Your Global Automation Partner

TURCK

LUS211…
Ultrasonic Level Sensors

Instructions for Use

Contents

Contents

1 About These Instructions

These instructions for use describe the structure, functions and the use of the product and will help you to operate the product as intended. Read these instructions carefully before using the product. This is to avoid possible damage to persons, property or the device. Retain the instructions for future use during the service life of the product. If the product is passed on, pass on these instructions as well.

1.1 Target groups

These instructions are aimed at qualified personal and must be carefully read by anyone mounting, commissioning, operating, maintaining, dismantling or disposing of the device.

1.2 Explanation of symbols used

The following symbols are used in these instructions:

⚠	**DANGER** DANGER indicates a dangerous situation with high risk of death or severe injury if not avoided.
⚠	**WARNING** WARNING indicates a dangerous situation with medium risk of death or severe injury if not avoided.
⚠	**CAUTION** CAUTION indicates a dangerous situation of medium risk which may result in minor or moderate injury if not avoided.
❗	**NOTICE** NOTICE indicates a situation which may lead to property damage if not avoided.
ℹ	**NOTE** NOTE indicates tips, recommendations and useful information on specific actions and facts. The notes simplify your work and help you to avoid additional work.
▶	**CALL TO ACTION** This symbol denotes actions that the user must carry out.
⇨	**RESULTS OF ACTION** This symbol denotes relevant results of actions.

1.3 Other documents

Besides this document the following material can be found on the Internet at **www.turck.com**:

- Data sheet
- Commissioning manual IO-Link devices
- IO-Link parameters manual
- EU Declaration of Conformity (current version)
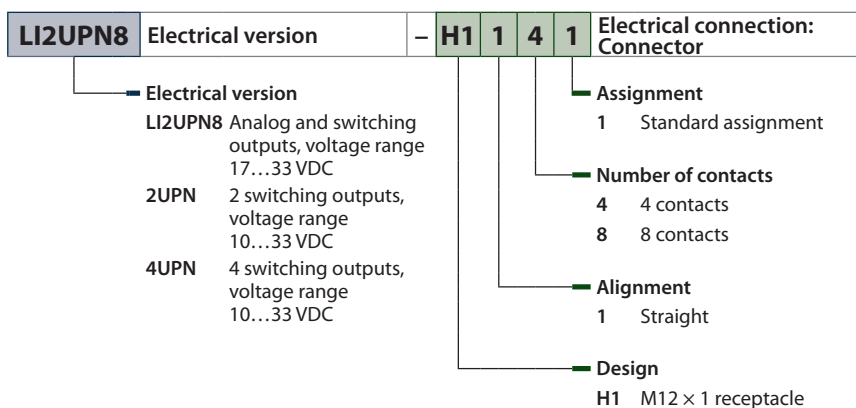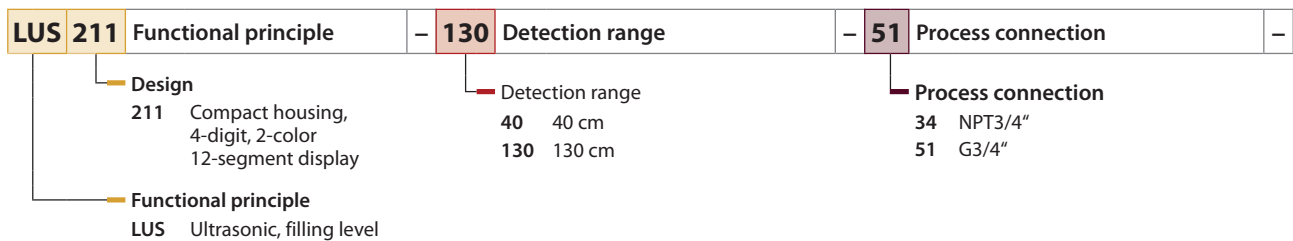- Approvals

1.4 Feedback about these instructions

We make every effort to ensure that these instructions are as informative and as clear as possible. If you have any suggestions for improving the design or if some information is missing in the document, please send your suggestions to **techdoc@turck.com**.

2 Notes on the Product

2.1 Product identification

LUS211	–	130	–	51	–	LI2UPN8	–	H1141

LUS	211	Functional principle	–	130	Detection range	–	51	Process connection	–

Design
211 Compact housing, 4-digit, 2-color 12-segment display

Detection range
40 40 cm
130 130 cm

Process connection
34 NPT3/4"
51 G3/4"

Functional principle
LUS Ultrasonic, filling level

LI2UPN8	Electrical version	–	H1	1	4	1	Electrical connection: Connector

Electrical version
LI2UPN8 Analog and switching outputs, voltage range 17…33 VDC
2UPN 2 switching outputs, voltage range 10…33 VDC
4UPN 4 switching outputs, voltage range 10…33 VDC

Assignment
1 Standard assignment

Number of contacts
4 4 contacts
8 8 contacts

Alignment
1 Straight

Design
H1 M12 × 1 receptacle

2.2 Scope of delivery

The scope of delivery includes:

- Ultrasonic level sensor
- Quick Start Guide
- LUS211-51…: Sealing ring from passivated steel with NBR seal

2.3 Turck service

Turck supports you with your projects, from initial analysis to the commissioning of your application. The Turck product database under **www.turck.com** contains software tools for programming, configuration or commissioning, data sheets and CAD files in numerous export formats.

The contact details of Turck subsidiaries worldwide can be found on p. [▶ 39].

3 For Your Safety

The product is designed according to state-of-the-art technology. However, residual risks still exist. Observe the following warnings and safety notices to prevent damage to persons and property. Turck accepts no liability for damage caused by failure to observe these warning and safety notices.

3.1 Intended use

The ultrasonic level sensors of the LUS211… series detect without contact the presence of solid or liquid objects and measure the distance to those objects.

The devices may only be used as described in these instructions. Any other use is not in accordance with the intended use. Turck accepts no liability for any resulting damage.

3.2 Obvious misuse

■ The devices are not safety components and must not be used for personal or property protection.

3.3 General safety instructions

■ The device may only be assembled, installed, operated, parameterized and maintained by professionally-trained personnel.
■ Not all objects are detected equally well by the sensor. The detection of the object must be checked by the user prior to regular operation.
■ Replace the device if the plug connector is faulty or if there are other defects.
■ Only operate the device within the limits stated in the technical specifications.

4 Product Description

The ultrasonic level sensors of the LUS211… series are contained in a metal housing and provided with different standard process connections. The sensor head can be rotated by up to 340° after installation. The devices are provided with a metal-bodied M12 connector for connecting the sensor cable. The process values are shown via the display. The device functions can be set via touchpads or via IO-Link.

Devices with the following output functions are available:

- LUS211-…-2UPN8…: 2 switching outputs (PNP/NPN/Auto)
- LUS211-…-4UPN8…: 4 switching outputs (PNP/NPN/Auto)
- LUS211-…-LI2UPN8…: 1 switching output (PNP/NPN/Auto) as well as 1 switching output (PNP/NPN/Auto) or 1 analog output (I/U/Auto)

4.1 Device overview
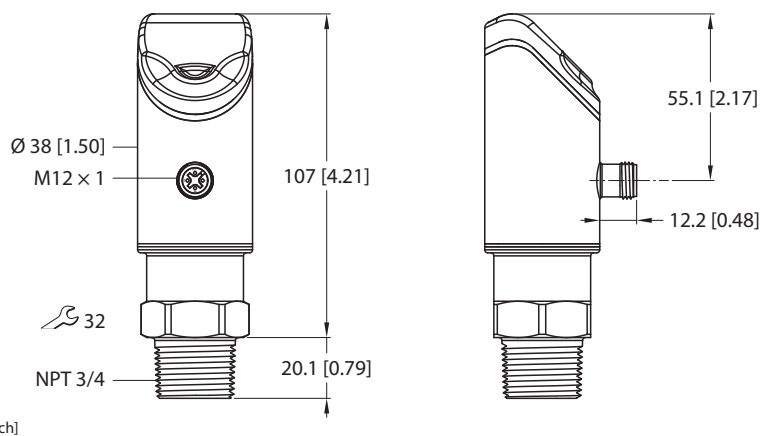

Ø 38 [1.50]
M12 × 1
107 [4.21]
55.1 [2.17]
12.2 [0.48]
32
NPT 3/4
20.1 [0.79]

mm [Inch]

