



Ultrasonic Flow Meter stationary · portable for liquids

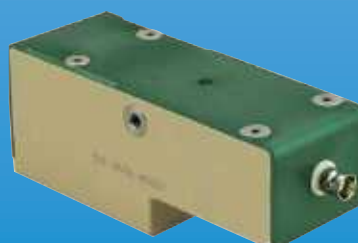
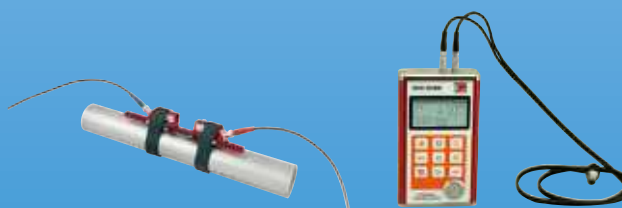


measuring
•
monitoring
•
analysing

DUC



- Media: ultrasonic conducting liquids
- Temperature measuring range:
-40 ... 150 °C
- Accuracy: up to 1 %
- Flow velocities: 0 ... ±30 m/s
- Pipe sizes: DN 10 ... DN 6000
- For the most common materials
(ultrasonic conductive) like steel and
plastics
- Heat quantity measurement



CS

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Description

DUC uses the effect of acceleration and deceleration of acoustic signals travelling in a moving liquid. Two ultrasonic clamp-on transducers are mounted (from outside) on a pipe and produce an acoustic path. The transducers send and receive acoustic signals and 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. 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.

DUC emits a coded signal pattern into the pipe. The received signals will be compared with the sent signals and only the signal pattern which correlates with the original one 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.

Applications Areas

- Power plants (cooling water), district heating, pump protection, condensate and boiler feedwater measurements
- Water and waste water industry (treatment plant inflow), treatment plant outflow, drinking water networks, verification of water meters, pump protection, distribution and consumption measurements, leakage detection
- Facility management (hot and cold water, cooling systems and air conditioning systems, optimisation of energy efficiency, pump control, optimisation of heating and air conditioning)
- Chemical and petrochemical industry (crude oil and light oil), raw and waste water, aggressive and toxic media, measurement of heat carriers (e.g. thermal oils)
- Food and beverage (correct hygienic measurement of media, heat volume measurement in energy supply)

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 1 MHz and 4 MHz
- 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 operation (only with stationary transmitter)

Flow Transmitter

DUC-xP portable flow transmitter

The flow measurement, thermal output and heat quantity measurement is possible for one measurement point with a pair of ultrasonic transducers in combination with a pair of PT100 temperature sensors. Other features of DUC-xP transmitter are battery operation, integrated data logger and a stable aluminium/ABS housing.

DUC-xF stationary 1-channel flow transmitter

Ultrasonic Transducers

DUC-W standard ultrasonic transducers

The ultrasonic transducers are mounted onto the piping and transmit and receive the ultrasonic signals that are used in the flow transmitter to calculate the volumetric flow rate and mass flow rate.

Ultrasonic transducer DUC-Wx40 (4 MHz):

Red housing,
pipe diameters: DN10 ... DN100
Operating temperature: -40 °C ... 150 °C
Protection: IP68 (for stationary transducer)
Material: PEEK/aluminium

DUC-WP40



DUC-WF40



Measurement Accuracy for each Channel

Pipe size	Flow velocity	Accuracy
10 - 25 mm	0...2 m/s	± 0.05 m/s
	2...30 m/s	2.5% of reading
25 - 50 mm	0...2 m/s	± 0.03 m/s
	2...30 m/s	1.5% of reading
50 - 300 mm	0...2 m/s	± 0.02 m/s
	2...30 m/s	1% of reading
300 - 6000 mm	0...2 m/s	± 0.02 m/s
	2...30 m/s	1% of reading

Ultrasonic transducer DUC-Wx10 (1 MHz):

Blue housing,
pipe diameters: DN32 ... DN400
Operating temperature: -40 °C ... 150 °C
Protection: IP68 (for stationary transducer)
Material: PEEK/aluminium

DUC-WP10



DUC-WF10



Ultrasonic transducer DUC-W

Technical Details

Flow transmitter DUC-MF
(stationary)

