

## Part 1 - General

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### 1.1 Section includes:

Impulse radar for hydrometric free field applications for low-energy detection of the water level. Water level detection with automatic arithmetic averaging over 2...20 sec for compensation of the wave influence on the Measurement.  
Designed with maintenance free flat antenna.

### 1.2 Measurement Procedures

Operation of the radar level sensor is based on pulse radar technology. The transmitting antenna emits short radar pulses. 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 automatically, if required, by the radar sensor. To do this, on initial startup there is the possibility of inputting the relevant measurement mode and a reference value.

### 1.3 Alternates

- Staff Level Gauges (manual read)
- Contact Gauges (manual read)
- Float-operated shaft encoder level sensor
- Pressure level sensor
- Bubbler sensor

### 1.4 System Description

#### Performance Requirements

##### Water Level

##### Measurement range:

0.4 ... 35 m; 40 ... 3500 cm; 1.3 ... 115 ft

##### Resolution (SDI-12 interface)

0.001 m; 0.1 cm; 0.01 ft;

##### Accuracy (SDI-12)

0.4 ... 2 m; 1.3 ... 6.6 ft:  $\pm 10$  mm ·  $\pm 0.03$  ft

2 ... 30 m; 6.6 ... 98.5 ft:  $\pm 3$  mm ·  $\pm 0.01$  ft

30 ... 35 m; 98.5 ... 115 ft:  $\pm 10$  mm ·  $\pm 0.03$  ft

Average temperature coefficient: 0.01 % of full scale/10 K (range:  $-20$  ...  $+60$  °C ·  $-4$  ...  $+140$  °F)

##### Accuracy (4 ... 20 mA): $\pm 0.1\%$ of full scale

Average temperature coefficient (at  $+20$  °C ·  $+68$  °F) 10 ppm of full scale/K

Possible deviation at the 4 ... 20 mA output due to strong, high-frequency electromagnetic fields relating to the Standard "CENELEC EN 61000-6-2"  $< \pm 180$   $\mu$ A

##### Measuring time

2...20 seconds; factory setting: 20 seconds

##### Units

m, cm, ft

Pressure sensor

ceramic, capacitive; temperature compensated

Temperature-compensated operating range

-5 °C ... +45 °C

Supply voltage

5.4 ... 28 V DC, typ. 12/24 V DC

Current consumption

Measurement operation < 180 mW (< 15 mA at 12 V)

Rest mode < 0.6 mW (< 0.05 mA at 12 V)

Interfaces

4 ... 20 mA (measurement update every 20 seconds)

SDI-12

RS-485, two-wire (SDI-12 protocol)

Beam angle of antenna 12 ° (±6 °)

Transmission frequency 25.3 GHz

Transmission power < 5 mW

## 1.5 Certifications

Performance classification in accordance with DIN EN ISO 4373

Measurement reliability Performance class 1

Temperature range Temperature class 1

Relative humidity Class 1

EMC limits and radio approvals

CE:

Safety of equipment of low voltage device EN 62368-1:2014 + AC:2015

Approval for Short Range Device; Europe ED ETSI EN 302 729

FCC:

Approval for Short Range Device; USA FCC 47 CFR Part 15

## 1.6 Environmental Requirements

Operational Criteria

Temperature range

Operation -40 ... +60 °C; -40 ... +140 °F

Storage -40 ... +85 °C; -40 ... +185 °F

Type of protection at horizontal installation IP 67

(submersion depth max. 1 m; 3.3 ft; Submersion duration max. 48 h)

Materials

Housing ASA (UV-stabilized ABS)

Radom (front plate) TFM PTFE

Mounting 1.4301 (V2A)

Weight (including mounting) approx. 2.1 kg · 4.63 lb

Cable gland sealing range

with inlet (min. Ø ... max. Ø) 4.0 ... 7.0 mm · 0.16 ... 0.28"

without inlet (min. Ø ... max. Ø) 7.0 ... 11.0 mm · 0.28 ... 0.43"

Connection capacity of screw terminal strip

Solid conductor 0.25 ... 2.5 mm<sup>2</sup> · AWG 24 to 12

Wire with end cap and plastic collar 0.25 ... 1.5 mm<sup>2</sup> · AWG 24 to 16

Relative humidity 0 ... 100 %

## 1.7 Warranty

The product includes a one-year warranty from the date of shipment (EU: 2 years)

## 1.8 Maintenance Service

Carrying out maintenance work

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

Scheduled Maintenance

## Part 2 - Products

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### 2.1 Manufacturer

OTT Hydromet GmbH

### 2.2 Manufactured Unit

The OTT RLS is a radar level sensor for non-contact water level measurement at surface water locations. The sensor uses impulse radar technology to determine the water level. This energy-efficient, non-contact measurement method means the OTT RLS operates with no effect from temperature gradients, water pollution or sediment load and ensures exact measurements.

