Badger Meter Europa

MultySonic 8000

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Flow measurement and flow profile determination in fluids

MultySonic 8000 is an ultrasonic flowmeter that can acquire, apart from the flow, the flow profile as well as the mean medium temperature and changes in the medium composition.
MultySonic 8000 measures everywhere in filled pipes, partially filled pipes, open channels, rivers and streams. MultySonic 8000 also works under extreme conditions, maintenance-free, calibration-free and reliably. The measurement system monitors itself continuously and the multichannel property ensures redundant safety. With MultySonic 8000 measurement transducer, you can realize up to eight different measurement points.

Features

- Maintenance-free
- Recording backflow & back up
- No culverts required
- Ex-approved
- High accuracy
- For channels from 0,2 to 50 m wide
- For different channel profiles
- Easy software updates via USB
- Remote control via internet

General advantages

- Flow measurement independent of medium viscosity
- Suitable for electrically non-conducting media
- Practically no pressure loss
- Retrospective installation without pipe interruption is possible

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Versatile, accurate and usable anywhere

Sewage plants
- Monitoring of sewage plants inflow and outflow according to the German self-monitoring regulation (EkVO)
- Control of rain trapping ponds
- Feeding of parallel ponds
- Monitoring the after-purification

Drain water associations and city works
- Recording the exact discharge quantities
- Recognition of false water quantities
- Checking and acquisition of the canal hydrology
- Recording velocity profiles

Thermal power stations

Here, MultySonic 8000 reliably carries out
- The monitoring of tapped and recycled cooling water quantities for accounting purposes
- Energy balancing to avoid impermissible flow heating
- Exact determination of the mean water temperature, even in case of temperature skeins
- Optimization of the pump performance

Storage power stations and pumped storage power stations
- Turbine and pump monitoring
- Optimization of the turbine efficiency
- Turbine acceptance according to international standards
- Checking the required water quantities
- Pipe rupture monitoring

River power stations
- Efficiency optimization and vane control
- Monitoring of environment protection requirements

Innovative metering processes, precise and intelligent evaluation

Running time methods with hitherto-unachieved resolution for flow measurement

The electronics measures the running time difference of the ultrasonic signals running in and against the direction of flow with unbelievable precision. The evaluation technology developed has a resolution of up to < 30 psec.

That is the reason that MultySonic 8000 measures even the smallest flow speeds reliably. And because the runtime measurement is a purely digital time measurement, the electronics works in a driftfree and maintenance-free manner.

Correlation process for measurement under the most difficult conditions

Ultrasonic signals are disturbed by a large number of influencing quantities; this includes EMC radiation, gas or solid impurity loading, machine noise etc. In order to be able to reliably find the ultrasonic signals again in this „ambient noise", in the case of the traditional ultrasonic devices, the signal amplitude must be a multiple of the noise. MultySonic 8000 is developed a new kind of evaluation method, which finds the ultrasonic signals even if the amplitude of the noise is a multiple of the signal amplitude. The benefits for the user are the reliable and stable measurement data even under extremely unfavorable conditions.

Innovative pulse Doppler process for determining the flow profile

When the flow of open channels is to be measured, major constructions are often required. Either filled pipes are generated through expensive procedures, and there, for example, MAG meters are deployed, or precisely defined cross-sections, for example, Venturis are built, to acquire the flow through a level measurement. This is expensive, often inaccurate and in addition, brings the danger of overflooding.

For flow profile determination, MultySonic 8000 sends pulses packets into the fluid. The pulses are reflected on the mobile gas bubbles or particles. Owing to the motion of the particles, the frequency of the ultrasonic signal changes according to the Doppler principle. Thus, the frequency displacement is a measure of the particle speed or the medium speed. Since, in addition, the time till the echo is received is measured, the position of the particles can also be determined. By the use of several ultrasonic paths on different measurement levels, MultySonic 8000 determines a high-resolution spatial image of the flow profile. Expensive construction measures like culverts, long inflow paths etc. become superfluous.

