TURCK

Your Global Automation Partner

DR...
Radar Distance 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

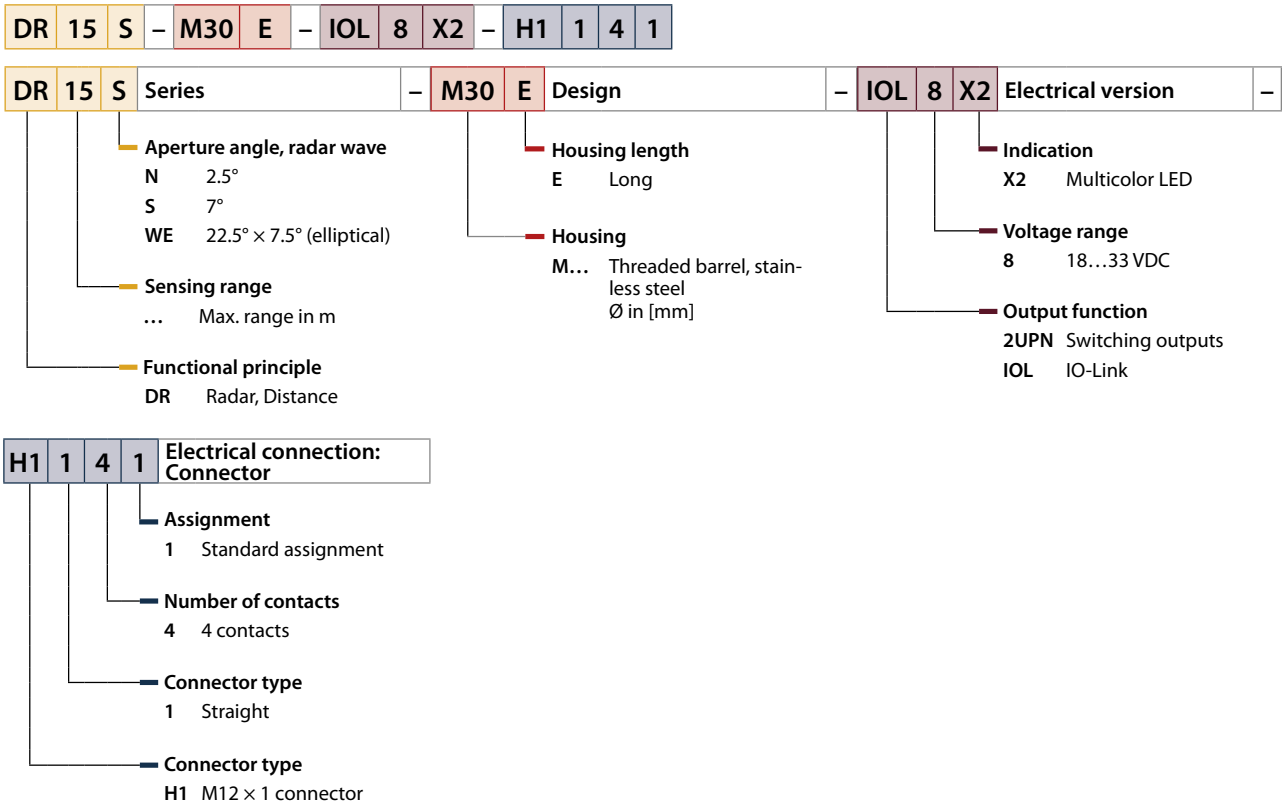
1.4 Feedback about these instructions

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 distance sensors:



2.2 Scope of delivery

The delivery consists of the following:

- Radar distance sensor
- Two M30 threaded nuts for mounting
- Quick Start Guide

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 [▶ 36].

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 radar distance sensors of the DR… series detect without contact the presence of solid or liquid objects and measure the distance to those objects. If multiple objects are in the detection range, the object closest to the sensor is detected. Detection range and object detection can be adjusted via filter settings and sensor configurations.

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.

3.4 Notes on the UL approval

- The device must be powered by a Class 2 power supply unit or a power supply with a limited voltage/current.
- The radar sensors must be used with a listed (CYJV/7 or CYJV2/8) cable/connector module with a rated value of at least 36 VDC and 270 mA that is suitable for the application in the final installation.

4 Product description

The radar distance sensors of the DR… product series are contained in a metal housing. The devices are provided with a metal M12 plug connector for connecting the sensor cable. The device functions can be set via IO-Link.

Devices with the following output functions are available:

- DR…-IOL8X2…: 1 switching output (PNP/NPN/Auto) as well as 1 switching output (PNP/NPN/Auto) or 1 analog output (I/U/Auto)
- DR…-2UPN8…: 2 switching outputs (PNP/NPN/Auto)

