

measure analyse optimise



## IoT-Ready Flow Measurement Technology



### NivuFlow 750

Highly accurate flow measurement for lightly polluted and polluted media in full and partial filling

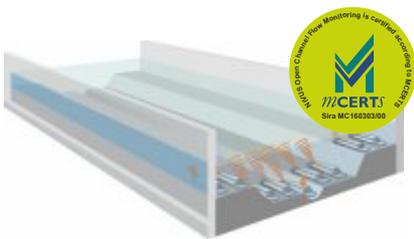
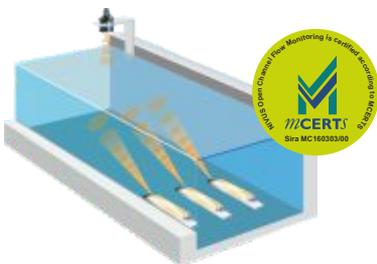
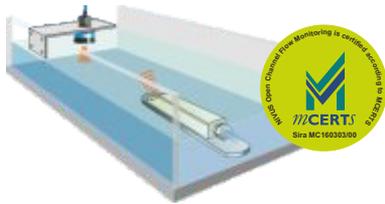


## Innovation, reliability and maximum accuracy

Together with the sensors, the NivuFlow 750 forms a stationary measuring system for continuous flow measurement and flow control for low to heavily contaminated media of various compositions.

It is used in part filled and full flumes, canals and pipes of various geometries and dimensions. The measurement transducer is able to record the current flow rate at a maximum of 3 different measuring points with up to 81 flow velocity sensors.





## Flow measurement systems at the highest technical level

- Also suitable for the most difficult applications
- Measurement of the real flow velocity profile
- Up to 32 individual velocities per sensor
- Integrated, scientifically developed flow models
- Worldwide connectivity for commissioning, maintenance, data transfer and service
- Extensive diagnostic functions for safe and fast commissioning and maintenance
- Self-monitoring and self-diagnosis with status output in accordance with Namur NE 107
- Cycle operation for autonomous measurements
- Combination of several partial measurement points with different measurement methods in one overall measurement



### Typical Applications

WWTPs, channel networks, discharge constructions, industrial wastewater networks, measurement places for billing, intakes, drainage lines, return sludge lines, recirculation lines and many more

## The right sensor for each application

A wide selection of sensor designs is available for measuring flow velocity and flow level in flumes, pipes and canals ranging from very small to several metres in size: Flow velocity sensors with and without integrated flow level measurement as well as air-ultrasonic flow level sensors.

Highly resistant sensors in PEEK design with Hastelloy mounting plates or in titanium design and FEP-protected cables withstand even highly aggressive and corrosive environments.

### Your benefits

- Absolutely zero point stable and drift-free sensors
- Low installation expenses through perfectly matched mounting accessories
- Installation under process conditions
- Various sensor constructions guarantee the best solution for each application
- Digital signal transmission for error-free connections over long distances
- Ex approval Zone 1



**Air-ultrasonic sensor**  
for level measurement,  
Mounting in the channel  
head



**Flow velocity sensors**  
for mounting on the channel bottom  
or the channel side



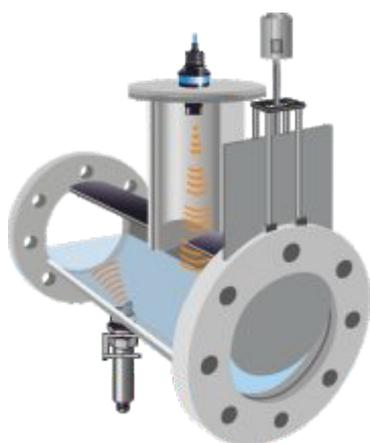
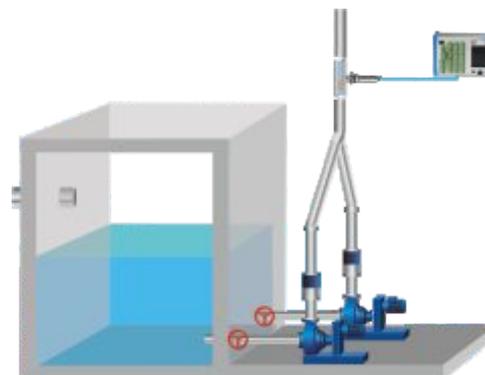
**Flow velocity sensors**  
For mounting on pipes and in  
the NIVUS Pipe Profiler



