Level transmitter HM-LT60

Submersible digital transmitter for level measurement in liquids

HM 2204

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.

INNOVATIVE AND FLEXIBLE DESIGN. KEY FEATURES:

- Digital electronics. 4-20 mA signal. Level and temperature values via MODBUS communication (LT60RS).
- MODBUS communication via RS485 (LT60RS). Registry based for all needs (transfer of values, configuration and maintenance).
- Innovative Autozero function as standard. Just shorten two cables.
- Fixed or adjustable ranges (can on LT60RS be readjusted via MODBUS communication).
- Accuracy 0,35 % (option 0,15 %).
- Lightning protected (option). Fulfills the demands for Class 1 testing according to IEC61643-1 5 kA. This means that the transmitter can withstand a stroke of lightning close to the supply/signal cable.
- Withstands media temperatures up to 80 °C continuously.
- Stainless steel IP68 measurement probe with a rugged Hastelloy C276 stainless steel diaphragm (others on request).
- Well protected embossed diaphragm.
- Completely casted electronics for highest possible reliability.
- Well tested and approved for CE (EMC and PED).

Types and order codes:

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

HM-LT60 xxx- x x x x

	Description	Suffix	Figure 1	Figure 2	Figure 3	Figure 4	Standard cable lenght
Electronics	Fixed digital	FD					
	Modbus communication	RS					
	Fixed digital, lightning protected	FDL					
	Modbus communication, lightning protected	RSL					
Diaphragm	Stainless steel 316L		3				
	Hastelloy C276		4				
	Ceramic		5				
Connection	Submersible probe			0			
	Submersible G1/2"			01			
Span min.-max.	0-3,5 mH2O (4 °C)				1		10 m
	0-5 mH2O (4 °C)				2		10 m
	0-10 mH2O (4 °C)				3		15 m
	0-20 mH2O (4 °C)				4		25 m
	0-50 mH2O (4 °C)				5		55 m
	0-100 mH2O (4 °C)				6		specify
	0-200 mH2O (4 °C)				7		specify
	0-400 mH2O (4 °C)				8		specify
Design	Atmospheric pressure					0	
	Absolute pressure					2	

Ordering example

Level transmitter with submersible measuring probe, Hastelloy C276 diaphragm, Modbus communication and Autozero, 10 m cable and calibrated range 0-5 m water level will have the order code: **HM-LT60RS-4020**

Description

LT60 is a level transmitter for applications where pressure connection in the bottom of the vessel is not possible or desirable, for exampel pump pits. LT60 consists of a measurement probe with the diameter 31 mm. As standard the probe has a very robust Hastelloy C276 stainless steel measuring diaphragm for high corrosion resistance (other on request). The probe can be equipped with diaphragm protection covers if needed.
The probe are suspended in its connection cable. (Standard lenght see above.) 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 10 m.
Connection of the probe cable can be done in optional connection box, BOX100. This box is equiped with an appropriate connection for the probe cables atmoshperic vent tube. Its also possible to equip this box with a local display and reinforced lightning protection.
LT60FD have fixed measuring ranges and no communication. LT60RS can communicate via MODBUS. Range etc. can be set by the user.

Function

LT60 has a piezoresistive sensor connected to the media by means of a diaphragm. 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. 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 (absolute pressure versions have no tube).
LT60 has microcomputer-based electronics, which communicate with the outside world with 4 to 20 mA signal as well as MODBUS communication (LT60RS). The electronics measure and converts the output signal from the pressure dependent sensor bridge to digital values. The digital value is converted to analogue for the 4 to 20 mA current loop.
The digital value can also be read via MODBUS communication (LT60RS) in optional engineering units, percentage or current.
LT60RS can be configured/ calibrated fully by means of a PC via MODBUS communication.

MODBUS Communication

MODBUS communication can be used for transfer of measured values, for example the level and the media temperature (etc.). The communication can also be used for configuration of all LT60RS parameters direct from a suited control system or from a PC (with appropriate software).
The MODBUS communication is fully registry based (see the manual for LT60 for more information).
Physical interface for MODBUS is RS485, 4 lines.
Supply voltage (8-36 VDC) use the 4-20 mA lines and the communication use two separate lines A and B.
A standard RS485 dongle can be use (it is recomended to use an optoisolated RS485 dongle).

Autozero function
LT60RS and LT60FD has an innovative solution to eliminate the problem of zero shift (due to for example covering or mechanical damage of the diaphragm). Just place LT60 in free air (zero pressure on the diaphragm) and shorten two cables for ten seconds. This action resets the 4 mA to zero pressure (and also makes the communication to send zero level in engineering units).

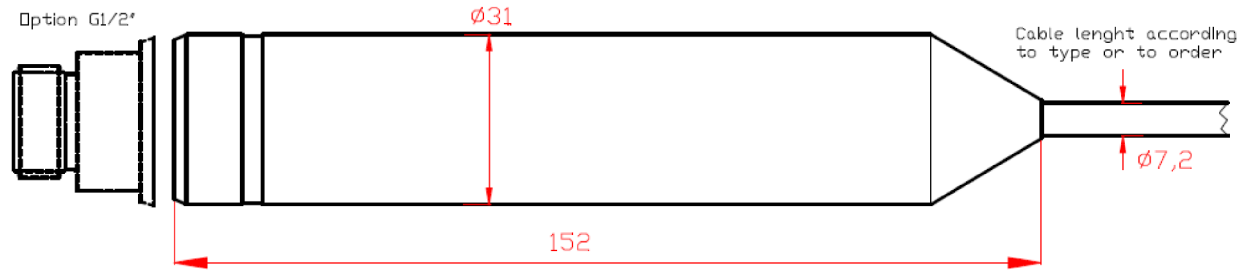
Approvals
LT60 is CE approved according to the EU directives for pressure equipment, PED, and EMC.

