

Ultrasonic Level Meter SLU



It is highly recommended that the user carefully read all of the instructions in this manual before installation or use of the level meter for the first time. Keep the manual in a safe place. The manufacturer reserves the right to implement changes without prior notice.

Safety



All operations described in this instruction manual should be carried out only by trained personnel or an accredited person. Warranty and post warranty service must be exclusively carried out by the manufacturer. Improper use, installation or set-up of the level meter can result in undesirable results (overfilling of the tank or damage of system components).

The manufacturer is not responsible for improper use, losses of work caused by either direct or indirect damage, and for expenses incurred during installation or use of the level meter.

Measuring Principle

The SLU Ultrasonic level meters are compact measurement devices containing an ultrasonic transmitter and an electronic module. The transducer generates ultrasonic pulses that travel at the speed of sound toward the target medium. These sound waves are reflected off the surface of the medium and are received by the transducer system. The "time of flight" between the transducer and the surface and then back to the transducer is measured. Based on the time period during which the individual pulses spread towards the level and back, this period is averaged by the electronics (that also performs temperature compensation) and subsequently are converted to an output current 4...20mA with HART protocol or output RS-485 Modbus and the measured value is displayed on the display.

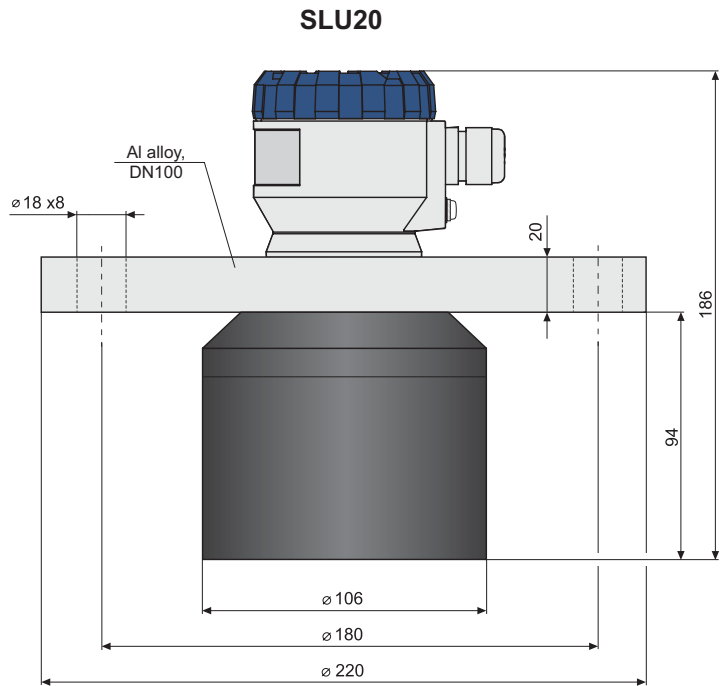
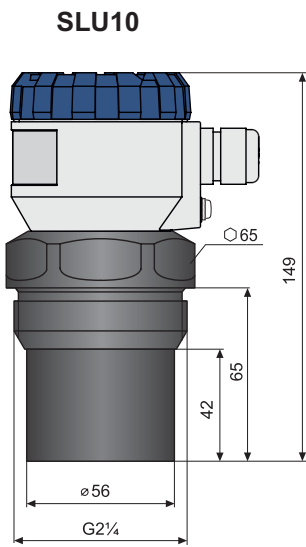
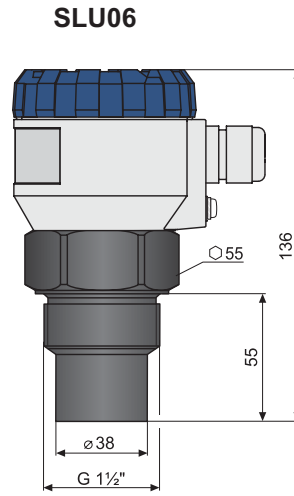
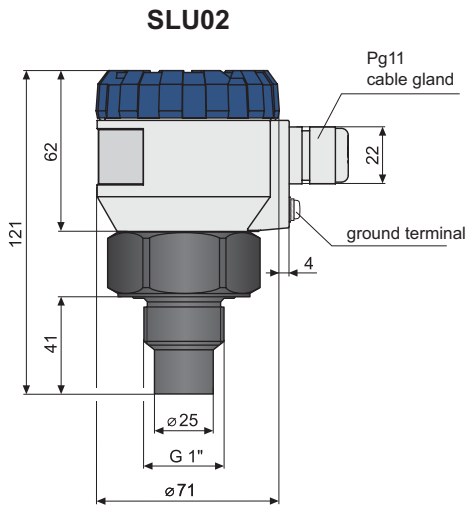
The central processor evaluates and blocks out interfering signals, performs temperature compensation, compares the cleaned received signal with the false reflection map (e.g. from mixers, ladders, reinforcement etc.) and selects a suitable reflection (echo).

The SLU ultrasonic level meters are suitable for continuous non-contact level measurement of liquids (water, waste water sewage, etc.), mash and paste materials (sediments, resins etc.) in closed or open vessels, sumps, reservoirs and open channels. In the case of bulk-solid materials, the measuring range is reduced, but can be amplified or compensated by using the horn accessory.

Variant of Sensor

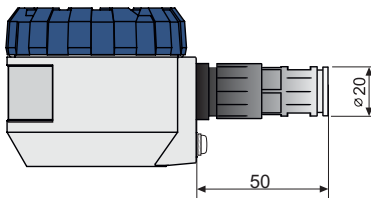
- **SLU-02** - Measuring range from **0.15m - 2m** plastic PVDF transmitter and plastic body (PP+HDPE), process connection with thread G 1"
- **SLU-06** - Measuring range from **0.25m - 6m** plastic PVDF transmitter and plastic body (PP+HDPE), process connection with thread G 1.1/2"
- **SLU-10** - Measuring range from **0.4m - 10m** plastic PVDF transmitter and plastic body (PP+HDPE), process connection with thread G 2.1/4"
- **SLU-20** - Measuring range from **0.5m - 20m** plastic PVDF transmitter and plastic body (PP+HDPE), aluminum alloy flange

Dimensional Drawings



Flange (for type 20) according to standard: DIN 2527, PN10

Variant SLU with protective cable shield



Installation Instructions

Install the level meter in the vertical position into the upper lid of the tank or vessel or reservoir using a the threaded connection, a fastening nut or a flange so that the level meter axis is perpendicular to the surface level of the measured liquid (Fig.1)

The min. dimensional parameters to install the level meter in to a lid or a ceiling of tank are giving (Fig.3)

When installing in an open channel (reservoir, drain etc.) install the level meter on to a bracket as close as possible to the expected max. level.

Each measuring range of SLU models has a specified “dead zone”. This means that within the first 10 to 50 centimeters (depending on the model) below the transmitter, no signal reflected in this area can be evaluated. The dead zone (Fig.2) determines the min. distance possible between the level meter and the highest surface level. The min. distances to the medium are given in the chapter ‘Specifications’.

It is necessary to install the level meter so that the target level will not interfere with the dead zone when filled up to the maximum level. If the measured level interferes with the dead zone, the level meter will not work supply the correct output signal.

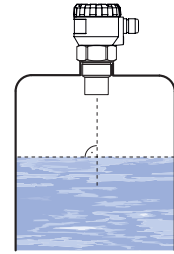


Fig.1 Recommended installation in the tank

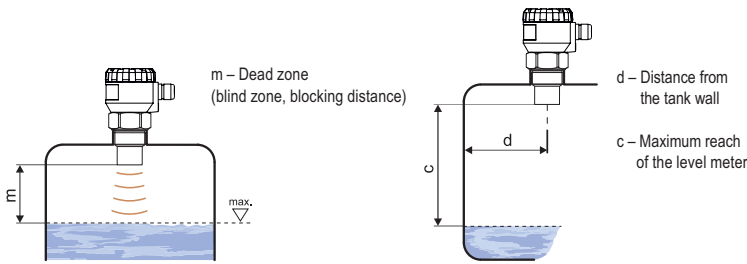


Fig. 2: Level meter dead zone

Fig. 3: Installation distance from the tank wall

SLU-02;10	$d > 1/12 c$ (min. 200 mm)	d – Distance from the tank wall
SLU-06	$d > 1/8 c$ (min. 200 mm)	c – Maximum reach of the level meter
SLU-20	$d > 1/10 c$ (min. 200 mm)	

If the maximum surface level in the tank interferes with the dead zone, the level meter has to be mounted higher within a neck extension to the tank. In this way, the tank can be filled to the maximum volume. The inner neck surface has to be even and smooth (without edges and welded points) the inner edge should be rounded where the ultrasonic wave emanates from the pipe. The neck diameter should be as large as possible but the neck height should be as low as possible, minimizing the extra distance between the medium and the sensor. Recommended dimensions of the extended neck are given in (Fig.4).

