

Data sheet deltawaveC-F

1- Channel, 2- Channel, Ex



Ultrasonic clamp-on
flowmeter for liquids

Overview

Range of applications

- -40 to 150 °C
- Pipe Size DN10 – DN6000
- Pipe Material: Most common materials (ultrasonic conductible) like steel, plastics (PE, PVC, PEEK,...)
- Flow velocities: 0....+/-30 m/s
- Media: Liquids
- Accuracy: Up to 1%
- Certificates: CE / ATEX (in preparation)
- Heat quantity measurement
- Operation in hazardous areas (Ex)
- 5-point calibration (factory certificate)

Typical Applications

Power Plants

- Cooling water
- Boiler feed water
- Condensate and heat circuits

Water and waste water industry

- Influent, Effluent, Sludge
- Consumption and distribution measurements
- Chemical flows (small pipes, low flows)
- Leakage detection
- Treatment dosage control

Facility Management

- Pump Control
- Optimization of heating and air conditioning
- Optimization of energy efficiency

Chemical and petrochemical industry

- Basic materials as well as intermediate and final products
- Hydrocarbon liquids
- Measurement on high pressure systems

Food and Beverage

- Consumption optimization

Pharmaceutical and semiconductor industry

- Non-invasive measurement of ultra pure fluids



Picture 1 Mounted transducers with spacer bar at steel pipe.

Introduction



Measurement principle

deltawaveC-F uses the effect of acceleration and deceleration of acoustic signals travelling in a moving fluid. Two ultrasonic clamp on transducers are mounted (from outside) on a pipe, as shown in Pictures 2/3/4 and produces an acoustic path. The transducers sending and receiving acoustic signals, the transit times T_1 and T_2 are measured by an electronic flow transmitter. The signal from transducer A towards transducer B is accelerated by the flow (short T_1) the return signal from transducer B to transducer A is decelerated by the flow (longer T_2). The difference between T_1 and T_2 together with the path length L can be used to determine the average flow velocity v . This principle is known as the acoustic time-of-flight principle. The flow is calculated from the geometry data of the pipe and the flow velocity.

High level signal processing:

deltawaveC-F emits coded signal pattern into the pipe. The received signals will be compared with the sent signals and only signal pattern which correlate with the original sent pattern will be used for flow calculation (cross correlation based signal evaluation). The calculation of the flow is done with the integrated DSP (digital signal processor). Thus the calculation has high sampling rates. The DSP calculation of the time-of-flight is a pure digital transit time measurement it works very precise, is completely drift and maintenance free and there is no need for recurring calibrations.

Features

- Clear text based user interface with LED backlight QVGA display
- User interface control with 6 soft buttons
- Quick- Mount- System with space bar for ultrasonic transducers F10 and F21
- AFC compensation algorithm: compensates influences of changing media temperatures to the ultrasonic transducer distance
- Reynolds compensation: compensates influences of media viscosity on the ultrasonic measurement
- Ultrasonic transducers AND technology: reducing signal echoes and dispersion effects and having a positive effect on the signal to noise ratio.
- 2 channel version
- Applicable for ex hazardous areas (only deltaxwaveC-F  flow transmitter respectively  ultrasonic transducers)

deltawaveC-F overview

deltawaveC-F 1-Channel flow transmitter

Flow measurement, thermal output and heat quantity measurement is applicable for one measurement point in combination with one pair ultrasonic transducers and one pair PT100.

deltawaveC-F 2-Channel flow transmitter

Flow measurement is applicable for one or two different measurement points with two pairs of ultrasonic transducers. deltaxwaveC-F 2 channel version supports different mathematical operations like $CH1+CH2$, $CH1-CH2$, $(CH1+CH2)/2$; due to the appliance of two pair ultrasonic- transducers mounted. Opposite mounting of 2 pairs of transducers on the same pipe the accuracy of measurement will be increasing, a redundancy operation is possible or disruptive influences depending small inlet path lengths will be compensated.

