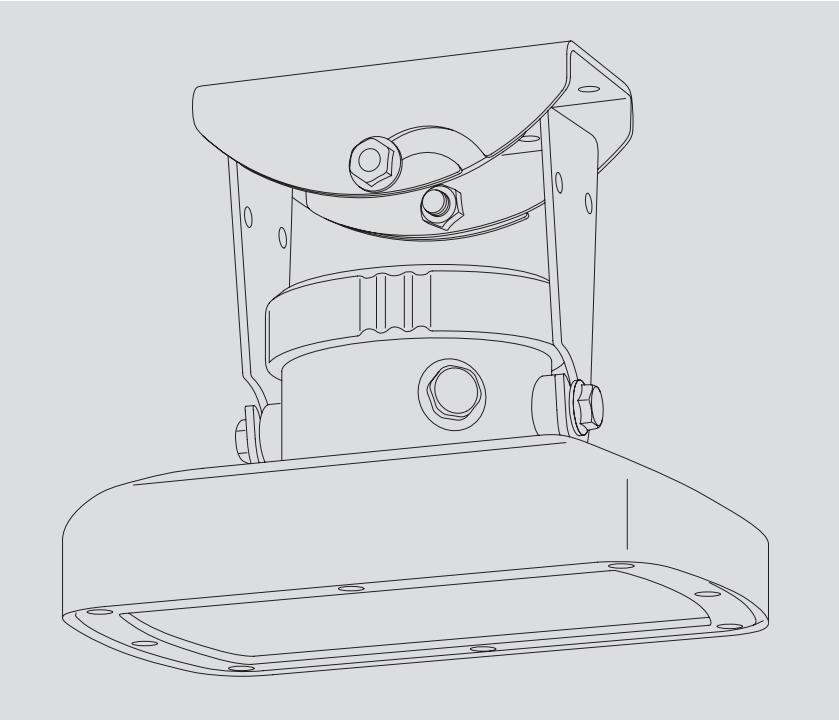
Operating instructions

Radar Level Sensor
OTT RLS



English

We reserve the right to make technical changes and improvements without notice.

Table of contents

1 Scope of supply

OTT RLS

– 1 Radar sensor OTT RLS, two part gimbal-mounting (consisting of device and wall brackets)
– 1 Set of installation fittings (4 x wood screws 6 x 40; 4 x plastic plugs S8)
– 2 Double open-ended wrenches size 10 x 13
– 1 Operating instructions
– 1 Factory acceptance test certificate (FAT)

2 Order numbers

OTT RLS	**Radar sensor OTT RLS** – Version 1: 4 … 20 mA + RS-485 interface – Version 2: 4 … 20 mA + SDI-12 interface	63.105.001.9.2

3 Basic safety information

- Read these operating instructions before using the OTT RLS for the first time! Make yourself completely familiar with the installation and operation of the OTT RLS! Retain these operating instructions for later reference.
- The OTT RLS is used for contactless level measurement of surface waters. Only use the OTT RLS in the manner described in these operating instructions! For further information → see Chapter 4, "Introduction".

- Note all the detailed safety information given within the individual work steps. All safety information in these operating instructions are identified with the warning symbol shown here.
- Never use the OTT RLS in areas where there is a danger of explosion. For further information → see Chapter 5, "Installing the OTT RLS".
- Note that the OTT RLS may only be installed by a professional (e.g. qualified electrician). For further information → see Chapter 5, "Installing the OTT RLS".
- Protect the power supply connection with a fuse (5 ampere, blowing speed: fast). For further information → see Chapter 5, "Installing the OTT RLS".
- It is essential to comply with the electrical, mechanical and climatic specifications given in the Technical Data section. For further information → see Chapter 12, "Technical data".
- Do not make any changes or retrofits to the OTT RLS. If changes or retrofits are made, all guarantee claims are voided. Furthermore, the radio approval required for its operation is void!
- Have a faulty OTT RLS inspected and repaired by our repair center. Never make any repairs yourself under any circumstances. For further information → see Chapter 8, "Repair".
- Dispose of the OTT RLS properly after taking out of service. Never put the OTT RLS into the normal household waste. For further information → see Chapter 10, "Note about the disposal of old units".

FCC

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 berequired to correct the interference at his own expense.

Industry Canada

This Class A digital apparatus complies with Canadian ICES-003.
Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

4 Introduction

The OTT RLS radar sensor is used for contactless measurement of the levels of surface water.

The OTT RLS is based on impulse radar technology. The transmitting antenna transmits short radar pulses in the 24 GHz ISM band. The separate receiver antenna receives the pulses reflected from the water and uses them to determine the distance between sensor and water surface: the time taken by the radar pulses from transmission to reception is proportional to the distance between sensor and water surface. The actual water level of the waterway is then calculated using a scaling function by a datalogger attached to the radar sensor. For this a reference level has to be input when starting.

The transmission antenna has a beam width of approx. ± 6°. The resulting sensor beam can be seen in the depiction in Figures 2 and 3.

Three standardised electrical interfaces are available for connecting the OTT RLS to a datalogger or peripheral devices: 4 … 20 mA, SDI-12 and RS-485 (SDI-12 protocol).

A gimbal mounting allows problem-free and simple mounting even on slanted surfaces. A waterproof terminal area can be found under a removable screw cover for attaching the sensor cable.

Due to the low power consumption, a cable length of up to 1000 meters can be implemented for the power supply.

The complete radar sensor is constructed to be proof against flooding (diving bell principle).

Fig. 1: Overview of radar sensor OTT RLS.

