



SMART HART® Differential Pressure Transmitter Series LD357B

Installation and Maintenance Instructions



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1. Safety information

Safe operation of these products can only be guaranteed if they are properly installed, commissioned, used and maintained by qualified personnel (see Section 1.11 on this document) in compliance with the operating instructions. General installation and safety instructions for pipeline and plant construction, as well as the proper use of tools and safety equipment must also be complied with.

1.1 Intended use

The transmitters object of the present instructions comply with the directive ATEX 2014/34/UE and are characterized by the following methods of protection:

II 1G Ex ia IIC T6 Ga

They are suitable for installation in Zone 0, Zone 1, Zone 2.

For connections and installation refer to this manual.

1.2 Access

Ensure safe access and if necessary a safe working platform (suitably guarded) before attempting to work on the product. Arrange suitable lifting gear if required.

1.3 Lighting

Ensure adequate lighting, particularly where detailed or intricate work is required.

1.4 Hazardous liquids or gases in the pipeline

Consider what is in the pipeline or what may have been in the pipeline at some previous time. Consider: flammable materials, substances hazardous to health, extremes of temperature.

1.5 Hazardous environment around the product

Consider: explosion risk areas, lack of oxygen (e.g. tanks, pits), dangerous gases, extremes of temperature, hot surfaces, fire hazard (e.g. during welding), excessive noise, moving machinery.

1.6 The system

Consider the effect on the complete system of the work proposed. Will any proposed action (e.g. closing isolation valves, electrical isolation) put any other part of the system or any personnel at risk? Dangers might include isolation of vents or protective devices or the rendering ineffective of controls or alarms. Ensure isolation valves are turned on and off in a gradual way to avoid system shocks.

1.7 Pressure systems

Ensure that any pressure is isolated and safely vented to atmospheric pressure. Consider double isolation (double block and bleed) and the locking or labelling of closed valves. Do not assume that the system has depressurised even when the pressure gauge indicates zero.

1.8 Temperature

Allow time for temperature to normalise after isolation to avoid danger of burns.

1.9 Tools and consumables

Before starting work ensure that you have suitable tools and/or consumables available. Use only genuine Spirax Sarco replacement parts.

1.10 Protective clothing

Consider whether you and/or others in the vicinity require any protective clothing to protect against the hazards of, for example, chemicals, high /low temperature, radiation, noise, falling objects, and dangers to eyes and face.

1.11 Permits to work

All work must be carried out or be supervised by a suitably competent person. Installation and operating personnel should be trained in the correct use of the product according to the Installation and Maintenance Instructions.

Where a formal 'permit to work' system is in force it must be complied with. Where there is no such system, it is recommended that a responsible person should know what work is going on and, where necessary, arrange to have an assistant whose primary responsibility is safety.

Post 'warning notices' if necessary.

1.12 Electrical work

Before starting work study the wiring diagram and wiring instructions and note any special requirements. Consider particularly: mains supply voltage and phase, local mains isolation, fuse requirements, earthing, special cables, cable entries / cable glands, electrical screening.

1.13 Commissioning

After installation or maintenance ensure that the system is fully functioning.

Carry out test on many alarms or protective devices

1.14 Disposal

Unwanted equipment should be disposed of in a safe manner.

1.15 Returning products

Customers and stockists are reminded that under EC Health, Safety and Environment Law, when returning products to Spirax Sarco they must provide information on any hazards and the precautions to be taken due to contamination residues or mechanical damage which may present a health, safety or environmental risk. This information must be provided in writing including Health and Safety data sheets relating to any substances identified as hazardous or potentially hazardous.

2. Introduction

2.1 Product Overview

The Spirax Sarco LD Series electronic transmitters are devices that use a sensor to measure pressure, level and temperature, and transmit a current signal ($4 \div 20\text{mA}$) proportional to the measured variable. The LD Series consists of the following models:

TT352	Electronic temperature transmitter
LD256	Electronic pressure transmitter
LD357B	Electronic differential pressure transmitter
LD357BL	Electronic level transmitter

2.2 Attention!

This manual does not contain information concerning all type of Transmitter or all different installation and/or working and mounting solutions.

For more information or for particular problems not considered in this manual, please address to our technical office.

The warranty period is the one contemplated in our general servicing conditions.

This warranty is neither increased nor restricted by the contents of this manual.

This Transmitter has to be installed and used only by qualified persons who have first checked the correctness of supply voltage so that both in standard working conditions and in presence of damages of the plant or of any part of it, no dangerous voltage can reach the Transmitter.


As the Transmitter can be utilized both with high pressure values and with aggressive media it must be considered that an incorrect use of it could bring even serious damages to people and things.

A correct and safe working needs an adequate transport, stock and mounting other than an appropriate maintenance service.

So it is necessary for the people handling these Transmitter to have knowledge and experience in mounting, servicing and working and to have title to do their job with reference to "Safety Standards".

2.3 Definitions and Symbols

In this manual are used the following symbols and labels:

	Equipment for use in potentially explosive atmospheres
II 1G	Equipment Group II Category 1G, suitable for potentially explosive Zone 0 area (gases, vapours or mists) and with redundancy for zone 1 and 2
Ex ia	Equipment protection by intrinsic safety, level of protection "ia"
IIC	Group IIC apparatus, fit for substances of group IIC, IIB and IIA
T6, T5, T4	Temperature Class of the transmitter (maximum surface temperature) <ul style="list-style-type: none">➤ only when used in the ambient temperature range $-40^{\circ}\text{C} + 40^{\circ}\text{C}$➤ only when used in the ambient temperature range $-40^{\circ}\text{C} + 55^{\circ}\text{C}$➤ only when used in the ambient temperature range $-40^{\circ}\text{C} + 80^{\circ}\text{C}$
Ga	Equipment with equipment protection level (EPL) "Ga"



Warning!

Warning label, used to warn about hazardous materials, locations, or objects, including electric currents, poisons, and other things.



Prohibition!

Prohibition label, used to indicate something is not permitted.



Mandatory!

Mandatory label, used to set obligation tasks to be performed by the user.



Information!

Information label, used to set general information for the user or warn about hazards for the equipment.

3. Description

The LD357B series SMART differential pressure transmitters are microprocessor based instruments that combine the analog signal advantages (4-20mA) together with the flexibility of digital communication using HART® protocol. They can be remotely configured by a universal hand held terminal (HHT) or by a PC with a dedicated interface.

Moreover, it is possible to locally configure the instruments (zero and span) by means of push buttons and to display the data on the wide LCD display.

The transmitter series LD357B, measure differential pressure with spans from 1,2 to 20000 mbar with a static pressure up to 200 bar. The pressure measuring element is a piezoresistive sensor. It is possible to choose a variety of sensors to satisfy all process conditions.

The Spirax Sarco measuring cell contains the sensor and transmits the pressure to the electronics. Thermal drift is compensated using the temperature signal generated by a PTC thermistor integrated in the sensor itself. Based on these readings the microprocessor generates the 4-20mA analog output "two wires system" and displays the pressure measurement on the LCD. Some of the main characteristics of this microprocessor-based transmitter, are:

- Wide Rangeability;
- Automatic temperature compensation;
- Digital communication using HART® protocol.