Fig. 1: LUS211-…-34…

Ø 38 [1.50]
M12 × 1
113.1 [4.45]
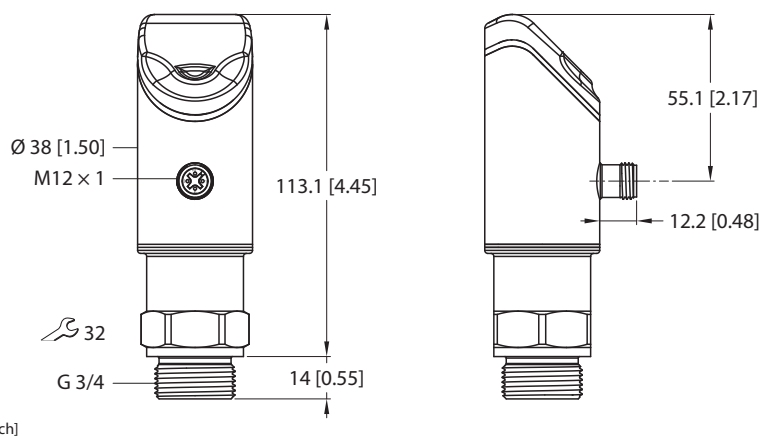55.1 [2.17]
12.2 [0.48]
32
G 3/4
14 [0.55]

mm [Inch]

Fig. 2: LUS211-…-51…

4.2 Properties and features

- 4-digit, two-color 12-segment display, display rotatable by 180°
- Rotatable housing according to the mounting of the process connection
- G3/4" or NPT3/4" process connection
- Programmable NO/NC contact
- Process value transfer and parameterization via IO-Link

4.3 Operating and display functions

The front of the device is provided with three touchpads [ENTER], [MODE] and [SET], a 4-digit 12-segment multicolor display and status LEDs. This enables the user to set all essential functions and properties directly on the device and read the actual process values and taught switch points.

4.4 Operating principle

Ultrasonic sensors are designed for the non-contact and wear-free detection of a variety of targets by means of sound waves. It does not matter here whether the target is transparent or non-transparent, metallic or non-metallic, solid, liquid or in powder form. Environmental conditions such as spray, dust or rain also hardly affect the functioning of the sensors.

Ultrasonic sensors emit one or several ultrasonic pulses that are propagated in the air at the speed of sound. A part of the ultrasonic wave is reflected by the object. The sensor measures the total time of flight from the sensor to the object and back to the sensor. The distance to the object is then calculated with the following formula:

$$D = c \times t / 2$$

D   Distance from the sensor to the object in m

c   Speed of sound in air in m/s

t   Time of flight for the ultrasonic pulse in s

To improve accuracy, the ultrasonic sensor forms the mean value from the measurement of several sound pulses before outputting a new value. The ultrasonic velocity depends on the composition and the temperature of the gas in which the sound is propagated. In most ultrasound applications, the composition of the gas is stable whereas the temperature may often fluctuate.

The speed of sound in air varies with the temperature according to the following approximation formula:

$$c_{air} = 20 \times \sqrt{(273 + T)}$$

c_{air} Speed of sound in air in m/s

T   Temperature in °C

The speed of sound at an air temperature of 20 °C is approximately 344 m/s

The following formula applies to sensors with integrated temperature compensation:

$$c_{air} = (331.5 \times 0.596 + T)$$

Fluctuations in air temperature affect the speed of sound, which in turn has an effect on the total time for the echo measured by the sensor. An increase in air temperature shifts both measuring range limits closer to the sensor and the time of flight of the echo is shorter. A drop in air temperature shifts both measuring range limits away from the sensor and the time of flight of the echo is longer. This shift is approximately 3.5 % of the limit distance with a temperature change of 20 °C.

Good ultrasonic reflectors are metals, glass, stone, wood with smooth and hard surfaces, as well as liquids that are aligned appropriately to the sensor. Cloth, sand or grains absorb some of the sonic energy. Foams and skins are particularly poor reflectors.

4.5 Functions and operating modes

4.5.1 Setting options

The devices feature the following three setting options:

- Setting via IO-Link
- Setting via the touchpads
- Setting via FDT/DTM

4.5.2 Normal operation – run mode

The device detects the distance to the surface of the medium and shows the required switching or analog behavior according to the factory set or customer-specific parameters. The measured distance to the medium is shown in the display. The selected unit and the status of the existing switching outputs are indicated via LEDs.

4.5.3 Programming mode

If the sensor is unlocked, the display switches to Programming mode after the [MODE] touch-pad is pressed. All parameters and their associated values can be read and modified in Programming mode. A short press of the [ENTER] touchpad displays the values of a parameter. The [MODE] and [SET] touchpads are used to navigate in Programming mode.

4.5.4 Output functions – switching output

A window function and a hysteresis function can be set for the switching outputs.

Window function

The window function is used to teach in a switching range in which the switching output takes on a defined switching state. The switching range is defined by an upper and lower limit value. The minimum distance between the limit values is 5 mm (LUS211-40…) and 10 mm (LUS211-130…). If the upper limit value is changed, the lower limit value is automatically adjusted.
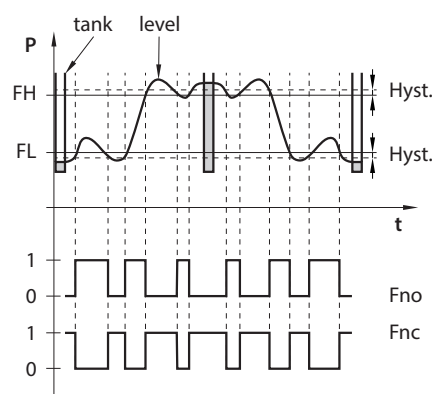

Fig. 3: Behavior of the switching output – Window function

Hysteresis function

The hysteresis function is used to teach in a stable switching state that is not affected by system-related fluctuations and the adjusted setpoint. The switching range is defined with a switching point and a reset point. The minimum hysteresis is 5 mm (LUS211-40…) and 10 mm (LUS211-130…). If the switching point is changed, the reset point is automatically adjusted.
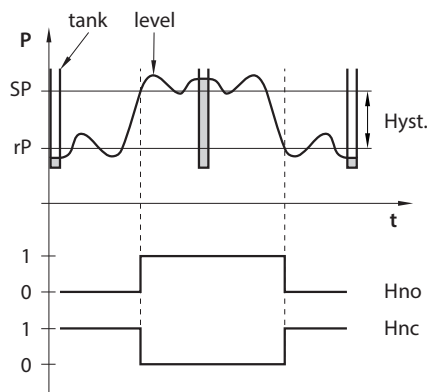
Fig. 4: Behavior of the switching output – Hysteresis function

4.5.5 Output functions – analog output

The analog output of the LUS…LI2UPN8 sensors can be set as either a current or voltage output. The measuring range can be defined as required.

The minimum distance between the start and end point is 50 mm (LUS211-40…) and 100 mm (LUS211-130…).

Current output

In the defined measuring range, the device supplies an analog current signal between ASP (analog start point) and AEP (analog end point). The following output configurations can be set:

- 4…20 mA (factory setting)
- 0…20 mA
- 20…4 mA
- 20…0 mA

Voltage output

In the defined measuring range, the device supplies an analog voltage signal between ASP (analog start point) and AEP (analog end point). The following output configurations can be set:

- 0…10 V
- 0…5 V
- 1…6 V
- 0.5…4.5 V
- 10…0 V
- 5…0 V
- 6…1 V

4.5.6 IO-Link mode

The devices must be connected to an IO-Link master for operation in IO-Link mode. If the port is configured in IOL mode, bidirectional IO-Link communication is provided between the IO-Link master and the device. For this the device is integrated in the controller level via an IO-Link master. The communication parameters are exchanged first of all; the cyclic data exchange of the process data (process data objects) then starts.

4.5.7 SIO mode (standard I/O mode)

In standard I/O mode no IO-Link communication takes place between the device and the master. The device only transfers the switching state of its binary outputs and can also be run via a fieldbus device or controller with digital PNP or NPN inputs. An IO-Link master is not required for operation.