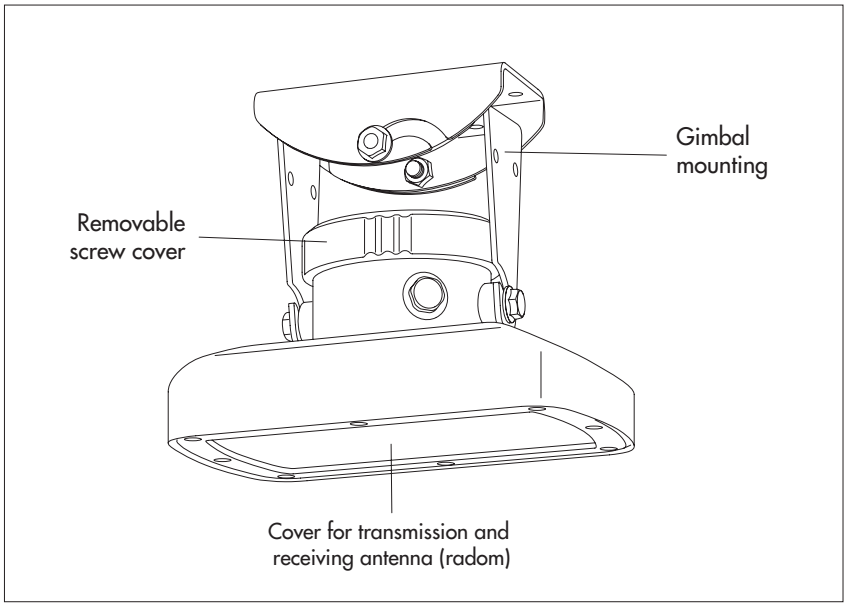


Fig. 2: Application example 1:
Mounting the OTT RLS on a bridge.

The projection of the sensor beam onto the water surface is virtually round.

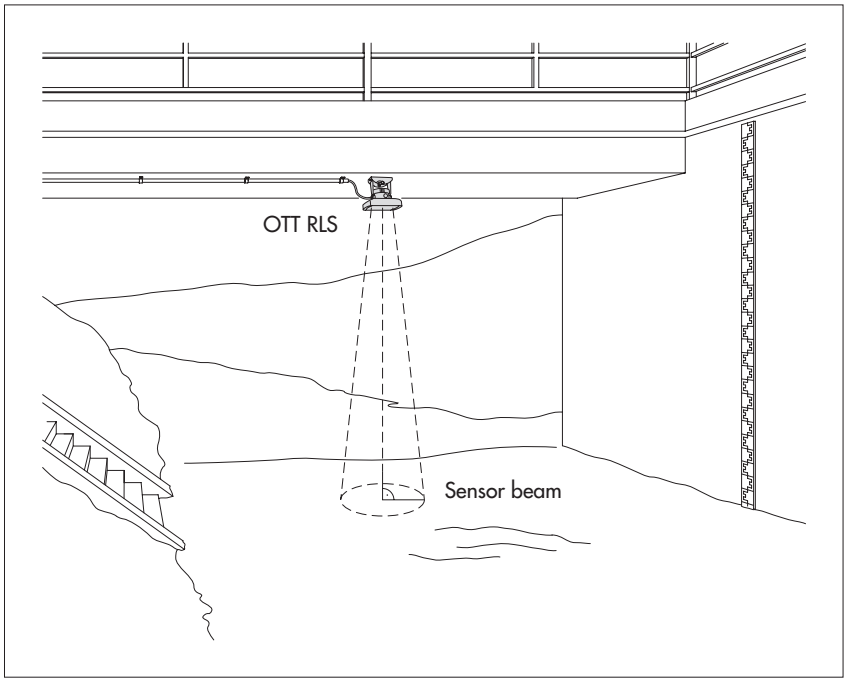
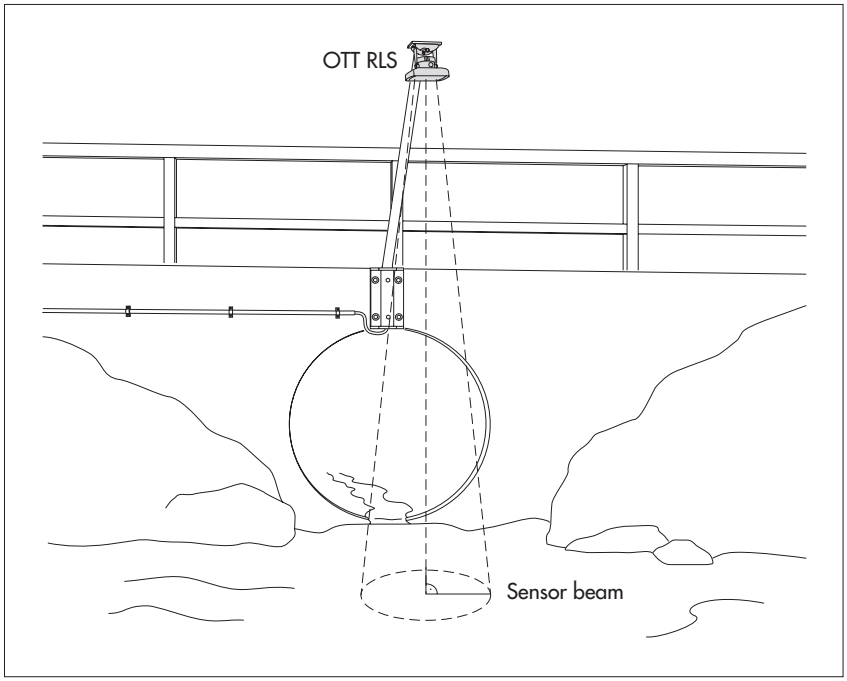


Fig. 3: Application example 2:
Mounting the OTT RLS on an auxiliary construction, e.g. metal stand with mounting plate.



5 Installing the OTT RLS

Caution: The installation of the OTT RLS may only be undertaken by qualified persons (e.g. electrician)!

The OTT RLS has no Ex protection!

5.1 Criteria for selecting a suitable mounting location

- Locations that come into question include, for example, bridges and auxiliary constructions directly above the waterway section to be measured.
- The minimum distance between lower edge of the sensor and water surface must be 0.8 m (dead area in which no useable measurement is possible).
- Select a mounting point high enough so that measurement is possible even with high water levels.
- The mounting point must be steady. Vibrations and movement of the mounting point must be avoided. Bridges are affected by movements of several centimeters as a result of load changes and temperature movements.
- The water surface must be as smooth as possible in the area of the sensor beam. Avoid turbulent areas and areas where obstructions in the waterway or bridge piers cause changes in the water level.
- The area within the sensor beam (see Figures 2 and 3) must be completely free of obstructions. Table for approximating the size of the sensor beam:

Distance OTT RLS – Water surface	Diameter Sensor beam
5 m	1.06 m
10 m	2.12 m
15 m	3.19 m
20 m	4.25 m
25 m	5.31 m
30 m	6.38 m
35 m	7.44 m

The diameters given are minimum sizes. Where possible, select an area free of obstruction that is clearly larger.