4.1 Device overview

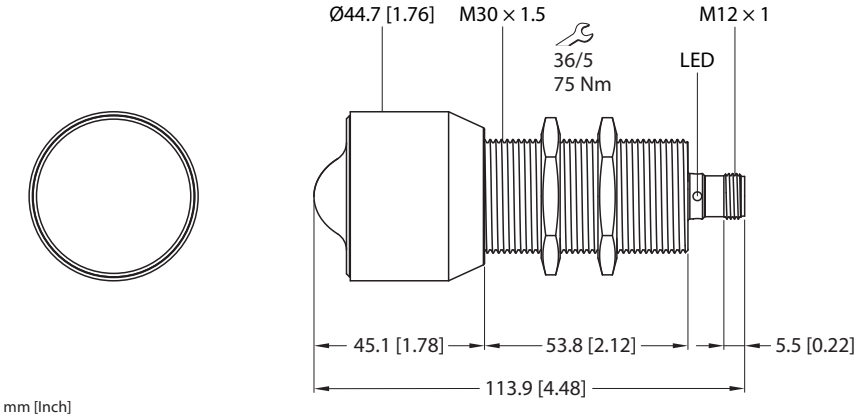


Fig. 1: Dimensions of DR15S…

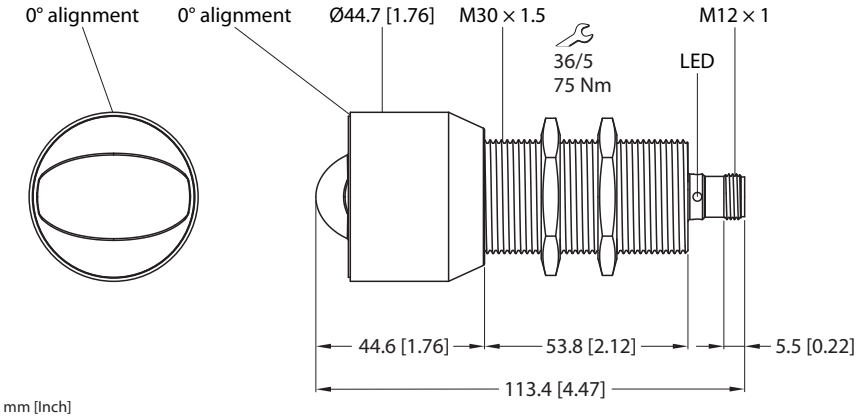


Fig. 2: Dimensions of DR7.5WE…

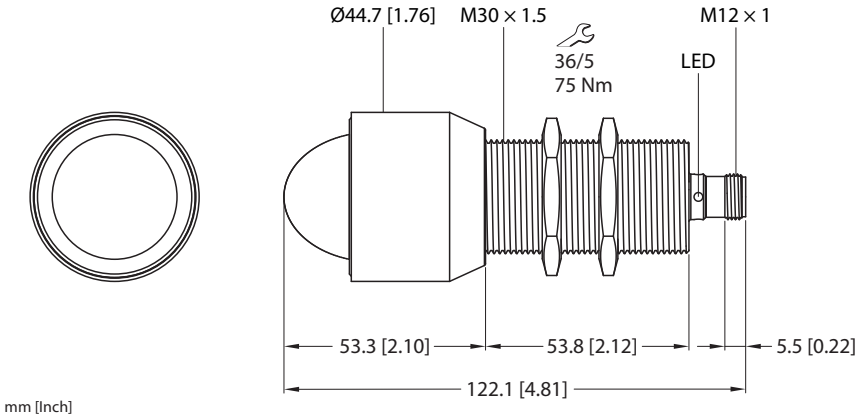


Fig. 3: Dimensions of DR30N…

4.1.1 Indication elements

The radar distance sensors are provided with a green and a yellow LED that are visible via four indicator points. Only one LED can be active. If an LED is active, all four indicator points are lit.

4.2 Properties and characteristics

- Range: 7.5 m, 15 m or 30 m
- Blind zone: 35 cm
- Resolution: 1 mm
- Cone angle of the radar beam: ± 2.5°, ± 7.5° or ± 22.5° × ± 7.5°
- Approved in accordance with ETSI 305550-2
- Male connector, M12 × 1, 4-pin
- Operating voltage 18…33 VDC
- Switching output switchable between PNP/NPN
- Switchable 4…20 mA/0…10 V analog output
- Automatic current and voltage detection
- IO-Link Smart Sensor Profile 3.2 (presence detection)
- Cylindrical housing M30

4.3 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.

4.4 Functions and operating modes

The device measures the distance between the detected object and the end of the sensor housing. A single point mode (SPM), two point mode (TPM) or window mode (WIn) can be set for the switching outputs. The measuring range of the analog output can be defined as required within the measuring range limits. The device provides analog or switching signals at the outputs depending on the version. The measured value is also sent via the IO-Link process data to the higher control level. The distance value can be transferred in m via the process data. The device can be parameterized using TAS and IO-Link.

4.4.1 Setting options

The devices feature the following setting options:

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

4.4.2 Output functions — switching output

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

Two point mode

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

If an object is moved away from the sensor, the switching output is active for as long as the object is located between the start of the detection range and the switch-off point SP1. If the object passes the switch-off point SP1, the switching output becomes inactive.

If an object is moved toward the sensor, the switching output is inactive as long as the object is located between the end of the detection range and the switch-on point SP2. If the object passes the switch-on point SP2, the switching output becomes active.

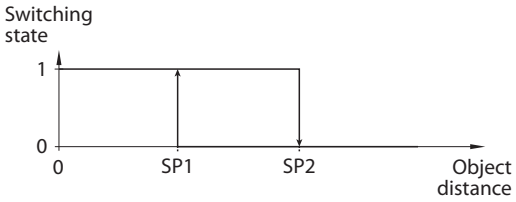


Fig. 4: Two point mode

Window mode

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

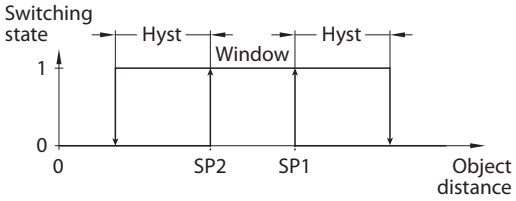


Fig. 5: Window mode

4.4.3 Output functions — analog output

The analog output of the DR…IOL8X2 sensors can be set as either a current or voltage output. The measuring range is freely definable.

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:

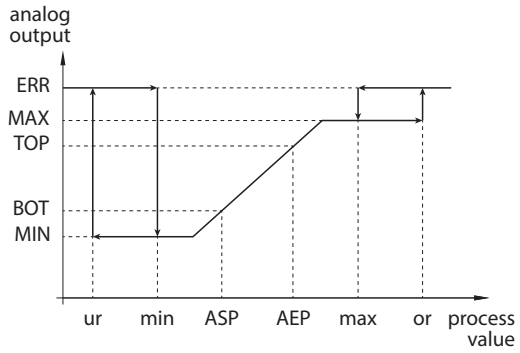


Fig. 6: Rising output characteristic

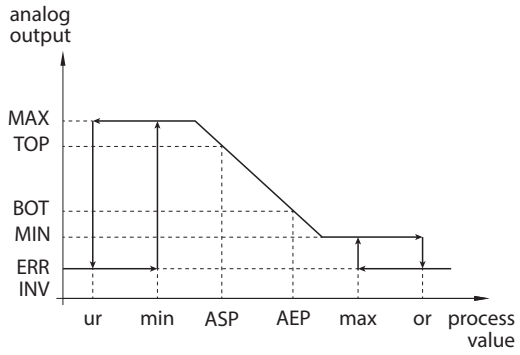


Fig. 7: Falling output characteristic, MIN ≠ 0

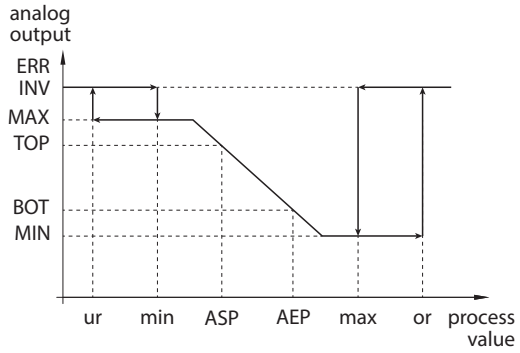


Fig. 8: Falling output characteristic, MIN = 0

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

4.4.4 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.