## Application Examples

### Pump Stations

- Quick and easy retrofitting to all pipework materials
- No cutting or dismantling of existing pipes
- Reliable and accurate measurement of slightly polluted media through to to sludge

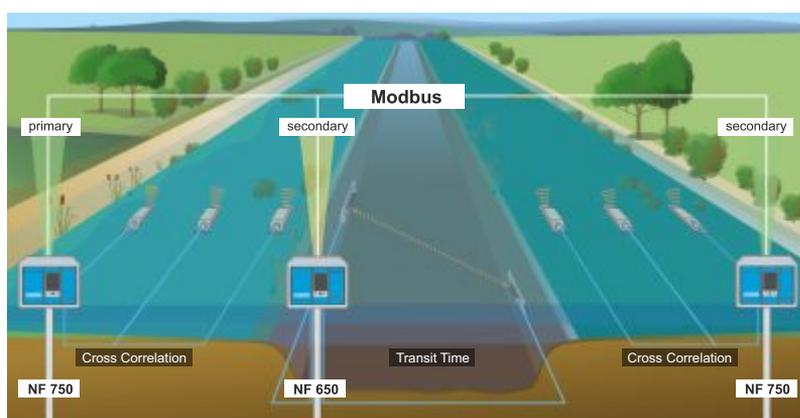
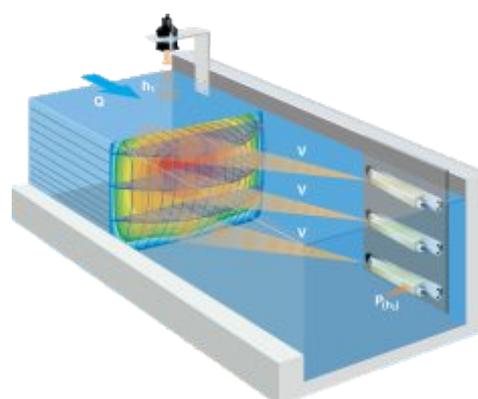


### Control Measurement Section

- Measurement and control of transfer volumes in rainwater treatment plants
- Reliable and accurate recording of night-time discharges, dry and rainwater volumes
- Intelligent control algorithms for surge detection, quick close and flush-free as well as automatic flushing functions
- Easy integration into higher-level sewer management systems

### Measurement Places for Billing

- Equipment for calibrated and certified billing measuring points, e.g. for industrial dischargers
- Highly accurate multi-path systems with up to 288 precisely positioned individual flow velocities in the flow profile
- Absolutely zero-point stable and drift-free measuring system without interference from sieve skins, grease films, etc.



### Multi Measurement Places

- Combination of different measuring methods at complex measurement places
- Multiple measuring point capability
- Integration option for up to 81 flow velocity measurement sensors
- Modbus coupling of all NivuFlow transmitters

## Nivu Flow 750 - Universal transmitter

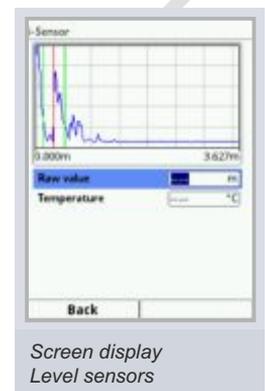
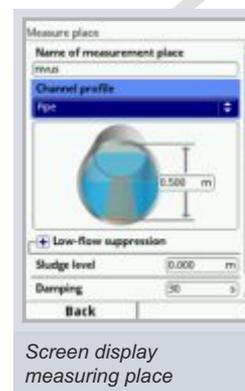
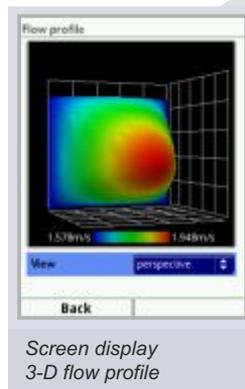
The intuitive one-hand operation and the bright high-resolution colour display allow quick, easy and cost-efficient commissioning on site. Additional input devices or software are not required.

