

deltaflow

Flow Metering for Gas, Steam and Liquid

deltaflow
made by **systemec**



systemec
CONTROLS

Metering for Gas, Steam and Liquid

de

The deltaflow is a pitot tube which measures the flow in conduits according to the differential pressure principle. It can be used to meter gases, steams, and liquids under almost any operating condition in many different industries.

In Power Plants:

The deltaflow meters all gaseous media reliably and precisely, including fresh air, preheated air, recycled stack gas, and flue gas before and after wash scrubber, as well as media with an extremely high particulate load (when used with the LSP air purging system), live steam, medium-pressure steam, low-pressure steam and feed water – all tested to PED97/23/EC with CE certification.

Special Advantages:

- Energy savings realized from using deltaflow are so significant that a deltaflow purchased to meter steam or feed water often pays for itself within just a few weeks.
- With exact measurements of combustion exhausts from boilers, burnout, slagging and efficiency levels can be adjusted for optimum performance. Because pressure loss levels are so minor, smaller pumps, blowers and compressors can be used.
- Your deltaflow is a reliable exhaust gas meter, suitable for high and very high temperatures up to above 1200 °C, which has been tested by the TÜV (German Technical Inspection Agency).



DF25 with LSP air purging system for combustion gas with high particulate content after air preheating.

Chemistry and Petrochemistry

The deltaflow is also a viable solution in the chemical and petrochemical industries - for metering products, exhaust or flue gasses, or inert or aggressive media. In an endurance test, lasting several months and performed in 1996 at Wacker-Chemie in Burghausen, Germany, the deltaflow proved its durability measuring 100% steam-saturated, aggressive and polluted flue gas.

Special Advantages:

- The deltaflow's high degree of precision and accuracy increases the quality of your process and your products
- Your deltaflow can be made of materials suited for especially corrosive or high-temperature media, thus providing a solution even for your "problem areas." Such as pyrolysis, for example: the deltaflow can be manufactured using acid-resistant materials which allow continuous operation at temperatures over 1200 °C.
- Neither vacuum nor high-pressure explosive environments nor high pressure applications are a problem; all probes conform to ATEX standards (explosion proofed) and TÜV certified up to 690 bar.



DF25HDD3 for polluted, high-pressure natural gas behind a drill head.

Water and Wastewater Treatment

The deltaflow is especially valuable for metering biogas and sewer gas in the water and wastewater treatment industry. The deltaflow proves its reliability metering air flow into aeration tanks.

Special Advantages:

- Because the deltaflow is not sensitive to condensation or pollution, it is the ideal metering tool for measuring sewer gas.
- The deltaflow is designed for stability in long-term use and is drift-free, making it particularly suitable for metering under rough conditions.
- deltaflow is useful for metering air, water, and steam in gasification and sludge incineration applications



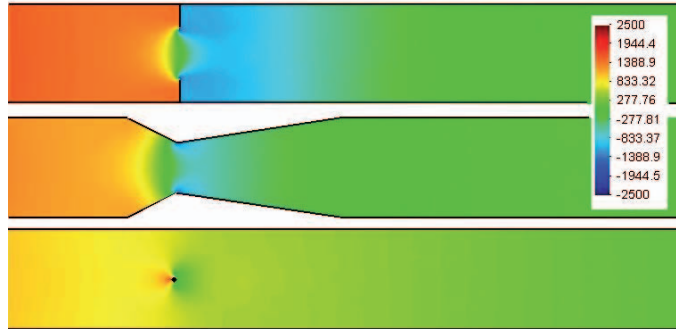
Deployment of deltaflow for biogas flow metering.

Economical, Precise, and Versatile

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Minimal Pressure Loss Results in Minimal Energy Costs

Unnecessary pressure loss costs money! In many applications, these losses may add up to several tens of thousands of dollars each year. One decisive advantage a pitot tube has over classic differential pressure elements is its low-impact, streamlined design: it creates virtually no constrictions inside a conduit, resulting in the lowest residual pressure loss compared to traditional primary elements such as orifices or venturis.



Pressure loss when using: orifice (upper fig.), Venturi (middle fig.), and deltaflow (bottom fig.)

Save Up To 90% in Installation Times and Costs

To install your deltaflow, simply weld in a single stud. There is no need to cut open a conduit or spend time welding numerous flanges. The deltaflow can be completely installed in only 1 to 2 hours for most applications! And because it is so lightweight, an installer can single-handedly manage the installation of even the largest probes without the aid of any heavy equipment. Neither is there any need for complicated alignment procedures, since incoming flow can approach at an angle of $\pm 10^\circ$ without affecting the targeted precision levels.

Highest metering precision thanks to optimized probe profile and high precision manufacturing

The shape of a probe and the manufacturing quality strongly influence the measurement's precision and therefore also your process' factor of quality. Thanks to a continuous further development and a number of patents, deltaflow offers you:

- absence of drift
- precision
- long-term stability
- reliability.

Optimized Flow Profile Yields Maximum Precision

The originality to the deltaflow's profile is in its acceleration curves and its sharp tear-off edges. The profile was developed and optimized through extensive testing by systec Controls in collaboration with the Department of Flow Dynamics at the University of Erlangen. The acceleration curves increase the flow speed towards the tear-off edges several times over. The sharp tear-off edge causes a defined and drift-free break-off point of the flow independent of velocity.

Patented probe profile

The particularity of the deltaflow profile lies in its acceleration curves and its tear-off edges. Thanks to the streamlined profile the flow speed towards the tear-off edge is accelerated by approximately a factor 2.3. This increases the differential pressure. The probe's calibration factor, i. e. its resistance coefficient, which strongly influences the flow metering results, remains extremely constant.



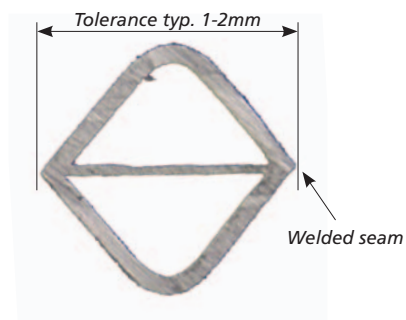
Flow rate at the edge of the deltaflow is accelerated to approximately 2.3 times the previous speed.

Result: The resistance coefficient remains constant throughout the entire measuring range.

The degree of precision is maintained even in the lower measuring ranges because there is no critical drift of the breakoff point. Measuring ranges of 1:30 and larger are completely feasible.

No Measuring Errors Caused by Welded Seams at Probe's Cross Section

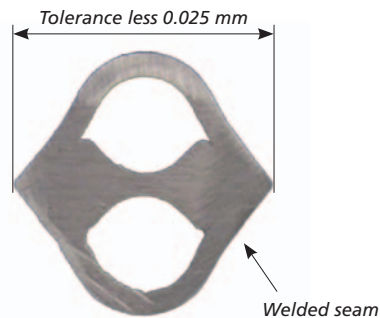
Most pitot tubes are constructed of two outer walls and a separating wall welded between the two chambers. These are generally manufactured by welding them in sideways and then manually adjusting them, resulting in production tolerances at the edge to edge width of between 1 and 2 mm. But a production tolerance of as little as 1 mm can result in a measuring error of up to 10% in a conduit measuring 100 mm, and the error can be even greater in conduits of smaller diameter! To solve this problem, systec developed a production process in which the deltaflow's welds are located along the probe's curves instead of at the critical cross section.



Traditional probe profile: Welded seams and surface adjustment at the critical front surfaces, resulting in asymmetries at the edge to the edge width.

Production Tolerance of <0.025 mm Through New Manufacturing Processes

The deltaflow uses cold-rolled profiles. The measurement tolerance at the edge to edge width therefore does not exceed +/- 0.025mm which gives a very accurate shape.



Flow profile of the DF25: Welded seams are located on the noncritical curves; there is no impact on the measurements at the edge to edge width.

Absence of Capillaries Prevents Measurement Errors Caused by Water Columns

Internal differential pressure pipes and the dp-tappings of the DF25 and DF44 have a diameter of at least 8mm which allows any accumulated flow to drain. This means that there is no error in differential pressure caused by water columns. For liquid service this also allows gases to vent properly. This means that there is no error caused by capillary action.

Tested by the TÜV (German Technical Inspection Authority)

Already in 1996 the deltaflow DF25 and DF50 were successfully subjected to a three-month durability test conducted by the TÜV Compliance Board in accordance with clean air requirements and were included the environmental guidelines for water / steam saturated flue and exhaust gasses. By the way: the deltaflow was neither heated nor cleaned throughout the entire test.

High Pressures and Temperatures

The deltaflow DF25-HDD3 can be used for live steam at pressures far exceeding 600 bar and temperatures far hotter than 600° C. Tests were performed in accordance with pressure equipment guidelines 97/23/EC (formerly TRD). And because special demands are made on materials used in high-pressure applications, we have developed the DF25-HD3 with a unique flow profile specifically intended for use with live steam. This profile has the most minimal tolerances and is manufactured from massive blocks, which means that it is not subject to any influence from heat used in welding processes. Advantage: Maximum measurement precision, maximum durability, maximum security.



The high-precision profile of the DF25-HDD3 is manufactured using massive steel blocks - this means there are neither welding seams nor heat-affected zones.

Integrated Pressure and Temperature Sensors

The deltaflow can easily be equipped with integrated pressure and temperature sensors in order to compensate for pressure or temperature if necessary, eliminating the need for separate attachments.

Low Maintenance

In most applications, the deltaflow works for years without requiring any maintenance at all. In media with high particulate content or in polluted media, we recommend using the LSP air purging system from systec Controls for periodic cleaning cycles.

The deltaflow's precision performance has been confirmed by the Technical University at Erlangen:

"Based on the calibration results, it can be stated that the deltaflow pitot tube causes less pressure and energy loss in conduits and enables more precise measurements than the orifices previously used in conduits."

(Dr. F. Durst, Professor)

deltaflow Model Series



	DF 8	DF 12	DF 25			
Pipe diameter	1 - 25 mm	DN20 - DN100	DN65 - ID2500 mm			
Media	Gas, Liquid, Steam		Gas, Liquid, Humid Gas			
Precision	Better than 1% of the measured value, 0.5% after calibration (optional)					
Installation	weld-in, flanged or screw-in spool piece	cutting ring stud (PN40), flange connector, spool piece (screw-in, flange connection, weld-in)	cutting ring stud (PN40), flange connector, weld-in, spool piece (weld-in, with flange connection)			
Sampling range	To >1:30, bi-directional					
Pressure range	0 - 690 bar	0 - 160 bar	0 - 250 bar			
Temperature range	-200 to +1240 °C					
Materials	<ul style="list-style-type: none"> • 1.0305 (studs only) • 1.4571 (ANSI/ASME 316Ti) (standard) • 1.4828 (309) (high temperature) • 1.4539 (904L), Hastelloy C4, Haynes Alloy (oxidizing media) • 1.5415 (A204) , 1.7380 (A182-F22), 1.7335 (A182-F12), 1.4903 (P91) (boiler steels) • Additional materials available on request 					
Options	Integrated pressure and temperature sensors Weather-proof casing for harsh outdoor applications LSP air purging system for very dusty fluids (up to 200 g/m³) Flowcom for industrial heat and energy calculation and for gas compensation Calibration by our testing stand / by external testing stands (e. g. PtB) (up to nominal length DN400. Larger nominal lengths are available on request.					
Connecting the dp transmitter						
	thread	oval adapter	ball valve	needle valve	three-way manifold	double needle valve
	By request the following components are also available: five-way block, Ermeto and Swagelok fittings etc.					
Accreditations	Eex / ATEX PED 97/23/EC	Eex / ATEX PED 97/23/EC	Eex / ATEX Emission quantity measurement (on request)) PED 97/23/EC			
Material Certifications	3.1 / EN 10204 3.2 / EN 10204 2.2 / EN 10204					

DF 25HDD3



DF 25 Quicklock



DF 44



65 - 1000 mm

High Pressure Steam,
High Pressure Liquids

weld-in

60 - 690 bar

Eex / ATEX
PED 97/23/EC

DN65 - ID2500 mm

High pressure Gases or Liquids with
strong tendency to pollution,
Online cleaning

ball valve stud

0 - 100 bar

Eex / ATEX
PED 97/23/EC

DN200 - ID15000 mm

Gas Liquid, Humid Gas,
Liquid, Steam

flange connector

0 - 100 bar

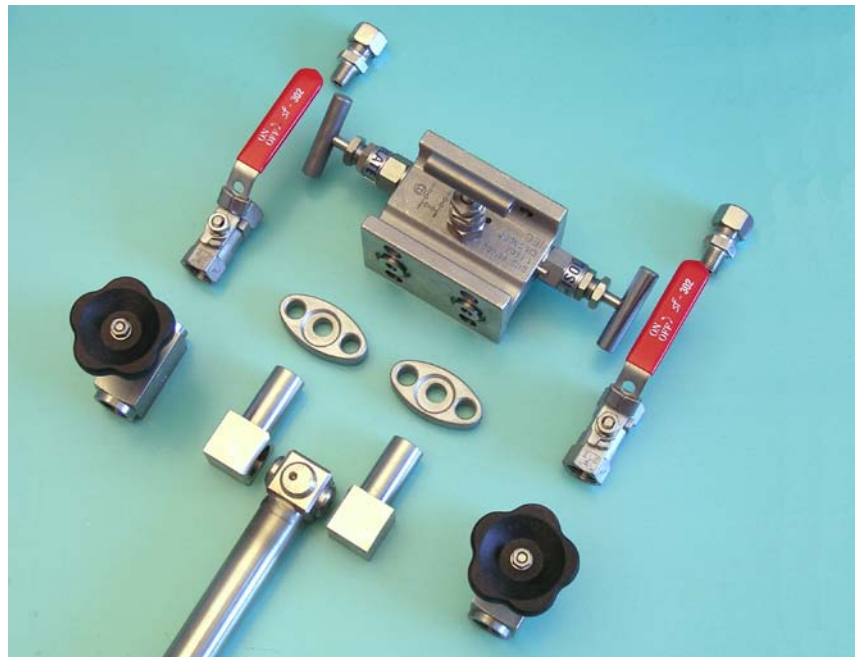
Eex / ATEX
Emission quantity measurement (on
request) PED 97/23/EC

deltaflow multitask - the patented connecting concept

The connecting concept that helps you save time and money

A connecting system is needed to transfer the differential pressure to the evaluation instrument (differential pressure transmitter); when using a traditional probe, this connecting system must be adapted to each given application, and this is usually time consuming and expensive. This problem doesn't exist if you use the patented connecting concept of systec Controls!

The deltaflow's connecting system consists of a head and two universal adapters. These components are identical for every type of fluid, i. e. for steam, gas or liquids. According to the orientation of the conduit, the head may be oriented horizontally or vertically. This means that you don't need a particular set of components for every single measurement application. And, since the deltaflow connecting concept is so flexible, it has a name which it deserves: Multitask.



deltaflow Multitask connection and a choice of primary shut-offs

The multitask concept offers users several advantages

- Shorter delivery times and stable prices. Since all dimensions, in particular the adapter spacings, are standardized, it is possible to realize all common connections in a very short time: three-way manifold for direct transmitter installation, thread connections, needle valves and ball valves, weld-on ends as well as many others. Thanks to this modular design, delivery times are short. And the respective prices remain unchanged, as they are since many years.

• Tested (pressure) safety

A decisive advantage: the new probe head is TÜV certified in compliance with the directive for pressure equipment PED 97/23/EC. The deltaflow therefore guarantees, in all high pressure applications, the safety users need.

A special advantage when metering steam

An important difference, when compared with other pressure probes, is that the deltaflow doesn't need expensive condensation containers. The volume of the Multitask connection adapters has been dimensioned so that enough steam condensation is always secured. Moreover the deltaflow is insensitive to installation errors because of its condensation pots that are smaller than those of traditional probes.

Low straight run requirements

For the purposes of flow metering, low straight run are required – more precisely, a long, straight, and undisturbed inlet path. While it is true that pitot tubes have the advantage of being able to cope very well with extremely short inlet paths, what do you do when even a short inlet path is not feasible? There is often a lack of space when installing into previously-existing conduits and in situations involving large diameter conduits.



Steam flow metering with direct installed transmitter and integrated directly temperature measurement

taflow

ImproveIT – Installation without straight run requirements

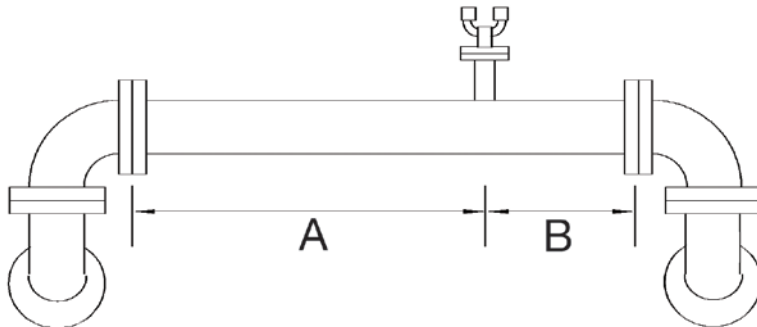
Installation without inlet path

The ImproveIT database was compiled based on years of experience and thousands of individual calibrations using the deltaflow in situations involving shortened inlet paths. ImproveIT documents the deviations and lists calibration constants for a large number of different installation conditions. This allows us to provide well-substantiated information about the deviations and linearities you can expect in almost any flow disturbance you may encounter. Simply draw a sketch of your installation, and we will calculate the adjusted flow values for you. It really is that simple.



The systec testing facility determines the effect shortened inlet paths have on the deltaflow.

