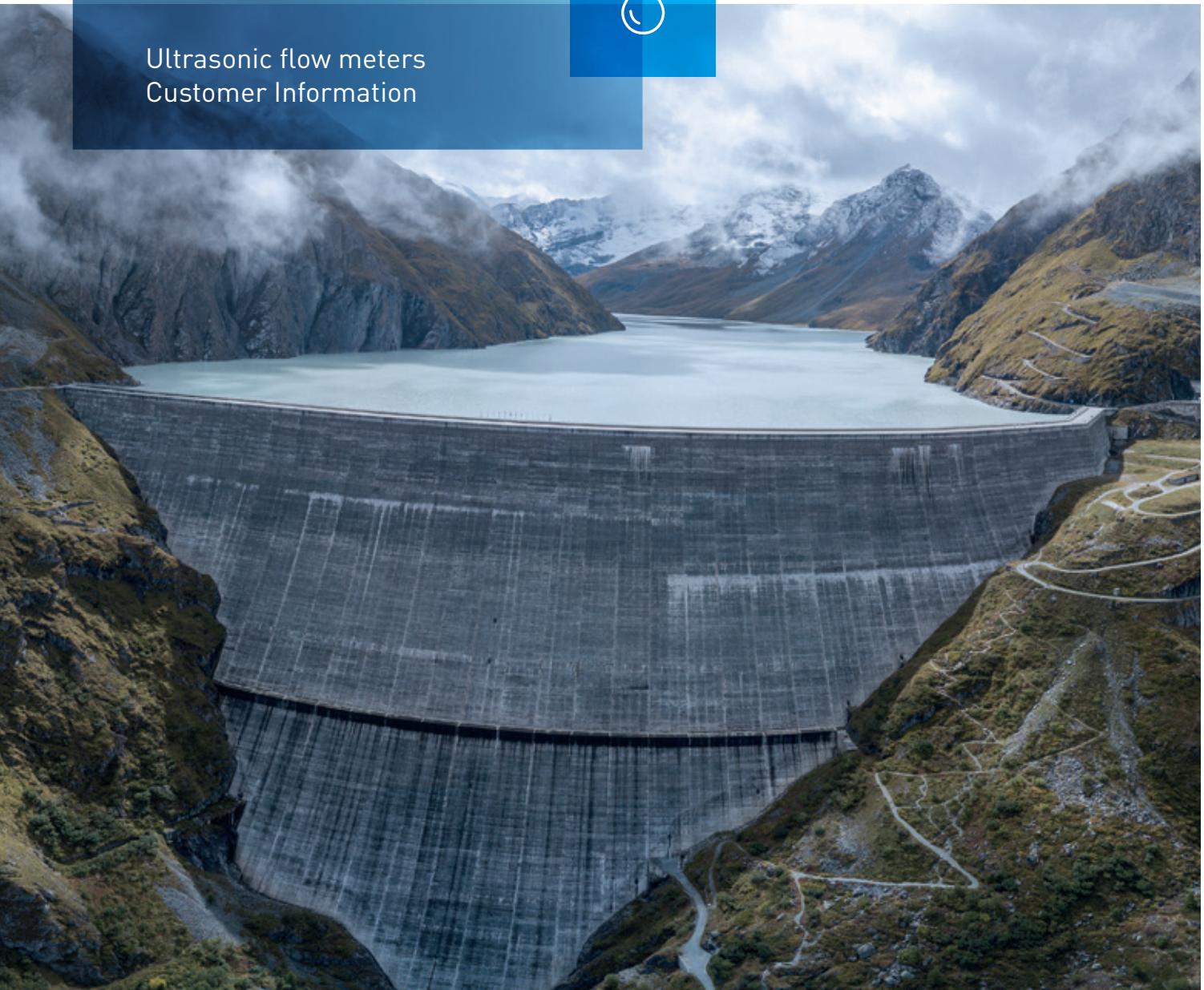


Acoustic Flow Measurements and their Applications

Ultrasonic flow meters
Customer Information



Hydro Power



Hydrology



Wastewater



Water Supply



Industry



Innovative measurement solutions
for valuable resources



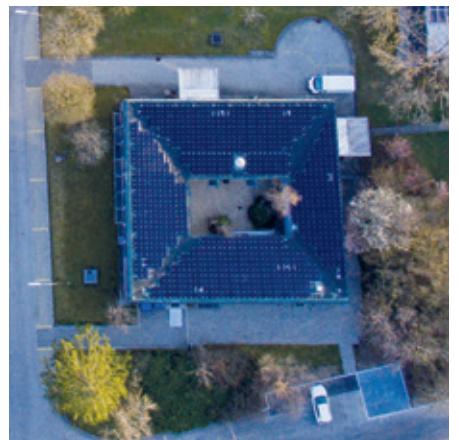
Vision

Frontpage:
Grande Dixence, Val des Dix, Sion / VS, Switzerland

The precise measurement of flow rates and water consumption is becoming increasingly important in a globalised world facing major challenges to meet the sustainable usage of natural resources. In addition, process automation and trends such as «Industry 4.0» and the «Internet of Things» have also increased the demands on data quality and granularity in the fields of hydro-power, hydrology, waste water, supply and industry.

In 2018, GWF Technologies GmbH was founded in Kaufbeuren, Germany, to meet these challenges. The company is able to take full advantage of the 120 years of experience of its Swiss-based parent company GWF MessSysteme AG in the fields of utility metering and data communication and can rely on a broad product and IP portfolio. Our products and solutions are based on the acoustic principle of measurement ultrasound and we can draw on the wealth of experience gained from employing the

technology in an array of applications. Furthermore, our products and solutions stand out due to their accuracy and reliability of measurement and the exceptional level of manufacturing quality, which is protected by proprietary IP and patents. We invest intensively in the further development of our portfolio and also overcome individual water metering challenges thanks to the competent handling of small-run and project products. Discover our products and services on the following pages. Contact us – we look forward to exchanging ideas on the key future issue of «water» and working together.



Production facility with solar panel roof



Office building in Kaufbeuren

Products



You can find GWF Technologies GmbH flow meters working all around the world. Our flow meters are manufactured in Germany to assure only the best possible quality in design and final product.