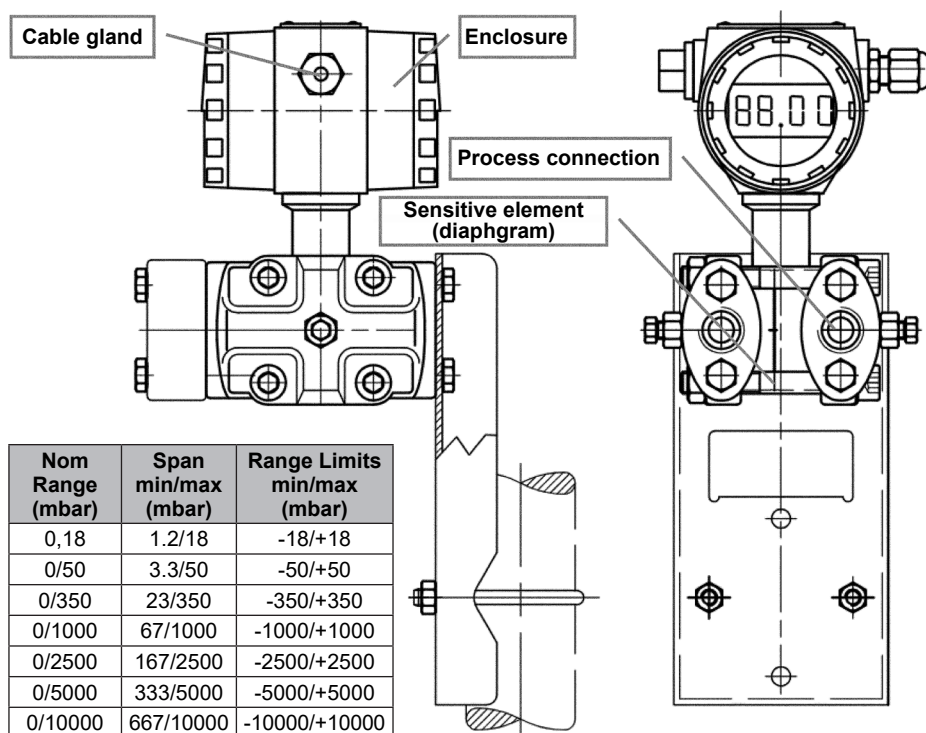


Fig. 1 - LD357B differential pressure transmitter

4. Installation

4.1 Transmitter Identification

Transmitter data can be found on the nameplate fixed on the top of transmitter enclosure (see Marking). The Serial Number must be quoted at the occurrence of a specific request to the manufacturer.

4.2 General mounting requirements

Prior installation shall be observed following considerations:

- Check whether Transmitter's operating conditions are within the limits as reported in the nameplate, technical specifications sheets and/or label.
- Make sure that the operating conditions are compatible with the specification given to the manufacturer.



Mandatory!

- For measurement in the presence of particularly hot liquids (e.g. steam) make sure that the Transmitter is supplied with a suitable finned arm or siphon.
- For viscous liquids or those containing solid particles in suspension make sure that the connection to the process is a suitable one in order to avoid clogs.



Warning!

Direct sunlight may cause serious damages to the instrument.
Never install standard Transmitter under the sun or in any other location which could cause direct overheating through radiation.

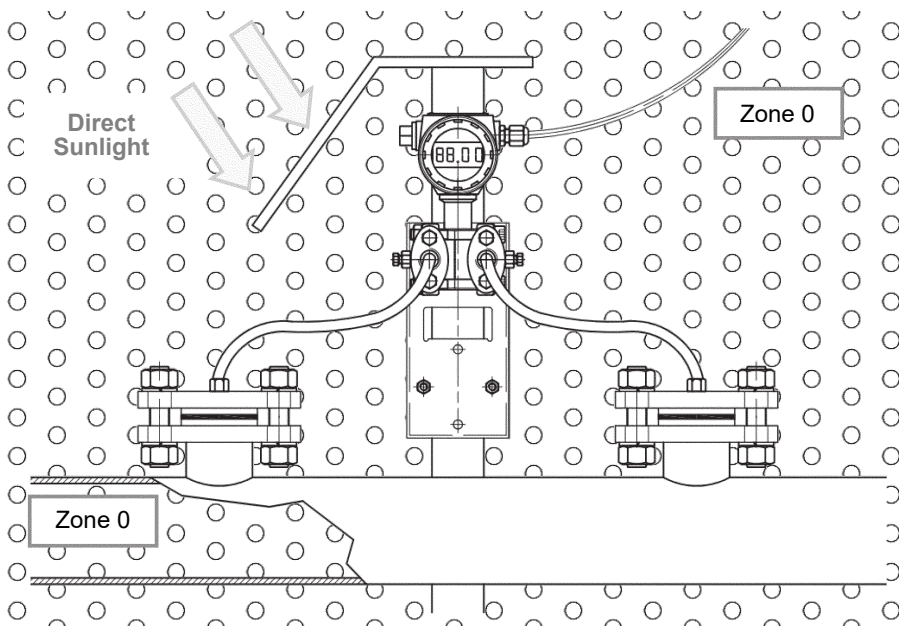


Fig. 2 - Mounting requirements

4.3 Mechanical Installation

The Transmitter should be located, if possible, at some easily accessible, well lighted place on the vessel, in order to allow putting in operations and maintenance work. Location should also be such that ambient temperature at the Transmitter enclosure be not excessive (see MARKING).



Information!

- Plant overpressure / over-temperature: observe rating plate.
- Installation on seismic areas: inform technical department.
- In case of unstable fluids: inform technical department.
- In case of damages: inform technical department.
- Inspection frequency: consideration should be given to applicable national legislation.



Warning!

- The process connection must be realized in such a way that guarantees the hold at the maximum working pressure and temperature.
- Do not overcome the maximum pressure and temperatures indicated in the technical data sheet of the selected model.
- When the device is connected to the process it can be submitted to high pressures and temperatures. To avoid accidents subsequent to sudden discharge of pressure and/or to contact with dangerous or flammable fluids it is necessary to take the maximum attention when the Transmitter is taken off, heated or repaired, verifying that it is isolated from the process and is not submitted to pressure and/or temperature.

4.4 Installation for relative pressure measurement

The transmitters LD357B may be used for relative pressure measurements or level measurements in tanks or piping. In Fig. 3 the simplest mounting, direct on piping, is illustrated.



Warning!

- Remember to introduce always a security valve in order to put in maintenance operations when necessary.
- When the connections are located on a vertical process line, the flow should be upward.



Information!

Fig. 3, Fig. 4, Fig. 5 and Fig. 6 show some of the installations recommended by ISO 2186 Standards. Refer to this Standard for more information.

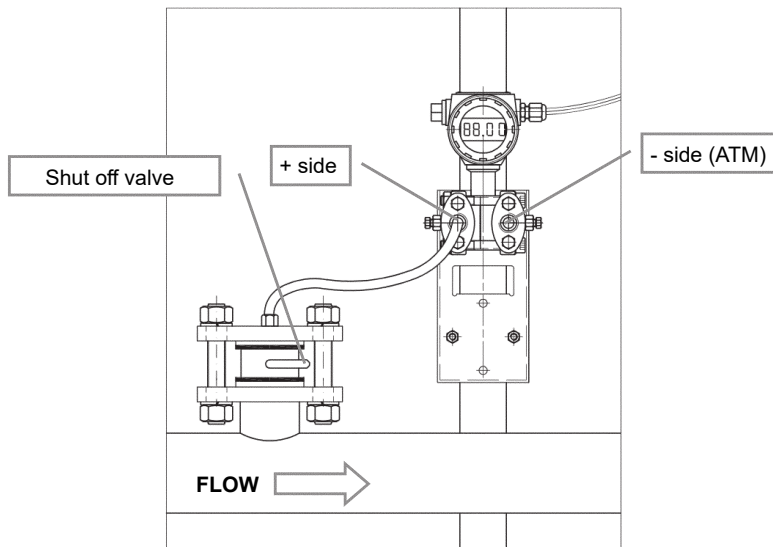


Fig. 3 - Relative pressure measurements in piping lines

Normal mounting position for the transmitter is below the lower pressure connections