The device parameters can be set via IO-Link and then operated at the digital inputs with the appropriate settings in SIO mode. Not all functions and properties of the device can be used in SIO mode.

4.5.8 Auto sensing function

When connected to an I/O module, the auto sensing function enables the device to support the set switching output behavior (PNP/NPN) or analog output characteristics. The auto sensing functions are activated by default.

4.6 Technical accessories

The following accessories are not supplied with the device:

Type name	Description	Figure
USB-2-IOL-0002	IO-Link adapter V1.1 with integrated USB interface	
WKC4.4T-2-RSC4.4T/TXL	Connection cable, M12 female connector, angled to M12 connector, straight, 4-pin, cable length: 2 m, sheathing material: PUR, black; cuLus approval	
WKC4.4T-2/TXL	Connection cable, M12 female connector, angled, 4-pin, cable length: 2 m, sheathing material: PUR, black; cuLus approval	

In addition to the above connection cables, Turck also offers other cable types for specific applications with the correct terminals for the device. More information on this is available from the Turck product database at **www.turck.de/products** in the Connectivity area.

5 Installing

The sensor detects the surface of the medium nearest to the sensor and outputs the distance.

The sensors can be installed in any alignment according to application requirements. The sound wave is propagated vertically to the sonic transducer at an opening angle of 15° (LUS211-40…) and 16° (LUS211-130…). The display of the unit can be rotated by 180° (see parameter DiSr). The maximum tightening torque for fastening the sensor is 40 Nm.
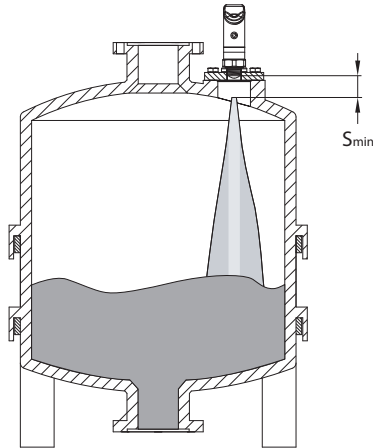
Fig. 5: Mounting the LUS211…

▶ Install the sensor at the intended mounting location.
▶ Install the sensor in such a way that no foreign objects are located in the detection range or in the blind zone.
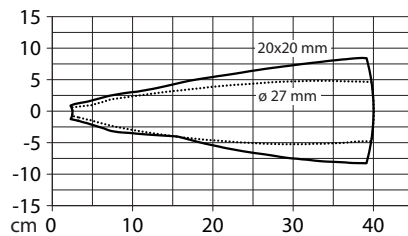
Fig. 6: LUS211-40… wave pattern
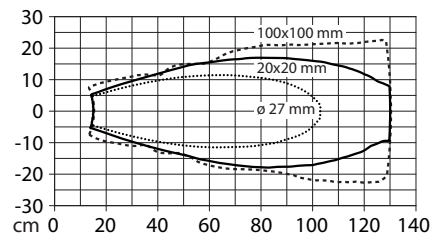
Fig. 7: LUS211-130… wave pattern

▶ When using more than one ultrasonic sensor in an application: Avoid the overlapping of sonic cones. An overlap can occur if two sensors are mounted less than 200 mm (LUS211-40…) or 450 mm (LUS211-130…) apart. If this minimum distance is not ensured, synchronize the sensors via IO-Link.
▶ Optional: Rotate the sensor head within the 340° range to align the connection to the I/O level as well as to ensure optimum operability and readability.

6 Connection

> **ℹ NOTE**
> The device must be provided with an SELV/PELV power supply compliant with a limited energy circuit in accordance with UL61010-1 3rd Edition (IEC/EN 61010-1).

▶ Connect the female connector of the connection cable to the male connector of the sensor.

▶ Connect the open end of the connection cable to the power supply and/or processing units.

6.1 Wiring diagrams

Fig. 8: LUS…LI2UPN pin layout

Fig. 9: LUS…LI2UPN wiring diagram
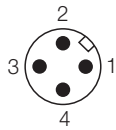
Fig. 10: LUS…2UPN… pin layout
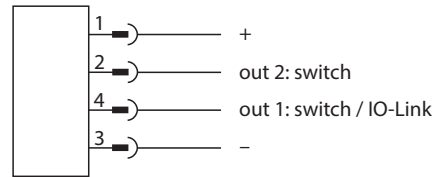
Fig. 11: LUS…2UPN… wiring diagram
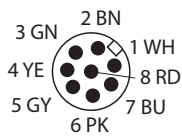
Fig. 12: LUS…4UPN… pin layout
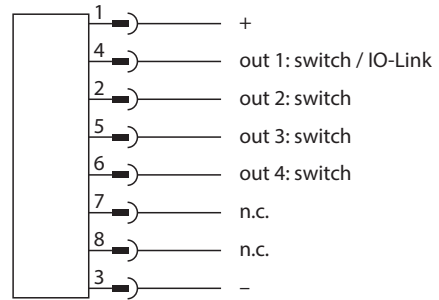
Fig. 13: LUS…4UPN… wiring diagram

7 Commissioning

After connecting and switching on the power supply, the device is automatically ready for operation.

8 Operation

8.1 LEDs – operation

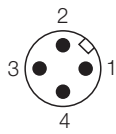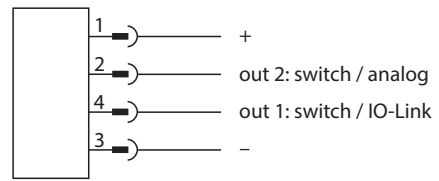| LED	Indication	Meaning
PWR	Green	Device is operational
	Green flashing	IO-Link communication
FLT	Red	Error
DST	Green	Distance between the sensor and the surface in % or selected unit
LVL	Green	Level display in % or selected unit
VOL	Green	Filling volume in % or selected unit
SSI	Yellow flashing (1 Hz)	Signal strength ≤ 20 %
	Yellow flashing (2 Hz)	Signal strength > 20 % ≤ 40 %
	Yellow flashing (4 Hz)	Signal strength > 40 % ≤ 60 %
	Yellow	Signal strength > 60 % ≤ 80 %
	Green	Signal strength > 80 %
PCT	Off	Display of the selected unit
	Green	Displayed in %
LOC	Yellow	Device locked
	Yellow flashing	"Lock/unlock" process active
	Off	Device unlocked
I	Yellow	Switching output 1 active
II	Yellow	Switching output 2 active

8.2 Display indications

Display	Meaning
d-OR	Value not displayable (> 9999)
d-UR	Value not displayable (< -1999)
Err	Unspecified, internal error
ErrG	Incorrect geometrical information on the dimensions of the medium container
ErrL	Burden at the analog output outside of the permissible range
ErrT	No object detected
SC	Short circuit
Loc	Device locked
uLoc	Device unlocked
- - - -	Sensor failure

9 Setting and Parameterization

9.1 Settable functions and features

Setting options via touchpads and IO-Link interface

The following functions and properties can be set and used both in standard I/O mode as well as in IO-Link mode:

- Locking/unlocking the device
- Window function
- Hysteresis function
- Analog range
- Advanced settings:
  - Reset to presettings
  - Reset to factory settings
  - Measured variable and unit
  - Container geometry
  - Minimum and maximum value memory
  - Display color and behavior
  - Password setting

Other setting options via IO-Link

The following additional functions and properties can be set and used via the IO-Link interface:

- OUT1 output configuration for SIO mode: PNP/NPN, automatic detection on/off
- OUT2 output configuration for SIO mode: PNP/NPN, automatic detection on/off
- Setting display units for IO-Link mode: metric, imperial
- Lock data storage on IO-Link master
- Fully lock user interface (display and touchpads locked)
- Lock parameters (parameters are displayed but cannot be changed)
- Operating hours counter including warning limits
- Muting: Switching sonic transducers on and off to synchronize multiple sensors in the application via the controller

Auto sensing function

When connected to an I/O module, the auto sensing function enables the device to support the set switching output behavior (PNP/NPN) or analog output characteristics. The auto sensing functions are activated by default.

9.2 Setting via touchpads

Use the [MODE] or [SET] touchpads to navigate through the main menu and the EF extended functions menu. A Turck-specific default menu guidance as well as a VDMA menu can be selected. The menu guidance can be set via the **SoF** parameter.

