FREQUENTLY ASKED QUESTIONS – OTT SVR 100

SITE – GENERAL

1: Does the SVR 100 radar sensor has to be installed above the water course? How far from the side / shore can be measured?
If possible, the sensor should be positioned in such a way that it detects the area of the maximum surface velocity looking perpendicular onto the surface. For uniform flow cross-sections, this area is usually located in the middle of the stream. A measurement from the shore is critical, because in this case much less energy returns to the sensor. In addition, the software will not apply an angle compensation for the orientation angle (angle of view from the shore in the direction of the center of the current).

2: What is the maximum distance from sensor to water surface?
It is 25 meters.

3: What is the minimum temperature for field employment?
The SVR 100 operates in a range of -40°C to +85°C. For a measurement, however, the water must be ice-free.

4: Does the wave velocity always correspond to the flow velocity?
Yes, a basic assumption for surface velocity radar sensors is that the waves on the water surface move with the flow velocity.

5: At higher water levels – are standing waves a problem?
Yes, the measurement of standing waves is not representative for the discharge of the water course. Standing waves may cause erroneous v-measurements.

6: How is the calibration done when the water river bed is normally dry? And in case of rain, there is no way to check the measured value?
The calibration is carried out with the help of the Prodis 2 software. All necessary information about the measuring cross-section, the water level range and the settings of the measuring system can be stored and managed there. A theoretical model provides k values based on an assumed logarithmic velocity distribution in the measurement cross section.

7: What is the definiton of k-factor?
The k-factor is a factor used to compute the channel's mean velocity from the locally measured surface velocity.

8: What theoretical model do you use for this case (dry channel)?
The theoretical model works with the velocity distribution according to Hulsing, Smith and Cobb. *(Hulsing, Harry, Smith, Winchell, and Cobb, E. D.: Velocity-head coefficients in open channels. In: U.S. Geol. Survey Water-Supply Paper 1869-C, S. 7 (1966))*

9: Is it possible to enter k-factors depending on the waterlevel?
The OTT SVR 100 is a pure speed sensor. There is no possibility to store the measured data on the sensor or to calculate the discharge on the sensor. Water level dependent k-factors for the discharge calculation are administered on the data logger, which is used for the flow calculation (e.g. OTT netDL). There they can be entered manually or imported from an XML file.

10: Is it possible to adjust the direction of the measuring device to a certain area on the water surface?
Yes. The alignment of the device is done by eye, so that the sensor is aligned parallel to the bank and around the recommended angle of inclination against the water surface. The aim is to measure in the range of the maximum surface speed.

The angle of inclination can vary between 20° and 60°, whereby the optimum range is between 30° and 45°.

11: How do I know where the SVR measuring spot is, or where the SVR measures?
Location and size of the footprint vary depending on water level, the installation height and the tilt angle. You may apply trigonometrical formulas for the computation of the footprint area and location or use an excel sheet which we provide on request.

12: Is there a problem with weeding above and below the measuring cross section? This will also influence the ratio.
Weeding is usually accompanied by an increase in the water level and a reduction in the surface velocity (with the same discharge). The velocity profile changes, the change in the ratio of vo max to vm can be modelled or determined by calibration measurements.

13: Is it possible to use the device in channels that change their shape and cross-section area after floods?
In principle yes, but you'll need to adjust the velocity index rating after the flood is over. OTT Prodis 2 will manage the cross-section data by date and time.

14: Is there any setting for Manning coefficient? How is the roughness of river bed considered?
The current version of OTT Prodis 2 provides three types of calibration models (theoretical model, multipoint measurement model and velocity – index – method). Currently the theoretical approach is based on a logarithmic velocity distribution (documented by Hulsing, Smith & Cobb) and does not consider Manning coefficients. But it is planned to consider Manning coefficients in the next Prodis 2 release.

15: Is Prodis 2 an additional software or will it be shipped with the OTT SVR 100?
OTT Prodis 2 is not included in the scope of delivery. It needs to be ordered separately.

16: In which area around the measuring device or around the measuring spot may persons stay for an unlimited time period?
In order not to falsify the measurement result, persons should not be in the radar beam. This must be observed when, for example, hydrometric comparative measurements are carried out for calibration purposes. The width and position of the measuring surface can be determined by trigonometric calculations.