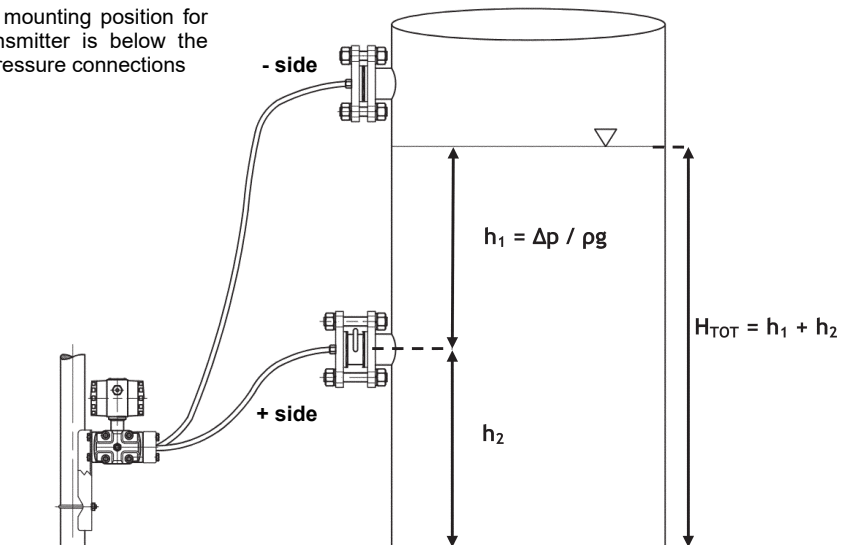


Fig. 4 - Level measurements in open vessels

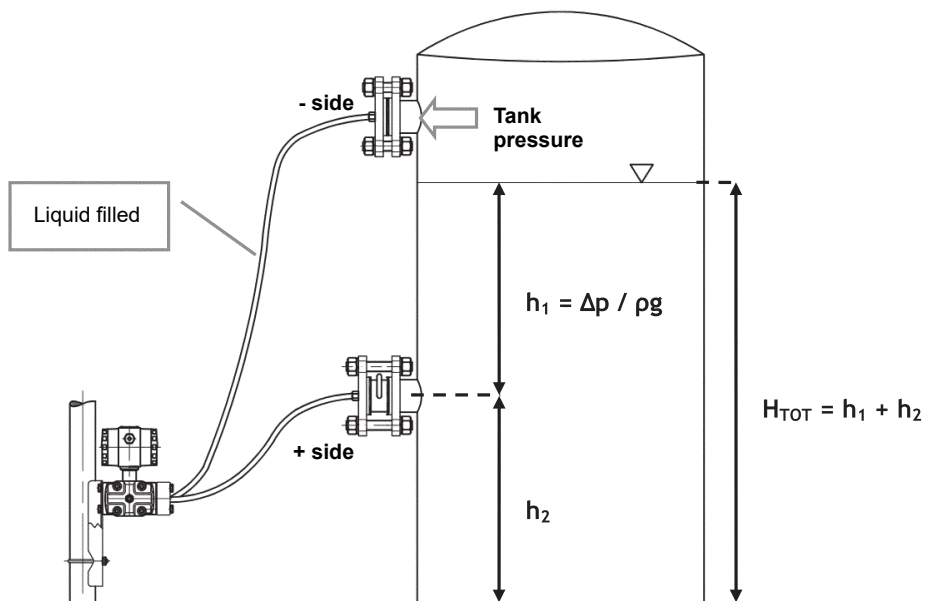


Fig. 5 - Level measurements in closed vessels with corrosive vapors

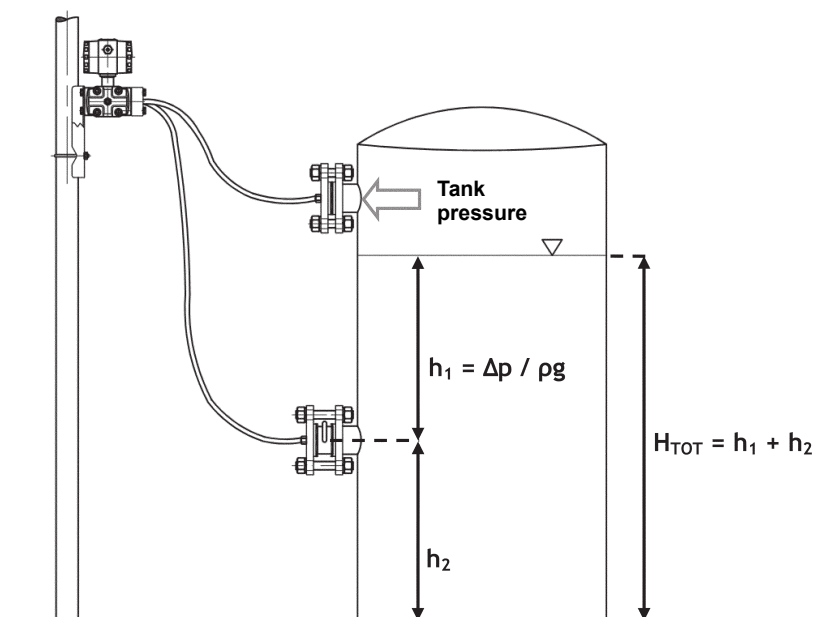


Fig. 6 - Level measurements in closed vessels with dry and clean vapours



Information!

- Referring to **Fig. 5**: the descending pipes can be filled with condensate vapors of the process fluid or with suitable inert liquid to prevent direct contact with the transmitter diaphragm.
- Referring to **Fig. 6**: the transmitter can be mounted above the process connections only when in service with dry and clean gas vapors without seal liquid.



Mandatory!

- Pressure connections on model LD357B are marked with "H" ("+") and "L" ("-"); the higher pressure will be applied to "+" side.
- Always check carefully all manifolds, reducers if any, vents and drain plugs for leaks.

4.5 Installation for differential pressure measurement

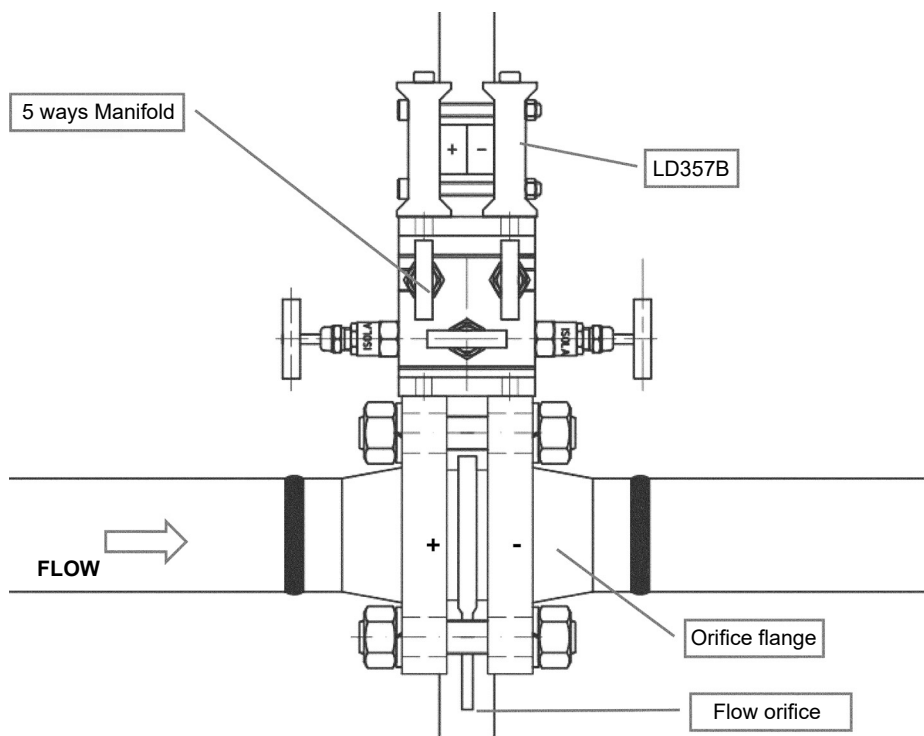


Fig. 7 - Differential pressure measurements in piping



Mandatory!