- Avoid large metal surfaces near the sensor beam (reflections from these surfaces can distort the measurement result).
- The climate specifications in the technical data must be kept to at the mounting location.
- Stilling wells are unsuitable as a mounting location.

WARNING

Danger of explosion due to spark formation and electrostatic discharge

The use of the OTT RLS in explosive atmospheres can lead to the danger of ignition of this atmosphere. An explosion resulting from this involves the risk of very severe material and personal damage.

- **Never** operate the OTT RLS in explosive areas (e.g. in sewers).

5.2 Notes on power supply

The OTT RLS requires a power supply of 9.6 … 28 V direct current of type 12/24 V DC (e. g. a battery or mains connection with galvanically isolated low safety voltage).

The OTT RLS is immediately ready for operation after connecting the power supply.

Warning:

- The power supply must be protected by a fuse (5 ampere, blowing speed: fast) on the input side.
- When using solar panels, we recommend the use of an overvoltage protection device.

5.3 Suitable cable types when using the RS-485 interface

The maximum length of the cable is 1,000 m. Recommended cable type: Twisted-pair cable; unshielded (alternatively: shielded). The wires intended for the power supply can be twisted pair, but do not have to be.

- up to 400 m cable length: 2 x 2 x 0.34 mm^2
  e. g. Lapp UNITRONIC FD CP (TP) plus UL/CSA*, item no. 0030928; external diameter 8.8 mm
- 400 … 600 m cable length: 2 x 2 x 0.5 mm^2
  e. g. Lapp UNITRONIC FD CP (TP) plus UL/CSA*, item no. 0030937; external diameter 9.3 mm
- 600 to 1,000 m cable length: 2 x 2 x 0.75 mm^2
  e. g. Lapp UNITRONIC FD CP (TP) plus UL/CSA*, item no. 0030946; external diameter 10.2 mm

* The outer casing of these cables is UV-steady and therefore ideally suitable for the external area. It is not necessary to attach the screen at these cable examples.

5.4 Mounting the OTT RLS

Assembling the gimbal mounting

Mounting surface: concrete or masonry

- Make four holes (Ø 8 mm/43 mm) deep using a hammer drill (use wall bracket as a template).
- Insert the four plastic plugs supplied into the holes.
- Attach the wall bracket using the four wood screws supplied.
- Insert housing bracket (without sensor) into wall bracket and lightly tighten the hex bolts A.

Mounting surface: auxiliary construction, e. g. metal stand with mounting plate

- Drill four holes (Ø 7 mm) in the mounting plate (use wall bracket as a template).
- Attach the wall bracket e. g. using four hex bolts (M6) and nuts.
- Insert housing bracket (without sensor) into wall bracket and lightly tighten the hex bolts A.

Preparing the cable gland

- Remove "Globemarker" (hexagon with size indication of cable diameters that can be used).
- With a cable diameter of 7.0 … 11.0 mm, remove inlet: insert screwdriver vertically into the seam. See Figure 4. Minimum cable diameter with inlet: 4.0 mm.
- Lever out inlet with screwdriver.
- Insert cable.

Mounting the sensor

- Unscrew screw cover.
- Insert connecting cable through cable gland.
- Remove insulation from connecting cable.
- With flexible wires: put end caps on the wires.
- Connect the connecting cable to the terminal block. Take note for this of Chapter 5.5 to 5.9! If required, the terminal strip can be pulled out for connecting.
- Retighten connecting cable as necessary.
- Tighten the tightening nut of the cable gland (torque for tightening nut: 6 Nm).
- Screw on the screw cover and tighten firmly by hand.
- Insert sensor into housing bracket and lightly tighten the hex bolts B.
- Align the housing parallel (longitudinal and lateral axis) with the water surface using a spirit level.
- Tighten the hex bolts B on the housing shell.
- Tighten the hex bolts A on the wall and housing brackets.
- Check alignment of the OTT RLS once more.

Warning:

▶ The alignment of the sensor parallel to the water surface must be carried out as accurately as possible!

→ If alignment is out by 1.0 °, this leads to a linearity error of approx. 0.15 mm per meter change in the distance.
→ If alignment is out by 2.5 °, this leads to a linearity error of approx. 1 mm per meter change in the distance.
→ If alignment is out by 5 °, this leads to a linearity error of approx. 4 mm per meter change in the distance.

▶ Ensure no moisture enters the connection area when the screw cover is open!

Fig. 4: OTT RLS – connection area.

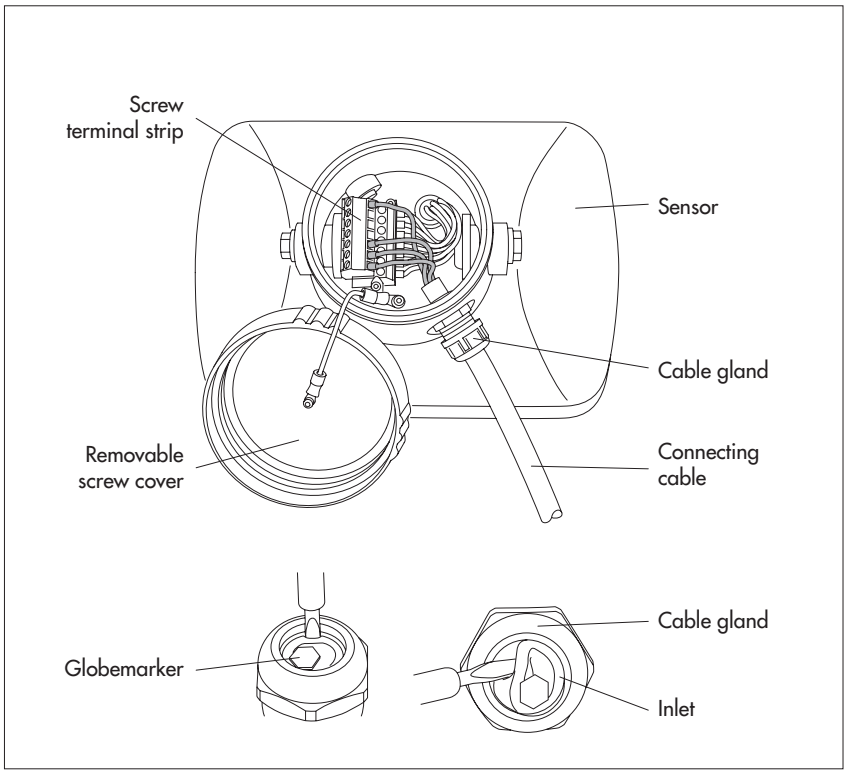
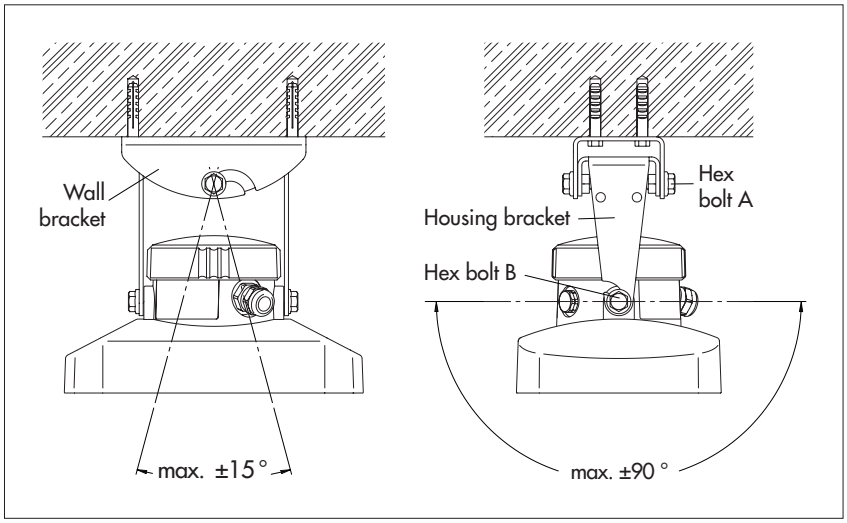