4.4.5 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 . 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.

4.4.6 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

4.4.7 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.

4.4.8 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 Technical accessories

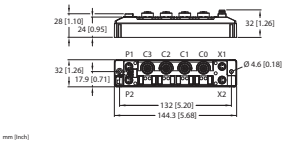
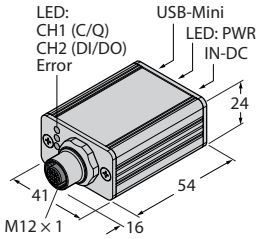
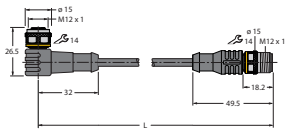
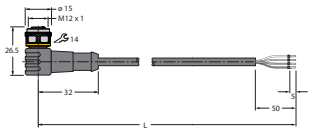
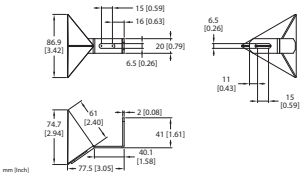
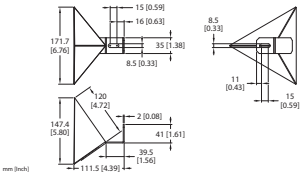
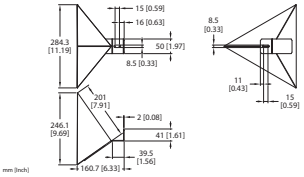
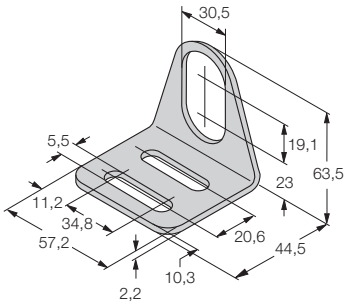
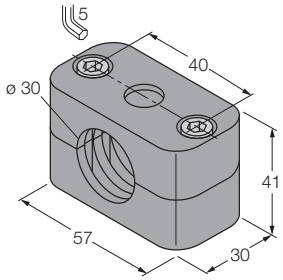
Figure	Type	Description
	TBEN-S2-4IOL	Compact multiprotocol I/O module for Ethernet, 4 × IO-Link master channels, 4 × universal digital PNP channels, 0.5 A, channel diagnostics
	USB-2-IOL-0002	IO-Link adapter V1.1 with integrated USB interface
	WKC4.4T-2-RSC4.4T/TXL	Extension cable, M12 female connector, angled to M12 connector, straight, 4-pin, cable length: 2 m, jacket material: PUR, black; cuLus approval
	WKC4.4T-2/TXL	Extension cable, M12 female connector, angled, 4-pin, cable length: 2 m, jacket material: PUR, black; cuLus approval
	RR-6	Radar reflector made of stainless steel, cathetus length 60 mm, RadarCrossSection: 10 m² (cf. automobile)
	RR-12	Radar reflector made of stainless steel, cathetus length 120 mm, RadarCrossSection: 250 m² (cf. HGV)
	RR-20	Radar reflector made of stainless steel, cathetus length 200 mm, RadarCrossSection: 1115 m² (cf. ship)

Figure	Type	Description
	MW-30	Stainless steel mounting clip for M30
	BSS-30	Mounting clip for smooth and threaded barrel devices; material: polypropylene

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 object 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. Refer to the following table for the cone angle:

Type	Cone angle
DR…S-…	± 7.5°
DR…WE-…	± 22.5° × ± 7.5° (elliptical)
DR…N-…	±2.5°

The maximum tightening torque when mounting the sensor is 75 Nm.

- Mount the sensor at the intended location. Be aware of the blind zone s_{min}, in which no object detection is possible (see [▶ 30]).
- Mount the sensor in such a way that no foreign objects are located in the detection range.

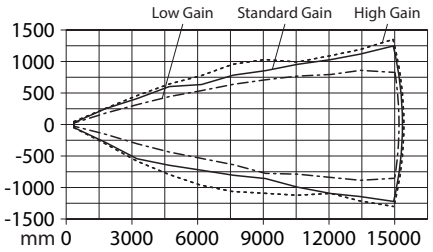


Fig. 9: DR…S… range diagram

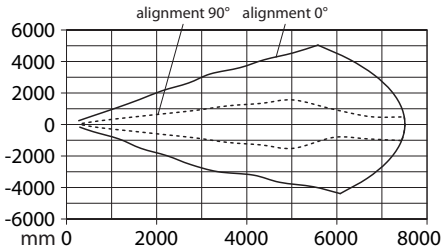


Fig. 10: DR…WE… range diagram

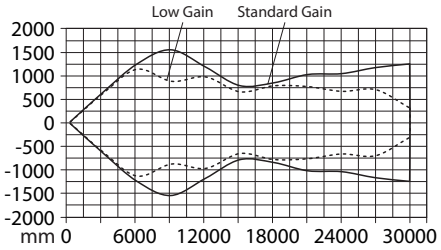


Fig. 11: DR…N… range diagram

NOTE

The range diagrams refer to a standard target (10 × 10 cm, orthogonal to the beam direction) under laboratory conditions. The detection ranges for other targets may differ from those for a standard target due to the different reflection properties and geometries.

- Align the sensor at right angles to the desired target. If the radar wave hits the target at right angles, it will be reflected with the maximum possible signal strength.

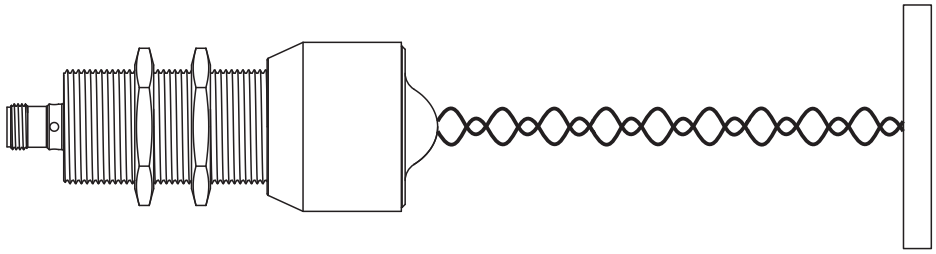


Fig. 12: Planar target — path of radar waves (schematic)

- The inclination angle of planar targets must be smaller than the cone angle of the sensor. If the target is inclined too much, the reflected radar signal will no longer be detected by the sensor.

