TURCK

Your Global Automation Partner

LRS510...
Radar Level Sensors

Instructions for Use

Contents

1 About these instructions

These instructions describe the setup, functions and use of the product and help you to operate the product according to its intended purpose. Read these instructions carefully before using the product. This will prevent the risk of personal injury and damage to property. Keep these instructions safe 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

The following symbols are used in these instructions:

	**DANGER** DANGER indicates a hazardous situation with a high level of risk, which, if not avoided, will result in death or serious injury.
	**WARNING** WARNING indicates a hazardous situation with a medium level of risk, which, if not avoided, will result in death or serious injury.
	**CAUTION** CAUTION indicates a hazardous situation with a medium level of risk, which, if not avoided, will result in moderate or minor injury.
	**NOTICE** CAUTION indicates a situation which, if not avoided, may cause damage to property.
	**NOTE** NOTE indicates tips, recommendations and important information about special action steps and issues. The notes simplify your work and help you to avoid additional work.
▶	**MANDATORY ACTION** This symbol denotes actions that the user must carry out.
⇨	**RESULT OF ACTION** This symbol denotes the relevant results of an action.

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
- Declarations of conformity (current version)
- Approvals

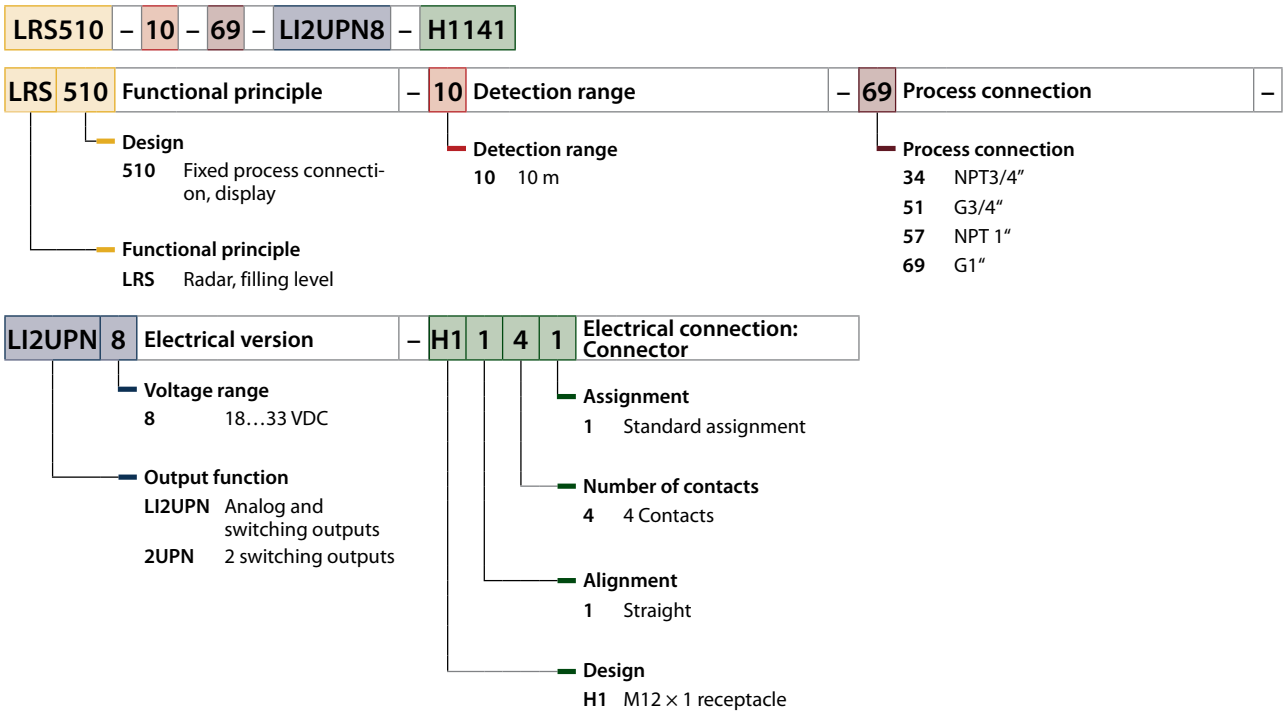
1.4 Feedback about these instructions

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

These instructions apply to the following radar level sensors:



Devices with Smart Sensor Profile 4.3.2

These instructions for use apply to devices from production date 2314 (date format YYWW) or later with Smart Sensor Profile 4.3.2. You can find the production date on the back of the housing.

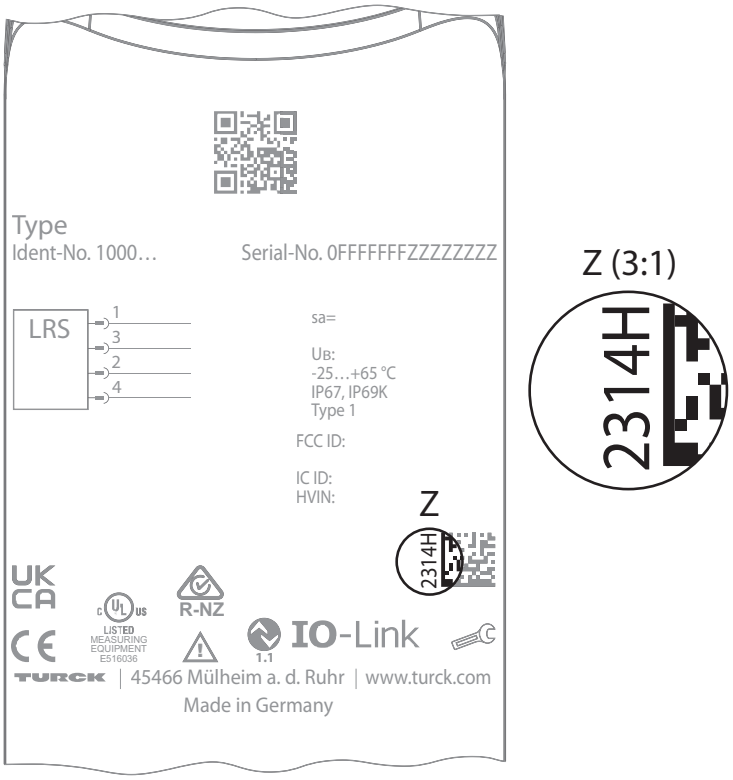


Fig. 1: Production date on the back of the housing

2.2 Scope of delivery

The delivery consists of the following:

- Radar level sensor
- Quick Start Guide
- LRS510-51… and LRS510-69…: Sealing ring made from passivated steel with NBR seal

2.3 Turck service

Turck supports you in your projects – from the initial analysis right through to the commissioning of your application. The Turck product database at **www.turck.com** offers you several software tools for programming, configuring or commissioning, as well as data sheets and CAD files in many export formats.

For the contact details of our branches worldwide, please see page [▶ 54].

3 For your safety

The product is designed according to state of the art technology. Residual hazards, however, still exist. Observe the following safety instructions and warnings in order to prevent danger to persons and property. Turck accepts no liability for damage caused by failure to observe these safety instructions.

3.1 Intended use

The LRS510… radar level sensors monitor the levels of liquid media. The sensors are pressure and vacuum proof in accordance with the specifications on the data sheet.

The device must 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 meets the EMC requirements for the industrial areas. When used in residential areas, take measures to prevent radio frequency interference.
- The device must only be fitted, installed, operated, parameterized and maintained by trained and qualified personnel.
- Only use the device in compliance with the applicable national and international regulations, standards and laws.
- The maximum transmission output of the sensor is within the approved limit values specified in ETSI EN 305550 and FCC/CFR. 47 Part 15.
- Only operate the device within the limits stated in the technical specifications.

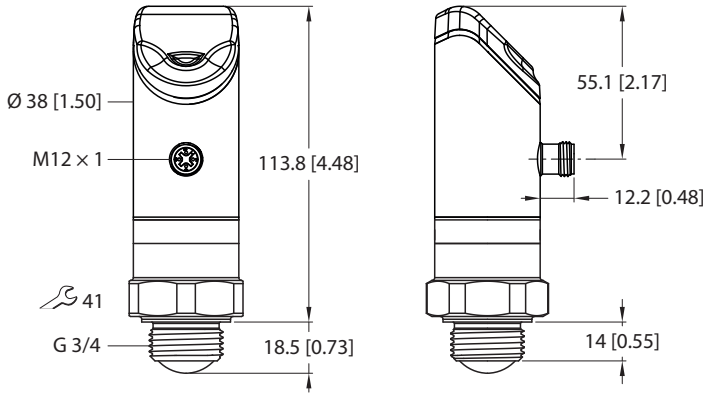
4 Product description

The radar level sensors of the LRS510… product series are contained in a metal housing and are 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 measured values appear on the display. The device functions can be set via touchpads or via IO-Link. The switching outputs and the analog output are controlled and parameterized via process data channels.

Devices with the following output functions are available:

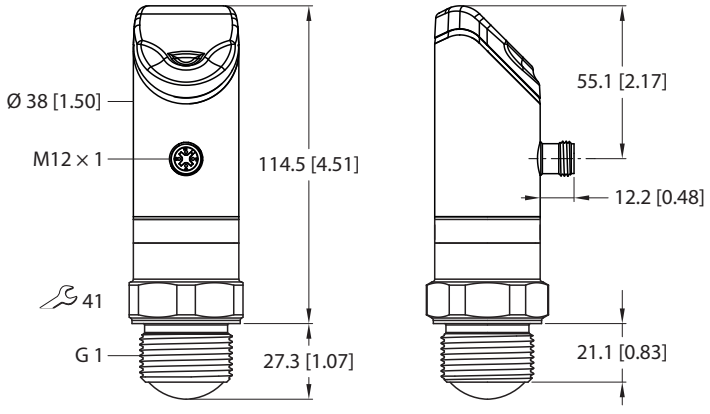
- LRS510-…-2UPN8…: Two switching outputs (PNP/NPN/Auto) according to Smart Sensor Profile 4.3.2 (2-channel, quantity detection)
- LRS510-…-LI2UPN8…: One switching output (PNP/NPN/Auto) and one switching output (PNP/NPN/Auto) or one analog output (I/U/Auto) according to Smart Sensor Profile 4.3.2 (2-channel, quantity detection)

4.1 Device overview



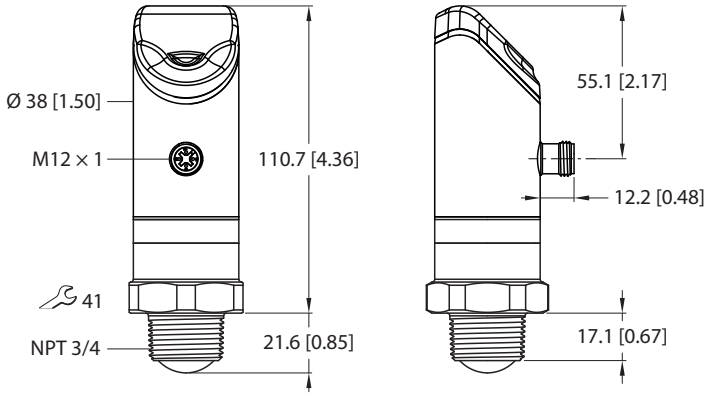
mm [Inch]

Fig. 2: Dimensions LRS510-…51…



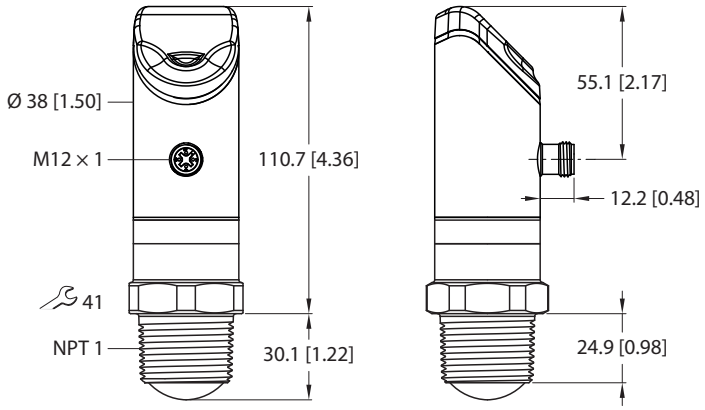
mm [Inch]

Fig. 3: Dimensions LRS510-…69…



mm [Inch]

Fig. 4: Dimensions LRS510-…34…



mm [Inch]

Fig. 5: Dimensions LRS510-…57…

4.2 Properties and features

- Range: 10 m
- Blind zone: 35 cm
- Resolution: 1 mm
- Approved acc. to ETSI 305550-2
- Approved in accordance with FCC/CFR. 47 Part 15
- 4-digit, 2-color, 12-segment display, rotatable by 180°
- Housing is rotatable after mounting the process connection
- Process connection G3/4", G1", NPT3/4" or NPT1"
- NO/NC programmable
- Process data transfer via two channels: Switching outputs and analog outputs are each parameterized using process data channel 1 (MDC1) or 2 (MDC2)
- Distance and level in mm, m, in, ft (display or process data channel 1) or % (process data channel 2)
- Container volume in l, m^3, in^3, ft^3, gal (display or process data channel 1) or % (process data channel 2)
- Transmission of process data and parametrization via IO-link
- Pressure resistance 0…16 bar
- IO-Link Smart Sensor Profile 4.3.2 (quantity detection)

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 set switching points.