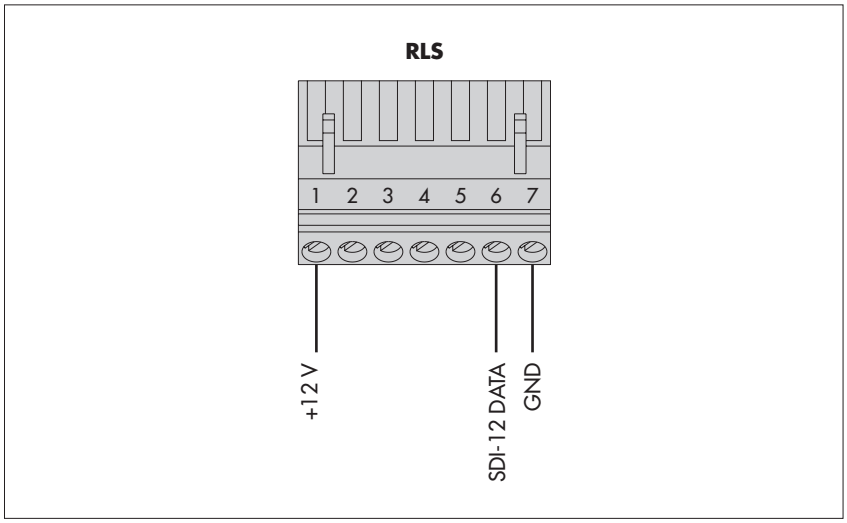
Fig. 5: OTT RLS – rotation range of gimbal mounting.



5.5 Connecting the OTT RLS to any datalogger using an SDI-12 interface

- Connect the OTT RLS to an SDI-12 input of the datalogger. Follow the datalogger handbook as you do this. Refer to Figure 6 for the connection assignments of the OTT RLS.

Abb. 6: Connecting the OTT RLS to any datalogger using an SDI-12 interface.



5.6 Connecting the OTT RLS to any datalogger using a 4 ... 20 mA interface

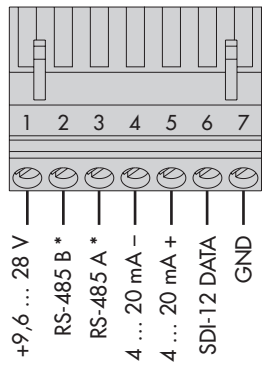
- Connect the OTT CBS to a 4 … 20 mA input of the datalogger. Follow the datalogger handbook as you do this as well as Chapter 12 of these instructions. Refer to Figure 7 for the connection assignments of the OTT RLS. Contacts used: 1, 4, 5 and 7.

5.7 Note on using the OTT RLS RS-485 interface in combination with any datalogger

The RS-485 interface can only be used with an OTT datalogger. In this case, the transmission protocol via the physical RS-485 interface is the SDI-12 protocol. Connect OTT RLS via the RS-485 interface to the OTT LogoSens/DuoSens → see Chapter 5.8, Method B.

Fig. 7: OTT RLS screw terminal strip.

Please note: The 4 … 20 mA interface cannot be used parallel to the SDI-12 or RS-485 interfaces.



* SDI-12 protocol via physical RS-485 interface
(for connecting to OTT DuoSens and OTT LogoSens)

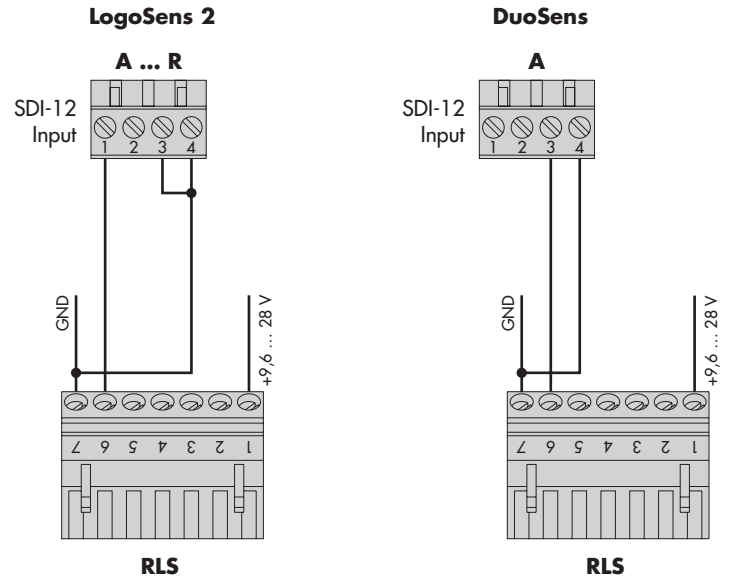
5.8 Connecting the OTT RLS via SDI-12 or RS-485 interface to LogoSens 2 or DuoSens

Method A: Connecting the OTT RLS via the SDI-12 interface (protocol and physical interface: SDI-12). The maximum length of the cable is 70 m. Recommended cable cross-section: 0.25 mm^2:

- Connect the OTT RLS to the LogoSens 2 Station Manager or to the DuoSens Compact Datalogger as shown in Figure 8. Take note of the operating instructions for the LogoSens 2/DuoSens.