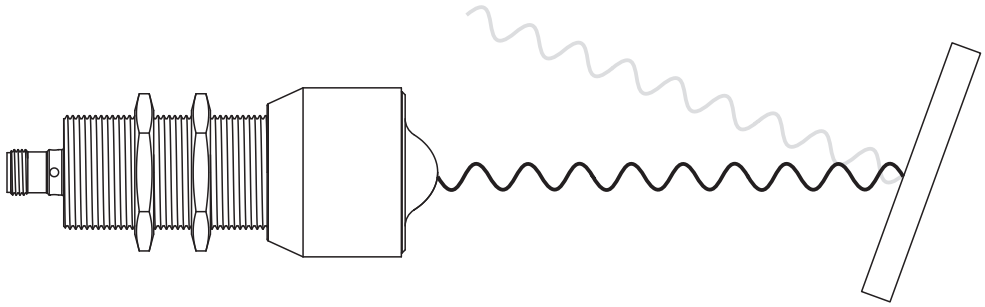


Fig. 13: Inclined planar target — path of radar waves (schematic)

- Align the sensor centrally on targets with a bent surface (e.g. cylindrical targets). As the main component of the radar signal is scattered in different directions after hitting the target, the strength of the detected signal is smaller than with planar targets.

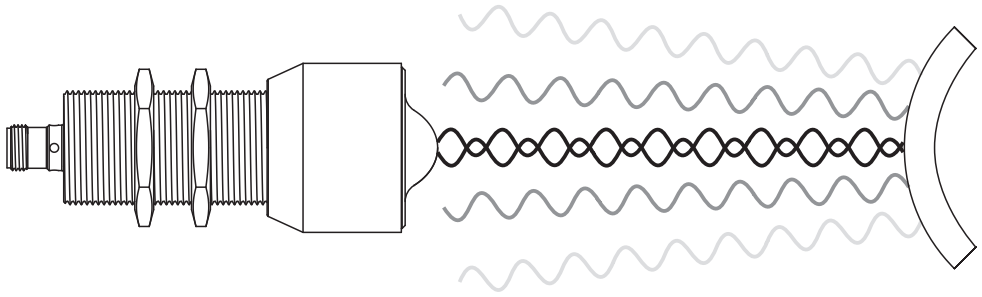


Fig. 14: Target with bent surface — path of radar waves (schematic)

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

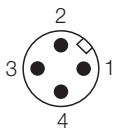


Fig. 15: DR…IOL8X2 pin layout

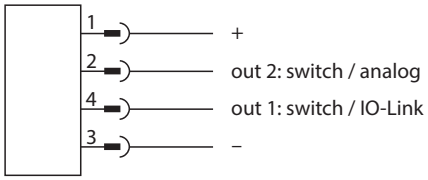


Fig. 16: DR…IOL8X2 wiring diagram

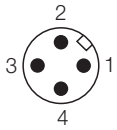


Fig. 17: DR…2UPN… pin layout

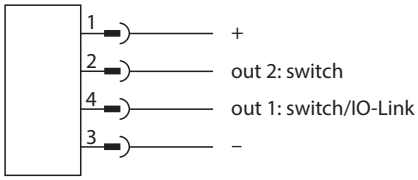


Fig. 18: DR…2UPN… wiring diagram

7 Commissioning

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

The analog and switching outputs have a 300 ms readiness delay.

7.1 Activating IO-Link mode

NOTE
The voltage range in IO-Link mode is 18…30 VDC.

- ▶ Set a cycle time of min. 2.3 ms on the IO-Link master.
- ⇨ The device is operational. After a readiness delay of 450 ms, the process data can be sent to the IO-Link master.

7.2 Activating SIO mode

- ▶ Connect the device to a standard I/O port or an analog port.
- ⇨ The device is operational after a readiness delay of 500 ms.

The readiness delay in SIO mode is required to operate preactivated sensors so that the sensor can exclude being connected to an IO-Link master. The readiness delay does not have an effect on any potential IO-Link communication.

8 Operation

8.1 LEDs

LED	Meaning
Yellow	NO contact: object within the teach-in range, switching output 1 on NC contact: no object in teach-in range, switching output 1 on
Green	NO contact: object within the detection range, switching output 1 off NC contact: object within the teach-in range, switching output 1 off
Off (only NO contact)	No object within the detection range, switching output 1 off
Green flashing	IO-Link mode active

8.2 Process input data

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0…3	Measured value in 0.1 mm							
4	Reserved (scaling)							
5							SSC1.2	SSC1.1

Bit	Meaning
SSC1.1	Switching signal output 1
SSC1.2	Switching signal output 2
Scaling	0xFC (scale 10^{-4})

9 Setting and parameterization

The devices are parameterized using TAS and IO-Link. Parameter setting via IO-Link is explained in the IO-Link parameters manual.

9.1 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.

9.2 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 status
FEN20-4IOL	V1.2.0.0
TBEN-L4/5-8IOL	V3.3.2.0
TBEN-LL-8IOL	V1.1.1.0
TBEN-S2-4IOL	V3.4.1.0

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 sensor to an IO-Link port of the IO-Link master.

9.2.1 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.