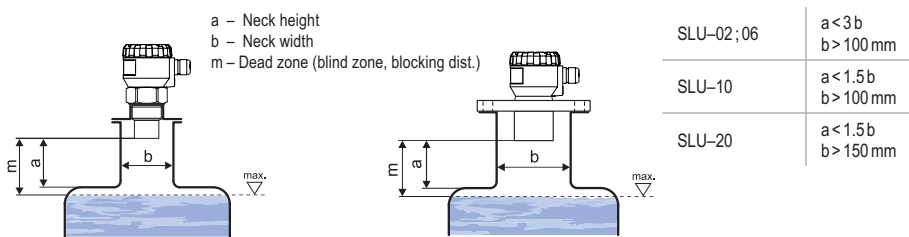


Fig. 4: Possible installation of the installation neck

SLU-02;06	$a < 3b$ $b > 100 \text{ mm}$
SLU-10	$a < 1.5b$ $b > 100 \text{ mm}$
SLU-20	$a < 1.5b$ $b > 150 \text{ mm}$

If the emitted ultrasonic signal of the level meter is affected by features, objects or obstructions (roughness on walls of the tank, large welds, inner tank partitions, mixers etc.), it is necessary to map the false reflections by activating the mode "TEACHING". In case of installed mixers, it is necessary to put the sensor in line with the mixer. (Fig.5 and 6).

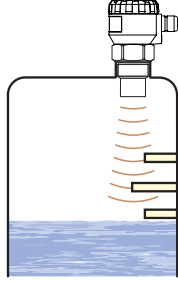


Fig. 5: False echo from obstacles in the tank

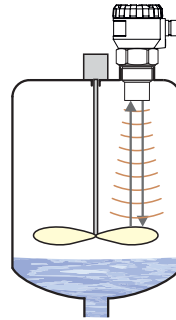


Fig. 6: False echo from the mixer paddle

Do not install the level meter directly in or above the filling point (Fig.7)

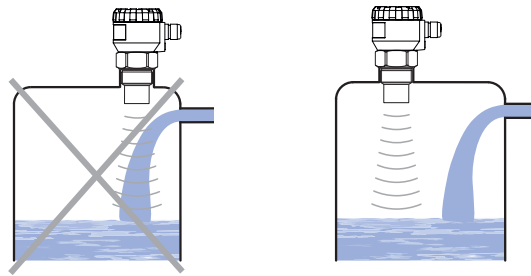


Fig. 7: Level meter installation outside the influence of filling

When measuring the level of bulk-solids, the measurement range is reduced (due to absorption of ultrasonic waves by the bulk medium), shortening the measuring range by up to 50% depending on the grain material and size. We therefore recommend selecting a level meter with greater range than the maximum measuring range for the application. It is also appropriate to use a directional horn (see image 8), which reduces the shortening of the measuring range, because enhances the concentration of the acoustic energy while preserving the same beam angle, and improves the sensitivity when receiving the reflected echo. We recommend that Sitron is fully consulted before a model is selected.

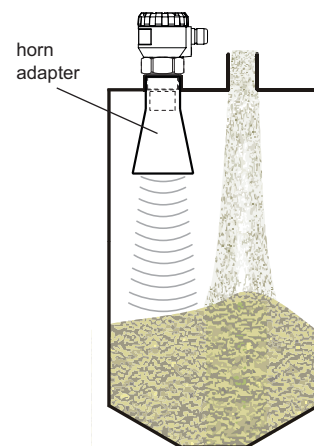


Fig. 8: Level meter installation in silo or hopper

During filling, mixing and other processes, foam can develop on the surface level of the measured liquid. The foam may considerably absorb the ultrasonic signal which might cause malfunction or inaccurate reading by the level meter.

(Fig.9). For such cases, it is necessary to set up "SENSITIVITY" mode to "high" or contact Sitron for further consultation.

In case of a thin layer of foam, it is also possible to use the directional horn for improving receipt of the reflected echo.

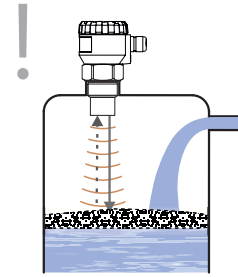


Fig. 9: Foam on the surface

Scattering or attenuation of the ultrasonic signal can result if the surface level has been moderately stirred or rippled (by a mixer, coming liquid etc.). It can result in reduction of the measurement range or unreliable function of the level meter (Fig.10).

Rotating mixer blades will cause surface agitation, which may result in false reflections of the ultrasonic signal from the surface level and unreliable operation of the level meter (Fig.13).(obr.11). For a rippled or swirling level, you can use the directional horn to eliminate scattering of the ultrasonic signal.

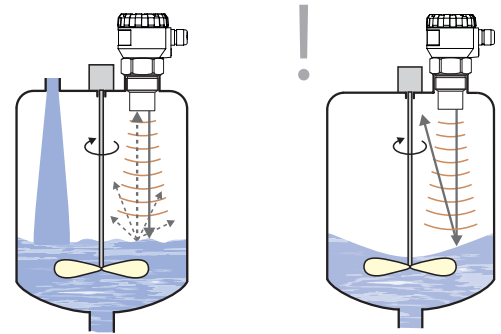
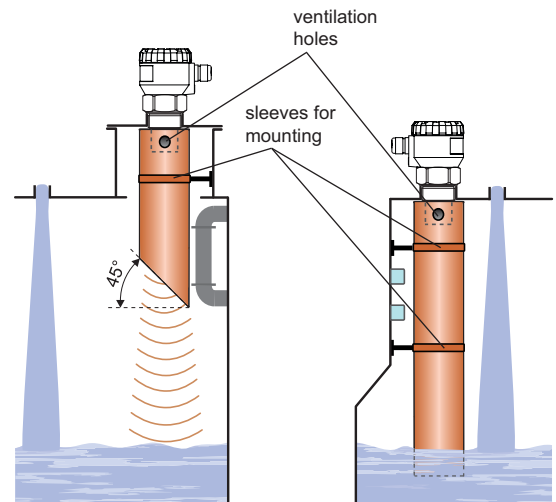


Fig. 10: Moderately stirred surface Fig. 11: Intensely stirred surface

If the level sensor is mounted to bottlenecks and places with barriers, or near uneven walls or the filling area, where the transmission signal could be distorted, we recommend using a guide tube (acoustic horn). The tube must be made from a single material with a smooth inner surface (see image 12a, 12b). The minimum tube diameter must have the dimension "b" according to image 4 on page 5. After installing, you must perform the procedure "TEACHING". We recommend consulting with the Sitron on the construction of the guide tube.



Obr. 12a: Short guide tube installation

Obr. 12b: Total guide tube installation

The level meter must not be installed in places with direct solar radiation and must be protected against the effects of local weather.

If installation in places with direct solar radiation is inevitable, it is necessary to mount a shielding cover above the level meter (Fig. 13).

It is suitable to run the cable under a cable bushing (obliquely down in slack) according to Fig. 14 to prevent penetration of humidity into the housing. In this way, rain and condensing water can flow off freely. The cable bushing and connector have to be sufficiently tightened to prevent penetration of humidity.

To lower the minimum distance to the measured medium, a reflection board made from solid, even and smooth material can be installed to the level meter. Then the tank can be filled nearly up to the maximum height. This solution is suitable for open tanks and reservoirs (Fig. 15).