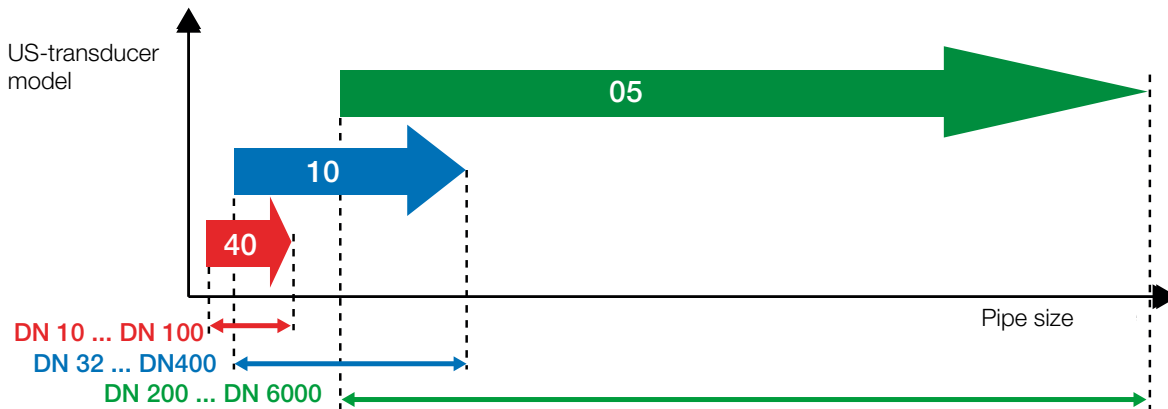


Flow transmitter DUC-MP
(portable)



	DUC-MF (stationary)	DUC-MP (portable)
Measuring principle	ultrasonic time-of-flight	ultrasonic time-of-flight
Physical Quantities	volume flow, mass flow, flow velocity, heat	volume flow, mass flow, flow velocity, heat
Installation	wallmount	portable
Counter	heat quantity, volume, mass	heat quantity, volume, mass
Measuring range	-30 ... +30 m/s	-30 ... +30 m/s
Signal damping	0 ... 100 s (adjustable)	0 ... 100 s (adjustable)
Diagnostic functions	ultrasonic velocity, signal strength, SNR, signal quality, Amplitude, energy, oscilloscope function for graphical display and evaluation of signal	ultrasonic velocity, signal strength, SNR, signal quality, Amplitude, energy, oscilloscope function for graphical display and evaluation of signal
Human interface	intuitive via 8 soft keys, clear text display	intuitive via 8 soft keys, clear text display
Menu language packages	EN/DE/FR EN/ES/FR EN/RU/CHN EN/DE/PL	EN/DE/FR EN/ES/FR EN/RU/CHN EN/DE/PL
Flow transmitter units	metric/US	metric/US
Outputs	2 x 4 ... 20 mA, 1 x pulse with 1 channel/ 2 x pulse with 2 channel, 1 x micro USB, 1 x relay optional RS232/RS485 (RS485 supports Modbus communication)	2 x 4 ... 20 mA, 1 x pulse, 1 x micro USB, 1 x relay
Inputs for heat measurement	2 x Pt 100	2 x Pt 100
Additional inputs (optional)	2 x 4-20mA (active) per ADS1 board	-
Measuring channels	1, optional 2	1
Power supply	90 - 240 V _{AC} , optional 18-36 V _{DC}	Integrated battery or 100 ... 240 V _{AC} wide range power supply
Battery operation	-	approx. 22 h
Integrated data storage	optional as for DUC-MP	4 GB
Saved data	optional	