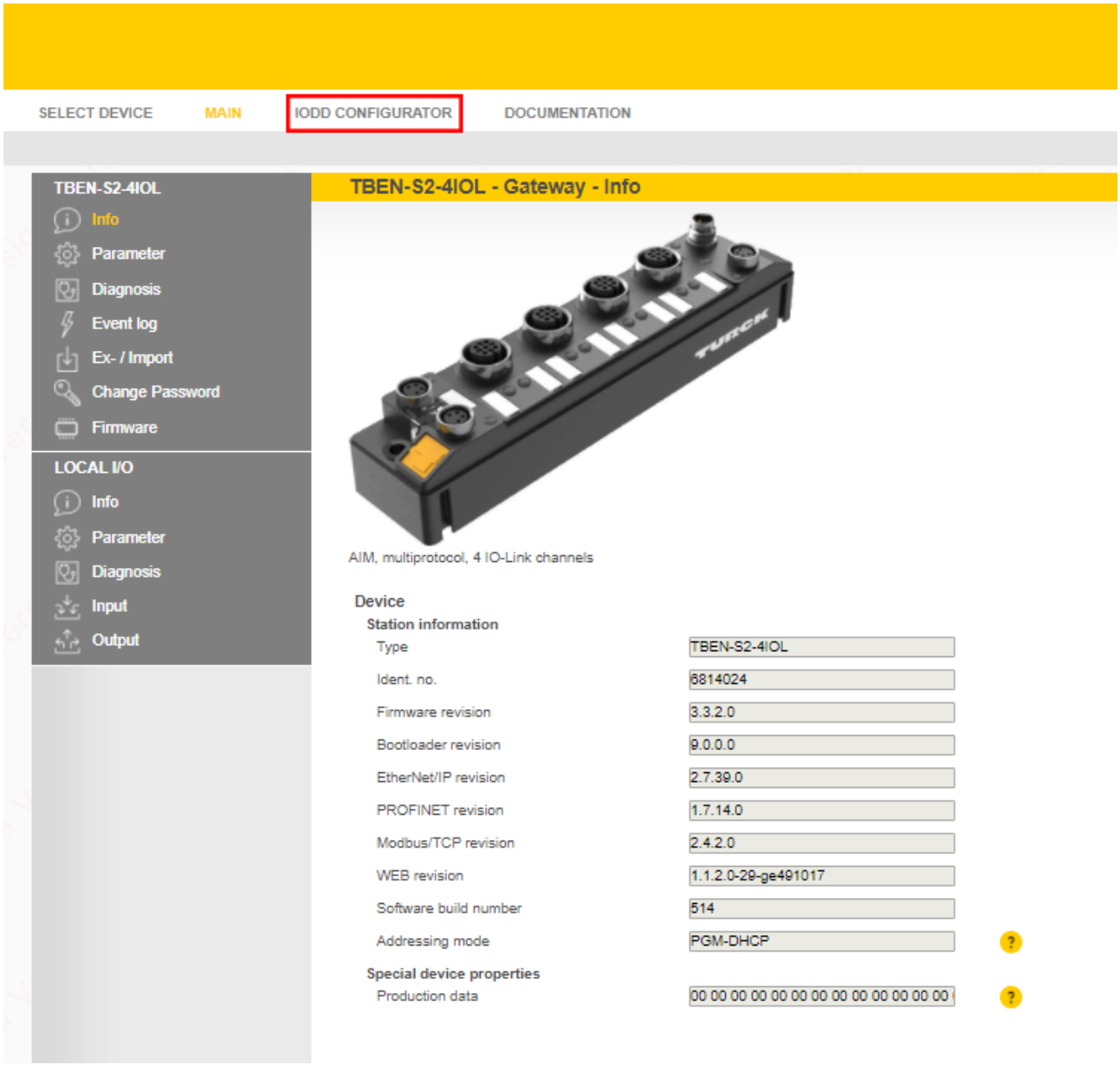


Fig. 19: Web server – IODD Configurator

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

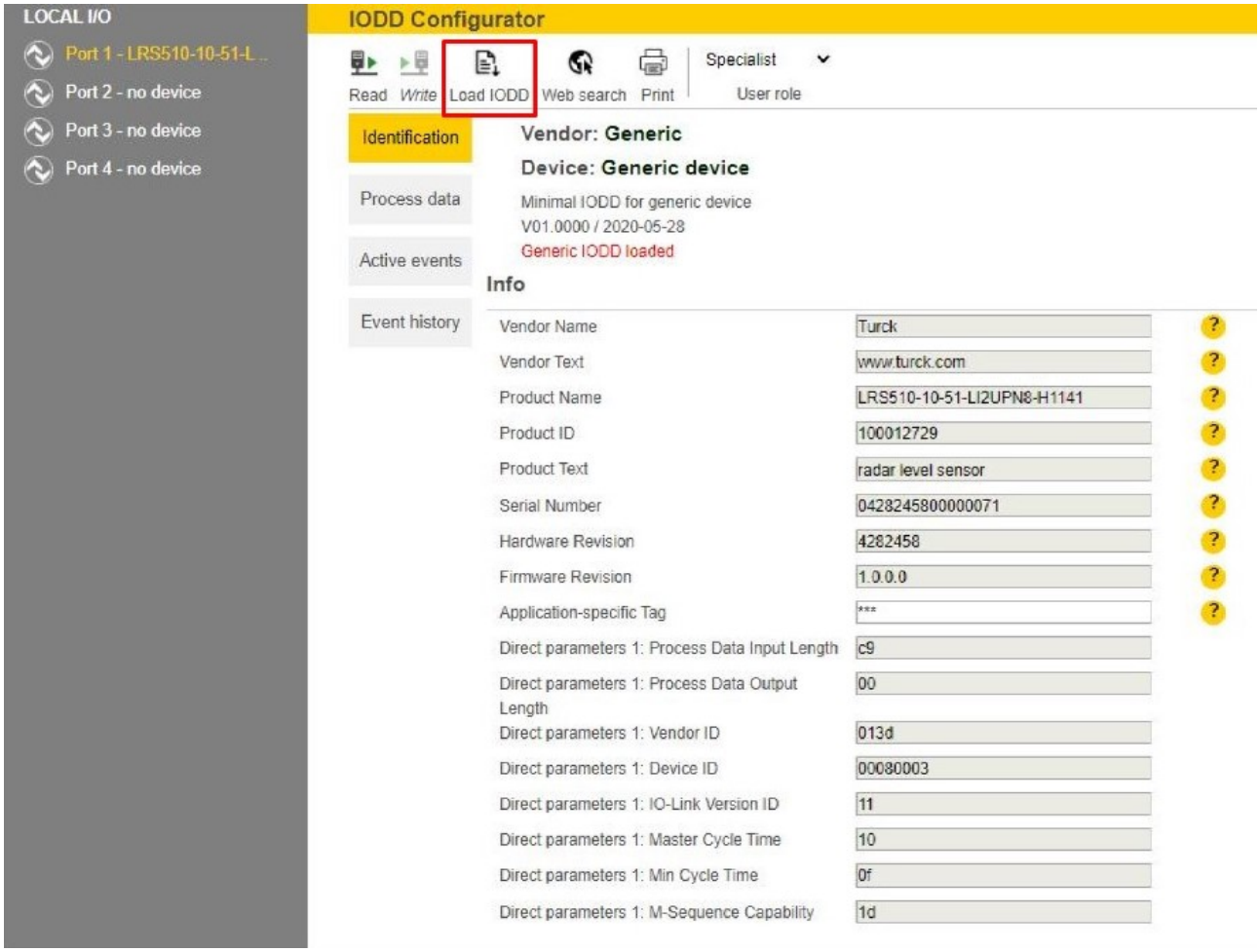


Fig. 20: Loading IODD

9.2.2 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**.

