Level transmitter LT100

Submersible transmitter for level measurement in liquids

Level transmitter with submersible probe in stainless steel for level measurement in vessels where pressure connection in the bottom of the vessel is not possible or desirable. For exampel pump pits, reservoirs or plastic tanks.

- LT100 has microcomputer based electronics.
- HART communication.
- Accuracy 0,1 %.
- Configuration through HART communication from PC with the program PI100 or with a standard hand held HART terminal.
- Withstands mediatemperatures up to 80 °C continuously.
- Well tested and approved for Exia according to ATEX, CSAus-c and CE (EMC and PED). LT100 is type approved for marine use by DNV-GL.
- Lightning protected (option). Fullfills the demands for Class 1 testing according to IEC61643-1, 5 kA (10/350 uS).
  This means that the transmitter can withstand a stroke of lightning close to the supply/signal cables. (Not available togheter with Exia approval.)
- Stainless steel measurement probe with a rugged metal diaphragm in different materials.
  LT100 can also be delivered completely in Titanium.
- Embossed diaphragm, insensitive to particles and contact. Can easily be cleaned without deformation.
- Big span turn down ratio. Down to 1/30 of sensor max limit.

PONDUS INSTRUMENTS

Types and order codes:

The transmitters order codes for different configurations can be found from the table below.

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	Description	Suffix	Figure 1	Figure 2	Figure 3	Figure 4	Comment
Electronics	HART	H					
	HART and Exia	HE					
	HART and lightning protection	HL					
Design	Probe and diaphragm in Titanium	Txx					(where xx is above suffix)
Diaphragm	Titanium		1				
	SAF205		2				
	SS 316L		3				
	Hastelloy C-276		4				
	Tantalum		5				
	Gold plated		8				
Connection	Submersible probe			0			
	Submersible probe G1/2"			01			
Span min.-max.	0,12-3,5 mH2O (4°C)				2		
	0,68-20 mH2O (4°C)				4		
	6,8-200 mH2O (4°C)				6		
Reference pressure	Atmospheric pressure					0	
	Absolute pressure					2	
Cable	Different lenght of the cable						state m

Ordering example: Lightning protected level transmitter with submersible measuring probe, 10 m cable and calibrated range 0-1,5 m water level will have the order code: **LT100HL-4020** with calibrated range 0-1,5 mH2O

Description

LT100 is a level transmitter for applications where pressure connection in the bottom of the vessel is not possible or desirable, for exampel pump pits.
LT100 consists of a measurement probe with the diameter 31 mm. The probe has a Hastelloy C-276 measuring diaphragm for highest corrosion resistance (other material as options). The diaphragm is also very insensitive to mechanical damage because of its design.
The probe are suspended in its connection cable. Standard lenght for the probe cable is 10 m. The cable is reinforced with a Kevlar cord and can be delivered in lenght up to 1000 m. For extremely corrosive media the cable can be delivered with teflon coating, max lenght 25 m.
Connection of the probe cable can be done in optional connection box. A specially designed connection box can be delivered as an accessorie. See next page.
Its also possible to equip this box with a local display.
LT100 can as an option be delivered with a good lightning protection (see next page for description).
LT100 can as an option also be delivered in intrinsic safe design, Exia.

Function

LT100 has a piezoresistive sensor connected to the media by means of a diaphragm and a capillary tube. The media pressure acts on the diaphragm and is tranfered to the sensor through a pressure intermediate oil. Since this oil completely fills the volume between the diaphragm and the sensor the diaphragm movement is very small when the pressure changes. Since the diaphragm are embossed to the surface underneath it is very insensitive to particles and contact. The capillary tube protects the sensor from high overloads because of short pressure shocks. To obtain atmospheric pressure on the back side of the sensor (for reference pressure) it is connected to the surrounding through a capillary tube inside the probe cable.
LT100H has microcomputer-based electronics, which communicate with the outside world with 4 to 20 mA signal as well as HART communication. The electronics measure and converts the output signal from the pressure dependent sensor bridge to digital values. Furthermore, the tempearture is measured.
The electronics perform compensation for temperature drift of the sensor by means of compensation values entered at the factory calibration and at the same time the temperature measurement is also calibrated. Compensation for the non-linearity in the sensor is done in the same manner.
Different kinds of transfer functions, such as linear, square root, curves..., can be selected. The electronics perform the calculation for the selected transfer function and then the digital value is converted to analogue for the 4 to 20 mA current loop. The digital value can also be read via HART communication in optional engineering units, percentage or current.
LT100H can be configured/calibrated fully by means of a hand terminal or a PC via HART communication.