Hydrology



Channels



Hydro Power



Water Supply



Wastewater



Industry

Fluvius TT

Page 7



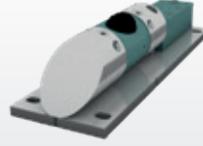
Kanalis TT MT

Page 9



Ductus TT

Page 11



Ductus TT COHP

Page 12



ReVision

Page 14



Q-Eye PSC MT

Page 19



Q-Eye PSC Pro portable

Page 19



Q-Eye Radar MT

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Q-Eye PSC portable

Page 20



In this product overview we describe the various applications for our instruments. A vast amount of applications can be solved using acoustic flow measurement. GWF Technologies GmbH is at the forefront of «State of the Art» and future development.

Our measurement instruments can be used everywhere where there is flowing water. For example rivers, channels or pipes – we measure everywhere.

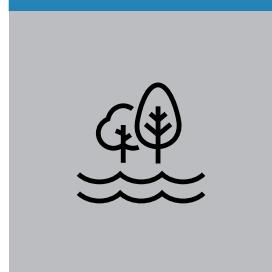
When sound propagates through water, pressure fluctuations can be detected. They travel through the water, the channel or the pipe as sound waves. With our instruments it is possible to record these ultrasound waves.

Depending on the measurement technique applied, we detect the Transit Time with and against the flow direction. For other applications we use the Pulse Doppler effect. Here our instruments record the change of the wave length reflected by a particle in the flow.



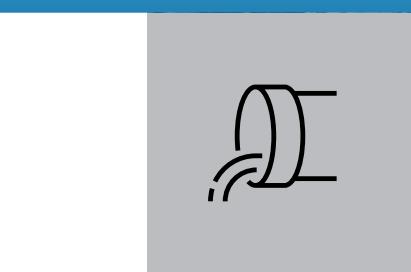
Hydrology

→ p. 6



Wastewater

→ p. 18



We measure everywhere.



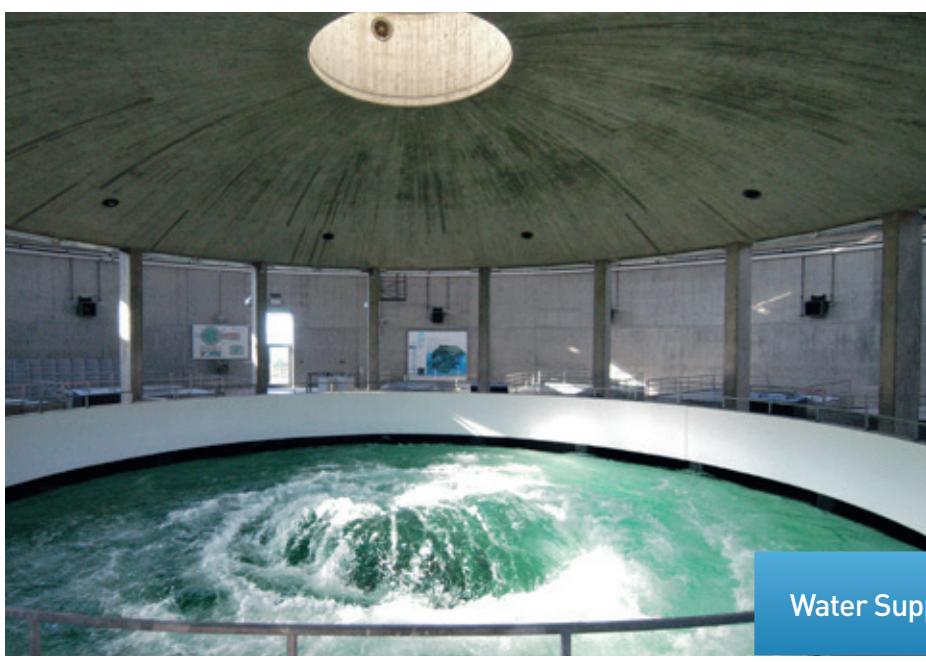
Channels

→ p. 8



Hydro Power

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Water Supply

→ p. 14



Numerous rivers intersect our landscape from small brooks up to huge river networks. Some of them form a natural border between two countries.

At all times man has preferred to live in river areas. Clear water, the possibility to use the river for transport, generating power from water and the scenic beauty are amongst the reasons. However, our actions have more and more influence on water quantity and quality. In many regions taking water for irrigation or as drinking water are the reasons. More than half of all big rivers around the world have been polluted during the course of time.

Observations of water levels have been used since ancient times, systematic flow measurements go back to the middle of the 19th century. This historical data has been used as the basis for various applications, for example for flood protection and flood forecasting. They also form the foundation for the design of hydro-engineering constructions.

In recent years the acoustic flow measurement has established itself as the standard method for measurements on many hydrological stations. With this almost contact free technology data can be recorded continuously and it provides 24/7 monitoring.

Hydrology



Products



The range of application for Fluvius TT runs from small waterways to huge river systems with high suspended solids. By means of acoustic transmission a coded signal is sent through the water and the transit time is calculated providing the speed of river flow. When an acoustic wave propagates in water, part of the energy is damped by friction and suspended solids. This procedure is frequency-related. The higher the frequency, the bigger the damping. For wider distances we use low frequencies as they allow for a considerably better receiver signal.

Specifications

Fluvius TT ECM IE Travel time system with digital signal processing	
Acoustic Paths	1-8, length 1-1000 m
Frequency	15, 28 and 200 kHz
Accuracy	± 2 % (typical)
Display	4 lines, 20 characters
Datalogger	internal, sampling interval user selectable
Communication	RS-232, Modbus, Ethernet, USB
Inputs	max. 8 x 4-20 mA
Outputs	max. 4 x 4-20 mA, 2 x Relay, 2 x Pulse
Power Supply	85-264 V _{AC} (50-60 Hz) or 24 V _{DC}
Battery Backup	integrated 2 Ah
Enclosure	Aluminium, wall mounted