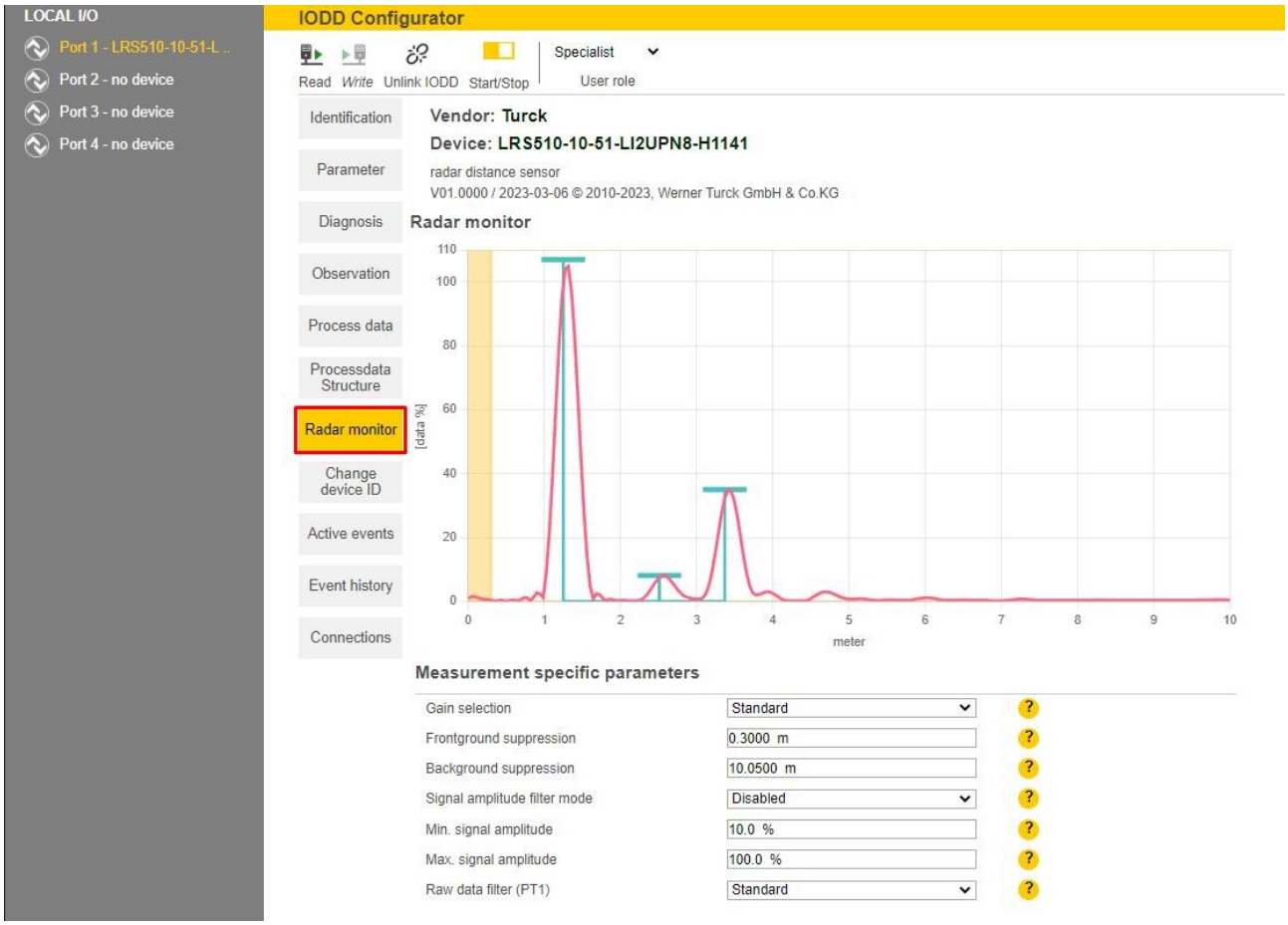


Fig. 21: Turck Radar Monitor – overview

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).

9.2.3 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.