- Always check carefully all manifolds, reducers if any, vents and drain plugs for leaks

4.6 Electronic head orientation

In order to rotate the electronic head in the desired position you must follow these passages (**Fig. 8**):

- unscrew the 2 stop dowels (A) with key CH.2;
- by hand gently rotate the enclosure (B) in the desired position;
- once the desired position is reached fix the stop dowels (A) again with the same key.

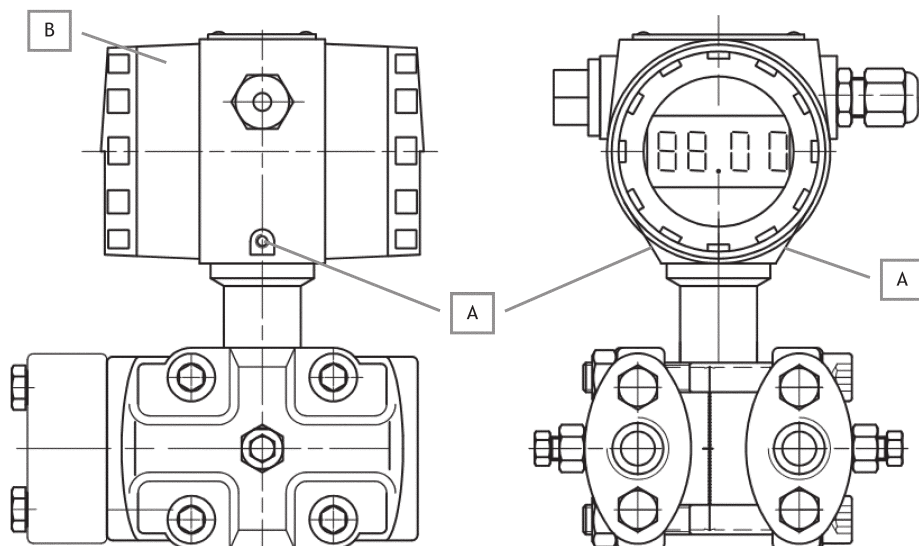


Fig. 8 - Rotating the transmitter head



Information!

It is not necessary to turn off the supply.

4.7 Electrical connection

Under the rear cap is placed the terminal block reporting the electric polarity (**Fig. 9**). Insert the power supply cable into the enclosure through one of the two threaded openings. Transmitter is protected from accidental inversion of polarity. For a better use is recommended a twisted pair cable (22 AWG min). Avoid placing Transmitter near devices powered in AC or Switching. Connect ground-tap of the Transmitter to the local common earth (PE) as indicated in paragraph Earthing.



Warning!

The threaded opening that is not used must be sealed using a suitable cap. The caps included in the delivery are only for protection during transport.

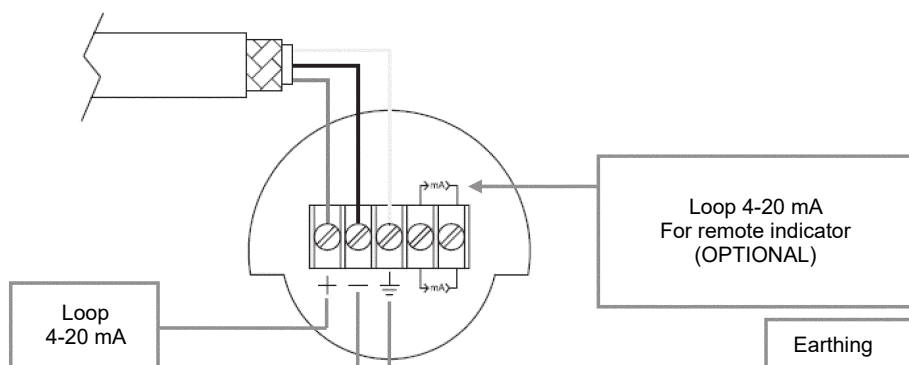


Fig. 9 - Electrical connection of the power cable to the terminal block



Information!

Impedance of the cables defines the possible maximum length for digital communication. It's recommended using cable with a low impedance. The maximum length of the point to point connection, with a load of 250 ohm and single twisted cable 22 AWG-207 pF/m it's about 1000 meters.

The maximum connection length for the analog signal only is limited by the loads (connected devices and cable) present in the current loop.

To obtain output signal of 4-20 mA, you have to determine the minimum supply voltage as a function of the load relation: see **Fig. 10**. From the following formula you can achieve the right minimum value of supply voltage:

$$V_{dc} = 0.0215 \times R + 12$$

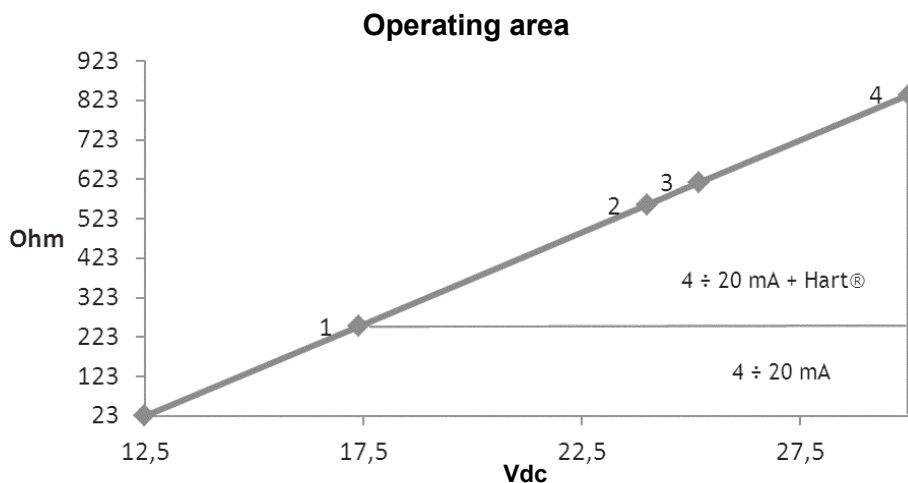
Where: R = output load [Ohm].

The power supply source to assure a minimum current value of 24 mA.



Mandatory!

In order to obtain a 4÷20 mA + Hart® output a minimum load of 250 Ohm is required.



TAG	-	1	2	3	4
Vdc	12.5	17.4	24	25.2	30
Ohm	23	250	558	615	837

Fig. 10 - Operating area for Ex ia protection

The electronic transmitters totally comply with the HART® protocol specification Revision 6.0, so they include remote process variable interrogation, parameter setting and diagnostics.

The device is a 4÷20mA 2-wire transmitter, with FSK communication.

It is possible to read via HART® the following variables:

- ✓ **PV:** transmitter main measure;
- ✓ **SV:** % of the span;
- ✓ **TV:** analog output;
- ✓ **QV:** electronic board temperature.

Please refer to **Fig. 11** for the 4÷20 mA + Hart® modem connection.

In **Fig. 12** the Hart® connection type is shown.

It is possible to purchase the Hart Server as an additional product; this is a software including all the interrogation, configuration and diagnostics functions required by the Hart® specification.