9.2.1 Locking the device

▶ Touch [MODE] and [SET] simultaneously for 3 s.
⇨ When the LOC LED flashes, Loc will appear on the display and then go out.
⇨ LOC LED is yellow.

The sensor is automatically locked if the touchpads of the device are not actuated for 1 min.

9.2.2 Unlocking the device

▶ Touch [ENTER] for 3 s until all green bars are flashing on the display.
▶ Swipe [MODE], [ENTER], [SET] in succession: Two red flashing bars appear when each touchpad is touched. Swipe the nearest touchpad once the two red bars turn green.
▶ Release the touchpads when six green bars are flashing on the display.
⇨ LOC LED goes out.
⇨ uLoc appears in the display and goes out.

9.2.3   Standard menu – overview

Standard menu guidance – main menu
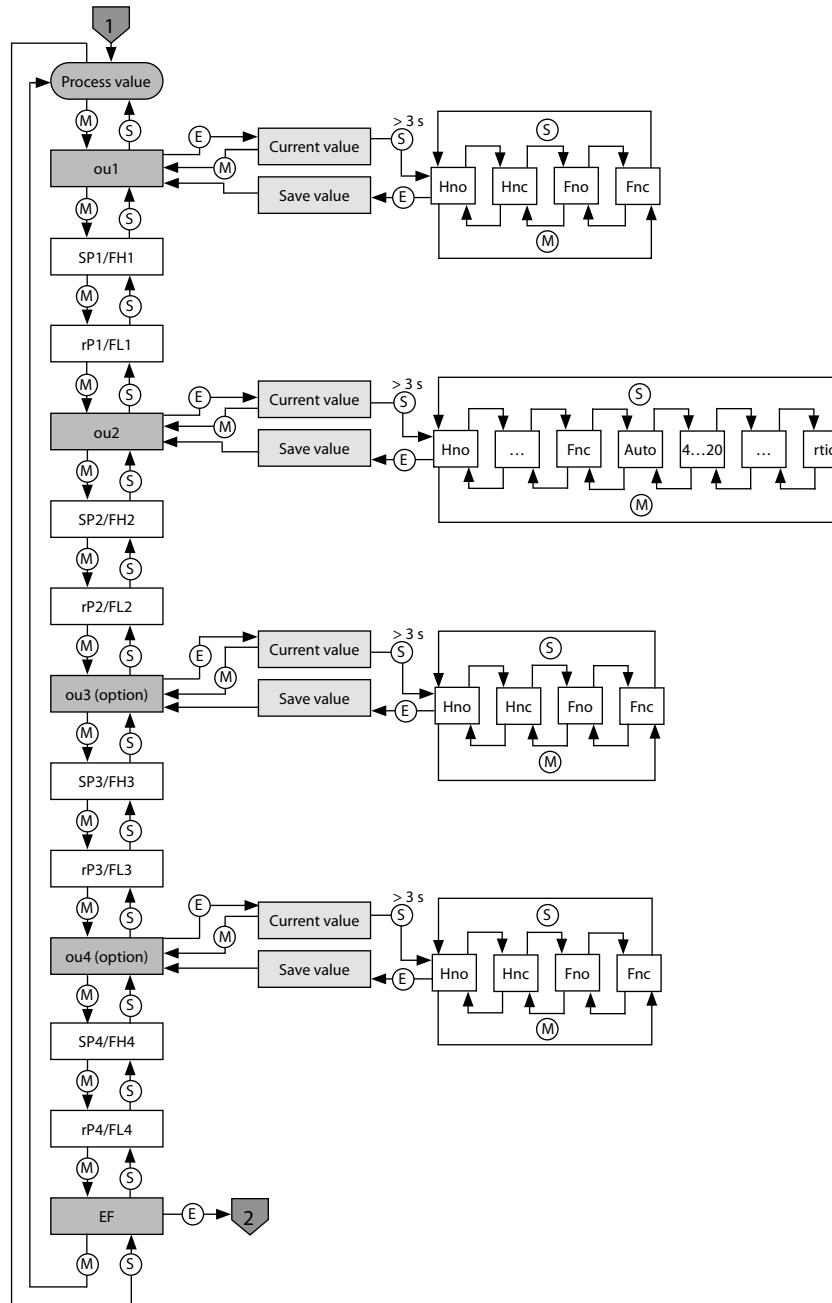
Fig. 14: Main menu

Standard menu guidance – EF extended functions menu
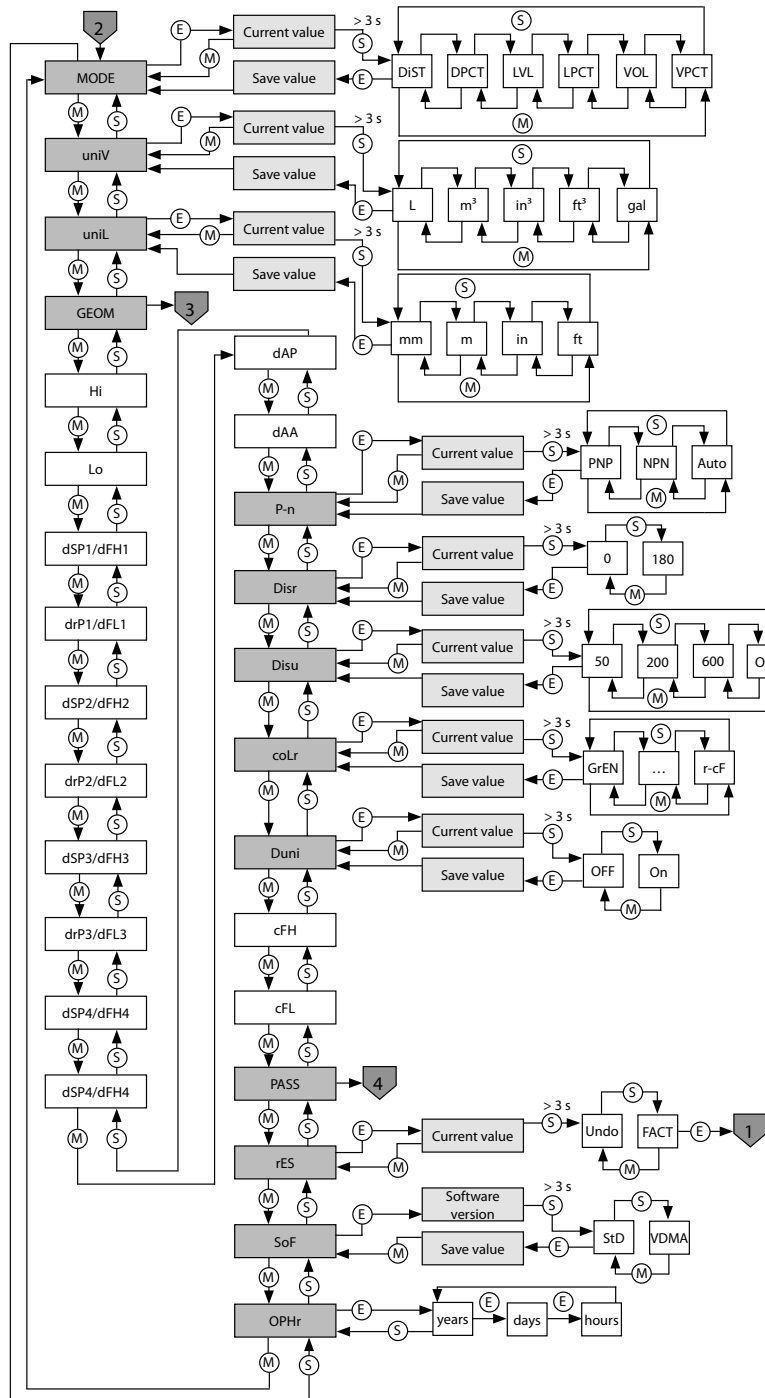
Fig. 15: EF extended functions menu