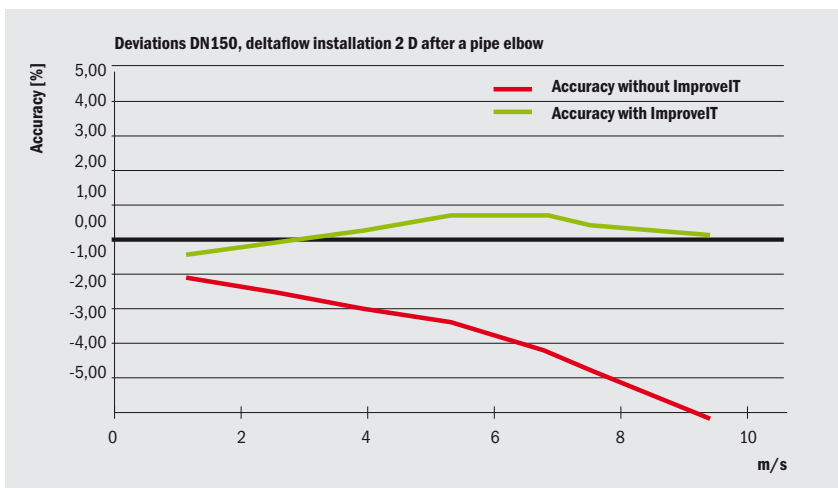
Inlet Path A	1D	2D	3D	5D	7D	10D	15D	20D	Outlet Path A
With ImproveIT	2%	2%	1,5%	1%	1%	1%	<1%	<1%	3D
Without ImproveIT			5%	3%	3%	2%	1,5%	1%	4D



An example of a double pipe elbow on multiple levels: Most flow meters require an inlet path of 20 to 40 D. The deltaflow can be installed after only 1 D with a very small degree of error. After only 7 D, the accuracy of the deltaflow enhanced with the ImproveIT database is less than 1%.

Here's How It Works:

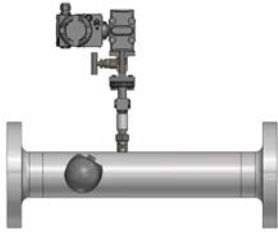
When you place your deltaflow order, you include a sketch or a drawing of your application. We will make a recommendation about the best place for installation, determine your adjustment factor, and tell you what degree of precision you can expect—all free of charge! For a small fee to cover costs, your local sales representative can take the pertinent measurements on-site if you prefer. The data provided by ImproveIT can even be transferred to probes made by other manufacturers with a slight increase in the error factor.



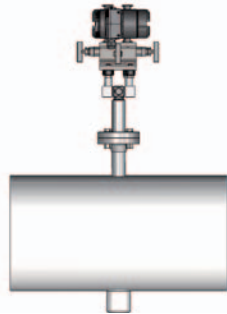
deltaflow installation 2 D after a pipe elbow. There are significant deviations without ImproveIT; all values are better than 1% with ImproveIT

Some examples of typic installations

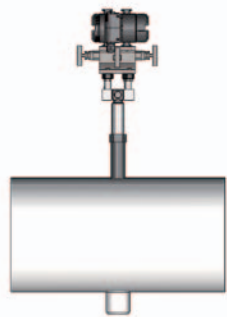
The deltaflow offers several installation and mounting possibilities convenient for your application as. for instance:



Spool piece (DF8 / DF 12 / DF 25)



Flange connection (DF12 / DF25 / DF44)



Cutting ring stud (DF 12 / DF 25)



Weld-in probe (DF12 / DF25HDD3)

deltaflow Installation Position

Liquid:

In order to consider proper venting or draining location depends on type of media and orientation of pipe. To meter liquids, the entire probe should be filled with liquid allowing gas bubbles to vent off. To allow this to happen, the unit should be installed with a slight downward slope from the dp transmitter towards the measurement profile.



Gas:

For gasses, the installation theory is exactly opposite to that of liquids. The deltaflow should be completely filled with the gas, and condensation should be able to drain freely back into the conduit.



Steam:

The deltaflow for steam is always installed into the conduit in a horizontal position. The steam condenses in the connection adapters. The differential pressure is then transmitted across the condensate column to the transducer which is located below it.



Upstream & Downstream Distances

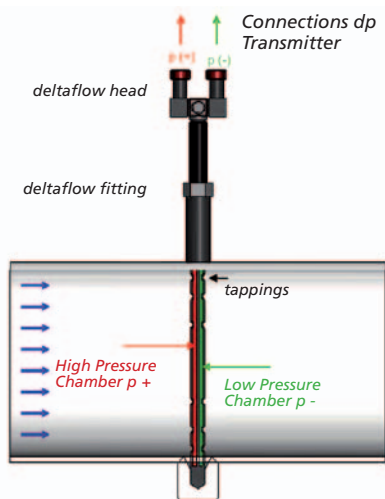
The new ImproveIT database makes it possible to use the deltaflow in applications where the inlet runs are very short. The following table shows upstream and downstream distances (in multiples of inner pipe diameter ID) and the corresponding accuracies when using ImproveIT.

	Inlet-/Out-let-path	<1 %	1%	1,5%	2%
	A (ID)	7 ID	4 ID	3 ID	1 ID
	B (ID)	4 ID	3ID	3 ID	2 ID
	A (ID)	7 ID	4 ID	3 ID	1 ID
	B (ID)	3 ID	3 ID	3 ID	2 ID
	A (ID)	7 ID	4 ID	2 ID	1 ID
	B (ID)	3 ID	3 ID	2 ID	1 ID
	A (ID)	12 ID	5 ID	3 ID	2 ID
	B (ID)	4 ID	3 ID	3 ID	2 ID

The differential pressure method: - A proven metering principle for highest precision

The deltaflow's working principle is the highly precise differential-pressure metering method. The two separated chambers of the deltaflow are provided with pressure sensing holes (dp tap-pings). These drillings isolate different pressure values in the two chambers: in the upstream one a higher and in the downstream chamber a lower pressure.

Therefore between both chambers

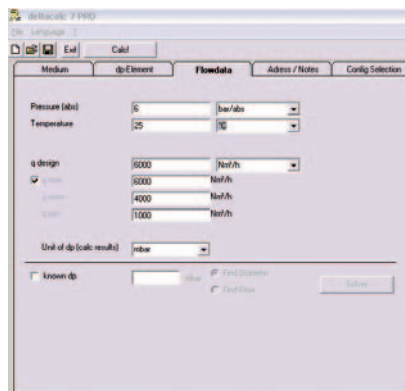


exists a pressure difference that allows the mass flow to be determined very precisely. Using a differential pressure transmitter, the differential pressure is converted in an electric signal (e. g. 4 ...20 mA / bus), proportional to the mass flow, that is then transmitted to the process control system.

A benefit for the user is that the deltaflow contains several dp tap-pings making it completely bi directional and provides a steady averaging. This design facilitates extremely precise metering even with irregular flow profiles.

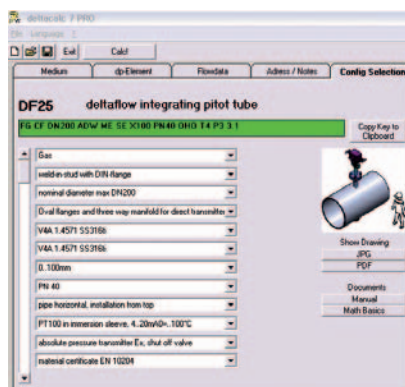
Flow calculations

The resulting differential pressure and flow rates are calculated in the same way as with traditional primary elements. You will find the exact calculation formulas in the in the computation fundamentals which can be found on the Internet site of systec Controls and in the EN-ISO 5167. Generally, you'll receive the calculation protocol from systec Controls. Using the deltacalc calculation software you may easily verify the results your deltaflow provides you with.



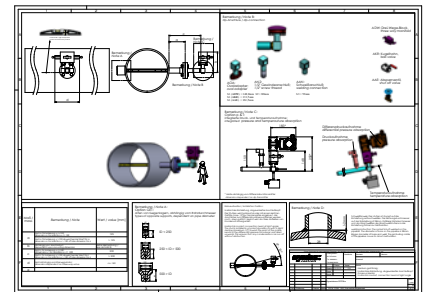
Installation and Maintenance Guide or in the EN-ISO 5167. The deltacalc calculation software allows you to easily and efficiently double-check the figures you receive from your deltaflow - to get started, download it free of charge from our website (www.systec-controls.de).

Special advantages offered by deltacalc
With deltacalc you can configure your probe so that it exactly fits your application and then order it using the automatically generated model code. The deltacalc also generates information drawings for most applications: they also provide you with the most common dimensions.



The deltacalc always verifies if the chosen probe type suits your application so that you can be sure your deltaflow complies with your application's requirements.

A suggestion: if you get a licence from systec Controls for your deltacalc (at a small fee) you will be able to calculate and dimension not only deltaflow, but also other components like orifices and Venturis.



You can find more information and application examples at www.systec-controls.de products deltaflow

This is the information we need to know when you place your request/order:

Conduit: Material
Inner diameter
Wall thickness

Operating Conditions: Medium
Min.Max. pressure,
Min.Max. temperature,
Min.Max. flow range

Required Certifications: Ex / ATEX
PED 97/23/EC
3.1
3.2
Other

Your request is welcome even at on-line form at www.systec-controls.de (information&contact)

Flow Metering Technology “by systec”



deltawave

deltawave ultrasonic flow-meters are conceived for flow metering in filled or partially filled conduits as well as in open or closed canals. When installed in thermal power plants, the deltaxwave is used for the precision flow metering of the cooling water volume and for measuring its temperature. In hydroelectric power plants it controls the water supply or it may be used for leakage control, e. g. in penstocks. Thanks to its high precision, it is admitted for the acceptance test of turbines in compliance with ISO 60041; moreover, it determines the efficiency of turbines too. And also in the hydrologic field deltaxwave proved its strengths: as an outlet flow meter or even in the flood-wave forecasting. deltaxwave's ultrasonic transducers are simply mounted in the existing cross-section of the canal or of the conduit.

flowcom made by systec

When measuring professionally, you need to evaluate the results professionally too. The flowcom is the ideal complement of deltaxflow or of any other flow metering system. It compensates the errors, due to temperature and pressure, occurring in flow meters and determines the mass or the volume of gas flows. When used for steam and water applications, it can also compute energy amounts. Its suitability is TÜV (German Technical Inspection Agency).



deltaxflowC

The deltaxflowC meters gas flows in conduits and canals applying the highly precise differential pressure principle. Thanks to its integrated microcontroller, which performs the measurement of differential pressure and of temperature, the deltaxflowC delivers a completely pressure- and temperature-compensated mass flow signal; additionally it provides signal outputs for pressure or temperature. When it comes to gas flow metering: deltaxflowC is the multitalent at your disposal.



The headquarters of the systec Controls is located in Puchheim near Munich. Here we develop and produce our products in accordance with DIN EN ISO. But innovation and product quality alone are not enough for us. We have also submitted our systems for examination by independent institutions—and they have been clearly proven to be efficient and

reliable. And we are always available to help you, even after your equipment has been installed. You can reach our hot-line **24 hours a day, 7 days a week.**
systec Controls - the specialists in flow metering technology.

systec
CONTROLS

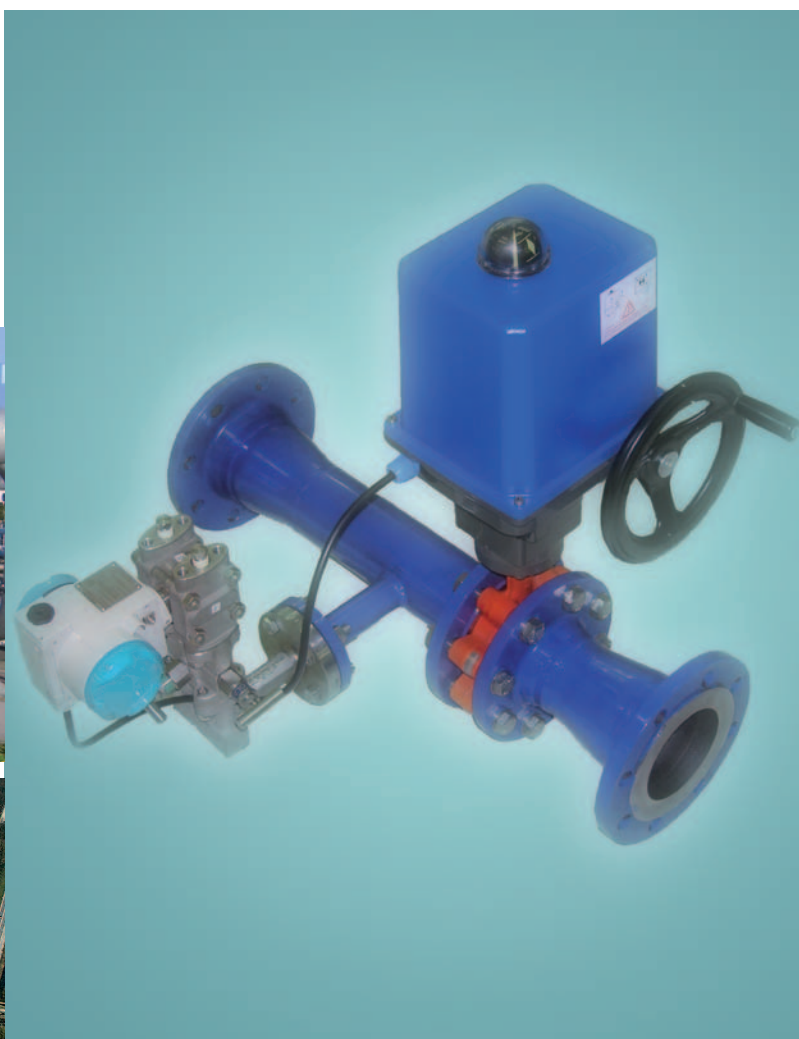
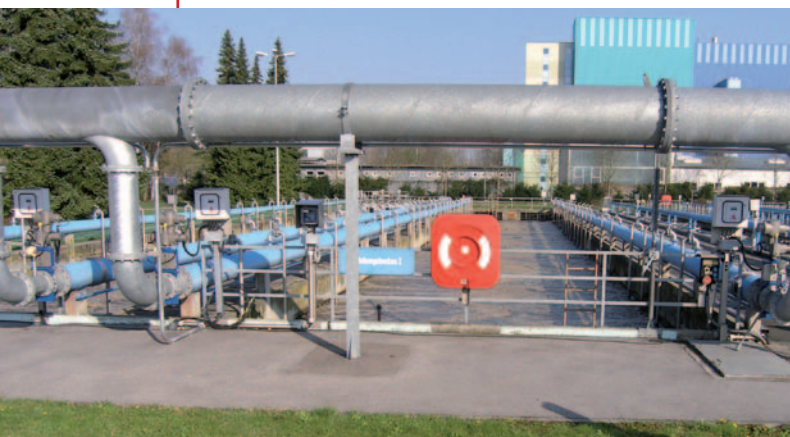
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deltafit

Air-flow regulation for sewage treatment plants

- Precise
- Compact
- Maintenance-free

deltafit
made by systec



Clever messen!
systec
CONTROLS

Measurement and regulation of air for aeration tanks

The precise regulation of the air quantities for the aeration tanks ensures not only the optimum sewage treatment process: The exact measurement and dosing of the energy-intensively compressed air saves cash and prevents the costly production of „surplus“ compressed air which is not really required for the optimum operation of the aeration tanks.

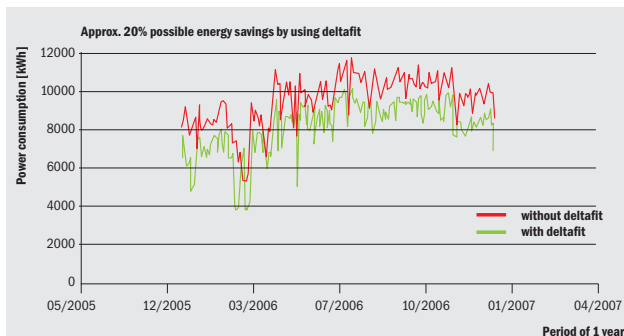
deltafit increases the efficiency of the installation through demand-driven air conduction. The compact measurement and control system saves energy costs and works maintenance-free over years, even under the harshest conditions. The optimally adjusted deltafit components are used in thousands and prove their high accuracy and availability in the entire process industry. After their installation and parameterisation, no expensive commissioning is required, according to the motto „Install - Switch on - Forget“.

Saves costs and reduces CO₂-output

Even medium-sized sewage treatment plants must partially spend electricity costs of more than 500,000 euros a year. Thereby, just making available the air supply for the aeration tanks often causes more than 60% of the total energy costs, i.e. more than 300,000 euros in the example mentioned. Therefore, the precise dosing of the air quantity is a decisive argument for optimising the operating costs. Often, an energy cost reduction of 20% or more can only be obtained through deltafit.

Economic from installation to operation

deltafit saves energy costs over the whole investment period. deltafit is extremely cost-effective regarding the purchase. Pre-mounted and parameterised components ensure quick installation and simple commissioning. The intelligent drive provides not only the precise flap position; the integrated regulator and the transmitter power supply allow to do without an expensive, separate controller. The low pressure drop also saves energy costs. The high control quality and measuring accuracy of deltafit ensures optimum process operations, i.e. the optimisation of the decomposition performance and consequently the observation of the limit values during the process and, at the same time, prevents costly waste of compressed air. The maintenance efforts are practically non-existent, the components used have a long life.

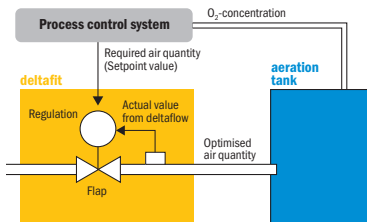


Typical power consumption of a medium-sized biological sewage treatment plant.

Optimisation of the oxygen concentration

Even very small changes of the sewage level in the aeration tank or of the aerator condition cause significant changes of the pressure conditions in the compressed-air pipings.