Transducers

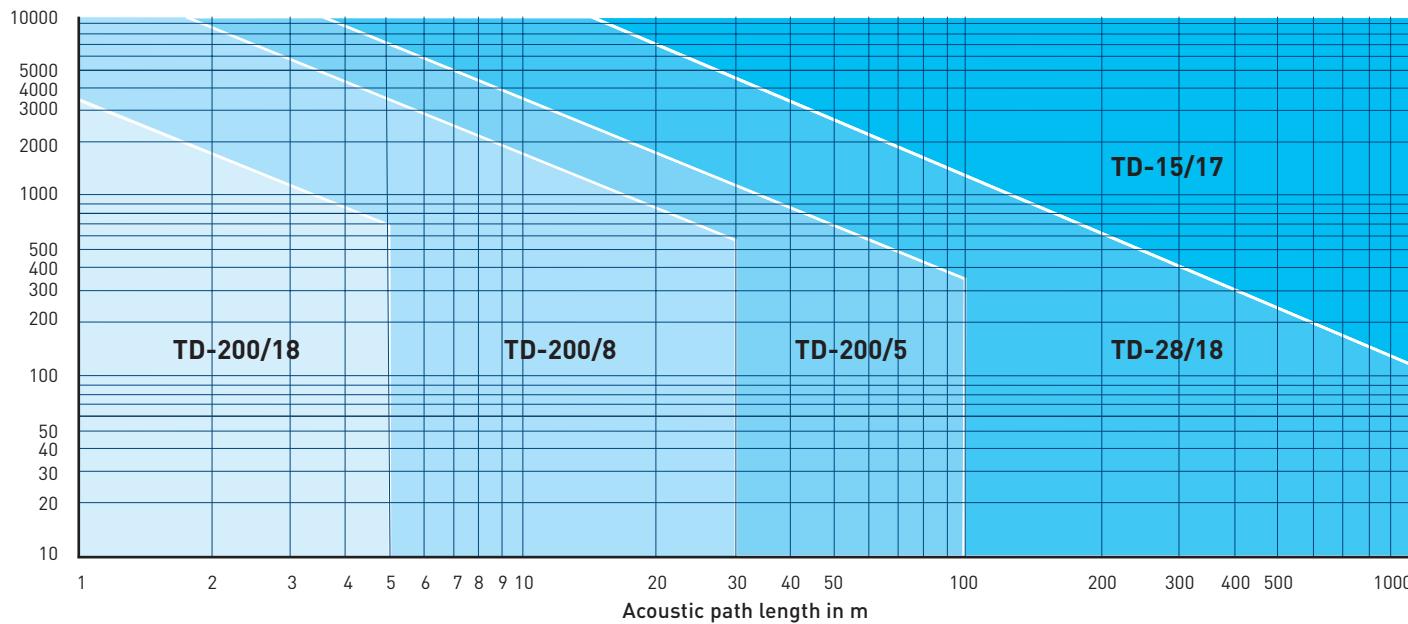


Specifications

	TD-15/17	TD-28/18	TD-200/5	TD-200/8
Frequency	15 kHz	28 kHz	200 kHz	200 kHz
Typical Channel Width	> 400 m	400 m	100 m	30 m
Dimensions	Ø 368 mm, Height 121 mm	Ø 183 mm, Height 142 mm	Ø 340 mm, Height 170 mm	Ø 218 mm, Height 109 mm

Commonly used transducer frequencies for various path lengths and sediment loads.

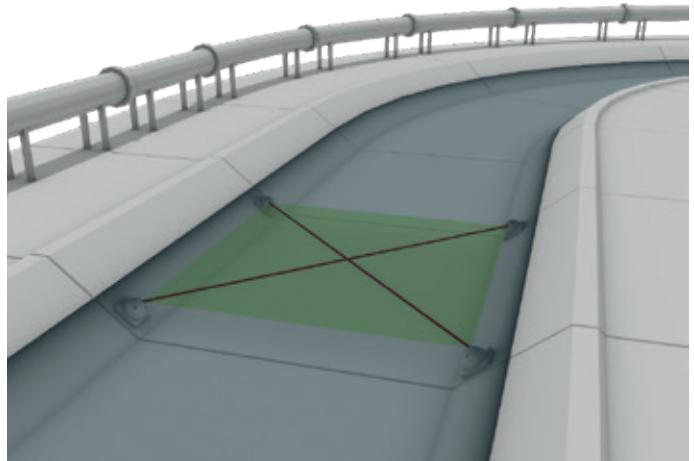
Sediment load in g/m³



Channels are artificially created waterways used for shipping, transportation, irrigation, drainage and for cooling water extraction of power plants.

A further important use is the transportation of water used for the supply of drinking water. Here the focus lies on detecting water loss at an early stage; sometimes it is difficult to detect small leakages.

Our instruments measure precisely and reliably in order to prevent long term water losses.



Crossed-path system, Irrigation channel

Channels



Products



Specifications

Kanal TT MT Travel time system with digital signal processing	
Acoustic Paths	1-10 (more upon request)
Channel Width	1-20 m (other upon request)
Frequency	200 kHz
Accuracy	± 2 % (typical)
Display	4 lines, 20 characters
Datalogger	16GB MicroSD card
Communication	RS-485, Modbus (RS-232 or RS-485), WLAN, GPRS, Ethernet 10/100 Mbps
Inputs	max. 4 x 4-20 mA, 2 x digital
Outputs	max. 4 x 4-20 mA, 4 x Relay, 2 x digital
Power Supply	85-260 V _{AC} (48-60 Hz) oder 9-36 V _{DC}
Enclosure	ABS, wall mounted

Transducers



Specifications

	TD-200/8	TD-200/18
Frequency	200 kHz	200 kHz
Typical Channel Width	20 m	5 m
Dimensions	Ø 218 mm, Height 109 mm	Ø 140 mm, Height 70 mm

Mounting Assembly Standardized mounting devices are available for any kind of channel geometry like rectangular, trapezoid or natural river banks. The flow optimized design protects the transducers against moving objects suspending in the flow stream. It also provides room for connections and protective conduits.