Thermal output and heat quantity measurement is only supported in operation mode $(CH1+CH2)/2$.

deltawaveC-F flow transmitter, 1 Channel, 2 Channel

The deltaxwaveC-F Ex flow transmitter could be applied up to Ex Zone 1. The technology of deltaxwaveC-F Ex flow transmitter is installed in a special Ex housing. The electronics are implemented in the pressure encapsulated area of the housing (Ex d). The cable terminal compartment is located in the area of the housing with extended security (Ex e). To read off the measurement results from the display from deltaxwaveC-F Ex the housing is equipped with a gauge glass. For parameterization it is necessary to remove the gauge glass (screw cap).

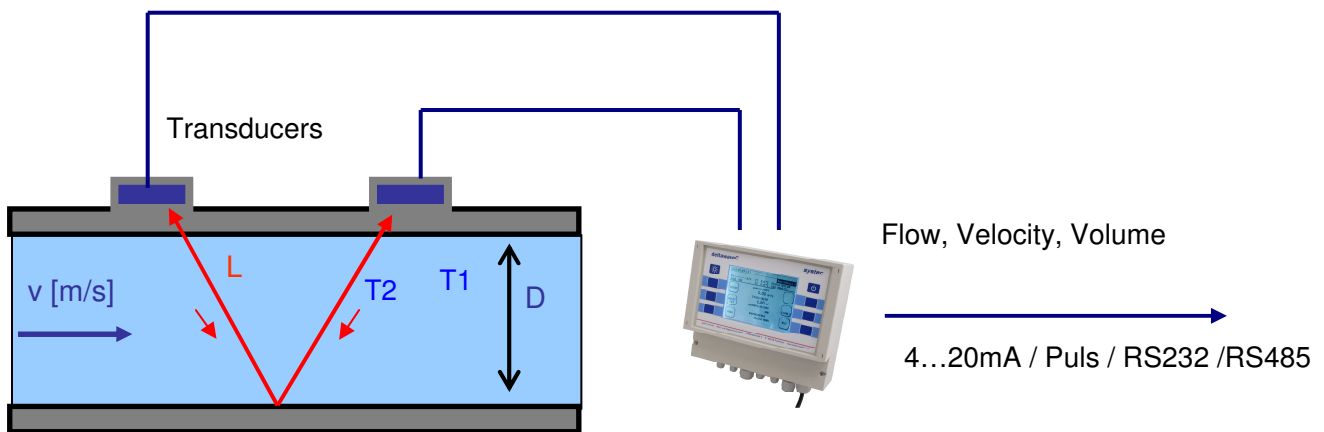
The ultrasonic transducers

deltawaveC-F standard ultrasonic transducers

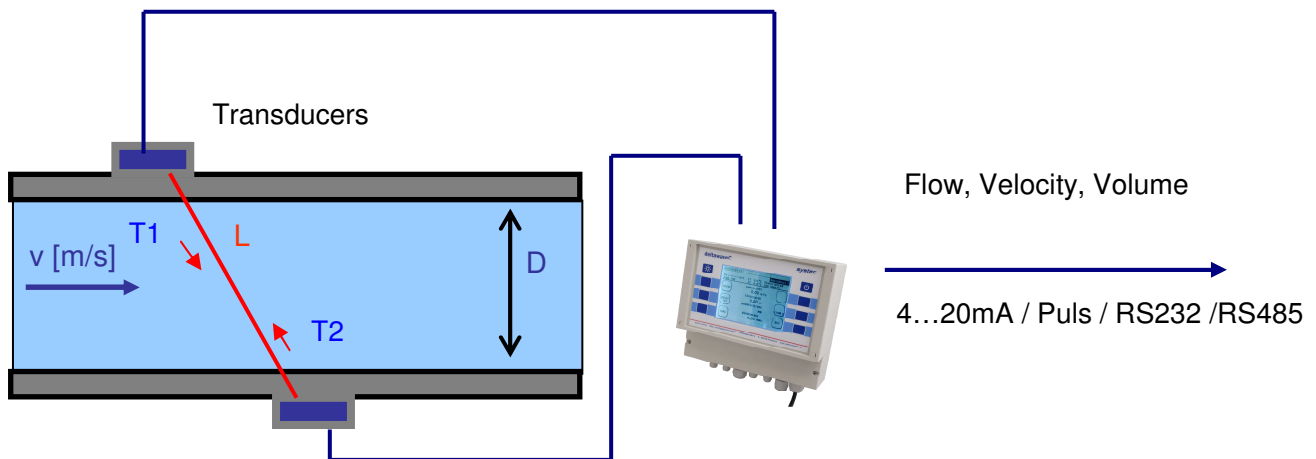
The standard ultrasonic transducers can be used together with each deltaxwaveC-F flow transmitter. The standard ultrasonic transmitters **are not** applicable for usage in ex hazardous areas.

