

Technical Note for the OTT RLS 500 installation and site selection:

The OTT RLS 500 radar level sensor accurately and efficiently measures surface water level.

The OTT RLS 500 sensor technology is based on FMCW radar technology. The radar sensor transmits a frequency-modulated continuous wave signal in the frequency range 77 to 81 GHz (W band). The distance measurement is then carried out by an indirect runtime measurement via a frequency comparison of the received signal - reflected from the water surface - to the transmitted signal. The radar sensor then automatically calculates the actual water level of the body of water. To do this, it is possible to enter the corresponding measurement mode and a reference value during commissioning.

The OTT RLS 500 scans the water surface within one second, the OTT RLS 500 HF scans 1, 2, 4 or 8 times, each lasting 100 milliseconds. An OTT RLS 500 (HF) measurement interval is defined as the arithmetic mean of several scans over an adjustable averaging time. The averaging time is 1... 60 seconds (corresponding to 1... 480 scans); factory setting: 1 second.

Installation:

Please refer to the OTT RLS 500 Operating Instructions for detailed information on power requirements, cable diameter, mounting of the sensor, and connecting the OTT RLS 500 to a data logger.

1. The OTT RLS 500 is a precision instrument and should not be jarred or dropped.
2. The OTT RLS 500 should be mounted directly above the water surface, such that the radar beam is perpendicular to the water. The antenna of the OTT RLS 500 should be aligned within 1° of vertical to prevent trigonometric-alignment measurement errors.
3. The OTT RLS 500 requires secure mounting to prevent vertical displacement by wind or vibration. Any movement disturbs measurements and can result in vertical alignment errors.
4. Make certain the OTT RLS 500 is mounted high enough to avoid being submerged during high water or flood conditions.

Figure 1: Sensor beam and footprint of the RLS 500.

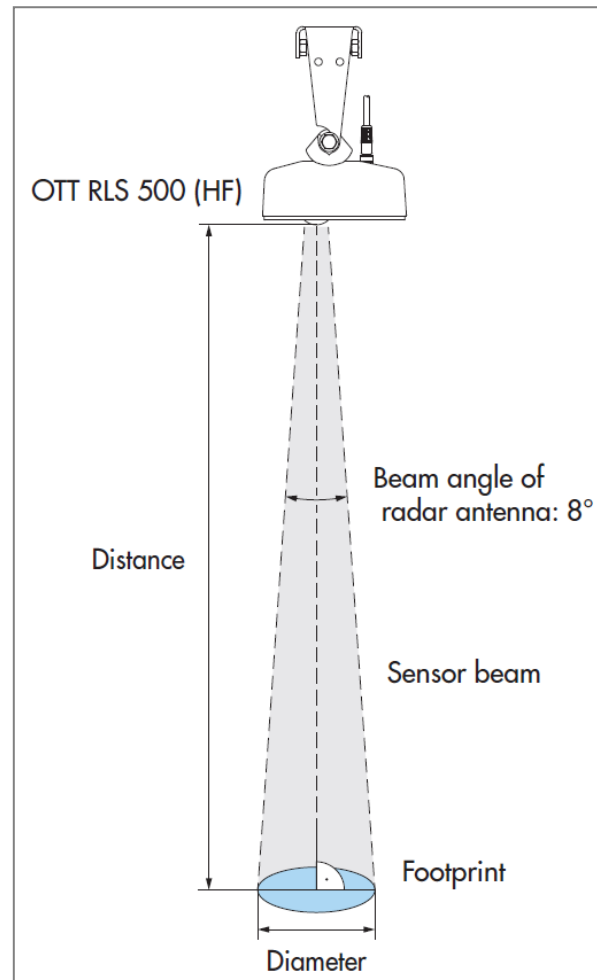


Table 1: Minimum horizontal clearance requirements

Distance (m)	Diameter (m)	Distance (ft)	Diameter (ft)
1,0	0,14	3,0	0,42
2,0	0,28	7,0	0,98
3,0	0,42	10,0	1,40
4,0	0,56	14,0	1,96
5,0	0,70	17,0	2,38
7,5	1,05	25,0	3,50
10,0	1,40	33,0	4,62
15,0	2,10	50,0	7,00
20,0	2,80	66,0	9,24
25,0	3,50	83,0	11,62
30,0	4,20	99,0	13,86

Site Selection:

To obtain reliable and correct measurements the following boundary conditions and installation guidelines should be observed when selecting an installation location for the OTT RLS 500.