Regulation diagram

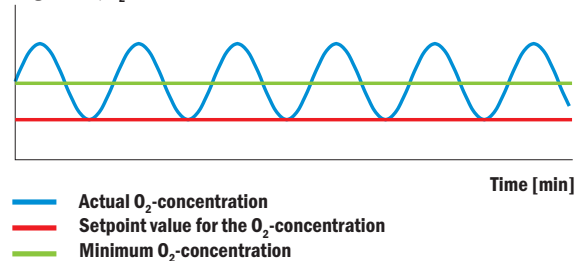


The air diffusion of the plant is thus permanently exposed to partially strong variations. Therefore, the regulation of the aeration according to the oxygen concentration is too slow for a consumption-optimised regulation. The O₂-concentration responds to the actually delivered air quantity only with a delay. Therefore, the O₂-concentration varies continuously around the setpoint value. This has negative effects on the power consumption and the cleaning process.

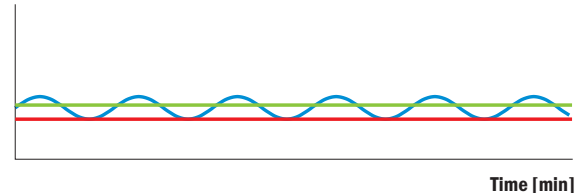
deltafit, however, continuously monitors the delivery of air and thus responds immediately to the smallest hydraulic changes. Thereby, deltafit ensures a constant oxygen concentration and consequently an optimised process.

Variation of the oxygen concentration

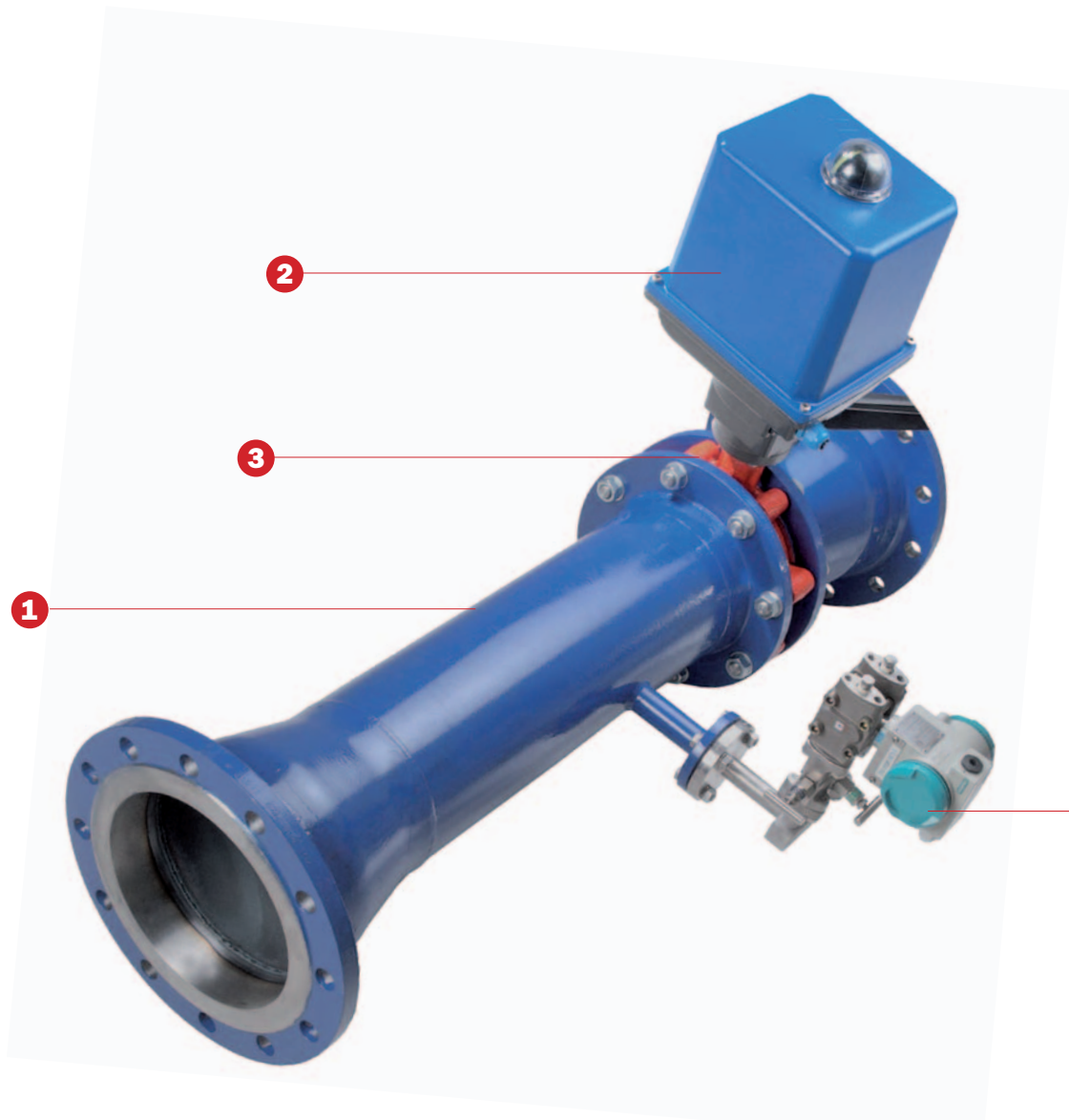
Regulation, O₂-controlled



With deltafit regulation, air-quantity controlled



Construction and components



	Components	Function	Benefits
1	Measuring path		<ul style="list-style-type: none"> • Compact construction • Built-in rectifier function, no inlet section required
2	Regulation drive	Here, the air-quantity setpoint from the process control system is connected, and the flap position is regulated accordingly	<ul style="list-style-type: none"> • Drive with integrated regulation • No additional wiring • Connect only setpoint and supply • High control quality • Easy parameterisation via Windows software • Various disturbance functions
3	Flap	Regulates the flow	<ul style="list-style-type: none"> • No dirt deposits • Robust • Cost-effective • Sensitive control characteristic
4	deltaflow + differential pressure transmitter	Measurement of actual flow value	<ul style="list-style-type: none"> • Insensitive to dirt and condensates • Highly accurate *) • Integrates across the whole pipe section • No drift of measured value • Maintenance-free

*) As an option, pressure and temperature can also be compensated.

Regulating precisely means measuring accurately: deltaflow

The deltaflow measuring principle

Regulating precisely starts with the accurate mass flow measurement (actual value). The accurate and drift-free flow measurement is also a difficult measuring task in the practical operation of sewage treatment plants.

- Optimum inlet conditions are not always possible.
- The quality of the compressed air can be subject to humidity and contamination level and cause deposits in the flow sensors.

deltafit copes with all these problems: This air-flow measuring and control system uses the proven deltaflow pitot tube. Its high accuracy was tested several times, even with reduced inlet sections, by the Physikalisch-Technische Bundesanstalt (PTB) in Braunschweig, Germany. The results are convincing: Even under restricted inlet conditions, the accuracy was always better than 0.6%.

Particles, condensates, lubricating residues are no problem for deltafit. Therefore, deltafit uses a long-term accurate and absolutely robust measuring method which minimises the maintenance and ensures the high control quality, even after many years. [The technical documents for deltaflow are available at http://www.system-controls.de/files/deltaflow_prospekt.pdf.]

The use of deltafit is advantageous to the following applications:

- Municipal sewage treatment plants
- Industrial purification plants
- Large sewage treatment plants
- Small wastewater treatment plants
- Combustion air regulation e.g. steam boilers in waste incineration plants

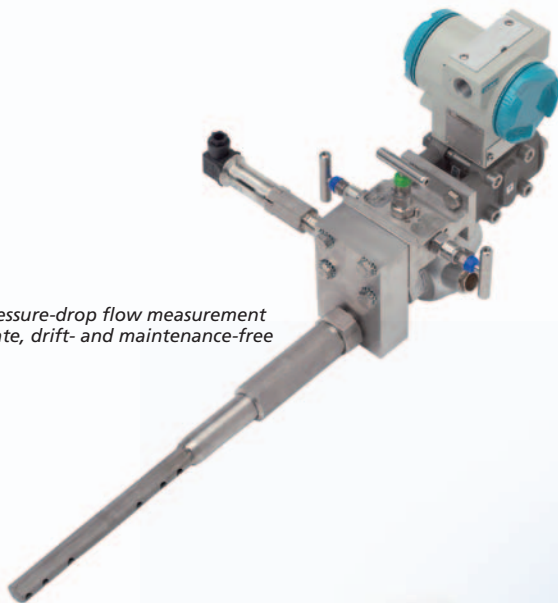
Proven a thousand times and simply reliable

Even under unfavourable installation conditions, the deltaflow pitot tube integrated in the deltafit system can also accurately measure disturbed flow profiles thanks to the unique, patented probe profile.

The measuring path is designed in a way that disturbances of the flow profile in the inlet are effectively reduced. This gives the devices a high accuracy, even under unfavourable inlet conditions. deltafit works without expensive and susceptible slide valves. The flap used in place of slide valves works reliably, even with contaminated air, loaded with particles and condensate. „Flooding or drowning“ is not possible. The intelligent control drive of the flap takes over the power supply of the connected differential pressure transmitter. Therefore, no separate controller, which would need additional wiring, is required. Under normal operating conditions, the drive works free of maintenance. The reduction gears are lubricated for a lifetime and require no relubrication.

The deltaflow pitot tube has proved its reliability for years in thousands of applications, even under the harshest conditions. With almost a thousand applications only in Germany, it is one of the best-proven methods for measuring gas flow. Approved as a flow measurement device for aggressive, contaminated and condensing gases, deltaflow is ideally suited for the conditions in sewage treatment plants.

*Low pressure-drop flow measurement
- accurate, drift- and maintenance-free*



Comfortable software possibilities for the regulation drive

systeme Controls designs deltafit according to the individual process data and carries out the adjustments of the drive and the differential pressure transmitter. On the site, only the power supply and the setpoint need to be connected - finished.

If later changes need to be carried out on the drive, a comfortable Windows software is available for this purpose. The software also enables a complete commissioning of the drive and is available free of charge.

Varied safety adjustments

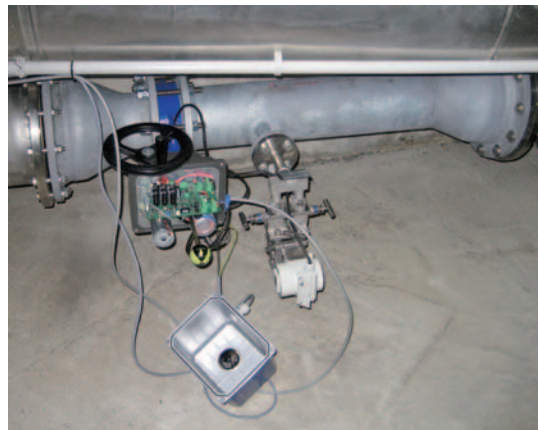
The deltafit regulation drive is characterised by a variety of safety functions. The user can fix how the drive should behave e.g. in case of a power or setpoint loss or a disturbance.

Moreover, the software offers the access to the diagnostic menu. Here, important drive parameters such as the motor run time or the housing temperature are available. So the information on the actual operating state of the drive is available at any time. As an option, the drive can be controlled via Profibus. All adjustments can then be easily carried out from the process control centre.

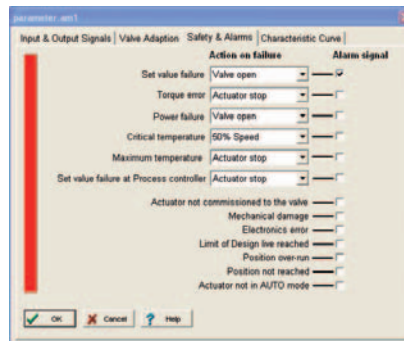
Inlet conditions Improve IT

With the new ImproveIT database, it is possible to use the deltaflow without any inlet sections.

Even with strongly varying process data regarding temperature and pressure, the usual accuracy of 0.6% is obtained through the compensation of these influencing variables.



Minimum installation effort



Comfortable and simple parameterisation software



Optimised air entry - Optimised operating costs and pollution control

What you need to know for your enquiry/order:

- Piping**
 - Material
 - Internal diameter
 - Wall thickness
 - Insulation
 - Pressure
 - Temperature

Flowmetering „by systec“



deltawave - Ultrasonic multimeter for flow and flow profile

The deltawave ultrasonic device is far more than a flowmeter for filled and (!) partially filled pipelines as well as open or closed channels: It also determines very precisely the flow conditions in partially filled pipelines or during open-channel measurements.

In an open flume, deltawave combines the „normal“ level measurement with the highly accurate multi-path transit time measurement and a revolutionary ultrasonic evaluation method. The deltawave electronics can be operated with up to 16 transducer pairs, - i.e. work with 16 measuring paths which, even under difficult conditions, reliably and accurately sense the real circumstances.

flowcom made by systec

Whoever measures professionally, needs to evaluate professionally. The flowcom is the ideal supplement to the deltaflow or any other flowmetering system. It compensates for the pressure- and temperature-related error of flowmeters and calculates mass or volume flows of gas. In steam, it can additionally calculate the quantities of energy. It is qualification-tested by the TÜV.



portaflow X clamp-on flowmeters for mobile measurements in sewage treatment systems and waterworks

The portable clamp-on flowmeter portaflowX and his permanently installed brother TimeDelta measure the flow of liquids in pipelines using the highly accurate transit time method. Very easy use, highest accuracy and extremely competitive prices characterise this series of instruments. Using the new ABM method, pipe diameters from 13 to 6000mm can be measured at temperatures between -40 and +200°C and a turbidity of up to 10,000 mg/l.



The headquarters of the company systec Controls are located in Puchheim near Munich. Here, we develop and manufacture our products according to DIN EN ISO 9000:2000. However, innovation and product quality alone are not sufficient for us. We have also had our systems examined by independent institutes - with a clear and verifiable success.

Besides, we are also at your service after the installation of your plant. You can reach our hotline **24 hours a day and 7 days a week.**

systec Controls - the specialist for flowmeters.

Handed over by:

Clever messen!
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deltaflow pitot



systemec
Messen & Regeln
Controls

deltaflow

deltaflow pitot tube: simple, precise, adaptable

Portable Flow Rate Measurement Using the Prandtl Tube Principle

The deltaflow pitot tube can be used anywhere it is necessary to establish flow profiles and verify volume measurements.

The principle is tried and true: Use the hand-held deltaflow pitot tube measurement probe at various locations along the cross section to calculate the flow rate from the measured differential pressure—just as you have always done using the classic Prandtl tube system.

The deltaflow pitot tube has a whole series of advantages:

- Ease of use
- High degree of precision
- Best adaptability to unique processes

From the Industry – For the Industry: Optimal Usability



Straight construction makes insertion easy

The measurement profile of the deltaflow pitot tube is perfectly cylindrical. The time-tested deltaflow measurement profile measures a maximum of 22mm in diameter, the attachable guidance tube measures 25mm. This means that the deltaflow pitot tube can quite easily be inserted into the sampling cross-section through existing connections or mountings. Using a special insertion mounting, the deltaflow pitot tube can be inserted into the process under sealed conditions through a 1" ball valve.

Detachable extensions make transport easy

Even people who have to work with large diameters prefer to work with a measuring instrument that is easy to transport. This is no problem with the new deltaflow pitot tube: the newly-developed threaded coupling allows you to simply disassemble the deltaflow pitot tube and then reassemble it in the desired length! And because our coupling requires no temperature-sensitive sealings or gaskets, the deltaflow can be used under even the most minimal of process conditions.



For the Most Demanding Applications: Proven deltaflow Precision

Measure more precisely with the proven deltaflow profile

The deltaflow profile was tested and developed in cooperation with the Department of Flow Mechanics at the University of Erlangen. With its acceleration returns and its sharp tear-off edge, it has achieved the highest level of measurement linearity. This has been established by the PtB as well as others. In addition, when compared to a Prandtl tube, the differential pressure has been significantly increased, which means that much lower flow rates can be measured more precisely. The deltaflow is not even susceptible to transverse flows: you can hold the deltaflow at an angle of up to 10° without effecting the precision of the measurement.

delta

W pitot

Greatest Process Adaptability: Rough Conditions Are Our Specialty!

- **Straight, cylindrical design:** The newly developed DP coupling of the deltaflow pitot makes the entire measurement probe a single, straight instrument. This lets you access your sampling cross-section through any 1" aperture. By using a special insertion mounting, you can even seal the process off from any environmental influence.
- **Assembly in individual sections:** The deltaflow pitot can be disassembled into convenient sections and reassembled to desired lengths by means of a simple threaded coupling. Use up to 8 extension sections to extend the length of the deltaflow pitot to an impressive 8.5m.
- **Large Differential Pressure Bores:** Differential pressure tapings 8mm in diameter make sampling in particulate and condensating media possible.
- **High-Tech Stainless Steel:** The deltaflow is constructed of the highest quality 1.4828 stainless steel and can thus withstand temperatures up to 1040°C.

Our employees all about the conditions under which comparison samplings are performed: the measurement must stand up to contaminated and aggressive media, high temperatures, and condensation. It is often necessary to take samplings at locations that are difficult to access. Heat and dust are just as commonplace as harsh weather and cold temperatures. The operator doesn't want to introduce any new sampling bores, but wants to use existing apertures instead. Available support personnel are pretty much nonexistent nowadays, and everything should happen as quickly as possible, because the budget is tight...

The deltaflow pitot is your trustworthy and reliable tool. It can be made efficiently small for transport and powerfully long when it comes to the job of sampling. And it is good to know that the deltaflow pitot will not make your rough working conditions even more difficult. Almost indestructible, it will continue doing its job for decades without requiring calibration. Can any other tool on the market today make that claim?

With Your Measurement Case, You Have the Job in Hand

You can comfortably store your deltaflow pitot, the handheld manometer, up to six 1m-long extension sections, the documentation, and all accessories in this sturdy measurement case. You will also receive an Excel file along with your deltaflow to assist you in automating your sampling analysis per DIN 2640 standards and allow you to present it print-ready to your client. After all, effective work is more than taking measurements! The handheld manometer is battery-powered, displays the differential pressure in all popular units, and comes standard with calibration instructions.



