Level transmitter LT100

Submersible transmitter for level measurement in liquids

Level transmitter with submersible probe in stainless steel for applications where pressure connection in the bottom is not possible or desirable. E.g. 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 EExia according to ATEX and CE (EMC and PED).
- 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 resista stroke of lightning near the supply/signal cables. (Not available together with EExia approval.)
- Stainless steel measurement probe with a rugged Hastelloy C 276 diaphragm (others on request).
- Embossed diaphragm, insensitive to particles and mechanical contact. Can easily be cleaned without deformation.
- Big span turn down ratio (down to 1/30 of sensor limit.)

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Types and order codes:

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

LT100 x x - x x x x

	Description	Suffix	Figure 1	Figure 2	Figure 3	Figure 4		
Electronics	HART	H						
	HART and Exia	HE						
	HART and lightning protection	HL						
Diaphragm	Hastelloy C-276		4					
Connection	Submersible probe			0				
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			
Design	Atmospheric pressure					0		
Filling oil	Siliconoil						None	
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, fe.g. 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 probe is suspended in its connection cable. Standard lenght for the probe cable is 10 m, but can upon request be delivered in lenght up to 60 m.
Connection of the probe cable can be done in a specially designed connection box, delivered as an accessory. This box is equipped with an appropriate connection for the probe cable atmoshperic vent tube.
It is possible to equip the box with a local display.
LT100 can as an option be delivered with a good lightning protection (see next page for description) or in intrinsic safe design, EExia.

Function

LT100 has a piezoresistive sensor connected to the media by a diaphragm and a capillary tube. The media pressure acts on the diaphragm and is transfered to the sensor through a pressure intermediate oil. Since this oil completely fills the volume between the diaphragm and 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 mechanical contact. The capillary tube protects the sensor from 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 a 4 to 20 mA signal as well as HART communication. The electronics measure and converts the output signal from the pressure sensor bridge to digital values. Furthermore, the total resistance of the sensor bridge is measured and these values are converted to digital temperature values.
The electronics perform compensation for temperature drift of the sensor by means of compensation values entered at the factory calibration. At the same time the temperature measurement is 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 fully configured/ calibrated with a hand held terminal or a PC via HART communication.

Lightning protection
As an option LT100 can be equiped with lightning protection. The transmitter will then have the code LT100HL where L indicates ”Lightning protected”. This can not be combined with the intrinsic safe option (see below).
The lightning protection is built in at factory. No external changes or components are needed.
This option must be made by order, it can not be built in afterwards.
The protection is designed to resist a lightning stroke near the probe and connection cables but can not resist a direct stroke. It 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 cable shield must be appropriately grounded for the protection to fulfill its purpose.

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

Connection box
A specially designed connection box can be delivered as an accessory. The box is equipped with cable glands and terminals for connection of the probe and the signal/supply cable.
It 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 ingress protection of the box. Protection class IP67.
The vent connection is design to prevent high pressure water (from for example cleaners) to enter the vent or the box.

Display
The box can be equiped with a local display. The display can show the signal in optional engineering units, for example mWc or mH2O.Unit and limits is made by 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 delivered on CD-ROM for Windows 2000/ XP 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 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 held terminal
For parameter settings a hand held terminal of HART type can be used.

Approvals
LT100 is CE approved according to the EU directives for pressure equipment, PED, and EMC.
LT100HE is explosionproof approved, EEx ia IIC T4, by NEMKO (according to the EU directive ATEX).
The pressure intermediate oil is a FDA approved silicon oil.

To consider
Dont expose the diaphragm to unnecessary damage (even though its very robust and insensitive).
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 without risk for plugging.
If the media are turbulent or flowing secure the probe appropriately.

Connection and adjustment

Connection
The probe cable consists of 2 wires, shield and a vent tube. 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. Do not remove.

Adjustment
Adjustments can be done through HART communication. Connect the HART modem or a hand held 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, e.g. span, zero, damping etc.

Size

Probe size:	
Diameter	31 mm
Lenght	250 mm
Cable:	
Lenght (standard)	10 m
(option up to 60 m)	
Diameter	6,5 mm
Area	0,75 mm2
Vent tube (diam.)	2,3 mm

Technical data 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.
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:	Hastelloy C-276 (certain coatings on request)	**Repeatability:**	Better than +/- 0,1% of max range.
Other media touched parts:	Stainless steel SS2353	**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:	0,75 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):**	EExia IIC T4 (NEMKO) according to ATEX
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%.

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