

#### Stationary Discharge Measurement

OTT Sonicflow

Ultrasonic system for continuous discharge measurement in flowing waters



## OTT Sonicflow

Travel time differential approach for precise flow velocities

OTT Sonicflow is used for discharge measurement in rivers and canals around the world. Thanks to up-to-date ultrasonic technology and smart signal evaluation, the rugged measuring system provides precise values even in shallow waters. It can be used for waters between 5 m and 200 m in width.

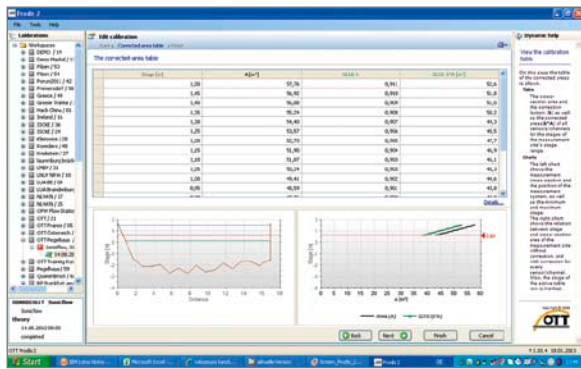
Two ultrasonic transducers arranged at the banks in a diagonally offset manner simultaneously transmit sound pulses into the water and then receive the signals at the opposite side each. Along with the direction of flow, sound is accelerated, whereas it is decelerated against the direction of flow. The propagation times of the signals are measured. A digital signal processor analyzes them and determines the exact travel time differential. It is proportional to the average flow speed in the measuring path.

In the datalogger connected (e.g. OTT netDL), the discharge is then calculated as the product from the cross-section flow through, flow velocity measured, and water level dependent correction factor.

Quantitative  
Hydrology

# OTT Sonicflow – as each station is different

## Optimized discharge calculation using OTT Prodis 2



Systems based on ultrasonic propagation time measurement calculate the discharge as a product of the cross-sectional area flown through and average cross-sectional velocity. The latter item is determined from the flow velocity measured and a water level dependent correction factor.

For multi-level systems, correction factors are not necessarily required. In such a case, the discharge may also be calculated directly using the Mean Section method (according to ISO 6416).

### Comprehensive overview

Additionally, OTT Prodis 2 provides useful features to manage cross-section geometry and all important parameters of stations and measuring systems. This allows a fast and complete overview to be obtained.

For determining station specific correction factors, OTT Prodis 2 software provides different calibrating methods, from simple model approach through measured velocity profiles to the velocity index method. Each type of calibration results in a K value table that is imported into the datalogger and used in the calculation of the average cross-sectional velocity.

The software is also very easy to use. Assisted by the online help, you simply step-by-step click through the menus, from creating the station up to exporting the K value table. Upon completing a calibration, the software will create a report showing all important data on the measuring system and calibration.

This allows an easy startup of the equipment. Moreover, Prodis 2 helps to continuously improve the calibration taking into account station specific hydraulics over time. This ensures that high-quality results will be obtained in the long run.

## Creating the proper path for your measuring task

With the OTT Sonicflow unit, a maximum of 8 measuring paths can be implemented. It depends on the particular station how many measuring paths are required and how to place the transducers. The following configurations are conceivable:

### Single-path system

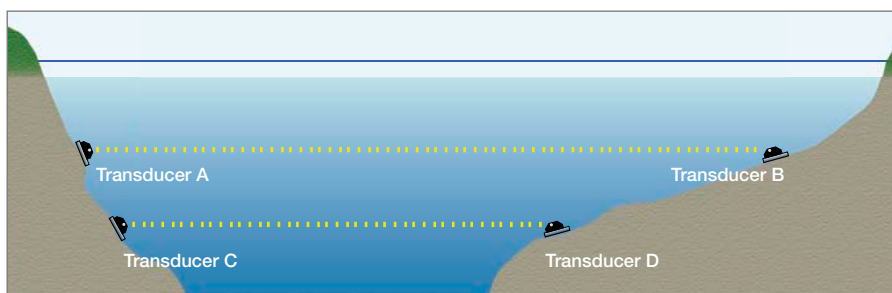
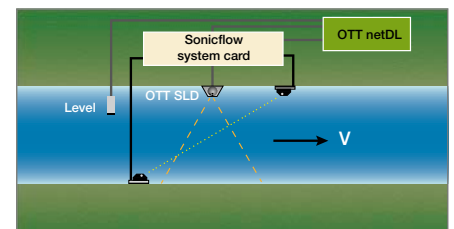
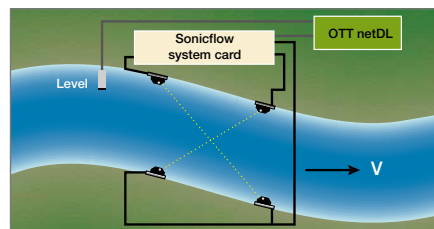
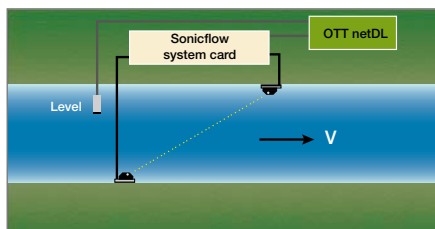
When the main flow is parallel to the banks, a simple configuration using only one path is possible (e.g. canals, completed straight water sections).

### Cross-path system

In difficult locations, where the main direction of flow is not parallel to the banks, four transducers the paths of which are crossing provide dependable measurement values (e.g. naturally meandering waters, measuring tracks downstream of river bends).

### Hybrid system

The benefit of a hybrid system including OTT Sonicflow and OTT SLD is a redundant flow measurement using different physical principles (travel time and Doppler methods). This ensures reliability of the measurement data even in events resulting in increased suspended matter loads (flooding).



### Multi-level system

Multiple levels are useful for measuring cross-sections showing heavily varying water level or flooding (e.g. for divided stations with flood plains).

### Competent support during design

We will assist you when you are designing your discharge measuring equipment. Together with you, we will inspect the site and analyze all relevant information on the station at first. Then we will jointly create a solution that is tailored to your station. Also for project detail planning, you will find competent experts with us who precisely know what is to be taken into account. We all pursue the same goal – reliable measurement data.

*Abstract of the OTT questionnaire for evaluating continuous discharge stations* ▶

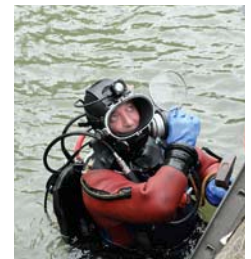
Information on the waterway hydraulics		
▶ Waterway course	straight	<input type="checkbox"/>
	sharp bends	<input type="checkbox"/>
	meandering	<input type="checkbox"/>
▶ Velocity distribution in measurement cross-section	gentle bends	<input type="checkbox"/>
	regular	<input type="checkbox"/>
▶ Influenced by vegetation in measurement cross-section	irregular	<input type="checkbox"/>
	vegetation on edge area	<input type="checkbox"/>
	vegetation on bed	<input type="checkbox"/>
...	...	

### Everything is feasible – underwater installation operations



Installing underwater sensors should be reserved for professionals. However, the respective effort should be kept within a limit. Therefore we have created solutions that are feasible and reduce the expenditure of time required. Together with an experienced provider specializing in installing discharge measurement systems, our HydroService department operates efficiently and professionally – from securely installing the transducers through routing and connecting the required cables up to incorporating the sensors into the local elevation system.

All underwater operations are carried out by professional and specially trained divers. They install the transducers using appropriate tools that are specially designed for carrying out underwater operations and properly align the transducers. Divers also clear the water bed along the acoustic paths of obstructions so that the sound signals can propagate without being disturbed. This ensures reliable operation of the measuring system.



### Useful wall brackets for a quick installation

Each Sonicflow transducer is embedded in a frame that is seating well-protected in a rugged transducer support. It may be rotated into any direction enabling the transducer to be precisely aligned.