1. The OTT RLS 500 has a IP 67 rating and can be mounted outdoors in unprotected locations.
2. Avoid submerged obstructions such as rocks or bridge piers that disturb or influence the water level. Check for such obstructions when the water is at the lowest anticipated level.
3. To minimize the influences of wave action 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 smoother the surface of the water the more accurate water measurement.
Measurement sites with periodic wind may see wind driven waves that could cause noise in the measurement data. This is due to reflection of radar pulses off wave peaks and tends to occur when the water is shallow and there is a large distance between the water surface and the bottom of the sensor, e.g., 20m.
4. There should be a clear path between the sensor and the water to avoid false reflections. The OTT RLS 500's beam path should be free of excessive turbulence, splashing, waves, pipes, wires, and other obstructions that could disturb the measurement. False reflections may prevent the OTT RLS 500 from completing a measurement.
5. The mounting location should also avoid horizontal structural surfaces such as beams, brackets, and side wall joints, these surfaces tend to reflect a strong false signal. A defined minimum horizontal clearance is required to avoid false signals. Refer to the table for minimum horizontal clearance requirements.
6. Be aware that bridges and other large structures expand and contract with temperature. The bridge height can change several cm/inches with diurnal temperature changes. Trucks and other traffic loads can cause transient changes to the bridge height which negatively affects water level measurements. To minimize these effects, the OTT RLS 500 should be mounted near a bridge support point or a pillar, but not directly in the middle between such points. Select a suitable mounting location near a pillar, if possible, that meets the horizontal clearance requirement
7. Signals transmitted from the OTT RLS 500 are reflected off of the water surface. If the measuring site is prone to snow and ice cover,

the signals may be refracted and may not be received by the OTT RLS 500; resulting in a measurement error.

8. Measuring sites where foam is present should be avoided. Foam absorbs the transmitted impulse, preventing it from returning to the receiving antenna. The degree of absorption depends on the type of foam, its thickness and density. The impulse can be completely absorbed.
9. Rain does not affect measurements, except in the event of tropical rain fall or heavy rain, with intensities of more than 30 mm/h (1.18 inch/h)

Figure 2:
Mounting the OTT RLS 500 on a bridge.

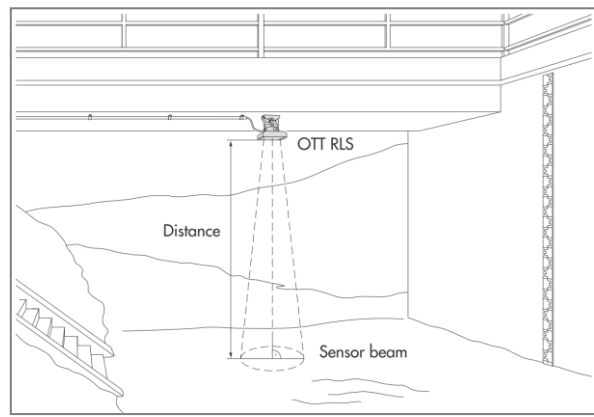
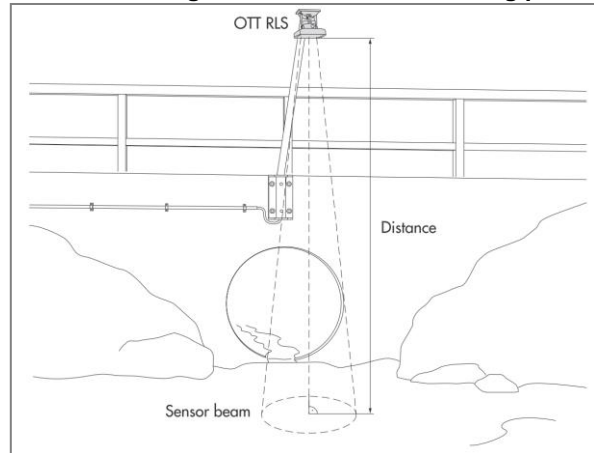


Figure 3:
Mounting the OTT RLS 500 on an auxiliary construction, e.g. metal stand with mounting plate.



Installation in shafts and stilling wells:

Due to its narrow beam, the OTT RLS 500 can be used in shafts and stilling wells. Still there are some points to consider:

1. Proper installation is crucial. Ensure the radar sensor is correctly aligned and that the stilling well or shaft is free from obstructions that could interfere with the radar signal.
2. The diameter of the well should be large enough to accommodate the expanding radar beam. If the well is too narrow, the radar signal may reflect off the walls, causing inaccurate readings. Ideally, the well diameter should be at least two to three times the beam width at the maximum measurement distance.
(Refer to Table 1 for beam diameter)
3. Regular maintenance is necessary to ensure the stilling well remains clean and free from buildup, which can affect measurement accuracy
4. The OTT RLS 500 does not have EX-protection! Do not use it in EX rated areas.
5. Especially metal shafts and wells can lead to reflections of the radar signal. Use longer measurement & averaging time if measurements are noisy.