Fig. 8: Connecting the OTT RLS to LogoSens 2 or DuoSens using an SDI-12 interface.

The letters above the screw terminal strip identify the possible connections on the LogoSens 2/DuoSens.

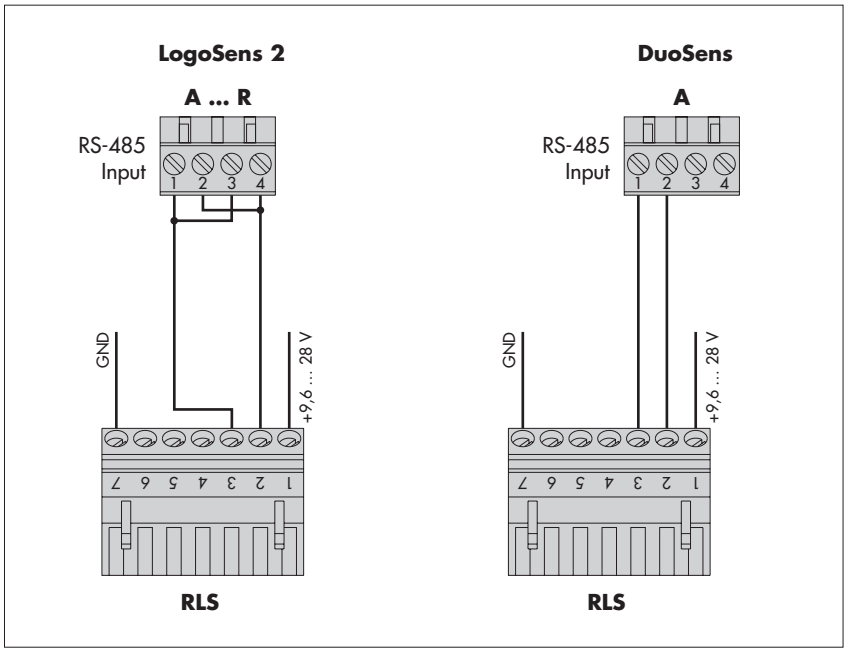


Method B: Connect OTT RLS using the physical RS-485 interface (SDI-12 protocol via physical RS-485 interface). Refer to Chapter 5.3 for the maximum cable length and the recommended cross-section of the cable:

- Connect the OTT RLS to the LogoSens 2 Station Manager or to the DuoSens Compact Datalogger as shown in Figure 9. Take note of the operating instructions for the LogoSens 2/DuoSens.

Fig. 9: Connecting the OTT RLS to LogoSens 2 or DuoSens using an RS-485 interface (SDI-12 protocol).

The letters above the screw terminal strip identify the possible connections on the LogoSens 2/DuoSens.

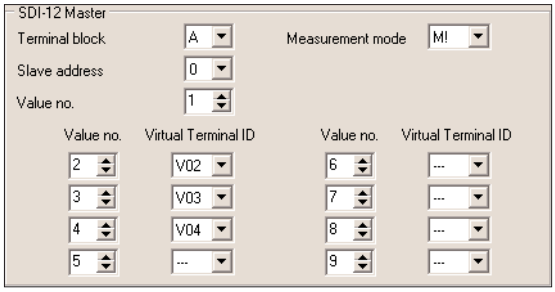


Configuring the LogoSens 2/DuoSens for the OTT RLS with SDI-12 interface

- Create a LogoSens 2/DuoSens channel with *SDI-12 Master* or *OTT SDI RS485* function block (*serial sensors* tab).
- Apply the following settings:

Fig. 10: Adjusting the operating parameters of the LogoSens 2/DuoSens *SDI-12 Master* function block.

The function block *OTT SDI RS485* is set in the same way.



- Terminal block — LogoSens 2: A … R
  DuoSens *SDI-12 Master*: A 3-4 (specified)
  DuoSens *OTT SDI RS485*: A 1-2 (specified)
  terminal block used (screw terminal strip) of the LogoSens 2/DuoSens.

▶ Slave address	SDI-12 bus address. Each slave address may only be allocated once to an SDI-12 bus line. (checking/setting: see operating instructions LogoSens 2/DuoSens, Chapter *SDI-12 transparent mode*.) Typical setting: *0* (only one OTT RLS is connected to the terminal block; no bus operation).
▶ Value no.	identifies which value (the xth of *n* values) of the OTT RLS is recorded in this channel. Typical setting: *1* (first of three values: level in [m])
▶ Measurement mode	*M!* (for the maximum 3 values + status information of the OTT RLS).
▶ Value no./ Virtual terminal ID	Allocation of the other two measured values + status information of the OTT RLS to virtual terminals (level in [cm]; level in [ft]; status information; see Chapter 6.1 for further information; command **`aM!`**).

■ In the relevant *Channel* function blocks, adjust the required units and number of digits after the decimal place (m: 3; cm: 0; ft: 2).

Note: To record all three values + status information of an OTT RLS, four channels in the LogoSens 2/DuoSens are thus necessary. The first channel contains the function block *SDI-12 Master* or *OTT SDI RS485* as the input signal. The other channels each contain a function block *Virtual Sensor* (V02 to V04) as the input signal. Naturally, just individual channels can be recorded. In this case, there are fewer entries required in the *Value no./Virtual terminal ID* field.

Please note: The measuring time is approx. 20 seconds.

5.9 Connecting the OTT RLS to LogoSens 2 or DuoSens using a 4 ... 20 mA interface

■ Connect the OTT RLS to the LogoSens 2 Station Manager or to the DuoSens Compact Datalogger as shown in Figure 11 and 12. Take note of the operating instructions for the LogoSens 2/DuoSens. Maximum cable length/recommended cable cross-section: Ensure that the ohm cable resistance together with any resistor present does not exceed the maximum permitted load resistance (see Chapter 11)!

