min.	Range Limits Max.	Min. Span	Unit	Range limits Min.	Range limits Max.	Min. Span	Unit
L2	-50	50	1.25	kPa	-200	200	5	inH_2O
L3	-250	250	2.08	kPa	-36	36	0.3	psi
L4	-2500	2500	20.83	kPa	-360	360	3	psi
L5	-25000	25000	208.3	kPa	-3625	3625	30.2	psi

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.

Diaphragm material and Fill Fluid (Low Side)

COD.			COD.		
1	316L SST	Silicone Oil **(2)**	D	316L SST	Inert Oil Krytox **(15)**
2	316L SST	Inert Oil Fluorolube **(3) (15)**	E	Hastelloy C276	Inert Oil Krytox **(1) (15)**
3	Hastelloy C276	Silicone Oil **(1) (2)**	G	Tantalum	Inert Oil Krytox **(15)**
4	Hastelloy C276	nert Oil Fluorolube**(1)(3)(15)**	K	Monel 400	Inert Oil Krytox **(1) (15)**
5	Monel 400	Silicone Oil **(1) (2)**	M	Monel 400 Gold Plated	Silicone Oil **(1) (2)**
7	Tantalum	Silicone Oil **(2)**	P	Monel 400 Gold Plated	Inert Oil Krytox **(1) (15)**
8	Tantalum	Inert Oil Fluorolube **(3) (15)**	Q	316L SST	Inert Oil Halocarbon 4.2 **(15)**
9	316L SST	Fomblim Oil	R	Hastelloy C276	Inert Oil Halocarbon 4.2 **(1) (15)**
A	Monel 400	Fomblim Oil **(1)**	S	Tantalum	Inert Oil Halocarbon 4.2 **(15)**

Flange, Adapter and Drain/Vent Valves material (Low Side)

COD.		COD.	
A	304L SST	M	Monel 400 **(1)**
C	Plated CS (Drain/Vent in Stainless Steel) **(16)**	N	316 SST – CF8M (ASTM – A351) (Drain/Vent in Hastelloy C276) **(1)**
H	Hastelloy C276 (CW – 12MW, ASTM – A494) **(1)**	P	316 SST – CF8M (ASTM – A351) Flange with PVDF (Kynar) insert **(3) (4) (5)**
I	316 SST – CF8M (ASTM – A351)		

Wetted O'Ring Material (Low Side)

COD.		COD.		
0	Without O'Rings	K	Kalrez	**Note**: O'rings are not available on the sides with remote seals.
B	Buna N	T	Teflon	
E	Ethylene – Propylene	V	Viton	

Drain/Vent Position (Low Side)

COD.		COD.		
0	Without Drain/Vent	D	Bottom	**Note**: For better Drain/Vent operation, vent valves are strongly recommended.
A	Drain/Vent (Opposite to Process Connection)	U	Top	Drain/Vent valve not available on the sides with remote seals.

Process Connection (Low Side)

COD.		COD.		COD.	
0	¼ - 18 NPT (Without Adapter)	5	1/2 - 14 NPT Axial with PVDF Insert **(3) (4) (6)**	U	Low Volume Flange For Level Welded
1	1/2 - 14 NPT (Without Adapter)	9	Remote Seal (Low Volume Flange) **(3) (7)**	V	Without Connection (Mouting With Gage Flange)
3	Remote Seal (With Plug) **(7)**	T	1/2 14 BSP (With Adapter)	W	Without Connection (Absolut Reference)

Process Connection (Level tap)

COD.		COD.		COD.	
U	1" 150 # (ANSI B16.5) **(18)**	C	3" 600 # (ANSI B16.5)	S	JIS 40A 20K **(17)**
V	1" 300 # (ANSI B16.5) **(18)**	N	3" 600 # (ANSI B16.5 RTJ)	F	JIS 50A 10K **(17)**
W	1" 600 # (ANSI B16.5) **(18)**	3	4" 150 # (ANSI B16.5)	T	JIS 50A 40K **(17)**
O	1.1/2" 150 # (ANSI B16.5)	4	4" 300 # (ANSI B16.5)	K	JIS 50A 20K **(17)**
P	1.1/2" 300 # (ANSI B16.5)	D	4" 600 # (ANSI B16.5)	G	JIS 80A 10K **(17)**
Q	1.1/2" 600 # (ANSI B16.5)	5	DN 25 PN 10/40 **(18)**	L	JIS 80A 20K **(17)**
9	2" 150 # (ANSI B16.5)	R	DN 40 PN 10/40	H	JIS 100A 10K **(17)**
A	2" 300 # (ANSI B16.5)	E	DN 50 PN 10/40	M	JIS 100A 10K **(17)**
B	2" 600 # (ANSI B16.5)	6	DN 80 PN 10/40	Z	User's specification
1	3" 150 # (ANSI B16.5)	7	DN 100 PN 10/16		
2	3" 300 # (ANSI B16.5)	8	DN 100 PN 25/40		

Type and Flange Material (Level Tap)

COD.		COD.		COD.	
2	316 SST (Integral Flange)	4	304 SST (Slip-on Flange)	6	Carbon Steel (Slip-on Flange)
3	Hastelloy C276 (Integral Flange)	5	316 SST (Slip-on Flange)	Z	User's specification

Extension Length

COD.		COD.		
0	0 mm (0")	3	150 mm (6")	
1	50 mm (2")	4	200 mm (8")	Note: Extension Material 316 SST
2	100 mm (4")	Z	User's specification	

Diaphragm Material / Extension (Level Tap)

COD.		COD.	
A	304L SST / 304L SST	6	316L SST with Teflon Lining (For 2"and 3")
1	316L SST / 316 SST	7	316L SST Gold Plated
2	Hastelloy C276 / 316 SST	B	Tantalum with Teflon Lining
3	Monel 400 / 316 SST	L	316L SST Halar Plated **(14)**
4	Tantalum / 316 SST **(9)**	C	Hastelloy Teflon Plated
5	Titanium / 316 SST **(9)**		

Fill Fluid

COD.		COD.	
1	DC – 200/20 Silicone Oil	G	Glycerin + water **(11)**
3	DC704 Silicone Oil	B	Fomblim 06/06
2	MO – 10 Fluorolube Oil **(8)**	H	Halocarbon 4.2
4	Krytox Oil	T	Sylltherm 800 Oil
N	Neobee M20 Propylene Glycol Oil		

Housing Material

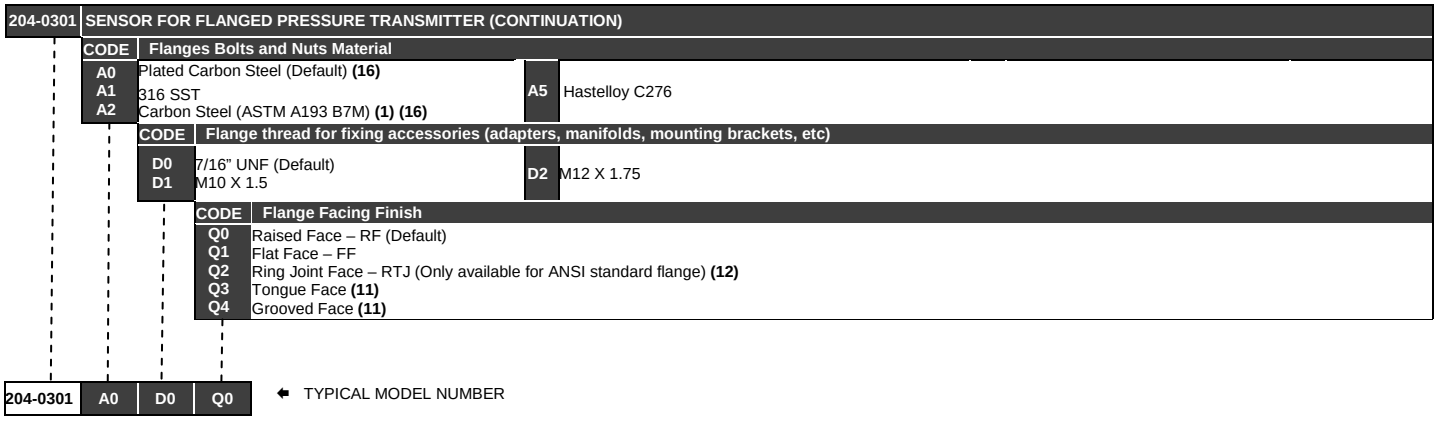
COD.	
0	Without Housing **(11)**
1	316 SST
2	Hastelloy C276
3	Super Duplex (UNS 32750) **(10)**
4	Duplex (UNS 31803) **(10)**
5	304L SST **(10)**

Gasket Material

COD.	
0	Without Gasket
T	Teflon (PTFE)
G	Grafoil (Flexible lead)
C	Copper
I	316 L SST

204-0301	L2	1	I	B	U	0	1	2	2	1	1	1	T

← TYPICAL MODEL NUMBER



NOTES	
(1) Meets NACE MR – 01 – 75/ISO 15156 recommendations.	**(14)** Applicable only to:
(2) Silicone Oils not recommendations for Oxygen (O_2) or Chlorine service.	**-** Thickness of steel: 0.05 mm
(3) Not applicable for vacuum service.	- Diameter/capillary length:
(4) Drain/Vent not applicable.	2" ANSI B 16.5 DN 50 DIN, JIS 50 A, for seals up to 3 meters of capillary and level models (by inquiry).
(5) O'Ring should be Viton or Kalrez.	3" ANSI B 16.5 DN 80 DIN, JIS 80 A, for seals up to 5 meters of capillary and level models.
(6) Maximum pressure 24 bar.	- Faces: RF and FF;
(7) For remote Seal only 316 SST - CF8M (ASTM A3510 flange is available (thread M12).	- Temperature Range: +10 to 100 ºC + 101 to 150 ºC (by inquiry)
(8) Fluorolube fill fluid is not available for Monel diaphragm.	- Not applicable for diaphragm thickness;
(9) Attention, check corrosion rate for the process, tantalum plate 0.1 mm, AISI 316L extension 3 to 6mm.	- Not applicable for use with gaskets.
(10) Item by inquiry.	**(15)** Inert Fluid: safe for oxygen service.
(11) Supplied without Gasket.	**(16)** Not applicable for saline atmosphere.
(12) Gasket for housing, available only in Stainless 316.	**(17)** Not available for slip-on flange.
(13) Range of application of temperature from -40 ºC to 150 ºC.	**(18)** Not available for integral flange.