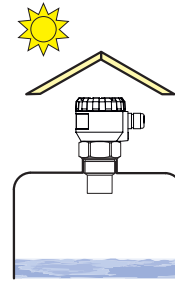


Fig. 13: Solar radiation shielding cover

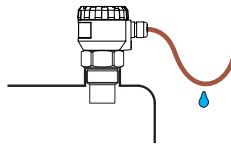


Fig. 14: Prevention to avoid intrusion of humidity

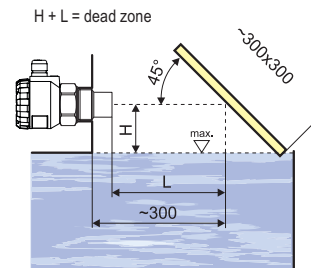


Fig. 15: Reflection board

Electrical Connections

The level meter is connected to the power supply or PLC or other control (evaluating) devices with a suitable cable with the outer diameter of 6 to 8mm using screw terminals located under the display module. The recommended cross section of cores for the current version $2 \times 0.5 / 0.75 \text{ mm}^2$ and for the version with Modbus communication $2 \times 2 \times 0.25 \text{ mm}^2$ (twisted pair, shielded). Plus pole (+U) is connected to the terminal (+), minus pole (0 V) to the terminal (-) and the shielding (only for shielded cables) to the terminal (). Communication wires A and B of the line RS-485 (for version M - Modbus) are connected to the terminal A and B.

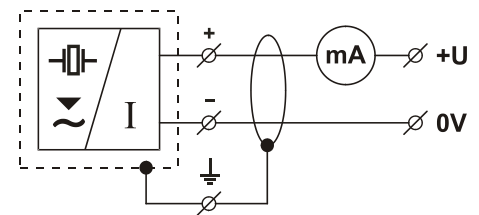
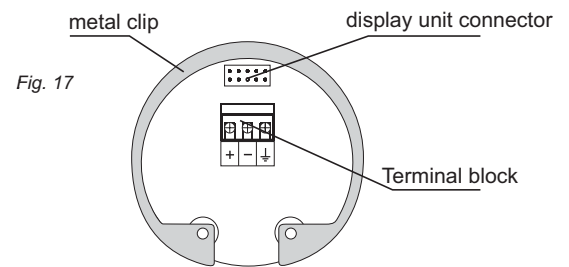
Procedure to connect the cable to the level meter:

- 1 - Unscrew the housing cover/ lid.
- 2 - Using your finger tips or finger nails, gently remove display by clutching the upper edge of the display module.
- 3 - If you cannot grasp the module, you can use a small screwdriver. Insert it as far as the seam allows so that it can be nudged upward as you work your way around the display from several sides. This will allow you to slightly lift the module.
- 4 - Release the cable outlet and thread the stripped supply cable in.
- 5 - Connect the cable to the screw terminals according to the diagram in Fig.17 or 18. Firmly tighten the terminals and the cable outlet.
- 6 - If the level meter with Modbus is involved as a terminal for RS-485, we recommend (to avoid reflections on the line) that the 120 ohms switch is activated. This is done by moving the small lever of the switch marked 120 ohms to the ON position. For level meters connected to the line RS-485 as an intermediate device (i.e. Slave), the termination resistors are not connected (switch remains off).
- 7- Insert the display module back into the head so that the connectors is properly connected. Be carefull that the position is correct or the terminal pins may be damaged.

8- Close the housing cover and then apply a PTFE or silicone tape seal to the threaded connection of the level meter body.

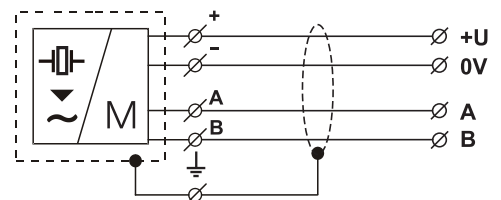
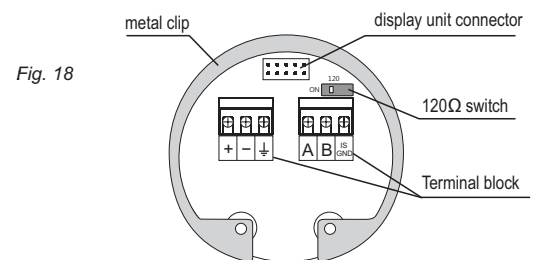
Now the level meter can be installed into the tank and wired back to the control unit or power supply. See safety not below.

Wiring diagram of the level meter with current output SLU(02/06/10/20)-C



Inside view of screw terminals of the level meter with current output SLU(02/06/10/20)-C

Wiring diagram of the level meter with Modbus SLU(02/06/10/20)-M



Inside view of screw terminals of the level meter with Modbus SLU(02/06/10/20)-M



Electrical connection must be done in de-energized state!
 The supply voltage source should preferably be realized as a stabilized power supply unit with safe voltage from 18 to 36 V DC (18 to 30 V DC for X version), which can be a part of the evaluation or display device.
 With case of strong electromagnetic interferences (EMI), parallel cable ducting with power lines, or when cable length exceeds 30 m we recommended the use of shielded cables.

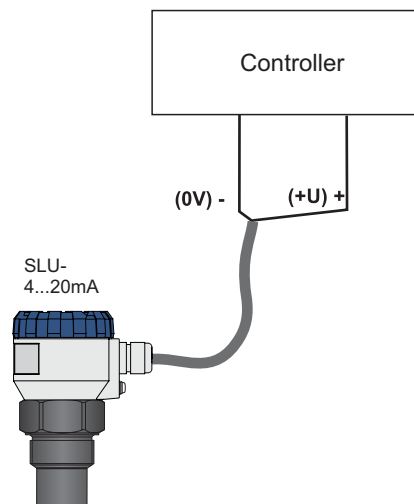


It is also necessary to design and take measures to reduce the effects of static electricity to a safe level in the wiring. Installation in explosive atmospheres needs to be carried out in compliance with CSN EN 60079-14 (Electrical installations for explosive gaseous atmospheres - Part 14: Electrical installations in dangerous areas other than mining) and possibly also in compliance with other standards relating to the area concerned.

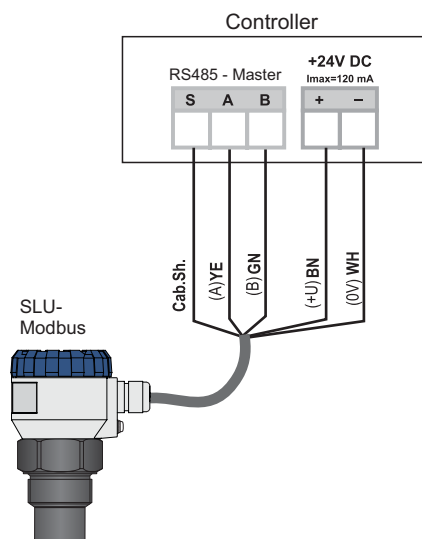


The supply voltage source should be preferably realized as a stabilized power supply unit with safe voltage from 18 to 36 V DC (18 ± 30 V DC for Xi version), which may be part of the evaluation or display device. In case of strong electromagnetic interference (EMI), parallel cable ducting with power lines, or when cable length exceeds 30 m, we recommend the use of shielded cables.