Ordering Specifications:

DF25P-P	Sampling unit, Material 1.4828
DF25P-M5	Extension section, 500mm, Material 1.4828
DF25P-M10	Extension section, 1000mm, Material 1.4828
DF25P-M20	Extension section, 2000mm, Material 1.4828
DF25P-A	Connection and handle section, hose attachment, 4x1mm Material 1.4828
DF25P-K	Carrying case, hard-sided plastic with aluminum frame insulated with sponge padding, 1050x350x110mm. Holds all parts except DF25P-M20
DF25P-H25	Handheld manometer, 0..25mbar (0..43m/s in environmental air), min./max memory, damping, 0.1%vM+0.1%v.E., incl. battery
DF25P-H130	Same as DF25P-H25, except 0..130mbar equals ..99m/s
DF25P-HT	Handheld temperature measurement tool, incl. Sensor Type K -200..1000°C
DF25P-Vxxm	Connecting hose between probe and handheld manometer
DF25P-KP	Thread-protecting copper paste
DF25P-D	Documentation and Excel file analysis per DIN 2640 (1 copy included in DF25P-P)

Flow-Measurement Equipment „made by systec“

flowcom made by systec

Anyone who measures professionally must also evaluate professionally. The flowcom is the ideal enhancement to the deltaflow or any other flowmetering system. It compensates for flowmeter errors which occur in conjunction with pressure and temperature and calculates mass and standard volume flows of gas or steam. It can also compute energy and heat. The flowcom has been tested by the TÜV (Technical Monitoring Agency)



© WWW.PUR2.DE



deltaflow DF25FF made by systec

deltaflow Model DF25FF integrating-pitot tube with integral pressure and temperature transmitters, tested for suitability by Germany's TÜV 100% steam-saturated smoke and exhaust gases

are insensitive to dirt and aggressive media at temperatures up to 1,200 °C.

LSP1 made by systec

LSP1 is an air-flushing system for automatically scavenging dp-primary elements and stepping lines. The design and the function of the LSP1 is adapted to meet the particular prerequisites of power stations. Approaches, signals, and reports active or passive. Signal retention during the flushing process. Available alternatively for 2 pressure or 1 dp measurement transmitters. Fulfilling IP65. All come with a 2-year guarantee as standard.



The home of the systec Controls company is located in Puchheim, near Munich. Here we develop and manufacture our products according to DIN EN ISO 9001

standards. But innovative technology and product quality alone are not enough for us: we have allowed our systems to be evaluated and tested by independent institutions – with clear-cut and verifiable success! And we remain at your service after your equipment has been installed: you can reach **our hotline 24 hours a day, 7 days a week.** systec Controls – Your specialist for flow-metering technology.



Presented by:

systec
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systec Controls Hotline
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Mass Flowmeter for Gases

- Multivariable with ultra fast dp-, p- and T-Sensors
- Compact, accurate and user-friendly
- Ideal for OEMs

deltaflowC

Gas Massflowmeter Venturi- and Probe Type



Precise gas mass flow metering

deltaflowC was developed to meter air in pipes and channels in a very precise, cost effective manner. deltaflowC features the smallest and fastest multivariable transmitter for metering the mass flow of gases. deltaflowC operates according to the highly precise differential-pressure method. Extremely fast sensors for differential pressure, static pressure and temperature, as well as a powerful microcontroller, are integrated in the transducer in an area of just a few cm². The mass flow is metered up to 2000 times per second. The microcontroller processes the values of a mass flow and outputs the mass flow signal, as well as the pressure and temperature signals.

Successfully tested for practical application

The deltaflowC sensor system has proven effective in various applications, including the challenging serial production of combustion engines of trucks and commercial vehicles. Precise and stable in long-term use, even with the strongest pulsations, it precisely measures the mass of air supplied to the engine and makes an important contribution to optimum engine control. This technology is now also available for industrial applications. The deltaflowC has 4..20 mA and 0..10 V outputs or alternatively a CAN-bus interface and can be setup in just a few seconds.

Zero maintenance and zero drift

Thanks to modern microcontroller technology, deltaflowC offers an outstanding high zero point stability, a large measuring range, high accuracy and high measurement dynamics.

deltaflowC compensates the influence of pressure and temperature on the measurement and provides the (compensated) mass flow to the user. Unlike other measuring methods, such as thermal mass flow meters, deltaflowC is particularly resistant to oil films and surface dirt deposits. Another advantage of deltaflowC is the fact, that the measurement of different gases will not need a new calibration. Together with the automatic zero-point correction, this makes deltaflowC almost zero maintenance and zero drift.

High Accuracy

deltaflowC is available in two accuracy classes. The standard type offers an accuracy of 4%. deltaflowC is also optionally available as version with a calibration certificate and an accuracy of 2% (see page 5).

Typical applications

- Pressurized air
- Building services/heating, ventilation, air-conditioning
- Combustion air regulation
- Monitoring of process air
- Pneumatics
- Inert gases for welding and laser processes such as laser sinter 3d printing (SLS)
- Supply of technical gases in laboratories
- Exhaust gas metering
- Compressors
- Extraction units
- Exhaust gas volume metering



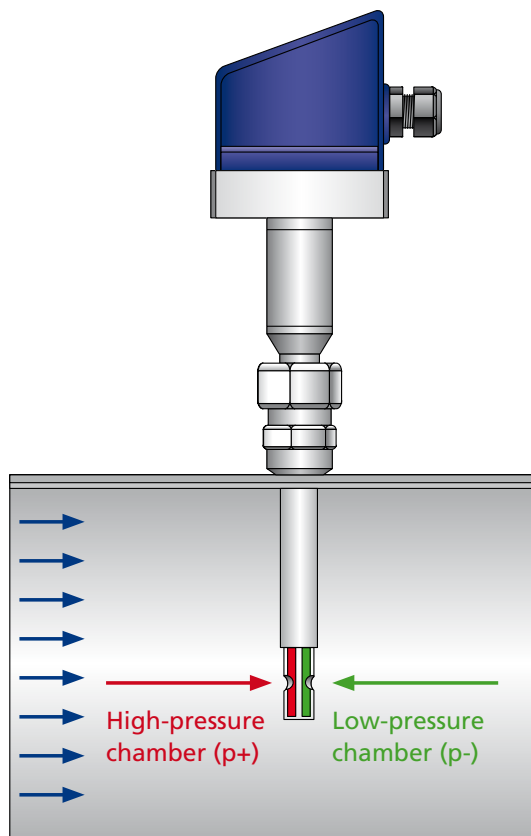
deltaflow

deltaflowC can be used to meter wide ranges of flow, temperature and pressure. With only one insertion length, it fits almost all pipes or channels. deltaflowC thus has very short delivery times and reduces warehousing costs.

The two analog outputs operate independently of each other and, in addition to mass flow, can also provide pressure or temperature. If fitted with a CAN-bus-interface, deltaflowC offers a protocol including flow, temperature and pressure, filtering options and a number of diagnosis parameters.

Customized devices

OEM / private label versions are available on request. The standard device has 1x 0...10 V + 1x 4...20 mA analog outputs. As an alternative to analog outputs, deltaflowC can be fitted with a CAN-bus interface. The optional display indicates flow rate, flow total, pressure and temperature and offers an additional pulse output (OPC). We will be happy to adapt the deltaflowC to meet (OEM) customer requirements.



Functional principle of deltaflowC probe

Metering the mass flow according to the differential-pressure method

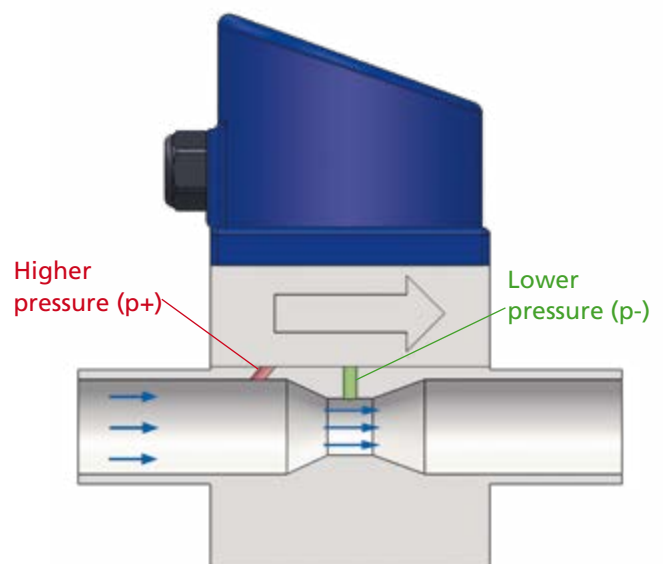
deltaflowC operates according to the proven and highly precise differential-pressure metering method. The deltaflowC probe has two separate chambers in the patented systec Controls probe profile, fitted with tappings in order to measure the differential pressure.

The deltaflowC venturi generates the differential pressure between two tappings, one upstream and one in the reduced neck cross-section.

The flow of the medium creates a pressure difference between the two measurement holes of the probe or venturi: In the aperture, facing the direction of flow a higher pressure (p+) and in the aperture facing away from the direction of flow a lower pressure (p-).

A differential pressure proportional to the flow is generated in the two differential pressure outlets; this is recorded by the integrated differential pressure transmitter. In parallel, thanks to the integrated pressure and temperature sensors the current density of the medium is calculated and finally, together with the pipe cross-section, the mass flow is determined and transmitted as electrical signal to the control unit.

$$q_m = K \cdot \frac{\pi d^2}{4} \cdot \varepsilon \cdot \sqrt{2 \cdot dp \cdot \rho(p_{abs}, T)}$$



Functional principle of deltaflowC venturi

deltaflowC

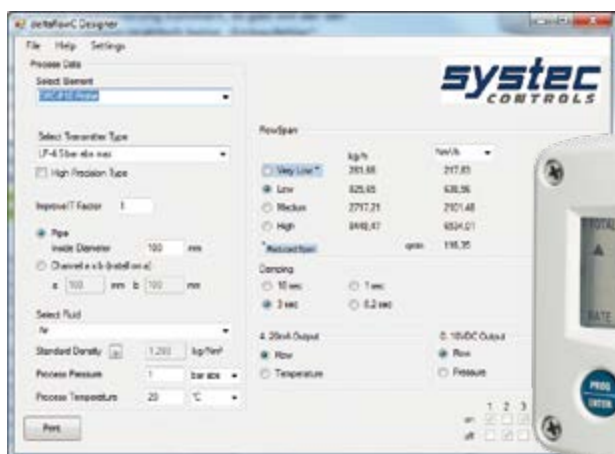
Easy to mount and parameterize

With smaller pipes (from DN 20), deltaflow is used across the entire inner diameter of the pipe. With larger pipes, up to DN 6000 and larger, the insertion depth is 100 mm. The flow calculation always takes account of the different positions of the dp tapplings, which vary from one application to another. This guarantees metering accuracy for all pipe sizes. Significantly, the user does not have to worry about correct positioning; there are virtually no "installation errors" with deltaflowC.

The deltaflowC probe is delivered with a cutting ring stud as standard. The transducer can be easily parameterized in just a few seconds using only DIP switches. The optional display offers not only a local indication of all interesting values, but also a totalizer pulse output OPC. For the flow calculation, user-friendly and simple software is available to download free of charge from the systec Controls website (www.systec-controls.de). Using the remote F012 supply display unit, it is very easy to take a measurement including totalizer. The display unit that is connected to the mains powers either the deltaflowC probe or venturi with 24 VDC.



Quick lock deltaflowC:
retractable under pressure



Free design software deltaflowC-Designer



F012 remote display with
sensor power supply

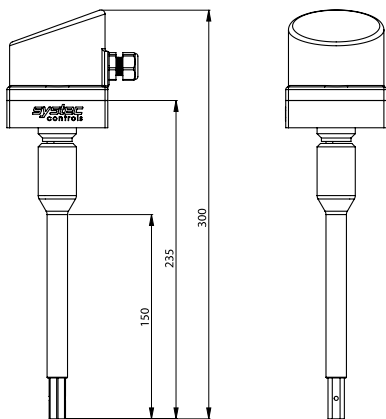
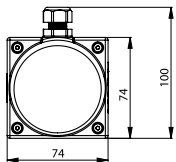
Blind deltaflowC-venturi without display



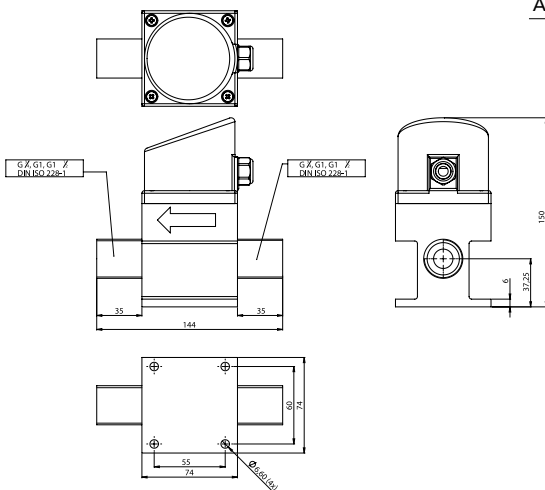
deltaflowC

The advantages at a glance

- The probe only requires a stud on the pipe. With the venturi, a pipe section is screwed in; that's all there is to it!
- deltaflowC computes the pressure and temperature and directly outputs the mass flow signal
- deltaflowC additionally provides output for temperature or pressure
- External pressure and temperature sensors are not required
- An external flowcomputer is superfluous
- Complex compensation processing is not required
- Simple parameterization and set-up
- Best value for money
- Adaption to OEM requirements

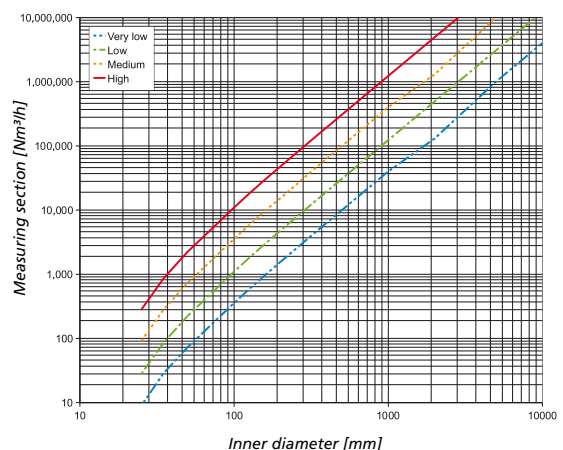


The compact venturi with connections G3/4, G1, G1 1/2 external thread also offers outstanding measurements for small flow rates.



Technical data

Description	Specification			
Measurement principle	Differential-pressure with pressure and temperature compensation			
Measured values	Mass flow, static pressure, temperature			
Media	Gases, non-explosive/corrosive, free of water or conductive liquids			
Accuracy *	Standard Type	High Accuracy Type (calibrated)		
		Standard type: 4% of measured value from 10% of the low-flow metering range	4% from 7% of the low-flow metering range	2% of measured value from 15% of the low-flow metering range
Variants	Probe	Venturi		
Process connection	15 mm weld-in cut-ring stud (C- / SS-steel)	G3/4, G1, G1 1/2, external thread in acc. with DIN ISO 228-1		
Housing & probe material	1.4571 Stainless steel	Aluminium		
Pipe sizes	DN20 to ∞	-		
Maximum insertion length	Typically to end stop, max 100 mm -			
Operating conditions	Min	Typical	Max	Unit
Flow span probe (depends on type and pipe diameter)	0..30	-	0..∞	kg/h
Flow span venturis (depends on type and dimension*)	0..2,5	-	0..1100	kg/h
Pressure range LP	0 (Vacuum)	-	4,5	bar abs
Pressure range HP	0 (Vacuum)	-	14	bar abs
Medium temperature	-80	-	120/250***	°C
Temperature electronics	-40	-	120	°C
Measurement range*	1:25 (4 measurement ranges); 1:7 (at one measurement range)			
Bursting pressure	16			bar abs
*) for detail information, please use free deltaflowC-designer software ***) Venturi/Probe				
Electrical specification				
Connections	GND	Ground connection		
Connection max. 1.5 mm ²	24 VDC	Power supply		
	0 - 10 VDC	Output voltage signal		
	4 - 20 mA	Output current signal		
	Alternative CAN-bus-Interface type CAN 2.0B, 25..1000 kBit/s			
	Min	Typical	Max	Unit
Voltage	18	24	36	VDC
Current	22	40	55	mA
Parameterized outputs				
Temperature output	-50 (4 mA)	-	250 (20 mA)	°C
Absolute pressure output	0,5 (0V)	-	10 (10 VDC)	bar abs



Flow metering technology “by systec”



deltaxwaveC-P clamp-on flowmeter for measuring liquids in filled pipes

The flowmeter with heat quantity metering operates according to the ultrasonic transit time method and is a high-precision device. The ultrasonic transducers can be quickly and easily clamped onto the pipe externally. It is not necessary to separate the pipes and there is no process stoppage. After simple parameterization, measurement of, for example, drinking water, wastewater, heating and cooling water, crude, light and thermal oils is leak-proof, pressure-resistant and wear-free. Together with the optionally available clamp-on temperature sensors, thermal energy can be recorded and documented reliably.

deltaflow for flow metering of gas, steam and liquids

The deltaflow pitot tube has proven its effectiveness a thousand times over for measuring the flow of gas, steam and liquids in pipes. Pitot tubes induce the lowest pressure loss of all differential pressure elements, which means that many applications can be used to make energy savings of several thousand euros per year. With an accuracy of up to 0.4% of the measured value as tested by the Physikalisch-Technische Bundesanstalt (PTB), the deltaflow probe can also be reliably used in the most adverse conditions.

deltaflow is extremely robust and its suitability is TÜV (German Technical Inspection Agency) tested for use in condensing, aggressive and dirty flue gases. deltaflow is available for pipe diameters from 1 mm – 15 m and a pressure level of up to 690 bar and can thus be used for the vast majority of flow applications.