9.2.4   VDMA menu – overview

VDMA menu – main menu
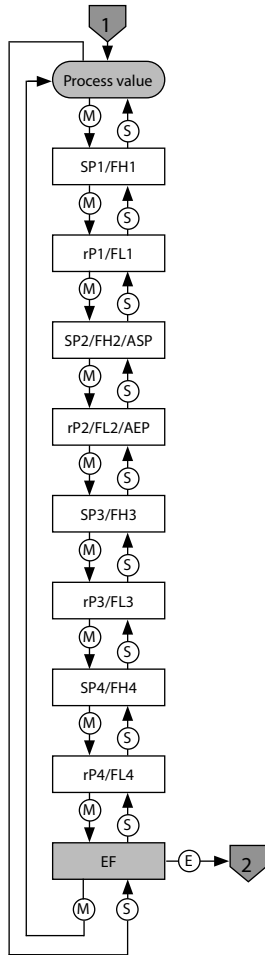
Fig. 16: VDMA main menu

VDMA menu – EF extended functions menu
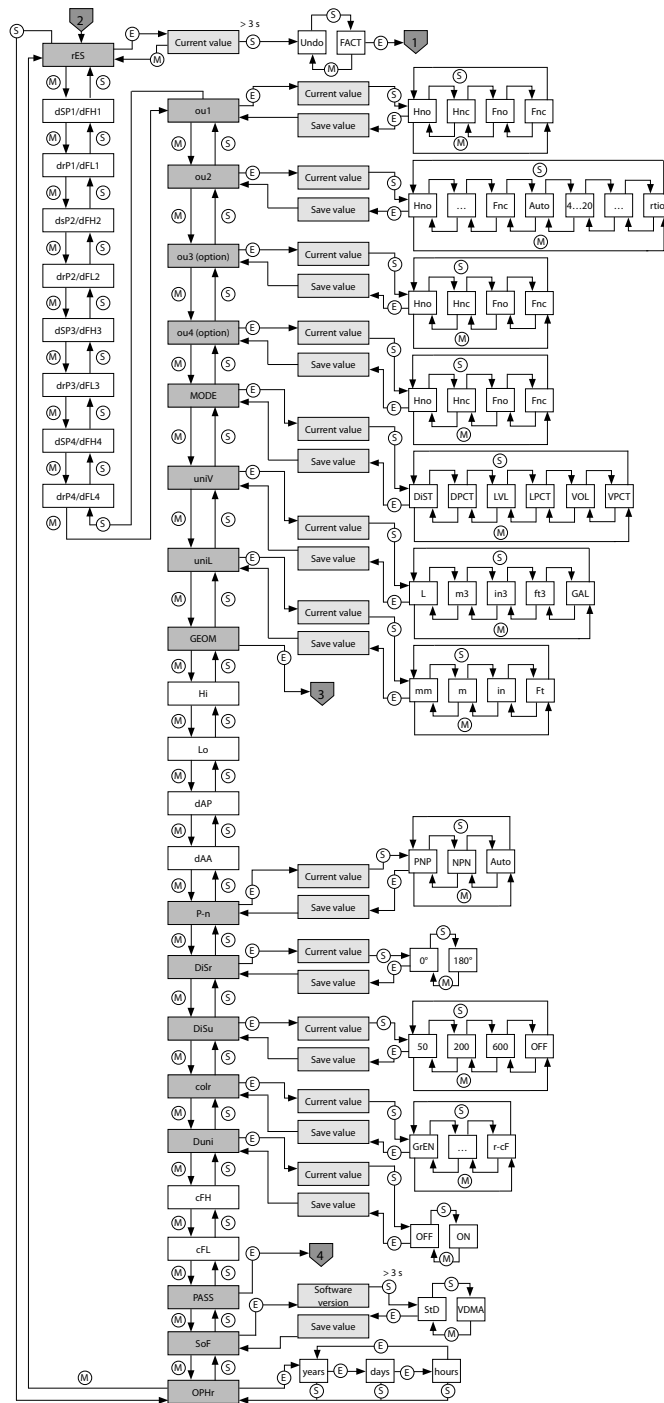
Fig. 17: VDMA EF extended functions menu

9.2.5 Setting parameter values via touchpads

Turck standard menu

▶ Unlock the device when [MODE] or [SET] is touched, a red running light appears and the LOC LED is lit.

▶ Touch [MODE] or [SET] until the required parameter is displayed.

▶ Touch [ENTER] to select a parameter.

▶ Changing the displayed value: Touch [SET] for 3 s until the display is no longer flashing. Or: Touch [MODE] in order to return to parameter selection.

▶ Increase or decrease the value incrementally via [MODE] or [SET]. Certain values can be changed by continuously touching [MODE] or [SET].

▶ Touch [ENTER] to save the modified value. The saved value flashes twice.
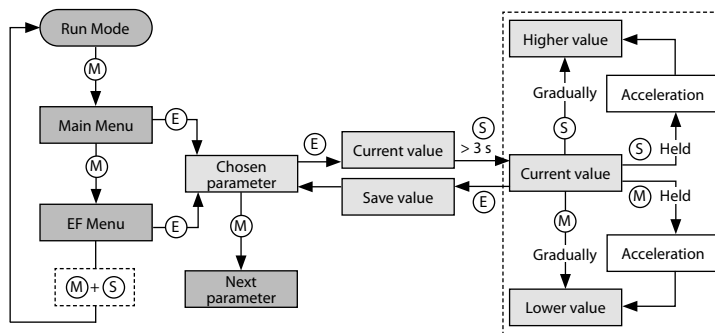
Fig. 18: Setting parameter values

VDMA menu

▶ Unlock the device when [MODE] or [SET] is touched, a red running light appears and the LOC LED is lit.

▶ Touch [MODE] or [SET] until the required parameter is displayed.

▶ Touch [ENTER] to select a parameter.

▶ Increase or decrease the value incrementally via [MODE] or [SET]. Certain values can be changed by continuously touching [MODE] or [SET].

▶ Touch [ENTER] to save the modified value. The saved value flashes twice.
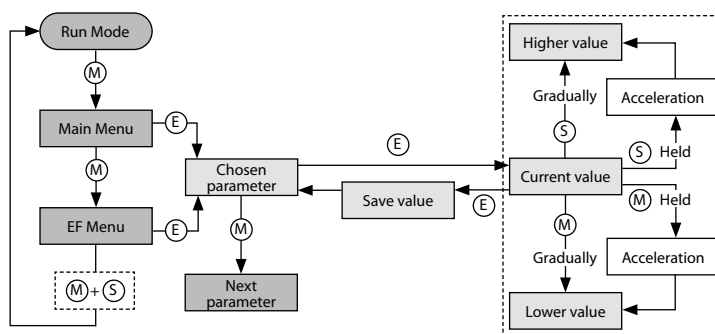
Fig. 19: Setting parameter values

9.2.6 Setting parameter values via touchpads – GEOM menu

▶ Touch [ENTER]: The next parameter is displayed.

▶ Touch [ENTER]: The parameter value is displayed.

▶ Increase or decrease the value gradually via [MODE] or [SET]. Certain values can be continuously changed by holding down [MODE] or [SET].

▶ Touch [ENTER] to save the modified value. The stored value flashes twice and the next parameter is displayed.
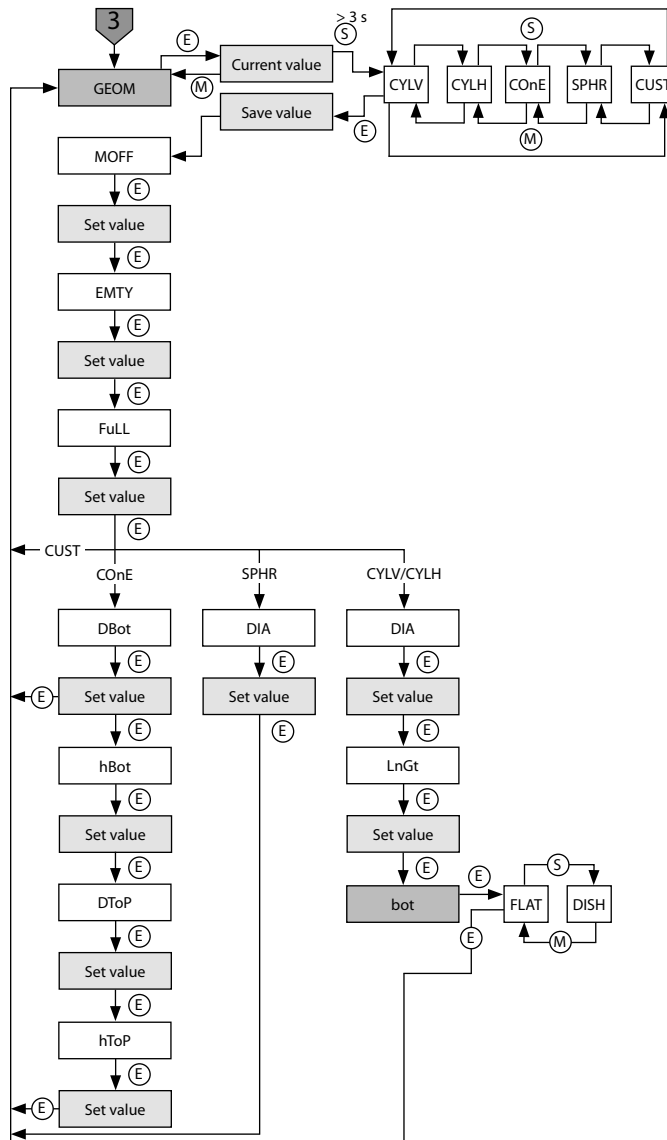
Fig. 20: GEOM menu

9.2.7   Protecting the sensor with a password

▶   Select PASS in the EF menu.