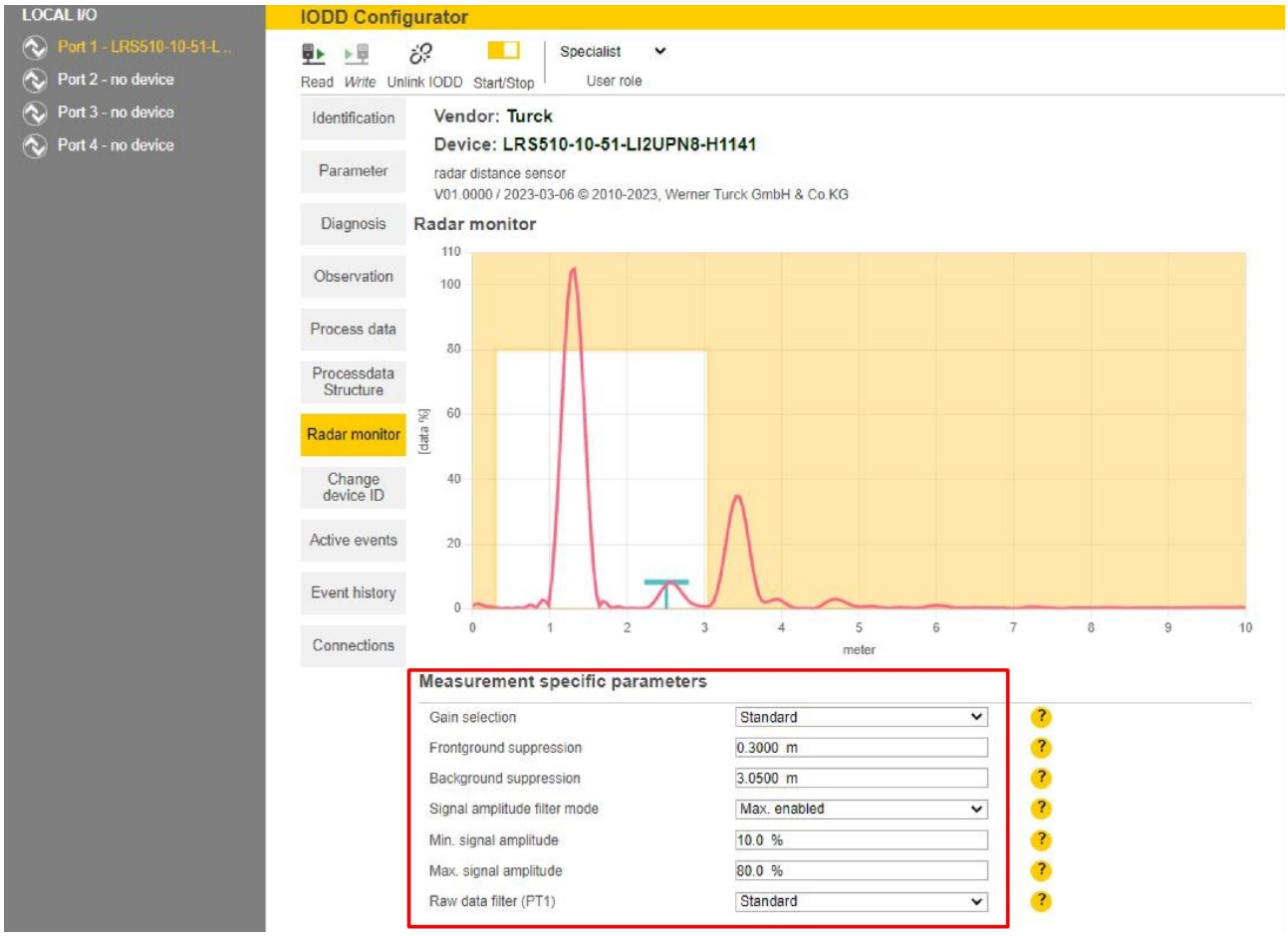


Fig. 22: Example – filtering signals

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.

If the device does not work as expected, proceed as follows:

- Exclude environmental disturbances.
- Check the connections of the device for errors.
- Check device for parameterization errors.

If the malfunction persists, the device is faulty. 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 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

DR15S-M30E…H1141

Type	DR15S-M30E-IOL8X2-H1141	DR15S-M30E-2UPN8X2-H1141
ID	100030148	100030149
Radar data		
Frequency range	122…123 GHz	
Range	350…15,000 mm	
Resolution	1 mm	
Minimum measuring range	500 mm	
Minimum switching range	50 mm	
Linearity error	≤ ± 0.1 %	
Edge length of the norm target	100 mm	
Output power ERP	10 dBm	
Output power EIRP	20 dBm	
Cone angle	15°	
Repetition accuracy	2 mm	
Hysteresis	≤ 50 mm	
Electrical data		
Operating voltage	18…33 V DC	
Residual 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	NC/NO programmable, PNP/NPN
Output 2	Analog output	Switching output
Current output	4…20 mA	–
Voltage output	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	
Readiness delay	≤ 450 ms	
Response time typical	< 10 ms	
IO-Link		
IO-Link specification	V1.1	
IO-Link port type	Class A	
Communication mode	COM 2 (38.4 kBaud)	

Type	DR15S-M30E-IOL8X2-H1141	DR15S-M30E-2UPN8X2-H1141
Process data width	48 bit	
Measured value information	32 bit	
Switching point information	1 bit	2 bit
Maximum cable length	20 m	
Frame type	2.2	
Minimum cycle time	5 ms	
Function of pin 4	IO-Link	
Function of pin 2	Analog	DI
Profile support	Smart Sensor Profile	
Mechanical data		
Design	Threaded barrel, M30E	
Dimensions	Ø 44.7 × 113.9 mm	
Housing material	Stainless steel, 1.4401 (AISI 316) PTFE	
Max. tightening torque of housing nut	75 Nm	
Electrical connection	M12 × 1 connector	
Ambient temperature	-25…+65 °C	
Storage temperature	-40…+85 °C	
Protection class	IP67, IP69K (UL: type 1)	
Operating voltage indicator	LED, green	
Switching state indication	2-color LED, yellow	
Vibration resistance	20 g (10…2000 Hz), EN 60068-2-6	
Shock testing	EN 60068-2-27	
Shock resistance	100 g (11 ms)	
EMC	EN 61000-6-2:2019 ETSI EN 301489-3 v.1.6.1	
Approvals	CE, UKCA, ETSI, FCC, UL	

DR7.5WE-M30E…H1141

Type	DR7.5WE-M30E-IOL8X2-H1141	DR7.5WE-M30E-2UPN8X2-H1141
ID	100030150	100030151
Radar data		
Frequency range	122…123 GHz	
Range	350…7500 mm	
Resolution	1 mm	
Minimum measuring range	500 mm	
Minimum switching range	50 mm	
Linearity error	≤ ± 0.1 %	
Edge length of the norm target	100 mm	
Output power ERP	10 dBm	
Output power EIRP	20 dBm	
Cone angle	45°	
Horizontal cone angle	15°	
Repetition accuracy	2 mm	
Hysteresis	≤ 50 mm	
Electrical data		
Operating voltage	18…33 V DC	
Residual ripple	< 10 % U_{ss}	
DC rated operational current	≤ 250 mA	
No-load current	≤ 150 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	NC/NO programmable, PNP/NPN
Output 2	Analog output	Switching output
Current output	4…20 mA	–
Voltage output	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	
Readiness delay	≤ 450 ms	
Response time typical	< 10 ms	
IO-Link		
IO-Link specification	V1.1	
IO-Link port type	Class A	
Communication mode	COM 2 (38.4 kBaud)	
Process data width	48 bit	