Information!

Ref. to **Fig. 11**: only one transmitter could be connected to each barrier.

Ref. to **Fig. 12**: up to three transmitters can be connected to each barrier with a maximum of 5 Ex ia barriers.

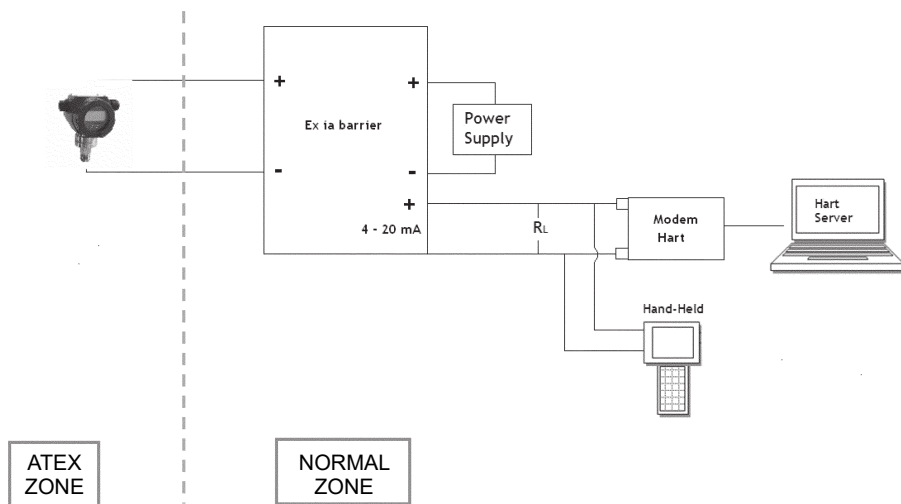


Fig. 11 - 4÷20 mA + Hart® modem connection with Ex ia barrier

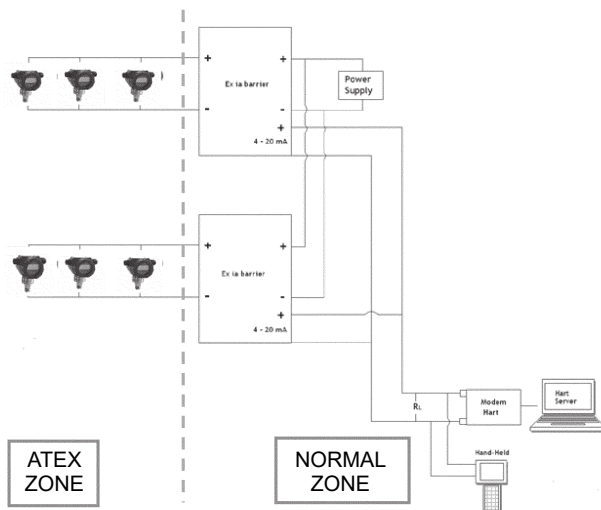


Fig. 12 - Only HART® Multidrop connection

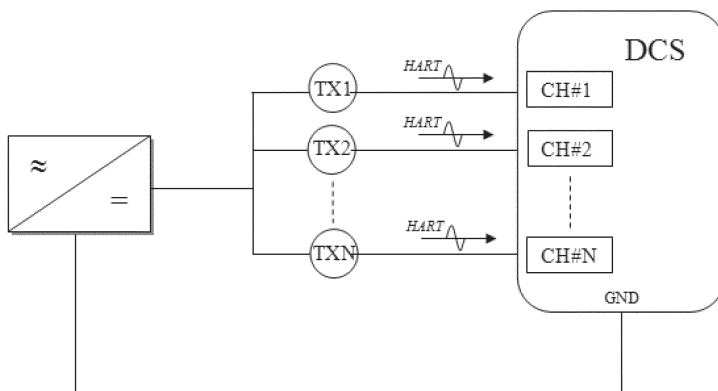


Fig. 13 - DCS connection



Mandatory!

Transmitter response time is <256ms.

DCS Polling time must be set approximately at 800ms in order to avoid updating problems both in analog and digital measurement.

On request the transmitter can be supplied in order to support a Polling time of 500ms but with a minimal consumption of 5 mA.

4.8 Intrinsic Safety Protection

In case of use in areas with danger of explosion, it must be verified that the identified type of transmitter fits for the classification of the zone and for the presence of flammable substances in the plant (see MARKING).

The safety essential requisite against the risk of explosion in the classified areas are fixed from the European Directives 2014/34/EU of 26 February 2014 (as far as it concerns the 'Equipment') and 1999/92/EC of December 16th 1999 (as far as it concerns the 'Working Environment').



Warning!

For the electrical connections please follow the instructions brought in this operator manuals taking care that for the use in classified areas it is necessary to foresee the standard EN 60079-14.



Prohibition!

Avoid any ignition hazard due to impact or friction (EN 60079-0:2012 § 8.3).

If the protective guard or any part of the device is damaged by impact or friction, the type of protection is invalidated.

For the use of the transmitter in hazardous area, you must consider the use of associated apparatus (barrier), certified according to EN 60079-11, with electrical output compatible with the maximum input parameters of the transmitter (shown below).

The evaluation of the system formed by the associated apparatus, the transmitter and the connecting cables must be performed by experienced personnel and must be in accordance with the requirements of EN 60079-25 concerning intrinsically safe systems.

For proper installation must take into account the safety instructions of the barrier used.



Warning!

The choice of the associated apparatus has to be made based on the maximum input parameters of the transmitter

Maximum input parameters of the equipment (relative to the intrinsically safety):

Parameter	Tamb ≤ 60°C	Tamb ≤ 80°C
Output signal	4÷20 mA	4÷20 mA
Input voltage (V)	30 V	25.2 V
Input current (Ii)	100 mA	100 mA
Input power (Pi)	0.75 W	0.62 W
Internal capacitance (Ci)	10 nF	10 nF
Internal inductance (Li)	Negligible	Negligible



Information!

The device has passed the test of dielectric strength required by the harmonized standard EN 60079-11. The test has been carried out between the intrinsically safe circuit and the casing to a voltage of 500V for a time equal to 60s.

The Aluminum housing containing the electronics has passed the tests required by standard EN 60529 for the degree of protection IP66.

The SS AISI 316 housing containing the electronics has passed the tests required by standard EN 60529 for the degree of protection IP67.

4.9 Earthing



Warning!

The earth connection is required to prevent damage to people and malfunction of the instrument.

- **Case 1: Installing the instrument in a plant devoid of earthing systems**

In the case where the plant devoid of earthing, it is necessary to connect the earth wire to the terminal block through the cable that carries the signal and the power supply (**Fig. 9**).

- **Case 2: Installing the instrument in a plant provided with earthing systems**

Make sure the earthing (GND) of the system has the least resistance possible.

You can add an additional earth wire with section not less than 4 mm² to ensure such connection.

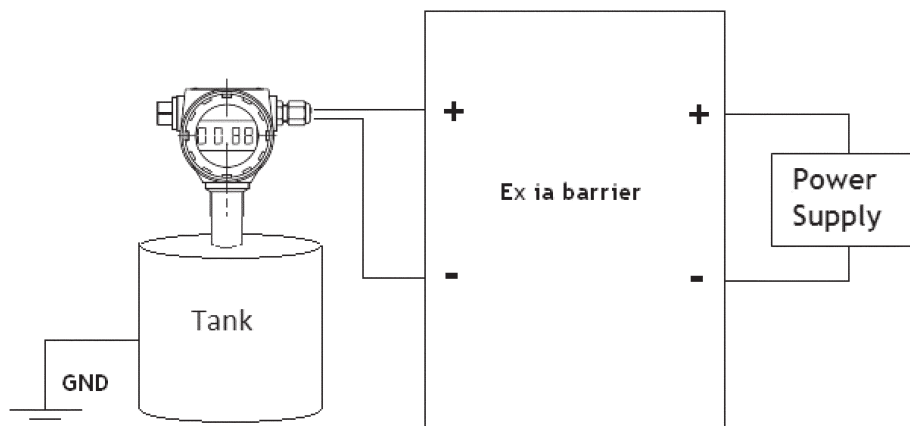


Fig. 14 - 4 ÷ 20 mA loop connection with Ex ia barrier



Warning!

