

deltawaveC

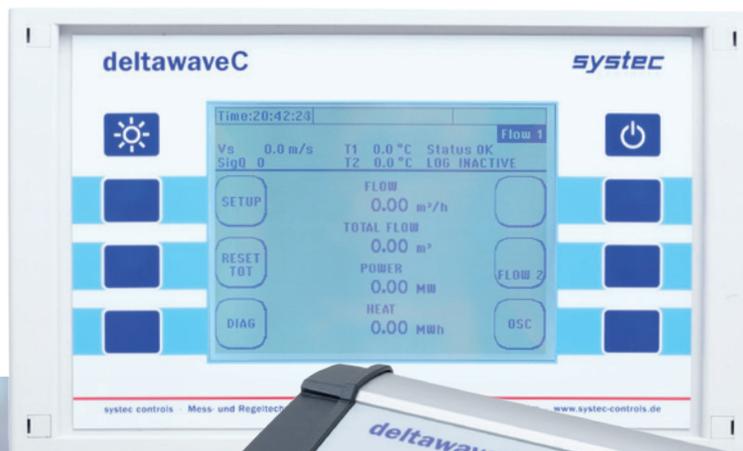
## Measurement of Flow and Heat Quantity in Liquid-Carrying Pipes

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

# deltawaveC

deltawaveC-F stationary

deltawaveC-P portable



**systemc**  
CONTROLS

## Contactless flow measurement for liquids

deltawaveC devices are available in two different series: the deltawaveC-P for mobile sampling measurements and for measuring tasks over an extended period of time, and the deltawaveC-F, for continuous measurements in fixed installations.

Both units use the proven and highly precise ultrasonic transit time difference method. By employing the latest digital signal processors, these robust measurement devices are extremely accurate and drift-free.

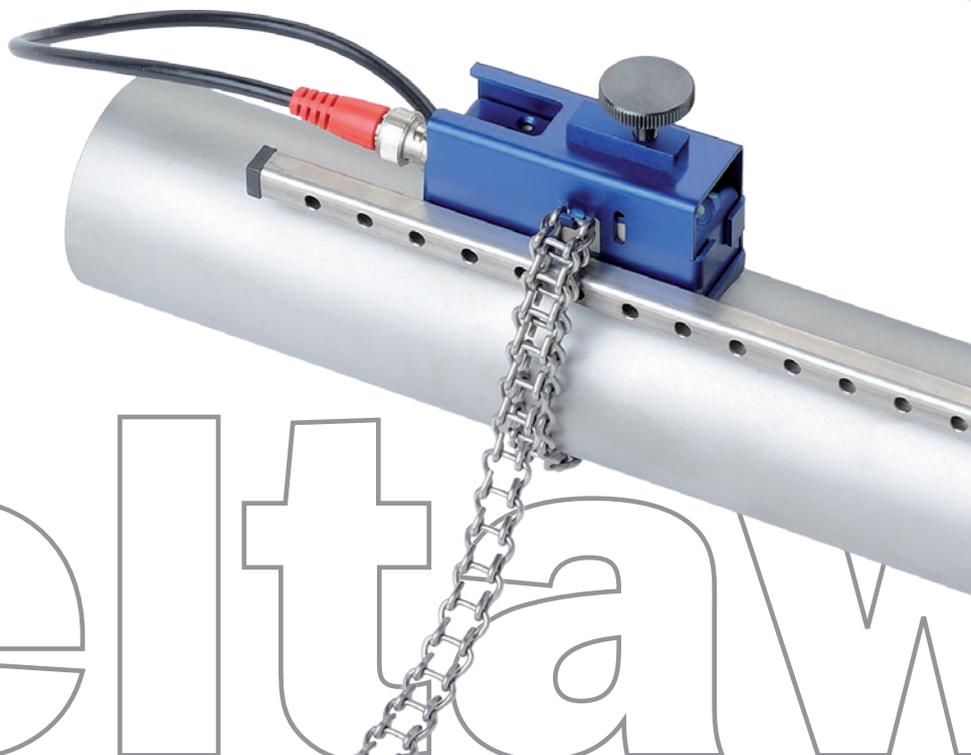
### Saves installation and operating costs