204-0301 SENSOR FOR SANITARY PRESSURE TRANSMITTER

COD.	Range Limits Min.	Range Limits Max.	Min. Span	Unit
S2	-50	50	1.25	kPa
S3	-250	250	2.08	kPa
S4	-2500	2500	20.83	kPa
S5	-25000	25000	208.3	kPa

Range Limits Min.	Range Limits Max.	Min. Span	Unit
-200	200	5	inH_2O
-36	36	0.3	psi
-360	360	3	psi
-3625	3625	30.2	psi

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)

COD.		
1	316L SST	Silicone Oil **(2)**
2	316L SST	Inert Oil Fluorolube **(3) (12)**
3	Hastelloy C276	Silicone Oil **(1) (2)**
4	Hastelloy C276	Inert Oil Fluorolube**(1)(3)(12)**
5	Monel 400	Silicone Oil **(1) (2)**
7	Tantalum	Silicone Oil **(2)**
8	Tantalum	Inert Oil Fluorolube **(3) (12)**
9	316L SST	Fomblim Oil
A	Monel 400	Fomblim Oil **(1)**
D	316L SST	Inert Oil Krytox **(12)**
E	Hastelloy C276	Inert Oil Krytox **(1) (12)**
G	Tantalum	Inert Oil Krytox **(12)**
K	Monel 400	Inert Oil Krytox **(1) (12)**
M	Monel 400 Gold Plated	Silicone Oil **(1) (2)**
P	Monel 400 Gold Plated	Inert Oil Krytox **(1) (12)**
Q	316L SST	Inert Oil Halocarbon 4.2 **(12)**
R	Hastelloy C276	Inert Oil Halocarbon 4.2 **(1) (12)**
S	Tantalum	Inert Oil Halocarbon 4.2 **(12)**

COD. Flange, Adapter and Drain/Vent Valves Material (Low Side)

COD.		
C	Plated CS (Drain/Vent in Stainless Steel) **(13)**	
H	Hastelloy C276 (CW – 12MW, ASTM – A494) **(1)**	
I	316 SST – CF8M (ASTM – A351)	
M	Monel 400 **(1)**	
N	316 SST – CF8M (ASTM – A351) (Drain/Vent in Hastelloy C276) **(1)**	
P	316 SST – CF8M (ASTM – A351) Flange with PVDF (Kynar) insert **(3) (4) (5)**	

COD. Wetted O'Ring Material (Low Side)

COD.		
0	Without O'Rings	
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)

COD.		
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)

COD.		
0	1/4 - 18 NPT (Without Adapter)	
1	1/2 - 14 NPT (Without 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) (7)**	
T	1/2 14 BSP (With Adapter)	
U	Low Volume Flange For Level Welded	
V	Without Connection (Mounting with Gage Flange)	
W	Without Connection (Absolut Reference)	

COD. Process Connection (Level tap)

COD.		
8	Threaded DN25 DIN 11851 – with extension / 316L SST **(9)(10)**	
9	Threaded DN40 DIN 11851 - with extension / 316L SST **(9)(10)**	
H	Threaded DN40 DIN 11851 – without extension / 316L SST **(9)**	
V	Threaded DN50 DIN 11851 - with extension / 316L SST **(9)(10)**	
U	Threaded DN50 DIN 11851 - without extension / 316L SST **(9)**	
X	Threaded DN80 DIN 11851 - with extension / 316L SST **(9)(10)**	
W	Threaded DN80 DIN 11851 - without extension / 316L SST **(9)**	
4	Threaded IDF 2" - with extension / 316L SST **(9) (10)**	
B	Threaded IDF 2" – without extension / 316L SST **(9) (10)**	
K	Threaded IDF 3" - with extension / 316L SST **(9) (10)**	
3	Threaded IDF 3" - without extension / 316L SST **(9) (10)**	
5	Threaded RJT 2" - with extension / 316L SST **(9) (10)**	
C	Threaded RJT 2" - without extension / 316L SST **(9)**	
L	Threaded RJT 3" - with extension / 316L SST **(9) (10)**	
2	Threaded RTJ 3" - without extension / 316L SST **(9)**	
S	Threaded SMS 1 1/2" – without extension / 316L SST **(9) (10)**	
7	Threaded SMS 2" - with extension / 316L SST **(9) (10)**	
E	Threaded SMS 2" – without extension / 316L SST **(9) (10)**	
M	Threaded SMS 3" - with extension / 316L SST **(9) (10)**	
1	Threaded SMS 3" - without extension / 316L SST **(9) (10)**	
F	Tri-Clamp 1 1/2" – without extension / 316L SST **(10)**	
Q	Tri-Clamp 1 1/2" HP (High Pressure) - without extensio/ 316L SST n **(8) (10)**	
6	Tri-Clamp 2" - with extension / 316L SST **(10)**	
D	Tri-Clamp 2" – without extension / 316L SST **(10)**	
N	Tri-Clamp 2" HP (High Pressure) - with extension / 316L SST **(8) (10)**	
P	Tri-Clamp 2" HP (High Pressure) – without extension / 316L SST **(8) (10)**	
I	Tri-Clamp 3" - with extension / 316L SST **(10)**	
G	Tri-Clamp 3" – without extension / 316L SST **(10)**	
J	Tri-Clamp 3" HP (High Pressure) - with extension / 316L SST **(8) (10)**	
R	Tri-Clamp 3" HP (High Pressure) – without extension o **(8) (10)**	
Z	User's specification	

COD. Diaphragm Material (Level Tap)

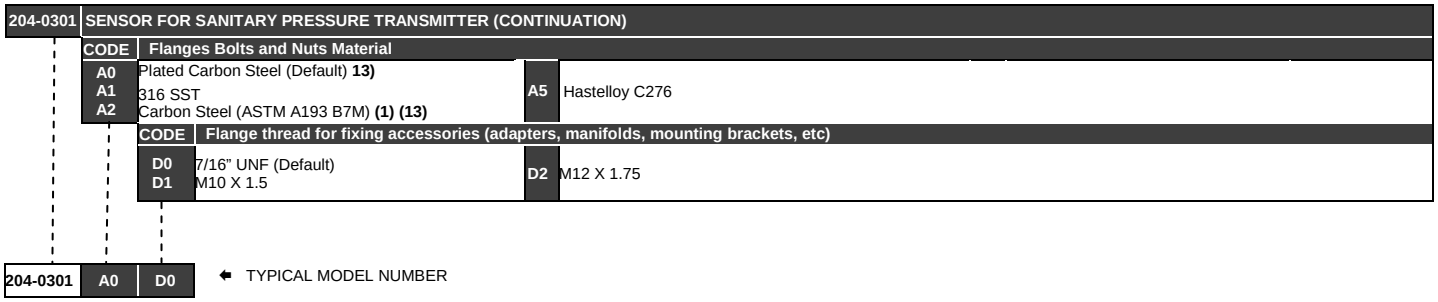
COD.		
1	316L SST	
2	Hastelloy C276	
3	Monel 400	
4	Tantalum **(11)**	
5	Titanium **(11)**	
6	316L SST with Teflon Lining (For 2"and 3")	
7	316L SST Gold Plated	
B	Tantalum with Teflon Lining	
L	316L SST Halar Plated **(20)**	
C	Hastelloy Teflon Plated	

COD. Fill Fluid

COD.		
1	DC – 200/20 Silicone Oil	
3	DC704 Silicone Oil	
2	MO – 10 Fluorolube Oil **(8)**	
4	Krytox Oil	
N	Neobee M20 Propylene Glycol Oil (Approved 3A) **(10)**	
G	Glycerin + water **(11)**	
B	Fomblim 06/06	
H	Halocarbon 4.2	
T	Sylltherm 800 Oil	

204-0301	L2	1	I	B	U	0	1	2	2

⬅ TYPICAL MODEL NUMBER



NOTES

(1) Meets NACE MR – 01 – 75/ISO 15156 recommendations.
(2) Silicone Oils not recommendations 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) For remote Seal only 316 SST - CF8M (ASTM A3510 flange is available (thread M12).
(8) HP – High Pressure
(9) Not available for tri-clamp connections.
(10) Compliant with 3A-7403 standard for food and other applications where sanitary connections are required.:
- Neobee M2O Fill Fluid
- Finishing wet Face: 0,8 µm Ra (32 µ" AA)
- Wet O-Ring: Viton, Buna-N and Teflon

(11) Item by inquire.
(12) Inert Fluid: Oxygen Compatibility, safe for oxygen service.
(13) Not applicable for saline atmosphere.

TECHNICAL CHARACTERISTIC

Functional Specifications	
Process Fluid	Liquid, gas or vapor.
Output	Digital only. Complies with IEC 61158-2 (H1): 31.25kbit/s voltage mode, bus powered.
Power Supply	Bus powered: 9 – 32 Vdc. Quiescent current consumption: 12 mA
Indicator	4 1/2-digit numerical and 5-character alphanumerical LCD indicator (optional).
Hazardous Area Certifications	Explosion proof (FM, CSA, NEMKO, CEPEL), intrinsic safe (FM, CSA, NEMKO, EXAM, CEPEL, NEPSI), dust ignition proof and non-incendive (FM). FISCO Field Device Ex ia IIC T4 (FM, CSA, NEMKO, EXAM, CEPEL, NEPSI) FNICO Field Device Ex n1 IIC T4 (FM, CSA, NEMKO, EXAM, CEPEL)
European Directive Information	**Authorized representative in European Community** Smar Gmbh-Rheingaustrasse 9-55545 Bad Kreuzanach **PED Directive (97/23/EC) – Pressure Equipment Directive** This product is in compliance with the directive and it was designed and manufactured in accordance with sound engineering practice using several standards from ANSI, ASTM, DIN and JIS. **EMC Directive (2004/108/EC) - Eletromagnetic Compatibility** The EMC test was performed according to IEC standard: IEC61326-1:2006, IEC61326-2-3:2006, IEC61000-6-4:2006, IEC61000-6-2:2005. For use in environment only. Keep the shield insulated at the instrument side, connecting the other one to the ground if necessary to use shielded cable. **ATEX Directive (94/9/EC) – Equipment and protective systems intended for use in potentially explosive atmospheres** This product was certified according European Standards at NEMKO and EXAM (old DMT). The certified body for manufacturing quality assessment is EXAM (number 0158). **LVD Directive 2006/95/EC – Electrical Equipment designed for use within certain voltage limits** According the LVD directive Annex II the equipment under ATEX "Electrical equipment for use in an explosive atmosphere" directive are excluded from scope from this directive. The EC declarations of conformity for all applicable European directives for this product can be found at www.smar.com.
Zero and Span Adjustments	Noninteractive, via digital communication.
Failure Alarm (Diagnostics)	For sensor circuit failures, events are generated and status is sent to link outputs. Detailed diagnostics are available in the contained parameters.
Temperature Limits	Ambient: -40 to 85 °C (-40 to 185 °F) Process: -40 to 100 °C (-40 to 212 °F) (Silicone oil) 0 to 85 °C (32 to 185 °F) (Halocarbon and Fluorolube oil) -20 to 85 °C (-4 to 185 °F) (Krytox oil and Fomblim oil) -25 to 85 °C (-13 to 185 °F) (Viton O-ring) -40 to 150 °C (-40 to 302 °F) (**LD302L**) Storage: -40 to 100 °C (-40 to 212 °F) Display: -20 to 80 °C (-4 to 176 °F) -40 to 85 °C (-40 to 185 °F) (Without damage)
Turn-on Time	Performs within specifications in less than 10 seconds after power is applied to the transmitter.
Configuration	Basic configuration may be done using the local adjustment magnetic tool if device is fitted with display. Complete configuration is possible using configuration tools.
Volumetric Displacement	Less than 0.15 cm^3 (0.01 in^3)
Overpressure and Static Pressure Limits (MWP – Maximum Working Pressure)	**From 3.45 kPa abs. (0.5 psia)* to:** 0.5 MPa (72.52 psi) for range 0 8 MPa (1150 psi) for range 1 16 MPa (2300 psi) for ranges 2, 3 & 4 32 MPa (4600 psi) for models H2 to H4 40 MPa (5800 psi) for range 5 52 MPa (7500 psi) for range 6 ** Except the LD302A model* Flange Test Pressure: 60 MPa (8570 psi) **For ANSI/DIN Level flanges (LD302L models):** 150lb: 6 psia to 230 psi (-0.6 to 16 bar) at 38 °C (100.8 ºF) 300lb: 6 psia to 600 psi (-0.6 to 41 bar) at 38 °C (100.8 ºF) 600lb: 6 psia to 1200 psi (-0.6 to 83 bar) at 38 °C (100.8 ºF) PN10/16: - 60 kPa to 1.4 MPa at 120 °C (248 °F)

Functional Specifications	
	PN25/40: - 60 kPa to 4 MPa at 120 °C (248 °F) The above pressures will not damage the transmitter, but a new calibration may be necessary.
Humidity Limits	0 to 100% RH
Damping Adjustment	User configurable (via digital communication).