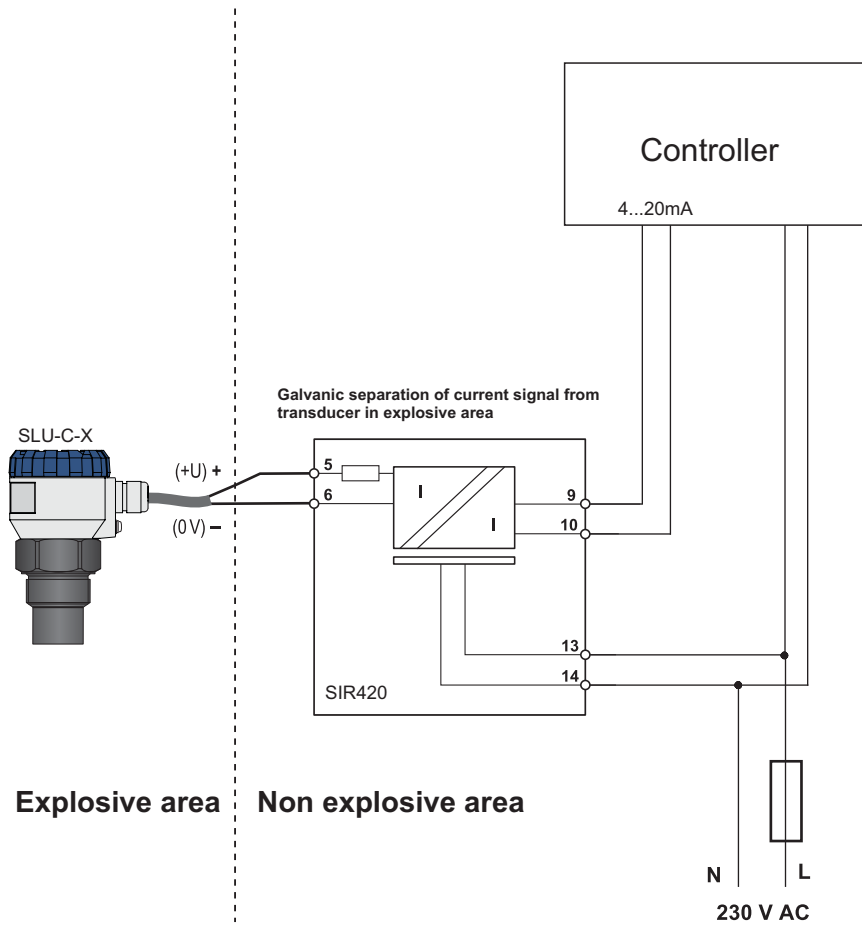
Connections for Level Meter with output 4 ... 20mA



Connection for Modbus Level Meter



Electrical connection for level meter in Classified Area



Set up elements

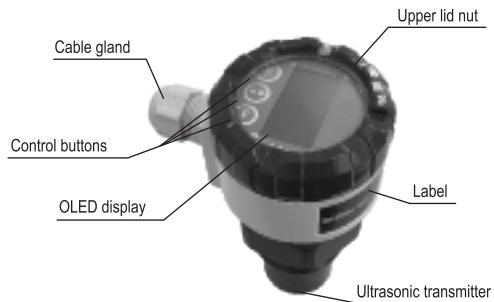


Fig. 20: Full view of the level meter

Button

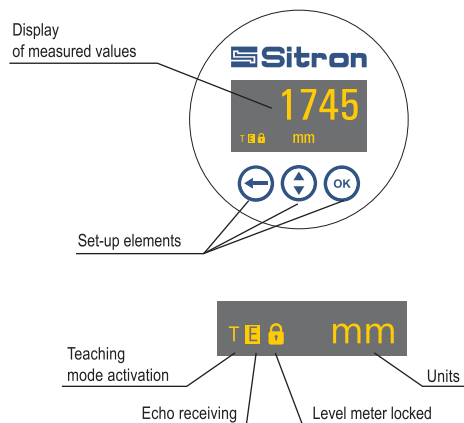
- Set-up mode access
- Confirmation of selected item in the menu
- Move the cursor in the line
- Saving of set-up data

Button


- Move in the menu
- Change of values

Button

- Cancelling of carried out changes
- Shift one level up

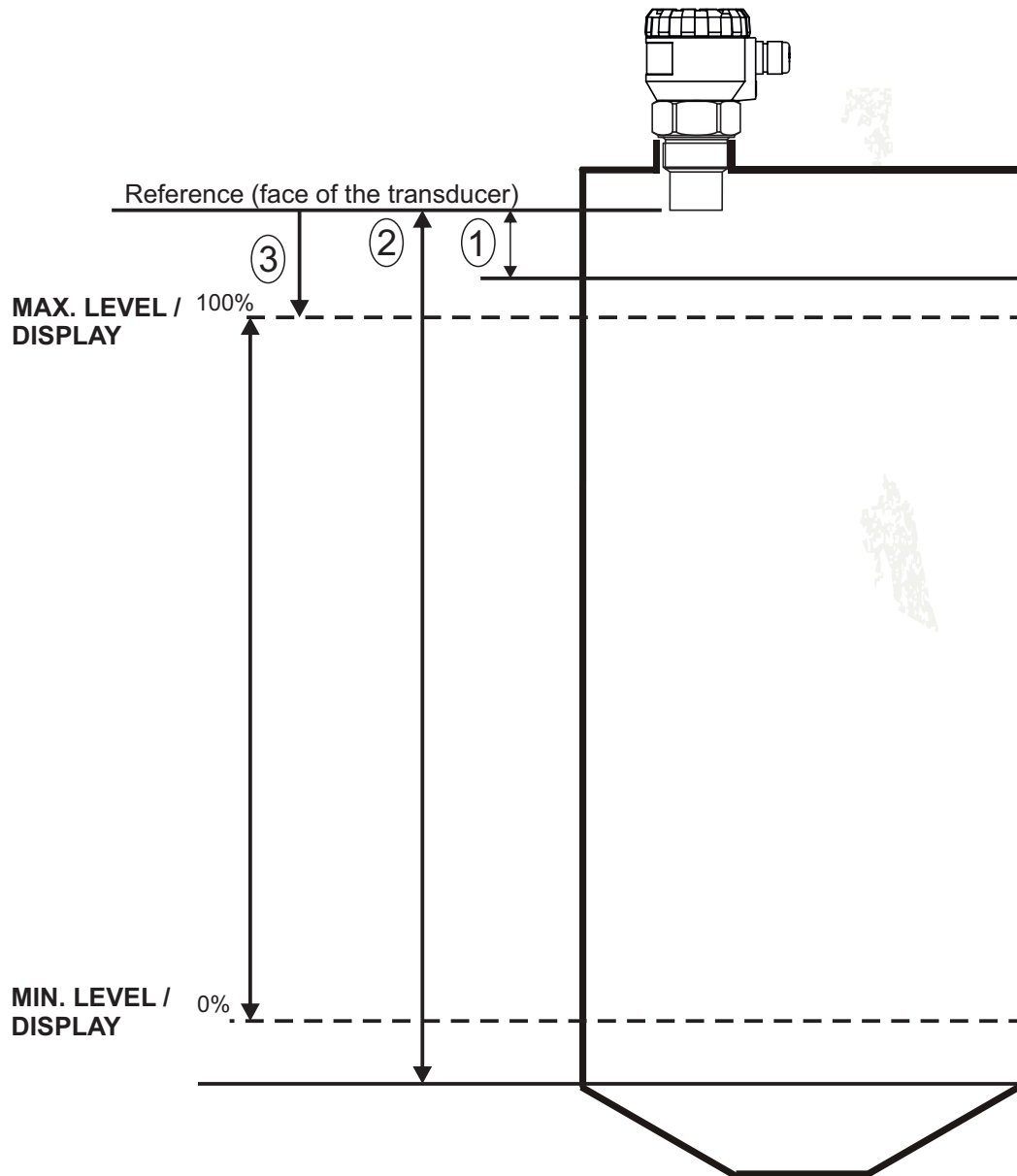


Status Signalization

display	function
"NO ECHO"	Lighting intermittently – the level meter is not able to receive echo for a long time. Incorrect installation of the level meter
"DEAD ZONE"	Lighting intermittently – the measured level is in the "dead zone" of the level meter or the ultrasonic converter is dirty.
"NO PASSWORD"	It will appear in the item "MENU" – the level meter is protected using a password against unauthorised setting. Enter the correct password
Symbol "T" ¹⁾	Lighting permanently – "TEACHING" mode activation.
Symbol "E" ¹⁾	Lighting intermittently – correct echo receiving (of the reflected signal) from the measured surface level.
Symbol  ¹⁾	Lighting permanently – level meter is locked against unauthorized settings by a password. You must enter the correct password to unlock it

¹⁾ symbol appears in the lower left corner of the display

Measurement Diagram




1 - Dead zone or instrument erasure, (when level is above the dead zone a **DEAD ZONE** error message will show in the display indicating that above this range the instrument will not measure) see (page 23) technical specifications to know the blind area of the instrument.