Thanks to clamp-on technology, the ultrasonic transducers used can be installed in a matter of minutes. No need exists to cut or penetrate your pipes. This possibility, together with the elimination of process interruptions, means that deltawaveC devices are the key to optimizing operating costs. The contactless measurement is virtually

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

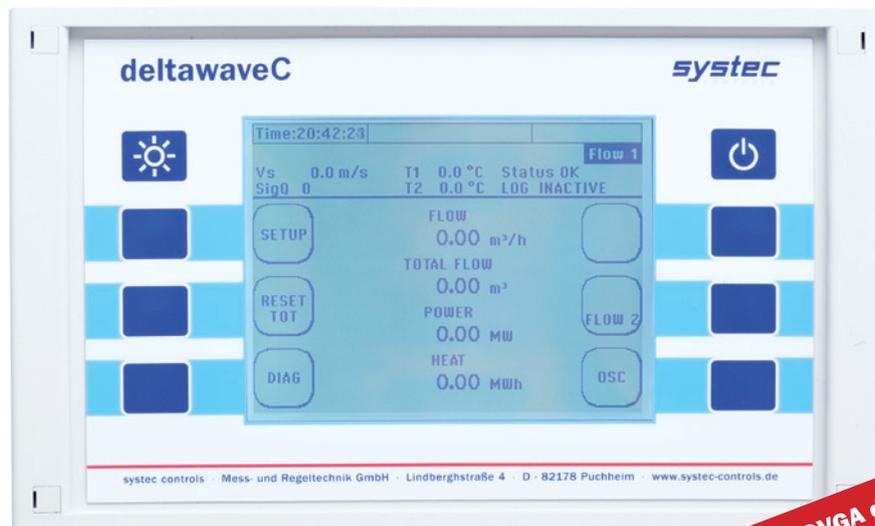
With the new Quick Setup option parameterization takes less than one minute. And online help makes the manual unnecessary for most tasks.

The single user interface shared by both device versions eliminates the learning curve for anyone already familiar with one of the deltawaveC devices. You'll find all menu items and displays in plain text on the large backlit display. Cryptic abbreviations are unnecessary on the graphics-capable QVGA display. The clear menu structure and easy and quick operation via eight keys makes for added user-friendliness.



# deltawaveC

Highly precise and reliable flow measurement



Large QVGA display, simple to use

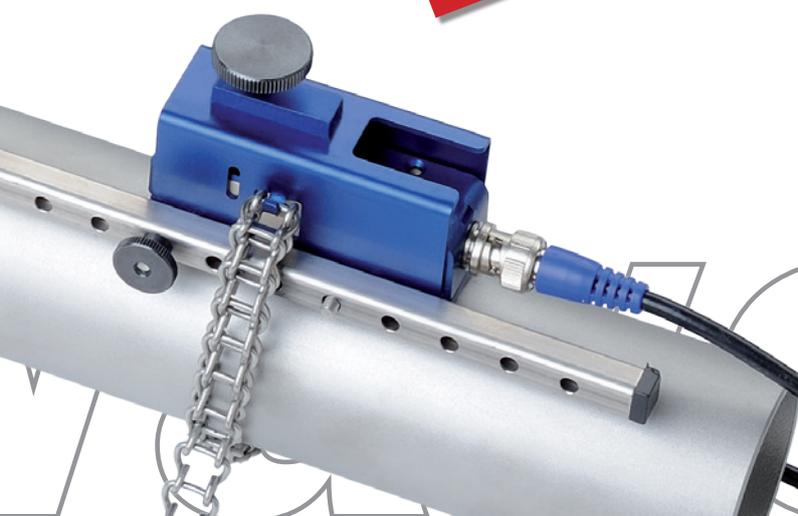
deltawaveC-F



Fast, secure transducer installation thanks to systemec's "Quickmount" technology

deltawaveC-P

The display and usage concept are identical for both the portable and permanently mounted deltaxwaveC. This not only simplifies the operation of both devices – it also gives the user a complete overview of his measuring point.