Single-path system

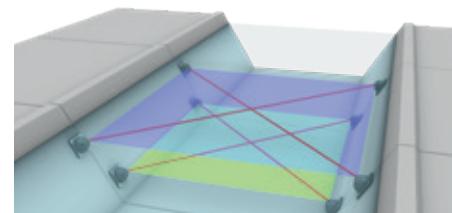
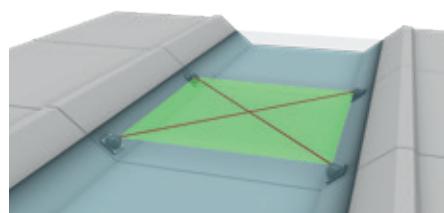
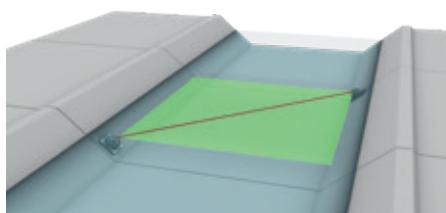
In its most basic form, the system operates with a single pair of transducers. However, it relies upon a relatively stable velocity profile, essentially unaffected by changes in the relation between water level and flow. The main flow has to be parallel to the bank. The relationship between measured velocity and flow is established by hydrometric calibration.

Crossed-path system

In rivers there is a high risk of cross flow. Its intensity depends mainly on the river's geometry and if there is an upstream bend in the river. Although the cross flow does not influence the quantity of the flow, it may affect the measurement, a second pair of transducers will be necessary. By crosswise arrangement of four transducers, effects of changing flow direction can be eliminated.

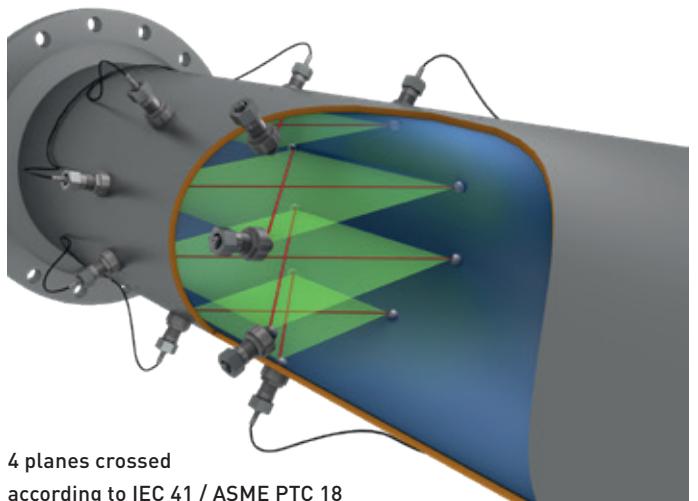
Multi-path system

An even more accurate flow measurement can be obtained with systems using several planes. The measured result can be further improved by using a multi path system layering each of the acoustic paths in parallel planes one above the other. This negates having an expensive hydrometric calibration. This type of system is suitable for applications with large water level fluctuations, reverse flow or a vertical velocity distribution outside the theoretical normal.



Hydro power is an important source of energy which contributes to supplying power to the earth's population. Today, hydro power plants deliver approximately 3.5 per cent of electric energy generated worldwide. Their share in power generation from renewable resources comes to 18 per cent. In the future this share will continue to grow, as resources of fossil fuels are depleted.

The hydro electric performance depends essentially on the usable altitude difference between upper reservoir and lower reservoir, and hence the flow. In order to use the «fuel» water in an optimal way, this flow has to be monitored without any interruptions.



Hydro Power



Products



For pipes with a diameter of more than half a meter, acoustic flow measurement systems have long established themselves as a reliable and convenient measurement method. Measurements in several planes are a recommended method to determine the efficiency of the turbine without the need for calibration meeting the latest international standards. Fixed installed equipment form the basis for verifying the efficiency. A deterioration of efficiency can be detected right away and therefore corrections can be initiated at an early stage.

Specifications

Ductus TT ECM IE Travel time system with digital signal processing	
Acoustic Paths	1-8
Accuracy	± 0,5 % with 8 paths
Range	± 20 m/s
Display	4 lines, 20 characters
Datalogger	internal, sampling interval user selectable
Communication	RS-232, Modbus, Ethernet, USB
Inputs	max. 8 x 4-20 mA
Outputs	max. 4 x 4-20 mA, 2 x Relay, 2 x Pulse
Power Supply	85-264 V _{AC} (50-60 Hz) oder 24 V _{DC}
Battery Backup	integrated, 2 Ah
Enclosure	Aluminium, wall mounted

Transducers

A variety of transducers is available – depending on the requirement

Internal mount assemblies which can be fixed directly to the wall. The transducers are aligned by rotating them in their mounting into a predefined position and then fixed in place by tightening. Feedtrough assemblies for installation through exposed penstock walls with access to the interior and exterior of the penstock flow meter section.



Specifications

	Internal Mount	FT-L
Frequency	200 kHz	120 kHz
Beam Width	18° (-3dB)	10° (-3dB)
Configuration	IEC41 / ASMEPTC 18	IEC41 / ASMEPTC 18
Pipe Diameter	1,0 m to 10 m	0,3 m to 10 m
Pipe Wall Thickness	- n.a.	welding socket or thread
Pressure Rate	60 bar *)	60 bar *)
Material	Stainless Steel / Polyamide	Stainless Steel
Cable	twisted pair with shield	twisted pair with shield
Temperature Range	-10° to 60°C	0° to 40°C
Dimensions	320 x 100 x 70 mm (LxWxH)	Ø 1 1/2", Length: 186 mm
Mounting	From the inside	When pipe can be dewatered for installation. Designed to allow removal of the entire transducer for repair, replacement or cleaning without the need to dewater the pipe.

