Stationary Discharge Measurement
OTT SLD
Doppler technology for continuous discharge measurement in flowing waters

OTT SLD

Side Looking Doppler with smart signal evaluation

The OTT SLD is a stationary unit for continuously measuring flow velocity and water level in rivers, streams, and open channels. This energy efficient system employs the acoustic Doppler principle of operation to provide reliable measurement results, even at high water level and high concentrations of suspended material. The sensor is designed for installation at the water's edge and is easily installed using a convenient stainless steel support structure that allows for quick and cost-efficient maintenance. The OTT EasyUse software facilitates systematic on-site setup using a PC or tablet.

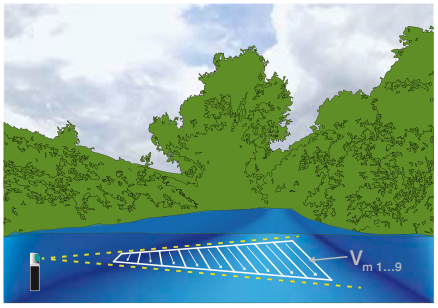
The SLD is fitted with two horizontal ultrasonic transducers that measure water velocity perpendicular to flow. Water level is measured by an optional vertical acoustic beam using the travel time method and cross-referenced with an integrated pressure measurement cell. The internal signal processor evaluates collected measurements before storing or transmitting velocity, water level or calculated total discharge.

Total discharge can be calculated internally or by a datalogger that is connected to the system via SDI-12, RS-485 using SDI-12, or Modbus. The SLD unit is a highly flexible continuous discharge measuring system that may be used in a large variety of applications.

Quantitative
Hydrology

OTT SLD – advanced features, flexible options

Sophisticated flow velocity measurement



Two transducers arranged in the sensor head in a concave or convex manner, transmit horizontal ultrasonic signals into the water. These transmitted signals hit suspended matter or other water particles, generating frequency-shifted echo signals. These signals return to the transducer, where the frequency shift is measured. The resulting frequency shift is proportional to the flow velocity in the measured volumes.

The OTT SLD measures the signal propagation time. Therefore, the distance traveled by the echo signals is known and associated flow velocities can be allocated to specific measurement cells. The SLD determines flow velocities in nine measuring cells and provides the discharge calculation for all cells (available output using discharge measurement mode). Interference caused by shallow vessel draft passing through the measured volume is filtered to prevent the measurement result from being distorted.

Quality check for improved data

To ensure high-quality values are measured all the time, the strength of echo signals received from individual measuring cells is recorded and analyzed. This is an important criterion for determining the plausibility of measured values and provides valuable information on changes in measurement conditions, for example when flooding causes an increase in suspended material or passing vessels cause measurement interruptions. In such cases, the operator of the measuring system can be alerted immediately or the system may respond autonomously using the vessel filter.

Optional: Water level measurement included

For measuring the water level, an additional vertical transducer transmits ultrasonic signals to the water surface. The propagation time of several sonic pulses travelling to the water surface and back is measured. From these values, an evaluation algorithm derives the distance between sensor and water surface and calculates the water level. To exclude incorrect measurements, e.g. caused by local interference, the acoustic water level measurement is supported by an absolute pressure cell.

Advantages

- High measuring accuracy (± 3 mm)
- High immunity to atmospheric pressure variations
- Sophisticated algorithm for signal evaluation

Internal or datalogger calculation – discharge measurement as desired

The OTT SLD has two measurement modes:

- Velocity measurement mode (combined with optional water level measurement)
  Calculation of discharge occurs in the data logger.
- Discharge measurement mode (with integrated water level measurement)
  Discharge is calculated by the SLD.

The SLD unit is highly flexible and supports simple integration into existing infrastructure, including a smart station manager. It is also for use as a stand-alone measuring system that outputs discharge values or velocity and water level measurements. The optional gateway allows Modbus communication and provides a solution for networking the SLD with a supervisory process control system.

For external discharge calculation (velocity measurement mode), the unit is simply connected to the datalogger using the SDI-12 interface, e.g. to the OTT netDL. The datalogger receives the required water level data either from the SLD unit itself or the data is provided by an external water level sensor. The velocity measurement mode is recommended for applications in which the datalogger operates as a centralized station manager that serves several sensors and forwards the data collected to centralized computers or web servers.

Optimized correction factors using OTT Prodis 2

When using the velocity index method, the discharge calculation uses the average cross-sectional velocity derived from the flow velocity values received from individual measuring cells. In which case, station specific correction factors are required. Using the OTT Prodis 2 calibration software, you can precisely determine and continuously adjust the correction factors of a station. The software wizard provides comprehensive information on each step. The structure of the menus makes the process transparent. As a result, the software provides a calibration table containing correction factors for different water levels. Export the table to the OTT SLD or datalogger to simplify commissioning and ensure realistic and long-term accurate results.

The right sensor type for your station

Both measuring frequency and beam angle are critical for the profiling range of an ultrasonic transducer. Lower frequencies result in a larger range than higher ones. Of course, the conditions at the station have an impact. The OTT SLD unit is available in two designs (horizontal or vertical installation) each of them providing three different frequencies. These designs offer the flexibility to adapt your flow measuring system to the local conditions in an optimum way.

	OTT SLD 2.0	OTT SLD 1.0	OTT SLD 0.6
Frequency	2 MHz	1 MHz	600 kHz
Beam angle	2.1°	2.4°	2.4°
Max. profiling range*	10 m	25 m	80 m
Size of measuring cell	0.2 ... 2 m	1 ... 4 m	2 ... 10 m
Blanking	0.1 ... 8 m	0.3 ... 15 m	0.5 ... 30 m

*The maximum profiling range depends on the conditions at the station and on the sediment load.