4.4 Operating principle

The FMCW radar (frequency modulated continuous wave) measures the distance to stationary objects.

The sensor outputs a radar signal that changes in frequency. A periodic, linear frequency which varies upwards and downwards is used to limit the frequency range and to simplify the signal evaluation. The rate of change df/dt of frequency remains constant. Objects in the detection range reflect the transmitted signal. The change in the signal delay and frequency of the reflected signal are used to determine the distance to the object.

The frequency modulated continuous wave radar therefore has a clear advantage over the unmodulated continuous wave radar, which cannot detect distances.

4.5 Functions and operating modes

4.5.1 Setting options

The devices have three setting options:

- Setting via IO-Link
- Setting via 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 filling medium appears in the display at the factory. The selected unit and the status of the existing switching outputs are indicated via LEDs.

4.5.3 Programming mode

When the sensor is unlocked, the display will go into programming mode after the user presses the [MODE] touch pad. In programming mode, all parameters and their corresponding values can be read out and changed. The values for a parameter are displayed by briefly pressing the [ENTER] touch pad. The [MODE] and [SET] touch pads are used to navigate within programming mode. For more information, refer to the chapter “Setting and parameterization.”

4.5.4 Operating modes

The following operating modes can be selected to set the tank geometry:

- Distance (DST) for distance measurement: The sensor measures the distance from the lens to the media surface or object.
- Level (LVL) for level measurement: The sensor uses the set tank geometry data to convert the measured distance value into the tank level value.
- Container volume (VOL) for volume measurement: The sensor calculates the volume value based on additional tank geometry data and the distance and level values.

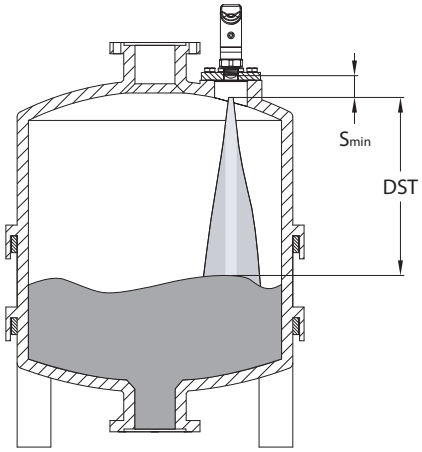


Fig. 6: Distance (DST) in containers

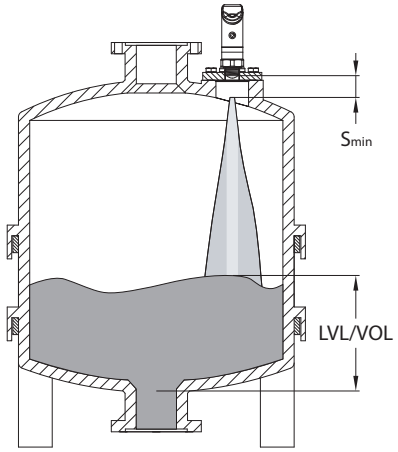


Fig. 7: Level (LVL) or container volume (VOL) in containers

The operating modes are selected from the Extended Functions (EF) menu under Set Mode (SEMO) or from the Turck Automation Suite (TAS). After selecting a mode, the appropriate IODD for the selected mode must be installed (see [▶ 20]).

4.5.5 Output functions — switching output

The switching logic can be inverted via IO-Link or via the touchpad (parameter LOGI). The following examples apply to the **HIGH** (0 → 1) switching logic.

Single point mode

In single point mode, the switching behavior is defined via a SP1 limit value and a hysteresis. The output changes its switching state at limit value SP1.

The hysteresis can be set via IO-Link or via the touchpad (parameter HYST) and must be within the detection range.

If the process value increases, the switching output is inactive as long as the process value is between the start of the detection range and the SP1 limit value. If the process value increases above the SP1 limit value, the switching output becomes active.

If the process value decreases, the switching output is active as long as the process value is between the end of the detection range and the SP1 limit minus the set hysteresis (SP1-Hyst). If the process value decreases below the limit value (SP1-Hyst), the switching output becomes inactive.

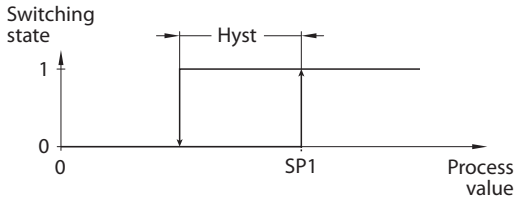


Fig. 8: Single point mode

Two point mode

In two point mode, the switching behavior is defined via a switch-on point SP1 and a switch-off point SP2. This mode can also be used as a freely adjustable hysteresis.

If the process value increases, the switching output is inactive as long as the process value is between the start of the detection range and the switch-on point SP1. If the process value rises above the switch-on point SP1, the switching output becomes active.

If the process value decreases, the switching output is active as long as the process value is between the end of the detection range and the SP2 switch-off point. If the process value decreases below the switch-off point SP2, the switching output becomes inactive.

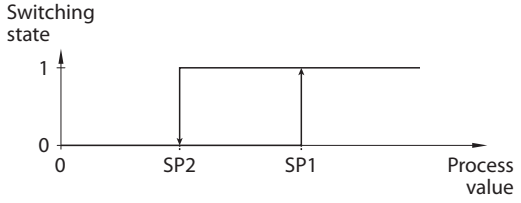


Fig. 9: Two point mode

Window mode

In window mode, an upper and lower window limit are set for the switching output. A hysteresis can be set for the window limits SP1 and SP2. The switching window must be within the detection range.

The hysteresis can be set via IO-Link or via the touchpad (parameter HYST) and must be within the detection range.

If the process value increases, the switching output is inactive as long as the process value is between the start of the detection range and the window limit SP2. The switching output remains active until the process value increases above the window limit SP1 plus the hysteresis (SP1+Hyst). If the process value increases above (SP1+Hyst), the switching output becomes inactive again.

If the process value decreases, the switching output is inactive as long as the process value is between the end of the detection range and the window limit SP1. The switching output remains active until the process value decreases below the window limit SP2 minus the hysteresis (SP2-Hyst). If the process value decreases below (SP2- Hyst), the switching output becomes inactive again.

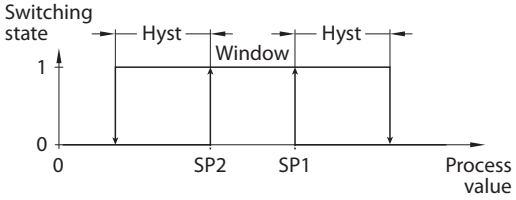


Fig. 10: Window mode

4.5.6 Output functions — analog output

The analog output of the LRS…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 500 mm.

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

Output behavior of the analog outputs

The following figures illustrate the behavior of the analog outputs:

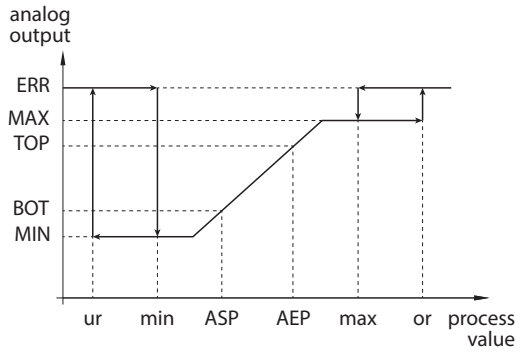


Fig. 11: Rising output characteristic

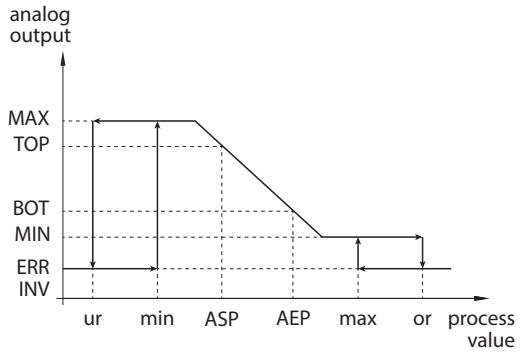


Fig. 12: Falling output characteristic, MIN ≠ 0

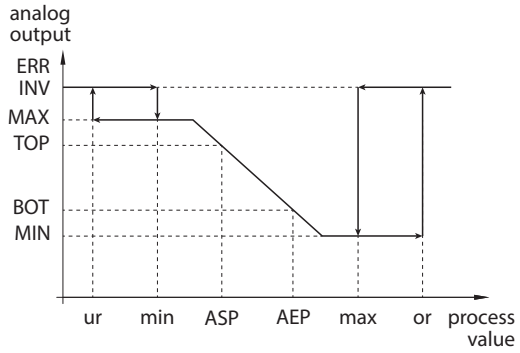


Fig. 13: Falling output characteristic, MIN = 0

Output configuration		BOT	TOP	ERR INV	MIN	MAX	ERR
4…20 mA	20…4 mA	4 mA	20 mA	3.5 mA	3.8 mA	20.5 mA	21.1 mA
0…20 mA	20…0 mA	0 mA	20 mA	21.1 mA	0 mA	20.5 mA	21.1 mA
0…10 V	10…0 V	0 V	10 V	11 V	0 V	10.5 V	11 V
0…5 V	5…0 V	0 V	5 V	6 V	0 V	5.5 V	6 V
1…6 V	6…1 V	1 V	6 V	0 V	0.5 V	6.5 V	7 V
0.5…4.5 V	4.5…0.5 V	0.5 V	4.5 V	5.5 V	0 V	5 V	5.5 V

Abbreviation	Description
ERR	Fault value
MAX	Upper value of the analog output
MIN	Lower value of the analog output
ASP	Analog start point
AEP	Analog end point
TOP	Value of the output when the AEP or ASP is reached
BOT	Value of the output when the ASP or AEP is reached
ur	Underrun/underrange
or	Overrun/overrange
max	Maximum process value
min.	Minimum process value

4.5.7 IO-Link mode

In order to operate in IO-Link mode, the device must be connected to an IO-Link master. When the port is configured in IO-Link mode, bidirectional IO-Link communication takes place between the IO-Link master and the device. To make this possible, the device is integrated via an IO-Link master at the control level. First the communication parameters are exchanged, and then the cyclic data exchange of process data (objects) starts.

4.5.8 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.

4.5.9 Auto detect function

When connected to an I/O module, the device detects the pre-defined switching output behavior (PNP/NPN) or the analog output characteristic. The auto detect function is activated by default.

4.5.10 Signal gain

A signal gain can be set in order to detect a poorly reflecting target. The signal gain can be set to the following levels.

- Low gain
- Standard gain
- High gain

4.5.11 Raw data filter (PT1 filter)

The raw data filter smooths the raw signal across a selectable time constant to improve capture performance. The set time constant has no effect on the measuring frequency. For example, the raw data filter **High** is suitable for turbulent surfaces. The filter is available in the following stages:

- Standard (200 ms)
- Low (25 ms)
- High (1000 ms)

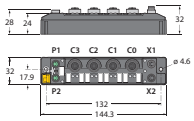
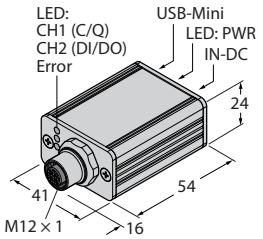
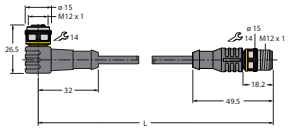
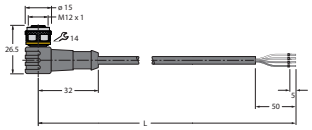
4.5.12 Foreground and background suppression

The foreground and background suppression blocks object signals (e.g. portcullises in tanks or permanently mounted obstructions in the detection area of the sensor) in the near or remote detection areas. The device continues to detect objects in the detection area, but they are not taken into account for signal evaluation (see [▶ 43]).

4.5.13 Minimum and maximum signal intensity filters

The signal intensity filters suppress object signals that do not exceed a selected minimum signal intensity and do not fall below a maximum signal intensity. The device continues to detect objects in the detection area, but they are not taken into account for signal evaluation (see [▶ 43]).

4.6 Technical accessories

Figure	Type	Description
	TBEN-S2-4IOL	Compact multiprotocol I/O module for Ethernet, 4 IO-Link master channels, 4 universal digital PNP channels, 0.5 A, channel diagnostics
	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 lens curvature does not have to be taken into account for the installation. The sensor detects the surface of the medium nearest to the sensor and outputs the distance. Object reflections can be filtered out using the sensor parameters.

