

# SLT11RS Digital submersible transmitter for Level measurement



## SLT11RS has many advantages:

- Digital electronics.
- Built up with separate measuring probe and electronics house. Probe cable without reference tube. Barometric sensor in house for atmospheric pressure compensation.
- Modular built to suit different needs. Measuring probe with different diameter, different diaphragm material, display option, etc.
- Settings can be done inside electronics housing, via communication or with display (option).
- Built in relays (option) for pump control etc.
- Withstands media up to 125 C continuously (with optional Teflon cable). Very little effect from temperature due to extremely small oil filling volume.
- Triple output/input: 4-20 mA, MODBUS communication and HART communication (option).
- High accuracy 0,25% (option 0,1%) and low temperature drift (total 0,2% of max range for -10 to +70 degrees C).
- Innovative Autozero function. Just press a button, done.
- Range turndown 30:1. One type fits most applications. Easy setting with span button.
- Well tested and approved for CE (EMC and PED), RoHS, REECH etc.
- Embossed diaphragm (only probe with 31 mm diameter). Insensitive to particles and contact. Easy to clean without deformation.
- Lightning protected as standard. The transmitter can withstand a stroke of lightning close to the supply/signal cables.
- Robust aluminium, IP67, housing protects the electronics and electrical connections from dust and moisture.

## Description:

Description SLT11 is an upgrade of the successful SLT09 level transmitter for applications where pressure connection in the bottom of the vessel is not possible or desirable, for example pump pits. SLT11 is designed with an innovative 2-sensor technology. SLT11 has a submersible measuring probe with two optional diameters 31 or 20 mm. The probe has optional diaphragm material for highest corrosion resistance (20 mm only SS316L). The probe hangs in its cable. The cables standard length is 10 m but can be delivered in length up to max 200 m. The probe cable is connected to the electronic housing where all electronics are placed. Connection of signal/supply cables are done in the electronic housing. SLT11 is equipped with the best possible protection against EMC and lightning strokes.

## Function:

SLT11 measuring probe measures the liquid level with a piezoresistive absolute pressure sensor connected to the diaphragm. This level will then fluctuate with the atmospheric pressure variation. To compensate for this variation there is a barometric sensor, placed in the electronic housing and connected to the surrounding atmosphere. The electronics uses this measurement to compensate the measured liquid level for the atmospheric pressure variations. The benefit of this technique is that the measurement will be more accurate because there is no need for a reference tube in the probe cable. This tube can often cause big faults because of plugging or condensation. The probe cable is also easier to lengthen/shorten for the user. Probe cable in Teflon can be delivered for applications with higher media temperature, up to +125°C (+257°F). Normal max media temperature is +80°C (+176°F).

SLT11 has microcomputer-based electronics, which communicate with the outside world with 4 to 20 mA signal as well as HART (option) and MODBUS communication. The electronics measure and converts the output signal from the pressure dependent sensor bridge to digital values. Furthermore, the total resistance of the probe 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 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 MODBUS and HART (option) communication in optional engineering units, percentage or current.

SLT11 can be configured/calibrated via buttons inside housing, via the display D10RS (pending) or a PC via MODBUS communication or HART communication (option) and also by means of a Hart hand terminal (option).

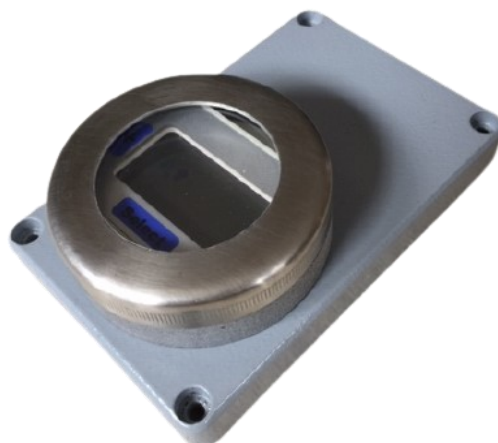
## Local switching:

SLT11 can as an option be equipped with two potential free optical relays. Switching points can be set from the display or via MODBUS communication from a PC (pending). Use for example for pump control, alarm etc.

## Display:

The transmitter can as an option also be equipped with a local display, D10RS. The display can show the signal in optional engineering units, for example mWc or mH2O. Unit and limits can be set by customer on the display.

The display can also be used for configuring the transmitter (pending).



## Autozero function:

SLT11 has an innovative solution to eliminate the problem of zero shift (due to for example mounting orientation, covering, corrosion or mechanical damage of the diaphragm). Place SLT11 measuring probe in correct mounting position with the pressure that shall represent 4 mA on the diaphragm and just press a button or shorten two cables for ten seconds. This action resets the 4 mA (and also makes the communication to send correct pressure/level in engineering units).