Convenient wall mounts for secure installation and easy maintenance

Depending on the local conditions, the OTT SLD unit may be installed vertically or horizontally. For quick and secure installation, we provide dedicated stainless steel mounts featuring low flow resistance. They are designed to be used on paved or on natural bank slopes and may be installed vertically or at an inclined position.

Covering and protecting the sensor and cable is a stainless steel hood. The sensor installation bracket is mounted to the C rail mount as a slide. This helps reduce maintenance efforts, as the slide is easily moved up or down. When the sensor requires cleaning, it is simply removed from the water by sliding the sensor up the rail. For hybrid systems (combined with a time differential system), the C rail mount provides space for the sensors on several levels.

Professional support for design and installation

Reflections caused by obstructions located in the measuring path or at the water surface/water bed affect the flow velocity measurement. Therefore, it is important to evaluate potential stations and review their surrounding conditions precisely. Rely on the OTT Hydromet expertise and benefit from experience gained over decades. Both during the early planning stage as well as for detail planning, you may get assistance from highly skilled experts who are very familiar with the requirements for discharge measurement.

Also, installing the measuring system is in the best hands with OTT. Any underwater operations such as sensor installation, cable laying, or cleaning the water bed may be done by specially trained divers. For performing these tasks, we closely cooperate with experienced providers who specialize in installing discharge measuring systems. This ensures professional installation, careful completion of all connecting operations, proper parametrizing, and optimum alignment of the sensor. Because your measuring system should operate reliably from the beginning!

OTT SLD – always reliable data

Features and benefits

— Continuous measurement of flow velocity and water level, increases temporal availability of flow velocity and discharge data
— Discharge calculated by the sensor, outputs total discharge to data collection platform (optional)
— Supports multiple communciation interfaces, including SDI-12 and Modbus, offered on most hydrologic data loggers or process control systems
— Cylindrical sensor shape, minimizes flow resistance
— Signal strength measurement enables data plausibility and quality assurance checks
— Automatic calculation of total volume – minimizes data processing
— Vessel filter greatly minimizes interference caused by passing vessels or water craft
— Minimal power consumption permits solar powered operation
— Prodis 2 Software (optional) calculates correction factors and facilitates station management of multiple data sets

Reduce installation and maintenance effort

— Installation on one side of the water – one sensor per station is sufficient
— One sensor cable – minimizes underwater operations
— OTT SLD EasyUse software – efficient system setup and commissioning
— Engineered wall mount accessories – protect sensor and help to easily raise sensor for maintainance
— Horizontal or vertical alignment – ideal for use along natural or artificial banks

Applications

Continuous discharge measurement in open channels and canals
(natural or nearly natural flowing waters, canals)

— Shipping, irrigation, and process water canals
— High sediment content waters/flood situation
— Also suited for small waters (smallest cell is 20 cm)

Technical data

Flow velocity measurement
- Measuring range: –10 m/s ... +10 m/s
- Accuracy: 1% of meas. value ±5 mm/s
- Resolution: 1 mm/s
- Measuremt. averaging time: 1 s … 3600 s

Number of measuring cells
9

Cell size / Blanking
- 600 kHz: 2 … 10 m/0.5 … 30 m
- 1.0 MHz: 1 … 4 m/0.3 … 15 m
- 2.0 MHz: 0.2 … 2 m/0.1 … 8 m

Beam angle/Max. profiling range*
- 600 kHz: 2.4°/80 m
- 1.0 MHz: 2.4°/25 m
- 2.0 MHz: 2.1°/10 m

Supply voltage
12 … 16 V DC, typ. 12 V

Power consumption
50 … 500 mW, depending on measurement interval

Water level measurement (optional)
- Measuring range: 0.15 ... 10 m
- Accuracy: ± 3 mm
- Resolution: 1 mm
- Measuremt. averaging time: 1 s … 3600 s

Minimum water depth above instrument
0.15 m (water level option)

Pressure cell (optional)
- Piezo-resistive
- Measuring range: 0 ... 10 m
- Accuracy: ±0.25 % FS
- Resolution: 1 mm

Internal memory
Capacity: 9 MB (non-volatile)

Communication interfaces
- RS-232
- SDI-12 or SDI-12 via RS-485
- Modbus (optional)

Maximum cable length
- RS422/485 max. 500 m (9600 Baud)
- RS232/SDI-12 max. 65 m (9600 Baud/1200 Baud)

Environmental
- Operating temperature: –5 °C ... + 35 °C
- Storage temperature: –40 °C … +70 °C
- Protection class: IP68

Dimensions
- Length: 45 … 52.2 cm, depending on measuring frequency
- Ø: 7.5 cm (cylindrical)

Housing material
POM

Plausibility check
Through status information

SLD wall mount (accessory)
Bracket, protective cover, and C rail mount
- Material: Stainless steel
- Details on request

Discharge calculation
Within the unit or externally on a data-logger, e.g. OTT netDL

OTT SLD EasyUse
Installation and service software
- System setup
- Commissioning
- Reviewing and optimizing

OTT Prodis 2 (accessory)
Calibration software including online help
- Determining correction factors (velocity-index method and others)
- Optimizing discharge calculation
- Managing stations

*The beam angle is understood to be the measured angle with regard to the main axis. The maximum profiling range depends on the water profile, salinity, suspended matter content etc.

Germany
OTT Hydromet GmbH
Ludwigstrasse 16 · 87437 Kempten
Phone +49 831 5617-0 · Fax -209
info@ott.com · www.ott.com

22.330.000.P.E Version: 03-02/2014