Performance Specifications	
Reference Conditions	Span starting at zero, temperature of 25°C (77°F), atmospheric pressure, power supply of 24 Vdc, silicone oil fill fluid, isolating diaphragms in 316L SST and digital trim equal to lower and upper range values.
Accuracy	**For differential and gage transmitters, ranges 1, 2, 3, 4, 5 and 6:** **0.1 URL ≤ span ≤ URL:** ± 0.075% of span **0.025 URL ≤ span < 0.1 URL:** ± [0.0375 + 0.00375 URL/span]% of span **0.0085 URL ≤ span < 0.025 URL:** ± [0.0015+0.00465 URL/span]% of span **For absolute transmitters ranges 2, 3, 4, 5 and 6, diaphragms in Tantalum or Monel or fill fluid in Fluorolube:** **0.1 URL ≤ span ≤ URL:** ± 0.1% of span **0.025 URL ≤ span < 0.1 URL:** ± [0.05 + 0.005 URL/span]% of span **0.0085 URL ≤ span < 0.025 URL:** ± [0.01 + 0.006 URL/span]% of span **For differential and gage transmitter range 0, diaphragms in 316L SST and fill fluid in Silicone or Halocarbon:** **0.2 URL ≤ span ≤ URL:** ± 0.1% of span **0.05 URL ≤ span < 0.2 URL:** ± [0.025 + 0.015 URL/span]% of span **For Absolute, range 1:** 0.2% of span Linearity, hysteresis and repeatability effects are included.
Stability	**For ranges 2, 3, 4, 5 and 6:** ± 0.15% of URL for 5 years at 20 °C temperature change and up to 7 MPa (1000 psi) of static pressure **For ranges 0 and 1:** ± 0.2% of URL for 12 months at 20 °C temperature change and up to 100 kPA (1 bar) of static pressure **For level transmitters:** ± 0.2% of URL for 12 months at 20 °C temperature change
Temperature Effect	**For ranges 2, 3, 4, 5 and 6:** **0.2 URL ≤ span ≤ URL:** ± [0.02% URL + 0.06% span] per 20 °C (68 °F) **0.0085 URL ≤ span < 0.2 URL:** ± [0.023% URL + 0.045% span] per 20 °C (68 °F) **For range 1:** **0.2 URL ≤ span ≤ URL:** ± [0.08% URL + 0.05% span] per 20 °C (68 °F) **0.025 URL ≤ span < 0.2 URL:** ± [0.06% URL + 0.15% span] per 20 °C (68 °F) **For range 0:** **0.2 URL ≤ span ≤ URL:** ± [0.15% URL + 0.05% span] per 20 °C (68 °F) **0.05 URL ≤ span < 0.2 URL:** ± [0.1% URL + 0.3% span] per 20 °C (68 °F) **For LD302L:** 6 mmH_2O per 20 °C for 4” and DN100 17 mmH_2O per 20 °C for 3” and DN80 Consult for other flange dimensions and fill fluid.
Static Pressure Effect	**Zero error:** **For ranges 2, 3, 4, 5 and 6:** ± 0.033% URL per 7MPa (1000 psi) **For range 1:** ± 0.05% URL per 1.7 MPa (250 psi) **For range 0:** ± 0.1% URL per 0.5 MPa (5 bar) **For level transmitters:** ± 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, 5 and 6:** correctable to ± 0.2% of reading per 7MPa (1000 psi) **For range 1and level transmitters:** correctable to ± 0.2% of reading per 3.5 MPa (500 psi) **For range 0:** correctable to ± 0.2% of reading per 0.5 MPa (5 bar)
Power Supply Effect	± 0.005% of calibrated span per volt
Mounting Position Effect	Zero shift of up to 250 Pa (1 inH_2O) which can be calibrated out. No span effect.
Electromagnetic Interference Effect	Approved according to IEC61326-1:2006, IEC61326-2-3:2006, IEC61000-6-4:2006, IEC61000-6-2:2005.

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

Physical Specifications	
Electrical Connection	1/2 - 14 NPT M20 X 1.5 PG 13.5 DIN 3/4 - 14 NPT (with 316 SST adapter for 1/2 - 14 NPT) 3/4 - 14 BSP (with 316 SST adapter for 1/2 - 14 NPT) 1/2 - 14 BSP (with 316 SST adapter for 1/2 - 14 NPT) **Note:** Explosion Proof approvals do not apply to adapter, only to Transmitter
Process Connection	1/4 - 18 NPT or 1/2 -14 NPT (with adapter) For L models see Ordering Code. See Ordering Code for more options.
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-CF8M (ASTM - A351), Hastelloy C276-CW-12MW (ASTM - A494) or Monel 400 **Wetted O-Rings (For Flanges and Adapters):** Buna N, Viton™ or PTFE. Ethylene-Propylene. The **LD302** 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 or IP66W*, IP68 or IP68W*. **The IP66/68W sealing test (immersion) was performed at 1 bar for 24 hours. For any other situation, please consult Smar. IP66/68W tested for 200h to according NBR 8094 / ASTM B 117 standards.* **Blank Flange:** When flange adapter and Drain/Vent material is carbon steel, blank flange is in carbon steel, otherwise blank flange is in 316 SST-CF8M (ASTM - A351) **Level Flange (LD302L):** 316 L SST, 304 SST, Hastelloy C276 and Plated Carbon Steel **Fill Fluid:** Silicone, Fluorolube, 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:** Plated carbon steel, Grade 8 or 316 SST For NACE applications: carbon steel ASTM A193 B7M **Identification Plate:** 316 SST
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. 5.85 to 9.0 kg (13 lb to 20 lb): L models depending on the flanges, extension and materials.
Control Functions Characteristics (Optional)	Function Blocks: RES, TRD, DSP, DIAG, AI, PID, APID, ARTH, INTG, ISEL, CHAR, AALM, TIME, LLAG, OSLD, CT and DENS.

Technical Characteristics of High Performance - CODE L1

High Performance option (code L1) is available under the following conditions only:

Application	Differential and Gage
Range	D2: -50 to 50 kPa -200 to 200 inH_2O D3: -250 to 250 kPa -36 to 36 psi D4: -2500 to 2500 kPa -360 to 360 psi M2: -50 to 50 kPa -200 to 200 inH_2O M3: -100 to 250 kPa -14.5 to 36 psi M4: -100 to 2500 kPa -14.5 to 360 psi
Diaphragm Material	316L SST or Hastelloy C276
Fill fluid	Silicone

Performance Specifications	
Reference Conditions	Span starting at zero, temperature of 25 °C (77 °F), atmospheric pressure, power supply of 24 Vdc, silicone oil fill fluid, isolating diaphragms in 316L SST and digital trim equal to lower and upper range values.
Accuracy	**RANGE 2:** **0.2 URL ≤ span ≤ URL:** ± 0.04% of span **0.05 URL ≤ span < 0.2 URL:** ± [0.021667 + 0.003667 URL/span]% of span **0.0085 URL ≤ span < 0.05 URL:** ± [0.0021 + 0.004645 URL /span]% of span **RANGES 3 and 4:** **0.1 URL ≤ span ≤ URL:** ± 0.05% of span; **0.05 URL ≤ span < 0.1 URL:** ± [0.005 + 0.045 URL/span]% of span **0.0085 URL ≤ span < 0.05 URL:** ± [0.0021+ 0.004645 URL/span]% of span
Stability	**For range 2:** ± 0.05% of URL for 6 months **For range 3:** ± 0.075% of URL for 12 months **For range 4:** ± 0.1% of URL for 24 months ± 0.2% of URL for 12 years, at 20 °C temperature change and up to 7 MPa (1000 psi) {70 bar} of static pressure, environment free of hydrogen migration.
Temperature Effect	**From -10 °C to 50 °C**, **protected from direct sun radiation:** **0.2 URL ≤ span ≤ URL:** ± [0.018% URL + 0.012% span] per 20 °C (68 °F) **0.0085 URL ≤ span < 0.2% URL:** ± [0.02% URL + 0.002% span] per 20 °C (68 °F)
Static Pressure Effect	**Zero error:** ± 0.025% URL per 7MPa (1000 psi) The zero error is systematic and can be eliminated by calibrating at the operating static pressure. **Span error:** Correctable to ± 0.2% of reading per 7 MPa (1000 psi)

Ordering Code

MODEL	DIFFERENTIAL , FLOW, GAGE, ABSOLUTE AND HIGH STATIC PRESSURE TRANSMITTER
LD302	FOUNDATION™ fieldbus

COD.	Type	Range Limits Min.	Range Limits Max.	Min. Span	Unit	Range Limits Min.	Range Limits Max.	Min. Span	Unit
D0	Differential and Flow	-1	1	0.05	kPa	-4	4	0.2	inH_2O
D1	Differential and Flow	-5	5	0.13	kPa	-20	20	0.5	inH_2O
D2	Differential and Flow	-50	50	0.42	kPa	-200	200	1.67	inH_2O
D3	Differential and Flow	-250	250	2.08	kPa	-36	36	0.3	psi
D4	Differential and Flow	-2500	2500	20.83	kPa	-360	360	3	psi
M0	Gage	-1	1	0.05	kPa	-4	4	0.2	inH_2O
M1	Gage	- 5	5	0.13	kPa	-20	20	0.5	inH_2O
M2	Gage	- 50	50	0.42	kPa	-200	200	1.67	inH_2O
M3	Gage	-100	250	2.08	kPa	-14.50	36	0.3	psi
M4	Gage	-100	2500	20.83	kPa	-14.50	360	3	psi
M5	Gage	- 0.1	25	0.21	MPa	-14.50	3600	30	psi
M6	Gage	- 0.1	40	0.33	MPa	-14.50	5800	48.3	psi
A1	Absolute	0	5	2.00	kPa	0	37	14.8	mmHga
A2	Absolute	0	50	2.50	kPa	0	7.2	0.36	psia
A3	Absolute	0	250	5.00	kPa	0	36	0.73	psia
A4	Absolute	0	2500	20.83	kPa	0	360	3	psia
A5	Absolute	0	25	0.21	Mpa	0	3600	30	psia
A6	Absolute	0	40	0.33	MPa	0	5800	48.3	psia
H2	Differential – High Static Pressure	-50	50	0.42	kPa	-200	200	1.67	inH_2O
H3	Differential – High Static Pressure	-250	250	2.08	kPa	-36	36	0.3	psi
H4	Differential – High Static Pressure	-2500	2500	20.83	kPa	-360	360	3	psi
H5	Differential – High Static Pressure	-25	25	0.21	MPa	-3600	-3600	30	psi

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.