*) other ranges upon request

Products



Specifications

Ductus TT COHP-IE Travel time system with digital signal processing	
Acoustic Paths	1 to 8
Accuracy	± 0,5 % with 8 paths
Range	± 20 m/s
Pipe Diameter	0,3 to 10 m
Pipe Wall Thickness	max. 100 mm (steel)
Display	4 lines, 20 characters
Datalogger	internal, sampling interval user selectable
Communication	RS-232, Modbus, Ethernet, USB
Inputs	max. 8 x 4-20 mA
Outputs	max. 4 x 4-20 mA, 2 x Relay, 2 x Pulse
Power Supply	85-260 V _{AC} (48-60 Hz) oder 9-36 V _{DC}
Battery Backup	integrated, 2 Ah
Enclosure	Aluminium, wall mounted

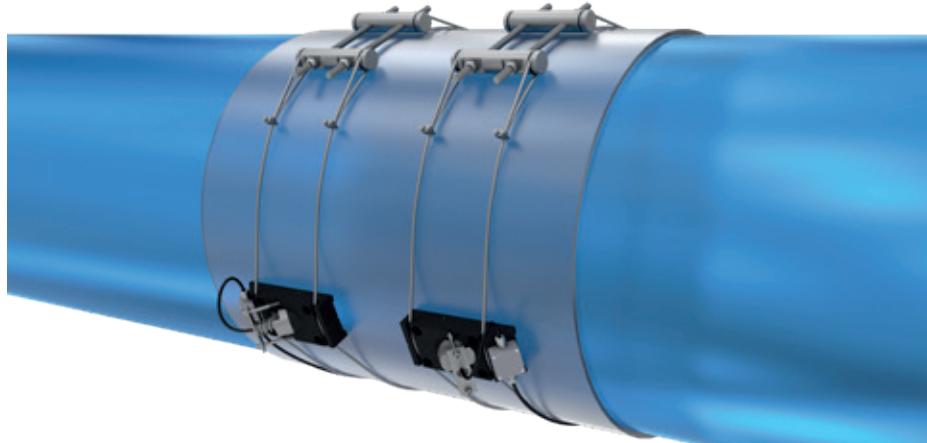
Transducers



Specifications

Transducers	
Pipe Diameter	0,3 m to 15 m
Pipe Wall Thickness	up to 100 mm (steel, plastic, glass fiber)
Pulse	200 kHz
Beam Width	8° (-3dB)
Material	Stainless steel, Polyamide
Dimensions	270 x 115 x 100 mm
Mounting	non intrusive, from the outside of the pipe

Clamp-On with 2 acoustic paths

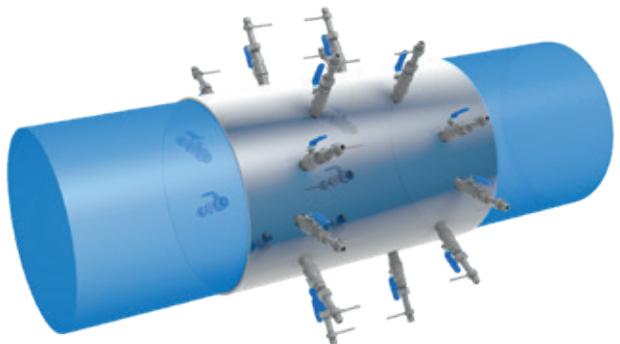


Advantages of Clamp-On Systems

A flow meter using clamp-on transducers makes measuring flow non-intrusive and easy from the outside of the pipe. The transducers are installed with little technical effort and without process interruption on the pipeline. Rotationally symmetric flow profiles can be determined with a single acoustic path; non-symmetric profiles require the use of several acoustic paths.

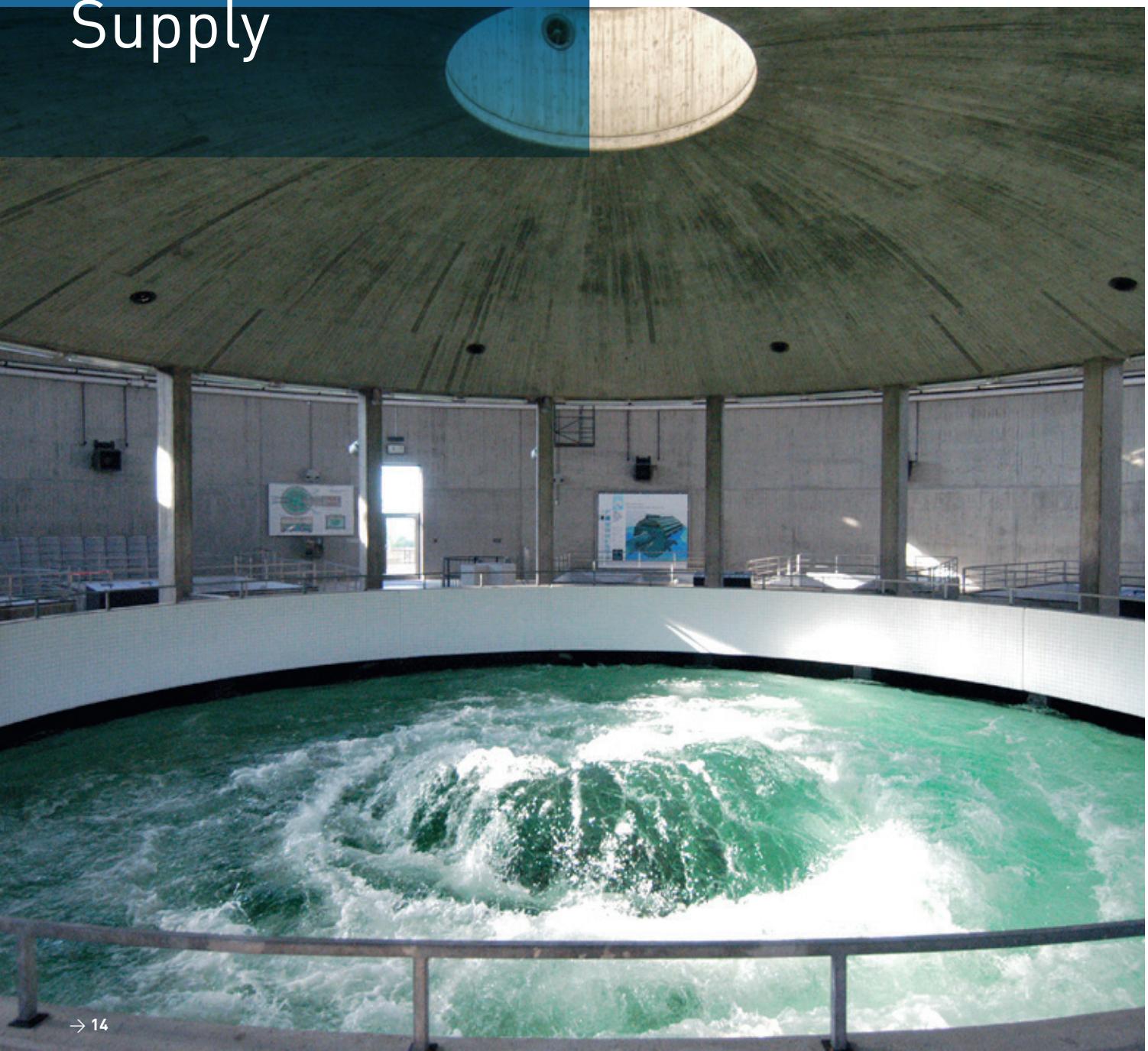


Although there is enough water on earth and it is not consumed but merely used, drinking water starts to get short. The uneven distribution of water amongst the regions, the rising population and our carelessness leads to a shortage of fresh drinking water. In the future more and more pipelines for drinking water will be built all over the globe. In order to operate huge and complex pipe networks efficiently, flow measurement will be necessary.