- Up to 16 (!) measurement paths make possible far more accurate measurements than was the case so far
- The flow profile is acquired in a far better manner than in the case of point-based systems or systems working in only one line, because: In traditional systems, changes in the flow profile owing to back-ups or alternating levels result in extreme measurement errors
- Detection of even the smallest (return) flows

Smartdamp - reacts immediately and is damped as well

The problem in the case of normal damping of the first order is well known: Nicely smoothened measured values „cost" a slow reaction of the measuring instrument with jerky measured value changes. The smoothened measured values are required for stable regulation; the realtime jump response cannot be dispensed with. Therefore, for the user, with most measuring instruments, there only remains a compromise between moderate regulation quality and a just about adequate reaction to jerky changes in measured values.

Here, the new damping strategy developed, „Smartdamp" gives a big advantage: Smartdamp quickly follows the measured value in case of sudden jumps, but reliably damps small measured value variations, to ensure a high control quality of the downstream control elements.

Convenient, safe and can be monitored via internet

Parameterization

MultySonic 8000 can be conveniently and easily prepared for measurement, even for very complex applications. Complete parameterization essentially consists of the input of the channel shape, definition of the path configuration, definition of the inputs and outputs as well as the selection of the discharge method.

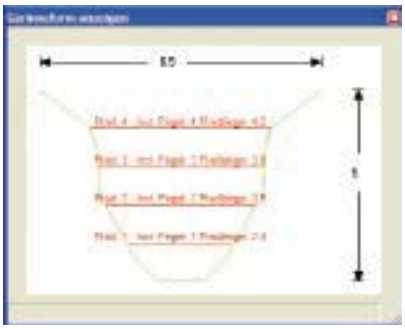
The accompanying Windows®-software makes possible an intuitive and mostly self-explanatory parameterization.

After completion of the parameters, they can be stored, from the workplace - PC or laptop - on a common memory stick and copied to the instrument. To do so, all that must be done is to connect the stick to MultySonic 8000 – the parameters are then copied fully automatically. Troublesome handling of the laptop under often rough measurement location conditions is thus eliminated. Even updates, software enhancements or layout changes of the display are easily possible with this tool.

Alternatively, MultySonic 8000 can also be connected via LAN with the Intranet or Internet and comfortably parameterized and updated via FTP. Reading the current measurement values is easily possible by means of the Webserver integrated in MultySonic 8000.

Channel shape

To deploy MultySonic 8000 in a pipe, only the inner diameter has to be input for defining the channel shape. Other channel shapes are quite easily defined by inputting a plotting point table. The userfriendly software permits a graphical examination of the input.



Inputting up to 128 plotting points makes an exact definition of the measurement point geometry possible. Therefore, a highly accurate determination of the flow becomes possible even in the case of complex cross-sections.

Depending on whether the channel is angular, round or natural, MultySonic 8000 connects the plotting points with straight lines or a spline. This increases the accuracy of the flow calculation even in round channels or natural running waters.

Path configuration

In the path configuration, it is necessary to input the respective path parameters. Essentially, these are the transducer type, the path height, path length and the path angle. In addition, from the menu „Expert settings“, there is the option to influence additional parameters like signal coding – the parameterization software is a transparent as well as comprehensive tool for individual configuration requirements.

Inputs and outputs

All inputs and outputs are freely parameterizable and scalable in the case. Apart from the outflow data, e.g. the level, flow speeds, medium temperature or other quantities of interest can also be transmitted. By means of switches on the I/O-card, the analog outputs can be operated both actively (24 V DC from MultySonic 8000) as well as passively (24 V DC from external voltage source).

With the digital outputs (2 relay outputs and 2 frequency outputs per board with output frequencies between 1 and 400 Hz), counting pulses or alarms can be led to the outside.

An I/O-board has 8 analog inputs, 4 analog as well as 4 digital outputs. If additional inputs and outputs are required the number of inputs and outputs can be doubled by simple plug-and-play by plugging in another I/O-card.

Discharge method

Depending on your application, there are a large number of ISO-standardized discharge models that ensure optimum accuracy.
After the installation of the ultrasonic transducers, the specific parameters of the measurement point like medium definition and calculation coefficients (which are to be simply taken from the manual) can be transmitted to the instrument with the help of the software „Parameters“.

Convenient expansion options

With one meter, it is possible to realize up to four different measurement points (sections) with a total of maximum 16 paths. MultySonic 8000 can be retrospectively expanded: Simply insert additional ultrasonic or I/O boards in the evaluation unit, switch on – done! Recognition is automatic, by plug-and-play.