Its extremely low energy consumption, the large power supply range and standardized interfaces make the OTT RLS very flexible for different applications. It can easily be connected to any data logger and remote transmission system.

With a measurement range of up to a maximum of 35 m the RLS also allows the measurement of large ranges. The OTT RLS is mounted directly above the water surface to be measured, e.g. on bridges or auxiliary constructions. Its solid, relatively light and waterproof housing is easy to install. There is no requirement for complex construction, such as stilling wells or float shafts, as the OTT RLS determines the water level measurements in a measurement cycle that compensates for wave or other rapid water level movements.

The OTT RLS is specifically designed for use in open air locations. The flat antenna construction, its minimal energy consumption and its compact, water-proof housing offer the user a system that is optimised for use at sites that have no requirement for mains power supply.

## 2.3 Equipment

### Radar Sensor

Radar sensor OTT RLS, two part swivel mount (consisting of device and wall brackets with 4 M8 Allen bolts) with SDI-12-, RS-485- and 4 ... 20 mA interface

## 2.4 Components

### Standard Equipment

OTT RLS

Installation kit (4 x wood screws 6 x 40 mm; 4 x plastic plugs S8)

Double open-ended wrenches size 10 x 13

Set of operating instructions

Factory acceptance test certificate (FAT)

Dimensions: L x W x H 222 mm x 152 mm x 190 mm · 8.74" x 5.98" x 7.48"

Shipping weight:

2.1 kg · 4.63 lb (including mounting)

## 2.5 Instrument Options

**Must be selected at the time of order. Choose one or the other.**

Measurement preset

Level

Distance to water

Units preset

Metric

Imperial

## 2.6 Optional Accessories

**Select as many as required .**

Data line LIYY 2 x 2 x 0.75 mm<sup>2</sup> ... m ea.

Data line shielded LIYCY 2 x 2 x 0.5 mm<sup>2</sup>... m ea.

OTT RLS bridge mounting (Mounting aid for attaching the OTT RLS to a bridge; For side mounting; Height according to customer requirements; Distance to bridge according to customer requirements; Including angle bracket for attachment from above)

## Part 3 - Execution

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### 3.1 Preparation

#### Selecting a suitable mounting location

1. Possible mounting locations are, for example, bridges and auxiliary constructions directly above the waterway section to be measured.
2. The minimum distance between lower edge of the sensor and water surface must be 0.4 m; 1.3 ft (dead area in which no useable measurement is possible).
3. Select a mounting point high enough so that measurement is possible even with high water levels.
4. 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. If pillars are available, the sensor can be mounted to a stable positioned pillar with a suitable spacer.
5. The water surface must be as smooth as possible in the area of the sensor beam. Avoid turbulent areas, areas where foam is created, surge areas and waterway sections where obstructions or bridge piers cause changes in the water level. The measurement result cannot be used if there is ice or snow on the water surface!
6. Choose a mounting location that does not become dry at low water levels.
7. The area within the sensor beam must be completely free of obstructions.

### 3.2 Installation

#### Mounting

Assembling the swivel mount

Preparing the cable gland

Align the housing parallel (longitudinal and lateral axis) with the water surface

#### 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 when doing this.

The maximum length of the cable is 100 m; 330 ft.

Recommended wire cross-section: 0.5 mm<sup>2</sup> · AWG 20. With separate voltage supply and point-to-point connection (no SDI-12 bus operation) a cable length of up to 300 m · 985 ft is possible.

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

Connect the OTT RLS to a 4 ... 20 mA input of the datalogger. Follow the datalogger handbook when doing this.

Maximum cable length: dependent on the level of the supply voltage and size of the burden (load resistor). Ensure that the ohmic resistance of the pressure probe cable together with any burden present does not exceed the maximum permitted load resistance.

The upper limit for the cable length is 1,000 m in all cases.

#### Connecting the OTT RLS to any datalogger using an RS-485 interface

The RS-485 interface is designed and tested for use with OTT & Sutron dataloggers. In this case, the transmission protocol via the physical RS-485 interface is the SDI-12 protocol.

The upper limit for the cable length is 1,000 m

### 3.3 Manufacturer's Service and Start-Up