## 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.

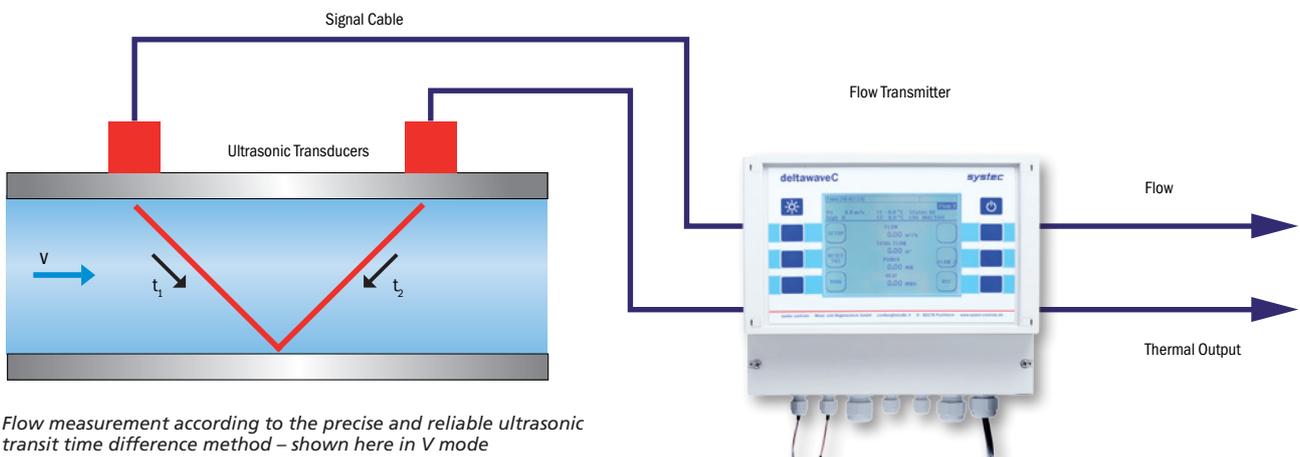
The ultrasonic transducers operate alternately as transmitters and receivers and transmit ultrasonic signals to one another, whereby the respective signal transit times of the outgoing and return signal ( $t_1$ ,  $t_2$ ) are measured.

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.

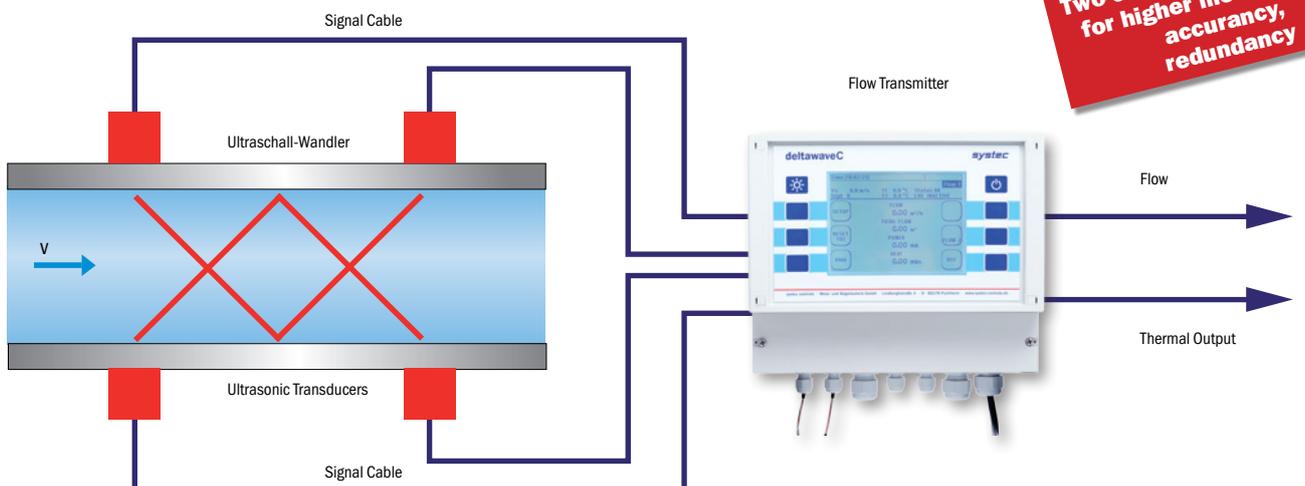
The use of multiple processors working in parallel means that deltaxwaveC achieves an extremely high measurement rate. Signal processing takes place in high-performance DSPs which are extremely precise and operate at very

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 realise 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.