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proven success. And of course, we are there for you even after the installation of your system. Our service-crew will assist you at your plant. systec Controls – the specialist in flow measurement technology.

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deltawaveC

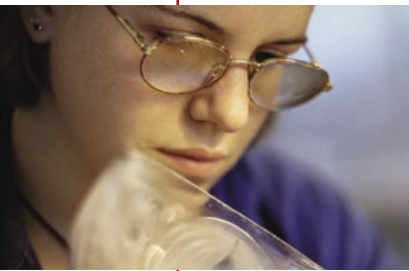
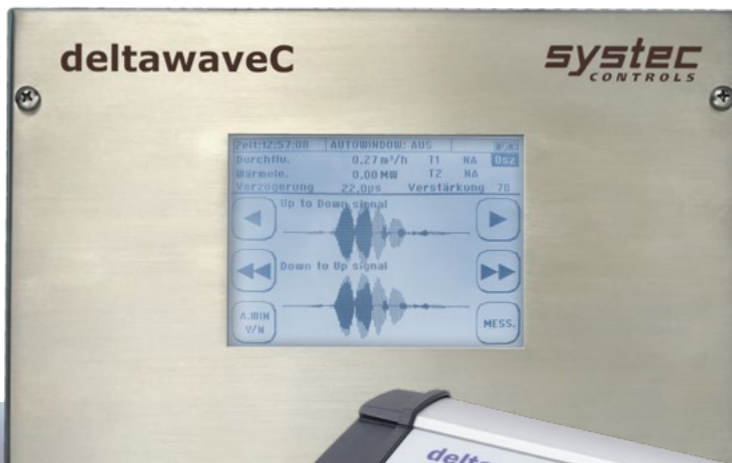
Measurement of Flow and Heat Quantity in Gas- and Liquid-Carrying Pipes

- precise
- simple
- non-intrusive and maintenance-free

deltawaveC

deltawaveC-F stationary

deltawaveC-P portable



systeme
CONTROLS

Contactless flow measurement for liquids and gases

deltawaveC-P is for mobile sample measurements and measurement tasks over a longer period of time. deltawaveC-F is for continuous measurements in fixed installation. Both devices use the proven, highly precise ultrasonic transit time difference method. With latest digital signal Processors works deltawaveC extremely precise.

Saves Installation and operating costs

Thanks to clamp-on technology, the ultrasonic transducers used can be installed in a matter of minutes. Disconnecting the pipeline and process interruptions are not necessary. deltawaveC-Devices contribute to the optimization of operating costs.

The contactless measurement is virtually...

- 100% leak-proof and pressure-resistant
- 100% drift free
- 100% wear-free and thus maintenance-free
- 100% free of pressure loss and thus energy-saving

With the Quick Setup option parameterization takes less than one minute. Online help makes the manual unnecessary for most tasks. The large, backlit display presents all menu items and displays in plain text. Also, the clear menu structure and the easy operation via eight keys ensure user-friendliness.

Highly precise through auto-optimizer even under the most difficult conditions

Thanks to the auto-optimizer, deltawaveC also gets problematic measuring points well under control. Pipe and fluid are a complex sound system. The acoustic characteristics define how well the coupling of the ultrasonic signals works and how much signals are distorted. The optimal attach of the ultrasonic transducers and an intelligent signal optimization affect massively the signal strength and -distort and thus the accuracy and reliability. High signal levels provide reserves when interference is impinge e.g., in the form of gas bubbles, growing incrusts, EMC or fouling in the pipeline.

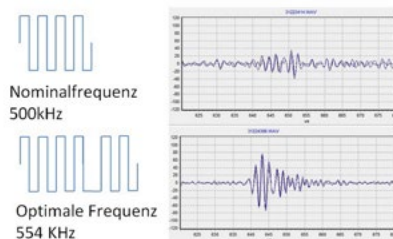
Automatic signal generation and evaluation

The distortion of the received signal and the achievable signal levels depend on the quality of the coupling, but also of whether the transmitting frequency and the frequency spectrum of the Pipeline harmonizes well. The variation of the signal frequency and the selection of transmit signals with different stimulus-/damping proportions was previously reserved for experts with the help of an oscilloscope. In the cross-correlation the ultrasonic scans of the up- and downstream signals are placed on top of each other and moved until an optimal "Coverage" of the signals is reached.

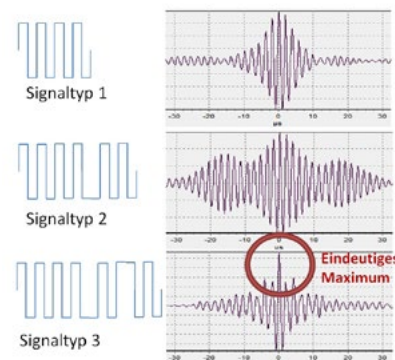
Automatic signal optimization facilitated "impossible" clamp-on measurements

On Click, deltawaveC varies the transmission frequencies as well as the signal encoding and analyzes the results regarding amplitude, signal-noise-ratio, signal distortion and significance of cross-correlation results. These evaluation provides the optimal settings for this measuring point.

The automatic signal optimization improves especially with unfavorable pipe/sensor combinations the signal quality enormously: The measurement has smaller zero point errors, better accuracies, lower measurement noise and more reserves against influences such as gas bubbles, solids or EMC- disturbances. Even at "simple" measuring points, the Signal optimization reduces the zero point errors and allows more dynamic measurements with lower measured value variance.



By automatic adapting frequency to the pipeline the coupling and decoupling of the signals works significantly better



By selecting the optimal combination of excitation pulses and damping pulses, a maximum can be found in the correlation-function.

deltawaveC

Clamp-on-gas measurement made easy

Until the development of the self-optimization of the delta-waveC, the clamp-on-gas measurement was very sensitive: Due to the large Impedance jump between the pipe wall and the gas in the pipeline, the sound energy is 10-potencies lower than for liquids. Since the pipeline and the process parameters of the fluid are usually fixed by the application, the measurement technology must be optimized for the measuring point.

Adjusted signal frequency and special damping for optimal signal quality

One solution is to offer a variety of different ultrasonic transducers for the various pipes and pipe materials to avoid the dreaded mismatching. The Consequence: Users would have to buy numerous transducers.

The new deltawaveCoG devices are using a different approach: The ultrasonic transducers are broadband, i.e. they are proficient not to use only one frequency but can be „detuned“. By adjusting the signal frequency to the pipeline, the coupling succeeds much better than with a fixed Frequency. In problematic applications, the benefit is considerable in signal strength: With the same gain, often the 2- to 8-fold signal amplitudes are achieved.

Another problem is the „distortion“ of the signals that are resulting from multiple reflections and the ringing (linger of sound) of the pipeline. A good but very up-to-work method is the mechanical damping of the pipeline. In this case damping elements, e.g. thick adhesive films or pressed plastic plates, are used in the vicinity of the ultrasonic transducers, which reduce the reverberation of the pipeline.

Here, too, the new deltawaveCoG device generation is more convenient: The transmission signals do not only consist of a transmitting part, but also, an attenuation part, in which a damping signal is generated in phase opposition to the transmitting signal, which effectively reduces the ringing in the pipeline. The result: Clearer reception signals, distortion and ringing are significantly reduced and thus more stable measured values as well as higher accuracies.



Gases	Natural gas, air (other gases on request)		
Temperature range for transducers	-40 – 150°C		
Pipe materials	Carbon steel, VA steel (other materials on request)		
Diameter	DN25-DN700		
Pipe wall thickness	LW10	2 – 5 mm	
	LW05	4 – 9 mm	
	LW03	7 – 15 mm	
Pipe inside diameter	LW10	40 – 90 mm	
	LW05	90 – 450 mm	
	LW03	90 – 700 mm	
	(other dimensions on request)		
Assembly mode	Z		
Media pressure (bar) Application dependent, typical field of application for Naturalgas, nitrogen, compressed air	Minimum pressure	metal	plastic
	LW10	10 (ID > 60 mm)	1
		5 (ID < 60 mm)	
	LW05	15 (ID > 120 mm)	
		10 (ID < 120 mm)	1
LW03	15	1	
(low pressure on request)			
Flow velocity	0.01...35 m/s, depending on the pipe diameter		
accuracy (volume flow)	± 1...3 % v. MW ±0.01 m/s application dependent		
	± 0.5 % v. MW ±0.01 m/s for field calibration		
reproducibility	0.15 % v. MW ±0.01 m/s		

Precise and reliable flow measurement

deltawaveC flowmeters operate according to the high-precision ultrasonic transit time difference method. Here, two ultrasonic transducers are mounted externally on the pipe and connected to the processing electronics.

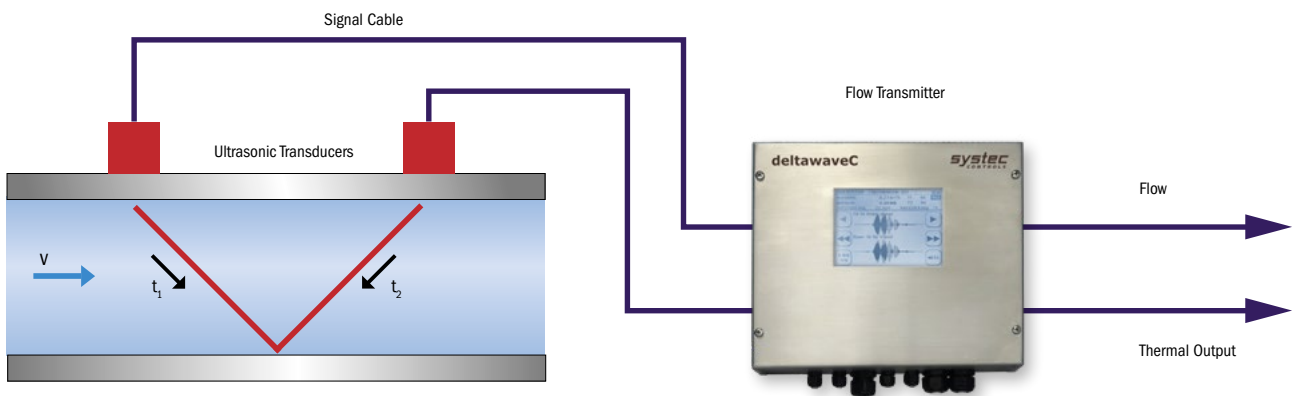
The ultrasonic transducers operate alternately as transmitters and receivers and transmit ultrasonic signals to one another, whereby the respective signal transit times of the outgoing and return signal (t_1 , t_2) are measured.

The deltaxwaveC measures the transit time difference of the ultrasonic signals

t_1 and t_2 that run with and against the direction of flow. These signals are accelerated (t_1) or delayed (t_2) by the flow of medium. The resulting difference in the two signal transit times is proportional to the flow velocity and, together with the pipe geometry, is used to precisely calculate the flow.

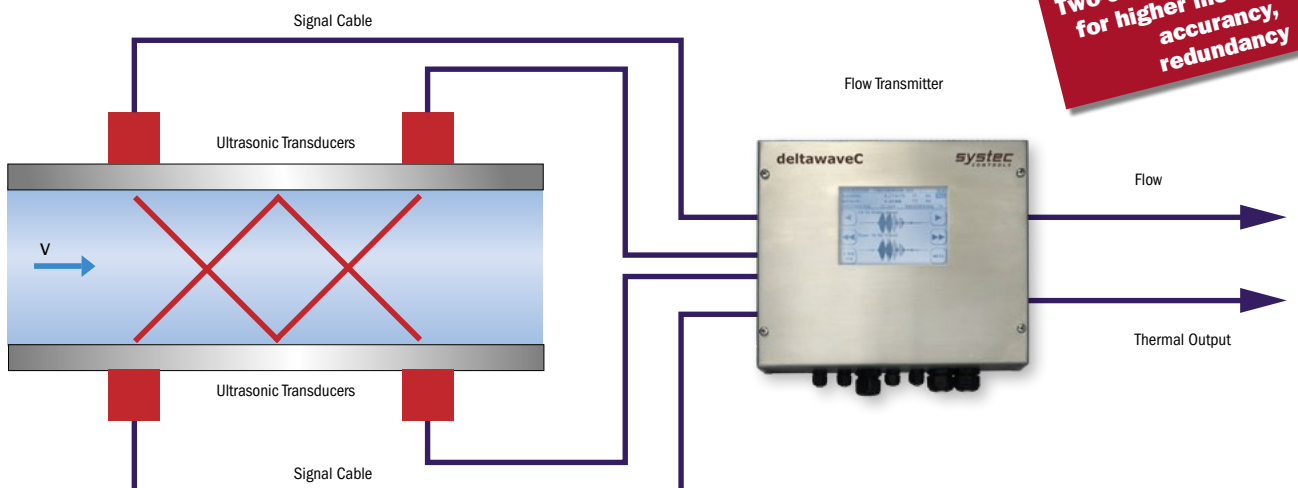
The use of multiple processors working in parallel means that deltaxwaveC achieves an extremely high measurement rate. Signal processing takes place in high-performance DSPs which are extremely precise and operate at very

high resolution. This enables the device to achieve internal resolution below 0.001 m/s flow velocity. Because the transit time measurement is completely digital, the measurement electronics are virtually drift and calibration-free. In this method, the flow rate is measured many times over, or typically from 50-150 times per second. The high number of measurements – as well as the use of the most modern digital signal processing – makes the deltaxwaveC highly reliable even under extremely dynamic, challenging processing conditions.



Flow measurement according to the precise and reliable ultrasonic transit time difference method – shown here in V mode

deltawaveC-F offers an optional two-channel measurement. Thus it is possible to realize either two different measuring points in one device or provide a conduit with two measurement paths. By using two different measuring points, the channels can be combined. Outputs such as addition, subtraction and averaging of the channels are possible. Equipping one flow measurement on a pipe with two measuring paths enables the compensation of disturbed flow profiles and reduce uncertainties. Additionally the redundancy ensures a higher measuring certainty.



Two-channel measurement for higher measurement accuracy, redundancy

Compensation of disturbed flow profiles with two-channel measurement

deltawaveC

High-performance measurement and evaluation process - even for difficult applications

Stable and reliable measurement under extremely difficult conditions

Ultrasonic signals are disturbed by a variety of influencing variables, including electromagnetic radiation, the presence of gas or solids, machine noise, etc. In conventional devices, in order to detect the ultrasonic signals to be evaluated within this "ambient noise" the signal amplitude must be several times that of the noise. An intelligent analysis method was developed for deltaxwaveC that detects the ultrasonic signals when the amplitude of the noise is several times more than that of the signal amplitude. The advantage for deltaxwaveC users: absolutely reliable and stable measurements, even in extremely unfavorable conditions.

This enables measurements even under conditions where high particle and gas loads are present – an impossible task for conventional devices.

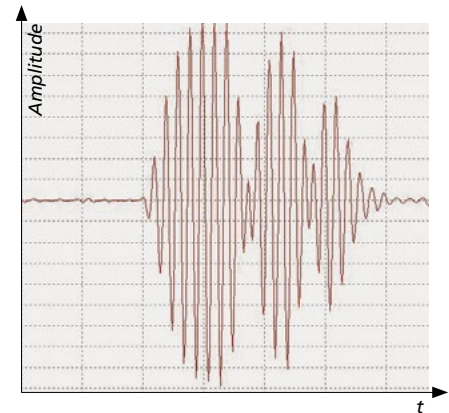
Verified signal quality ensures reliable measurement

deltawaveC's integrated oscilloscope function checks and verifies signal quality. This allows graphical signal display and the quick and easy verification of signal quality.

Modern cross-correlation process tackles the toughest measurement tasks

To ensure reliable measuring results even under difficult measuring conditions, for deltaxwaveC systec Controls developed modern and powerful signal processing algorithms. For reliable detection, deltaxwaveC employs - similar to the GPS satellite navigation system - encoded signal packets (bursts). Via the built-in phase shifts and clearly defined number of oscillations, prior to being sent the bursts receive a unique identity - just like a fingerprint. On the receiving end, the digital signal processor (DSP) then employs a cross-correlation method to uniquely determine the time (maximum correlation) at which the transmission signal matches a stored reference signal.

This allows the signal reception times required to determine the transit time to be determined very precisely. This also permits the clear identification of the desired signals in the event of high noise levels and/or low signal amplitude (e.g. high particle content in the medium) by means of cross-correlation. Your advantage: reliable and accurate measurement results even under difficult measurement conditions.



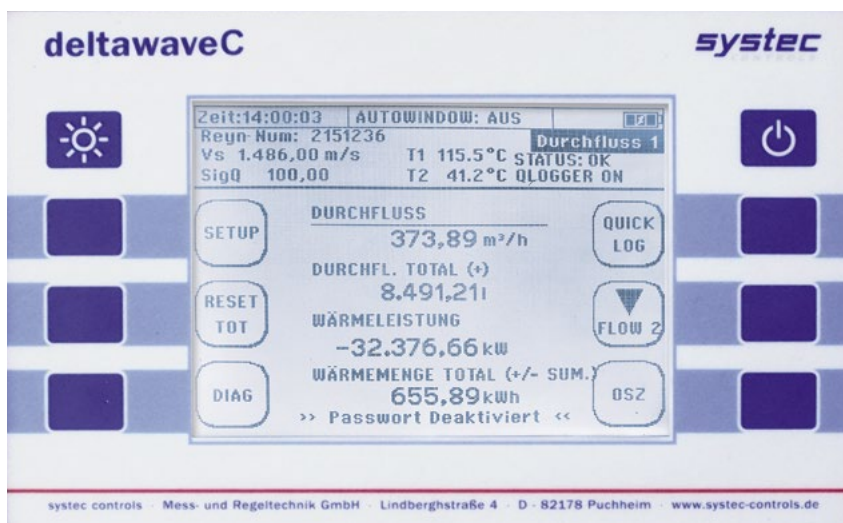
Encoded signals: typical signal packet with two 180° phase shifts for reliable signal recognition.