In the case represented in **Fig. 15**, within the earth wire may also scroll through the current protection of other instruments where the earthing of the system (GND) had not been carried out in an optimal manner.

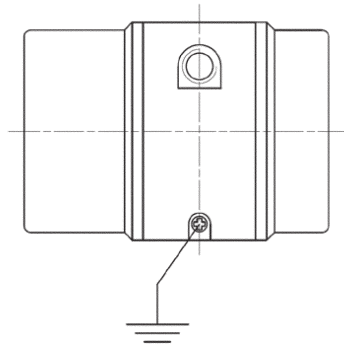


Fig. 15 - Earthing in the housing



Warning!

The hose must not be considered as a protection against electric shock for the protection of security, but as protection against electromagnetic interference of the instrument. Therefore, in the case of long distance cable ($L > 20$ m), both ends of the braid must be connected to the chassis or to the connectors. In the case of cables $L < 20$ meters, will be sufficient to connect the braid only from the side "Power Supply".

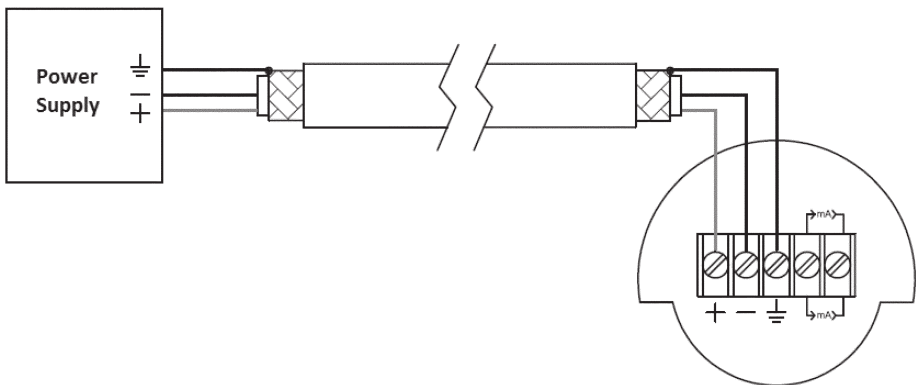


Fig 16 - Earthing of the shield for cables longer than 20 meters

5. Operations

5.1 Operations

Each transmitter is calibrated in factory and has on the nameplate the configuration data. If not differently stated in the purchase order the transmitter is configured as follow:

Upper Range Value (Higher pressure value): refer to the data sheet of unit

Lower Range Value (Lower pressure value): refer to the data sheet of unit

Damping 0 sec.

5.2 Configuration

The transmitter shows the status and the measure on the dot matrix LCD (Fig. 11).

The span is from -99999 to 999999.

The input signal to the transmitter can be related to the output signal in the following ways:

Direct mode = 4÷20mA output

Reverse mode = 20÷4mA output

The direct mode is obtained by setting the lower range point with the lowest value of the range (e.g. 0 bar) and by setting the upper range point with the highest value (e.g. 5 bar). The reverse mode is obtained by setting the lower range point with the highest value of the range (e.g. 5 bar) and by setting the upper range point with the lowest value (e.g. 0 bar).

It is possible to display the temperature value of the control board by pressing the following button during transmitter operation:

⇓ = electronic board temperature.

The unit of measure (°C) is defined in the entry TEMP UNIT in the keyboard menu (**Fig. 17**).

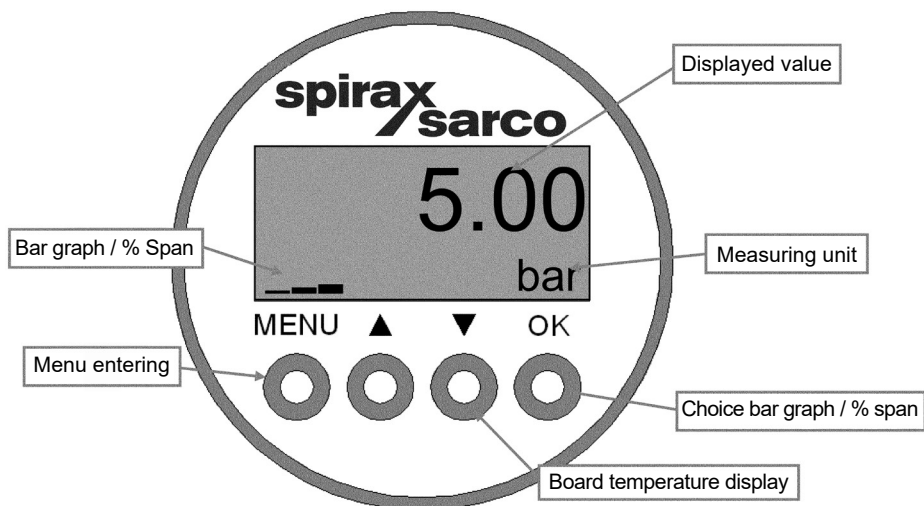


Fig. 17 - LD357B Display

5.3 Keyboard Configuration

The electronic transmitters have some configuration functions available via keyboard and LCD display, provided with the transmitters themselves.

- ✓ Press the [MENU] button to enter the password entering dialog (the default password is 0000). Confirm by [OK] to enter the configuration menu.
- ✓ The display will allow to choose from the different functions described in the table below. Use the ↑ and ↓ buttons to show the sequence of the available functions and press [OK] to confirm the selected function.
- ✓ When the display is in numerical entering mode, the cursor will blink.
- ✓ To move the cursor press the ⇐ button; to raise the value of the digit press the ↑ button. Press the [OK] button to confirm; use instead the [MENU] button to cancel the modifications and to go back to the standard display.

Function	Display name	Use	Choice span
Maximum FS flow rate	FMAX	Represents the maximum flow rate associated with the pressure set by the client in the URV.	-
Zero setting	LRV	Measure linked to the zero and to the 4mA output. The measuring unit is shown in the lower right corner of the display.	Between the sensor limits
Full span setting	URV	Measure linked to the full span and to the 20mA output. The measuring unit is shown in the lower right corner of the display.	Between the sensor limits
Measuring unit selection	PV UNIT (disabled in volumetric flow meters mode)	Measuring unit selection from the available ones. Press ↑ or ↓ to scroll.	Pressure: bar, mbar, Pa, hPa, kPa, MPa, mmH ₂ O, mH ₂ O, cmH ₂ O, Kg/cm ² , mmHg, psi, Torr, inHg, Atm, FtH ₂ O, g/cm ² , inH ₂ O Flow M ³ /h
Sensor Temperature unit	TEMP UNIT	Temperature unit selection from the available ones. Press ↑ or ↓ to scroll.	°C, °K, °F
Configuration of the measuring unit typology	XFR FUNC	Not configurable in this series.	LIN SQRT = volumetric flow meter