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 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.

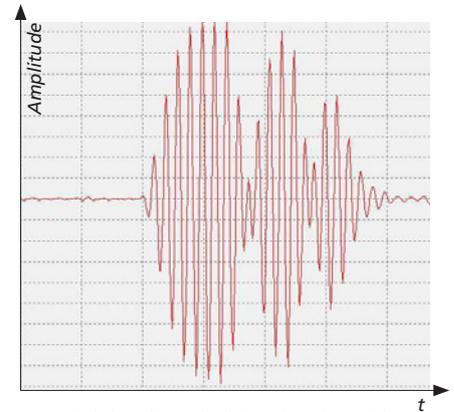
### Verified signal quality ensures reliable measurement

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.



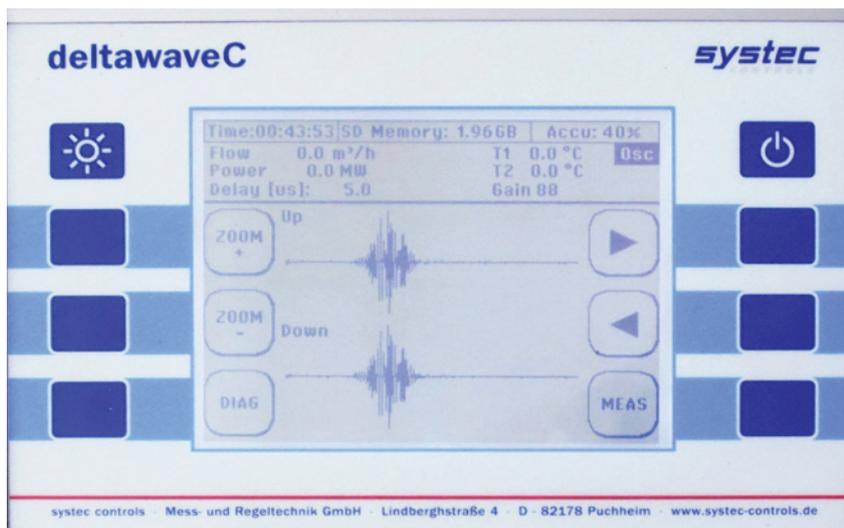
Encoded signals: typical signal packet with two 180° phase shifts for reliable signal recognition.