Fig. 11: Connecting the OTT RLS to LogoSens 2 using a 4 … 20 mA interface

Use the 100 Ohm OTT resistor (order number: 55.550.126.4.2)!

The letters above the screw terminal strip identify the possible connections on the LogoSens 2.

The supply to the current loop in the application case shown is via the OTT LogoSens 2.

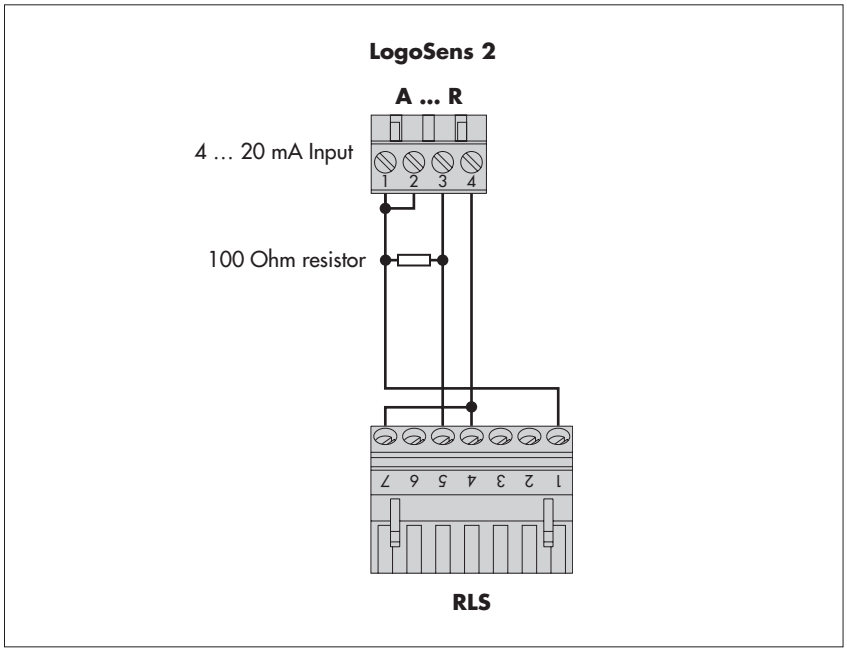
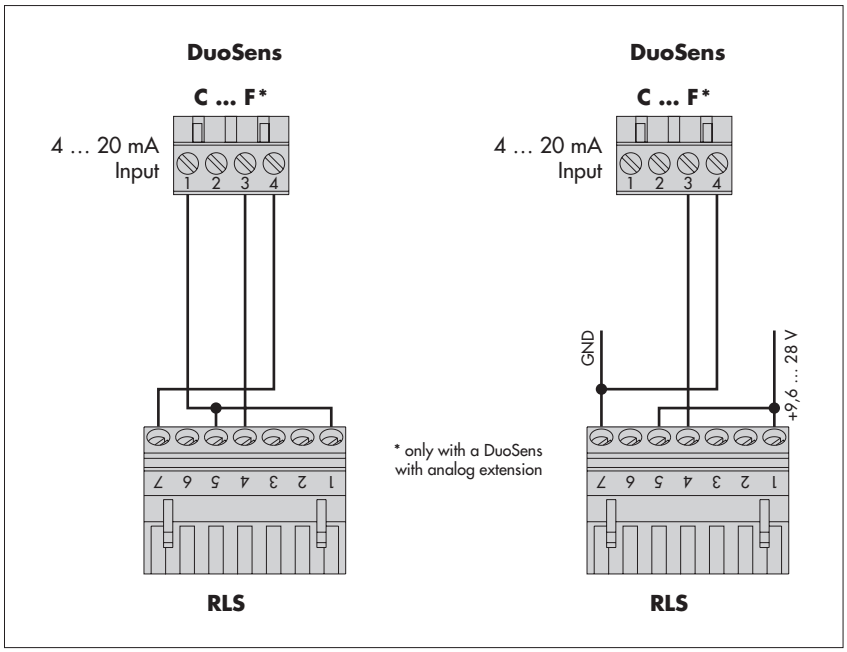


Fig. 12: Connecting the OTT RLS to DuoSens using a 4 … 20 mA interface.

The letters above the screw terminal strip identify the possible connections on the DuoSens.

The supply to the current loop in the application case shown on the left is via the OTT RLS.



Configuring the LogoSens 2/DuoSens for OTT RLS with 4 ... 20 mA interface

- Create a LogoSens 2/DuoSens channel with function block *I 4-20 mA* (LogoSens 2) or *U/I/Pt100/…* (DuoSens) (*Analog sensors* tab).
- Apply the following settings:

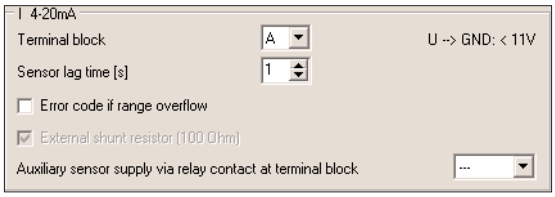


Fig. 13: Setting operating parameters of the LogoSens 2 *I 4-20 mA* function block.

The DuoSens function block *U/I/Pt100/…* is set in the same way.

▶ Terminal block	LogoSens 2: A … R DuoSens: C ... F terminal block used (screw terminal strip) of the LogoSens 2/DuoSens.
▶ Measurement mode (only with DuoSens)	Set to *I 4-20 mA ext.*
▶ Sensor lag time (s)	switches on the LogoSens 2/DuoSens input 1 second before the actual measurement process
▶ ☐ Error code if range overflow	if required: record error codes on range overflow
▶ Auxiliary sensor supply via relay contact at terminal block (only for LogoSens 2)	not required with an OTT RLS

- Insert a *2-point scaling* function block into this channel and set the appropriate water levels for the electrical values measured (e. g. Point 1: 4 → 35; Point 2: 20 → 0).
- In the *Channel* function block, set the unit and number of digits after the decimal place (m: 3; cm: 0; ft: 2).

Note on points 5.5 to 5.9

▶ To reference OTT RLS measured values to a level zero: Input the contact gauge/staff gauge measurement, for example using the scaling function of the datalogger, connected to the OTT RLS (e. g. LogoSens 2/DuoSens).