AFC technology for high accuracy under changing process conditions

AFC Automatic Fluid Control

Ultrasonic meters are dependent on the acoustic velocity of the relevant medium, which varies with the composition and temperature. This is well-known and with proper parameterization is not a problem. However, many conventional devices are programmed for water with a temperature of 20° Celsius, for example. If the temperature changes to 50° C the transducers would basically have to be repositioned. In everyday measurement practice this would be impractical, and is rarely done. The result is a loss of accuracy.

deltawaveC compensates for this effect by means of AFC technology and by newly developed, high-performance algorithms. The advantage is that the transducers need not be repositioned, and accuracy is virtually unaffected by typical process fluctuations. This also results in high measurement accuracy even under changing medium conditions, e.g. due to changes in temperature or composition.



All relevant measured variables at one screen

Integrated Heat Quantity Measurement

deltawaveC-P is compatible with the most common pipe sizes (DN10 - DN6000) and cross-sector applications. deltawaveC is not only a flowmeter, but also includes an integrated heat quantity measuring function. Together with the optionally available clamp-on temperature and ultrasonic transducers, heat and cooling quantities can be recorded and documented with reliability and accuracy. deltawaveC now also records mass (kg, T) and mass flow (kg/s; kg/h; T/s; T/h).

Rising energy prices and legal requirements regarding environmental protection and plant efficiency necessitate the ongoing optimization of energy flows. Whether monitoring the district heating networks that span from power stations to the consumer, process heat in the chemicals industry or in building services

engineering – assessing the energy performance of heat flows is tremendously important in many application areas. The integrated thermal energy measuring function of the deltawaveC enables rapid and convenient recording of heat flows. External, optionally available temperature sensors placed in the feed and return flow are used to measure the temperature difference. In parallel, deltawaveC-P measures the volume flow and, from this, calculates the heat flow, taking into account the specific heat coefficient of the medium. The temperature sensors can be matched in pairs on the device in order to increase measurement accuracy. All this takes place without penetrating the piping system – temperature and flow sensors are simply clamped on the pipe from the outside.

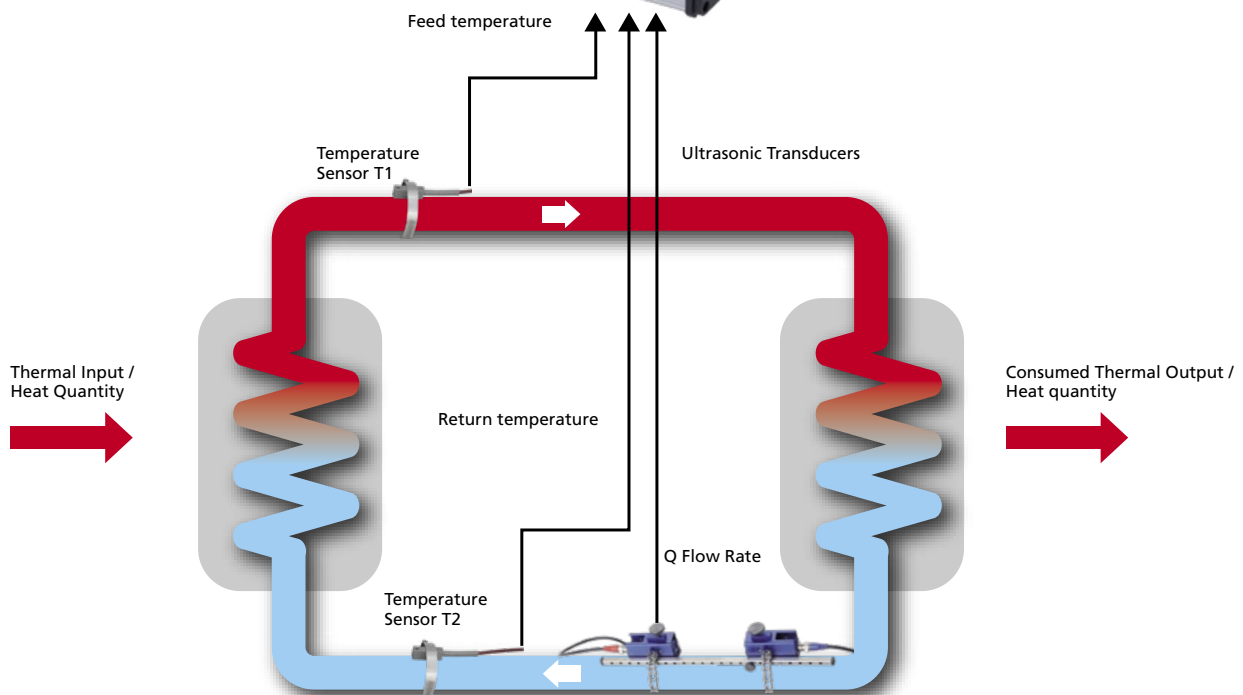


Thermal energy metering at Stadtwerke München



Thermal Output / Heat quantity

Volume Flow / Quantity



deltawaveC

A single device for multiple metering applications

Broad Application Spectrum

deltawaveC-P is compatible with the most common pipe sizes (DN10 - DN6000) and cross-sector applications. deltaxwaveC is not only a flowmeter, but also includes an integrated heat quantity measuring function. Together with the optionally available clamp-on temperature and ultrasonic transducers, heat and cooling quantities can be recorded and documented with reliability and accuracy.

Typical applications include:

Power Stations

- Circulating water/service water
- District heating networks
- Pump protection
- Condensate and feed water measurement
- Heavy and light oil

Water and wastewater management

- Sewage treatment plant inflow/effluent
- Drinking water networks, verification of water meters
- Pump protection
- Distribution and consumption metering
- Leakage detection

Building Services Engineering

- Hot and cold water
- Cooling systems & air-conditioning units
- Hydraulic compensation
- Pump control and set-up
- Optimization of heating systems

Chemicals and Petrochemicals

- Crude and light oil
- Industrial and waste water
- Aggressive and toxic media
- Measurement of heat carriers, e.g. thermal oils

Food and Beverage Industry

- Hygienic, reliable measurement of media
- Dosage measurements
- Cleaning solutions
- Water
- Beverages

Another advantage of the clamp-on ultrasonic flow metering: since the ultrasonic transducer does not come into contact with the medium, the measurement is:

- 100% contamination-free
- 100% hygienically safe

This is particularly interesting for quantity measurement of food and pharmaceutical products, and simplifies volume measurement of toxic or environmentally harmful liquids. Flow metering with the deltaxwaveC means no additional sealing surfaces or dead volumes!

Ex applications

The pressure encapsulated housing and the ultrasonic Ex-transducers make sure that the deltaxwaveC can be used in hazardous areas. Also a cost-effective way to combine a standard permanently installed deltaxwaveC-F device (outside hazardous area) with Ex-transducer (inside hazardous area) is possible.



High-performance ultrasonic transducer

AND technology ensures outstanding signal quality

AND Technology (Anti-Noise Deflector)

With the aid of AND technology the ultrasonic waves are guided and coupled such that unwanted echoes and signal dispersion are avoided, reducing noise and thus making energy available in the form of useful signal energy.

This is made possible by the newly developed design of the ultrasonic transducer (deflector), which achieves a signal yield several multiples greater in comparison to conventional devices.

Thanks to high-performance metal housing, the ultrasonic transducers are suitable for applications up to 380°C. This enables many high-temperature applications to be realized cost-effectively without special transducers, e.g. in district heating networks.

Fast, secure transducer mounting

Mounting with the mounting rail is simple: using the pre-defined hole matrix makes positioning the ultrasonic transducers on pipes a quick, secure and precise affair. This also avoids failed installation.

Selection of Ultrasonic Transducers for Transit Time Measurement

Typ	Medium temperature	Inside diameter
deltawaveC-P portable: XUC-PW-F40	-40...150°C	DN10...DN100
deltawaveC-F permanently installed: XUC-FW-F40	-40...150°C	DN10...DN100 <i>optional:</i> ☒
deltawaveC-P portable: XUC-PW-F10	-40...150°C	DN32...DN400
deltawaveC-F permanently installed: XUC-FW-F10	-40...150°C	DN32...DN400 <i>optional:</i> ☒
deltawaveC-P portable: XUC-PW-F05	-40...150°C	DN200...DN6000
deltawaveC-F permanently installed: XUC-FW-F05	-40...150°C	DN200...DN6000 <i>optional:</i> ☒

us-transducers also available with Ex-accreditation



Ex-Version

Ex us-transducer ambient temperature
-40°C < Ta ≤ 80°C
Accreditation: ☒ II 2G Exd II C T6...T3 Gb

New:

Now also high temperature transducers available DN25 ... DN400



HT XDR 500 - 55 ... 380°C
DN25 ... DN400

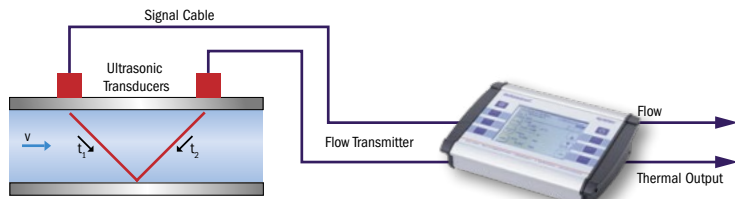
Ultrasonic transducers for permanent installation, degree of protection: IP68

deltawaveC

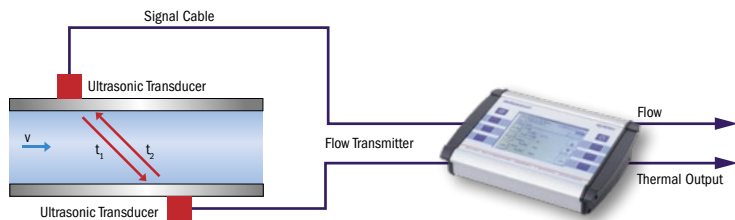
deltawaveC ultrasonic transducers – optimum metering performance for your application

The high-performance ultrasonic transducers are optimized for maximum signal yield and outstanding metering performance. deltaxwaveC's three ultrasonic transducer types can be used for most flow applications. One device for almost all measurement tasks! All ultrasonic transducers are clamped on the pipe externally and delivered with practical installation material. Installation is a matter of minutes – and there's no need to penetrate or open your pipe. Your process does not have to be interrupted.

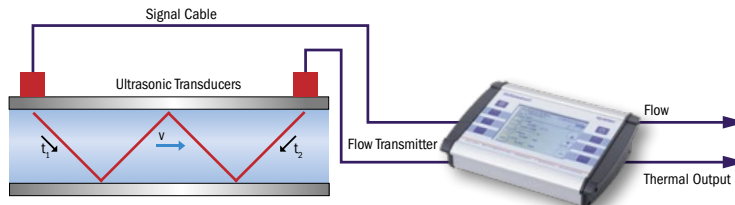
Typically, depending on the application and amount of space available, the sensors can be attached to your piping in the Z, V and W mode.



Mounting in V mode, standard mode



Mounting in Z mode, typical for large pipes



Mounting in W mode, typical for small pipes



deltawaveC transmitters and their data

Measurement	
Principle	Ultrasonic transit time difference with AFC technology
Values Measured	Flow, flow speed, heat flow
Totalizers	Heat quantity, volume
Measurement range	-30...+30 m/s
Signal damping	0...100 sec (adjustable)
Diagnostic functions	Acoustic velocity, signal strength, SNR, signal quality, amplitude, energy. Oscilloscope function allows graphical display and analysis of signals.

Measurement Accuracy		
Inner Diameter Ø	Range	Deviation
10...25 mm	2...30 m/s	2,5% of reading
	0...2 m/s	± 0,05 m/s
25...50 mm	2...30 m/s	1,5% of reading
	0...2 m/s	± 0,03 m/s
50...300 mm	2...30 m/s	1% of reading
	0...2 m/s	± 0,02 m/s
300...6000 mm	1...30 m/s	1% of reading
	0...1 m/s	± 0,01 m/s

Reproducibility for the vast majority of applications is <0.2%



Fast, safe transducer assembly, thanks to systec „Quickmount“ technology



Large QVGA display, easy handling



deltawaveC-P	
Operation	Intuitive via 8 main keys (Soft Keys), plain text display
Languages	DE, EN, CHN, F, E, RU among others
Units	Metric / US
Outputs	2x 4...20 mA (NAMUR NE43) 1x Impuls (20; 40; 60 ms) 1x Relais 1x MicroUSB
Inputs	2x PT100
Integrated Data Logger	4 GB
Data Logged	Measurement, diagnostic data and totalizers
Data Format	Text format, can be directly imported into all standard programs such as MS Office, MS Works etc.
Memory Cycle	Adjustable 1 second to 24 hours
Measurement Channels	1
Power Supply	Integrated rechargeable battery and 100-240V AC wide range adapter
Battery Operation	Approximately 12 hours (expandable on request)
Protection Class	IP40
Housing	Aluminium, PVC
Dimensions (LxWxD)	265 x 190 x 70 mm
Operating Temperature	-20...60°C
Weight	1,5 kg
Display	QVGA (320x240), black and white, adjustable back-lighting

deltawaveC-F	
Operation	Intuitive via 8 main keys (Soft Keys), plain text display
Languages	DE, EN, CHN, F, E, RU among others
Units	Metric / US
Outputs	2x 4...20 mA (NAMUR NE43) 1x Impuls (20; 40; 60 ms) 1x Relais <i>optionally:</i> RS232 / RS485 RS485 supports Modbus (RTU/ASCII)
Inputs	2x PT100
Integrated data storage	4GB, local data logging optional
Measurement Channels	1, optionally 2
Power Supply	85-264VAC, 18-36VDC (opt.)
Power Consumption	10 W
Protection Class	IP65
Cable Connections	Screw terminals
Housing	Stainless steel, wall-mounted
Dimensions (WxHxD)	300 x 260 x 108 mm
Operating Temperature	-20...60°C
Weight	4.1 kg
Display	QVGA (320x240), black and white, adjustable back-lighting

deltawaveC-F Ex	
<i>Technical data as deltaxwaveC-F except for:</i>	
Accreditation	II 2 G Ex de IIC T6
Housing	Stainless steel wall mounting
Dimensions (WxHxD)	398 x 310 x 242 mm
Operating Temperature	-20...50°C
Weight	19,93 kg

2 Kanal-Version deltaxwaveC-F / C-F Ex	
<i>Technical data as 1-channel version except for:</i>	
Outputs	2x 4...20 mA (NAMUR NE43) 1x Impuls (20; 40; 60 ms) 1x MicroUSB 1x Relais <i>optionally:</i> RS232 / RS485 RS485 supports Modbus (RTU/ASCII)
Measurement options	2 Individual channels Channel sum Channel difference Average of channels



deltawaveC

Accessories

deltawaveC-WD, the new wall thickness gauge for precise and easy measurements of the thickness of pipes and components, not only performs well as an accessory to the deltaxwaveC. Like the deltaxwaveC flowmeter, the device operates on the ultrasonic transit time method.

The thickness measurement is possible for all conventional piping materials like steel, copper and plastics.

Simply power on, input the pipe material and place the ultrasonic sensor on the pipe. The deltaxwaveC-WD shows the exact wall thickness.



**Also available
for hire**

deltawaveC units are for hire

You only need an ultrasonic flow metering unit temporarily, or you'd like to extensively test the deltaxwaveC-P? Simple: our deltaxwaveC-P units are for hire.

We'll also be happy to visit you on-site to carry out measurements.



The mobile deltaxwaveC-P measuring device comes in a robust practical carrying case complete with flow transmitter, ultrasonic transducers, installation material, signal cable and coupling grease, SD memory card and power supply.

Online Enquiries

directly under
"Contact & Information" at
www.system-controls.de

Flow metering technology “by systec”

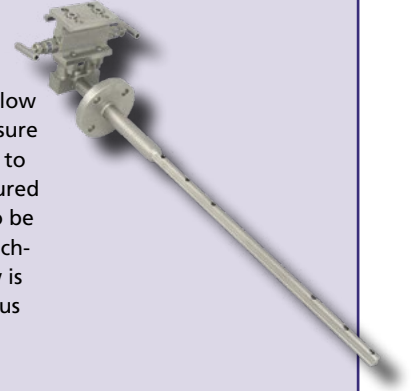


deltawaveV2 flow meter for channels, pipes and rivers

deltawaveV2 measures the flow of water and wastewater according to the multiple-path ultrasonic transit time difference method. This – as well as thanks to the use of modern digital signal processing - enables accuracies of better than 0.5%. A single deltaxwaveV2 electronic unit can serve up to 4 independent measurement points. Precise, reliable and virtually maintenance-free, deltaxwaveV2 is ideal for monitoring, control and accounting measurements.

deltaflow for flow metering of gas, steam and liquids

The deltaflow pitot tube has proven its effectiveness a thousand times over for measuring the flow and volume measurement of gas, steam and liquids in pipes. Pitot tubes induce the lowest pressure loss of all differential pressure elements, which means that many applications can look forward to energy savings of several thousand Euros per year. With an accuracy of up to 0.4% of the measured value as tested by the Physikalisch-Technische Bundesanstalt (PTB), the deltaflow probe can also be reliably used in the most adverse conditions. deltaflow is extremely robust and TÜV (German Technical Inspection Agency) tested for use in condensing, aggressive and dirty flue gases. deltaflow is available for pipe diameters from 1 mm – 15 m and a pressure level of up to 690 bar and can thus be used for the vast majority of flow applications.



deltaflowC

The deltaflowC measures the mass flow of gases in pipes and channels. Thanks to the integrated differential pressure, pressure and temperature sensors and patented microprocessor technology, measurement accuracies of greater than 2% can be achieved. The deltaflowC is particularly impressive on the strength of its high dynamic performance, zero-point stability and ease of operation. Practical, maintenance-free and available at good value for money, deltaflowC enables you to keep your process costs under control.