2- Maximum distance or measuring distance to be respected for each transmitter model (eg SLU 02 measures up to 2 meters / SLU06 measures up to 6 meters / SLU10 measures up to 10 meters / SLU20 measures up to 20 meters)

3 - Measuring range (Measuring range to be set on the transmitter in the parameters **MIN. LEVEL 0%** and **MAX. LEVEL 100%** (with reference to the face of the transducer) and **DISPLAY** parameters by entering the value of the process that you want to show in the display

Note: The measuring range to be configured must not be less than dead zone (1) and greater than the maximum ultrasound measurement distance (2).


Operation and Setting

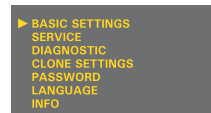
Set the level meter using 3 buttons placed on the display module (see Chapter Set-up elements). After 5 min. of inactivity, the level meter automatically returns back to the measurement mode. If the password is active, the level meter will be also locked. The values that have not been confirmed using the button  will not be saved! After the meter is locked, you cannot change the setting! When you attempt to edit, the words "NO PASSWORD" will appear on the display.

After connection of the supply voltage to the level meter the display shows the logo Sitron and the text "Starting" (approx. 15 s). Then, the level meter goes to the measuring mode and the display shows the current measured value.



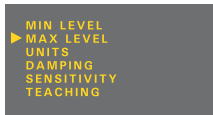
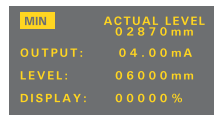
Basic configuration

After the first start of the level meter it is necessary to perform the basic configuration (setting of the measuring range, choice of units and possibly damping). The settings are accessible in the basic menu by pressing  the "BASIC SETTINGS".



MIN LEVEL and MAX LEVEL

You can freely define the **minimum / maximum distance from the front surface of the level meter** (item "LEVEL" for currents 4 / 20 mA). The "DISPLAY" is intended to set the value displayed on the display. Setting the units is done in the "UNITS".



ACTUAL LEVEL: Actual distance to level








OUTPUT: current 4 mA / 20 mA

LEVEL: Definition of the min / max level

DISPLAY: The value showed on the display

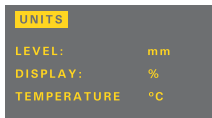
If in the bottom of the display appears (when entering the values) the inscription "OUT OF LIMITS", the value specified for the item "LEVEL" is outside the measuring range of the level meter. If the inscription "SPAN TOO SMALL" is shown, it must be specified a larger span between Min and Max values. For more information, see chapter "Specifications".

The decimal point position of the item 'LEVEL' is firmly set (according to the selected units), in the item "DISPLAY" it is freely adjustable








1. To enter to the menu press  the same button to select "BASIC SETTINGS". Then, using  and  select "MIN LEVEL" or "MAX LEVEL".
2. Now it is shown the item "MIN LEVEL" ("MAX LEVEL"). By pressing  and  set the output current "OUTPUT", the distance for the defined current "LEVEL" the value on the display "DISPLAY".
3. By pressing  button save the data. By next presses of the button  leave the menu. The level meter returns to measurement mode.

UNITS

Level meter can process and convert a large number of different **physical values** . The setting is done in the item "UNITS".

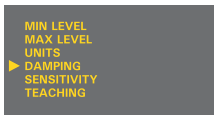


LEVEL: Unit selection (mm, cm, m, in, ft)
 DISPLAY: The unit showed on the display (% , mm, cm, m, in, ft, l, hl, m³, gal, bbl, mA)
 TEMPERATURE: Temperature unit (°C, °F)








1. To enter to the menu press  the same button to select "BASIC SETTINGS". Then, using  and  select "UNITS".
2. Now the menu item "UNITS" is shown. By pressing the  and  button make the settings of individual items.
3. By pressing  button save the data. By next presses of the button  leave the menu. The level meter returns to measurement mode.

DAMPING

Setting the **response time** of the measurements. The function is useful for suppressing level fluctuations, waves and rapid changes of the level. The reaction time will depend on the exponential function. Damping with a defined delay in seconds represents the time when exponential reaches 2/3 of its maximum value.



The damping time can be set in the interval from 0 to 99 s.

1. To enter to the menu press  the same button to select "BASIC SETTINGS". Then, using  and  select "DAMPING".
2. Now the menu item "DAMPING" is shown. By pressing the  and  button make the settings of individual items.
3. By pressing  button save the data. By next presses of the button  leave the menu. The level meter returns to measurement mode.

SENSITIVITY

The setting is defined in three steps of the level meter **sensitivity**.

- "LOW" – Low sensitivity in case of surrounding interferences affecting the measurement.
- "MEDIUM" – Medium sensitivity (suitable for most applications).
- "HIGH" – Enhanced sensitivity for measured mediums partly absorbing the ultrasonic signal (bulk solids, foams)



You can set the sensitivity in three degrees:
LOW – MEDIUM – HIGH.








TEACHING

The mode serves for **suppressing false reflections** resulting from reflection of the ultrasonic signal from roughnesses on walls of the tank, various partitions, mixers or other obstacles. The sensor starting this mode detects false reflections and save them in the memory. Then these false reflections will not affect the subsequent measurement (they are masked).

Before starting the mode it is necessary to empty the tank as much as possible (preferably completely).



If there are no above obstacles in the tank, it is not necessary to start this mode.

1. To enter to the menu press  the same button to select "SERVICE". Then, using  and  select "TEACHING".
2. Now it is shown the item "TEACHING". By pressing  set the value "LEVEL DISTANCE" (distance to the level) – supposed distance from the face of the sensor to the medium level. If the distance to the level is not precisely known, enter a value rather lower (in the tolerance field as shown in Fig. 19).
3. After entering the "SET LEVEL DISTANCE" by pressing  button the system starts "teaching" (false reflection mapping). During the mapping, the display shows flashing sign "RUNNING".
4. The mapping of false echoes can be completed when you see the inscription "Press OK to stop" and you press .
5. The procedure is completely finished when you can see the inscription "DONE". It is then possible to exit the menu by repeated pressing the button .



The mode "TEACHING" will stop automatically after ca. 1000 measurements.

If during the scanning of the tank in the bottom of the display appears the dialog "press OK to stop" (see figure) the level meter already found no further obstacles and "TEACHING" mode may be terminated. If it is not terminated, the level meter is still ready for the possible presence of obstacles (e.g. paddles of the agitator). Once it registers a further obstacle, the dialogue disappears and the obstacle is erased. This process may be repeated up to 1000 cycles. After this the "TEACHING" mode is automatically stopped.



In case of installed mixers, it is **necessary** to position the mixers under the level meter (direct the mixer blade to the ultrasonic signal beam).

Note: If there are significant obstacles in the upper half of the tank, **multiple false reflections** can occur especially in closed tanks. In such cases it is necessary to reduce the level in the tank as much as possible to correctly mask these possible multiple false reflections.

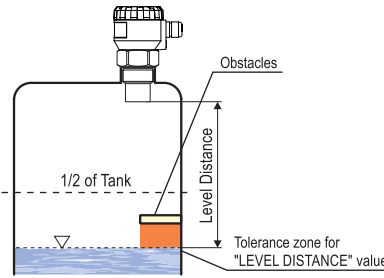
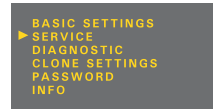


Fig. 21: Level distance zone

Service settings

In the supplemented configuration, you can set parameters of sensitivity, mapping of false reflections, temperature difference compensation, behaviour in case of fault conditions or HART® communication. Here, you can set the sensor into the initial state or reset it as well. The settings are accessible in the basic menu under the item "SERVICE".