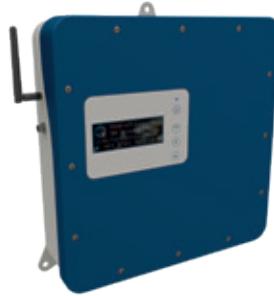


ReVision with 5 layers
installed into existing pipeline

Water Supply



Products



Specifications

ReVision Transmitter	
Acoustic Paths	1 to 10 (20 transducers) arranged in max. 5 planes, crossed
Flow	bi-directional
Accuracy	up to $< \pm 0,15\%$
Range	0 to $\pm 20\text{ m/s}$ (0 to $\pm 66\text{ ft./s}$)
Repeatability	$< \pm 0,02\%$
Zero Stability	$< 1\text{ mm/s}$
Communication	RS-485, Modbus (RS-232 or RS-485), WLAN, GPRS, Ethernet 10/100 Mbps
Inputs	max. 4 x 4-20 mA, 2 x digital
Outputs	max. 4 x 4-20 mA, 4 x Relay, 2 x Pulse
Power Supply	85-260 V _{AC} (48-60 Hz) oder 9-36 V _{DC}
Enclosure	ABS, wall mounted

The ReVision flow meter is a fully integrated metering solution with up to 10 acoustic paths for liquid fluids. It is a new entry in the GWF Technologies GmbH family of high accuracy acoustic metering products. It increases your profitability with exceptional repeatability and linearity throughout the flow range. Due to the patented velocity profile compensation no flow straightener is needed and no on-site calibration is required.

Concept Innovation

Space constraints and/or appropriate application configurations lead to complex industrial pipe flows which contain elbows, tees and/or other disturbing and non-uniform elements. This leads to difficulties in installing flow meters at a recommended «optimum» location, which is defined by a minimum distance upstream or downstream of known disturbances like an elbow or pump where a fully developed velocity profile is present. Even with multiple flow sensors, there may still be a significant error which is known as the profile factor.

Prior knowledge of the profile factor can be used to correct the velocity measurements made by flow sensors to a true spatially averaged velocity. The ReVision acoustic system provides detailed information on the flow velocity profile and an accurate measurement of the flow rate can be achieved by rebuilding the whole flow velocity profile across the pipe using predetermined conduit con-

figuration parameters and correction factors. Flow meters are also sensitive to velocity profiles where there is a large rotational component (swirl). Flow meters are also sensitive to velocity profiles where there is a large rotational component (swirl).

Swirl is normally generated by two or more out of plane changes in flow direction (e.g. one elbow/tee that goes from vertical to horizontal followed by an elbow/tee that changes the direction of flow in the horizontal plane). Swirl is present to some extent in almost every application and can generate significant transverse velocity components plus it takes a long distance to dissipate. If the swirl is not centred, it can cause significant errors. Thanks to the predetermined conduit configuration parameters and correction factors, the flow meter measurement accuracy is kept when asymmetric profiles and swirls are present in the pipe.



flow meter after a 90° elbow

Products



Specifications	FT-S	FT-M	FT-L
Pulse	1 MHz	1 MHz	120 kHz / 1 MHz
Beam Width	5° (-3dB)	10° (-3dB)	10° (-3dB)
Configuration	IEC41 / ASMEPTC 18	n.a.	IEC41 / ASMEPTC 18
Pipe Diameter	0,1 m to 2 m	0,1 m to 4 m	0,3 m to 10 m (120 kHz) 0,3 m to 5 m (1 MHz)
Mounting	welding socket or thread	welding socket or thread	welding socket or thread
Pressure Rate	20 bar *)	20 bar *)	60 bar *)
Material	Stainless Steel	Stainless Steel	Stainless Steel
Cable	twisted pair with shield	twisted pair with shield	twisted pair with shield
Temperature Range	0° to 40°C	0° to 40°C	0° to 40°C
Dimensions	Ø 1", Length: 293 mm	Ø 1 1/2", Length: 407 mm	Ø 1 1/2", Length: 186 mm
Installation	incl. fixing device ball valve and welding socket		

Designed to allow removal of the entire transducer for repair, replacement or cleaning without the need to dewater the pipe. Pipe needs to be dewatered for the time of installation.

*) other ranges upon request

Clamp-On Transducers

When combining the ReVision with clamp-on transducers, the flow measurement becomes non-intrusive and easy from the outside of the pipe. The transducers are installed with little technical effort and without process interruption on the pipeline.



Specifications	CO-L	CO-S
Pipe Diameter	0,3 m to 15 m	0,025 m to 1 m
Pipe Wall Thickness	up to 100 mm (steel, plastic, glass fiber)	up to 20 mm
Frequency	200 kHz	1 MHz
Beam Width	8° (-3dB)	5°
Material	Stainless steel, Polyamide	PEEK
Dimensions	270 x 115 x 100 mm (LxWxH)	80 x 30 x 30 mm (LxWxH)
Installation	from the outside of the pipe	from the outside of the pipe

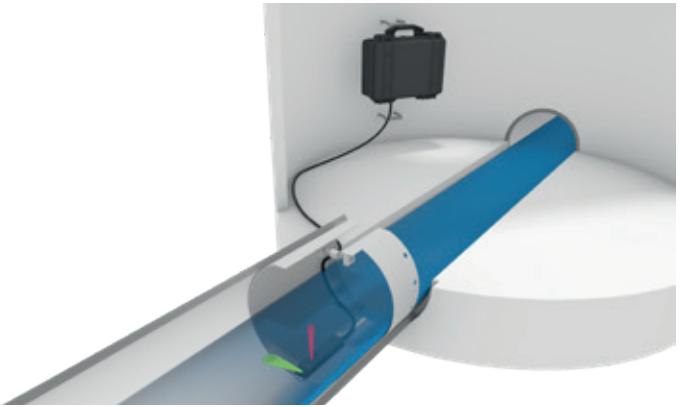
Transducer Replacement

In the unlikely event that a transducer should fail, the ReVision can be programmed to automatically compensate for the loss in path information with a little reduced accuracy in addition to advising the operator that an alarm is present. The transducer housings are separate from the transducers, allowing the transducers to be changed without special tooling and without shutting down the process. Designed to allow removal of the entire transducer for repair, replacement or cleaning without the need to dewater the pipe.