17: How long can the device be unattended?
The sensor usually doesn't require regularly maintenance. If the sensor alignment has changed (e.g. due to vandalism or other reasons) it needs to be readjusted. It probably will happen that insects enter the hollows of the housing, but this isn't an issue.

WEATHER & ENVIRONMENTAL INFLUENCES

1: Which weather influences have an effect on the measurement quality?
These are:
- Rain (e.g. if the sensor is looking in the flow direction)
- Snow (if the sensor is looking in the flow direction)
- Storm events with strong wind (vibration of the sensor, cross-flow on the water surface

2: What can be expected in terms of reliability in snow and temperatures below zero? (Use in the Alps)
As with rain, the influence of snow can be eliminated by directional separation (alignment against the flow and definition of the flow direction). The sensor itself works down to -40° C.

3: It's been said that there's a problem with wind from the side. I think, however, that headwinds also change the ratio dramatically.
The influence of wind is an issue especially in very slow flowing waters. Depending on the wind direction, the flow velocity is increased or decreased. In many cases, the influence of wind on the measurement accuracy is negligible and can be compensated by averaging the time. The only exception are strong wind gradients, as these generate surface waves that move in different directions than the water flows.

4: What about turbulent rivers? Do we have some sensor options to measure velocity at this type of rivers?
It depends on the characteristic of the turbulence. At water surfaces with macroturbulences the sensor will not work.

5: How effective is the sensor in tidal sites with bi-directional flow?
Since the direction of flow is detectable the OTT SVR 100 can be used for monitoring tidal flow as well.

OPERATION

1: How long does it take for a reliable measured value to be available after switching on the device? Does the SVR 100 have a warmup time after power before the measurement starts?
On average it takes 30 to 40 seconds depending on the site characteristics and turbulences on the water surface. This settling time will allow the sensor to tune programable gain, filters, tracking algorithms and all other internal adaptive systems for best SNR and best measurement accuracy.

2: Can the instrument be waked up by an SDI-12 command for measurements?
No. The OTT SVR 100 does not provide a physical SDI-12 interface. Once it is powered, it measures continuously. If consumption matters (e.g. in solar applications) you must switch power on/off by using a relay.

3: Is the sensitivity adjustment dynamic? Can the device make its own dynamic adjustment depending on the roughness of the water?
Yes, an important parameter of the radar signal is the signal - to - noise behavior (SNR). To internally improve the SNR value, the sensor uses a PGA (Programmable Gain Amplifier) module with an automatic gain control.

4: Where does the discharge calculation take place?
The calculation takes place in an external datalogger (e.g. OTT netDL 500 or Sutron XLink).

5: Is it possible to configure the radar sensor using SDI-12 commands without using the USB adapter?
Yes, you can communicate with the sensor on site through the acquisition station, using a PC.

6: How is quality control of the data received?
Received data will need to be check first by the user visually (hydrograph). Depending on the post-processing platform you may also apply automatic controls. Meta data will help you to identify erroneous measurement data.

7: Are periodic calibrations required? How often?
The OTT SVR 100 doesn't require a calibration. If it is used to computed discharge the system needs to be calibrated to get the mean channel velocity from the surface velocity. If a velocity – index – rating will be set up 5 … 10 calibration measurements at different flow situations are recommended.

8: What is the time averaging of flow velocity measurement?
The length of the moving average filter for flow measurement is user definable between 1 and 512. Factory default is 50. One sample for moving average is 1/10 per second.

9: Can the average velocity be calculated for a user defined period or is it set in the instrument?
Yes, the length of the moving average filter is user definable.

10: What is involved in maintenance of the mean velocity to surface velocity relationship?
You'll need to conduct hydrometric calibration measurements to develop a velocity–index–ratio. 5 … 10 measurements at different flow situations will be sufficiently to develop a good ratio. You may apply OTT Prodis 2 to manage the velocity–index–ratio. The index–ratio may be subject to change if the cross-sectional area has changed after extreme events (e.g. erosion of the river bed during a flood). Starting a new system, the calibration will be based on a theoretical model approach.

11: How can relative signal intensity can be used?