MEDIUM TEMPERATURE

The level meter is equipped with **automatic temperature compensation**. If for instance in the tank there is a difference of 10°C between the temperature of the measured material (medium) and the temperature at the mounting site of the level meter (see the mode "DIAGNOSTICS"), the measuring accuracy will be reduced by around 1% of the set range. If this function is activated, this temperature difference can be compensated. If in the tank (open channel) is a big difference between the temperature of the measured medium (liquid) and temperature in the place of installation of the SLU (see mode, DIAGNOSTICS), it is advised to improve the precision of the measurement by the zone temperature compensation. Otherwise, this mode is **not necessary to run**.

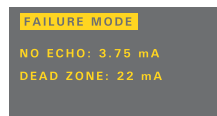
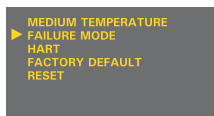


Inactive compensation (initial state), the word "NO" appears on the display.
See the "UNITS" menu for temperature unit selection (°C or °F).

After start of the **zone temperature compensation** mode it is necessary to set the temperature of the surface of the medium. The level meter then calculates the average value from the medium temperature and the temperature at the installation place of the level meter. With such an average temperature it counts in calculating of the velocity of acoustic waves propagation and for determination of the level position.

FAILURE MODE

It defines the **output current** of the level meter when the measured medium level is in the dead zone ("DEAD ZONE") or outside the measurement range in case of echo loss ("NO ECHO").



NO ECHO: Current in case of echo loss
DEAD ZONE: Dead zone current
The values can be set in three steps: 3.75 mA, 22 mA and LAST (last measured data).

HART

HART® mode (point to point, multidrop) and multidrop mode **address setting**. Up to 15 units can be connected to one two-wired cable in the multidrop mode.



In case of the address "00", the point to point mode is enabled. The range from "01" to "15" is reserved for addresses in the multidrop mode.

MODBUS

This item is part of a menu with Modbus output level meter SLU-M. Modbus mode is intended for the settings of the level Modbus addresses, baud rate and parity settings.



ADDRESS: 1 to 247 (default 1)
 BAUD RATE: 4800, 9600, 19200 (default 9600)
 FORMAT : 8N1, 8O1, 8E1, 8N2 (default 8N1)

FORMAT: — number of stop bits: 1
 — parity: N – non parity 2
 O – odd parity
 E – even parity
 — data: 8 – number of bits

FACTORY DEFAULT

To **reset the initial values** of the level meter set by the manufacturer, press the button



After you press the button "RUNNING" will be displayed for about 3 sec. After the initial values are set, "DONE" will be appear on the display.



RESET

Complete restart of the level meter. The same effect has also a short-time interruption of the supply voltage. To enable the resetting, press the button .



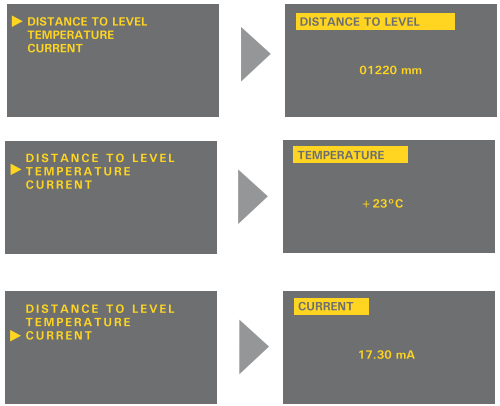
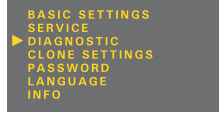
During the restart process, "RUNNING" will be displayed. Then the level meter will be automatically turned off and on.

Additional functions

Additional functions include modes to display temperature in the tank or to find out the actual flowing current in the loop. Besides, to lock modifications using a password and information about the level meter version. All of the functions are accessible from the main menu.

DIAGNOSTICS

It contains information about the actual temperature inside the tank (or about the compensated temperature) "TEMPERATURE" and current flowing through the loop "CURRENT". If the temperature compensation ("MEDIUM TEMPERATURE") is activated, the corrected temperature is displayed.

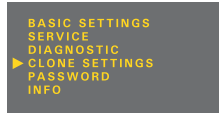


The temperature is measured inside the tank where the level meter is installed.

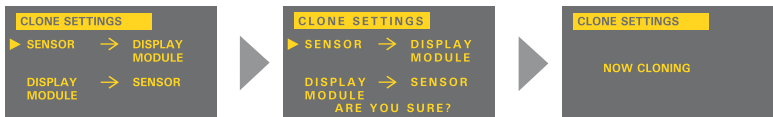
If the temperature of the measured medium is different, we recommend you to carry out the temperature compensation "MEDIUM TEMPERATURE" because of accuracy (see p. 15). Then the displayed temperature is an average value from the temperature set in the "MEDIUM TEMPERATURE" and the actual temperature measured by the sensor.

CLONE SETTINGS

This mode is intended for **copying** of level meter SLU body configuration into the display module and back. The display module can then be removed from the level meter body and put into another level meter and make there the settings transfer (cloning).



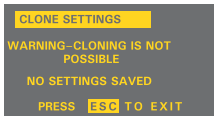
The "CLONE SETTINGS" mode transfers all data, excluding setting of the "Teaching" and HART®.



1. Press to enter the menu and select the item "CLONE SETTINGS". Copying of the settings from the body of the level meter to display module is done by selecting "SENSOR → DISPLAY MODULE". To transfer the settings from the display module to another level meter select the item DISPLAY MODULE → SENSOR.
2. The selected mode starts by pressing button During transmission the display shows "NOW CLONING".
3. After completing the process in the middle of the screen displays "DONE". It is then possible to leave the menu and the mode by pressing the button .



► **Incompatible type of level meter.** Transfer of the settings can be realized only with the same type of level meter (e.g. SLU-02 with SLU02, SLU-06 with SLU06) and with the firmware version 2.0 and later



► The data set is not stored into the display module. The transfer can not be done. It's necessary to repeat the procedure of the copying the settings in the mode CLONE SETTINGS.

PASSWORD

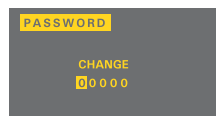
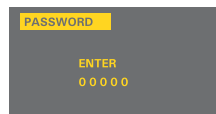
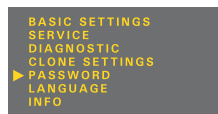
You can **lock** the level meter data against **unauthorized editing**.

After activating the password the data may be read, but can not be edited. If you try to edit the settings (without true password) the display shows "NO PASSWORD".

The password can be any 5-digit numeric combination. The combination of numbers 00000 is reserved for disabling the password.



1. Use the buttons and in the menu "PASSWORD" to select the mode "ENTER" for entering the password or the mode "CHANGE" for changing the password (when activated, the words are displayed inversely). Press the button once again to confirm the selection. You can change the password only when the level meter is unlocked. Otherwise, the words "NO PASSWORD" will be displayed.
2. Now you can edit the password. The actual edited item is displayed inversely. Press the button to move to the next position (clockwise direction), button serves to change the values (0 ... 9).
3. After the operation is completed, confirm the edited data by pressing the button .



Display of status information to confirm data:

"YES" – correctly edited password

"NO" – incorrectly edited password

"OK" – the password saved (only in case of "CHANGE")

The password is automatically hidden after it is edited or changed ("00000" will appear).

To deactivate the password, edit the numerical combination "00000" in the mode "CHANGE".

The level meter with activated password will be automatically locked after 5 minutes of inactivity or after 5 min. from switching to measuring mode. Locking of level meter is indicated in the lower left corner of the screen by the letter "L".



If the password is lost, contact the manufacturer.

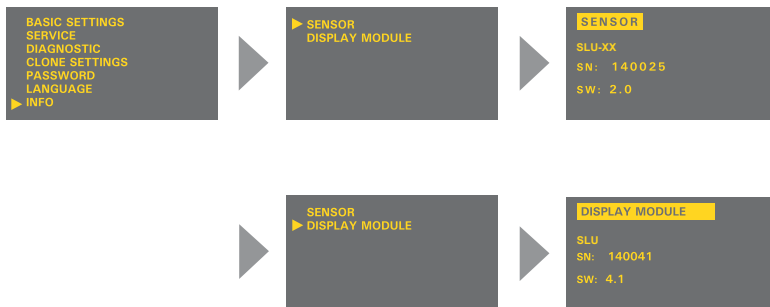
LANGUAGE

Setting the language of display menu.