6 SDI-12 commands and responses

6.1 Standard commands

All SDI-12 standard commands are implemented in the OTT RLS: The following SDI-12 standard commands are relevant for the operation of the OTT RLS:

Command	Response	Description
a!	**a<CR><LF>**	confirmation active **a** - sensor address
aI!	**allccccccccmmmmmm**… …**vvvxxxx<CR><LF>**	send identification **a** – Sensor address **ll** – SDI-12 protocol version **cccccccc** – manufacturer's identification (company name) **mmmmmm** – sensor identification **vvv** – sensor version **xxxxxx** – serial number OTT RLS reply= 13OTT HACH…RLS100xxxxxx
aAb!	**b<CR><LF>**	change address **a** – old sensor address **b** – new sensor address
?!	**a<CR><LF>**	query address **a** – sensor address
aM!	**atttn<CR><LF>**	start measurement **a** – sensor address **ttt** – Time in seconds until the sensor has determined the measurement result OTT RLS reply = 20 seconds **n** – number of measured values OTT RLS reply = 7
aD0! … **aD6!**	**a<value><CR><LF>**	send data **a** – sensor address D0: level [m] **<value>** – **pbb.aaa** D1: level [cm] **<value>** – **pbbbb** D2: level [ft] **<value>** – **pbbb.aa** D3: status **<value>** – **b** 0 = measured value OK 1 = no target recognized 2 = internal error 3 = variance of individual measurements too large **<value>** = **p** – sign (+,–) **b** – digit (before the decimal point) **a** – digit after the decimal point

More information on the SDI-12 standard commands can be found in the document *SDI-12; A Serial-Digital Interface Standard for Microprocessor-Based Sensors; Version 1.3* (see Internet page*www.sdi-12.org*).

6.2 Advanced SDI-12 commands

All advanced SDI-12 commands begin with an "o" for OTT. With these commands, it is possible to configure the OTT RLS using the transparent mode of a datalogger.

Command	Response	Description
▶ 4 … 20 mA interface – adjusting/reading unit of the measured values *		
aOPF<value>!	**aOPF<value><CR><LF>**	adjust unit for the commands „adjusting/reading the lower/upper limit".
aOPF!	**aOPF<value><CR><LF>**	read unit for the commands „adjusting/reading the lower/upper limit". **a** – sensor address **<value>** – 0 = m 1 = cm 2 = ft
▶ 4 … 20 mA interface – adjusting/reading the lower limit *		
aOPA<value>!	**aOPA<value><CR><LF>**	adjust lower limit
aOPA!	**aOPA<value><CR><LF>**	read lower limit **a** – sensor address **<value>** – **pb.a** **p** – sign (+,–) **b** – digits before the decimal point **b** – digits after the decimal point Number of positions: max. 6 (5 digits + decimal point) Note the following settings for the units m → **pbb.aaa** input in m (+0.000 … +35.000) cm → **pbb.aaa** input in m (+0 … +3500) ft → **pbb.aaa** input in feet (+0.00 … +115.00) Note: When switching between m → ft → m, rounding errors of ±0.001 are possible.
▶ 4 … 20 mA interface – adjusting/reading the upper limit *		
aOPB<value>!	**aOPB<value><CR><LF>**	adjust upper limit
aOPB!	**aOPB<value><CR><LF>**	read upper limit **a** – sensor address **<value>** – **pb.a** **p** – sign (+,–) **b** – digits before the decimal point **b** – digits after the decimal point Number of positions: max. 6 (5 digits + decimal point) Note the following settings for the units m → **pbb.aaa** input in m (+0.000 … +35.000) cm → **pbb.aaa** input in m (+0 … +3500) ft → **pbb.aaa** input in feet (+0.00 … +115.00) Note: When switching between m → ft → m, rounding errors of ±0.001 are possible.

* With these commands you can scale the available measuring range of an OTT RLS to a smaller range. Where you do not require the whole measuring range, this has the advantage that a higher resolution for the 4 … 20 mA interface can be achieved. Example: 16 mA measurement span stands for 2 m of water level change available (e.g. lower limit = +14,000 m; upper limit = +16,000 m).

7 Carrying out maintenance work

The OTT RLS radar sensor is almost maintenance free. No setting or calibration work is necessary. There are likewise no parts that need replacing regularly.

Carry out the following maintenance work at regular frequencies based on the local circumstances:

- Check the OTT RLS for dirt (e.g. thick, dewy spider's webs or insect nests can lead to impairment of the measured results). In this case, carefully clean the sensor. At the same time, ensure that the setting of the gimbal mounting does not change.
- Check for obstructions in the measurement beam (for example, for flotsam or branches of trees and bushes growing into this area). In this case, remove all obstructions.
- Check the plausibility of the measured values by comparing with a second sensor or with a staff gauge.

Warning: Never open the housing of the OTT RLS (exception: connection area)! There are no adjustment or operating elements inside the housing.

8 Repair

- With a device defect, use Chapter 9 , *Searching for disruptions/error correction* to see if you can resolve the problem yourself.
- In case of device defects, please contact the repair center of OTT:

OTT MESSTECHNIK GmbH & Co. KG
Repaircenter
Ludwigstraße 16
87437 Kempten · Germany.
Telephone +49 (0)831/5617-433
Fax +49 (0)831/5617-439
repair@ott.com

Warning: Only have a defective OTT RLS checked and repaired by the OTT repair center. Never make any repairs yourself under any circumstances. Any repairs or attempted repairs carried out by the customer will result in the loss of any guarantee rights.

9 Searching for disruptions/error correction

Sensor does not respond to the SDI 12 interface

- Fuse in the power supply input side defective?
  → Replace fuse.
- Sensor correctly connected to a datalogger with SDI-12 input (master)?
  → Correct connection assignment.
- Polarity of the power supply reversed?
  → Correct connection assignment.
- Power supply < 9.6 V or > 28 V?
  → Correct level of voltage supplied (check the length and cross-section of the connection cable).
- Is the power supply direct current?
  → Only operate sensor with direct current.

4 .. 20 mA signal not present

- Sensor correctly connected to a datalogger or peripheral device to 4 .. 20 mA input (check polarity)?
  → Correct connection assignment.
- 4 .. 20 mA current loop correctly supplied through datalogger or OTT RLS (internal/external supply)?
  → Correct connection assignment.