**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.



## Integrated Heat Quantity Measurement

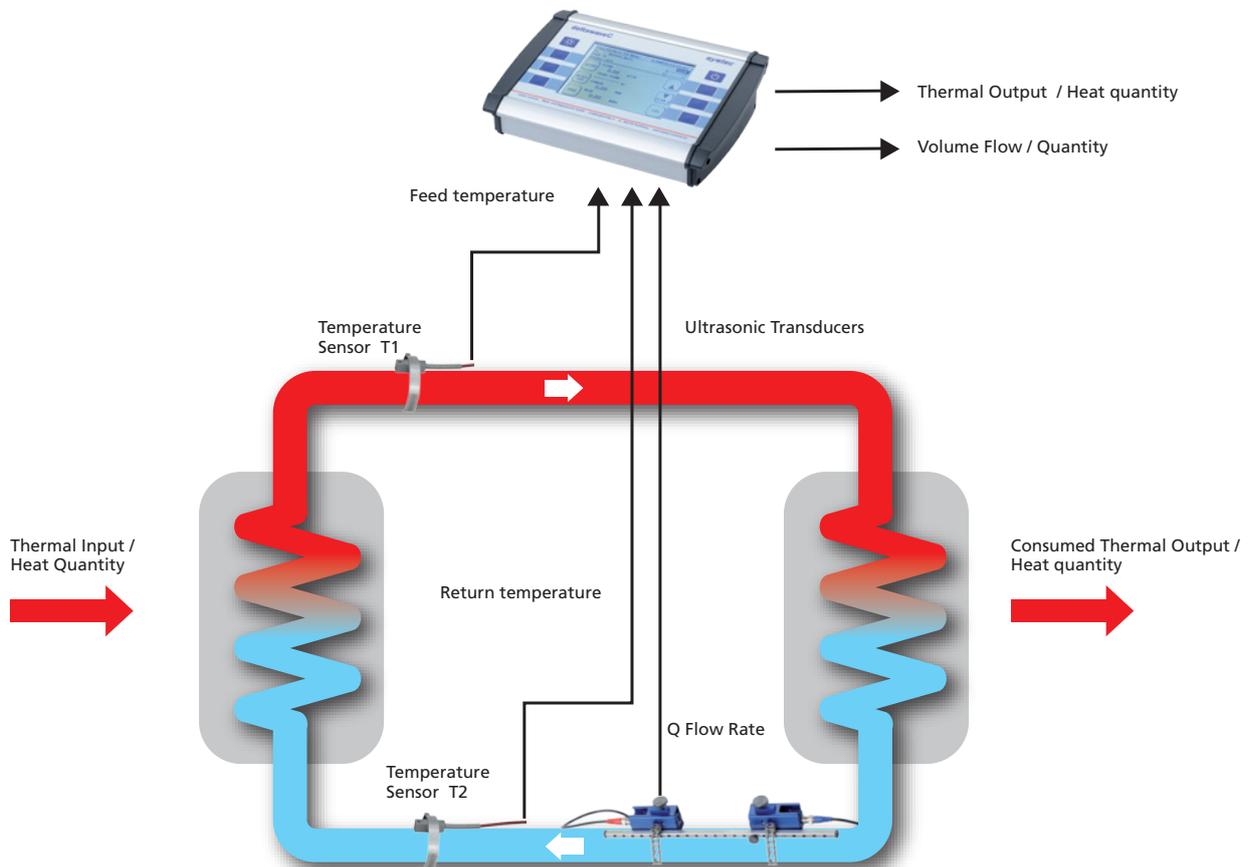
deltawaveC-P is compatible with the most common pipe sizes (DN10 - DN6000) and cross-sector applications. deltawaveC is not only a flowmeter, but also includes an integrated heat quantity measuring function. Together with the optionally available clamp-on temperature and ultrasonic transducers, heat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

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 onto the pipe from the outside.



*Thermal energy metering at Stadtwerke München*



# deltawaveC

**A single device for multiple metering applications**

## Broad Application Spectrum

deltawaveC is compatible with the most common pipe sizes (DN10 - DN6000) and applications across all sectors. 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 (Anti-Noise Deflector) the ultrasonic waves are guided and coupled such that unwanted echoes and signal dispersion is 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 plastic housing, the ultrasonic transducers are suitable for applications up to 150°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.



Transducer installation: quick and easy

### Selection of Ultrasonic Transducers for Transit Time Measurement

Type	Medium Temperature	Inner Diameter
deltawaveC-P portable: XUC-PW-F21	-40...150°C	DN10...DN100
deltawaveC-F permanently installed: XUC-FW-F21	-40...150°C	DN10...DN100 <i>optional: Ex</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: Ex</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: Ex</i>

**us-transducers also available with Ex-accreditation**



### Ex-Version

Ex us-transducer ambient temperature  $-40^{\circ}\text{C} < T_a \leq 80^{\circ}\text{C}$   
Accreditation: Ex II 2G Exd II C T6...T3 Gb