Drinking water is not the only area requiring flow measurement. The disposal and cleaning of waste water is of equal importance.

Waste water contains a multitude of organic substances which used to be dumped directly into the soil or the nearest river. As awareness has increased, most discharges are now treated to assure long term sustainability. The contamination of surface waters has now been reduced and the oxygen content could be increased once again. Due to the advance of waste water treatment around the world nature was able to regenerate in many places. Today's civilization is unthinkable without functioning water treatment plants. Modern plants are highly complex systems. They consist of channels for waste water flow, facilities for waste water collection and clarification plants. GWF Technologies GmbH can complete flow measurements in all of these areas.



Installation in manhole

Waste Water



Products

For sewage-treatment plants flow measurements are primarily installed for internal reasons, for example to control specific plant components with flow dependency or for controlling additives. International regulations, for example the EU-Directive for handling municipal waste water, require a continuous surveillance of waste water flow. Defective flow measurements on sewage-treatment plants can therefore influence their operation, but there can also be legal or environmental consequences.



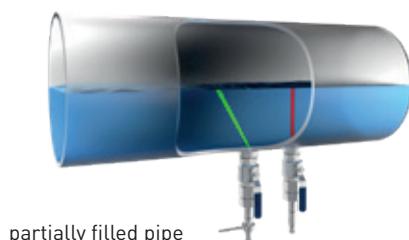
Compact*

Specifications

	Q-Eye PSC MT stationary Pulse-Doppler system	Q-Eye PSC Pro portable portable Pulse-Doppler system
Sensor	1 x velocity 1 x water level	1 x velocity 1 x water level
Pulse	1 MHz	1 MHz
Number of Cells	Q-Eye PSC MT: mean value Q-Eye PSC MT PRO: max. 18 cells	-
Range	velocity \pm 5,3 m/s water level (acoustic) 0,04-1,3 m expandable via external 4-20 mA sensor	velocity \pm 5,3 m/s water level 0,04-1,3 m expandable via external 4-20 mA sensor
Accuracy	\pm 1 % of measured value for v and h (ultrasonic) \pm 2 % for flow	\pm 1 % of measured value for v and h (acoustic) \pm 1 % FS for optional hydrostatic sensor \pm 2 % for flow
Cable Length	max. 80 m	max. 80 m
Display	4 lines, 20 characters	4 lines, 20 characters
Keyboard	4 keys	4 keys
Datalogger	16GB MikroSD card	16GB MikroSD card
Communication	RS-485, Modbus, WLAN, GPRS, Ethernet 10/100 Mbps	WLAN, GRPS, LAN (option)
Inputs	max. 4 x 4-20 mA, 2 x digital	max. 4 x 4-20 mA
Outputs	max. 4 x 4-20 mA, 4 x Relay, 2 x Pulse	max. 4 x 4-20 mA, 4 x Relay, 2 x Pulse
Power Supply	85-260 V _{AC} (48-60 Hz) oder 9-36 V _{DC}	rechargeable battery
Approval	ATEX (option mouse type)	ATEX (option mouse type)
Enclosure	ABS, wall mounted	HPX® Resin

* For details on the new COMPACT transmitter please see separate brochure

Insertion Type – only for stationary PSC

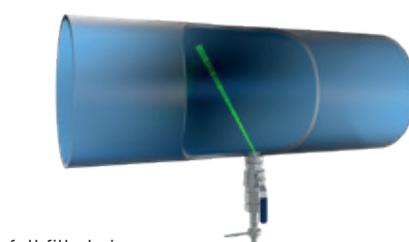


partially filled pipe

Mouse Type – for both stationary and portable



partially filled pipe



full filled pipe



open channel

Typical Applications

Products

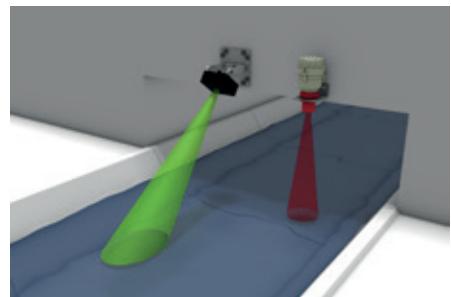
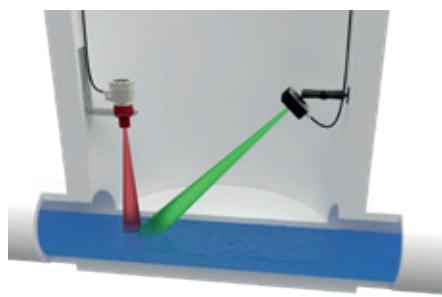


Compact*

Specifications

	Q-Eye Radar MT Pulse-Wave FFT Technology	Q-Eye Radar portable mobile contact free flowmeter
Sensor	1 x velocity 1 x water level (about external 4-20 mA sensor)	1 x velocity 1 x water level (about external 4-20 mA sensor)
Frequency	24 GHz	24 GHz
V-Sensor	bi-directional	bi-directional
Beam Width	10° at -3dB	10° at -3dB
Range	RV11 ± 0,05 m/s, to ± 15 m/s	RV11 ± 0,05 m/s, to ± 15 m/s
Resolution	1 mm/s; min. wave height 3 mm	1 mm/s; min. wave height 3 mm
Display	4 lines, 20 characters	4 lines, 20 characters
Keyboard	4 keys	4 keys
Datalogger	16GB MikroSD card	16GB MikroSD card
Communication	RS-485, Modbus, WLAN, GPRS, Ethernet 10/100 Mbps	WLAN, GRPS, LAN (Option)
Inputs	max. 4 x 4-20 mA, 2 x digital	max. 4 x 4-20 mA
Outputs	max. 4 x 4-20 mA, 4 x Relay, 2 x Pulse	max. 4 x 4-20 mA, 4 x Relay, 2 x Pulse
Power Supply	85-260 V _{AC} (48-60 Hz) oder 9-36 V _{DC}	rechargeable battery
Enclosure	ABS, wall mounted	HPX® Resin