Safety

There is a great deal of importance attached to safety. The main computer works with a highly secure embedded Linux operating system with a hierarchical security concept.
Without a password, only a display of the current operations data and reading the data logger are possible. For other tasks, there are different access rights „User / Service /Administrator“, which are password protected. This makes unintentional or malicious interference in the measurement task practically impossible.

Remote operation

If MultySonic 8000 is integrated in a computer network, parameters can be changed, the device status queries and saved measured values can be read directly from the Windows®-PC; MultySonic 8000 can save the measured values of 40 (!) years internally. Therefore, repeatedly searching for the measurement point is eliminated. MultySonic 8000 works fully automatically without disturbing the work flow of the measurement technician.

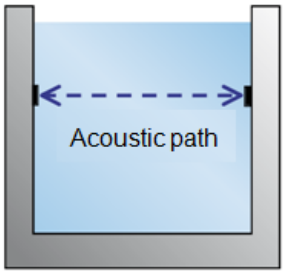
Proven measurement processes

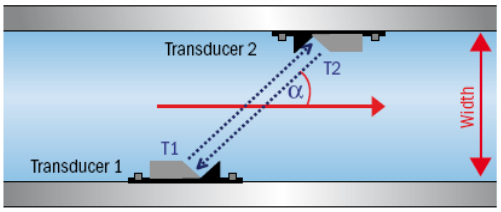
Basis of calculation

The determination of the flow speed is based on the ultrasonic running time method: Two ultrasonic transducers emit, at an angle α (15 - 75°), sound waves into the medium. Such a transducer pair together forms an acoustic path.

The sound waves emitted by transducers located upstream are accelerated by the flow; the sound waves emitted by the transducers located downstream get delayed. The running time difference (T2- T1) between the two is a direct measure of the mean flow speed across the path length. From this, if the geometry is known, the flow can be calculated.

MultySonic 8000 acquires the difference in running times with an extremely high resolution. As a result, extremely large measurement ranges of 1:10,000 (0.002..20 m/s) and excellent path accuracies (from 0.1%) can be realized. The calculation of the through flow or discharge is conformant to international standards.





High accuracy through multi-path measurement

Even with just a single acoustic path, under ideal conditions, a reproducible and reliable determination of the flow is possible. The flow conditions in large pipes and in open or partially filled channels are, however, very complex. Short inflow paths, changing levels, back-ups, channel roughness, wind and waves are only some of the many interfering quantities in the case of such measurements.
In order to achieve, under such difficult conditions, good through-flow or discharge accuracies, a multiple path measurement is necessary. By installing crossed transducer pairs, high accuracies are realized even with extremely short inflow paths (e.g. immediately after curves, after valves or pipe narrowing. The following table provides an overview of what accuracy can be achieved with which equipment:

	Accuracies					
Inflow path	> 10D			< 5D		
Paths / Crosswise measurements	2	4	6	2x2	4x2	6x2
filled pipes and filled rectangular cross-sections	1.5-2 %	0.5-1 %	0.50%	1.5-2 %	0.5-1 %	0.50%
open channels partially filled pipes, running water	3-4 %	2-3%	1-2%	3-4%	2-3%	1-2%

Simple installation

Installation options

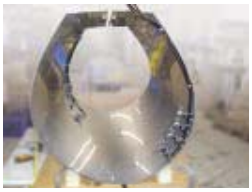
Regardless of whether there is a rectangular cross-section involved, or partially or fully filled pipes or naturally running water, the location of the measurement point considerably influences the measurement result.

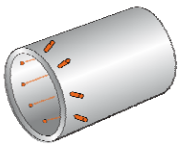
On the basis of the isometric view or drawing of the application, we recommend the best possible installation location and specify the expected accuracy free of cost.

The structural shape as well as the mounting of the transducer is matched individually to the measurement environment.

Installation in open channels

The transducers can be installed directly on the surface of the channel or on special mounting rails, which make it possible to pull them under operational conditions. Connecting a level measurement device (4..20 mA) makes possible correct discharge calculation under alternating level values.