PI 200PS and MEP7 Modbus Tool
PI200PS is a configuration tool complete with the PC program MEP7 Modbus Tool, RS485 modem and battery supply (see separate documentation).
The PC program MEP7 Modbus Tool is a Windows software tool for reading of values, configuration, calibration and documentation.
The program can configure transmitter specific values and perform maintenance, output signal and factory calibration.

Lightning protection
As an option LT60 can be equipped with lightning protection. The transmitter will then have the code LT60RSL or LT60FDL where L indicates ”Lightning protected”.
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 connection 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. Use for example connection box, BOX100.

Connection box, BOX100
A specially designed connection box can be delivered as an accessorie. The box is equiped with cable glands and terminals for connection of the probe cable and the signal/supply cable.
The box is equiped 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 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.



Connection and adjustment

Connection
The probe cables consists of 4 wires, shield and a vent tube. The wires are color marked:

White	Signal/supply +
Brown	Signal/supply -
Green	RS485A/Autozero 1
Yellow	RS485B/Autozero 2
Shield	Ground
Vent tube	Atmosphere pressure

(in the absolute pressure version there is no vent tube)

On the Vent tube there is a Fluid Filter mounted to prevent moisture to enter. DO NOT REMOVE!

Adjustment
Adjustments can be done through MODBUS communication and with the Autozero function.

Size
Probe size:

Diameter	20 mm
Lenght	157 mm

Cable:

Lenght (standard)	see text
(option up to 1000 m)	
Diameter	7,2 mm
Area	0,34/0,25 mm2
Vent tube (diam.)	2,3 mm

Reinforced with a Kevlar cord.

To consider
Dont expose the diaphragm to unnecessary damage. As standard the probe is delivered with a diaphragm protection cover.
Dont descend the probe so that it stands on the bottom of the vessel. If the media are turbulent or flowing fasten the probe appropriately. Highest media temperature is +80ºC.
Make sure that the vent tube is connected to the surrounding atmosphere (via the Fluid Filter) without the risk for plugging.
Make sure there is no free hydrogen ions in the media!
Make sure that the diaphragm withstands the media!

Technical specification HM-LT60:

Type:	Electronic submersible level transmitter with digital electronics	**Filling liquid:**	Silicon oil
Function:	Directly connected transmitter with piezoresistive sensor	**Series resistance:**	R kohm = (Supply voltage - 6)/20.
Operating range:	From 0% to 100% of upper sensorlimit	**Series resistance dependence:**	Better than +/- 0,1%
Span:	Fixed or adjustable ranges see page 2	**Supply voltage dependence:**	Better than +/- 0,1%
Zero:	0 mH20 fixed or adjustable (4 mA+/-0,35%)	**Temperature dependence:**	From -10 to 70 degrees C.
Overload: 3,5 mH2O:	Max 30 mH2O	Zero:	Max +/-0,5 % *2
5 mH2O:	Max 30 mH2O	Span:	Max +/-0,7 % *2
10 mH2O:	Max 30 mH2O	**Long time stability:**	Better than 0,1 % per year.
20 mH2O:	Max 60 mH2O	**Vibration dependence:**	
50 mH2O:	Max 150 mH2O	Perpendicular to the diaphragm:	Max +0,3 kPa/G
100 mH2O:	Max 200 mH2O	Parallell to the diaphragm:	Max +0,02 kPa/G
200, 400 mH2O:	Max 600 mH2O	**Repeatability:**	Better than +/- 0,1% of max range.
Material: Diaphragm:	Hastelloy C276 (others on request)	**Accuracy:**	Better than +/- 0,35% of max range (including nonliearity, hysteresis and repeatability).*1
Other media tuched parts:	Stainless steel SS2343	**Electrical connection:**	Lose wires, 2x0,34 and 2x0,25 mm2 (twisted pair)
Cable:	Polyurethane	**Encapsulation:**	Better than IP68 (tested to 500 m depht)
Ambient temperature:	-20 to +80 degrees C	**Electrical safety:**	According to EN 60204-1
Damping:	1 s fixed or adjustable	**EMC:**	According to EN 61326-1-2-3
Media temperature:	Max 80 degrees C	**PED:**	According to 97/23/EG
Output:	4-20 mA, two wire connection, signal proportional to the pressure. Max current at overload 24 mA. MODBUS communication.	**Lightning protection (option):**	Class 1 testing according to IEC61643-1. 5kA (10/350 uS).
Supply:	6-36 V DC	**Weight:**	850 g including 10 m cable.

*1 Option accuracy 0,15% (for 3,5 mH2O range 0,25%)
*2 Span and zero temperature dependance for 3,5 mH2O range max +/-0,6 %.