The sensors can be installed in any alignment according to application requirements. The radar wave propagates perpendicular to the surface of the radar lens with an opening angle of ±3°. The display of the unit can be rotated by 180° (see parameter DiSr). The maximum tightening torque for fastening the sensors is 45 Nm.

Multiple radar sensors can be mounted directly next to each other without the risk of any mutual interaction between the devices.

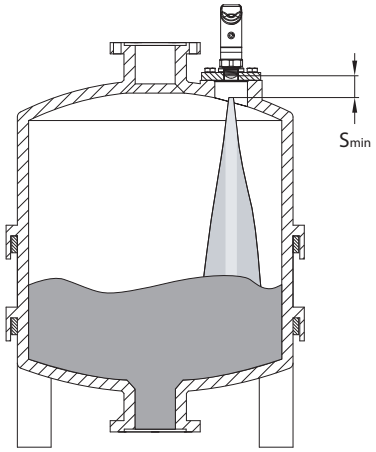


Fig. 14: Installing LRS510…

- Install the sensor at the intended mounting location. Observe blind zone s_{min}, in which no object detection is possible.
- For optimum operation, install the sensor in such a way that no foreign objects are located in the detection range.
- Install the sensor so that the limits of the detection range are not located on a container wall.
- Use short connection pieces to ensure unhindered signal propagation in the short range (see range diagrams).
- To prevent any disturbance signals do not direct the filling stream of the media through the detection range of the sensor.

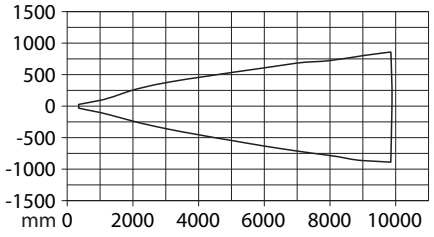


Fig. 15: LRS510-…-34-…, LRS510-…-51-… range diagram

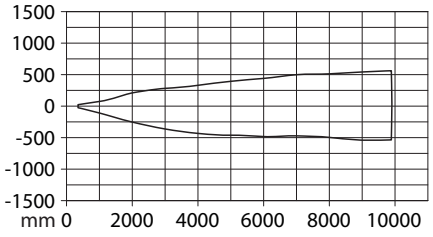


Fig. 16: LRS510-…-57-…, LRS510-…-69-… range diagram

- 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

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

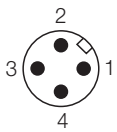


Fig. 17: LRS…LI2UPN pin layout

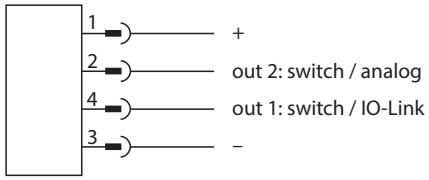


Fig. 18: LRS…LI2UPN wiring diagram

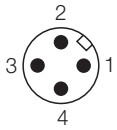


Fig. 19: LRS…2UPN… pin layout

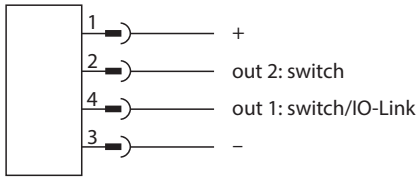


Fig. 20: LRS…2UPN... wiring diagram

7 Commissioning

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

7.1 Selecting an operating mode

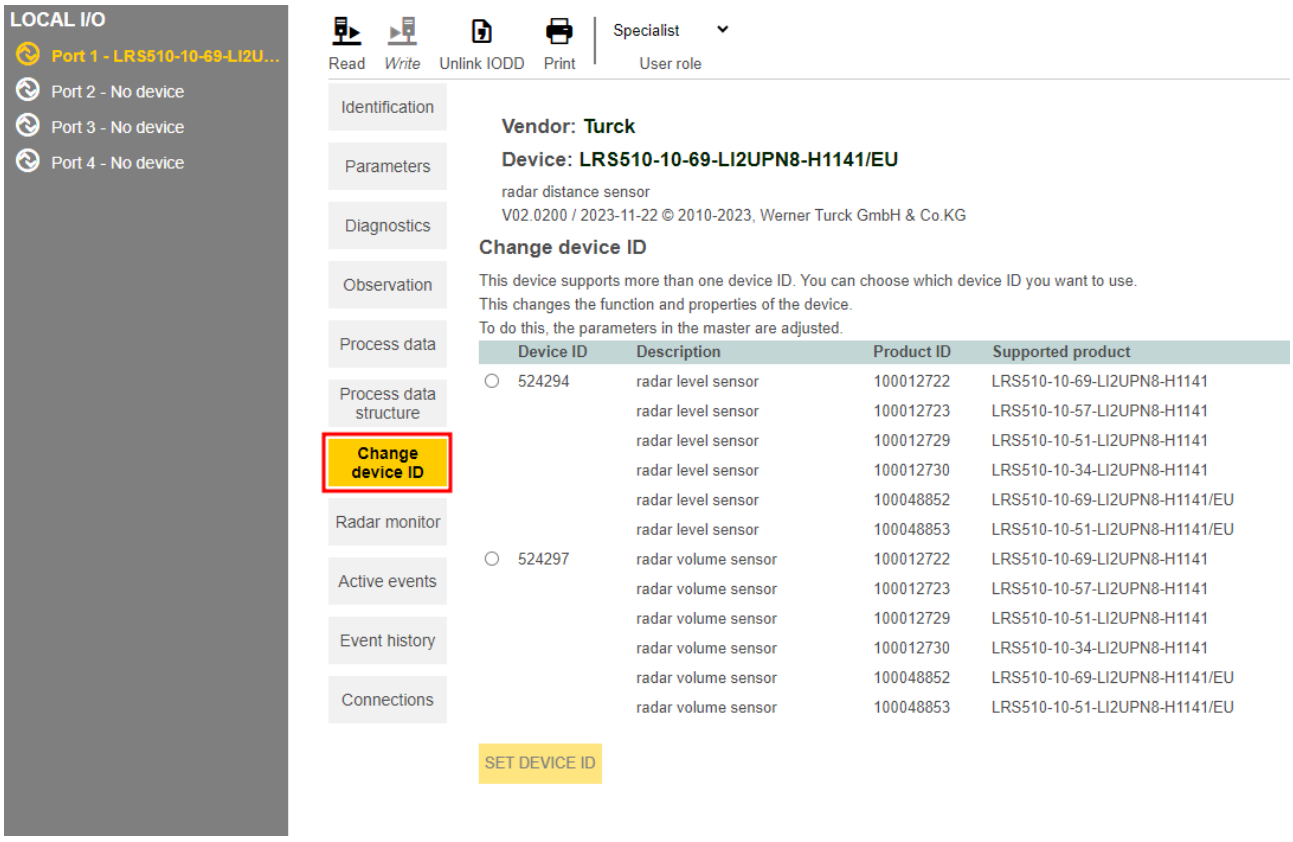
7.1.1 Selecting an operating mode via the display

The sensor is set by default to the Distance (DST) operating mode.

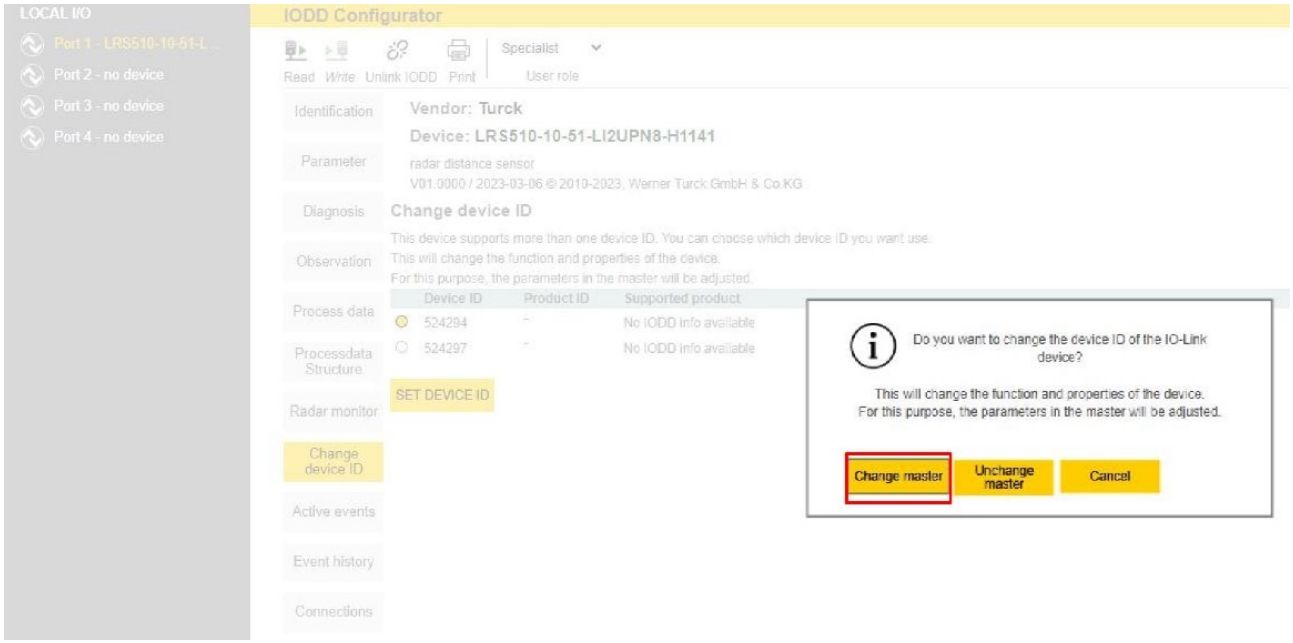
- ▶ Select the Distance (DST), Level (LVL) or Container volume (VOL) operating mode from the Extended Functions menu (EF) in the Set Mode SEMO (see [▶ 34]).
- ▶ To avoid fault signals, first enter the switching behavior via the OUT submenu and then the geometry data via the GEOM submenu.
- ⇨ Selecting a new operating mode will reset all parameters to their factory defaults.

7.1.2 Selecting an operating mode in IO-Link mode with TAS

- ▶ Connect the device to an IO-Link master.
- ▶ Use TAS to install the appropriate device ID via **Change device ID**:



- ▶ Confirm the changes with **Change master**: The selected device ID is written to the master port and written to the new device when a device is changed.
- ▶ Alternatively: Confirm the changes with **Reset master**: The selected device ID is set only in the device.



- After selecting a mode and a device ID, the appropriate IODD for the selected mode must be installed.

The following device IDs are used for the device-specific operating modes:

Device type	Operating mode	Device ID
LI2UPN	DST	524291
	LVL	524294
	VOL	524297
2UPN	DST	524292
	LVL	524295
	VOL	524298

8 Operation

8.1 LEDs – operation

LED	Display	Meaning
PWR	Green	Device is operational
	Flashes green	IO-Link communication
FLT	Red	Error
DST	Green	Distance between the sensor and the surface in selected unit
LVL	Green	Level indicator in selected unit
VOL	Green	Container volume in selected unit
SSI	Flashes yellow (1 Hz)	Signal strength ≤ 20 %
	Flashes yellow (2 Hz)	Signal strength > 20 % ≤ 40 %
	Flashes yellow (4 Hz)	Signal strength > 40 % ≤ 60 %
	Yellow	Signal strength > 60 % ≤ 80 %
	Green	Signal strength > 80 %
PCT	Green	Parameterization of the outputs selected via MDC2 (process data channel 2 in percent)
LOC	Yellow	Device locked
	Flashes yellow	"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
- - - -	Sensor failure
HW	Internal hardware fault
SC 1	Short circuit at output 1
SC 2	Short circuit at output 2
SC12	Short circuit at both outputs
WB 2	Wire break at current output 2
PArA	Inconsistent tank geometry data
VOLT	Operating voltage outside the permissible range
LOAD	Load at the analog output outside the permissible range
Oor+	Value outside the measuring range Distance (DST): Measured value ≥ 10.05 m Level (LVL): Measured value ≥ 9.7 m Volume (VOL): Maximum measured value exceeded. The measured value depends on the selected tank geometry.
Oor-	Value outside the measuring range Distance (DST): Measured value ≤ 0.3 m Level (LVL): Measured value ≤ 0 m Volume (VOL): Measured value ≤ 0 m^3
Oor	No measurement data available
TEMP	Device temperature outside the permissible range
Err	Unspecified error

8.3 Process input data

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0…3	Channel 1 (MDC1): Measured value in m (in Distance mode) Measured value in m (in Level mode) Measured value in m^3 (in Volume mode)							
4…7	Channel 2 (MDC2): Measured value in percent (in Distance, Level and Volume modes)							
8	Signal strength							Tank empty
9	Tank full	Outside the min. measure-ment range	Outside the max. measure-ment range	No meas-urement data	SSC2.2	SSC2.1	SSC1.2	SSC1.1

Bit	Meaning
SSC1.1	Switching signal output 1 channel 1: Distance in m, level in m or volume in m^3
SSC1.2	Switching signal output 2 channel 1: Distance in m, level in m or volume in m^3
SSC2.1	Switching signal output 1 channel 2: Distance, level or volume in percent
SSC2.2	Switching signal output 2 channel 2: Distance, level or volume in percent
No measurement data	No measurement data available
Out of measuring range +	Value outside the measuring range Distance (DST): Measured value ≥ 10.05 m Level (LVL): Measured value ≥ 9.7 m Volume (VOL): Maximum measured value exceeded. The measured value depends on the selected tank geometry.
Outside the measuring range -	Value outside the measuring range Distance (DST): Measured value ≤ 0.3 m Level (LVL): Measured value ≤ 0 m Volume (VOL): Measured value ≤ 0 m^3
Tank full	Highest level reached, depending on the selected tank geometry
Tank empty	The lowest level has been reached, depending on the selected tank geometry
Signal strength	in 5 % increments

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
- Set the switching outputs via Single Point Mode, Two Point Mode or Window Mode
- Analog output can be freely scaled to the measuring 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
- Operating hours counter including warning limits
- Output configuration OUT1/2: PNP/NPN, auto detection on/off

Other setting options via IO-Link

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

- 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)
- Switching cycle counter

9.2 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] to return to the parameter selection.
- 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 saved value flashes twice.