* For details on the new COMPACT transmitter please see separate brochure



Q-Eye Radar MT is an extremely versatile flow measurement system designed for continuous operation and suitable for measurements of flows not only in rivers and open channels, but also in municipal wastewater and storm water sewers. Compact construction combined with the contact-free measurement principle enables an easy installation and use. The maximum permissible installation height above the surface is 30 m. For waste water applications we

The optional ultrasonic depth sensor operates by energizing a piezoelectric transducer with an electronic pulse. This pulse creates a pressure wave that travels to the flow surface where a portion returns to the transducer. Our transmitter offers the best in liquid measurement. It is easy to install, eliminates maintenance caused by sensor fouling and your personnel do not get in contact with the fluid during installation.

Advantages of non-contact measurement

In some applications it is an advantage to have a non-contact measurement. By combining both radar and water level transmitter, they provide a revolutionary approach to open channel and sewer flow monitoring. Combined are pulse wave radar velocity sensing technology with ultrasonic pulse echo level sensing to measure open channel flows.



Look at him! The short target deadline was met once again. Our hard work of the past two weeks has finally paid off. The acoustic flow measuring system for a hydropower plant has passed its final test. Everything works fine – this is the best moment a project engineer can have.

Thanks to the excellent professional competence of our service department we manage projects all over the world. Skilled service technicians, electronic technicians, project engineers and training staff provide advice and support from project planning all the way to the turnkey installation.

Our products are mostly customized. Prior to the project planning we inspect the measuring site in order to submit a detailed solution.

For instant clarifications you can contact our telephone support. Or browse our website on your own to find the suitable product for your application.

Service



In operation worldwide



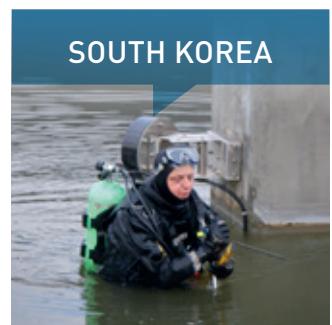
Location > Waste Water Treatment Plant
System > Kanalis TT
Transducer > TD-200/8



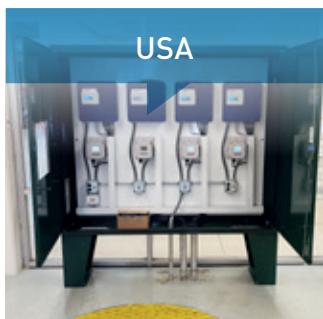
Location > Hydro Power System > Ductus TT COHP Transducer > Clamp-On



Location > Hydro Power System > Ductus TT (19") Transducer > Feedthrough



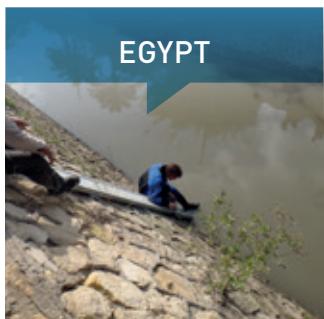
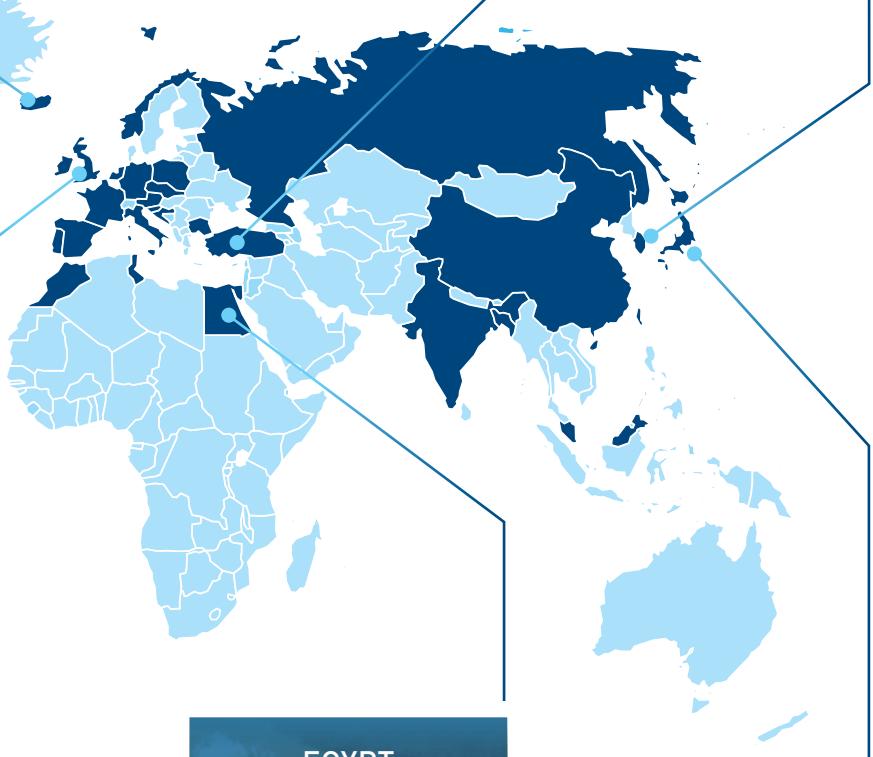
Location > River System > Fluvius TT Transducer > TD-15/17



Location > Waste Water Treatment Plant
System > Kanalis TT
Transducer > TD-200/8



Location > Water Supply System > Ductus TT Transducer > Internal mount



Location > Irrigation Channel
System > Kanalis TT
Transducer > TD-200/8



Location > River System > Fluvius TT Transducer > TD-28/18



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07/2018 - KIe60100

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