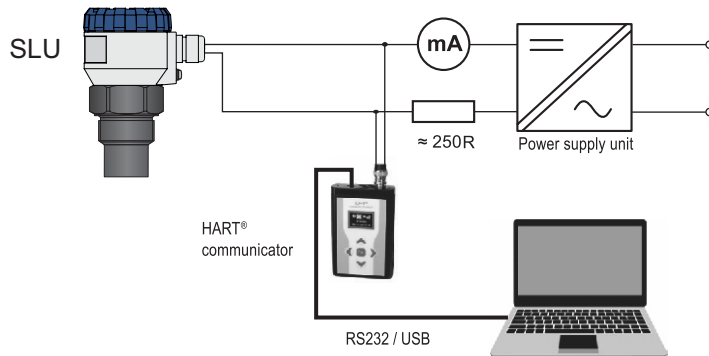
INFO

Information about the type, serial number and production date of the level meter (type, serial number – SN and firmware version – SW).



Protocol HART

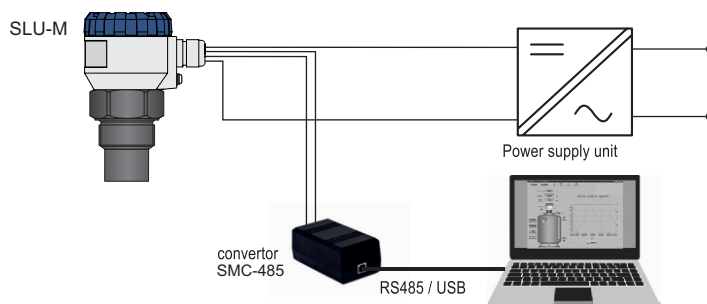
Universal communication interface for data communication of peripheral devices with the level meter. Data transmission runs through the same line as the $4 \div 20\text{mA}$ current loop without impact on analog communication. For setting the level meter and collection of measured data, it is necessary to have available a HART communicator, by which it is possible to communicate directly with the level meter, or using it, to mediate communication with a peripheral device, see image 22.



Obr. 22: Typical hardware configuration with HART

Protocol Modbus

Data communication takes place along a series line of a standard RS-485 with protocol Modbus RTU. A list of relevant variables is provided in a separate annex.



Obr. 23: Typical hardware configuration with Modbus®

Safe, Protection, Compatibility and Explosion Proof

The level meter SLU is equipped with protection against reverse polarity and output current overload Protection against dangerous contact is secured by low safety voltage compiles with EN 33 2000-4-41.

Electromagnetic compatibility according to EN 55022/B, EN 61326/Z1 and EN 61000-4-2 to 6.

Explosion proof of SLU-X type compiles with the following standards: EN 60079-0 : 2007;

EN 60079-11 : 2007 ; EN 60079-26 : 2007

Special Conditions for Safe use SLU-X

The device is designed for connection to the isolating repeater SIR-420. When the other approved supply units is used, whose output parameters satisfy above mentioned output parameters, its is necessary to have a galvanic separation or, if supply unit without galvanic separation is used (Zener barriers), it is necessary provide potential equalization between sensor and point of barrier earthing.

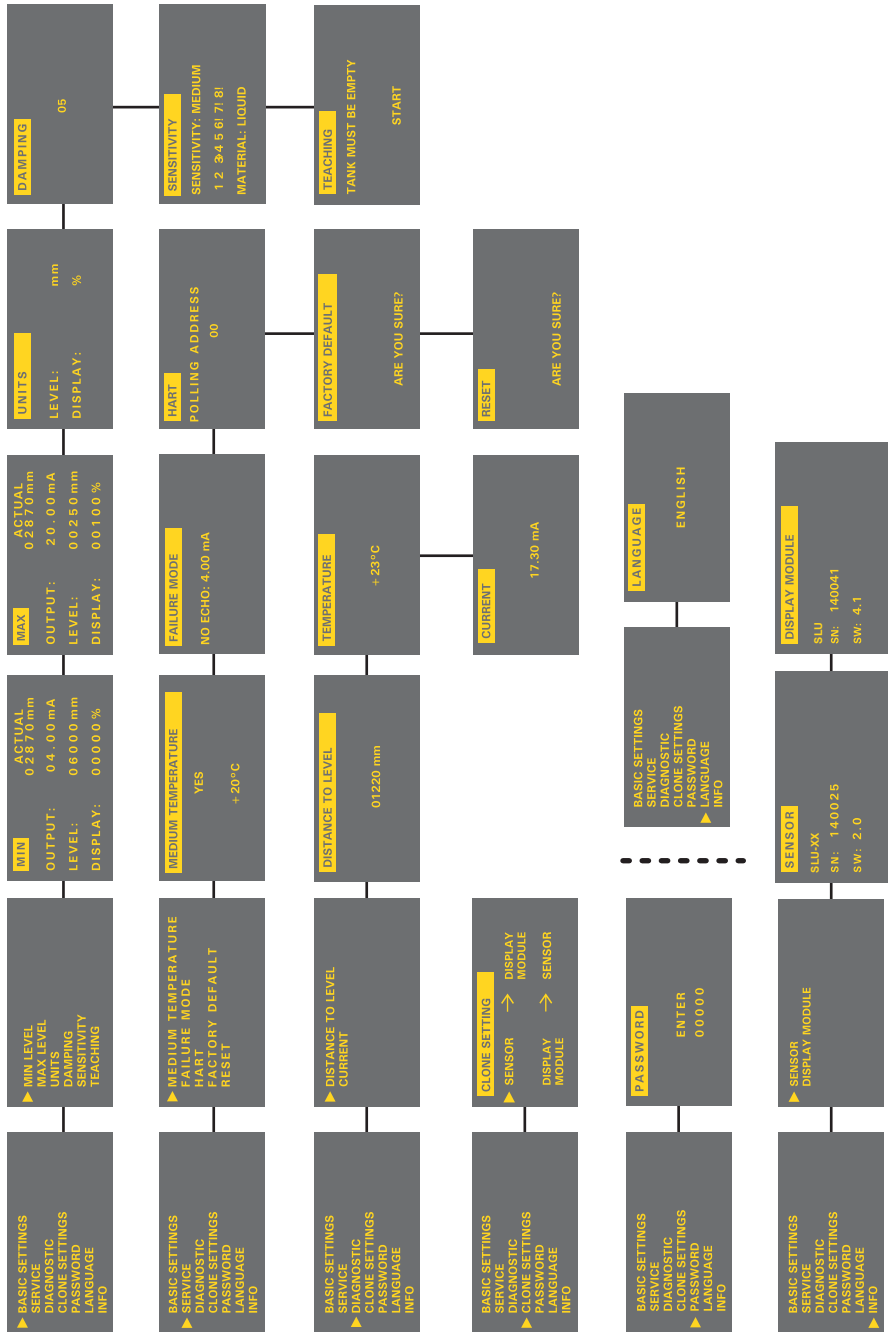
For application in zone 0 the present explosive atmosphere- mixture of air with flammable gases, vapour or mists must comply: 0,8 bar <math>p < 1,1 \text{ bar}</math>. The device must be installed in such a way, to prevent mechanical damage of sensor face.

Use, Manipulation and Maintenance

The level meter does not require any personnel for its operation. It is used to inform the technological entity operating personnel on the measured substance level height during the operation. Maintenance of this equipment consists in verification of the integrity of the level meter and of the supply cable. Depending on the character of the substance measured, we recommend to verify at least once per year the clarity of the ultrasound transducer emitting field and to clean it, respectively. In case any visible defects are discovered, the manufacturer or reseller of this equipment must be contacted immediately.

It is forbidden to perform any modifications or interventions into the SLU level meter without manufacturer's approval. Potential repairs must be carried out by the manufacturer or by a manufacturer authorized service organization only. Installation, commissioning, operation and maintenance of the SLU level meter has to be carried out in accordance with this instruction manual; The provisions of regulations in force regarding the installation of electrical equipment have to be adhered to. In accordance with EN 60079-14 (Electrical apparatus for explosive gas atmospheres - Part 14: Electrical installations in hazardous areas other than mines) and in accordance with other standards that apply to given area.