The head office of systec Controls is located in Puchheim, near Munich. Here, we develop and manufacture our products according to DIN EN ISO 9001. But innovation and product quality alone are not enough for us. We have also had our systems tested by independent institutes – with clear,

proven success. And of course, we are there for you even after the installation of your system. Our service-crew will assist you at your plant.

systec Controls – the specialist in flow measurement technology.

Presented by:

systec
CONTROLS

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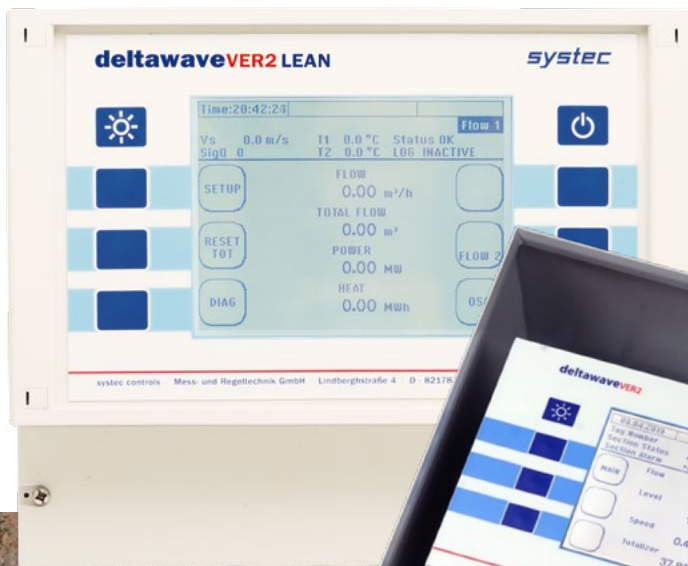
deltawave

Ultrasonic Flow Metering System for Water and Wastewater

- Partially and fully-filled channels, pipes and surface waters
- Multiple-path technology ensures highly precise measurement
- Virtually maintenance-free

deltawave**VER2** & deltawave**VER2** LEAN

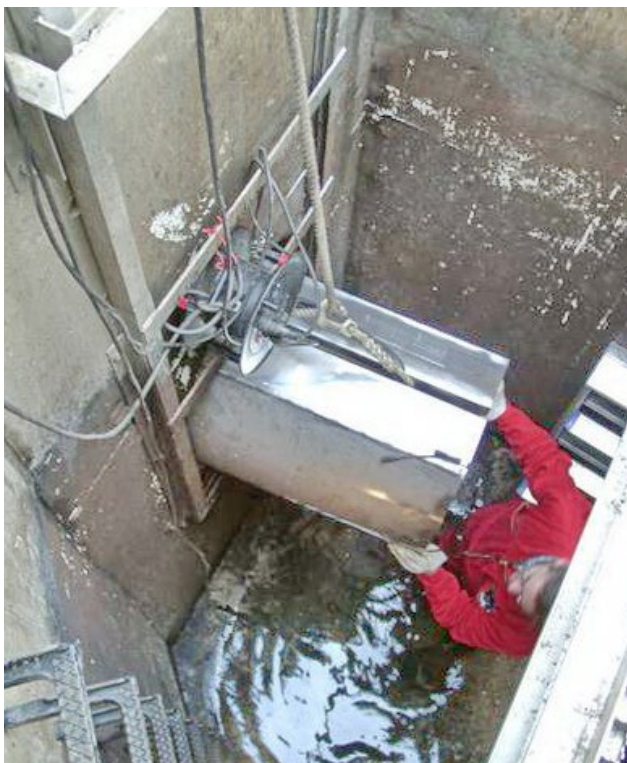
made by systec



systec
CONTROLS

Flowmeter for Liquids

deltawave^{VER2} provides precise measurement for all hydrological tasks and can be used in virtually any application: in filled and partially-filled pipes, open channels, canals and rivers. deltax^{VER2} functions even under extreme conditions, maintenance and calibration-free and reliably. The measurement system continuously monitors itself, and its multi-channel design ensures redundant safety.



Depending on your application requirements and budget, you may select a 2-, 4- or 8-path hardware version. In particular the new 2 path version deltax^{VER2} LEAN is for demanding applications with limited budgets.

deltawave^{VER2} is in use in a wide variety of industrial settings:

Water and Wastewater Management

Special advantages: Maintenance-free, deposits of biomass and dirt on the transducers have virtually no effect on measurement quality. IDM accuracy in filled and partially-filled cross-section area or open channel! No culverts required. Back-ups and back flows are reliably detected and measured.

• Treatment plants for industrial and municipal services

Applications include:

- Monitoring of treatment plant inflow and outflow according to the (German) self-monitoring regulation (EkVO)
- Monitoring of rainwater catchment basins
- Feeding of parallel basins
- Recirculation control and optimization

• Wastewater treatment associations and public utilities

Metering of exact discharge quantities for accounting purposes

- Detection of false water quantities
- Checking and recording of canal hydrology

Thermal and Hydro Power Stations

Special advantages: IDM accuracy in pressurized piping with minimal construction effort. Reliable quantity detection in inflow for river-sited power plants, turbine acceptance measurements. Installation/removal possible under operating conditions. Exact calculation of cooling water volume with public authorities.

• Thermal Power Stations

Here, deltax^{VER2} reliably carries out

- monitoring of tapped and recycled cooling water volumes for accounting purposes
- Energy balancing to avoid impermissible flow heating
- Online efficiency measurement
- District heating accounting measurements

• Storage and Pumped Storage Power Stations

- Turbine and pump monitoring
- Optimization of turbine efficiency
- Turbine acceptance per IEC 60041 and ASME PTC 18
- Monitoring of required water volumes
- Leak detection, even under dynamic operating conditions
- Measurements possible up to 100 bar – even in large pipes

• Low Head River Hydro Power Stations

- Efficiency optimization and vane control
- Monitoring of environmental protection requirements
- Monitoring of fish ladders

Perfect Accuracy
for Accounting
Applications

Turbine acceptance
and optimization

WaveVER2

Truly versatile, always precise and usable

Detect leaks quickly and accurately – even under dynamic operating conditions

General advantages:

- Flow measurement regardless of fluctuations in temperature, pressure, density and viscosity
- Virtually no loss of pressure
- Retrofit installation possible without disrupting piping
- Maintenance-free
- Standardized discharge equations per ISO6416, IEC 60041 and ASME PTC 18

Water management, environmental protection and hydrography

Special advantages: Continual discharge measurement, high accuracy, no maintenance required, detection of flooding events without the need for "rapid deployment troops", massive data storage, all communication interfaces RS232, MODBUS, M-BUS, USB, Micro SD-Card), detection of speed profiles.

- Flood monitoring
- Monitoring of adherence to environment regulations, e.g. for hydropower stations
- Discharge monitoring, e.g. from sewage treatment plants
- Monitoring of vessel navigability
- Low power consumption (remote area)

Leak Detection in Penstock

Applications

deltawaveVER2 is the perfect basis for a reliable and safe penstock protection. Digital communication of the inlet and outlet meters with the DCS ensure highest accuracy not only of the measurement but also of the transmission of the values. The transmitted diagnostic data, which is also included in the Bus-protocols, ensures proper operation of the meters and help operators to avoid false emergency shut downs.

sysTec Controls has installed many penstock protection meters and will support you in the perfect setup of your safety operation procedure. Perfect matching meters and a penstock shut down strategy will ensure safe operation and fast reaction in case of a penstock damage.

Which is why the deltawaveVER2 employs a significantly more powerful monitoring concept:

- 2 independent monitoring circuits
- Evaluation of digital meter readings via BUS comparison of simultaneous (analog) values
- Also suitable for dynamic conditions such as operational start-up and shutdown
- Better than 0.3% leakage uncertainty via calibration
- Extensive fault monitoring
- Fully digital measurement data acquisition and leakage analysis

District heating reference meter

deltawaveVER2 can be equipped with high temperature transducers, withstanding pressures up to 16 bars and temperatures up to 160°C. If desired, sysTec can supply spool pieces with ready installed sensors- calibrated on national reference metrology test beds.

In particular for billing applications of main pipe district heating applications, the meter needs to have the highest possible accuracy and reliability. The wetted ultrasonic flowmeter deltawaveVER2 is the ideal meter for that: Accuracies of < 0,5% after calibration, ISO60041-path arrangement, ISO9000 tracability, DAKKS or NIST calibration and many more advantages make deltawaveVER2 the meter of choice for this application.

Since deltawaveVER2 is a digital time measurement, drift effects will not affect the meters accuracy. The transducers are free of wear and tear and with no pressure loss.



Innovative measurement process, precise evaluation

Correlation method permits measurement under most difficult requirements

Ultrasonic signals are disturbed by a large number of influencing factors; this includes EMC radiation, gas or solid impurity loading, machine noise etc. For conventional ultrasonic devices to be able to reliably pick out the ultrasonic signals in this "ambient noise", the signal amplitude must be a multiple of the noise.

For deltawave^{VER2}, systec Controls has 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 deltawave^{VER2} user are reliable and stable measurement data even under extremely unfavorable conditions.

Smartdamp – reacts immediately and is damped as well

The problem in the case of normal damping of the first order is well known: You "pay" for nicely smoothed measurement values in the form of a slow reaction of the measuring instrument to rapid spikes in measured values. The smoothed measured values are required for stable regulation, yet the realtime jump response is essential too. Consequently, with most measuring instruments the user's only choice remains a compromise between moderate control quality and only minimally adequate reaction to jerky changes in measured values.

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

High-Tech Ultrasonic Transducer

High Signal Exploitation

deltawave^{VER2} ultrasonic transducers provide 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. The high signal exploitation means that a significantly more stable signal is achieved compared to other ultrasonic transducers and clamp-on-systems. This also makes possible the measurement of media that are poor conductors of sound or under high solid and gas loading, – and that at path lengths of more than 100 m.

The assembly plate comes with standard impact protection which reliably protects the transducer from damage from floating debris.



Short Response and Reverberation Times

Fast response and short reverberation of the ultrasonic transducer has a number of advantages: The maximum signal amplitude is quickly available, hence the signal is more easily recognizable. An ingenious structural shape and special casting materials make this advantageous transducer behavior possible.

High pressure/high-temperature transducers

Our high-pressure transducers for pressures exceeding 100 bar can e.g. be used in storage power stations. For applications involving invoicing services for district heating networks, for example, we manufacture high-temperature transducers which operate at up to 140°C.

deltawaveVER2

Maintenance-free, no culverts, no long approach paths

Plug and Play Hardware

Intelligent Evaluation

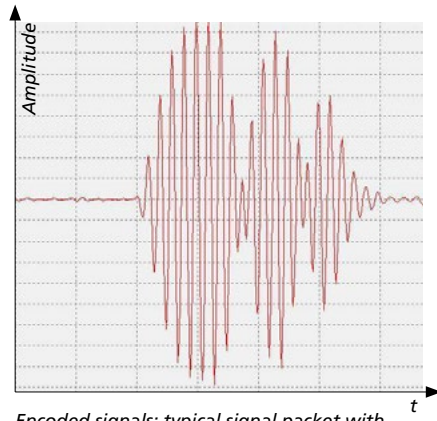
Transit time measurement with highest resolution of flow speed
deltawaveVER2's electronics measure the transit time difference of the ultrasonic signals running with and against the direction of flow with astonishing precision. The evaluation technology developed by systec Controls boasts a resolution of up to < 30 psec.

Consequently, deltaxwaveVER2 reliably measures even the smallest flow speeds. And because the transit time measurement is a purely digital time measurement, the electronics function in drift-free, maintenance-free manner.

Reliable signal detection by transmitting encoded signals

To exclude the possibility of wrong measurements with certainty, deltaxwaveVER2 transmits encoded 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, mismeasurements caused by noise are practically elimi-

nated. This becomes possible thanks to the extremely powerful ultrasonic transducers, which can cleanly convert such encoded transmission signals into ultrasonic signals.



Encoded signals: typical signal packet with two 180° phase shifts for reliable signal recognition.

High-performance hardware architecture

Multiboard Concept

deltawaveVER2 is a multiboard system with a main board and attached ultrasonic boards. The 4 path meter can easily be upgraded with a second ultrasonic board to a 8 path system. Since each board has its own processor, the system performance is always high independent of the number of operated paths. In other meters based on single processor multiplex architectures, the measurement rate and performance will be reduced when more paths are operated. This has negative effects on accuracy and dynamics of the measurement.

The main board of deltaxwaveVER2 has modern PC interfaces such as USB and SD-Card for easy setup, diagnosis and datalog. Also analogue and digital I/O are available for connecting deltaxwaveVER2 to DCS-systems and bus-interfaces for digital communication (M-Bus, Modbus, RS232 and RS485).

The low power consumption offers the possibility, to operate the meter with solar panels or with battery power for off grid applications.

SOS Technology for perfect reliability

The brandnew self optimizing signal (SOS) technology ensures proper operation under the most challenging applications where other flowmeters fail.

Other flowmeters are using fixed signals at fixed frequencies to generate the acoustic burst. The acoustic burst is often a single voltage peak or 3-4 peaks in a row.

deltawaveVER2 uses a unique technology, that varies the frequency and the sent burst to get the optimum received signal. The bursts used from

deltawaveVER2 are code burst (similar to morse codes) which can be identified by a numerical algorithm in the received signal. deltaxwaveVER2 analyses by its SOS technology the received signal in terms of quality and varies the frequency and the sent burst code to the optimum correlation result.

This is a big advantage in particular for challenging applications with high particles or gas loads, ambient EMC noise or high turbulences in the fluid. These influences effect the received signals massively and might lead to failures in the measurement.

The result is more reliable and more stable flow readings.

Developed along a modular concept, adaptable



Description	deltawaveVER2 flow transmitter Ultrasonic multimeter flow-meter	deltawaveVER2 LEAN flow transmitter Ultrasonic multimeter flow-meter	High pressure / High temperature transducer for external mounting on pipes and under operating conditions (optional)
Technical Data	<p>Number of acoustic paths: typically up to 8</p> <p>Power Supply: 90 - 240 VAC // 23 Watt 24 VDC // 11 Watt</p> <p>Protection Degree: IP66</p> <p>Display: Key operation, LED backlit Display: 320 x 240 pixels,</p> <p>Interfaces: USB, RS232, RS485-Modbus, M-Bus (Meter-Bus)</p> <p>Measurement Type: Multiple-path ultrasonic transit time difference (bidirectional)</p> <p>Outputs: 2 x 4...20mA, 2 x pulse, 1 x relays</p> <p>Inputs: 2 x 4...20 mA</p> <p>Output Signals: flow, mean flow velocity, level, temperature, function alarm, threshold alarms, volume meter</p> <p>Data Logger: Integrated, 4 GB</p> <p>Dimensions (wxhxd): 300 x 400 x 155 mm</p> <p>Weight: ca. 9.1 kg</p> <p>Mounting: Wall-mounted, M8/M10</p>	<p>Number of acoustic paths: typically up to 2</p> <p>Power Supply: 90 - 240 VAC // 22 Watt 24 VDC // 10 Watt</p> <p>Protection Degree: IP65</p> <p>Display: Key operation, LED backlit Display: 320 x 240 pixels,</p> <p>Interfaces: USB, RS232, RS485-Modbus, M-Bus (Meter-Bus)</p> <p>Measurement Type: Multiple-path ultrasonic transit time difference (bidirectional)</p> <p>Outputs: 2 x 4...20mA, 2 x pulse, 1 x relays</p> <p>Inputs: 2 x 4...20 mA</p> <p>Output Signals: flow, mean flow velocity, level, temperature, function alarm, threshold alarms, volume meter</p> <p>Data Logger: Integrated, 4 GB</p> <p>Dimensions (wxhxd): 260 x 240 x 120 mm</p> <p>Weight: ca. 1.3 kg</p> <p>Mounting: Wall-mounted, M8/M10</p>	<p>Frequency: 1 MHz / 500 kHz</p> <p>Path Lengths: 0.1 - 7 m (Type 1 MHz) 0.5 - 40 m (Type 500 kHz)</p> <p>Pressure Range: High-pressure version: Up to 100 bar High-temperature version (only 1 MHz): up to 28 bar</p> <p>Temperature Range: High-pressure version: -40...80°C</p> <p>High-temperature Version: (only 1 MHz): -40...140°C</p> <p>Pipe Size: DN800 and higher</p> <p>Cable Length: 10 - 150 m</p> <p>Accessories: Exchange armature (Exchange Kit) for switching out transducers under operating conditions</p>
Certifications	CE, Exd	CE	CE, Eexm



WAVEVER2

Autonomous Components, Highest Reliability



<p>deltawave 1.0 MHz ultrasonic transducer For wall mounting in pipes, channels and surface waters</p>	<p>deltawave 0.5 MHz ultrasonic transducer For wall mounting in pipes, channels and surface waters</p>	<p>deltawave 0.2 MHz ultrasonic transducer For installation in larger canals and surface waters</p>	<p>deltawave quicklock For external mounting on pipe, optionally under operating conditions</p>
<p>Frequency: 1 MHz</p> <p>Path Lengths: 0.1..7 m</p> <p>Temperature Range: -40..80°C Ex to 60°C</p> <p>Pressure Range: max. 10 bar(g)</p> <p>Material (contact with medium): PVC / PU / V4A (others upon request)</p> <p>Cable Length: 10 – 150 m</p> <p>Cable Type: RG 58</p>	<p>Frequency: 0.5 MHz</p> <p>Path Lengths: 0.5..40 m</p> <p>Temperature Range: -40..80°C Ex -20...60°C</p> <p>Pressure Range: max. 3 bar(g)</p> <p>Material (contact with medium): PVC / PU / V4A (others upon request)</p> <p>Cable Length: 10 – 150 m</p> <p>Cable Type: RG 58</p>	<p>Frequency: 0.2 MHz</p> <p>Path Lengths: 3..150 m</p> <p>Temperature Range: -40..80°C</p> <p>Pressure Range: max. 2 bar(g)</p> <p>Material (contact with medium): PVC / PU / V4A (others upon request)</p> <p>Cable Length: 10 - 300 m</p> <p>Cable Type: RG 58</p>	<p>Frequency: 1 MHz</p> <p>Path Lengths: 0.1..7 m</p> <p>Temperature Range: -40..80°C</p> <p>Pressure Range: PN 6 / PN100</p> <p>Material (contact with medium): PVC / V4A (others upon request)</p> <p>Cable Length: 10 - 150 m</p> <p>Cable Type: RG 58</p>
<p>Sensor delivered with standard wall mounting, other mounting systems available, e.g. mounting rails or locking rings.</p>	<p>Sensor delivered with standard wall mounting, other mounting systems available, e.g. mounting rails or locking rings.</p>	<p>Sensor assembly is specifically configured and manufactured depending on application.</p>	<p>Sensor can be delivered in different installation configurations. Optionally, installation and removal possible under operating conditions (Quicklock version).</p>
<p>Ex Zone 2 und Zone 1</p>	<p>Ex Zone 2 und Zone 1</p>		

Proven measurement process, simple installation

Basis of Calculation

The calculation of flow speed is based on the ultrasonic transit time process: two ultrasonic transducers emit sound waves into the medium at an angle α (15 - 75°). The two transducers function reciprocally as receiver and transmitter, and together form a so-called acoustic path. This type of transducer pair combines to form an acoustic path. The ultrasonic signals (T1) emitted by the transducer positioned upstream are accelerated by the flow, while the ultrasonic signals (T2) from the transducer located downstream are delayed. The transit time difference (T2-T1) between the pair is a direct measurement of the mean flow speed over the path length. Given a known geometry, this allows the flow to be calculated according to the formula $Q = A \times v_m$,

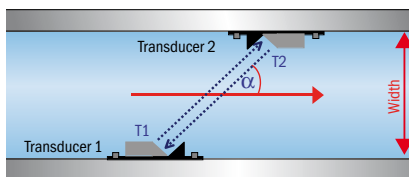
whereby:

- A= the cross-sectional area or so-called hydraulic surface
- v_m = mean flow speed over the cross-section

deltawave^{VER2} calculates the transit time difference with an extremely high resolution of less than 1 mm/s. The calculation of the flow and discharge conforms to international standard, and of course in addition to (rectangular) channels is also suitable for drains and surface waters with virtually any cross-section geometry.