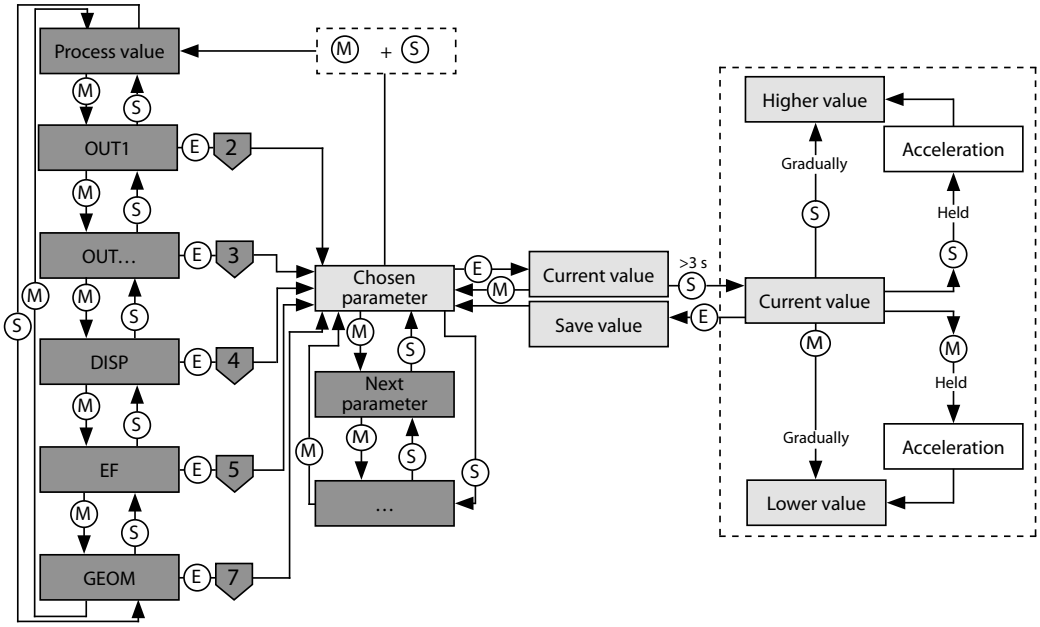


Fig. 21: Setting parameter values

9.3 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. Once the two red bars have turned green, move onto the next touchpad without removing your finger from the touchscreen.
- Release the touchpads when six green bars are flashing on the display.
- ⇨ LOC LED goes off.
- ⇨ uLoc appears in the display and then disappears.

9.4 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.

9.5 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.

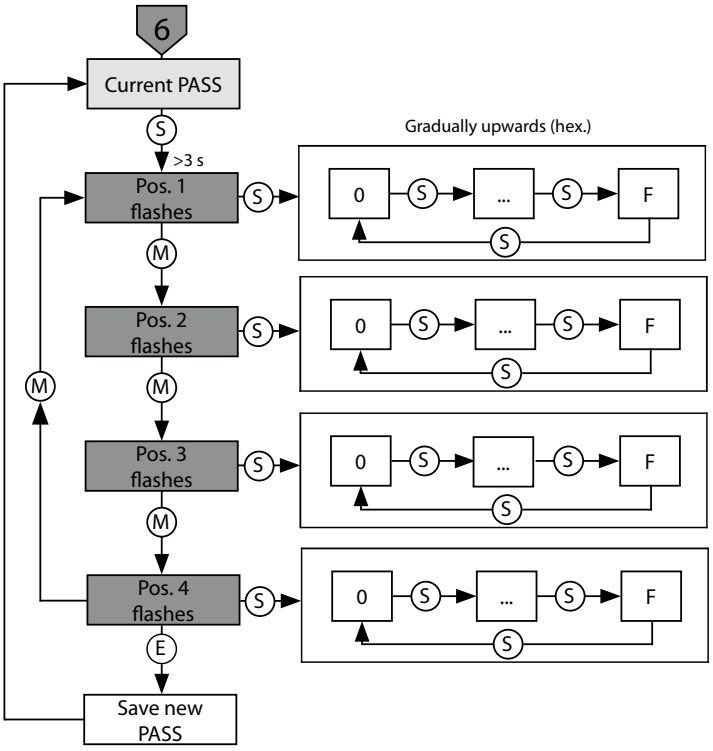


Fig. 22: Password setting

9.6 Setting via touchpads — standard menu guidance

Use the [MODE] or [SET] touchpads to navigate through the main menu, as well as the OUT… submenus, the EF extended functions menu, the DISP display menu or the GEOM geometry menu. Press [ENTER] to select the respective submenu. Touching [MODE] and [SET] at the same time will cancel the parameter assignment. The device returns to the standard display.

Default values are shown in **bold**.

9.6.1 Main menu

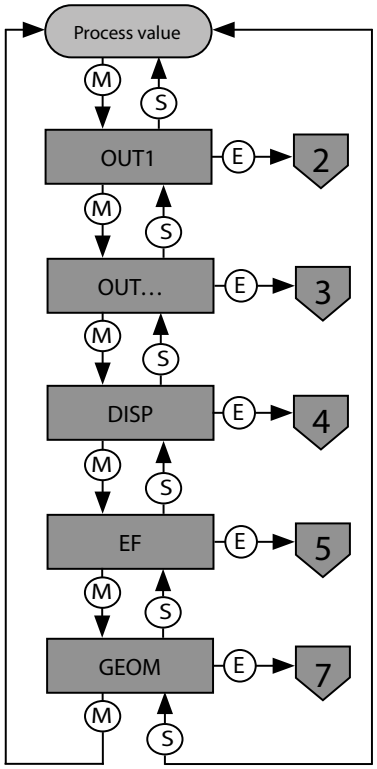


Fig. 23: Main menu

Parameters in the main menu

	Explanation	Function
OUT1	Output 1 submenu	Switching output 1 setting options
OUT…	Output … submenu	Setting options for additional outputs
DISP	Display submenu	Refer to the "Parameters in the DISP submenu" table for additional setting options
EF	Extended Functions submenu	For additional setting options see the “Parameters in the EF submenu” table
GEOM	Geometry submenu	Additional setting options for Level (LVL) and Container volume (VOL); see the "Parameters in the GEOM submenu" table

9.6.2 OUT… submenu (outputs)

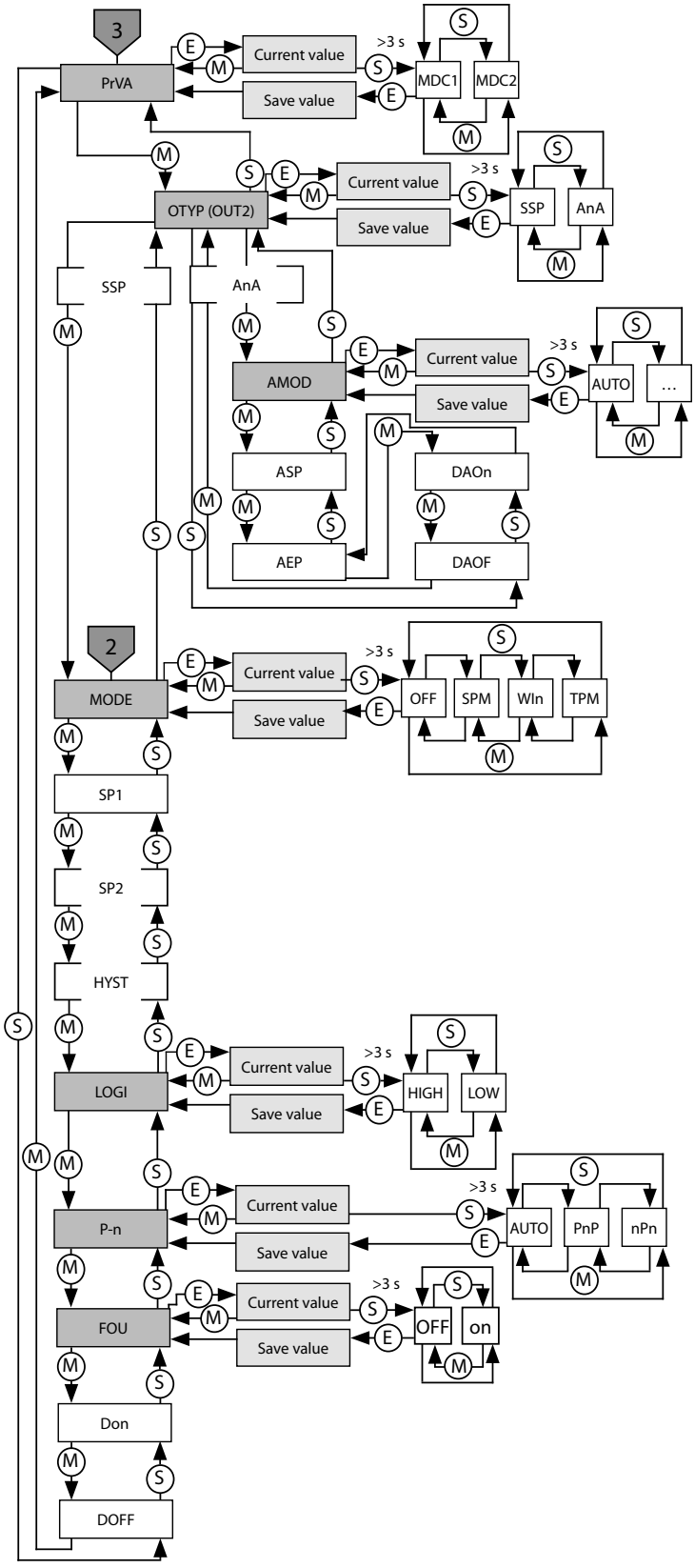


Fig. 24: Outputs submenu (OUT…)

Parameters in the outputs submenu (OUT…)

	Explanation	Options	Function
PrVA	Process data channel	MDC1	Activation and parameterization of the outputs via process data channel 1 (MDC1) in the selected unit depending on the operating mode set Assignment of process input data: channel 1 = SSC 1.1, channel 2 = SSC 1.2
		MDC2	Activation and parameterization of the outputs via process data channel 2 (MDC2) in percent depending on the set tank geometry Assignment of process input data: channel 1 = SSC 2.1, channel 2 = SSC 2.2
OTYP	Output Type (OUT2)	SSP	Switching output Smart Sensor Profile
		AnA	Analog output
MODE		OFF	
		SPM	Single point mode
		WIn	Window mode (window function)
		TPM	Two point mode
SP1	Limit value 1		SPM: Limit value at which the switching output changes its switching state **Default values:** DST: 5 m LVL: 4.825 m VOL: 1000 m^3
SP2	Limit value 2		TPM: Lower limit value at which the switching output changes its switching state as the measured value falls **Default values:** DST: 2.5 m LVL: 2.415 m VOL: 500 m^3
HYST	Hysteresis		**Default values:** DST: 0.05 m LVL: 0.05 m VOL: 0.002 m^3 The minimum hysteresis is 50 mm. The maximum hysteresis comprises the complete value range of the sensor.
LOGI	Invert switching logic	**HIGH**	0 → 1
		LOW	1 → 0
P-n	Behavior of the switching output	**AUTO**	Auto detection (NPN/PNP)
		PnP	N switching
		nPn	P switching
FOU	Behavior in the event of a fault (e.g. wire break or short circuit)	On	Switching output: Output activated in the event of a fault Analog output: Error value depending on the analog signal and the set function at output 2 (OUT2)
		OFF	Switching output: Output deactivated in the event of a fault Analog output: Error value depending on the analog signal and the set function at output 2 (OUT2)