Function	Display name	Use	Choice span
Fault configuration	ALARM TYPE	Fault condition analog output selection.	NONE = no action 21mA 3.85mA LAST = last read value
Damping setting	DAMP VALUE	Insert the signal averaging time constant.	0÷60s
Automatic zero elevation	OFFSET	At the button pushing the transmitter performs the zero elevation, in manner to put to zero the actual measure. The elevation is applied to the whole span.	-
4mA input automatic setting (zero)	SET LRV	At button pushing the transmitter will automatically link the 4mA output to the actual reference input.	-
20mA output automatic setting (span)	SET URV	At button pushing the transmitter will automatically link the 20mA output to the actual reference input.	-
Analog output test	LOOP TEST	It is possible to fix the analog output of the transmitter to a required mA value.	3.85÷21mA
Analog output calibration	CAL 4-20mA	The transmitter fixes the output to 4mA and asks by display to check the value (OK? YES/NO). Choose NO if the output is incorrect and insert the value read on an external Ammeter. Do it again until necessary. The same procedure for 20mA follows.	-
Hart® Polling address	ADDRESS	Hart® polling address modification.	0÷15 The minimum polling time is 8ms
Transmitter information	INFO	The polling address, the lower sensor limit (LSL), the upper sensor limit (USL) and the firmware revision are shown.	-

Function	Display name	Use	Choice span
Password setting	PASSWORD	Allows to insert a new password for the transmitter. To be used with care.	0000÷9999
Expert command: Manual zero elevation	ZERO ELEV. (disabled in volumetric flow meters mode)	Manual zero elevation insertion.	6 digits, including "-" sign and decimal point
Expert command: Gain settings	GAIN	Reduce the upper range limit by reducing the current output.	0.1÷10
Factory setting restore	RESTORE	Select and confirm using buttons \uparrow and [OK].	-



Information!

The password is in 4 digits format and spans from 0000 to 9999. If you can't remember or find the password you set, please contact our technical department Spirax Sarco.

— 6. Maintenance and Troubleshooting —

Although transmitters LD series do not require a maintenance on periodical basis, it is good practice to regularly check the general transmitter status, the possible presence of rust or damage on the case or on the measuring diaphragm and the presence of clogging in the process connection.



Prohibition!

Repair, maintenance and/or overhaul of the equipment shall only be conducted by the manufacturer himself, or by a repairer he has qualified or authorized.

Is forbidden during the maintenance operation to use the tool as a handle or step.



Please refer to the following pages scheme for troubleshooting.
In any case contact our technical department Spirax Sarco for help.

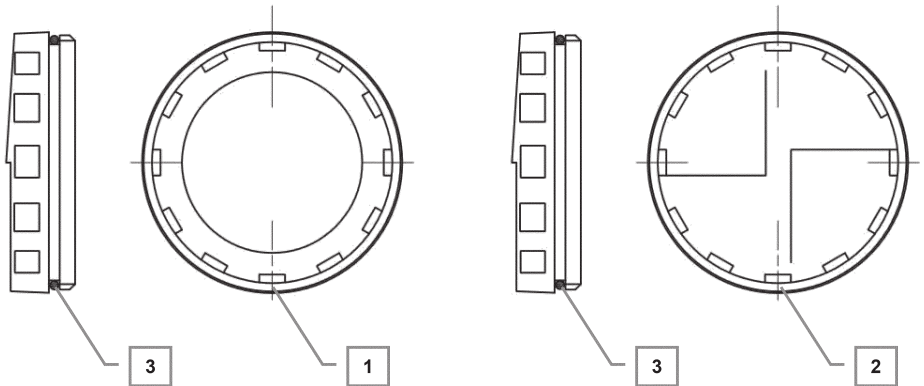
Condition	Potential source	Solution
The transmitter doesn't turn on	Supply	Check the supply voltage to be 12.5Vdc<Vsupply<30Vdc.
	Polarity	Check the transmitter connection polarity.
	Electrical load	Check that the load is less than the maximum allowed.
Measure is incorrect	Process	Accurately verify the compatibility between the process and the connection type.
	Sensor drift	Apply zero input conditions to the transmitter and use the OFFSET command.
	EMC interference	Accurately verify the possible presence of electromagnetic interference on the supply line. Check the PE connection.
Erratic analog output	Wrong span limits	Use the LRV and URV commando (or SET LRV and SET URV) to correct the output.
	Uncalibrated analog output	Use the LOOP TEST command to verify the analog output calibration. If it is not correct, use the CAL4-20mA command to calibrate the output.
	Incorrect HART® settings	Use the ADDRESS command to verify that the polling address is set to 0.
Analog output <4mA or >20mA	Transmitter in fault mode	Check if the output isn't out of the allowed span or check the presence of a failure (e1, e2, ... on display).
	Wrong fault settings	Check the settings using the ALARM TYPE command.
Unstable measure	Measuring disturbs	Set an input average using the DAMP VALUE command (i.e. 10 seconds).
Impossible to access the menu	Wrong / forgotten password	Contact Spirax Sarco for help

6.1 Display error codes

Type of error	Description
OVR	OVER RANGE: this message is shown if PV is greater than URV by 20% of the span.
UDR	UNDER RANGE: this message is shown if PV is lower than LRV by 20% of the span.
LCD OV	LCD OV: this message is shown if PV < -99999 or PV >99999. In this case could depends by damage of sensor or display.
EE CHK ERR	This message depends by an error configuration of the EEPROM memory .
EE ADC ERR	This message is shown if there are PV calculus error in primary ADC input. If it persist contact Spirax Sarco for help.
T EX AD ER	This message is shown if there are on external temperature signal calculus error in secondary ADC input. If it persist contact Spirax Sarco for help.
T IN AD ER	This message is shown if there are on internal temperature signal calculus error in secondary ADC input. If it persist contact Spirax Sarco for help.

6.2 Spare Parts

Together with the request of spare parts it is required to indicate Serial Number of the Transmitter to control that the correct components will be delivered.



Item	Product Code	Description	Quantity
01	Display Cover	Cover with display glass	1
02	Blind Cover	Blind cover terminals side	1
03	Cover O-rings	Gaskets for enclosure covers	2

7. Marking

On the transmitter enclosure is fixed an identification plate with inscriptions showing the characteristic data of the instrument.

Refer to Fig. 18, the Transmitter is provided with the following information:

1. Name and address of the manufacturer
2. CE marking followed by the identification number of the notified body involved in the production phase
3. Designation of series or type
4. Serial number (with the Year of construction)
5. ATEX marking for equipment-group II, followed by the specific marking of explosion protection (see Definitions And Symbols)
6. PED essential allowable limits: allowable Fluids, Maximum working pressure (PS), Nominal size (DN), etc.



Fig. 18 - Marking plate

8. Data sheet

Functional Data

With reference to the following, please note these definitions:

Nominal range: (referred to the sensor mounted in the instrument) the measured pressure range for which the sensor has been designed. Defined as a minimum and maximum value.

Nominal span: the interval between the minimum and maximum values of the sensor nominal range. The span is a single number.

Measuring range: the minimum and maximum range values for which the transmitter is to be calibrated.

Measuring span: the interval between minimum and maximum values of the measuring range.

Input scale initial value or zero input: minimum pressure value within in the measuring range.

Input full scale value: maximum pressure value within in the measuring range.

Transmitter Parameters

The parameters that are available for display and setting are:

Measuring span: possibility to change from 3,3% to 100% of the nominal span.

Zero adjustment: digital calibration $\pm 15\%$.

Low/upper range values: they can be set within the nominal range provided that the span > minimum span.

Damping: digitally adjustable from 0 to 60 sec. (minimum response time $\sim 0,1$ sec.).

Reverse output: automatically obtained via software.

Transfer function: linear/square root via software.

Self test: in case of malfunction the analog output is forced to the fail-safe state 3.85 mA or 21 mA.

Measuring units: 18 different pressure units or % of the measuring span, selectable via software.