COD. Diaphragm Material and Fill Fluid

1	316 SST	Silicone Oil **(9)**	8	Tantalum	Inert Oil Fluorolube **(2) (3) (15)**	K	Monel 400	Inert Oil Krytox **(1) (3) (15)**
2	316 SST	Inert Oil Fluorolube **(2) (15)**	9	316L SST	Fomblim Oil	M	Monel 400 Gold Plated	Silicone Oil **(1) (3) (9)**
3	Hastelloy C276	Silicone Oil **(1) (9)**	A	Monel 400	Fomblim Oil **(1) (3)**	P	Monel 400 Gold Plated	Inert Oil Krytox **(1) (3) (15)**
4	Hastelloy C276	Inert Oil Fluorolube **(1) (2) (15)**	D	316L SST	Inert Oil Krytox **(3) (15)**	Q	316 SST	Inert Oil Halocarbon 4.2 **(2) (3) (15)**
5	Monel 400	Silicone Oil **(1) (3) (9)**	E	Hastelloy C276	Inert Oil Krytox **(1) (3) (15)**	R	Hastelloy C276	Inert Oil Halocarbon 4.2 **(2) (3) (15)**
7	Tantalum	Silicone Oil **(3) (9)**	G	Tantalum	Inert Oil Krytox **(3) (15)**	S	Tantalum	Inert Oil Halocarbon 4.2 **(2) (3) (15)**

COD. Flange(s), Adapter(s) and Drain/Vent Valves Material

C	Plated CS (Drain/Vent in Stainless Steel) **(16)**	M	Monel 400 **(1)**
H	Hastelloy C276 (CW-12MW, ASTM-A494) **(1)**	N	316 SST – CF8M (ASTM A351) (Drain/Vent in Hastelloy C276) **(1)**
I	316 SST – CF8M (ASTM A351)	P	316 SST – CF8M (ASTM A351) Flange with PVDF (Kynar) Insert **(4) (5) (7) (11)**

COD. Wetted O-Rings Materials

0	Without O'Rings	K	Kalrez **(3)**
B	Buna N	T	Teflon
E	Ethylene – Propylene **(12)**	V	Viton

Note: O-Rings are not available on the sides with remote Seals.

COD. Drain/Vent Position

O	Without Drain/Vent	D	Bottom
A	Drain/Vent (Opposite to Process Connection)	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. Local Indicator

0	Without Indicator	1	With Digital Indicator

COD. Process Connections

0	1/4 - 18 NPT (Without Adapter)	B	High Side : 1/2 - 14 NPT and Low Side : Remote Seal (With Plug) **(10) (12)**
1	1/2 - 14 NPT With Adapter)	D	High Side : Remote Seal (With Plug) and Low Side – 1/2 - 14 NPT **(10) (12)**
3	Remote Seal (With Plug) **(3) (8)**	F	High Side : 1/2 - 14 NPT and Low Side - Remote Seal (Low Volume Flange) **(10) (12)**
5	1/2 - 14 NPT Axial with PVDF Insert **(5) (7) (14)**	H	High Side : Remote Seal (Low Volume Flange) and Low Side -1/2 – 14 NPT **(10) (12)**
9	Remote Seal (Low Volume Flange **(3) (4) (8)**	Q	8mm hole without thread. According to DIN 19213 **(13)**
T	1/2 - 14 BSP (With Adapter)	Z	User's specification
V	Manifold Valve Integrated to the Transmitter		

COD. Electrical Connections

0	1/2 - 14 NPT **(17)**	A	M20 X 1.5 **(19)**
1	3/4 - 14 NPT with 316 SST adapter for 1/2 - 14 NPT) **(18)**	B	PG 13.5 DIN **(19)**
2	3/4 - 14 BSP with 316 SST adapter for 1/2 - 14 NPT) **(6)**	Z	User's specification
3	1/2 - 14 BSP with 316 SST adapter for 1/2 - 14 NPT) **(6)**		

COD. Zero Span Adjustment

1	With Zero and Span Adjustment

COD. Mounting Bracket for 2" Pipe or Surface Mounting

0	Without Bracket	7	Carbon steel bracket. Accessories: 316 SST **(16)**
1	Carbon steel bracket and accessories **(16)**	9	L Type, carbon steel bracket. Accessories: 316 SST **(16)**
2	316 SST bracket and accessories	A	Flat, 304 SST bracket and 316 SST accessories
5	L type, carbon steel bracket and accessories **(16)**	Z	User's specification
6	L type, 316 SST bracket and accessories		

COD. Continues next page

LD302	D2	1	I	B	U	1	0	0	1	2	*

⬅ TYPICAL MODEL NUMBER

Notes

(1) Meets NACE MR – 01 – 75/ISO 15156 recommendations.
(2) Not available for absolute models nor vacuum applications.
(3) Not available for range 0 and 1.
(4) Not recommended for vacuum service.
(5) Maximum pressure 24 bar (350 psi).
(6) Options not certified for use in hazardous locations.
(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 transmitters.
(11) O'Ring should be Viton or Kalrez.
(12) Not available for range 0.
(13) Only available for pressure transmitters D4 or H4 and 7/16 UNF or M10 x 1.5 flange thread for fixing accessories.
(14) Only available for flange with PVDF (Kynar) insert.
(15) Inert Fluid: Safe for oxygen service.
(16) Not applicable for saline atmosphere.
(17) Certificate for use in Hazardous Locations (CEPEL, NEPSI, NEMKO, EXAM, FM, CSA).
(18) Certificate for use in Hazardous Locations (CEPEL, CSA).
(19) Certificate for use in Hazardous Locations (CEPEL, NEPSI, NEMKO, EXAM).

LD302 – DIFFERENTIAL, FLOW, GAGE, ABSOLUTE AND HING STATIC PRESSURE TRANSMITTERS (CONTINUATION)

Flanges Bolts and Nuts Material

COD.		COD.	
A0	Plated Carbon Steel (Default) **(4)**	A5	Hastelloy C276
A1	316 SST		
A2	Carbon Steel (ASTM A193 B7M) **(1) (4)**		

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

COD.		COD.	
D0	7/16" UNF (Default)	D2	M12 X 1.75
D1	M10 X 1.5		

Housing Material (6) (7)

COD.		COD.	
H0	Aluminum (Default) (IP/TYPE)	H3	316 SST for saline atmosphere (IPW/TYPEX) **(5)**
H1	316 SST – CF8M (ASTM – A351) IP/TYPE)	H4	Copperfree Aluminium (IPW/TYPEX) **(5)**
H2	Aluminium for saline atmosphere (IPW/TYPEX) **(5)**		

Tag Plate

COD.	
J0	With tag, when specified (Default)
J1	Blank
J2	According to user's notes

Identification Plate

COD.		COD.	
I1	FM: XP, IS, NI, DI	I6	Without Certification
I3	CSA: XP, IS, NI, DI	I7	EXAM (DMT): Group I, M1 Ex-ia
I4	EXAM (DMT): Ex-ia	IF	CEPEL: Ex-d
I5	CEPEL: Ex-d, Ex-ia	IE	NEPSI: Ex-ia

Painting

COD.		COD.	
P0	Gray Munsell N 6.5 Polyester	P8	Without Painting
P3	Black Polyester	P9	Blue Safety Epoxy – Electrostatic Painting
P4	White Epoxy	PC	Blue Safety Polyesters – Electrostatic Painting
P5	Yellow Polyester		

LD302 - D21I - BU10 - 012	A0	D0	H0	J0	I6	P0	*

TYPICAL MODEL NUMBER

Optional Items

* **Leave blank for no optional items**

Burn-out	**BD –** Down Scale (Accordance to NAMUR NE43 specification). **BU –** Up Scale (Accordance to NAMUR NE43 specification).
Special Applications	**C1 –** Degrease Cleaning (Oxygen or Chlorine Service) **(3)**.
High Performance	**L1 –** 0.04% accuracy **(2)**.
Square Root Extraction	**M3 –** With Square Root extraction.
Special Features	**ZZ –** User's specification.

Notes

(1) Meets NACE MR – 01 – 75/ISO 15156 recommendations.
(2) Only available for differential and gage pressure models.
(3) Degrease cleaning not available for carbon steel flanges.
(4) Not applicable for saline atmosphere.
(5) IP66/68W tested for 200 hours according to NBR 8094 / ASTM B 117 standard.
(6) IPX8 tested in 10 meters of water column for 24 hours.
(7) Ingress Protection:

Product	CEPEL	NEMKO/EXAM	FM	CSA	NEPSI
LD300	IP66/68W	IP66/68W	Type4X/6(6P)	Type4X	IP67

MODEL	FLANGED PRESSURE TRANSMITTERS
LD302	FOUNDATION™ fieldbus

COD.	Range Limits Min.	Range Limits Max.	Min. Span	Unit	Range limits Min.	Range limits Max.	Min. Span	Unit
L2	-50	50	1.25	kPa	-200	200	5	inH_2O
L3	-250	250	2.08	kPa	-36	36	0.3	psi
L4	-2500	2500	20.83	kPa	-360	360	3	psi
L5	-25000	25000	208.3	kPa	-3625	3625	30.2	psi

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)

COD.			COD.			COD.			COD.		
1	316L SST	Silicone Oil **(2)**	7	Tantalum	Silicone Oil **(2)**	E	Hastelloy C276	Inert Oil Krytox **(1)(19)**	Q	316L SST	Inert Oil Halocarbon 4.2 **(19)**
2	316L SST	Inert Oil Fluorolube**(3)(19)**	8	Tantalum	Inert Oil Fluorolube **(3) (19)**	G	Tantalum	Inert Oil Krytox **(19)**	R	Hastelloy C276	Inert Oil Halocarbon 4.2 **(1) (19)**
3	Hastelloy C276	Silicone Oil **(1) (2)**	9	316L SST	Fomblim Oil	K	Monel 400	Inert Oil Krytox **(1) (19)**	S	Tantalum	Inert Oil Halocarbon 4.2 **(19)**
4	Hastelloy C276	Inert Oil Fluorolube **(1)(3)(19)**	A	Monel 400	Fomblim Oil **(1)**	M	Monel 400 Gold Plated	Silicone Oil **(1) (2)**			
5	Monel 400	Silicone Oil **(1) (2)**	D	316L SST	Inert Oil Krytox **(19)**	P	Monel 400 Gold Plated	Inert Oil Krytox **(1) (19)**			

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

A	304L SST	M	Monel 400 **(1)**
C	Plated CS (Drain/Vent in Stainless Steel) **(20)**	N	316 SST – CF8M (ASTM – A351) (Drain/Vent in Hastelloy C276) **(1)**
H	Hastelloy C276 (CW – 12MW, ASTM – A494) **(1)**	P	316 SST – CF8M (ASTM – A351) Flange with PVDF (Kynar) insert **(3) (4) (5)**
I	316 SST – CF8M (ASTM – A351)		

COD. Wetted O'Ring Material (Low Side)