	Explanation	Options	Function
DOFF	Switch-off delay for switching output		0…60 s in increments of 0.1 s **Default: 0 (delay time not active)**
Don	Switch-on delay of the switching output		0…60 s in increments of 0.1 s **Default: 0 (delay time not active)**
AMOD	Analog output (OUT2)	**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
		0545	0.5…4.5 V
ASP	Start point of the analog signal		Measured value at which the analog output signal has its start point **Default values:** DST: 0.35 m LVL: 0 m VOL: 0 m^3
AEP	End point of the analog signal		Measured value at which the analog output signal has its end point **Default values:** DST: 10 m LVL: 9.7 m VOL: 0 m^3 (the maximum measured value depends on the selected tank geometry)
DAOn	Switch-on delay of the analog output for fault output		0…60 s in increments of 0.1 s **Default: 0 (delay time not active)**
DAOF	Switch-off delay of the analog output for fault output		0…60 s in increments of 0.1 s **Default: 0 (delay time not active)**

9.6.3 DISP submenu (display)

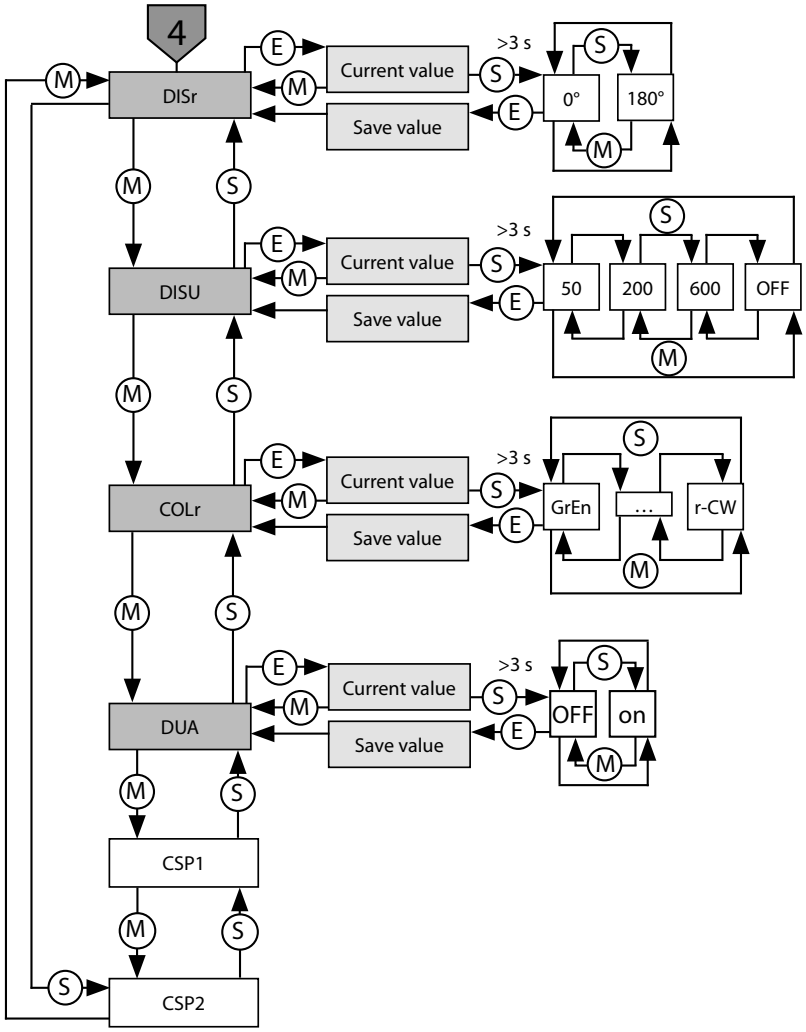
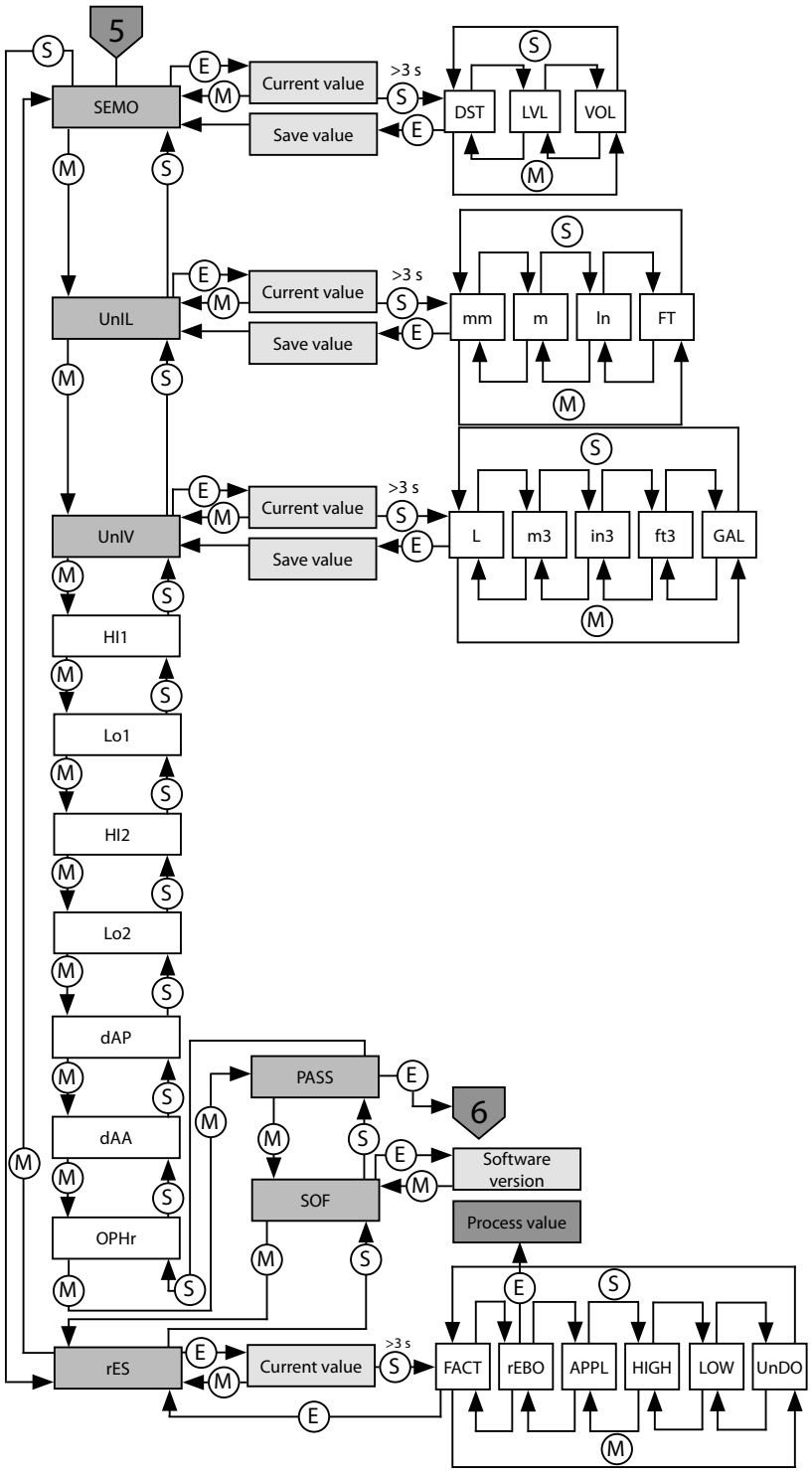


Fig. 25: Display submenu (DISP)

Parameters in the Display (DISP) submenu

	Explanation	Options	Function
DISr	Display orientation	**0°**	Display rotated by 0°
		180°	Display rotated by 180°
DISU	Display update	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 OUT1 is switched, otherwise red
		r1oU	Red if OUT1 is switched, otherwise green
		G2oU	Green if OUT2 is switched, otherwise red
		r2oU	Red if OUT2 is switched, otherwise green
		G-CW	Green if the measured value is between the switching points CSP1 and CSP2
		r-CW	Red if the measured value is between the switching points CSP1 and CSP2
DUA	Display	**OFF**	Display of measured value
		On	Alternating display of measured value and unit
CSP1	Virtual upper switching point		Upper switching point at which the display changes color (if display color G-CW or r-CW is selected) **Default: 9.95 m**
CSP2	Virtual lower switching point		Lower switching point at which the display changes color (if display color G-CW or r-CW is selected) **Default: 10 m**

9.6.4 EF (Extended Functions) submenu



Parameters in the Extended Functions (EF) submenu

	Explanation	Options	Function
SEMO	Set mode	**DST**	Distance mode
		LVL	Level mode
		VOL	Volume mode
UnIL	Unit of length	mm	Millimeters
		m	Meters
		In	Inches
		FT	Feet
UnIV	Unit of volume (VOL)	L	Liters
		m^3	Cubic meters
		in^3	Cubic inches
		ft^3	Cubic feet
		GAL	Gallons
HI	Maximum value memory		The highest fill level is stored and displayed.
Lo	Minimum value memory		The lowest fill level is stored and displayed.
dAP	Damping of the switching output		Filter for momentary or high frequency measurement peaks: 0…8 s in increments of 0.01 s **Default: 0 (filter disabled)**
dAA	Damping of the analog output		Filter for momentary or high frequency measurement peaks: 0…8 s in increments of 0.01 s **Default: 0 (filter disabled)**
OPHr	Operating hours counter		Display of operating hours in years (y), days (d) and hours (h)
PASS	Password		Define password and activate password protection
		0000	No password
SOF	Software version		Display the firmware version
rES	Reset	FACT	Reset the parameters to factory settings
		rEBO	Restart the device (warm start)
		APPL	Reset application-specific data
		HIGH	Reset the maximum value memory: The highest fill level is deleted.
		LOW	Reset the minimum value memory: The lowest fill level is deleted.
		UnDO	Reset the parameters to the previous settings (last device start)

9.6.5 GEOM submenu (geometry)

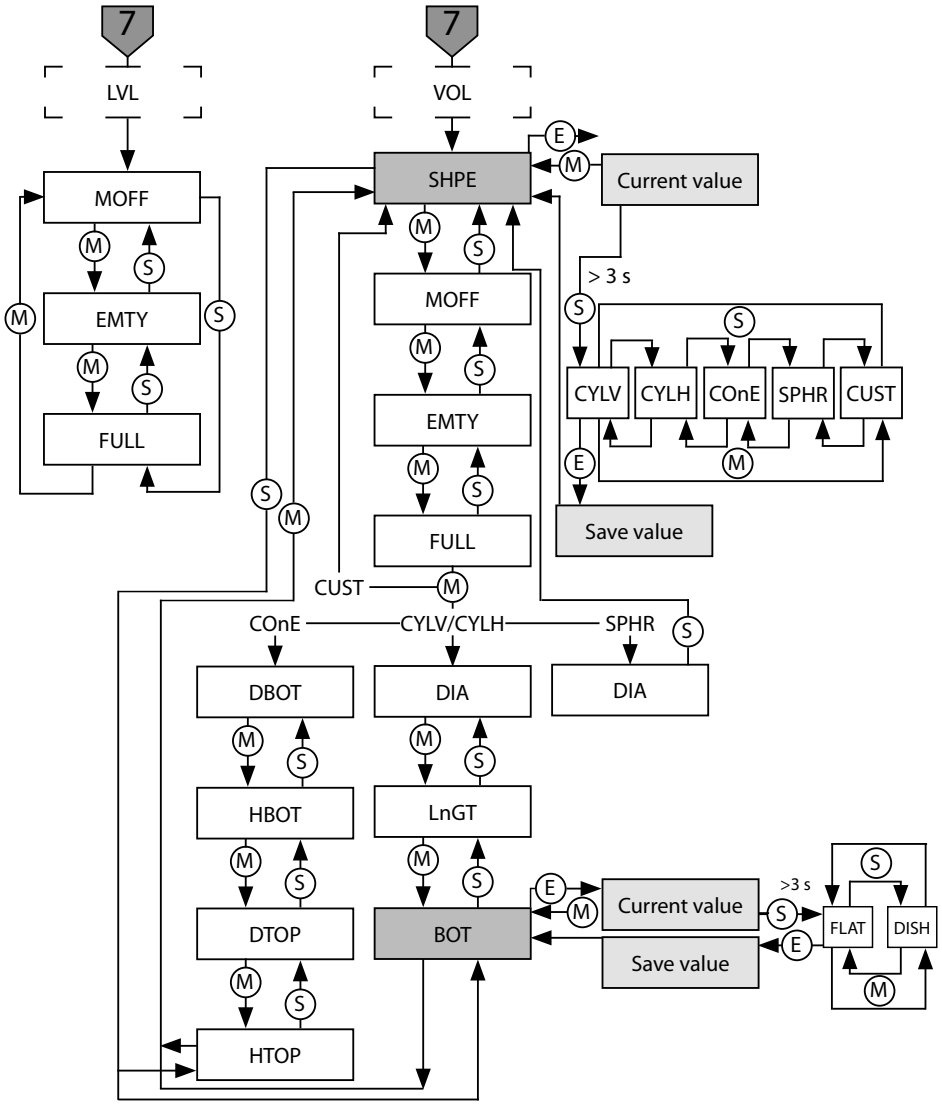


Fig. 26: Geometry submenu (GEOM)