The latest integrated numeric discharge models enable more accurate, more stable and more reliable determination of flow rates even under very difficult measurement conditions.

The 3D flow profile is calculated in real time and is reproducibly and verifiably indicated on the transmitter display. Factors influencing the calculation results such as channel shapes, discharge behaviour and wall roughness are considered during flow calculation.

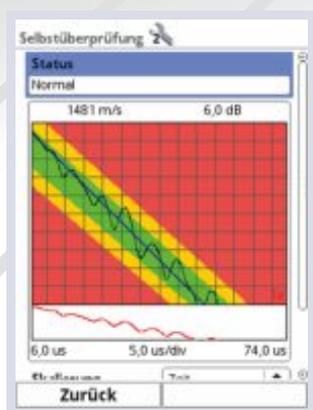
Delayed discharge behaviour and variable backwater effects are reliably recorded and taken into account in the calculation.

In addition to the compact DIN rail version there is a weatherproof field unit available featuring appropriate connection space for outdoor installation





## Sensor Monitoring and Self Diagnostics



An integrated, fully automatic evaluation algorithm allows a continuous check for any maintenance requirements or a necessary check of the measurement system.

A Namur NE 107-compliant diagnosis and status evaluation informs the operator about maintenance requirements, wear, sensor damage or destruction, as well as spillage or silting up of the measurement point.

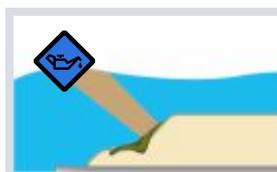
The sensor states classified in accordance with the Namur NE 107 protocol are shown on the graphic display using a colour-coded display and Namur-defined symbols. They can be transmitted via Modbus, integrated modem and alarm management system as well as via error message outputs.

### Sensor in working order



- Functionally reliable measurement within the specification

### Maintenance required



- Unspecific sensor behaviour (incrustations, disturbances in front of the sensor)
- Measurement works, but should be checked