deltawaveC-F ultrasonic transducers

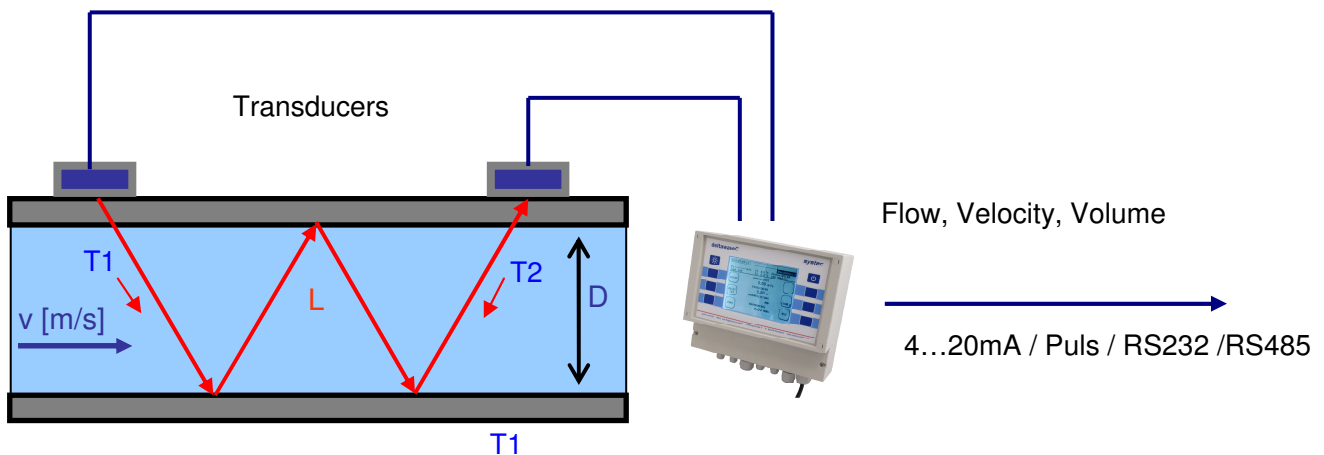
The deltaxwaveC-F ultrasonic transducers with Ex approval can be operate up to Ex Zone 1. If a standard deltaxwaveC-F flow transmitter without Ex approval (located outside the ex hazardous area - safe area) is used, than it is allowed to operate it together with ultrasonic transducers with Ex approval (located in an Ex hazardous area). deltaxwaveC-F Ex flow transmitter with ex approval could be operated together with ultrasonic transducers with ex approval up to Ex Zone 1.



Picture 2 Mounting in V-Mode (standard installation applicable for most applications)