	Explanation	Options	Function
SHPE	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)
EMTY	Lowest level		Measured from the bottom of the container
FULL	Highest level		Measured from the bottom of the container
DIA	Container diameter (CYLV, CYLH, SPHR)		Diameter of cylindrical and spherical containers; DIA must be ≥ FULL for CYLH and SPHr.
LnGT	Container length (CYLV, CYLH)		Total length of cylindrical containers; in the case of CYLV, LnGT must be ≥ FULL.
BOT	Container bottom type (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
HBOT	Bottom edge of cone (COnE)		Position and height of bottom diameter of conical containers (= length of cylindrical section at the bottom)
DTOP	Diameter of the top edge of the cone (COnE)		Upper diameter of the conical containers
HTOP	Top edge of cone (COnE)		Position and height of the upper diameter of conical containers (HTOP > HBOT)

9.6.6 Default values for container shapes

Parameter	CYLV	CYLH	COnE	SPHr
MOFF	10 m	1.478 m	10 m	1.478 m
EMTY	0 m	0 m	0 m	0 m
FULL	9.65 m	1.128 m	9.65 m	1.128 m
DIA	1.128 m	1.128 m	-	1.128 m
LnGT	9.65 m	9.65 m	-	-
BOT	FLAT	FLAT	-	-
DBOT	-	-	1.128 m	-
HBOT	-	-	-	-
DTOP	-	-	2.256 m^2	-
HTOP	-	-	-	-

9.6.7 Container shapes

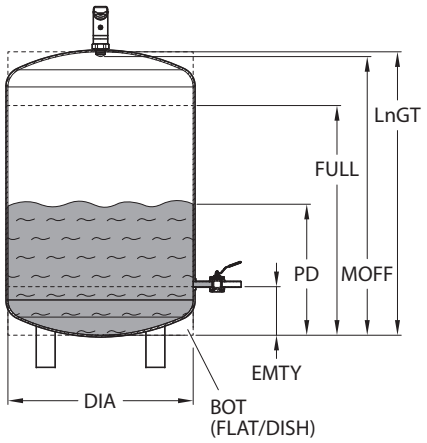


Fig. 27: Parameters – vertical cylinder

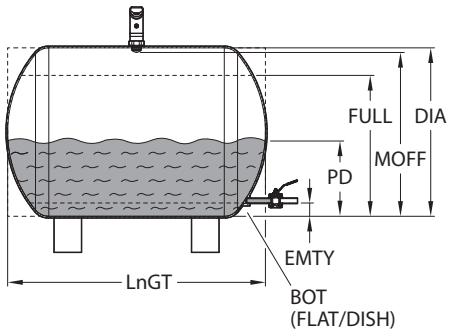


Fig. 28: Parameters – horizontal cylinder

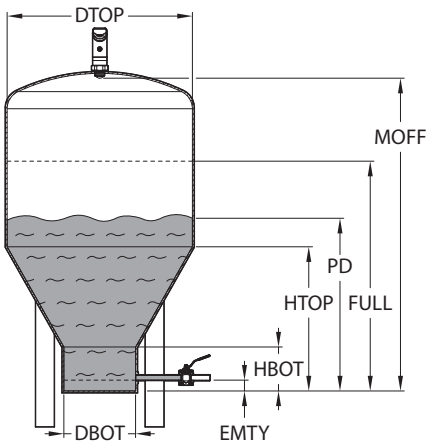


Fig. 29: Parameters – conical container

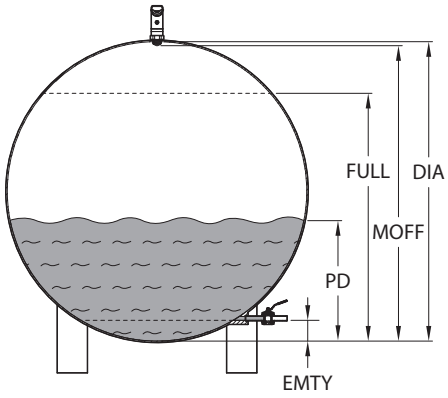


Fig. 30: Parameters – spherical container

9.7 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 online 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 parameter 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.

9.8 Setting and visualizing with the Turck Radar Monitor

The device can be configured and tested with TAS (Turck Automation Suite) or via the integrated web server of a Turck IO-Link master (e.g. TBEN-S2-4IOL). The IODD can be read in via TAS or the web server, such that all parameters of the IODD can be accessed.

An overview of the IO-Link parameters and descriptions can be found via the **IODDfinder**. The Turck Radar Monitor is also available for visualizing process data.

A Turck IO-Link master is required to access the sensor parameters and the Turck Radar Monitor. The following table shows the firmware version of the IO-Link master that is required to use the Turck Radar Monitor:

IO-Link master	Firmware state
FEN20-4IOL	V1.1.0.0
TBEN-L4/5-8IOL	V3.3.0.0
TBEN-LL-8IOL	V1.1.0.0
TBEN-S2-4IOL	V3.4.0.0

Refer to the instructions for use of the relevant device for information on the Turck IO-Link masters.

- Connect the IO-Link master to the power supply.
- Connect the IO-Link master to a PC via the Ethernet interface.
- Connect the radar sensor to an IO-Link port of the IO-Link master.

9.8.1 IO-Link master — opening the web server

- To open the web server of the IO-Link master, enter the IP address in the address bar of a web browser (default: **http://192.168.1.254**).

A login is required on the IO-Link master in order to edit settings via the web server and to call up the Turck Radar Sensor.

- Enter the password in the Login field on the start page of the web server. The default password is “password”.
- Click **Login**.

9.8.2 Reading in IODD in the web server

- Set the input port of the IO-Link master as an IO-Link port.
- Open the **IODD Configurator** tab in the web server.

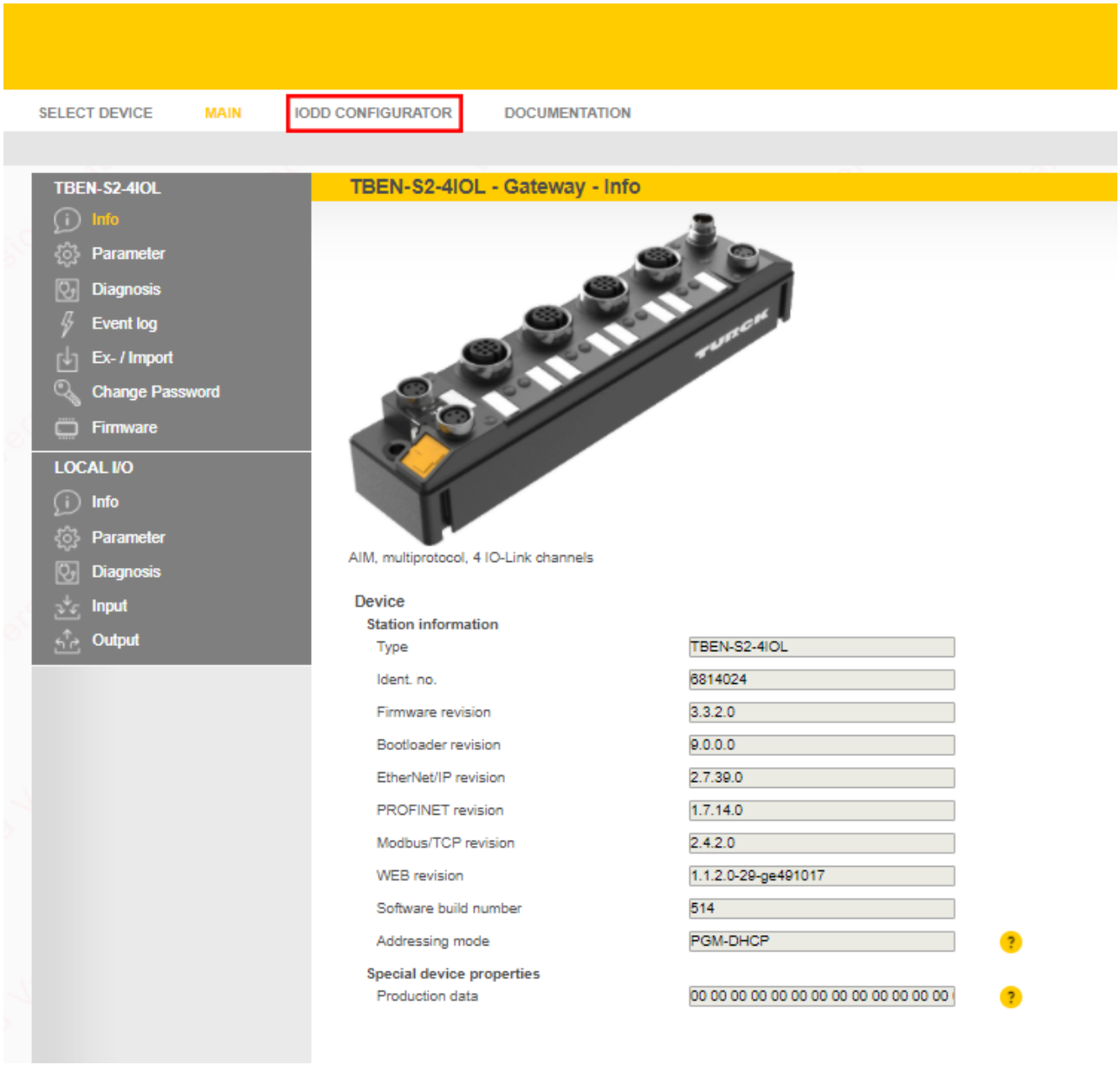


Fig. 31: Web server – IODD Configurator

▶ Load the specific device IODD in the web server via **Load IODD**.

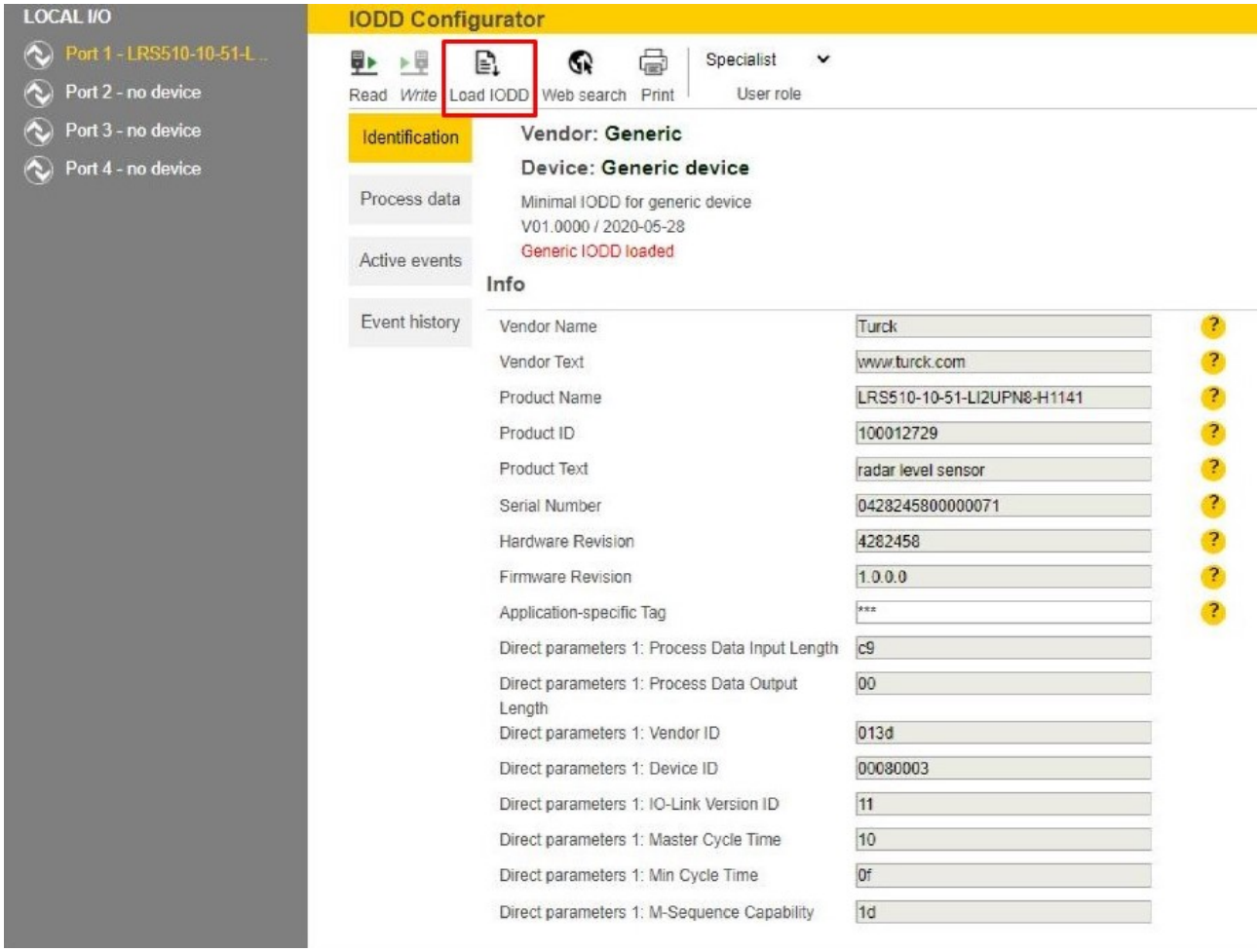


Fig. 32: Loading IODD

9.8.3 Turck Radar Monitor — overview

The Turck Radar Monitor makes it possible to visualize the process data and filter signals. The display consists of:

- FFT diagram and envelope curve
- Object detection

▶ To launch the Turck Radar Monitor, choose **Radar monitor**.