0	Without O'Rings	K	Kalrez
B	Buna-N	T	Teflon
E	Ethylene - Propylene	V	Viton

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

COD. Drain/Vent Position (Low Side)

0	Without Drain/Vent	D	Bottom
A	Drain/Vent (Opposite to Process Connection)	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. Local Indicator

0	Without Indicator	1	With Digital indicator

COD. Process Connection (Low Side)

0	1/4 - 18 NPT (Without Adapter)	T	1/2 14 BSP (With Adapter)
1	1/2 - 14 NPT (With Adapter)	U	Low Volume Flange For Level Welded
3	Remote Seal (With Plug) **(7)**	V	Without Connection (Mounting With Gage Flange)
5	1/2 - 14 NPT Axial with PVDF Insert (**3**) **(4) (6)**	W	Without Connection (Absolut Reference)
9	Remote Seal (Low Volume Flange) **(3) (7)**		

COD. Electrical Connection

0	1/2 – 14 NPT **(25)**	A	M20 x 1.5 **(26)**
1	3/4 – 14 NPT (with 316 SST adapter for ½ - 14 NPT) **(22)**	B	PG 13.5 DIN **(26)**
2	3/4 – 14 BSP (with 316 SST adapter for ½ - 14 NPT) **(9)**	Z	User's specification
3	1/2 – 14BSP (with 316 SST adapter for ½ - 14 NPT) **(9)**		

COD. Zero and Span Adjust

1	With Zero and Span Adjustment

COD. Process Connection

U	1" 150 # (ANSI B16.5) **(29)**	C	3" 600 # (ANSI B16.5)	S	JIS 40A 20K **(23)**
V	1" 300 # (ANSI B16.5) **(29)**	N	3" 600 # (ANSI B16.5 RTJ)	F	JIS 50A 10K **(23)**
W	1" 600 # (ANSI B16.5) **(29)**	3	4" 150 # (ANSI B16.5)	T	JIS 50A 40K **(23)**
O	1.1/2" 150 # (ANSI B16.5)	4	4" 300 # (ANSI B16.5)	K	JIS 50A 20K **(23)**
P	1.1/2" 300 # (ANSI B16.5)	D	4" 600 # (ANSI B16.5)	G	JIS 80A 10K **(23)**
Q	1.1/2" 600 # (ANSI B16.5)	5	DN 25 PN 10/40 **(29)**	L	JIS 80A 20K **(23)**
9	2" 150 # (ANSI B16.5)	R	DN 40 PN 10/40	H	JIS 100A 10K **(23)**
A	2" 300 # (ANSI B16.5)	E	DN 50 PN 10/40	M	JIS 100A 10K **(23)**
B	2" 600 # (ANSI B16.5)	6	DN 80 PN 10/40	Z	User's specification
1	3" 150 # (ANSI B16.5)	7	DN 100 PN 10/16		
2	3" 300 # (ANSI B16.5)	8	DN 100 PN 25/40		

COD. Type and Flange Material (Level Tap)

2	316L SST (Integral Flange)	4	304 SST (Slip-on Flange)	6	Carbon Steel (Slip-on Flange)
3	Hastelloy C276 (Integral Flange)	5	316 SST (Slip-on Flange)	Z	User's specification

COD. Extension Length

0	0 mm (0")	3	150 mm (6")	Note: Extension Material 316L SST
1	50 mm (2")	4	200 mm (8")	
2	100 mm (4")	Z	User's specification	

COD. Diaphragm Material / Extension (Level Tap)

A	304L SST / 304L SST	6	316L SST with Teflon Lining (For 2"and 3")
1	316L SST / 316 SST	7	316L SST Gold plated
2	Hastelloy C276 / 316 SST	B	Tantalum with Teflon Lining
3	Monel 400 / 316 SST	L	316L SST Halar Plated **(18)**
4	Tantalum / 316 SST **(10)**	C	Hastelloy Teflon Plated
5	Titanium / 316 SST **(10)**		

COD. Fill Fluid

1	DC – 200/20 Silicone Oil	G	Glycerin **(6)**
3	DC704 Silicone Oil	B	Fomblim 06/06
2	MO – 10 Fluorolube Oil **(8)**	H	Halocarbon 4.2
4	Krytox Oil	T	Sylltherm 800 Oil
N	Neobee M20 Propylene Glycol Oil		

COD. Housing Material

0	Without Gaskets **(12)**	3	Super Duplex (UNS 32750) **(11)**
1	316 SST	4	Duplex (UNS 31803) **(11)**
2	Hastelloy C276	5	Stainless Steel 304L **(11)**

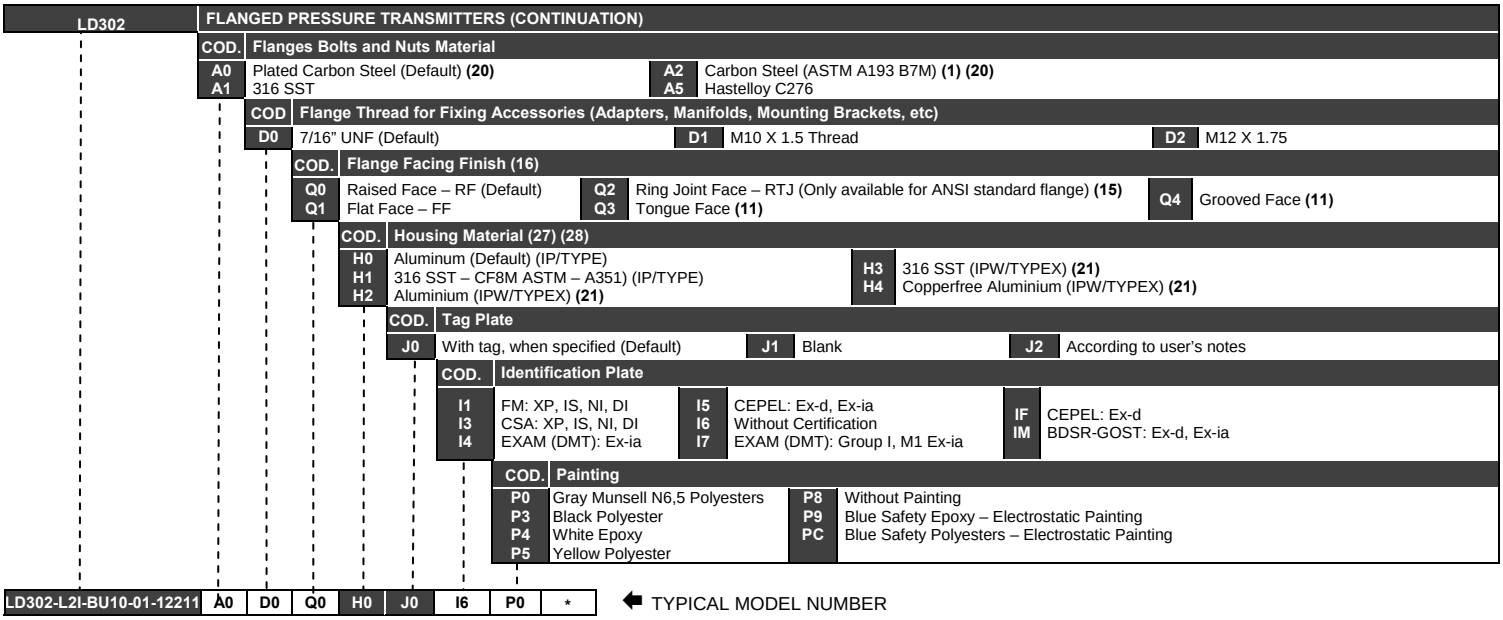
COD. Gasket Material

0	Without gasket	C	Copper
T	Teflon (PTFE)	I	316 L SST
G	Grafoil (Flexible lead)		

COD. Continues Next Page

LD302	L2	1	I	B	U	1	0	0	1	1	2	2	1	1	1	T	*

⬅ TYPICAL MODEL NUMBER



Optional Items

*** Leave blank for no optional items**

Burn-out	**BD -** Down Scale (Accordance to NAMUR NE43 specification)	**BU -** Up Scale (Accordance to NAMUR NE43 specification).
Special Applications	**C1 -** Degrease Cleaning (Oxygen or Chlorine Service **(13)**	**C2 -** For vacuum application.
Special Features	**ZZ -** User's specification.	
Gasket Connection	**U0 -** With one Flush Connection ¼" NPT (if supplied with gasket) **U1-** With two Flush Connections ¼" NPT per 180 ºC **U2 -** With two Flush Connections ¼" NPT per 90 ºC **U3 -** With two Flush Connections ½" NPT - 14 NPT per 180 ºC (with cover) **U4** – Without Gasket Connection	
Isolator Kit (14)	**K0 -** Without Kit	**K1 -** With Kit
Diaphragm Thickness	**N0** – Default **(24)**	**N1** - 0.1mm **(11)**

NOTES

(1) Meets NACE MR – 01 – 75/ISO 15156 recommendations.
(2) Silicone Oils not recommendations 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) For remote Seal only 316 SST - CF8M (ASTM A3510 flange is available (thread M12).
(8) Fluorolube fill fluid is not available for Monel diaphragm.
(9) Options not certified for use in hazardous locations.
(10) Attention, check corrosion rate for the process, tantalum plate 0.1 mm, AISI 316L extension 3 to 6mm.
(11) Item by inquiry.
(12) Supplied without Gasket.
(13) Degreaser's cleaning is not available for carbon steel flanges
(14) The insulator kit is applicable with Raised Face (HO) and Smooth Face (H1) with Gasket material.
T(Teflon) and only for the following models:
- For models with extension the Gasket T (Teflon) it has special share.

(15) Gasket for housing, available only in Stainless 316.
(16) Finishing flange faces:
ANSI B 16.5 / MSS-SP6:
- Raised or Smoth Face with gooved lining: 3.2 to 6.3 µm Ra (125 a 250 µ" AA);
Small or Large Tongue Face and Small or Large Groove with smooth finishing
not exceeding: 3.2 µm Rt (125 µ" AA);

RTJ ANSI B 16.20 / MSS-SP6:
- Smooth finishing not exceeding: 1.6 µm Rt (63 µ" AA);

DIN EN-1092-1:
- Grooved finishing "B1" (PN 10 a PN40): 3.2 a 12.5 µm Ra (125 a 500 µ" AA);
Smooth finishing "B2" (PN 63 a PN100), "C" (Tongue) e "D" (Groove): 0.8 a 3.2 µm Ra (32 a 125 µ" AA).
DIN 2501 (DIN 2526):
- Smooth finishing "E" (PN 160 a PN250): Rz = 16 (3.2 µm Ra (125 µ" AA).

Standard JIS B2201
Grooved finishing 3.2 a 6.3 µm Ra (125 a 250 µ" AA).

(17) Range of application of temperature from -40 ºC to 150 ºC.
(18) Applicable only to:
- Thickness of steel: 0.05 mm
- Diameter/capillary length:
2" ANSI B 16.5 DN 50 DIN, JIS 50 A, for seals up to 3 meters of capillary and level models (by inquiry).
3" ANSI B 16.5 DN 80 DIN, JIS 80 A, for seals up to 5 meters of capillary and level models.
- Faces: RF and FF;
- Temperature Range: +10 ºC to 100 ºC
+ 101 to 150 º C (by inquiry)
- Not applicable for diaphragm thickness;
- Not applicable for use with gaskets.