Intrinsic safety, Exia
LT 100 can as an option be delivered in intrinsic safe design, Exia IIC T4 Ga, according to ATEX and CSAus-c. The transmitter will then have the code LT100HE where E indicates ”Exia”.
This option can not be combined with the lightning protected option (see above).

Approvals
LT100 is CE approved according to the EU directives for pressure equipment, PED, and EMC.
LT100HE is explosionproof approved, ATEX EEx ia IIC T4 Ga, by NEMKO and Exia approved by CSA for US and C.
The pressure intermediate oil is a FDA approved silicon oil.
LT100 is type approved for marine use by DNV-GL.

Lightning protection
As an option LT100 can be equipped with lightning protection. The transmitter will then have the code LT100HL where L indicates ”Lightning protected”. This option can not be combined with the intrinsic safe option (see below).
The lightning protection is built in at the factory. No external changes or external components are needed.
The protection is designed to withstand a lightning stroke close to the probe cable and connec-tion cables but can not withstand a direct stroke. The protection is designed to meet the demands for Class 1 testing according to IEC61643-1 5 kA (10/350 uS).
This protection is normaly enough in most applications. In specially exposed installations, where there is high risk for direct strokes, the protection ought to be reinforced.
The lightning protection is built up as a three step protection.
The pulse that enters the transmitter is catched by two varistors, three transient protection diodes and a double surge arrester.
The probe cables shield must be appropriately grounded for the protection to fulfill its purpose.

Connection box
A specially designed connection box can be delivered as an accessorie. The box is equipped with cable glands and terminals for connection of the probe cable and the signal/supply cable.
The box can also be equipped with a local display.
The box is equipped with an appropriate connection for the probe cables atmoshperic vent tube. This connection does not affect the tightness of the box. Protection class IP67. The vent connection is design so that high pressure water from for example cleaners not can enter the vent or the box.

Display
The box can also be equiped with a local display. The display can show the the signal in optional engineering units, for example mWc or mH2O.Unit and limits is made to order.
The display is connected in series with the signal/supply cable and is feed by the current loop.

PI100
PI100 is a software tool on CD-ROM for Windows for configuration, calibration and documentation.
PI100 contains a database with available transmitter types. The program can configure transmitter specific values and perform maintenance, output signal and factory calibration. Furthermore, PI100 performs copying of current configuration, backup on to hard disc, transmitting/receiving via standard HART communication and a self-test with alarm functions.
PI100 contains online presentation of help functions, data sheets and user manual.

Hand terminal
For parameter settings a hand terminal of HART type can be used.

To consider

Dont expose the diaphragm to unnecessary damage (even though its very robust and insensitive).
As standard the probe is delivered with a transportation diaphragm protection cover. This can also be used in normal operation if required. For harsh applications a stainless steel protection cover can be supplied.
Dont descend the probe so that it stands on the bottom of the vessel.
Highest media temperature is +80ºC.
Make sure that the vent tube is connected to the surrounding atmosphere, via the fluid filter.
If the media are turbulent or flowing fasten the probe appropriately.
NOTE! Durability of the diaphragm and other parts of the transmitter is dependent of process parameters and media and is the users full responsibility.
Make sure that no free hydrogen can exist in the media, if so try to use gold plated diaphragm (code 8).

Connection and adjustment

Connection
The probe cables consists of 2 wires, shield, a vent tube and a kevlar reinforcement cord. The wires is colour marked:

White	Signal/supply +
Brown	Signal/supply -
Shield	Ground
Vent tube	Atmosphere

On the Vent tube there is a Fluid filter mounted to prevent moisture to enter.

Adjustment
Adjustments can be done through HART communication. Connect the HART modem or a hand terminal over a 250 ohm (min) resistor. Use the program PI100 a generic program or the HART hand held terminal for adjustments.
All parameters can be adjusted, for example span, zero, damping etc.