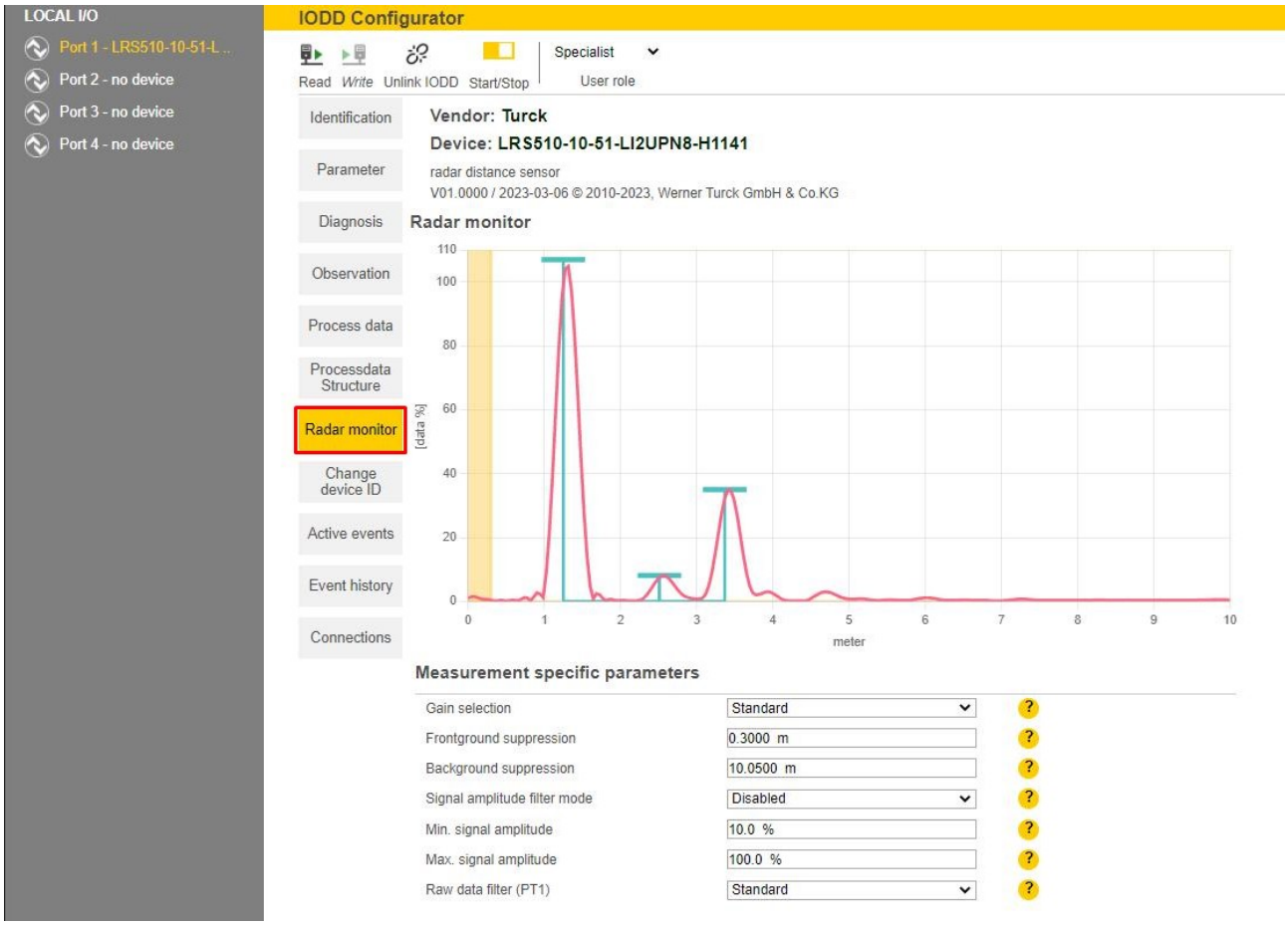


Fig. 33: Turck Radar Monitor – overview

Each displayed peak represents an object detected by the sensor in the detection range. The following points must be observed:

- Peaks with a blue bar (max. 10 value pairs consisting of distance value and intensity value) are forwarded for signal processing.
- The first peak is output as a process value.
- Peaks below a device specific signal intensity limit are no longer detected.
- Background noise can produce small ghost objects (see distance range from approx. 5 m in the figure above).

9.8.4 Turck Radar Monitor — filtering signals

The Turck Radar Monitor has filtering options for suppressing interference signals:

- Foreground suppression (≥ 0.3 m)
- Background suppression (≤ max. range + 0.05 m)
- Min. signal intensity filter
- Max. signal intensity filter (≥ 10 %)
- Signal boost for detecting weak targets (e.g. organic objects)
- Raw data filter (PT1 filter) to smooth the raw signal

The minimum distance between foreground and background suppression is 0.1 m. Example: If the foreground suppression is set to 1 m, the background suppression must be ≤ 0.9 m or ≥ 1.1 m.

Minimum and maximum signal intensity filters can be activated individually or together. The step width is 1 %. The minimum distance between the minimum and maximum signal intensity filter is 10 %.

Only peaks within the signal limits are passed on for further processing.

▶ Adjust the filter in the **Measurement specific parameters** area.

⇨ The signal limits are indicated in the Turck Radar Monitor in a white area. Peaks without blue bars are not passed on for data processing.

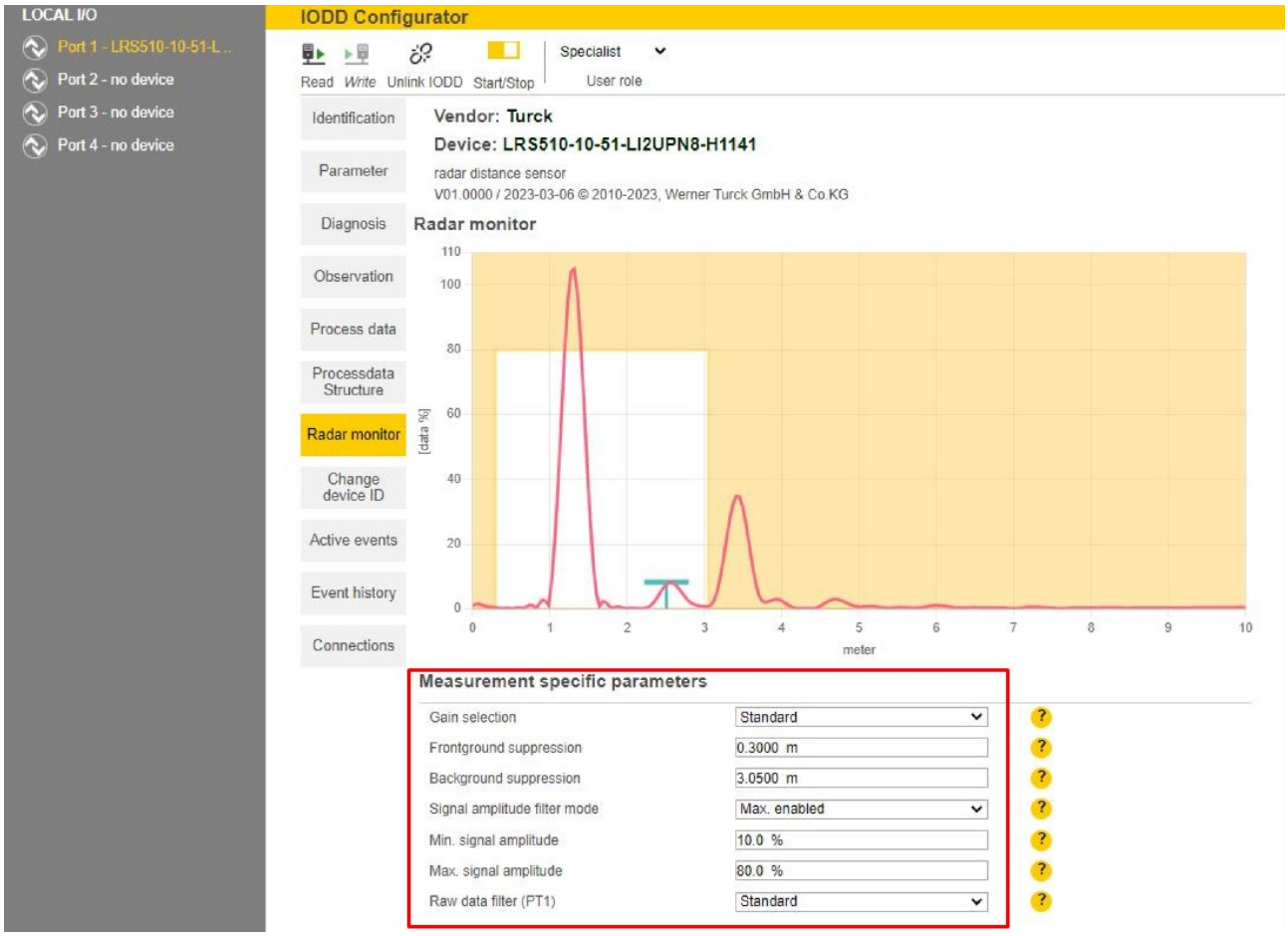


Fig. 34: Example – filtering signals

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.

10.1 Error diagnostics for parameterization with IO-Link

If the sensor is parameterized in IO-Link mode via TAS, possible error values are output if the parameterization is incorrect. The inconsistent index (parameter) and the description of the error are displayed via the **Diagnosis** menu item:

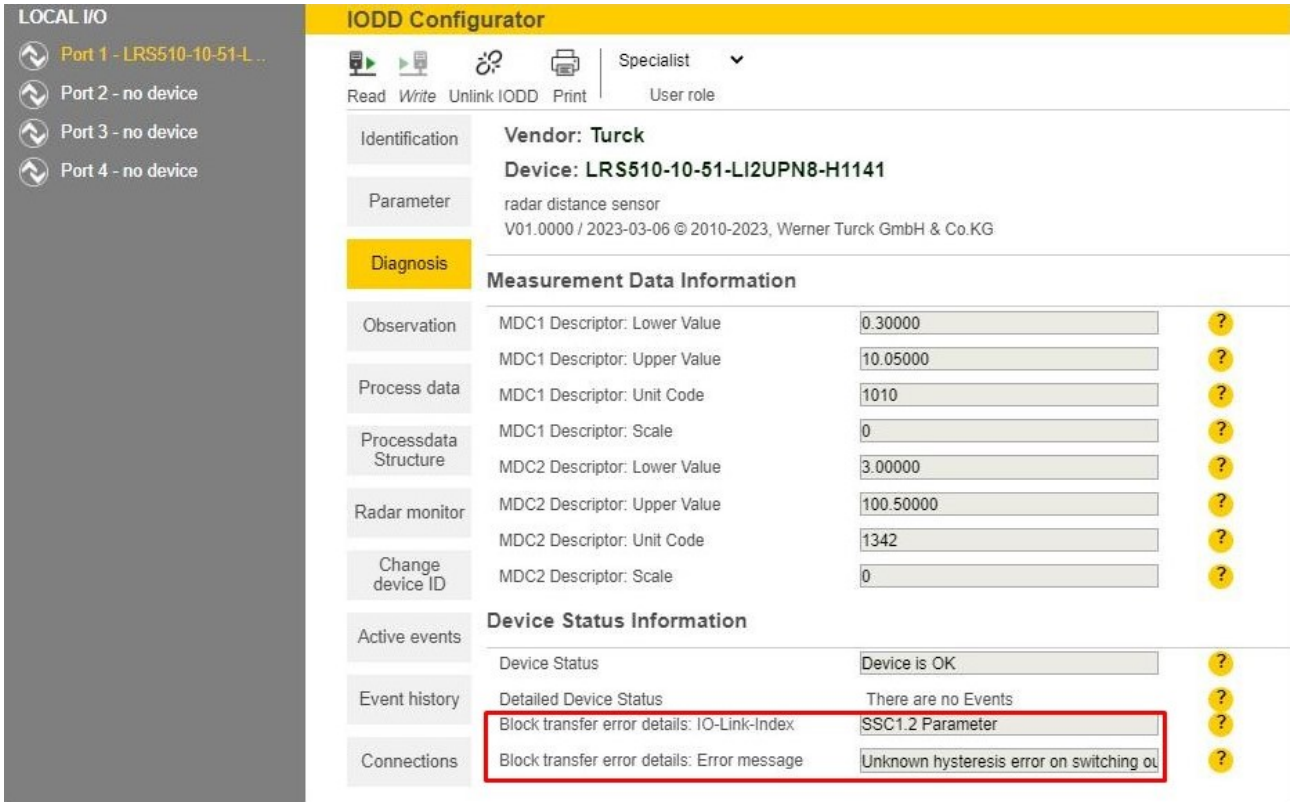


Fig. 35: Displays the index and fault signal in the event of incorrect parameterization