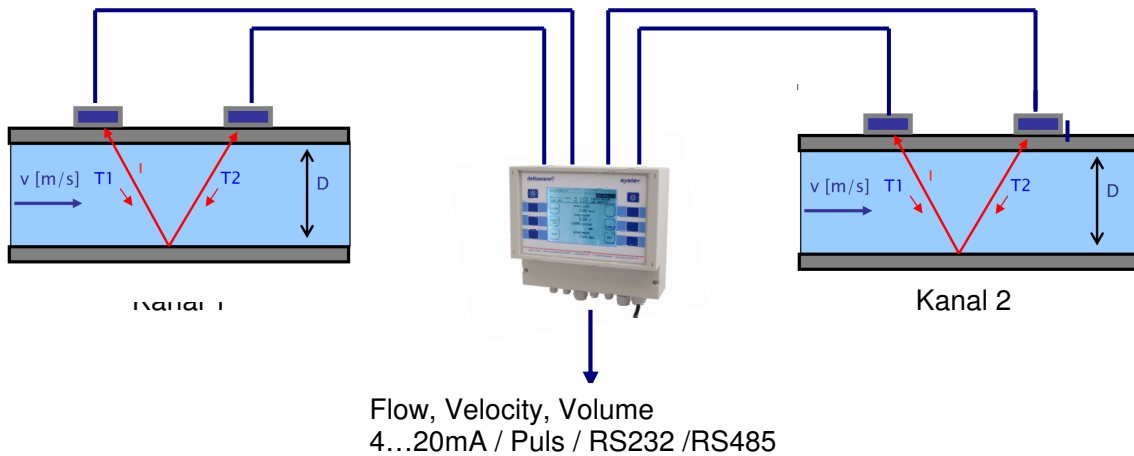


Picture 3: Mounting in Z-Mode (applicable for big pipe dimensions or high acoustic damping caused by pipe material and/or media)

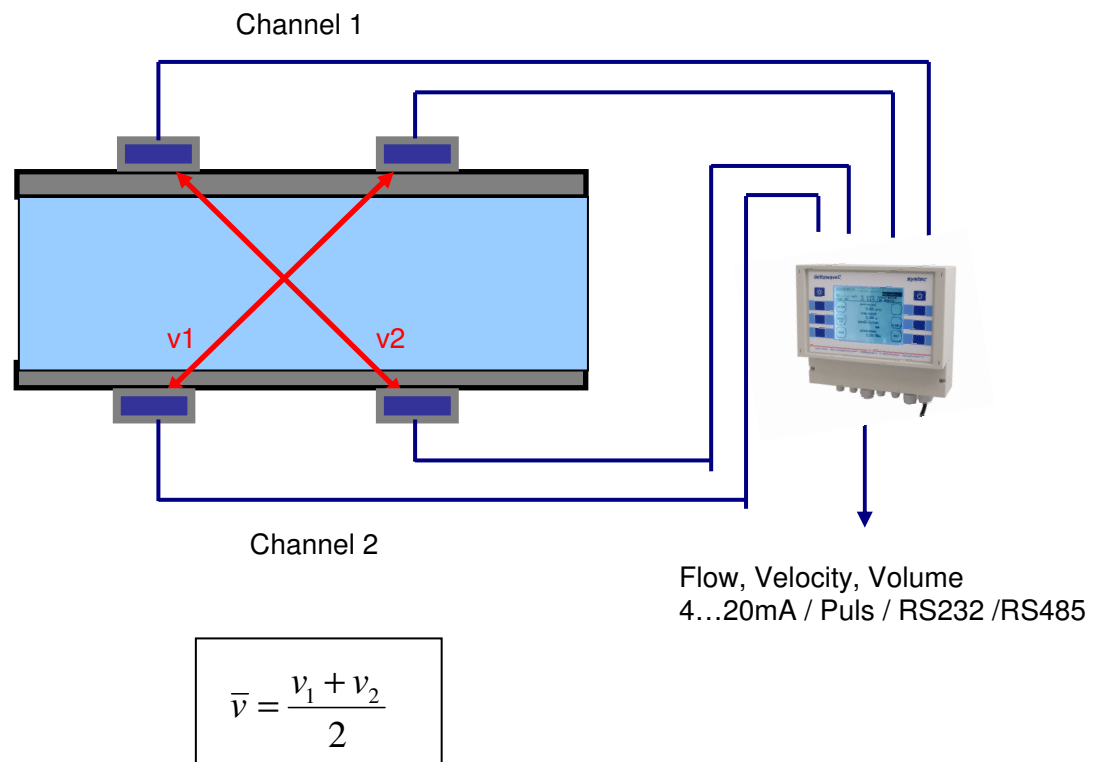


Picture 4: Mounting in W-Mode (preferred mounting method for pipe dimensions <DN32)