▶   Change values via [SET].

▶   Use [MODE] to navigate between the four digits of the password.

▶   Use [ENTER] to store the new password.
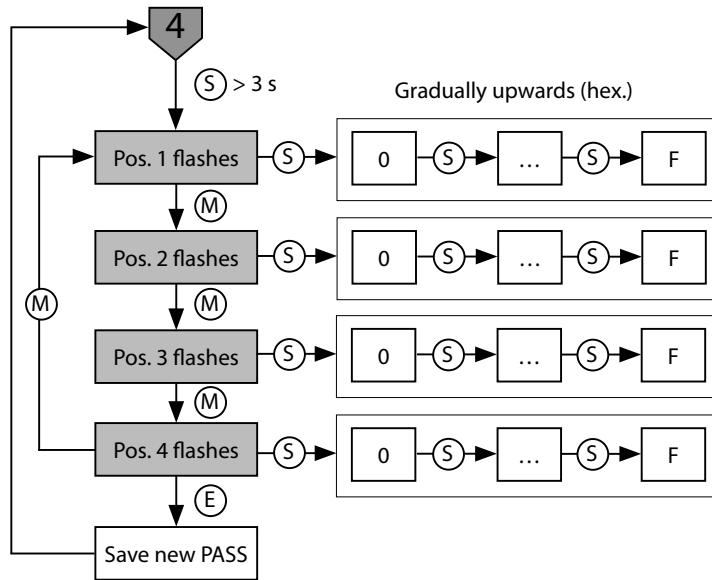
Fig. 21: Password setting

9.2.8 Parameters in the main menu

Default values are shown in **bold** type.

	Explanation	Options	Function
ou1	Function of output 1	**Hno**	Hysteresis function (NO = NO contact)
		Hnc	Hysteresis function (NC = NC contact)
		Fno	Window function (NO = NO contact)
		Fnc	Window function (NC = NC contact)
SP1…SP4	Switching point 1...4 for hysteresis function ou1…ou4: Hno/Hnc		Upper level at which the outputs 1…4 change their switching state **Default: 50 % of the detection range**
rP1…rP4	Reset switching point 1...4 for hysteresis function ou1…ou4: Hno/Hnc		Lower level at which the outputs 1…4 change their switching state **Default: 75 % of the detection range**
FH1…FH4	Upper switching point for window function ou1…ou4: Fno/Fnc		Upper switching point at which outputs 1…4 change their switching status **Default: 50 % of the detection range**
FL1…FL4	Lower switching point for window function ou1…ou4: Fno/Fnc		Lower switching point at which outputs 1…4 change their switching status **Default: 75 % of the detection range**
ou2	Function of output 2	**Hno**	Hysteresis function (NO = NO contact)
		Hnc	Hysteresis function (NC = NC contact)
		Fno	Window function (NO = NO contact)
		Fnc	Window function (NC = NC contact)
	Analog output	**Auto**	Automatic detection (4…20 mA/0…10 V)
		4-20	4…20 mA
		0-20	0…20 mA
		20-4	20…4 mA
		20-0	20…0 mA
		0-10	0…10 V
		0-5	0…5 V
		1-6	1…6 V
		10-0	10…0 V
		5-0	5…0 V
		6-1	6…1 V
		rtio	0.5…4.5 V
ASP	Start point of the analog signal ou2: Auto/analog values/rtio		Measured value at which the analog output signal has its start point **Default: Min. detection distance**
AEP	End point of the analog signal ou2: Auto/analog values/rtio		Measured value at which the analog output signal has its end point **Default: Max. detection distance**
ou3	Function of output 3	**Hno**	Hysteresis function (NO = NO contact)
		Hnc	Hysteresis function (NC = NC contact)
		Fno	Window function (NO = NO contact)
		Fnc	Window function (NC = NC contact)

	Explanation	Options	Function
ou4	Function of output 4	**Hno**	Hysteresis function (NO = NO contact)
		Hnc	Hysteresis function (NC = NC contact)
		Fno	Window function (NO = NO contact)
		Fnc	Window function (NC = NC contact)
EF	Submenu for additional setting options		See table "Parameters in the EF submenu"

9.2.9 Parameters in the EF submenu (Extended Functions)

	Explanation	Options	Function
MODE	Measured variable	**DIST**	Distance to the sensor
		DPCT	Distance to the sensor in % (scaled to Full-EMTY)
		LVL	Level
		LPCT	Level in % (scaled to FuLL-EMTY)
		VOL	Volume
		VPCT	Volume in % (scaled to FuLL-EMTY)
uniV	Volume unit	**A**	Liter
		m^3	Cubic meters
		in^3	Cubic inch
		ft^3	Cubic foot
		gal	Gallons
uniL	Unit of length	mm	Millimeters
		m	Meters
		in	Inches
		ft	Feet
GEOM	Geometry submenu		For additional setting options for the container geometry, see the Parameters in the GEOM submenu table
Hi	Maximum value memory		The highest level is stored and can be displayed/deleted (hold down [SET]).
Lo	Minimum value memory		The lowest level is stored and can be displayed/deleted (hold down [SET]).
dSP1… dSP4	Switch delay of SP1…SP4		0…60 s in increments of 0.1 s (0 = delay time not active) **Default: 0.0**
drP1…drP4	Switch delay of rP1…rP4		0…60 s in increments of 0.1 s (0 = delay time not active) **Default: 0.0**
dFH1… dFH4	Switch delay of FH1…FH4		0…60 s in increments of 0.1 s (0 = delay time not active), only available with window mode Fno or Fnc **Default: 0.0**
dFL1…dFL4	Switch delay of FL1…FL4		0…60 s in increments of 0.1 s (0 = delay time not active), only available with window mode Fno or Fnc **Default: 0.0**

	Explanation	Options	Function
dAP	Damping of switching output (filter)		Filter for momentary or high frequency measurement peaks: 0…8 s in increments of 0.01 s (0 = filter is deactivated) **Default: 0.0**
dAA	Damping of analog output		Filter for momentary or high frequency measurement peaks: 0…8 s in increments of 0.01 s (0 = filter is deactivated) **Default: 0.0**
P-n	Behavior of the switching output	**Auto**	Automatic detection (NPN/PNP)
		NPN	N switching
		pnp	P switching
diSr	Display orientation	**0°**	Display rotated by 0°
		180°	Display rotated by 180°
diSu	Measured value display	**50**	50 ms update time
		200	200 ms update time
		600	600 ms update time
		Off	Display update deactivated
coLr	Display color	**GrEn**	Always green
		rEd	Always red
		G1ou	Green if ou1 is switched, otherwise red
		r1ou	Red if ou1 is switched, otherwise green
		G2ou	Green if ou2 is switched, otherwise red
		r2ou	Red if ou2 is switched, otherwise green
		G-cF	Green if the measured value is between switching points cFL and cFH
		r-cF	Red if the measured value is between switching points cFL and cFH
Duni	Display of measured value and unit		Measured value and unit are displayed alternately (measured value: 4 s, unit: 1 s)
		Off	Unit is not displayed.
		ON	Unit is displayed.
cFH	Virtual upper switching point		Upper switching point at which the display changes color (if display color G-cF or r-cF is selected) **(default in distance mode: 0.5 × measuring range)**
cFL	Virtual lower switching point		Lower switching point at which the display changes color (if display color G-cF or r-cF is selected) **(default in distance mode: 0.75 × measuring range)**
PASS	Password protection		Define password and activate password protection
		0000	No password