Index values in the event of incorrect parameterization

IO-Link — index values	Meaning
0x000C	Device access locks
0x003C	SSC1.1 parameters
0x003D	SSC1.1 configuration
0x003E	SSC1.2 parameters
0x003F	SSC1.2 configuration
0x0050	Selection of switching output OUT…
0x0052	Selection of analog output OUT…
0x0053	Output behavior OUT1
0x0054	Unit of length
0x0055	Display update
0x0056	Error state at all outputs
0x0059	Change in display color window
0x005A	Display color
0x005B	Display orientation
0x005D	Unit of volume
0x005F	Output behavior OUT2
0x0062	Analog points OUT2
0x0070	Damping (analog output)
0x0071	Damping (switching output)
0x0078	Switch-on delay SP1
0x0079	Switch-on delay SP2
0x0088	Tank geometry
0x008A	Show display unit
0x008B	User-defined geometry height supports
0x008C	User-defined geometry volume supports
0x0090	Select signal intensity filters
0x0091	Max. signal intensity filter
0x0092	Min. signal intensity filter
0x0094	Foreground suppression
0x0095	Background suppression
0x00A7	Select signal boost
0x00A9	Signal stabilization (raw data filter)
0x00C0	Switch-on delay of the analog output for fault output
0x00C1	Switch-off delay of the analog output for fault output
0x00D1	Select MDC 1 or 2 for OUT1
0x00D2	Select MDC 1 or 2 for OUT2
0x400C	SSC1.1 parameters
0x400D	SSC1.1 configuration
0x400E	SSC1.2 parameters
0x400F	SSC1.2 configuration

Detailed error display in the event of incorrect parameterization

Value	Fault indication	Meaning
0x00	No error	The device is working properly
0x01	Value too low	The value of the index described is too small
0x02	Value too high	The value of the index described is too large
0x03	Illegal float value	Value is "nan" (not a number), "inf" or "finite"
0x1E	Illegal hysteresis value at the switching output	Value combination of SP1, SP2 and Hyst is out of the permissible range
0x1F	SP1 value is too large	SP1 > pv_max
0x20	SP2 value too small	SP2 < pv_min
0x21	Illegal hysteresis value at the analog output	AEP and ASP distance is less than the minimum analog output distance
0x22	ASP value too small	ASP less than pv_min
0x23	AEP value is too large	AEP greater than pv_max
0x3C	Hysteresis value in channel SSC… is too small	Hyst < pv_hyst_min
0x3D	Hysteresis value in channel SSC… is too large	HYST must be less than pv_max - pv_min
0x78	Foreground suppression value too small	Min. value must be greater than s_min
0x79	Foreground suppression value is too large	Max. value must be less than s_max-s_hyst_min
0x7A	Background suppression value too small	Min. value must be greater than s_max+s_hyst_min
0x7B	Background suppression value is too large	Max. value must be less than s_max
0x7C	The lower threshold of the signal intensity filter is too low	Min. value > 0 %
0x7D	The lower threshold of the signal intensity filter is too high	Max. value < 999.9 %
0x7E	The lower threshold of the signal intensity filter is too low	The difference between the signal intensity filters must be at least 10 %
0x7F	The upper threshold of the signal intensity filter is too high	Max. value < 999.9 %
0x8C	MOFF < FULL	Do not place the sensor in the medium
0x8D	MOFF is too big	Max. value must be less than s_max
0x8E	FULL is too close to EMTY	The difference between FULL and MOFF must be greater than s_a_min
0x8F	FULL is too close to MOFF	Difference between FULL and MOFF must be greater than s_min (blind zone)
0x90	Tank diameter < 0	Tank diameter must be greater than 0
0x91	Tank diameter < FULL	Tank diameter must not be less than FULL, as it is used as a height reference for the horizontal tank.
0x92	Tank diameter > measuring range	Tank diameter is larger than measuring range
0x93	EMTY < 0	EMTY is greater than 0
0x94	EMTY > FULL	EMTY is greater than FULL

Value	Fault indication	Meaning
0x95	HTOP ≤ HBOT	HTOP less than or equal to HBOT
0x96	HTOP > MOFF	HTOP is larger than MOFF
0x97	HBOT < 0	HBOT is less than 0
0x98	HBOT ≥ HTOP	HBOT is greater than or equal to HTOP
0x99	DBOT < 0	DBOT is smaller than 0
0x9A	DBOT > display	DBOT is higher than the display can show
0x9B	DTOP < 0	DTOP is less than 0
0x9C	DTOP > display	DTOP is higher than the display can show
0x9D	Tank length < FULL	Tank length is less than FULL
0x9E	Tank length > measuring range	Tank length is greater than the measuring range
0x9F	Tank length ≤ 0	Tank length is less than or equal to 0
0xA0	Tank height too small	For user-specific tank geometry, each subsequent height value must be greater than the previous one
0xA1	Elevation node is invalid	Elevation nodes must be stored in ascending order; all unused nodes must be set to 0
0xA2	Tank volume too small	For user-specific tank geometry, each subsequent height value must be greater than the previous one
0xA3	Volume node invalid	Volume nodes must be stored in ascending order; all unused nodes must be set to 0
0xA4	Invalid value for tank bottom shape	Only the following values are allowed: 0.1
0xA5	Invalid value for tank shape	Only the following values are allowed: 0, 1, 2, 3, 4
0xA6	Custom tank volume value exceeds the maximum value of MDC1	Check consistency within geometry parameters
0xA7	The length of the tank is less than 0.4 × DIA	The length of the tank must be ≥ 0.4 × DIA

11 Maintenance

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

12 Repair

The device is not intended for repair 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

If a device has to be returned, bear in mind that only devices with a decontamination declaration will be accepted. This is available for download at
https://www.turck.de/en/return-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 properly and do not belong in the domestic waste.

14 Technical data

14.1 Technical data — LRS510-10-…-2UPN8-H1141

Technical data	LRS510-10-34…	LRS510-10-51…	LRS510-10-57…	LRS510-10-69…
ID	100012732	100012731	100012726	100012725
Radar data				
Frequency range	122…123 GHz			
Range	35…1000 cm			
Resolution	1 mm			
Minimum size measuring range	500 mm			
Minimum size switching range	50 mm			
Linearity error	≤ ± 0.1 %			
Edge length of the norm target	100 mm			
Output power EIRP	10 dBm			
Cone angle	10°		6°	
Repetition accuracy	2 mm			
Hysteresis	≤ 50 mm			
Electrical data				
Operating voltage	18…33 V DC			
Ripple	< 10 % U_{SS}			
DC rated operational current	≤ 250 mA			
No-load current	≤ 100 mA			
Residual current	≤ 0.1 mA			
Short-circuit protection	Yes/cyclic			
Reverse polarity protection	Yes			
Communication protocol	IO-Link			
Output function	NC/NO programmable, PNP/NPN			
Output 2	Switching output			
Voltage drop at I_e	≤ 2 V			
Switching frequency	≤ 10 Hz			
Response time typical	< 10 ms			

Technical data	LRS510-10-34…	LRS510-10-51…	LRS510-10-57…	LRS510-10-69…
IO-Link				
IO-Link specification	V1.1			
IO-Link port type	Class A			
Communication mode	COM 3 (230.4 kBaud)			
Process data width	80 bits			
Measured value information	64 bits			
Switching point information	4 bits			
Frame type	2.2			
Minimum cycle time	5 ms			
Function pin 4	IO-Link			
Function pin 2	DI			
Maximum cable length	20 m			
Profile support	Smart Sensor Profile 4.3.2			
Mechanical data				
Design	With display, LRS			
Dimensions	127.1 × Ø 38 mm			
Housing material	Stainless steel/plastic, 1.4404 (316L)/ polyacrylamide 50 % GF UL 94 V-0 PEEK			
Max. tightening torque of housing nut	45 Nm			
Electrical connection	M12 × 1 connector			
Process connection	3/4" NPT	G3/4"	1" NPT	G1"
Ambient temperature	-25…+65 °C			
Storage temperature	-40…+85 °C			
Protection class	IP67/IP69K, ISO 20653 (not UL assessed)			
Switching state indication	2 × LEDs, yellow			
Vibration resistance	20 g (10…2000 Hz), EN 600068-2-6			
EMC	EN 61000-6-2:2019 ETSI EN 301489-3 V1.6.1			
Approvals	CE, UL, ETSI I 305550-2, FCC/CFR. 47 Part 15			

14.2 Technical data — LRS510-10-…-LI2UPN8-H1141

Technical data	LRS510-10-34…	LRS510-10-51…	LRS510-10-57…	LRS510-10-69…
ID	100012730	100012729	100012723	100012722
Radar data				
Frequency range	122…123 GHz			
Range	35…1000 cm			
Resolution	1 mm			
Minimum size measuring range	500 mm			
Minimum size switching range	50 mm			
Linearity error	≤ ± 0.1 %			
Edge length of the norm target	100 mm			
Output power EIRP	10 dBm			
Cone angle	10°		6°	
Repetition accuracy	2 mm			
Hysteresis	≤ 50 mm			
Electrical data				
Operating voltage	18…33 V DC			
Ripple	< 10 % U_{SS}			
DC rated operational current	≤ 250 mA			
No-load current	≤ 100 mA			
Residual current	≤ 0.1 mA			
Short-circuit protection	Yes/cyclic			
Reverse polarity protection	Yes			
Communication protocol	IO-Link			
Output function	NC/NO programmable, PNP/NPN, analog output			
Output 2	Analog or switching output			
Current output	Default: 4…20 mA			
Voltage output	Default: 0…10 V			
Load resistance, current output	≤ 0.5 kΩ			
Voltage output load resistance	≥ 2 kΩ			
Voltage drop at I_e	≤ 2 V			
Switching frequency	≤ 10 Hz			
Response time typical	< 10 ms			
IO-Link				
IO-Link specification	V1.1			
IO-Link port type	Class A			

Technical data	LRS510-10-34…	LRS510-10-51…	LRS510-10-57…	LRS510-10-69…
Communication mode	COM 3 (230.4 kBaud)			
Process data width	80 bits			
Measured value information	64 bits			
Switching point information	4 bits			
Frame type	2.2			
Minimum cycle time	5 ms			
Function pin 4	IO-Link			
Function pin 2	Analog			
Maximum cable length	20 m			
Profile support	Smart Sensor Profile 4.3.2			
Mechanical data				
Design	With display, LRS			
Dimensions	127.1 × Ø 38 mm			
Housing material	Stainless steel/plastic, 1.4404 (316L)/ polyacrylamide 50 % GF UL 94 V-0 PEEK			
Max. tightening torque of housing nut	45 Nm			
Electrical connection	M12 × 1 connector			
Process connection	3/4" NPT	G3/4"	1" NPT	G1"
Ambient temperature	-25…+65 °C			
Storage temperature	-40…+85 °C			
Protection class	IP67/IP69K, ISO 20653 (not UL assessed)			
Switching state indication	2 × LEDs, yellow			
Vibration resistance	20 g (10…2000 Hz), EN 600068-2-6			
EMC	EN 61000-6-2:2019 ETSI EN 301489-3 V1.6.1			
Approvals	CE, UL, ETSI I 305550-2, FCC/CFR. 47 Part 15			

15 Appendix: Conformity and Approvals

15.1 EU Declaration of Conformity

Hans Turck GmbH & Co. KG hereby declares that the level sensors of the LRS510-… series comply with Directive 2014/53/EU. The complete text of the EU declaration of conformity can be obtained from the following Internet address: **www.turck.com**

15.2 FCC Digital Device Limitations

FCC ID: YQ7-LRS-510-10

IC ID: 8821A-LRS51010

This device complies with Part 15 of the FCC Rules and Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions:

(1) this device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :

(1) l'appareil ne doit pas produire de brouillage, et

(2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

(1) LRS510 sensors shall not point towards the sky in normal operations.

(2) Operation of LRS510 sensors on board an aircraft or a satellite is prohibited.

15.3 IC Digital Device Limitations

IC ID: 8821A-LRS-510-10

(1) LRS510 sensors shall not point towards the sky in normal operations.

(2) Operation of LRS510 sensors on board an aircraft or a satellite is prohibited.

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