Measuring mode 2- channel system



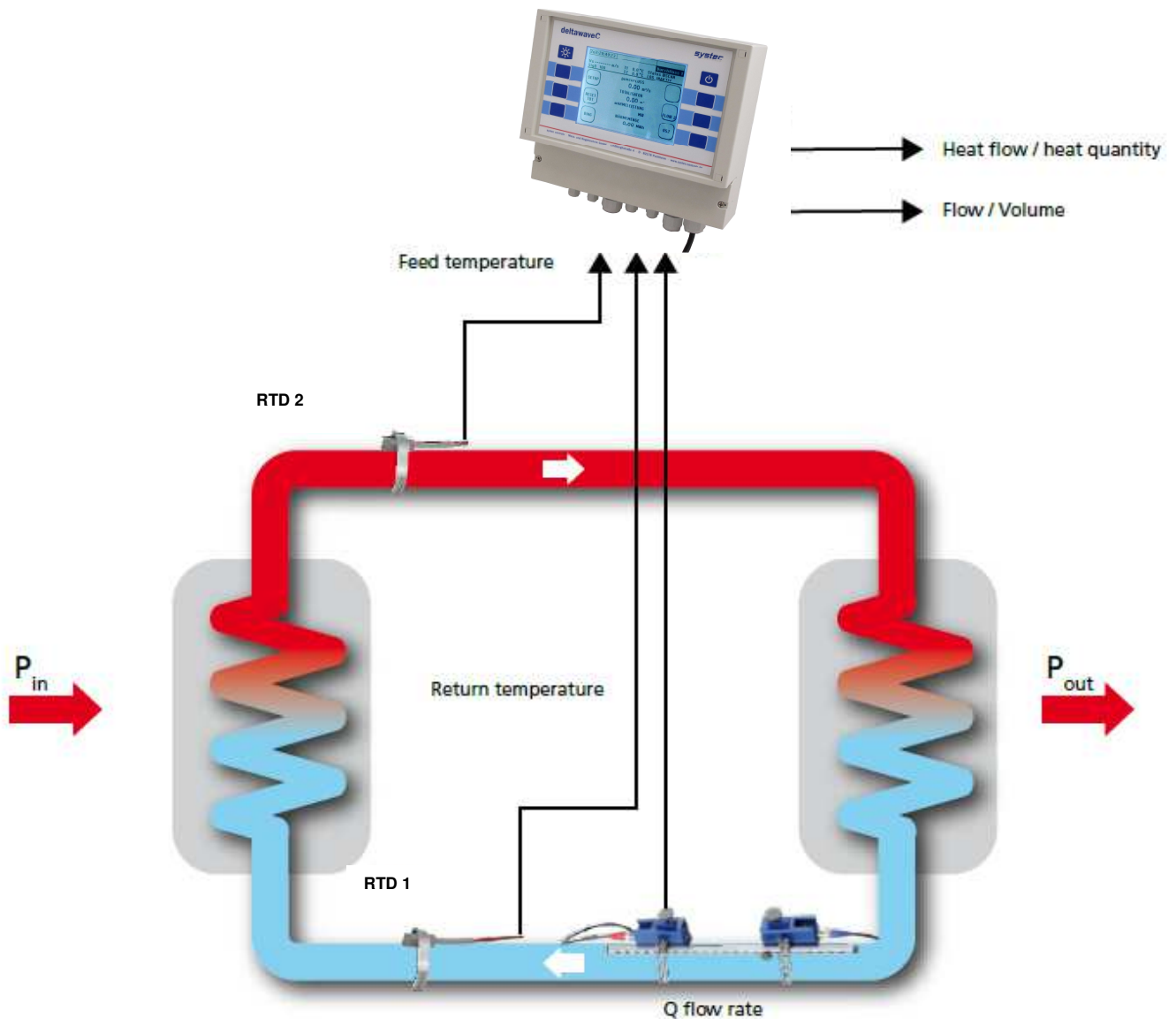
Picture 5: Simultaneous measurement at 2 different measurement points with two pair ultrasonic transducers



Picture 6: Simultaneous measurement with two pairs of ultrasonic transducers at one common metering point => accuracy will be increased, a redundancy operation is possible or disruptive influences depending small inlet path lengths will be compensated.