(19) Inert Fluid: Oxygen Compatibility, safe for oxygen service.
(20) Not applicable for saline atmosphere.
(21) IP66/68W tested for 200 hours according to NBR 8094 / ASTM B 117 standard.
(22) Certificate for use in Hazardous Locations (CEPEL, CSA).
(23) Not available for slip-on flange.
(24) Diaphragms of Titanium and Monel available only in 0.1 mm, and diaphragms of Tantalum only in 0.075 mm.
(25) Certificate for use in Hazardous Locations (CEPEL, NEPSI, NEMKO, EXAM, FM, CSA).
(26) Certificate for use in Hazardous Locations (CEPEL, NEPSI, NEMKO, EXAM).
(27) IPX8 tested in 10 meters of water column for 24 hours.
(28) Ingress Protection:

Product	CEPEL	NEMKO/EXAM	FM	CSA	NEPSI
LD300	IP66/68W	IP66/68W	Type4X/6(6P)	Type4X	IP67

(29) Not available for integral flange.

MODEL | **SANITARY PRESSURE TRANSMITTERS**

LD302 | **FOUNDATION™ fieldbus**

CODE	Range Limits Min.	Range Limits Max.	Min. Span	Unit	Range Limits Min.	Range Limits Max.	Min. Span	Unit
S2	-50	50	1.25	kPa	-200	200	5	inH_2O
S3	-250	250	2.08	kPa	-36	36	0.3	psi
S4	-2500	2500	20.83	kPa	-360	360	3	psi
S5	-25000	25000	208.30	kPa	-3625	3625	30.2	psi

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 connection.

COD | Diaphragm Material and Fill Fluid (Low Side)

1	316L SST	Silicone Oil **(2)**	7	Tantalum	Silicone Oil **(2)**	E	Hastelloy C276	Inert Krytox Oil **(1) (17)**	Q	316L SST	Inert Haloc 4.2 Oil **(17)**
2	316L SST	Inert Fluorolube Oil **(3) (17)**	8	Tantalum	Inert Fluorolube Oil **(3) (17)**	G	Tantalum	Inert Krytox Oil **(17)**	R	Hastelloy C276	Inert Haloc 4.2 Oil **(1) (17)**
3	Hastelloy C276	Silicone Oil **(1) (2)**	9	316L SST	Fomblim Oil	K	Monel 400	Inert Krytox Oil **(1) (17)**	S	Tantalum	Inert Haloc 4.2 Oil **(17)**
4	Hastelloy C276	Inert Fluorolube Oil **(1) (3) (17)**	A	Monel 400	Fomblim Oil **(1)**	M	Monel 400 Gold Plated	Silicone Oil **(1) (2)**			
5	Monel 400	Silicone Oil **(1) (2)**	D	316L SST	Inert Krytox Oil **(17)**	P	Monel 400 Gold Plated	Inert Krytox Oil **(1) (17)**			

CODE | Flange(s), Adapter (s) and Drain Valve(s) Material (Low Side)

C	Plated CS (Drain in Stainless Steel) **(15)**	M	Monel 400 **(1)**
H	Hastelloy C276 (CW-12MW, ASTM - A494) **(1)**	N	316 SST – CF8M (ASTM – A351) (Drain in Hastelloy C276) **(1)**
I	316 SST - CF8M (ASTM - A351)	P	316 SST – CF8M (ASTM – A351) Flange with PVDF (Kynar) insert **(3) (4) (5)**

CODE | Wetted O-Ring Material (Low Side)

0	Without O-Ring	E	Ethylene - Propylene	T	Teflon
B	Buna-N	K	Kalrez	V	Viton

Note: O-Rings are not available on the sides with remote seal.

CODE | Drain Position (Low Side)

0	Without Drain	D	Bottom
A	Drain (Opposite to process connection)	U	Top

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

CODE | Local Indicator

0	Without Indicator	1	With Digital Indicator

CODE | Process Connection (Low Side)

0	1/4 - 18 NPT (Without Adapter)	T	1/2-14 BSP (With Adapter)
1	1/2 - 14 NPT (With Adapter)	U	Low Volume Flange For Level Welded
3	Remote Seal (With Plug – Vacuum Assembly) **(7)**	V	Without Connection (Mounting With Gage Flange)
5	1/2 - 14 NPT Axial with PVDF insert **(3) (4) (6)**	W	Without Connection (Absolut Reference)
9	Remote Seal (Low Volume Flange) **(3) (7)**		

CODE | Electrical Connection

0	1/2 - 14 NPT **(18)**	A	M20 X 1.5 **(20)**
1	3/4 - 14 NPT (With 316 SST adapter for 1/2 - 14 NPT) **(19)**	B	PG 13.5 DIN **(20)**
2	3/4 - 14 BSP (With 316 SST adapter for 1/2 - 14 NPT) **(9)**	Z	User's Specification
3	1/2 - 14 BSP (With 316 SST adapter for 1/2 - 14 NPT) **(9)**		

CODE | Zero and Span Adjust

1	With Local Adjustment

CODE | Process Connection

8	Threaded DN25 DIN 11851 – with extension / 316L SST **(10) (11)**	7	Threaded SMS 2" - with extension / 316L SST **(10) (11)**
9	Threaded DN40 DIN 11851 - with extension / 316L SST **(10) (11)**	E	Threaded SMS 2" – without extension / 316L SST **(10) (11)**
H	Threaded DN40 DIN 11851 – without extension / 316L SST **(10)**	M	Threaded SMS 3" - with extension / 316L SST **(10) (11)**
V	Threaded DN50 DIN 11851 - with extension / 316L SST **(10) (11)**	1	Threaded SMS 3" - without extension / 316L SST **(10) (11)**
U	Threaded DN50 DIN 11851 - without extension / 316L SST **(10)**	F	Tri-Clamp 1 1/2" – without extension / 316L SST **(11)**
X	Threaded DN80 DIN 11851 - with extension / 316L SST **(10) (11)**	Q	Tri-Clamp 1 1/2" HP (High Pressure) - without extension / 316L SST **(8) (11)**
W	Threaded DN80 DIN 11851 - without extension / 316 SST **(10)**	6	Tri-Clamp 2" - with extension / 316L SST **(11)**
4	Threaded IDF 2" - with extension / 316L SST **(10) (11)**	D	Tri-Clamp 2" – without extension / 316L SST **(11)**
B	Threaded IDF 2" – without extension / 316L SST **(10) (11)**	N	Tri-Clamp 2" HP (High Pressure) - with extension / 316L SST **(8) (11)**
K	Threaded IDF 3" - with extension / 316L SST **(10) (11)**	P	Tri-Clamp 2" HP (High Pressure) – without extension / 316L SST **(8) (11)**
3	Threaded IDF 3" - without extension / 316L SST **(10) (11)**	I	Tri-Clamp 3" - with extension / 316L SST **(11)**
5	Threaded RJT 2" - with extension / 316L SST **(10) (11)**	G	Tri-Clamp 3" – without extension / 316L SST **(11)**
C	Threaded RJT 2" - without extension / 316L SST **(10)**	J	Tri-Clamp 3" HP (High Pressure) - with extension / 316L SST **(8) (11)**
L	Threaded RJT 3" - with extension / 316L SST **(10) (11)**	R	Tri-Clamp 3" HP (High Pressure) – without extension / 316L SST **(8) (11)**
2	Threaded RTJ 3" - without extension / 316L SST **(10)**	Z	User's specification
S	Threaded SMS 1 1/2" – without extension / 316L SST **(10) (11)**		

CODE | Diaphragm Material

H	Hastelloy C276	I	316L SST

CODE | Fill Fluid

S	DC 200 – Silicone Oil	T	Syltherm 800	B	Fomblim 06/06
D	DC 704 – Silicone Oil	N	Neobee M20 **(11)**	K	Krytox 1506
F	Fluorolube MO-10	G	Glycerin + Water **(12)**	H	Halocarbom 4.2

CODE | Wet O-ring

0	Without O-ring	T	Teflon **(11)**	B	Buna-N **(11)**	V	Viton **(11)**

CODE | Tank Adapter

0	Without Tank Adapter	1	With Tank Adapter in 316 SST

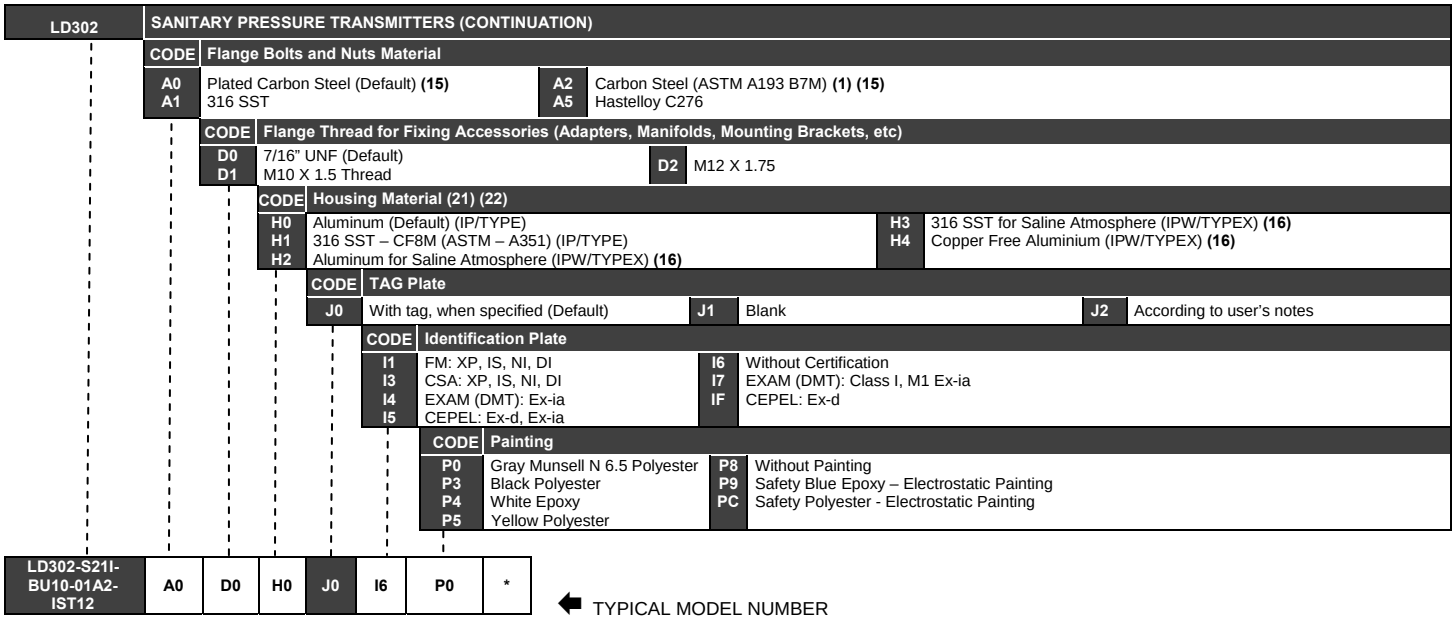
CODE | Tri-Clamp

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

LD302	S2	1	I	B	U	1	0	0	1	A	I	S	T	1	2	*

⬅ TYPICAL MODEL NUMBER

* Leave it blank when there are not optional items.