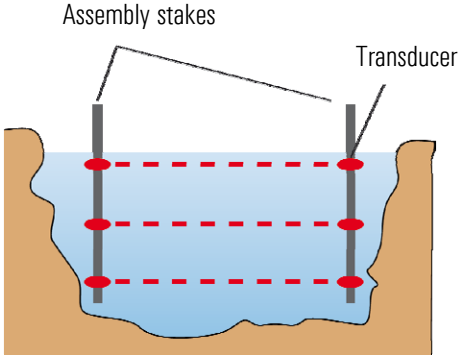
Installation examples for natural running waters on bridges and dams

Installation is possible on bridges and dams as well as at a distance from the banks.

In channels in the case of which the banks are not uniform in cross-section or covered by vegetation, according to international standards, it is also permitted to mount the transducers on stakes that must be inserted at a certain distance from the banks. In particular, when the ratio between „not measured" and „measured" flow is low, the correction (calibration) to be carried out is also less and the generated measurement inaccuracies are within tolerance.

Installation in piping

In filled pipes, the transducers are either introduced into the inside of the tube through welding sockets or installed internally, e.g. by means of a clamping ring. The cables are led out here via special sealing packing. Welding sockets in the Quicklock construction can be installed in ongoing operation at operating pressures up to 100 bar and – if necessary at all – maintained. In the case of partially filled pipes, the measurement system is only enhanced by one more level measuring instrument.



Maintenance-free, no culverts, no long approach paths

High-Tech ultrasonic sensors

High signal performance

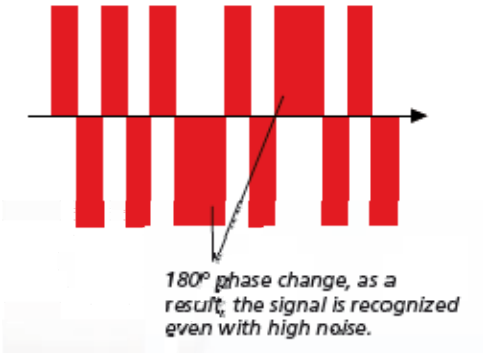
The ultrasonic sensors provide an excellent signal exploitation. Piezo, the housing, gluing and casting materials were optimized for the highest transmission of the sound energy. Therefore, the integration of the ultrasonic signals in the fluid takes place with the best possible signal exploitation. As compared to other ultrasonic sensors and clamp-on-systems, a significantly more stable signal is achieved owing to the high signal exploitation. This also makes possible the measurement of media that are bad conductors of sound or under high solid and gas loading – and that at path lengths of more than 100 m. The assembly plate has a standard impact protection, which protects the transducer reliably from damage by driven material.

Fast reaction to encoded transmission signals

To exclude the possibility of wrong measurements with certainty, MultySonic 8000 transmits coded transmission signals – similar to Morse code. The digital signal processor then searches in the received signal for the transmitted Morse code. If a deviating signal is found, the signal is rejected. As a result, mis-measurements caused by noise are practically eliminated. This becomes possible thanks to the extremely powerful ultrasonic sensors, which can cleanly convert such coded transmission signals into ultrasonic signals.

Short response and reverberation times

Fast response and reverberation of the ultrasonic sensor has a number of advantages: The maximum signal amplitude is quickly available, hence the signal is more easily recognizable. In pulse-echo operation, a short reverberation time ensures short block distances, i.e. even echoes that originate close to the transducer can also be heard, since the reverberation is sufficiently damped. An ingenious structural shape and special casting materials make this advantageous sensor behavior possible.



Powerful hardware architecture

Multiboard concept

The measurement sensor consists of a main computer, which makes it possible for the user to individually confi gure measurement cards. Plug&Play applies here purposefully for all extension cards: Open the housing, insert the new measurement card, close the housing, use the new measurement card. The main computer recognizes new measurement cards automatically and immediately makes the hardware available, without any further steps being required.

Since all the measurement cards have their own processors, the system performance is always assured, regardless of whether 4, 8, 12 or 16 ultrasonic paths are used. The powerful 64-bit Linux main computer merely assigns their tasks to the measurement cards and the respective cards then fulfill their measurement function fully independently. Thus, depending on the configuration, the individual measurement path is measured up to more than 100 times per second. This ensures not only the measurement performance, but also a high degree of redundancy and system stability. All the boards are equipped with a separate self-monitoring system.