	Explanation	Options	Function
rES	Reset	FacT	Reset the parameters to the factory settings
		Undo	Reset the parameters to previous settings (last device start)
SOF	Soft menu version	**StD**	Standard menu guidance
		VDMA	VDMA menu guidance
OPHr	Operating hours counter		Display of operating hours in years (y), days (d) and hours (h)

9.2.10 Parameters in the GEOM submenu (geometry)

The following two diagrams show the settable parameters depending on different tank forms.
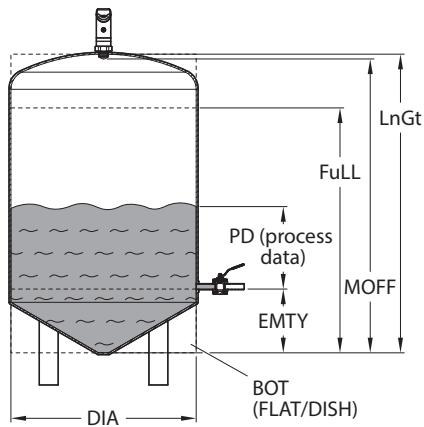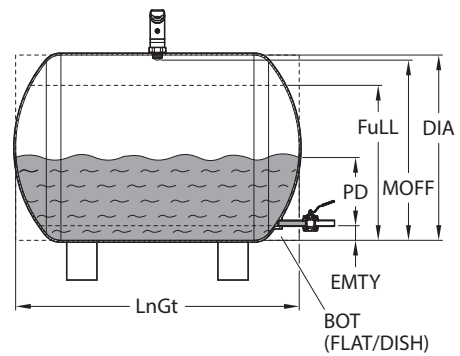

Fig. 22: Parameters – vertical cylinder

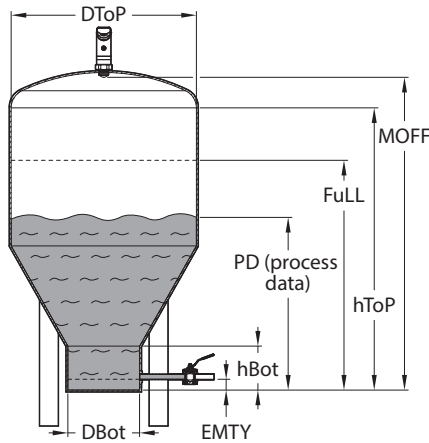Fig. 23: Parameters – horizontal cylinder
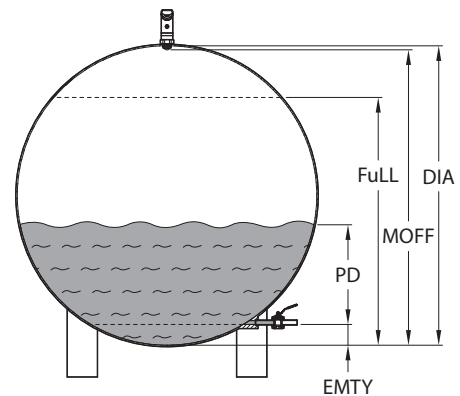

Fig. 24: Parameters – conical container

Fig. 25: Parameters – spherical container

	Explanation	Options	Function
GEOM	Container shape	**CYLV**	Vertical cylinder
		CYLH	Horizontal cylinder
		COnE	Conical container
		SPHR	Spherical container
		CUST	Customized
MOFF	Sensor position		Mounting offset of the sensor (threaded end to container bottom) **Default: Detection range**
EMTY	Lowest level (DPCT, LVL, LPCT, VOL, VPCT)		Measured from container bottom (MOFF - EMTY ≤ s_max.) **Default: 0**
FuLL	Highest level (DPCT, LVL, LPCT, VOL, VPCT)		Measured from container bottom (MOFF - FuLL ≥ s_min, FuLL - EMTY > a_min) **Default: Measuring range minus blind zone**
DIA	Container diameter (CYLV, CYLH, SPHR)		Diameter of cylindrical and spherical containers; DIA must be ≥ FuLL for CYLH and SPHR. **Default: 564.1895 mm**
LnGt	Container length (CYLV, CYLH)		Total length of cylindrical containers; with CYLV LnGt must be ≥ FuLL. **Default: Measuring range minus blind zone**
BOT	Type of container bottom (CYLV, CYLH)	**FLAT**	Flat bottom
		DISH	Two dish-shaped (convex bottoms at both ends)
DBot	Diameter at the bottom edge of cone (COnE)		Lower diameter of conical containers **Default: 0.0**
hBot	Bottom edge of cone (COnE)		Position and height of bottom diameter of conical containers (= length of cylindrical section at the bottom) **Default: 0.0**
DToP	Diameter of the upper edge of the cone (COnE)		Upper diameter of the conical containers **Default: 0.0**
hToP	Upper edge of cone (COnE)		Position or height of the upper diameter of conical containers (hToP > hBot) **Default: 0.0**

9.3   Setting via IO-Link

The device can be parameterized within the technical specifications (see data sheet) via the IO-Link communication interface – both offline, e.g. with the configuration tool as well as also on-line via the controller. An overview of the different functions and properties that can be set and used for IO-Link or SIO mode can be found in the chapter "Setting" and in the IO-Link para-meter manual of the device. Detailed instructions on the parameterization of devices via the IO-Link interface are provided in the IO-Link commissioning manual.

All the parameters can be changed in IO-Link mode via the controller during commissioning as well as during operation. In SIO mode the device operates according to the last setting made in IO-Link mode.

10   Troubleshooting

If the device does not function as expected, first check whether ambient interference is present. If there is no ambient interference present, check the connections of the device for faults.

If there are no faults, there is a device malfunction. In this case, decommission the device and replace it with a new device of the same type.

11 Maintenance

The device is maintenance-free. Clean with a damp cloth if required.

12 Repair

The device must not be repaired by the user. The device must be decommissioned if it is faulty. Observe our return acceptance conditions when returning the device to Turck.

12.1 Returning devices

Returns to Turck can only be accepted if the device has been equipped with a Decontamination declaration enclosed. The decontamination declaration can be downloaded from
https://www.turck.de/en/retoure-service-6079.php
and must be completely filled in, and affixed securely and weather-proof to the outside of the packaging.

13 Disposal

The devices must be disposed of correctly and must not be included in general household garbage.

14 Technical Data

14.1 Technical data – LUS211-…-2UPN8-H1141

Technical data	LUS211-40-…-2UPN8-H1141	LUS211-130-…-2UPN8-H1141
ID	LUS211-40-51…: 100003163	LUS211-130-51…: 100003165
	LUS211-40-34…: 100003164	LUS211-130-34…: 100003166
Function	Ultrasonic diffuse mode senor	
Range	5…400 mm	130…1300 mm
Resolution	0.5 mm	1 mm
Minimum measuring range	50 mm	100 mm
Minimum switching range	5 mm	10 mm
Ultrasonic frequency	320 kHz	200 kHz
Temperature drift	1.5 % of full scale	
Edge length of the norm target	20 mm	100 mm
Approach speed	≤ 3 m/s	≤ 10 m/s
Traverse speed	≤ 1.3 m/s	≤ 2 m/s
Operating voltage	10…33 VDC	
No-load I_0	≤ 150 mA	
Maximum current per switching output	250 mA	
Load resistance	≤ 1000 Ω	
Residual current	≤ 0.1 mA	
Response time, typically	60 ms	90 ms
Readiness delay	300 ms	
Communication protocol	IO-Link	
Output function	NO contact/NC contact, PNP	
Output 1	Switching output or IO-Link mode	
Output 2	Switching output	
Switching frequency	5 Hz	6.5 Hz
Hysteresis	5 mm	10 mm
Voltage drop at I_e	≤ 2.5 V	
Short-circuit protection	Yes	
Reverse polarity protection	Yes	
IO-Link		
IO-Link specification	V1.1	
IO-Link port type	Class A	
Communication mode	COM 2 (38.4 kBaud)	
Process data width	32-bit	
Measured variable information	28-bit	
Switching point information	4-bit	
Frame type	2.2	
Minimum cycle time	5 ms	
Function Pin 4	IO-Link	