Autozero can also be done via communication, both via MODBUS and HART (option) and also from the display.

## Span setting function:

SLT11 has a simple solution to set the level for span, 20 mA output. Just put the level (pressure) that shall represent 20 mA on the SLT11 probe diaphragm and press the span button for ten seconds. This action sets 20 mA to represent this level (pressure) (and also makes the communication to send correct pressure/level in engineering units).

Span can also be set via communication, both via MODBUS and HART (option) and also from the display.

## Approvals:

SLT11 is CE approved according to the EU directives for pressure equipment, PED, and EMC. SLT11 fulfils all requirements for RoHS, REACH and WEEE directives.

The pressure intermediate oil is a FDA approved silicon oil.



## Cable:

Length: Standard 10 m, see text and code table (option up to 200 m).

Cable sheath: PUR

(polyurethane), black

Outer diameter: 7,5 mm

Cord: 4, colour coded

Cord size: 0,34 mm<sup>2</sup>

## To consider:

Never place the electronic housing direct on a cold or damp wall, leave a gap.

Always place the electronic housing so that the cable entry for the probe cable is directed downwards.

Use round signal/supply/relay cable and tighten the cable feed through firmly.

Make sure that the electronic housing cover is tight.

Make sure that the reference tube in the box is connected to the surrounding atmosphere.

Don't 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.

Don't descend the probe so that it stands on the bottom of the vessel.

Highest media temperature is +80°C (+176°F) or with Teflon cable +125°C (+257°F).

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 (H+ or H-) can exist in the media, if so try to use gold plated diaphragm.

Check that the cable sheath corrosion resistance is sufficient for the media.

## Default settings for relay:

Opto 1:

From 4 mA (and below) to 20 mA—ON

From 20 mA and above—OFF

Opto 2:

From 4 mA (and below) to 20 mA—OFF

From 20 mA and above—ON

Relay switching points can be set via MODBUS and from the display (pending).

## Lightning protection:

As standard SLT11 is equipped with a very efficient lightning protection.

The protection is designed to withstand a lightning stroke close to the 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 normally enough in most applications.

The lightning protection is built up as a three step protection. The pulse that enters the transmitter is caught by two varistors, three transient protection diodes and a double surge arrester. The lightning protection protects both the 4-20 mA/supply connection and also the probe cable connection.

The transmitter housing must be appropriately grounded for the protection to fulfil its purpose.



## MODBUS Communication:

MODBUS communication can be used for transfer of measured values, for example the level and the media temperature (etc.). Several units can be connected in parallel and addressed to communicate its values (addresses from 1-255). Standard address at delivery is 10.

The communication can also be used for configuration of all SLT11 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 SLT11 for more information).

Physical interface for MODBUS is RS485, 4 lines. Supply voltage (11-48 VDC) use the 4-20 mA lines and the communication use two separate lines A and B.

A standard RS485 dongle can be used (but it is optimal to use an optoisolated RS485 dongle).



## HART Communication:

SLT11 can communicate via HART (option), both for signalling values and for configuration.

HART is a standard communication protocol that can be used for signalling of measured values and for full configuration of all SLT11 parameters. The HART protocol have three levels of commands, Universal, Common Practice and Transmitter Specific commands.

A HART modem must be used.

The physical interface use FSC (Frequency Shift Communication) signalling. This is done by overlaying a 1200 Hz or 2400 Hz full sine wave on the current loop. The 4-20 mA signalling is fully unaffected by this.



## PI200PS/PSD:

PI200PS is a PC package for configuration of MODBUS Pressure, Differential and Level Transmitters.

This battery powered modem box with mA display can be used with optional MODBUS software.