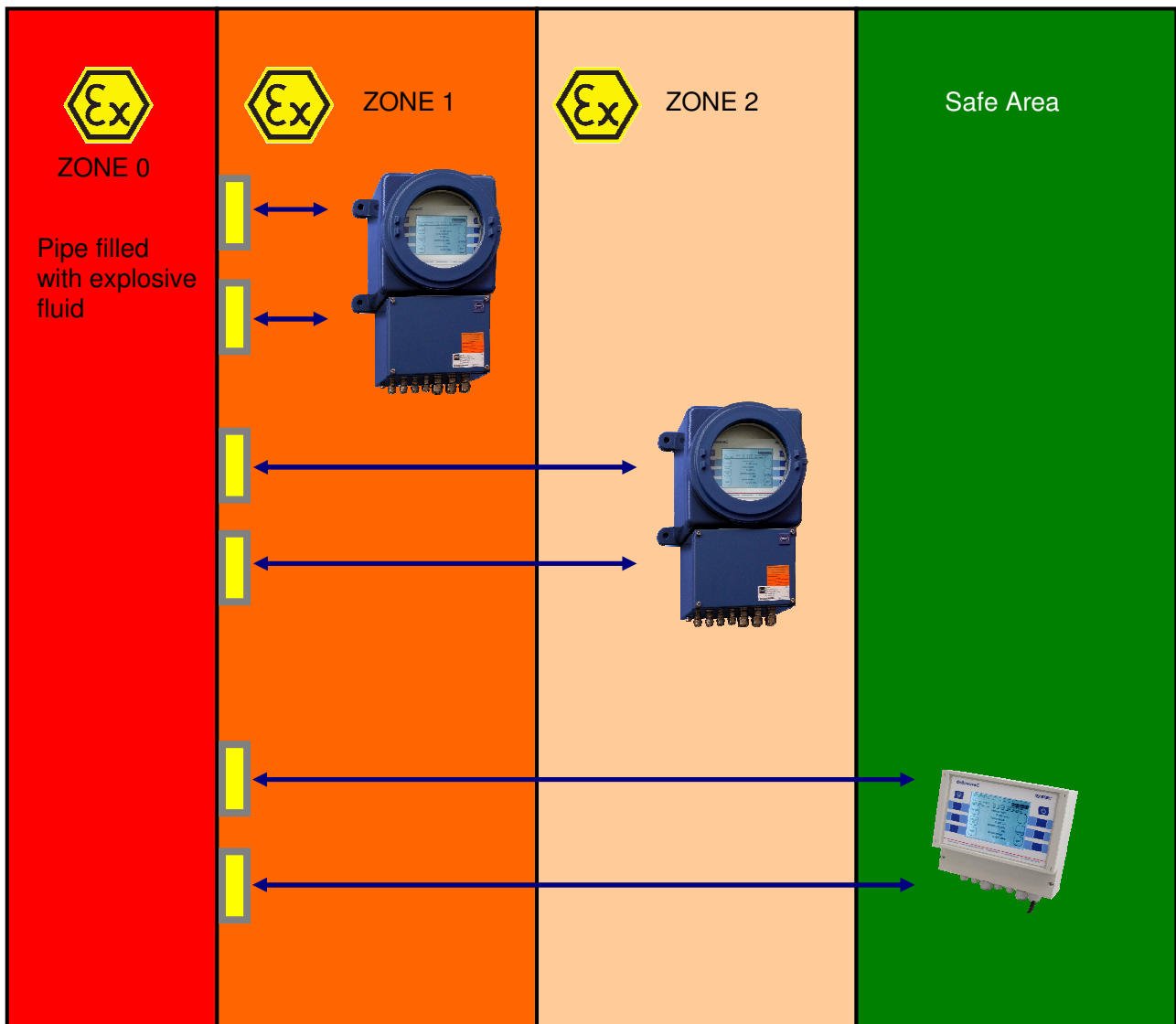
Measurement of heat quantity

deltawaveC-F is more than a flow meter. Together with external temperature sensors it can also measure the heat transfer of your media. Only two external PT100 have to be connected to deltawaveC-F for measuring feed / return temperatures (RTD 1 / RTD 2) within the heating circuit. The measured temperature difference and the measured flow Q can then be used to calculate the thermal output and the heat quantity. systec Controls offers comfortable clamp-On PT100 for these applications as an option.