* Leave it blank when there are not optional items.

Optional Items

Burn-out	BD - Down Scale (Accordance to NAMUR NE43 specification) BU - Up Scale (Accordance to NAMUR NE43 specification)
Special Procedures	C1 - Degrease Cleaning (Oxygen or Chlorine Service) **(13)** C2 - For Vacuum Application C4 - Polishing of the wet parts according to 3A Certification **(11) (12)**
Special Features	ZZ - User's Specification
Diaphragm Thickness	N0 – Default N1 - 0.1mm **(12)**

Note

(1) Meets NACE MR-01-75/ISO 15156 recommendations.
(2) Silicone oil not recommended for Oxygen (O2) or Chlorine Service.
(3) Not applicable for vacuum service.
(4) Drain not applicable.
(5) O-Ring material must be of Viton or Kalrez.
(6) Maximum pressure 24 bar.
(7) For remote seal is only available flange in 316 Stainless Steel - CF8M (ASTM A351) (thread M12).
(8) HP – High Pressure.
(9) Options not certified for use in hazardous locations.
(10) Not available for Tri-clamp.
(11) Compliant with 3A-7403 standard for food and other applications where sanitary connections are required:
- Neobee M2O Fill Fluid
- Finishing wet Face: 0.8 µm Ra (32 µ" AA)
- Wet O-Ring: Viton, Buna-N and Teflon

(12) Item by inquiry.
(13) Degrease cleaning is not available for Carbon Steel Flanges.
(14) Temperature application range: -40 to 140 °C.
(15) Not applicable for saline atmosphere.
(16) IP66/68W tested for 200 hours according to NBR 8094 / ASTM B 117 standard.
(17) The inert fluid guarantees safety for Oxygen (O_2) service.
(18) Certificate for use in Hazardous Locations (CEPEL, NEPSI, NEMKO, EXAM, FM, CSA).
(19) Certificate for use in Hazardous Locations (CEPEL, CSA).
(20) Certificate for use in Hazardous Locations (CEPEL, NEPSI, NEMKO, EXAM).
(21) IPX8 tested in 10 meters of water column for 24 hours.
(22) Ingress Protection:

Product	CEPEL	NEMKO/EXAM	FM	CSA	NEPSI
LD300	IP66/68W	IP66/68W	Type4X/6(6P)	Type4X	IP67

Appendix A

CERTIFICATIONS INFORMATION

European Directive Information

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

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

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

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

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

Other Approval

Sanitary Approval

Certifier Body: 3A Sanitary Standards
Model Designations: **LD302** with or without extension
Sensors and Sensor Fittings and Connections Used on Fluid Milk and Milk Products,
Number: 74-03. (Authorization No. 873).

Device Registration ITK:

Certifier Body: Fieldbus Foundation

Model: **LD302**
Device Type: Pressure Transmitter
ITK Ver: 4.60
ITK Campaign No.: IT040600
Registration Date: 6/26/2007
DD Revisions: 0x04
CFF Revisions: 040102.cff

The above device has successfully completed rigorous testing by the Fieldbus Foundation and has received registration and the right to use de FF checkmark logo as specified by MT-045.

Hazardous Locations Certifications

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

North American Certifications

FM Approvals (Factory Mutual)

Certificate N: FM 4Y3A4.AX and 3015629
Explosion-proof for Class I, Division 1, Groups A, B, C and D.
Dust-ignition proof for Class II, Division 1, Groups E, F and G; Class III, Division 1.

Intrinsically Safe for use in Class I, Division 1, Groups A, B, C and D; Class II, Division 1, Groups E, F and G; Class III, Division 1. FISCO Field Device Ex ia IIC T4.
Non-incendive for Class I, Division 2, Groups A, B, C and D. FNICO Field Device Ex n1 IIC T5.
Entity parameters: V_{max} = 24 Vdc I_{max} = 250 mA Pi = 5.32 W Ci = 5 nF Li = 8 Mh

Maximum Ambient Temperature: 60 ºC.
Enclosure Type 4X/6/6P or Type 4/6/6P.

Canadian Standards Association (CSA)

Certificate N: CSA1111005
Class 2258 02 Explosion Proof for Class I, Division 1, Groups B, C and D; Class II, Division 1, Groups E, F and G; Class III, Division 1; Class I, Division 2, Groups A, B, C and D; Class II, Division 2, Groups E, F and G; Class III. FNICO Field Device Ex n1 IIC T5.

Class 2258 04 Intrinsically Safe, Entity – For Hazardous Locations for Class I, Division 1, Groups A, B, C and D; Class II, Division 1, Groups E, F and G; Class III, Division 1. FISCO Field Device Ex ia IIC T4.
• Intrinsically safe with entity parameters: Vmax = 24 V Imax = 380 mA Pi = 5.32 W Ci = 5 nF Li = 10 uH.
Maximum Ambient Temperature: 40 ºC.
Enclosure Type 4X or Type 4.

European Certifications

Certificate No: Nemko 03 ATEX 1430X
ATEX Intrinsically Safe from Group II 1GD, Ex-ia IIC T4
Entity parameters: Pi = 1.15 W Ui = 22,5 V Ii = 208 mA Ci = 5 nF Li = 6 µH
Maximum Ambient Temperature: 62 ºC.
FISCO Field Device Ex ia IIC T4
FNICO Field Device Ex nL IIC T5

Certificate No: Nemko 02 ATEX 035X
ATEX Explosion Proof from Group II 2G, Ex-d, Group II T6
Enclosure Type IP66/68 or IP66/68W.

Special conditions for safe use:

1. The transmitters are marked with three options for the indication of the protection code. The certification is valid only when the protection code is indicated, by the user, in one of the boxes following the code. The following options apply:

• **Ex d IIC T6 ( ) with X ticked in the parenthesis**:
The Ex d IIC T6 protection according to certificate Nemko 02ATEX035X / 02ATEX149X applies for the specific transmitter. Certified Ex d IIC cables entries shall be used.

• **Ex ia IIC T4 ( ) with X ticked in the parenthesis**:
The Ex ia IIC T4 protection according to certificate Nemko 03ATEX1430X applies for the specific transmitter. Certified diode safety barriers shall be used.

• **Ex d IIC T6 / Ex ia IIC T4 ( ) with X ticked in the parenthesis**:
The transmitter has double protection. Both Ex d IIC T6 and Ex ia IIC T4 protection apply for the specific transmitter according to certificates Nemko 02ATEX035X / 02ATEX149X and Nemko 03ATEX1430X. In this case the transmitter shall be fitted with appropriate certified cable entries Ex d IIC and the electric circuit supplied by a certified diode safety barrier as specified for the protection Ex ia IIC T4.

2. For enclosures of the transmitters made of aluminum impact and friction hazards shall be considered when the transmitter is used in category II 1 G according to EN 50284 clause 4.3.1
3. The diode safety barrier shall have a linear resistive output characteristic.

4. The pressure of the potentially explosive atmosphere surrounding the transmitter shall be within the range 0.8 mbar to 1.1 mbar.

Certificate No: DMT 00 ATEX E 067
ATEX Intrinsically Safe
Group II 1/2G Ex ia IIC T4/T5/T6
Entity parameters: Pi = 5.32 W Ui = 24 V Ii = 380 mA Ci ≤ 5 nF Li = neg.
Ambient Temperature: -40 ºC ≤ Ta ≤ 60 ºC
FISCO Field Device Ex ia IIC T4
FNICO Field Device Ex nL IIC T4

South America Certification

Certificado No: CEPEL-EX-075/96
Intrinsicamente Seguro – Ex-ia IIC T4/T5
Parâmetros: Pi = 5.32 W Ui = 30 V Ii = 380 mA Ci = 5 nF Li = Neg
Temperatura ambiente: -20 < T_{amb} < 65 ºC para T4;
-20 < T_{amb} < 50 ºC para T5.
FISCO Field Device Ex ia IIC T4
FNICO Field Device Ex n1 IIC T5

Certificado No: CEPEL-EX-54/98
À prova de explosão – Ex-d IIC T6
Temperatura ambiente: 40 ºC

Grau de Proteção: IP 66/68 ou IP66/68W

Asia Certification

Certificate No: Nepsi GYJ04140
Intrinsically safe - Ex ia IIC T4/T5/T6
Entity Parameters: Pi = 2.0 W Ui = 16 V Ii = 250 mA Ci = 5 nF Li = 0

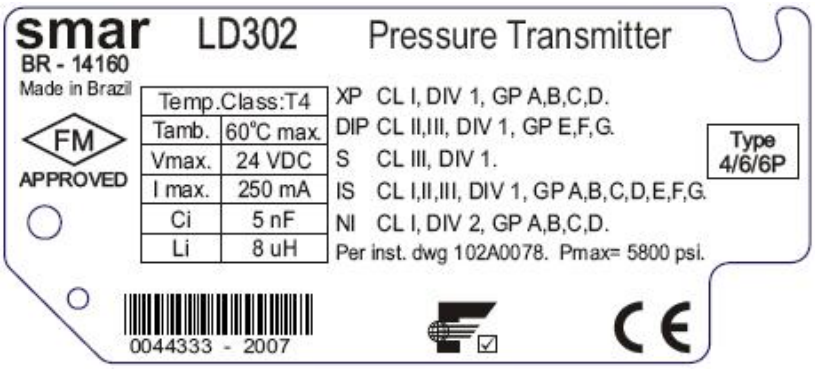
FISCO Field Device Ex ia IIC T4

Identification Plate and Control Drawing

Identification Plate

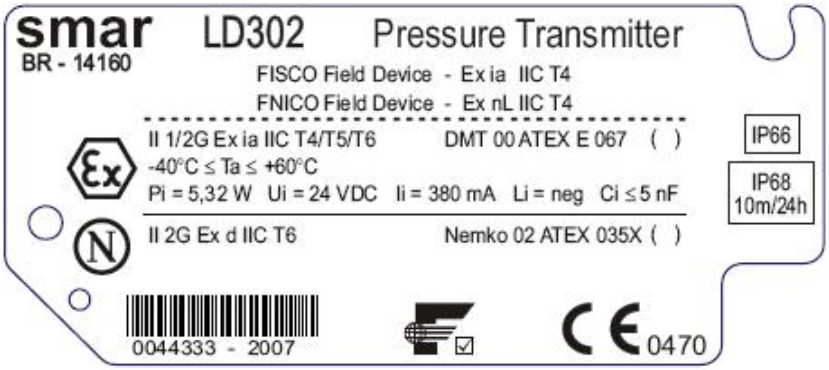
- Identification of Intrinsically safe and Explosion Proof for gas and steam:

FM



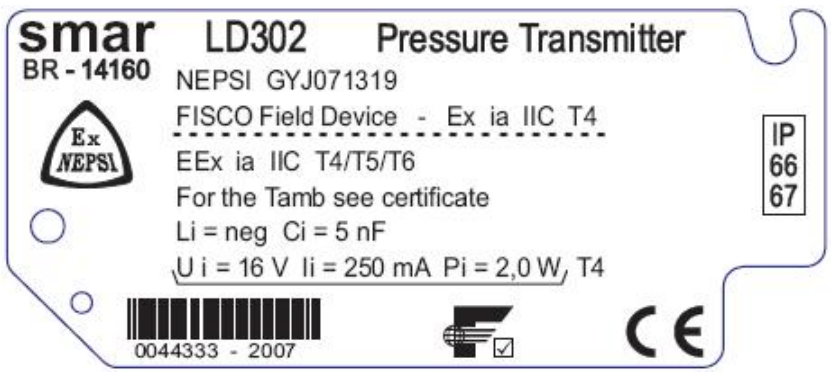
CSA

NEMKO and EXAM



CEPEL

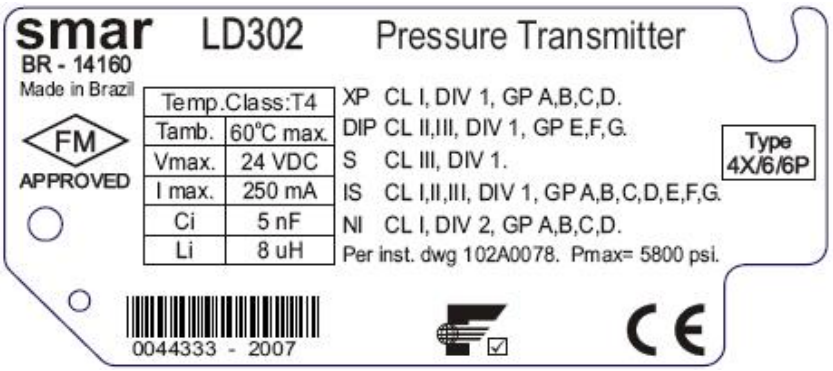
NEPSI



WITHOUT APPROVAL

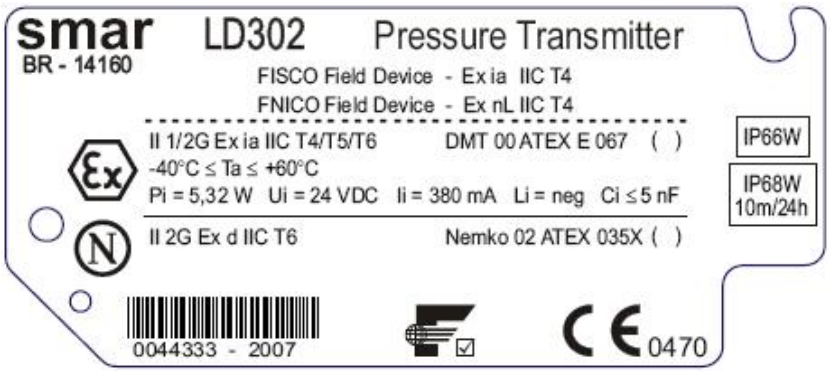
- Identification of Intrinsically safe and Explosion Proof for saline atmospheres:

FM



CSA

NEMKO and EXAM

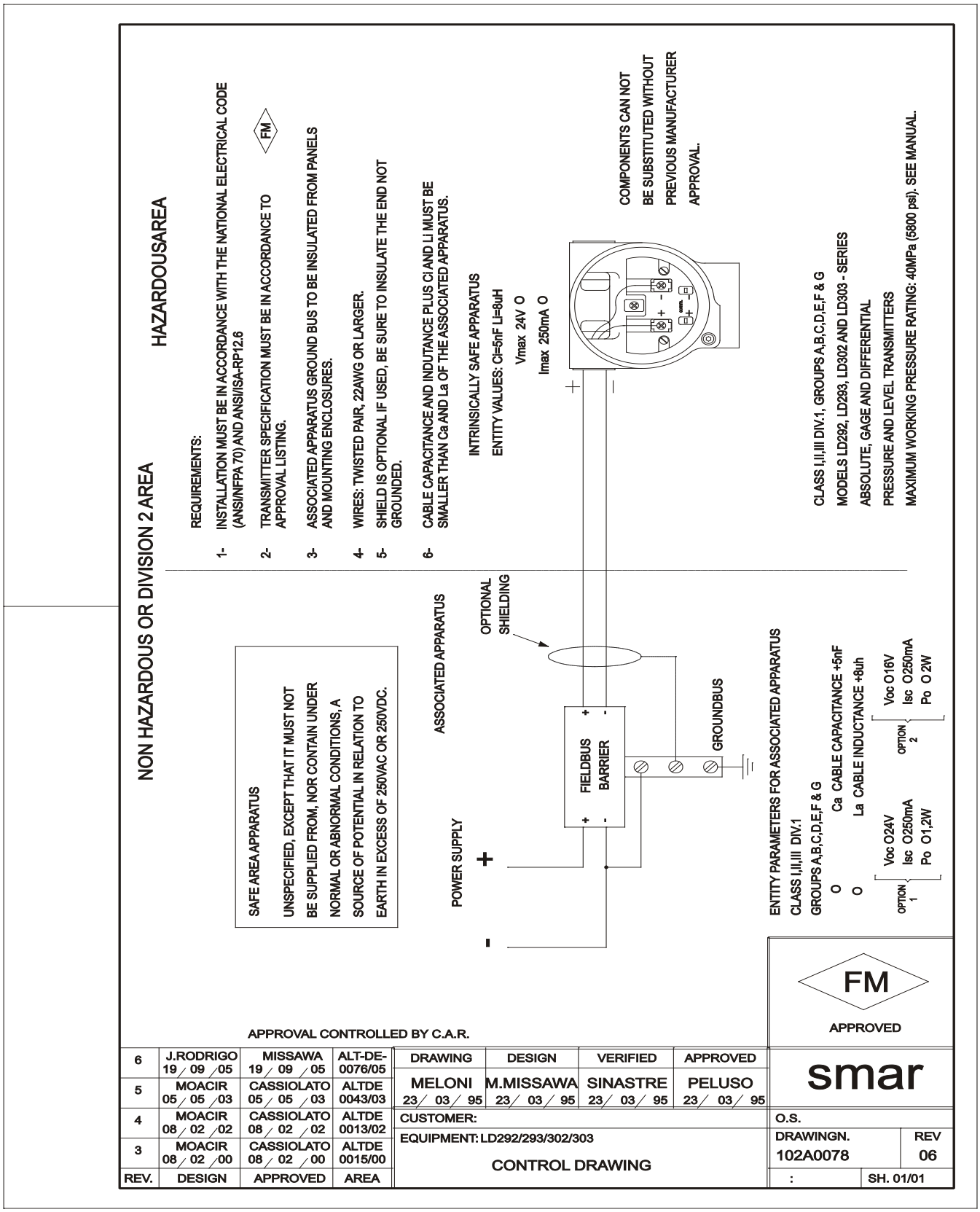


CEPEL


smar
BR - 14160
LD302 Transmissor de Pressão
Segurança
INMETRO
CEPEL
FISCO Field Device - Ex ia IIC T4
FNICO Field Device - Ex nL IIC T4
IP
66 W
68 W
BR - Ex d IIC T6 CEPEL - EX - 054/98
BR - Ex ia IIC T4/T5 CEPEL - EX - 075/96
Tamb = -20° a 65°C (T4) -20° a 50°C (T5)
Ui = 30 V Ii = 380 mA Pi = 5,32 W Ci = 5 nF Li = desp
0044333 - 2007
CE

Control Drawing

Factory Mutual (FM)



Appendix B

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 (°F)		Process Temperature (°F)	
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 **www.smar.com/contactus.asp**.

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.

Appendix C

SMAR WARRANTY CERTIFICATE

1. SMAR guarantees its products for a period of 24 (twenty four) months, starting on the day of issuance of the invoice. The guarantee is valid regardless of the day that the product was installed.

2. SMAR products are guaranteed against any defect originating from manufacturing, mounting, whether of a material or manpower nature, provided that the technical analysis reveals the existence of a quality failure liable to be classified under the meaning of the word, duly verified by the technical team within the warranty terms.

3. Exceptions are proven cases of inappropriate use, wrong handling or lack of basic maintenance compliant to the equipment manual provisions. SMAR does not guarantee any defect or damage caused by an uncontrolled situation, including but not limited to negligence, user imprudence or negligence, natural forces, wars or civil unrest, accidents, inadequate transportation or packaging due to the user's responsibility, defects caused by fire, theft or stray shipment, improper electric voltage or power source connection, electric surges, violations, modifications not described on the instructions manual, and/or if the serial number was altered or removed, substitution of parts, adjustments or repairs carried out by non-authorized personnel; inappropriate product use and/or application that cause corrosion, risks or deformation on the product, damages on parts or components, inadequate cleaning with incompatible chemical products, solvent and abrasive products incompatible with construction materials, chemical or electrolytic influences, parts and components susceptible to decay from regular use, use of equipment beyond operational limits (temperature, humidity, etc.) according to the instructions manual. In addition, this Warranty Certificate excludes expenses with transportation, freight, insurance, all of which are the customer's responsibility.

4. For warranty or non-warranty repair, please contact your representative.

   Further information about address and contacts can be found on www.smar.com/contactus.asp

5. In cases needing technical assistance at the customer's facilities during the warranty period, the hours effectively worked will not be billed, although SMAR shall be reimbursed from the service technician's transportation, meals and lodging expenses, as well dismounting/mounting costs, if any.

6. The repair and/or substitution of defective parts do not extend, under any circumstance, the original warranty term, unless this extension is granted and communicated in writing by SMAR.

7. No Collaborator, Representative or any third party has the right, on SMAR's behalf, to grant warranty or assume some responsibility for SMAR products. If any warranty would be granted or assumed without SMAR's written consent, it will be declared void beforehand.

8. Cases of Extended Warranty acquisition must be negotiated with and documented by SMAR.

9. If necessary to return the equipment or product for repair or analysis, contact us.
   See item 4.

10. In cases of repair or analysis, the customer must fill out the Revision Requisition Form (FSR) included in the instructions manual, which contains details on the failure observed on the field, the circumstances it occurred, in addition to information on the installation site and process conditions. Equipments and products excluded from the warranty clauses must be approved by the client prior to the service execution.

11. In cases of repairs, the client shall be responsible for the proper product packaging and SMAR will not cover any damage occurred in shipment.

12. Responsibility: Except for the above-mentioned general warranty conditions for SMAR products, SMAR will not assume any responsibility before the customer, without limitation, for damages, consequences, indemnity claims, loss of earnings, service expenses and other costs caused by the non-observation of the installation, operation and maintenance instructions included in SMAR manuals. Furthermore, the buyer also agrees to exempt the supplier for indemnity of damages (with exception to costs for repairs or the reposition of defective products above described) directly or indirectly caused by inadequate tests, application, operation or repair of SMAR products.

13. It is the customer's responsibility to clean and decontaminate products and accessories prior to shipping them for repair, and SMAR and its dealer reserve themselves the right to refuse the service in cases not compliant to those conditions. It is the customer's responsibility to tell SMAR and its dealer when the product was utilized in applications that contaminate the equipment with harmful products during its handling and repair. Any other damages, consequences, indemnity claims, expenses and other costs caused by the lack of decontamination will be attributed to the client. Kindly, fill out the Declaration of Decontamination prior to shipping products to SMAR or its dealers, which can be accessed at www.smar.com/doc/declarationofcontamination.pdf and include in the packaging.

14. This warranty certificate is valid only when accompanying the purchase invoice.