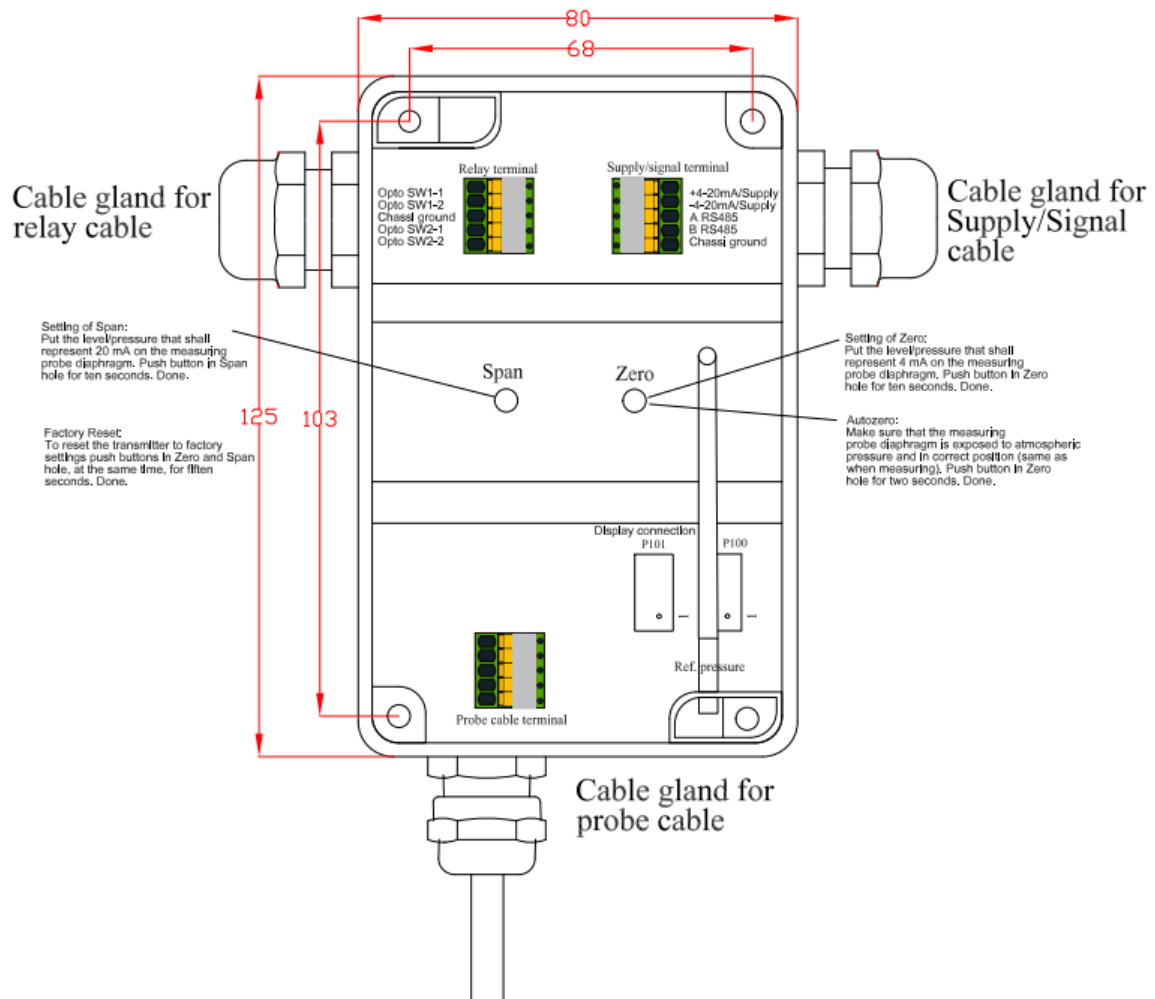
Included in the package is a PC program, MEP7 Modbus Tool, dedicated for configuration of Pondus Instruments pressure, differential and level transmitters.

To PI200PS a low resistance mA meter easily can be connected to show the mA output signal.

PI200PSD has an inbuilt display to show the transmitters mA output signal (see picture).



## Electronics box layout and size:

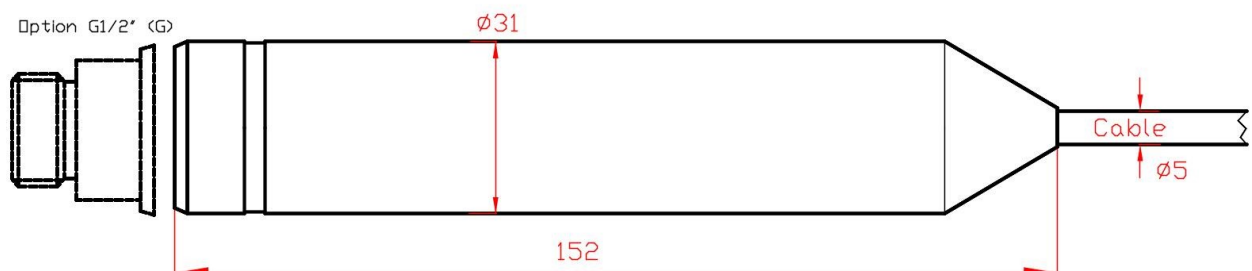


## Level probe size:

Level probe type A, AP:



Level probe type B, BG: (preliminary size)