For easy and secure installation of the transducer supports, we recommend using streamlined stainless steel brackets that are specifically manufactured for the OTT Sonicflow unit. They allow the transducers to be installed on fortified or non-fortified bank slopes and additionally protect the transducers against floatsam. Optionally, each transducer support is shipped pre-assembled onto a respective base plate with adjustment ring for adjusting the inclination. Of course, we also manufacture customized brackets when required by your station.



#### Support structure

Here, the base plate of the transducer support is installed to a stainless steel structure which has an approximate diameter of a plate. The support structure is designed to be used for stations with rather shallow water level in which case the transducers are easily accessible.



#### C rail mount

For higher water levels, C rail mounts are beneficial. Here, the base plate is mounted to a C rail as a slide. This allows the transducer to be easily moved for cleaning or servicing. Also, the height of the measuring level may easily be changed if necessary. For multi-level systems, multiple transducers may be installed one above the other to longer C rails.

The C rails are suited for vertical or inclined installation.



# OTT Sonicflow – continuously better

## Flexible service contracts for long-term optimized discharge data

Whether for regularly controlling and optimizing your discharge measuring system, for repairs or for providing the data – we offer flexible service contracts that include service modules which are fully customized to your needs. Rely on the OTT HydroService expertise and benefit from manageable maintenance and long-term available verified discharge data.

## Features and benefits

- Compact, modular system design – allows for individual configuration according to type of water and requirements
- Rugged transducer support – optimum protection and precise sensor alignment
- Sturdy stainless steel wall brackets – minimum flow resistance, secure installation, and easy maintenance
- Only little sensor coverage necessary – can also be used in shallow water
- Intuitive calibration software – professional calibration of the measuring system as well as easy-to-use management of measuring cross-section and system parameters
- Low power consumption – optional battery or solar operation
- Lightning protection incorporated



## Applications

- Continuous discharge measurement in open channels and canals, also in shallow, wide waters, tidal areas, estuaries (backwater, changes in direction of flow)
- Reliable discharge control in cooling water canals, e.g. in power stations
- Precise control of tidal gates, sluices, dams, sample collectors etc.
- Precise flow measurement for controlling irrigation canals



## Technical data

### Measuring range flow velocity

–10 m/s ... + 10 m/s

### Accuracy flow velocity

1% of measured value  $\pm$  2 mm/s  
(for a single-path standard installation with path length of 100 m and path angle of 45°)

### Waterway width

5 ... 200 m

### Measuring paths

- Number: 1 ... 8
- Path lengths: 14 ... 300 m  
Depending on the conditions at the measuring site

### Ambient temperature

– 10 °C ... + 60 °C

### Ultrasonic transducer (transceiver)

- 30 m connecting cable (standard)
- Frequency: 250 kHz
- Band width: 50%

### Power Supply

9 ... 15 V DC, typically 12 V DC

### Power consumption

300 mA (active); 0.1 mA (stand-by)

### Sonicflow system card

Basic card for installation in a protective housing

- For connecting up to two measuring paths
- May be extended with expansion cards to handle a maximum of 8 paths
- European size (L x W x H)  
160 x 100 x 60 mm
- RS-485 output for connection to an external data logger (e.g. OTT netDL, OTT LogoSens2)
- Digital signal processor (DSP) for state-of-the-art signal analysis and exact calculation of transit times.  
Coded signal transmission possible
- Integrated overvoltage protection of sensor inputs (transducer)

### Protective housing (accessory)

Plastic housing «MIDI»; for accommodating Sonicflow system card with expansion cards; to be fitted on the wall of the enclosure or similar construction

### Discharge calculation

Inside the datalogger, e.g. OTT netDL

- Storage capacity: 4 MB
- Continuous discharge measurement
- Output e.g. via modem or 4 ... 20 mA interface
- IP communication
- Alarm management
- Connection of additional sensors possible

### OTT Prodis 2 (accessory)

Calibration software for:

- Calculation of correction factors
- Optimization of discharge calculation
- Administration of measuring sites.

### Transducer frame and support (accessory)

- Material: POM, black
- Easy assembly and alignment

### Wall bracket (accessory)

Depending on the type of waterbody, support structure or C rail mount

- Material: stainless steel
- Details on request