Type	DR7.5WE-M30E-IOL8X2-H1141	DR7.5WE-M30E-2UPN8X2-H1141
Measured value information	32 bit	
Switching point information	1 bit	2 bit
Maximum cable length	20 m	
Frame type	2.2	
Minimum cycle time	5 ms	
Function of pin 4	IO-Link	
Function of pin 2	Analog	DI
Profile support	Smart Sensor Profile	
Mechanical data		
Design	Threaded barrel, M30E	
Dimensions	Ø 44.7 × 113.9 mm	
Housing material	Stainless steel, 1.4401 (AISI 316) PTFE	
Max. tightening torque of housing nut	75 Nm	
Electrical connection	M12 × 1 connector	
Ambient temperature	-25…+65 °C	
Storage temperature	-40…+85 °C	
Protection class	IP67, IP69K (not UL approved)	
Installation angle outdoor (elevation)	≤ 0°	
Operating voltage indicator	LED, green	
Switching state indication	2-color LED, yellow	
Vibration resistance	20 g (10…2000 Hz), EN 60068-2-6	
Shock testing	EN 60068-2-27	
Shock resistance	100 g (11 ms)	
EMC	EN 61000-6-2:2019 ETSI EN 301489-3 v.1.6.1	
Approvals	CE, UKCA, ETSI, FCC, UL	

DR30N-M30E…H1141

Type	DR30N-M30E-IOL8X2-H1141	DR30N-M30E-2UPN8X2-H1141
ID	100030150	100030151
Radar data		
Frequency range	122…123 GHz	
Range	350…30,000 mm	
Resolution	1 mm	
Minimum measuring range	500 mm	
Minimum switching range	50 mm	
Linearity error	≤ ± 0.1 %	
Edge length of the norm target	100 mm	
Output power ERP	10 dBm	
Output power EIRP	20 dBm	
Cone angle	5°	
Repetition accuracy	2 mm	
Hysteresis	≤ 50 mm	
Electrical data		
Operating voltage	18…33 V DC	
Residual ripple	< 10 % U_{ss}	
DC rated operational current	≤ 250 mA	
No-load current	≤ 150 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	NC/NO programmable, PNP/NPN
Output 2	Analog output	Switching output
Current output	4…20 mA	–
Voltage output	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	
Readiness delay	≤ 450 ms	
Response time typical	< 10 ms	
IO-Link		
IO-Link specification	V1.1	
IO-Link port type	Class A	
Communication mode	COM 2 (38.4 kBaud)	
Process data width	48 bit	
Measured value information	32 bit	
Switching point information	1 bit	2 bit

Type	DR30N-M30E-IOL8X2-H1141	DR30N-M30E-2UPN8X2-H1141
Maximum cable length	20 m	
Frame type	2.2	
Minimum cycle time	5 ms	
Function of pin 4	IO-Link	
Function of pin 2	Analog	DI
Profile support	Smart Sensor Profile	
Mechanical data		
Design	Threaded barrel, M30E	
Dimensions	Ø 44.7 × 122.1 mm	
Housing material	Stainless steel, 1.4401 (AISI 316) PTFE	
Max. tightening torque of housing nut	75 Nm	
Electrical connection	M12 × 1 connector	
Ambient temperature	-25…+65 °C	
Storage temperature	-40…+85 °C	
Protection class	IP67, IP69K (not UL approved)	
Installation angle outdoor (elevation)	≤ 0°	
Operating voltage indicator	LED, green	
Switching state indication	2-color LED, yellow	
Vibration resistance	20 g (10…2000 Hz), EN 60068-2-6	
Shock testing	EN 60068-2-27	
Shock resistance	100 g (11 ms)	
EMC	EN 61000-6-2:2019 ETSI EN 301489-3 v.1.6.1	
Approvals	CE, UKCA, ETSI, FCC, UL	

15 Turck branches — contact data

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Austria	Turck GmbH Graumanngasse 7/A5-1, A-1150 Vienna www.turck.at
Belgium	Turck Multiprox N. V. Lion d'Orweg 12, B-9300 Aalst www.multiprox.be
Brazil	Turck do Brasil Automação Ltda. Rua Anjo Custódio Nr. 42, Jardim Anália Franco, CEP 03358-040 São Paulo www.turck.com.br
Canada	Turck Canada Inc. 140 Duffield Drive, CDN-Markham, Ontario L6G 1B5 www.turck.ca
China	Turck (Tianjin) Sensor Co. Ltd. 18,4th Xinghuazhi Road, Xiqing Economic Development Area, 300381 Tianjin www.turck.com.cn
Czech Republic	TURCK s.r.o. Na Brne 2065, CZ-500 06 Hradec Králové www.turck.cz
France	TURCK BANNER S.A.S. 11 rue de Courtalin Bat C, Magny Le Hongre, F-77703 MARNE LA VALLEE Cedex 4 www.turckbanner.fr
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Mexico	Turck Comercial, S. de RL de CV Blvd. Campestre No. 100, Parque Industrial SERVER, C.P. 25350 Arteaga, Coahuila www.turck.com.mx
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Poland	TURCK sp.z.o.o. Wroclawska 115, PL-45-836 Opole www.turck.pl
Romania	Turck Automation Romania SRL Str. Siriului nr. 6-8, Sector 1, RO-014354 Bucuresti www.turck.ro
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Turkey	Turck Otomasyon Ticaret Limited Sirketi Inönü mah. Kayisdagi c., Yesil Konak Evleri No: 178, A Blok D:4, 34755 Kadiköy/ Istanbul www.turck.com.tr
United Kingdom	TURCK BANNER LIMITED Blenheim House, Hurricane Way, GB-SS11 8YT Wickford, Essex www.turckbanner.co.uk
USA	Turck Inc. 3000 Campus Drive, USA-MN 55441 Minneapolis www.turck.us

16 Appendix: conformity and approvals

16.1 EU Declaration of Conformity

Hans Turck GmbH & Co. KG hereby declares that the radar distance sensors of the DR… series comply with Directive 2014/53/EU and the Radio Equipment Regulations 2017. The complete text of the EU declaration of conformity can be obtained from the following Internet address: **www.turck.com**

16.2 FCC/IC Digital Device Limitations

FCC ID: YQ7-DRXXX-M30E
FCC ID: YQ7-DR75WEM30E
FCC ID: YQ7-DR30NM30E

IC ID: 8821A-DR75WEM30E
IC ID: 8821A-DR30NM30E

This device complies with Part 15 of the FCC Rules 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.

Radiofrequency radiation exposure Information:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance of 20 cm between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Warning for IC application:

The use of this device is on a 'no-interference, no-protection' basis.

Do not install or operate on board an aircraft or a satellite.

Do not aim upwards towards the sky.

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