Physical Characteristics

Power supply: 12.5 - 30 Vdc

Output signal:

Analog 4-20mA, 2 wires.

Digital using HART®

Response time: <256 ms (Std Hart®)

Measured value update frequency:

4-20 mA + Hart® output: ~ 1 s

Hart® output only: ~ 500 ms (on request)

Polling time:

4-20 mA + Hart® output: ~ 800 ms

Hart® output only: ~ 500 ms (on request)

Ambient Conditions

Temperature:

Process fluid: $-40 \div +80^{\circ}\text{C}$ (with capillary: up to 283°C)

Housing: $-40 \div +80^{\circ}\text{C}$

Handling and storage: $-40 \div +90^{\circ}\text{C}$

Relative Humidity: 0 a 100% R.H.

LCD display reading: $-10 \div +65^{\circ}\text{C}$

Power supply parameters:

If $T_a < 60^{\circ}\text{C}$

$U_i = 30\text{V}$, $I_i = 100\text{mA}$; $P_i = 0.75\text{W}$; $C_i = 10\text{nF}$; $L_i \approx 0$ mH

If $60 < T_a < 80^{\circ}\text{C}$

$U_i = 25.2\text{V}$, $I_i = 100\text{mA}$; $P_i = 0.63\text{W}$; $C_i = 10\text{nF}$; $L_i \approx 0$ mH

Performance

Total accuracy : $<0.1\%$ FS

Dead band: negligible

Display resolution: 0.1

Influence of Operating Conditions

Thermal drift: it is referred to $-10 \div +80^{\circ}\text{C}$ range.

Zero: $\pm 0.1\%/10^{\circ}\text{C}$.

Span: $\pm 0.1\%/10^{\circ}\text{C}$ at nominal range.

Static pressure effect

Nominal range 18-50 mbar: Zero: $\pm 0.4\%$ / 10bar. **Span:** 0.4% / 10bar.

Nominal range 350-2500 mbar: Zero: $\pm 0.1\%$ / 10bar. **Span:** 0.1% / 10bar.

Nominal range 5000-10000 mbar: Zero: $\pm 0.2\%$ / 10bar. **Span:** 0.2% / 10bar.

Over range effect

Nominal range 18-50 mbar: Zero: on either side $\pm 1\%$ at 50bar.

Nominal range 350-2500mbar: Zero: on either side $\pm 0.1\%$ at 100bar.

Nominal range 5000-10000mbar: Zero: on either side $\pm 1\%$ at 100bar.

Power supply effect:

Negligible between 12.5 and 30 Vdc.

Physical Specifications

Housing: die cast aluminum alloy EN AB-44100 finished with epoxy resin (RAL 5014). It is dust and sand tight and protected against sea wave effects as defined by IEC IP66. Suitable for tropical climate operation as defined by DIN 50015.

Covers O-ring: EPDM.

Filling fluid: silicone oil.

Nameplate: stainless steel, fixed on housing.

Calibration

Standard: at nominal range, direct action, linear.

Optional: at the conditions specified with the order.

Electrical connections: two cable entries on electronic housing: M20x1.5 and cable gland PG 13.5 for 7 to 12mm diameter cable.

Terminal board: 2 terminals for signal wiring up to 1.5mm^2 (14 AWG). Connection for ground and cable shield.

Mounting position: any position.

Net weight: 1.4kg approx.

Process Wetted Parts

Process connections: AISI 316.

Diaphragm: see ordering information table.

Options

Finned extension, siphon or remote mounting with capillary: for working temperature higher than 80°C up to 283°C .

Bracket: for 2 inch pipe mounting.

Degreasing for oxygen service.

Housing with radial or back mounting: AISI 316 (IP67).

Directive 2014/68/EU (PED)

Pressure equipment until Category III, for fluids (gases, liquids and vapours) in Group 1.

Directive 2014/34/EU (ATEX)

Equipment for explosive atmospheres Group II Category 1G suitable for zones 0, 1 and 2.

Intrinsically Safe: Ex ia IIC T6 Ga ($-40^{\circ}\text{C} > \text{Tamb} \div +40^{\circ}\text{C}$)

Ex ia IIC T5 Ga ($-40^{\circ}\text{C} > \text{Tamb} \div +55^{\circ}\text{C}$)

Ex ia IIC T4 Ga ($-40^{\circ}\text{C} > \text{Tamb} \div +80^{\circ}\text{C}$)

Directive 2014/30/EU (EMC)

Equipment with an adequate level of electromagnetic compatibility.

Main Dimensions

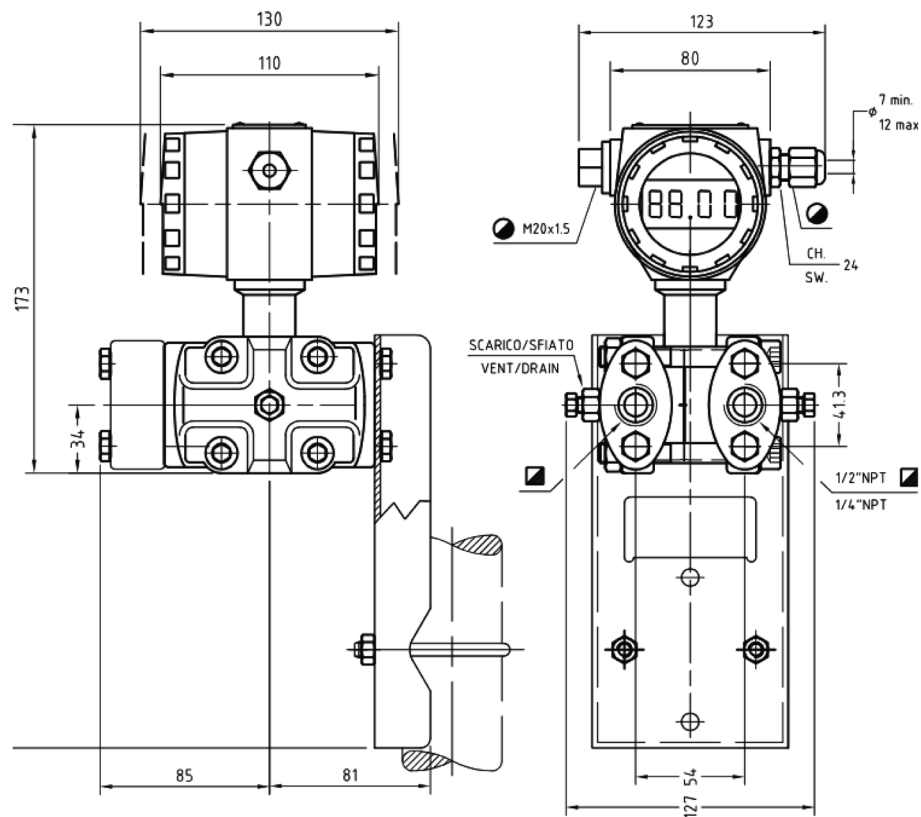


Fig. 19 - Main dimension (mm)

SERVICE

For technical support, please contact our local Sales Engineer or our Head Office directly:

Spirax Sarco S.r.l. - Technical Assistance

Via per Cinisello, 18 - 20834 Nova Milanese (MB) - Italy

Tel.: (+39) 0362 4917 257 - (+39) 0362 4917 211 - Fax: (+39) 0362 4917 315

E-mail: support@it.spiraxsarco.com

LOSS OF GUARANTEE

Total or partial disregard of above instructions involves loss of any rights to guarantee.

Spirax-Sarco S.r.l. - Via per Cinisello, 18 - 20834 Nova Milanese (MB) - Tel.: 0362 49 17.1 - Fax: 0362 49 17 307