Picture 7: Measurement of heat quantity – Measurement principle

deltawaveC-F in Ex applications



Picture 8: Combination possibilities of ex components

 = Ex ultrasonic transducers

- Ultrasonic transducers with Ex approval could be operated until Ex Zone 1
- deltaxwaveC-F Ex flow transmitter in Ex Zone 1 and 2
- The deltaxwaveC-F standard flow transmitter without Ex approval only in safe areas
- All deltaxwaveC-F flow transmitters could be used in combination with ultrasonic- transducers with Ex approval

Electronic Flow transmitter – Specifications

Measurement principle	Ultrasonic Time-of-flight
Signal processing	DSP based, cross correlation
Physical Quantities	Flow, velocity, Fluid velocity, Thermal Output, Heat Rate, Flow direction, Accumulated Flow
Counter	Volume, Heat Quantity
Measurement range	-30...+30 m/s
Calibration function	PT100, flow
Signal damping	0...100 sec (adjustable)
Diagnostic functions	In extracts: Sound velocity, Signal Amplitutde, SNR, Signal Quality (SQ), Signal Scan @ Display
Human interface	Intuitive via 6 Soft buttons
Menu languages	D, UK, FR, RU, ES, CHN
Flow transmitter units	Metric /UK /US
Outputs	2x 4...20mA (active or passive, connection with ground potential) 1x Pulse (Connection with ground potential) 1x Relays (Potential free) 1x optional RS232oder RS485 (Master Slave)
BUS Communication	MODBUS (RTU, ASCII) via optional RS485 interface [Format: Request, Function 04]
Data Logger	Optional Data Logger with 4GB capacity (available August 2015) – Not applicable together with MODBUS and serial communication
Inputs	2x US transducer, 2x PT100 (for measurement of heat quantity), Power Supply
Power supply	90-230VAC or 18-36VDC
Degree of protection	IP65
Cable connections	Screw terminals
Dimensions [L x W x D]	260x240x120mm
Calibration	Optional ISO 9000 based factory calibration certificate (per order)

Table 1 Common specifications of flow transmitter deltawaveC-F

deltawaveC 1- channel and 2- channel

Housing	PVC, Wallmount
Operating temperature	-20...60°C
Weight	1.3kg
Power consumption	ca. 10W (1 channel) /ca. 13W (2 channel)
Dimensions [L x W x D]	260 x 240 x 120mm

Table 2 Specifications for deltawaveC-F 1-Channel and 2-Channel standard flow transmitter

Additional deltawave 2-Channel

Measuring modes	CH1, CH2, CH1+CH2, CH1-CH2, (CH1+CH2)/2
Inputs	4x US transducer, 2x PT100 (for measurement of heat quantity), Power supply
Outputs (additional)	2 x Pulse
Weight	1.5kg

Table 3 Additional specifications for deltawaveC-F 2-Channel standard flow transmitter

deltawaveC-F flow transmitter, 1- channel, 2- channel


Housing	Combi Housing: - Ex d housing (pressure encapsulated) for electronics with gauge glass. Material: Aluminium, glass - Ex e (extended security) for cable terminal compartment. Material: stainless steel 1.4404
Betriebstemperatur	-20...50°C
Ex approval ATEX, IECEx	 II 2 G Ex de IIC T6 Ex de IIC T6 Gb
Type examination certificate ATEX, IECEx	PTB 06 ATEX 1077 IECEx PTB 07.0029
Operation Temperature	-20°C...+50°C
Weight	app. 22kg
Dimensions [BxHxT]	285 x 500 x 230 (Länge des Gehäuses ohne Kabelverschraubungen)