### Sensor outside the specification

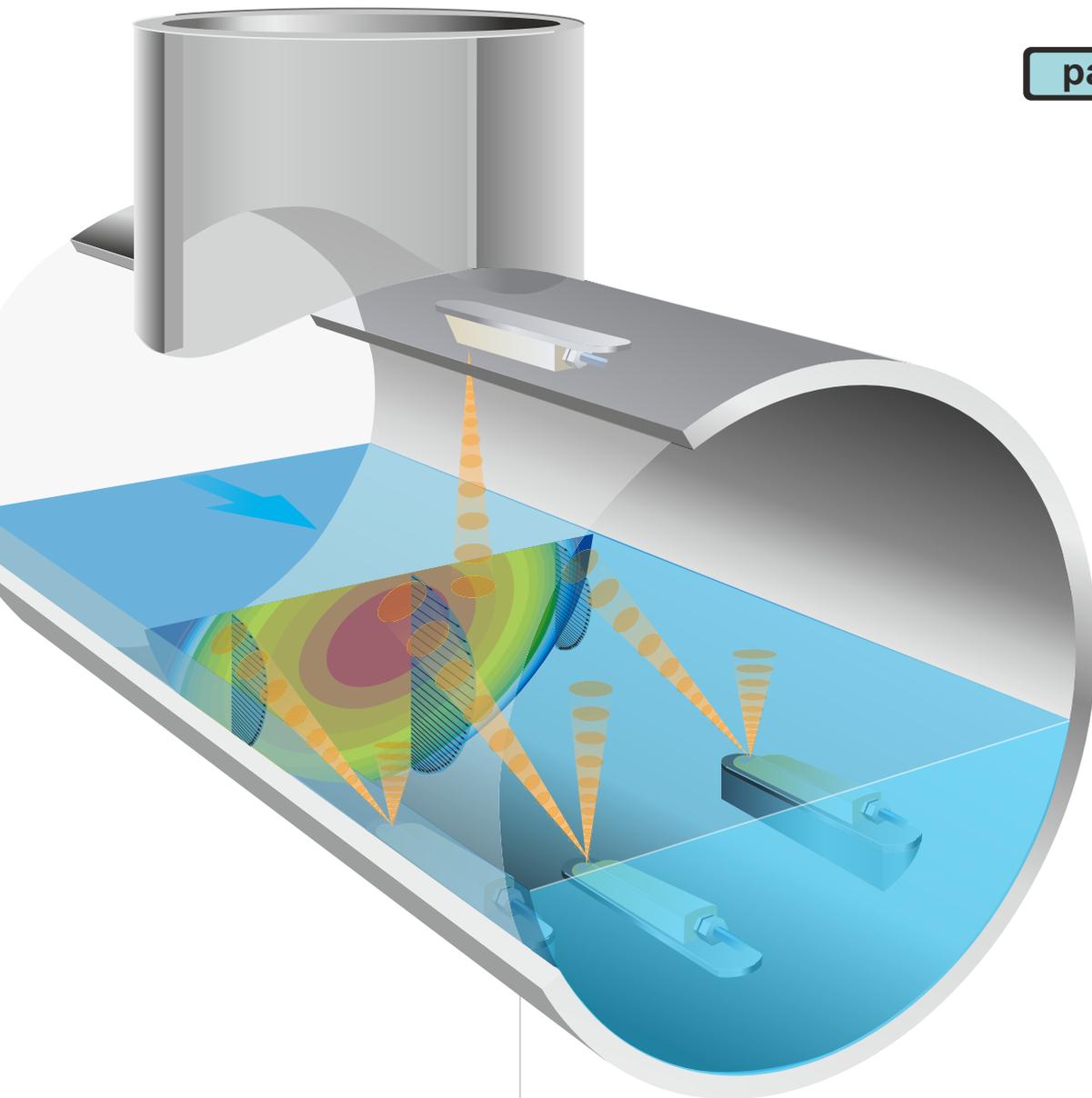


- Wear/spillage
- Sensor damage
- Impending measurement failure

### Sensor not in working order



- Mechanical sensor damage
- Electronic damage
- Massive wear
- Sensor destruction



patented

## How the NivuFlow 750 measures



The flow measurement principle as video under: [www.nivus.com](http://www.nivus.com)

Flow cannot be measured directly. Multiple factors are required to detect the flow  $Q$ : average flow velocity  $v$  (average) and the flow cross section  $A$  which leads to the general formula:

$$Q = v_{(\text{average})} \cdot A$$

The flow cross section  $A$  is investigated by continuously measuring the filling level considering the channel shape.

The flow velocity is detected by using the particles' velocity. Most media contain a certain load of dirt particles or gas bubbles which move in the same velocity as the liquid itself.

## Flow velocity measurement ( $v$ ) using cross correlation

- Scientifically tested, channel-specific mathematical flow models
- Calculation of the near-wall flow velocity distributions and the horizontal velocity profile
- Velocity integration over the entire cross-section
- Ideal for determining the average flow velocity even with hydraulically disturbed channels

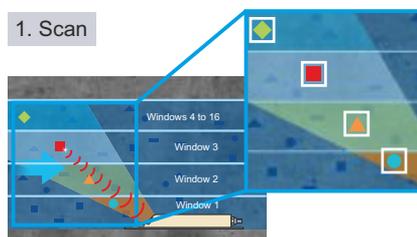
The measurement method used for flow velocity determination is based on the principle of ultrasonic reflection. One of the most modern and most efficient measurement methods for flow velocity detection is the NIVUS cross correlation method.

Existing reflectors within the medium (particles, minerals or gas bubbles) are scanned using an ultrasonic impulse with a defined angle.

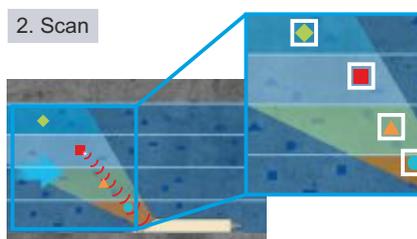
The resulting echoes are saved subsequently as images or echo patterns.