Ultrasonic transducers for permanent installation, degree of protection: IP68

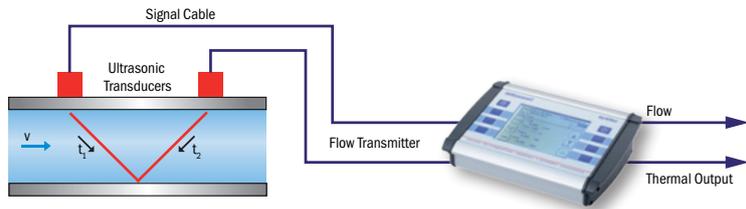
# deltawaveC

## deltawaveC ultrasonic transducers – optimum metering performance for your application

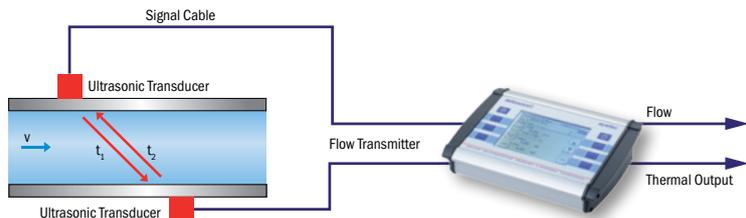
The high-performance ultrasonic transducers are optimized for maximum signal yield and outstanding metering performance. deltaxwaveC's three ultrasonic transducer types can be used for most flow applications. One device for almost all measurement tasks!

All ultrasonic transducers are clamped onto 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.

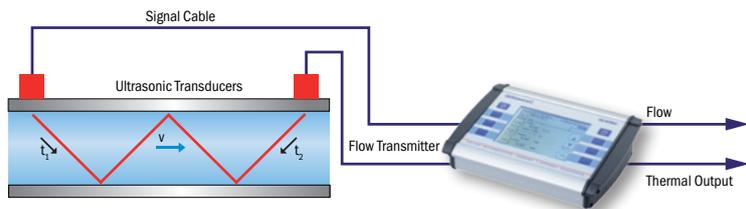
Typically, depending on the application and amount of space available, the sensors can be attached to your piping in the Z, V and W mode.