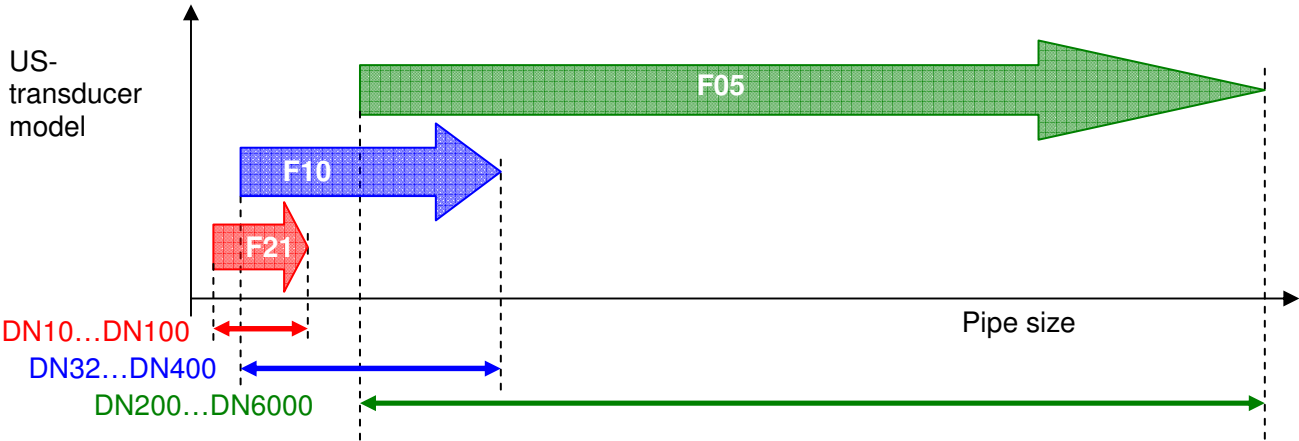
Table 4 Specifications flow deltawaveC-F Ex flow transmitter

Measurement accuracy for each measurement channel

Accuracy	
Pipe Size / Velocities	Accuracies
10-25mm	
0...2 m/s	+/- 0.05 m/s
2...30 m/s	2.5 % v. Messwert
25 – 50 mm	
0...2 m/s	+/- 0.03 m/s
2...30 m/s	1.5 % v. Messwert
50 – 300 mm	
0...2 m/s	+/- 0.02 m/s
2...30 m/s	1 % v. Messwert
300 – 6000 mm	
0...2 m/s	+/- 0.02 m/s
2...30 m/s	1 % v. Messwert

Table 5 Measurement accuracy. Table covers all deltawaveC-F models.

Ultrasonic transducers – specifications



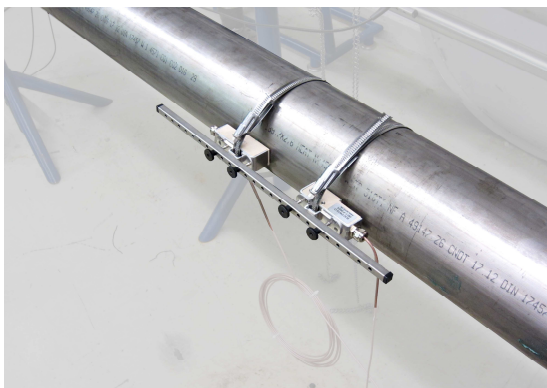
Type	Pipe Sizes	Media Temperature	Cable length	Material Housing	Acoustic Coupling
F21 2 MHz	DN10...DN100	-40...150°C	5m	PEEK / Aluminium	Gel / Foil (opt.)
F10 1 MHz	DN32...DN400	-40...150°C	5m	PEEK / Aluminium	Gel / Foil (opt.)
F05 500 kHz	DN200...DN6000	-40...150°C	5m	PEEK / Aluminium	Gel / Foil (opt.)

Table 6: Specifications of ultrasonic transducers

Additional specifications for ultrasonic transducers with Ξ_x approval

Ex approval ATEX, IECEx	II EX d IIC T6...T3 Gb
EG- type examination certificate ATEX, IECEx	EPS 13 ATEX 1 557 X IECEx XXX XX.XXXX X (certificate number depends on Charge) CE 2004
Ambient temperature	-40 °C ≤ Ta ≤ +80 °C (fluid temperature max. 150°C)
Degree of protection	IP68

Table 7: Specifications of ultrasonic transducers with ex approval



Picture 9: 1 MHz-ultrasonic transducers with spacer bar on water pipe, DN125

Further information

- www.systec-controls.de

Any questions? We are happy to support you!

At www.systec-controls.de (Infos&Contact) you can search for your contact person or your systec representative or you can send an inquiry directly to systec Controls

Of course also our sales team in the systec headquarter in Puchheim, Germany would be happy to support you.

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