Considering the beam angle it is possible to directly compute the particle velocity and hence the medium flow velocity from the temporal shift of the reflectors.

This allows to obtain highly accurate readings without the need to perform additional calibration measurements.



A few milliseconds later a second scan follows. The resulting echo patterns are saved as well.

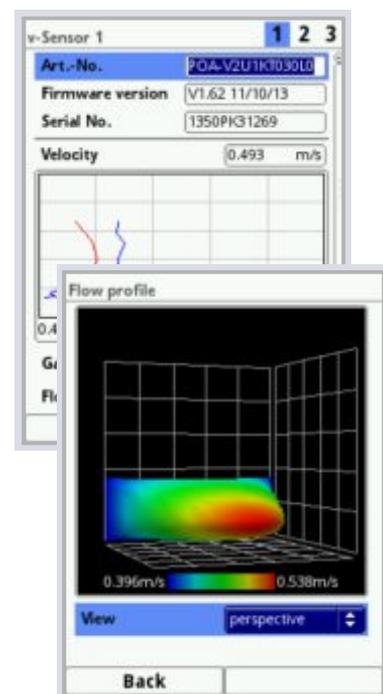


By correlating/comparing the saved signals, the positions of unambiguously identifiable reflectors can be identified. The reflectors can be identified at varying positions within the images since they have moved with the medium.



Overlay of image patterns

Gates			
	Position	v average	v raw
1	0.065 m	0.392 m/s	0.423 m/s
2	0.074	0.403	0.421
3	0.080	0.399	0.379
4	0.088	0.410	0.393
5	0.096	0.436	0.441
6	0.106	0.481	0.507
7	0.117	0.499	0.490
8	0.129	0.522	0.504
9	0.144	0.532	0.512
10	0.160	0.542	0.522
11	0.179	0.560	0.526
12	0.201	0.546	0.512
13	0.226	0.555	0.510
14	0.257	0.547	0.502
15	0.292	0.540	0.500
16	0.333	0.531	0.503