Menu Structure



Technical Specifications

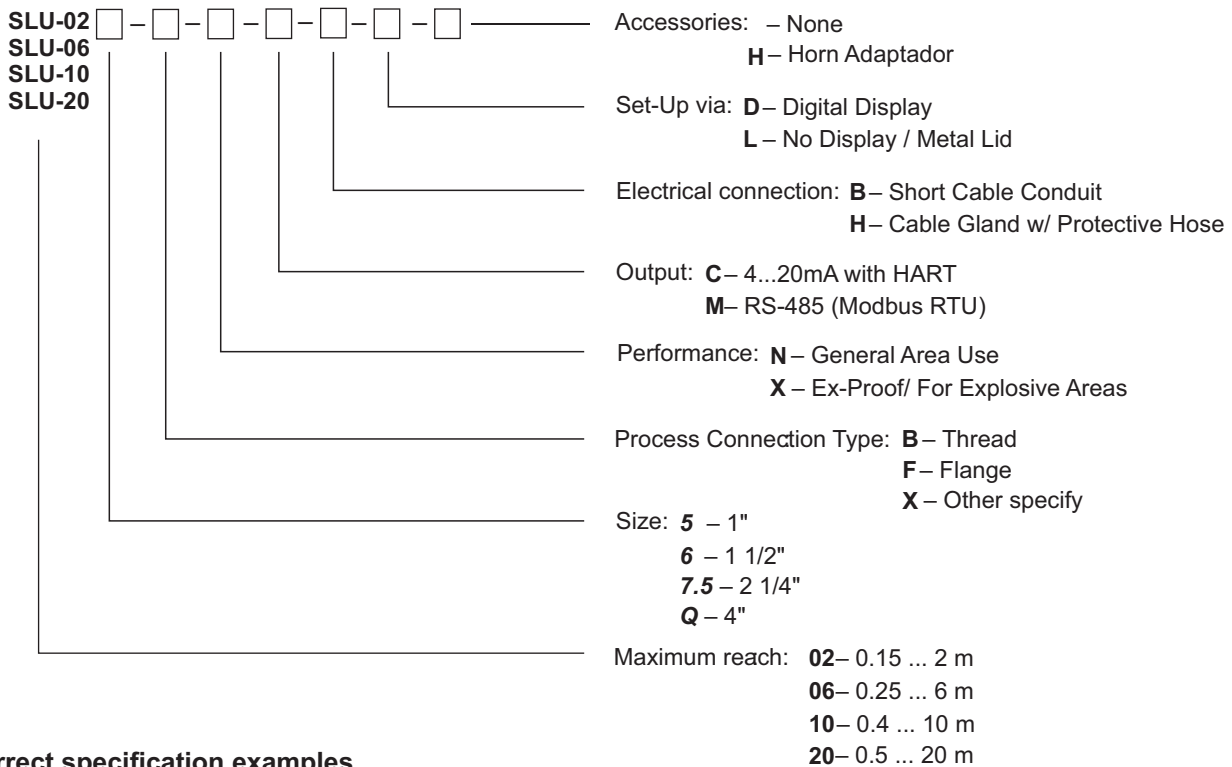
Level meter		
Measuring range ¹⁾	SLU-02	0.15 ... 2 m
	SLU-06	0.25 ... 6 m
	SLU-10	0.4 ... 10 m
	SLU-20	0.5 ... 20 m
Adjustable measuring range (SPAN)		Min. 200 mm
Supply voltage	SLU(02/06/10/20)-N	18 ... 36 V DC
	SLU(02/06/10/20)-X	18 ... 30 V DC
Output	SLU(02/06/10/20)-C SLU(02/06/10/20)-M	4 ... 20mA (Limit values 3.9 ... 20.5 mA), HART® RS-485 with protocol Modbus RTU
Current consumption	SLU-C SLU-M	4 ... 20 mA / Max. 22 mA Max. 20 mA
Resolution	SLU02 ; 10	< 1 mm
	SLU06	< 2 mm
	SLU20	< 2,5 mm
Accuracy (within the total range)		0.15 %
Temperature error		Max. 0.04% / K
Operating frequency	SLU02	120 kHz
	SLU06	75 kHz
	SLU10	50 kHz
	SLU20	30 kHz
Beamwidth (-3 dB)	SLU02 ; 10	10°
	SLU06	14°
	SLU20	12°
Ambient temperature range	SLU02 ; 06	-30 ... +70°C
	SLU10 ; 20	-30 ... +60°C
Short-time temperature stress resistance		+90°C / 1 h.
Max. operation overpressure (on transmission surface)		0.1 MPa
Sensitivity		3 Settings (low – medium – high)
Damping		0 ... 99 s
Measuring period		1 ... 4 s
Rise time		cca. 30 s
Additional technical data for Ex proof - Max. internal values		U _i =30V DC; I _f =132mA; P _i =0.99W C _i =370nF L _i =0.9mH
Failure indication (echo loss, level in dead zone ³⁾ , internal failure)		Adjustable in modes: 3.75mA; 22mA; Last measured value
Protection class		IP67
Mechanical connection	SLU02	thread G 1" (Optimal Horn adapter)
	SLU06	thread G 1.1/2" (Optional Horn adapter)
	SLU10	thread G 2.1/4" (Optional Horn adapter)
	SLU20	Aluminium alloy flange
Recommended cable	SLU(02/06/10/20)-C	PVC 2 x 0.75mm ²
	SLU(02/06/10/20)-M	PVC 2 x 2 x 0.25mm ² (twisted pair, shielded)
Maximal resistance of current output load	U = 24 V DC	R _{max} = 270 Ω ²⁾
	U = 22 V DC	R _{max} = 180 Ω
	U = 20 V DC	R _{max} = 90 Ω
Weight	SLU02	0.3 kg
	SLU06	0.4 kg
	SLU10	0.7 kg
	SLU20	3.1 kg

¹⁾ In case the level of bulk-solid materials is measured, the measurement range is reduced.

²⁾ Including 250R resistor in case of HART connection.

Display module	
Display type	Matrix OLED
Resolution	128 x 64 pixel
Character height / Number of digits measured value	9 mm / 5 Digits
Display colour	Yellow
Buttons	Membrane switch panel
Ambient temperature range	-30 ... +70 °C
Weight	46 g

Area classification (according to EN 60079-10 and EN 60079-14)	
SLU(02/06/10/20)-N	Performance for non-explosive areas
SLU02-X SLU06-X	Explosive proof - suitable for explosive areas (combustible gases or vapours) Ⓜ II 1/2G Ex ia IIB T5 Ga/Gb with isolation repeater (SIR-420), the whole level meter - zone 1, front head part - zone 0
SLU10-X	Explosive proof - suitable for explosive areas (combustible gases or vapours) Ⓜ II 1/2G Ex ia IIA T5 Ga/Gb with isolation repeater (SIR-420), the whole level meter - zone 1, front head part - zone 0
SLU20-X	Explosive proof - suitable for explosive areas (combustible gases or vapours) Ⓜ II 1/2G Ex ia IIA T5 Gb with isolation repeater (SIR-420), the whole level meter - zone 1



Correct specification examples

SLU-02-5-B-N-C-B-D-_
 SLU-06-6-B-X-C-H-D-Ĥ

SLU-10-7.5-B-X-M-B-D-H
 SLU-20-_-F-X-C-B-D-_-

1. The SLU02 has a measuring range from 0.15m to 2m with plastic PVDF transmitter and plastic body (PP+HDPE), process connection of G1" thread.
2. The SLU06 has a measuring range from 0.25m to 6m with plastic PVDF transmitter and plastic body (PP+HDPE), process connection of G1 1/2" thread.
3. The SLU10 has a measuring range from 0.4m to 10m with plastic PVDF transmitter and plastic body (PP+HDPE), process connection of G2 1/4" thread.
4. The SLU20 has a measuring range from 0.5m to 20m with plastic PVDF transmitter and plastic body (PP+HDPE), process connection of aluminum alloy flange.