Size

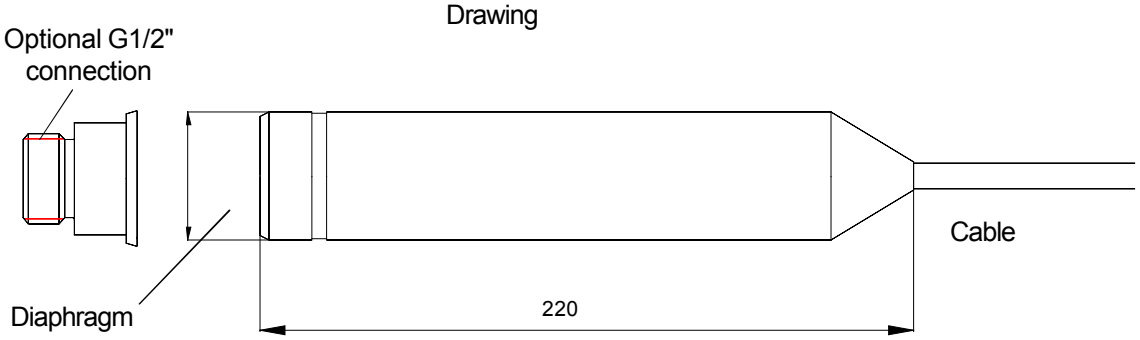
Probe size:	
Diameter	31,5 mm
Lenght	210 mm (230 mm with G1/2" connection)

Cable:

Lenght (standard)	10 m
(option up to 1000 m)	
Diameter	6,5 mm
Area	0,75 mm2
Vent tube (diam.)	2,3 mm

Reinforced with a Kevlar cord.

Drawing



Stainless steel diaphragm
protection cover (accessorie).

Technical specification LT100:

Type:	Electronic submersible level transmitter with microcomputer based electronics	**Series resistance:**	R kohm = (Supply voltage - 11)/20. For HART communication min 250 ohm
Function:	Directly connected transmitter with piezoresistive sensor	**Series resistance dependance:**	Better than +/- 0,1%
Operating range:	From -100% to 100% of upper sensorlimit	**Supply voltage dependance:**	Better than +/- 0,1%
Span:	Adjustable between upper sensor limit and 1/30 of this.	**Temperature dependance:**	Better than +/- 0,1% of max range. (From -10 to +70 degrees C.)
Zero:	Adjustable between -100% and 100% of upper sensor limit	**Long time stability:**	Better than 0,08 % per year.*2
Overload: 3,5 mH2O:	Max 25mH2O	**Vibration dependance:**	
20 mH2O:	Max 60 mH2O	Perpendicular to the diaphragm:	Max +0,3 kPa/G
200 mH2O:	Max 600 mH2O	Parallell to the diaphragm:	Max +0,02 kPa/G
Material: Diaphragm:	See page 2.	**Repeatability:**	Better than +/- 0,1% of max range.
Other media tuched parts:	Stainless steel SS2353 (option titanium)	**Accuracy:**	Better than +/- 0,1% of max range (including nonliearity, hysteresis, repeatability)*1
Cable:	Polyurethane	**Electrical connection:**	Lose wires
Ambient temperature:	-20 to +80 degrees C	Wire area:	0,5 mm2
Damping:	0,1-10 s. At delivery 0,1 s.	**Encapsulation:**	IP68
Media temperature:	Max 80 degrees C	**Electrical safety:**	According to EN 60204-1
Output:	4-20 mA, two wire connection, signal proportional to the pressure. Max current at overload 22,5 mA. HART communication	**EMC:**	According to EN 61326-1-2-3
Supply:	9-55 V DC	**Intrinsic safety (option):**	Exia IIC T4 Ga according to ATEX and CSA for US and C
Filling liquid:	AK100, food approved siliconoil (FDA approval)	**PED:**	According to 97/23/EG
Weight:	700 g including 10 m cable.	**Lightning protection (option):**	Class 1 testing according to IEC61643-1. 5kA (10/350 uS).

*1 Applies for turn down 1:1 to 1:15. For turn down 1:16 to 1:30 accuracy increases to 0,25%.
*2 Long time stability is for Hastelloy C276 diaphragm and might differ for other configurations.

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