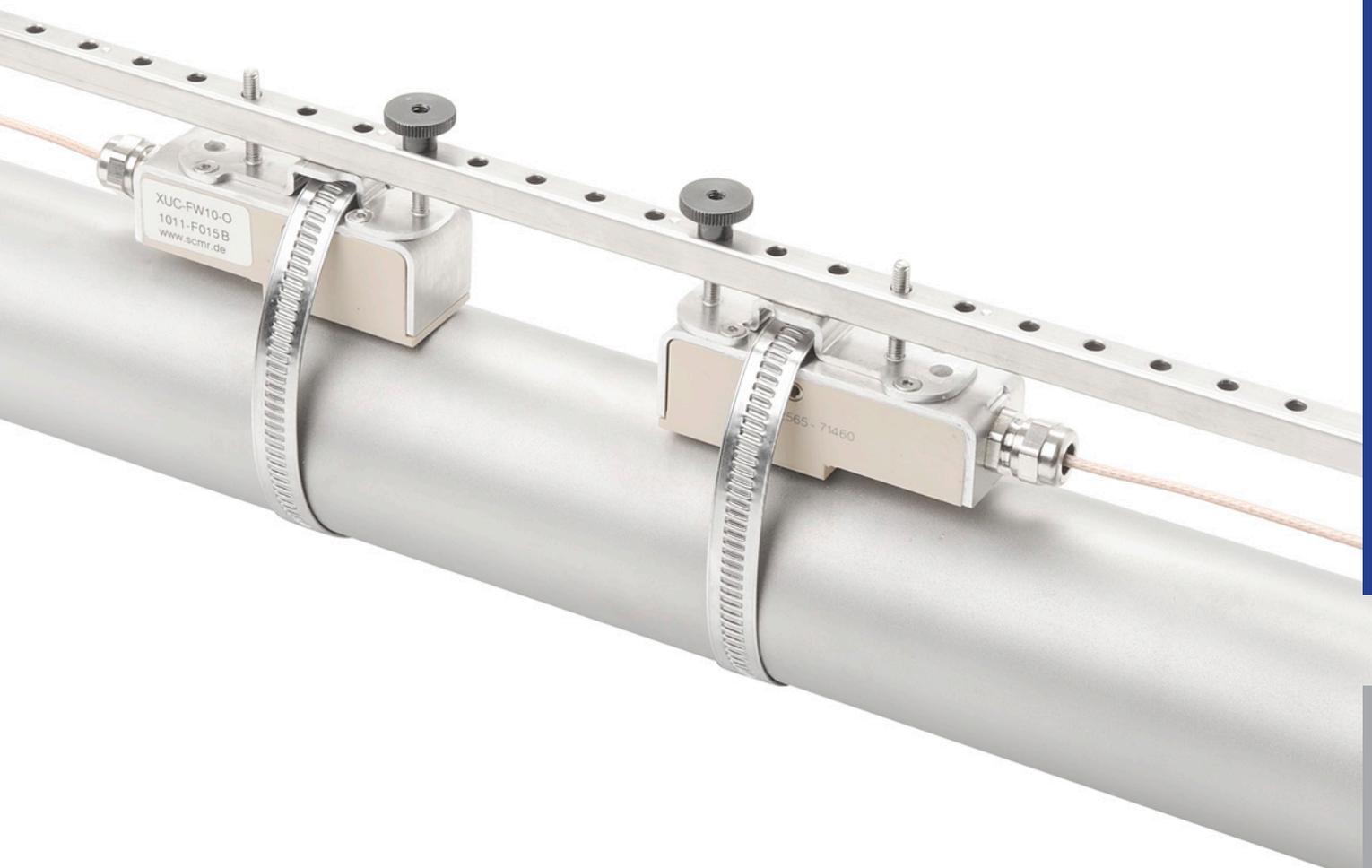
Mounting in V mode, standard mode



Mounting in Z mode, typical for large pipes



Mounting in W mode, typical for small pipes



# deltawaveC Transducer Specifications



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%



deltawaveC-P	
Operation	Intuitive via 8 main keys (Soft Keys), plain text display
Languages	DE, EN, CHN, F, E among others
Units	Metric / US
Outputs	2x 4...20 mA 1 x Impuls 1x Relais 1x MicroUSB
Inputs	2x PT100
Integrated Data Logger	2 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 re-chargeable battery and 100-240V AC wide range adapter
Battery Operation	Approximately 5 hours
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 among others
Units	Metric / US
Outputs	2x 4...20 mA 1x Impuls 1x MicroUSB 1x Relais <i>optionally:</i> RS 232 / RS 485
Inputs	2x PT100
Measurement Channels	1, optionally 2
Power Supply	85-264VAC, 18-36VDC (opt.)
Power Consumption	10 W
Protection Class	IP65
Cable Connections	Terminals
Housing	PVC, wall-mounted
Dimensions (WxHxD)	260 x 240 x 120 mm
Operating Temperature	-20...60°C
Weight	1.3 kg
Display	QVGA (320x240), black and white, adjustable back-lighting



deltawaveC-F Ex	
<i>Technical data as deltapwaveC-F except for:</i>	
Accreditation	II 2 G Ex de IIC T6
Housing	stainless steel wall mounting
Dimensions (WxHxD)	360 x 458,5 x 218 mm
Operating Temperature	-20...50°C
Weight	17,2 kg

2 Kanal-Version deltapwaveC-F / C-F Ex	
<i>Technical data as 1-channel version except for:</i>	
Outputs	2x 4...20 mA 2x Impuls 1x MicroUSB 1x Relais <i>optionally:</i> RS 232 / RS 485
Measurement options	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.

## Online Enquiries

directly under  
"Contact & Information" at  
[www.system-controls.de](http://www.system-controls.de)

*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.*

## Flow metering technology “by systec”

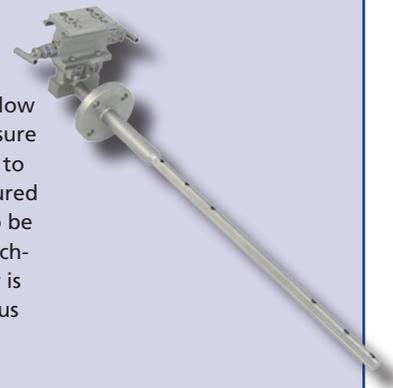


### deltawave flow meter for channels, pipes and rivers

deltawave 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 deltaxwave electronic unit can serve up to 4 independent measurement points. Precise, reliable and virtually maintenance-free, deltaxwave is ideal for monitoring, control and accounting measurements in conformance with ISO 6416, ISO 60041 and ASME\_PTC\_18.

### 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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