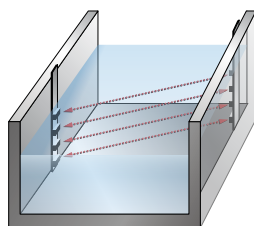
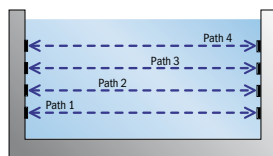
High accuracy via multiple-path measurement

Even with just a single acoustic path, under ideal conditions a reproducible and reliable determination of the discharge is possible. At the same time, the flow conditions in large pipes and open or partially filled channels are very com-



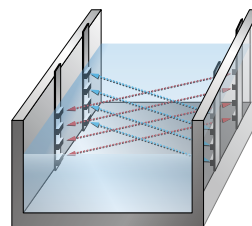
Schema Kanal (Draufsicht)

plex. Short inlet runs, changing water levels, back flow, channel roughness, wind and waves represent just some of the many disrupting factors in performing such measurements. Multiple-path measurement is necessary to precisely determine the relevant mean flow velocity under such difficult conditions. By arranging multiple acoustic paths – typically 4 – flow speeds are measured at different heights, the flow profile is optimally calculated and the mean flow velocity is precisely determined. The table below provides an overview of which deltawave^{VER2} equipment achieves the relevant accuracies.



Large channel widths commonly lack the necessary inlet conditions, leading to significantly reduced measurement accuracy when using other measurement methods due to the subsequently

distorted flow profile (turbulences). deltawave^{VER2} supports crosswise measurement, in which two acoustic paths are installed at each measuring level and whose measured speed values are then determined. Disruptive influences and turbulences are thus fully compensated for – and use is possible virtually without any inlet length.



Among others, measuring accuracy was calculated and verified at the Authority for Environmental Engineering and Water Engineering (VPUW) at the University of Kassel.

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, systec Controls recommends the best possible installation location and specifies the expected accuracy free of cost. If desired, and for reimbursement of the small charges that will be incurred, your systec Controls agent can also perform the measurement recording on-site.

The design and mounting of the transducer is individually customized to the measurement environment.

Inlet Path	Accuracies*				
	> 10D			< 5D	
Paths / Crosswise Measurements	2	4	6	2x2	4x2
	< 2%	0,5%	0,3%	< 2%	0,5%
Filled pipes and filled rectangular cross-sections					
	3%	2%	1%	3%	2%
Open channels Partially filled pipes, running water					

*Accuracies effective starting at $v = 0.1$ m/s

Installation in open channels

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



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. Using welding sockets in the Quick-lock construction form or an external exchange armature, the transducers can be installed and replaced while operations are running and at operating pressures up to 100 bar and – all entirely without interrupting operations.

In the case of partially filled pipes, the measurement system is only augmented by a single additional level meter.



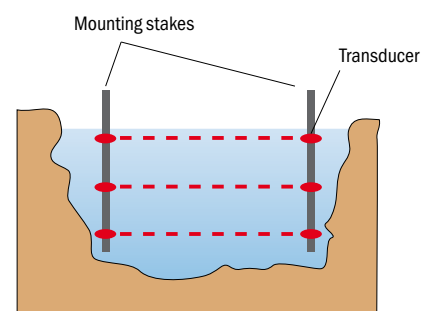
Installation Examples for Surface Waters

Installation is possible on bridges and dams, as well as at a distance from the banks. In channels where the banks are not uniform in cross-section or are covered by vegetation, international standards permit the transducers to be mounted on stakes that must be inserted at a certain distance from the banks. In particular, when the ratio between "unmeasured" and "measured" flow is low, the correction (calibration) to be carried out is also less and the generated measurement inaccuracies are within tolerance.



Even complex channel configurations can be recorded in the deltawaveVER2 via up to 256 plotting points.

In cooperation with the measurement point operator, systec Control develops customized and easy-to-assemble fastenings adapted to the flow channel.



Self-explanatory, convenient, safe and able to be monitored over the internet

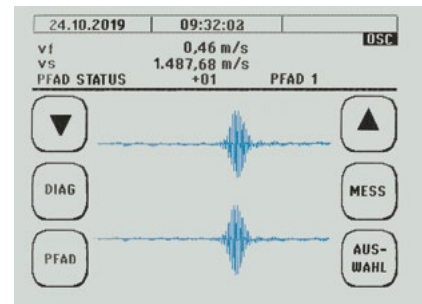
Parameterization

deltawaveVER2 can be conveniently and easily prepared for measurement, even for very complex applications.

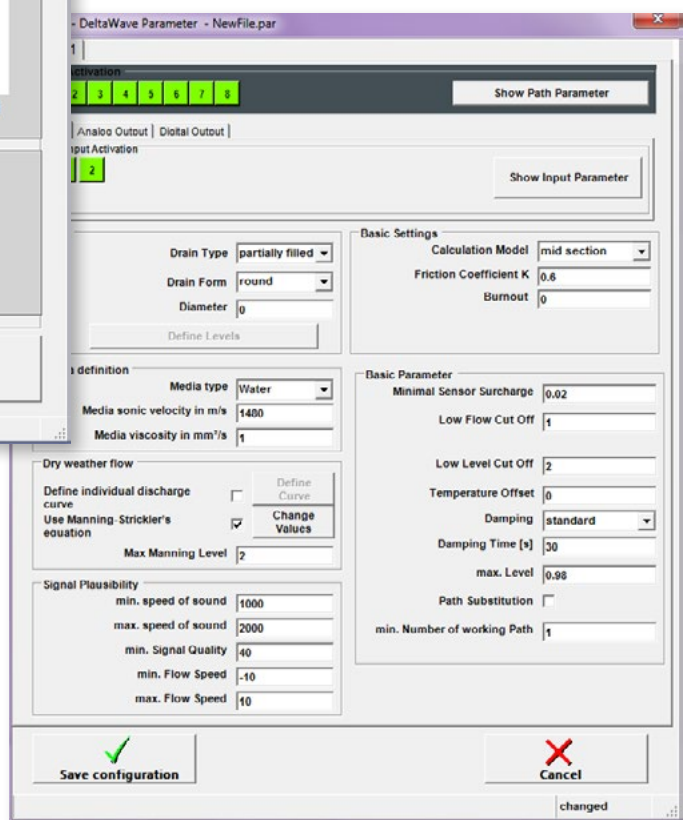
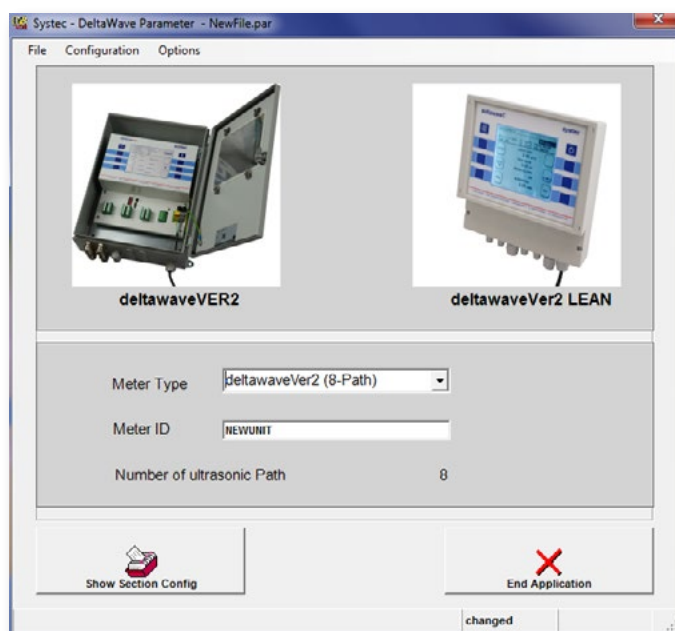
The accompanying Windows software enables intuitive and largely self-explanatory parameterization.

After finalizing the parameters, they can easily be stored on deltawaveVER2's SD card or transmitted to deltawaveVER2 via USB. Irksome maneuvering of the laptop under often rough conditions at the measurement site is this eliminated. Even updates, can be installed with this method

Oscilloscope Function



The integrated oscilloscope function allows for rapid verification of signal quality directly within the device. This function makes it possible to visually display the signals, as well as the simple and quick check of all acoustic paths.



deltawaveVER2

Discharge Method

Depending on your application, there are a large number of ISO-standardized discharge models that ensure optimum accuracy and traceability of measurement results. ISO6416 is followed for measurement of discharge flow in partially filled channels, with IEC41 and ASME PTC 18 observed for filled channels. For alternately wholly filled / partially filled channels deltawaveVER2 automatically switches to the correct standard.

Convenient Expansion Options

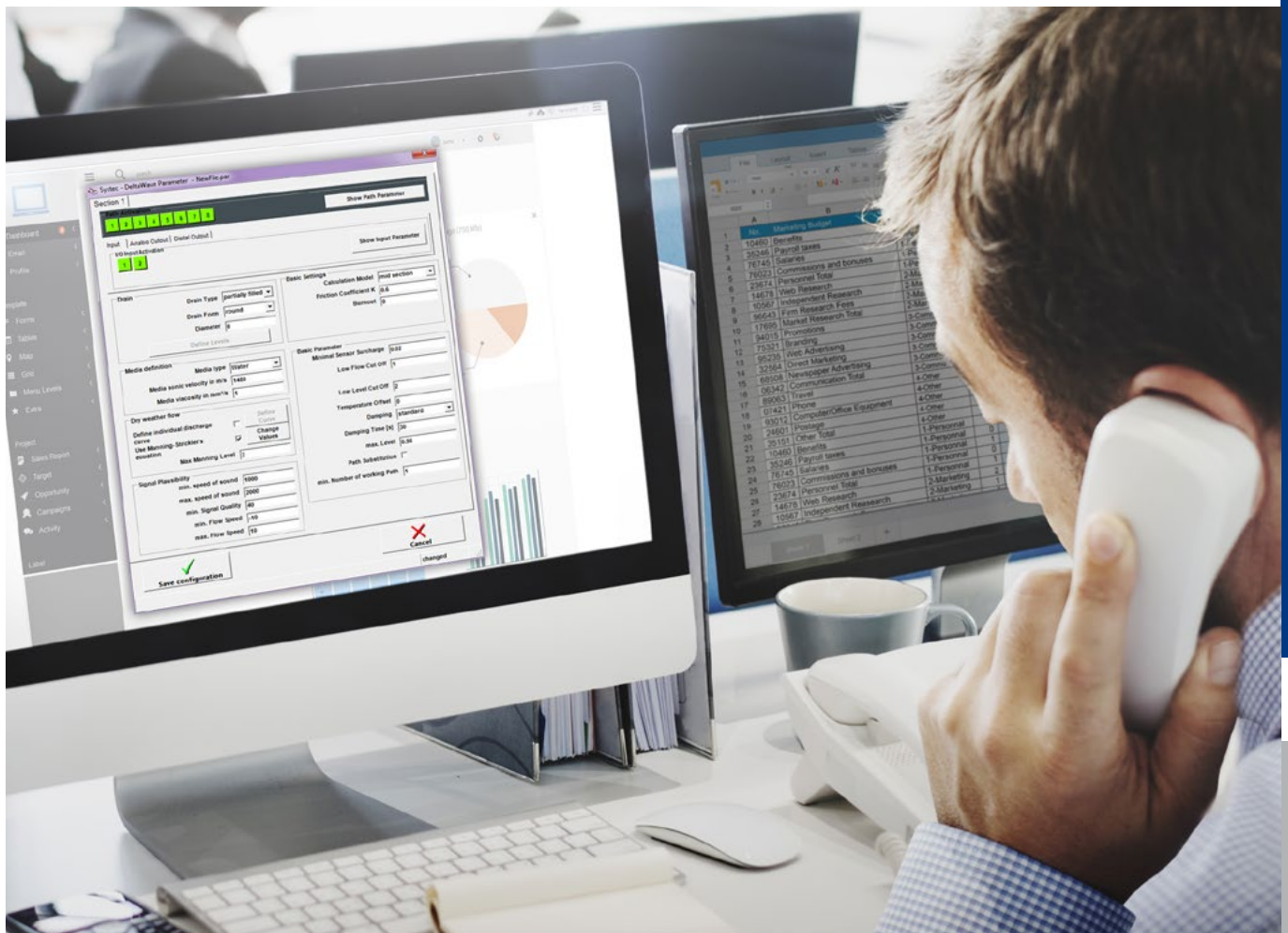
With one deltawaveVER2 measurement transducer, it is possible to realize up to four different measurement sites (sections) with a total maximum of 16 paths. Naturally, deltawaveVER2 can be retroactively expanded: simply insert additional ultrasonic or I/O boards into the evaluation unit, switch on – and done! Recognition is automatic, simply plug and play.

Safety

With deltawaveVER2, safety is first and foremost. deltawaveVER2's main computer operates based on a highly secure embedded Linux operating system with a hierarchical security schema. Without a password, only the 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 deltawaveVER2 is integrated into a computer network, parameters can be changed directly via any PC running Windows, the device status can be queried and stored measurement values can be read. deltawaveVER2 can internally store the measured values for 40 (!) years. Therefore, repeatedly searching for the measurement point is eliminated. deltawaveVER2 works fully automatically in the background without disturbing the work flow of the measurement technician



Flow metering technology “by systec”



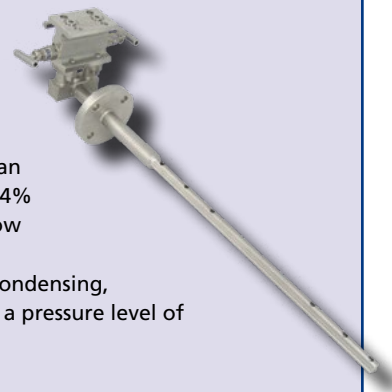
deltaflowC

The deltaflowC measures the mass flow of gases in pipes and channels. Thanks to the integrated differential pressure, pressure and temperature sensors and patented microprocessor technology, measurement accuracies of greater than 2% can be achieved. The deltaflowC is particularly impressive on the strength of its high dynamic performance, zero-point stability and ease of operation. Practical, maintenance-free and available at good value for money, deltaflowC enables you to keep your process costs under control.

deltaflow for flow metering of gas, steam and liquids

The deltaflow pitot tube has proven its effectiveness a thousand times over for measuring the flow and volume measurement of gas, steam and liquids in pipes. Pitot tubes induce the lowest pressure loss of all differential pressure elements, which means that many applications can look forward to energy savings of several thousand Euros per year. With an accuracy of up to 0.4% of the measured value as tested by the Physikalisch-Technische Bundesanstalt (PTB), the deltaflow probe can also be reliably used in the most adverse conditions.

deltaflow is extremely robust and TÜV (German Technical Inspection Agency) tested for use in condensing, aggressive and dirty flue gases. deltaflow is available for pipe diameters from 1 mm – 15 m and a pressure level of up to 690 bar and can thus be used for the vast majority of flow applications.



deltawaveC

deltawaveC devices are available in two different series: the deltawaveC-P for mobile / sampling measurements, and the deltawaveC-F, used for continuous measurements in fixed installations. Both units use the proven and highly precise ultrasonic transit time difference method. By using the latest digital signal processors, these robust gauges are extremely accurate and drift-free. Thanks to clamp-on technology, the ultrasonic transducers can be installed in a matter of minutes. No time-consuming work is required to cut or penetrate your pipes. This option, and the elimination of process interruptions, mean that deltawaveC devices are key to optimizing operating costs.



The head office of systec Controls is located in Puchheim, near Munich. Here, we develop and manufacture our products according to DIN EN ISO 9001. But innovation and product quality alone are not enough for us. We have also had our systems tested by independent institutes – with clear,

proven success. And of course, we are there for you even after the installation of your system. Our service-crew will assist you at your plant.

systec Controls – the specialist in flow measurement technology.

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