## Code table:

<b>SLT11abcd-xyz-1234</b> <small>(NOTE SLT11RS have as standard built in Lightning protection) Standard cable length is 10 m.</small>	<b>Suffix abcd Electronics</b>	<b>Suffix x Display</b>	<b>Suffix yz Probe type</b>	<b>Figure 1 Diaphragm material</b>	<b>Figure 2 Connection</b>	<b>Figure 3 Range</b>	<b>Figure 4 Ref. Pressure</b>	<b>Comment</b>
<b>Electronics</b>								
4-20 mA and Modbus	RS							Standard
4-20 mA, Modbus and Hart	RSH							
4-20 mA and Modbus. With relay.	RSR							
4-20 mA, Modbus and Hart. With relay.	RSHR							
<b>Display</b>								
No display		x						Standard
Built in display		D						
<b>Measuring probe type</b>								
Probe type A (diameter 20 mm)			A					
Probe type B (diameter 31 mm)			B					Standard
Probe type A with diaphragm protection SS			AP					
Probe type B with G1/2" thread			BG					
<b>Diaphragm material</b>								
Titanium (only for probe B)				1				
Stainless steel 316L (for probe A, AP, B and BG)				3				Standard for Probe A, AP
Hastelloy C276 (only for probe B, BG)				4				Standard for Probe B, BG
Gold plated (only for probe B, BG)				8				
<b>Connection</b>								
Submersible Probe					0			
<b>Span min-max (range)</b>								
0-3,5 mH2O (4 degrees C)						1		Specify cable length
0-5 mH2O (4 degrees C)						2		Specify cable length
0-10 mH2O (4 degrees C)						3		Specify cable length
0-20 mH2O (4 degrees C)						4		Specify cable length
0-35 mH2O (4 degrees C)						5		Specify cable length
0-70 mH2O (4 degrees C)						6		Specify cable length
0-200 mH2O (4 degrees C)						7		Specify cable length
0-400 mH2O (4 degrees C)						8		Specify cable length
<b>Reference Pressure</b>								
Atmospheric pressure							0	

**Ordering example:** Level transmitter with 4-20 mA, Modbus and relay. Built in display. Standard probe and range 0-20 mH2O will have the code **SLT11RSR-DB-4040**, specify cable length or standard 10 m.

## Technical data SLT11:

<b>Type:</b>	Electronic level transmitter with digital electronics	<b>Series resistance dependence:</b>	Better than +/- 0,1 %
<b>Function:</b>	Submersible level transmitter with separate electronics housing. Piezo-resistive sensor. Barometric sensor in electronic housing for atmosphere compensation.	<b>Supply voltage dependence:</b>	Better than +/-0,1 %
<b>Operation range:</b>	From 0% to 100% of range.	<b>Temperature dependence:</b>	Better than +/-0,2 % of max range (For -10 C to +70 C) *1
<b>Span:</b>	Adjustable between upper sensor limit and 1/30 of this.	<b>Long time stability:</b>	Better than 0,08% per year.
<b>Zero:</b>	Adjustable between -100% and 100% of upper sensor limit.	<b>Vibration dependence:</b>	(for Probe)
<b>Overload:</b>		Perpendicular to the diaphragm:	Max 0,3 kPa/G
3,5, 5, and 10 mH2O	Max 30 mH2O	Parallel to the diaphragm:	Max +0,2 kPa/G
20, 35, 70 mH2O	Max 150 mH2O	<b>Vibration test:</b>	Test according to IEC770
200 mH2O	Max 600 mH2O	<b>Repeatability:</b>	Better than +/- 0,1 % of max range.
400 mH2O	Max 1000 mH2O	<b>Accuracy:</b> (including non-linearity, hysteresis, repeatability).	Better than +/-0,25 % of max range. Option 0,1%.
<b>Material : Diaphragm:</b>	See Code table	<b>Mounting:</b>	Submersible Probe . Wall mounted electronic box.
Media touched parts:	Stainless steel 316L. PUR cable.	<b>Electrical connection:</b>	Spring loaded terminal
Housing:	Casted aluminium, painted.	<b>Encapsulation:</b>	IP67 house , probe IP68
<b>Ambient temperature:</b>	-20 to +80 degrees C		
<b>Damping:</b>	0,1 to 10 sec. Adjustable via communication.	<b>Electrical safety:</b>	According to EN60204-1
<b>Media temperature:</b>	80 C. With Teflon cable 125 C.	<b>EMC:</b>	According to EN61326-1-2-3
<b>Output:</b>	4-20 mA. Signal proportional to the pressure. Hart (option) and MOD-BUS communication.	<b>PED:</b>	According to 97/23/EC
<b>Supply:</b>	11-48 V DC	<b>Filling oil:</b>	AK100, food approved silicon oil (FDA approval).
<b>Series resistance:</b>	$R_{kohm} = (\text{Supply} - 11) / 20$	<b>Weigth:</b>	300-1000 g depending on probe cable length.

\*1 Depend on probe type and configuration.



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