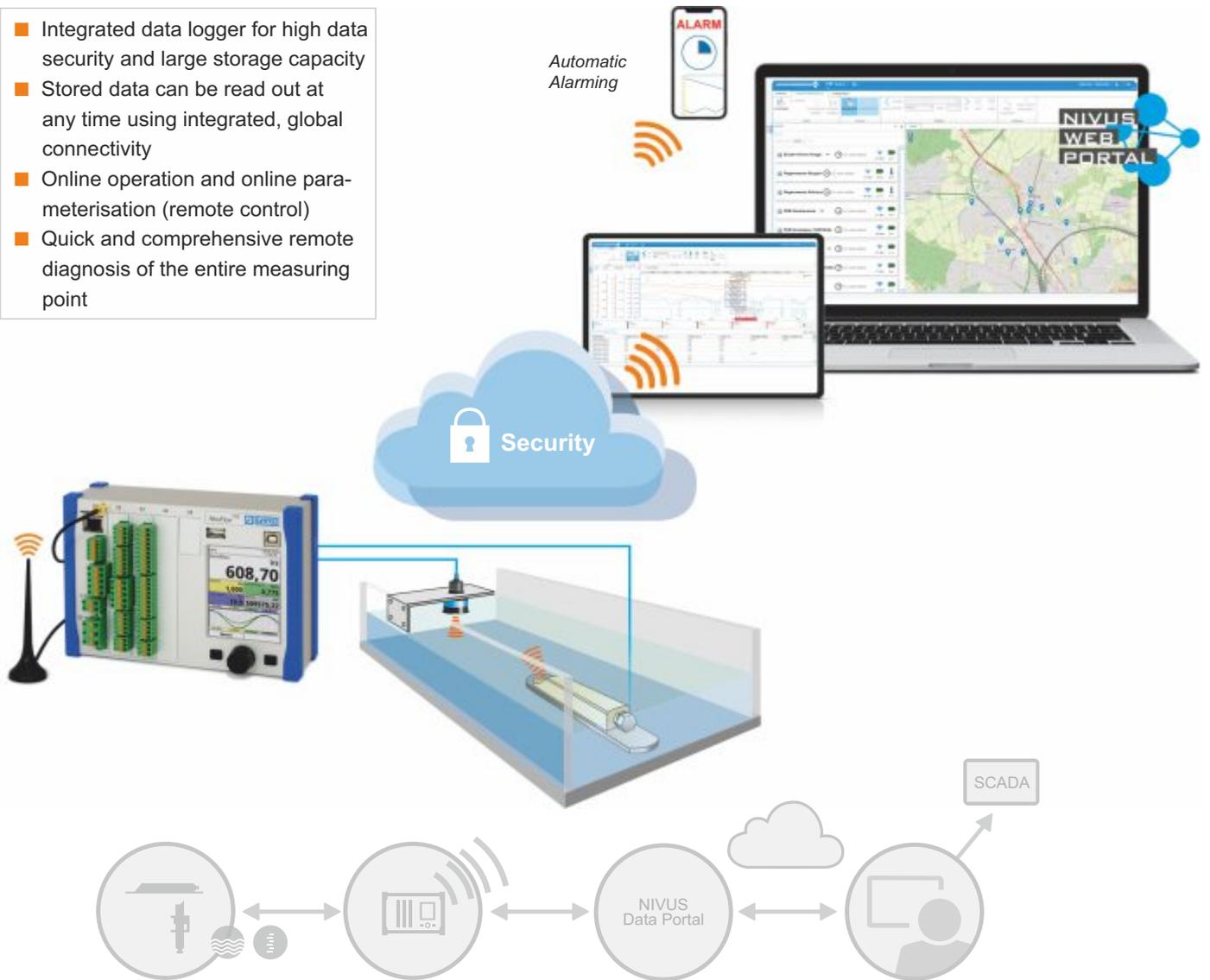
The NivuFlow 750 uses up to 32 gates per sensor for flow measurement. The determined flow profile can be directly indicated on the display.

### Your benefits

- Highest measurement accuracy even under backwater conditions
- Stable readings
- No calibration required
- Determination and indication of flow profiles at the measuring point

## IoT-Ready Flow Measurement

- Integrated data logger for high data security and large storage capacity
- Stored data can be read out at any time using integrated, global connectivity
- Online operation and online parameterisation (remote control)
- Quick and comprehensive remote diagnosis of the entire measuring point



### MPX Multiplexer / iXT Ex Separation Module

At measurement points with several flow velocity and level sensors, the MPX Multiplexer makes it possible to reduce the number of sensor cables to be laid to the transmitter. The signals and the power supply of the sensors are bundled and transmitted between several sensors and the transmitter.

The iXT Ex Separation Module is used to connect the sensors for use in Ex zone 1. The Ex separation already takes place in the input area of the control cabinet or the field enclosure. This means that there is no need for explosion-proof cable routing inside the control cabinet.



## Perfect solutions from a single source

Contemporary and accurate measurement technology that you can always rely on is a matter of course for us.

When realising your measurement projects, we are happy to support you with our decades of expertise in defining suitable measurement methods and with on-site inspections to determine the optimum installation point. We are also happy to help with the measurement planning of the tender in compliance with the authorities.

Our control cabinet construction division realises your wishes for the on-site accommodation of measurement and transmission technology, which is installed by our service team and competently commissioned in terms of hydraulics and data technology. The maintenance of the installed measuring systems as well as a plausibility check and evaluation of your measurement data complete our services. This leaves you more time for your essential tasks.

### Planning



### Remote Diagnostics



### On-Site Inspection



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### Installation Commissioning Maintenance



### Control Cabinet Construction



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## NivuFlow 750: flow measurement for lightly polluted and polluted media in full and partial filling

The technical specifications can be found in the instructions manuals or at [www.nivus.com](http://www.nivus.com)



Transmitter



Sensors



Wastewater



Ex Approval



2G/3G/4G  
Data Transmission



Data Management

## Measurements: flow velocity $v$ , flow level $h$ , calculation flow rate $Q$