Measured value varies or is not present

- Sensor (front plate) dirty?
  → Carefully clean the sensor.
- Obstruction in the measurement beam?
  → Remove obstructions.
- Sensor aligned at right angles to the water surface?
  → Correct sensor alignment.
- Mounting location of the sensor steady (e.g. bridge movement)?
  → Optimize mounting location.
- Large metal surfaces near the sensor beam (e.g. piling)?
  → Optimize mounting location.

10 Note about the disposal of old units

Within the member countries of the European Union

In accordance with the European Union guideline 2002/96/EC, OTT takes back old devices within the member countries of the European Union and disposes of them in an appropriate way. The devices concerned by this are marked with the symbol shown aside.

- For further information on the return procedure, please contact your ocal sales contact. You will find the addresses of all sales partners in the internet on "www.ott.com". Please take into consideration also the national implementation of the EU guideline 2002/96/EC of your country.

For all other countries

- Dispose of the OTT RLS properly after taking out of service.
- Observe the regulations valid in your country for the disposal of electronic devices.
- Never put the OTT RLS into the normal household waste.

11 Determining the maximum load resistance at the 4 ... 20 mA interface

The load resistance (resistor) connected to the OTT RLS must not exceed a specific maximum value. This value depends on the level of the supply voltage of the OTT RLS. If the load resistance is greater, the output current can no longer be evaluated. Smaller load resistances are allowed.

- Read off the maximum load resistance for your power supply from the following diagram.

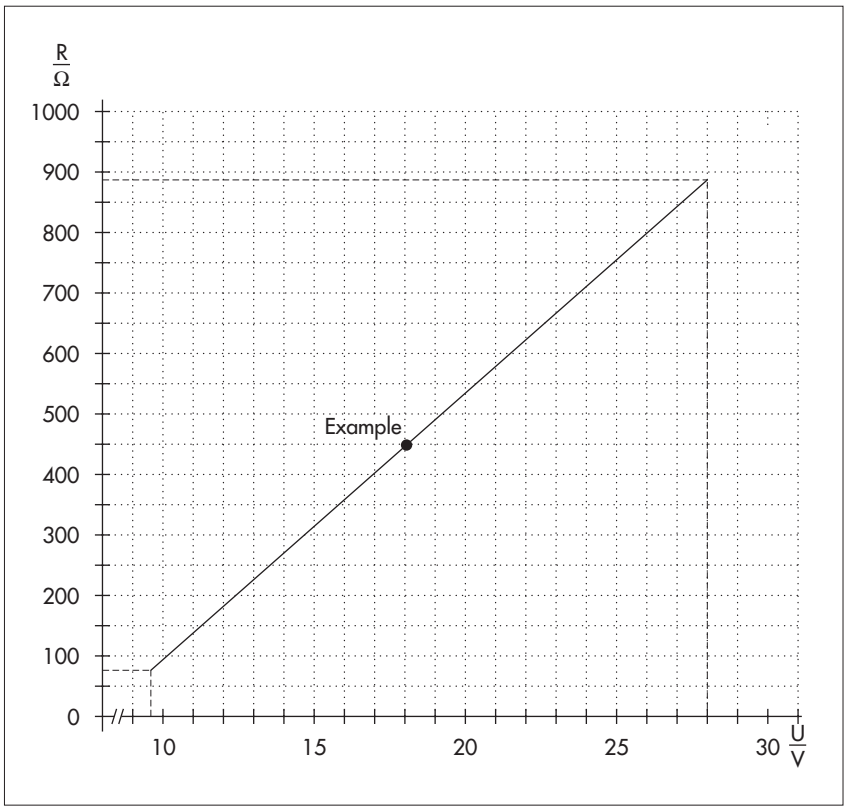
  Example: Power supply 18 volt → max. load resistance 450 ohm.

  The OTT RLS delivers an output current corresponding to the measured value for a load resistance of up to 450 ohm.
- Dimension the connected electrical circuit accordingly. Check the input resistance of the connected peripheral device for this purpose.

Figure 14. Diagram to determine the maximum load resistance as a function of the power supply.

Minimum power supply: 9.6 V
Maximum power supply: 28 V

Resistor tolerance: 0.1 %/15 ppm.



12 Technical Data

Measuring range	0.8 … 35 m	80 … 3500 cm	2.6 … 115 ft
Resolution SDI-12 interface	0.001 m	1 cm	0.01 ft
Measuring time	20 seconds		
Power supply	9.6 … 28 V DC, typ. 12/24 V DC		
Power consumption			
Measurement operation	< 140 mW		
Rest mode	< 1 mW		
Interfaces	4 … 20 mA, SDI-12, RS-485, two-wire (SDI-12 protocol)		
Beam angle of antenna	±6 °		
Materials			
Housing	ABA (UV-stabilized ABS)		
Radom (front plate)	TFM PTFE		
Mounting	1.4301 (V2A)		
Weight (including mounting)	approx. 2.1 kg		
Cable gland sealing range			
with inlet (min. Ø … max. Ø)	4.0 … 7.0 mm		
without inlet (min. Ø … max. Ø)	7.0 … 11.0 mm		
Connection capacity of screw terminal strip			
Solid conductor	0.25 … 2.5 mm^2 (AWG 24 to 12)		
Wire with end cap and plastic collar	0.25 … 1.5 mm^2		
Terminal assignment screw terminal strip			
Terminal 1	power supply		
Terminal 2	RS-485 B		
Terminal 3	RS-485 A		
Terminal 4	4 … 20 mA –		
Terminal 5	4 … 20 mA +		
Terminal 6	SDI-12 DATA		
Terminal 7	GND		
Rotation range of gimbal mounting			
Lateral axis	±90 °		
Longitudinal axis	±15 °		
Type of protection at horizontal installation	IP 67 (submersion depth max. 1 m; Submersion duration max. 48 h)		
Dimensions L x W x H	222 mm x 152 mm x 190 mm		
Temperature range			
Operation	–40 … +60 °C		
Storage	–40 … +85 °C		
Relative humidity	0 … 100 % non-condensing		
EMC limits and radio approvals			
EMV for Short Range Device	ETSI EN 301 489-3		
Safety of equipment of low voltage device	EN 60950-1		
Approval for Short Range Device; Europe	ETSI EN 300 440		
Approval for Short Range Device; USA	FCC 47 CFR Part 15		
Approval for Short Range Device; Canada	RSS 210 Issue 7		

CE

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