Technical data	LUS211-40-…-2UPN8-H1141	LUS211-130-…-2UPN8-H1141
Function Pin 2	DI	
Maximum cable length	20 m	
Profile support	Smart Sensor Profile	
Contained in SIDI GSDML	Yes	
Design	Smooth barrel, LUS	
Emission direction	Straight	
Dimensions	127.1 × Ø 38 mm	
Housing material	Stainless steel/plastic, 1.4404 (AISI 316L)/Grilamid TR90 UV	
Sonic transducer material	Plastic, epoxy resin and PU foam	
Electrical connection	Male connector, M12 × 1, 4-wire	
Protection type	IP67/IP69K, ISO 20653 (not UL assessed)	
Ambient temperature	-25…+70 °C	
Conformity declaration EN ISO/IEC	EN 61000-4-2 ESD: 4 kV CD / 8 kV AD	
	EN 61000-4-3 HF radiated: 80 MHz…1 GHz: 15 V/m 1.4…2 GHz: 15 V/m 2…2.7 GHz: 10 V/m	
	EN 61000-4-4 Burst: 2 kV	
	EN 61000-4-6 HF line-conducted: 10 V	
	EN 61000-4-5 1 kV, 42 Ω, Criterion B	
	EN 61326-2-3	
Approvals	CE, cULus	

UL conditions: T_a 0…+85 °C, use the same power supply for all circuits.

14.2 Technical data – LUS211-…-4UPN8-H1181

Technical data	LUS211-40-…-4UPN8-H1181	LUS211-130-…-4UPN8-H1181
ID	LUS211-40-51…: 100003171	LUS211-130-51…: 100003173
	LUS211-40-34…: 100003172	LUS211-130-34…: 100003174
Function	Ultrasonic diffuse mode senor	
Range	5…400 mm	130…1300 mm
Resolution	0.5 mm	1 mm
Minimum measuring range	50 mm	100 mm
Minimum switching range	5 mm	10 mm
Ultrasonic frequency	320 kHz	200 kHz
Temperature drift	1.5 % of full scale	
Edge length of the norm target	20 mm	100 mm
Approach speed	≤ 3 m/s	≤ 10 m/s
Traverse speed	≤ 1.3 m/s	≤ 2 m/s
Operating voltage	10…33 VDC	
No-load I_0	≤ 150 mA	
Maximum current per switching output	250 mA	
Load resistance	≤ 1000 Ω	
Residual current	≤ 0.1 mA	
Response time, typically	60 ms	90 ms
Readiness delay	300 ms	
Communication protocol	IO-Link	
Output function	NO contact/NC contact, PNP	
Output 1	Switching output or IO-Link mode	
Output 2	Switching output	
Output 3	Switching output	
Output 4	Switching output	
Switching frequency	5 Hz	6.5 Hz
Hysteresis	5 mm	10 mm
Voltage drop at I_e	≤ 2.5 V	
Short-circuit protection	Yes	
Reverse polarity protection	Yes	
IO-Link		
IO-Link specification	V1.1	
IO-Link port type	Class A	
Communication mode	COM 2 (38.4 kBaud)	
Process data width	32-bit	
Measured variable information	28-bit	
Switching point information	4-bit	
Frame type	2.2	
Minimum cycle time	5 ms	
Function Pin 4	IO-Link	

Technical data	LUS211-40-…-4UPN8-H1181	LUS211-130-…-4UPN8-H1181
Function Pin 2	DI	
Maximum cable length	20 m	
Profile support	Smart Sensor Profile	
Contained in SIDI GSDML	Yes	
Design	Smooth barrel, LUS	
Emission direction	Straight	
Dimensions	127.1 × Ø 38 mm	
Housing material	Stainless steel/plastic, 1.4404 (AISI 316L)/Grilamid TR90 UV	
Sonic transducer material	Plastic, epoxy resin and PU foam	
Electrical connection	Male connector, M12 × 1, 8-pin	
Protection type	IP67/IP69K, ISO 20653 (not UL assessed)	
Ambient temperature	-25…+70 °C	
Conformity declaration EN ISO/IEC	EN 61000-4-2 ESD: 4 kV CD / 8 kV AD	
	EN 61000-4-3 HF radiated: 80 MHz…1 GHz: 15 V/m 1.4…2 GHz: 15 V/m 2…2.7 GHz: 10 V/m	
	EN 61000-4-4 Burst: 2 kV	
	EN 61000-4-6 HF line-conducted: 10 V	
	EN 61000-4-5 1 kV, 42 Ω, Criterion B	
	EN 61326-2-3	
Approvals	CE, cULus	

UL conditions: T_a 0…+85 °C, use the same power supply for all circuits.

14.3   Technical data – LUS211-…-LI2UPN8-H1141

Technical data	LUS211-40-…-LI2UPN8-H1141	LUS211-130-…-LI2UPN8-H1141
ID	LUS211-40-51…: 100003167	LUS211-130-51…: 100003169
	LUS211-40-34…: 100003168	LUS211-130-34…: 100003170
Function	Ultrasonic diffuse mode senor	
Range	5…400 mm	130…1300 mm
Resolution	0.5 mm	1 mm
Minimum measuring range	50 mm	100 mm
Minimum switching range	5 mm	10 mm
Ultrasonic frequency	320 kHz	200 kHz
Temperature drift	1.5 % of full scale	
Edge length of the norm target	20 mm	100 mm
Approach speed	≤ 3 m/s	≤ 10 m/s
Traverse speed	≤ 1.3 m/s	≤ 2 m/s
Operating voltage	17…33 VDC	
No-load I_0	≤ 150 mA	
Maximum current per switching output	250 mA	
Load resistance	≤ 1000 Ω	
Residual current	≤ 0.1 mA	
Response time, typically	60 ms	90 ms
Readiness delay	300 ms	
Communication protocol	IO-Link	
Output function	NO contact/NC contact, PNP, analog output	
Output 1	Switching output or IO-Link mode	
Output 2	Analog output	
Current output	Default: 4…20 mA	
Load resistance current output	≤ 0.5 kΩ	
Voltage output	Default: 0…10 V	
Load resistance voltage output	≥ 8 kΩ	
Switching frequency	5 Hz	6.5 Hz
Hysteresis	5 mm	10 mm
Voltage drop at I_e	≤ 2.5 V	
Short-circuit protection	Yes	
Reverse polarity protection	Yes	
IO-Link		
IO-Link specification	V1.1	
IO-Link port type	Class A	
Communication mode	COM 2 (38.4 kBaud)	
Process data width	32-bit	
Measured variable information	28-bit	
Switching point information	4-bit	
Frame type	2.2	

Technical data	LUS211-40-…-LI2UPN8-H1141 LUS211-130-…-LI2UPN8-H1141
Minimum cycle time	5 ms
Function Pin 4	IO-Link
Function Pin 2	DI
Maximum cable length	20 m
Profile support	Smart Sensor Profile
Contained in SIDI GSDML	Yes
Design	Smooth barrel, LUS
Emission direction	Straight
Dimensions	127.1 × Ø 38 mm
Housing material	Stainless steel/plastic, 1.4404 (AISI 316L)/Grilamid TR90 UV
Sonic transducer material	Plastic, epoxy resin and PU foam
Electrical connection	Male connector, M12 × 1, 4-wire
Protection type	IP67/IP69K, ISO 20653 (not UL assessed)
Ambient temperature	-25…+70 °C
Conformity declaration EN ISO/IEC	EN 61000-4-2 ESD: 4 kV CD / 8 kV AD
	EN 61000-4-3 HF radiated: 80 MHz…1 GHz: 15 V/m 1.4z…2 GHz: 15 V/m 2…2.7 GHz: 10 V/m
	EN 61000-4-4 Burst: 2 kV
	EN 61000-4-6 HF line-conducted: 10 V
	EN 61000-4-5 1 kV, 42 Ω, Criterion B
	EN 61326-2-3
Approvals	CE, cULus

UL conditions: T_a 0…+85 °C, use the same power supply for all circuits.

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