The instrument provides a signal quality indicator in a range of 0 (good signal) to 3 (very bad signal). This indicator will be reported with each velocity measurement value. The values 1 and 2 most commonly will be reported when the internal amplifier (PGA) gain is being switched as during this time there are some fluctuations in the signal.

12: How can the vibration index be used?

The vibration – index can be used to detect possible vibrations during the velocity measurement. Vibration may affect the accuracy of measured values. Each velocity measurement comes along with a vibration – index. If the index indicates strong or very strong vibrations it is recommended to discard the measured values. This needs to be done during data post-processing procedures.

APPLICATION GENERAL

1: Are two radars interacting when installed side by side? Is it possible to use SVR and RLS at the same time?

No, two radars installed next to each other do not influence each other. You can therefore use several OTT SVR 100 radars for measuring very wide water courses. The same applies to using OTT SVR and OTT RLS at the same time.

2: How many units are required for a river span of 300 m? What is the minimum recommended distance between two units?

It depends on the shape of the cross-section, the river geometry as well as on water level variations. There is no recommended minimum distance as it is very unlikely that two or more radar sensors will interfere.

3: Can this system also be used to measure flow rates of wastewater treatment systems?

The OTT SVR 100 can be used at each open channel, but you'll need to care for the footprint size at the water surface. Waste water channels may be very narrow. In addition, the sensor does not provide ATEX approval.

4: How can I install units for hydro power plant for both ingoing and outgoing discharge data?

The sensor can be configured to measure both, positive and negative flow. If you want to have both, you'll need to install at least two sensors, one upstream of the power plant and one downstream. If you provide us the site info we can assist you in site reconnaissance. There is also a questionnaire for continuous measurement stations available at our homepage.

5: Can the sensor be moved to make spot measurements?

The OTT SVR 100 is designed to operate continuously on a fixed installation. However, if you use a tripod, keep the sensor in a fixed position, have a 12 VDC (or 24 VDC) power supply and a field PC it is theoretically possible.

COMPATIBILITY WITH OTHER DEVICES / PROTOCOLS

1: What are your recommended water level sensors to be worked with this velocity sensor?

We recommend OTT RLS for level measurement. We are currently designing a combined mounting for both OTT SVR and OTT RLS. But if you already have a different sensor on site you may also use this one of course.

2: Is it possible to connect the sensor to an ADCON datalogger?

The OTT SVR 100 need a 9 …27 VDC power supply. The ADCON RTU provides less than 9 V. If you can power the OTT SVR 100 separately you can connect it via Modbus to an ADCON RTU.

3: Can the OTT SVR 100 be connected to 3rd party dataloggers/PLC via Modbus? Are Modbus commands available?

Yes, the OTT SVR 100 provides a Modbus RTU communication protocol.

4: Is it possible to get the data visualization at addVantage Pro? Maybe sending the data in MIS files?
If the logger in the field is an OTT netDL the data exchange format is MIS so advantage Pro will be able to visualize the data.

5: Can the sensor be integrated with an Arduino for data logging?
Yes, this is possible. The sensor uses on the RS232 interface a protocol which is based on the standard NMEA protocol. All information provided over SDI-12 are present in that protocol structure. A protocol description can be provided on request.

TESTS – CERTIFICATES

1: Has the measurement accuracy of the instrument been certified by an independent laboratory?
Yes, we got a certificate by METAS for the velocity range of 0.08 – 2 m/s. METAS operates one of the oldest calibration channels in the world with a length of 140 m. Further information can be found here: https://www.metas.ch/metas/en/home/fabe/hydrometrie.html. The SVR 100 was attached to the trailer and driven across the water at different speeds. The roughness of the water surface was ensured by a mechanical device.

2: Has the sensor been tested on ephemeral streams for flood water?
No, the sensor has been tested long-run at our gauging station in Kempten where velocities vary depending on the downstream management of the water power station and the stream flow of the river Iller. If the river is ephemeral the sensor needs to be switched on depending on the water level to avoid erroneous measurement values.

3: Which is the ISO guideline for surface velocity measurement?
There isn't an ISO guideline published yet. There is an ISO work group working on a Standard with the headline: "Hydrometry - Use of non-contact methods for measuring water surface velocity and discharge". A publication is scheduled for mid of 2019 at the earliest.