General Specifications Ultrasonic transducer

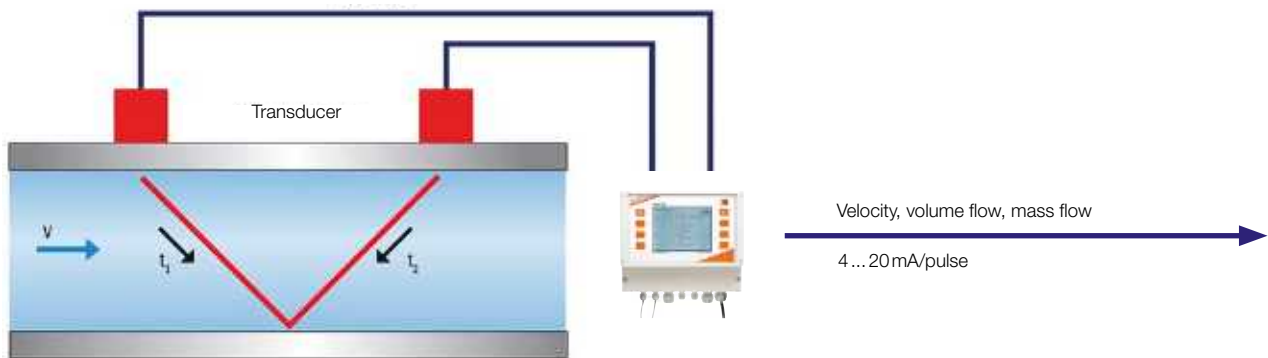


Ultrasonic transducers for transit time measurement

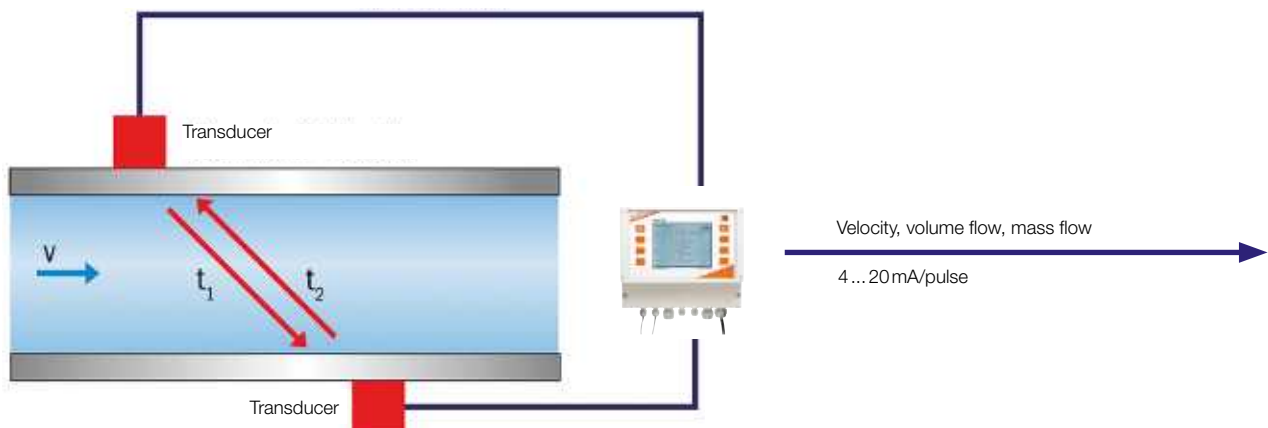
Model	Description	Media temperature	Pipe sizes	
DUC-WP40		portable	-40 ... 150 °C	DN 10 ... DN 100
DUC-WP10			-40 ... 150 °C	DN 32 ... DN 400
DUC-WP05			-40 ... 80 °C -40 ... 150 °C (optional)	DN 200 ... DN 6000
DUC-WF40		stationary	-40 ... 150 °C	DN 10 ... DN 100
DUC-WF10			-40 ... 150 °C	DN 32 ... DN 400
DUC-WF05			-40 ... 150 °C	DN 200 ... DN 6000

Mounting arrangement of the ultrasonic transducer

Mounting in V-mode (standard)

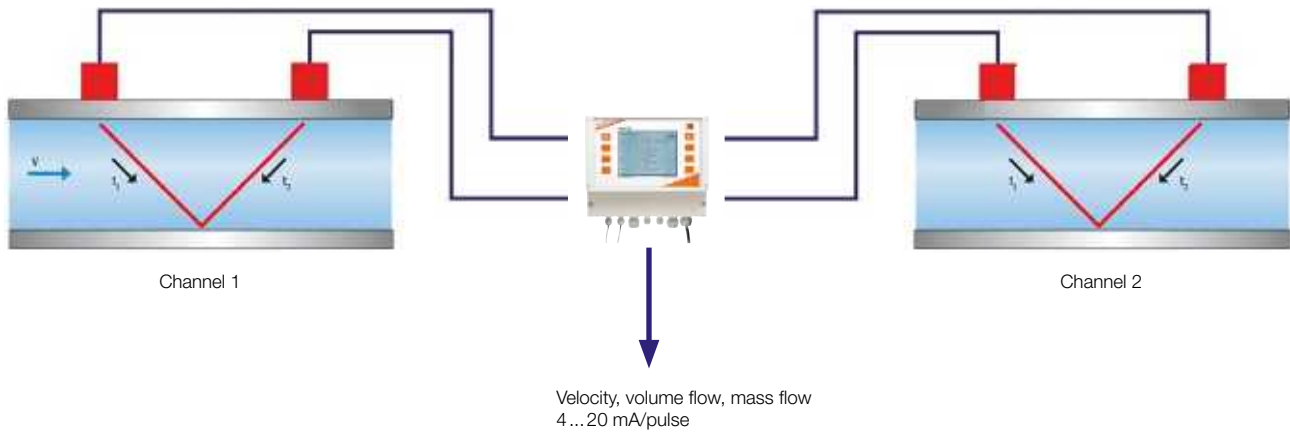


Mounting in Z-mode (applicable for big pipe dimensions or high acoustic damping)



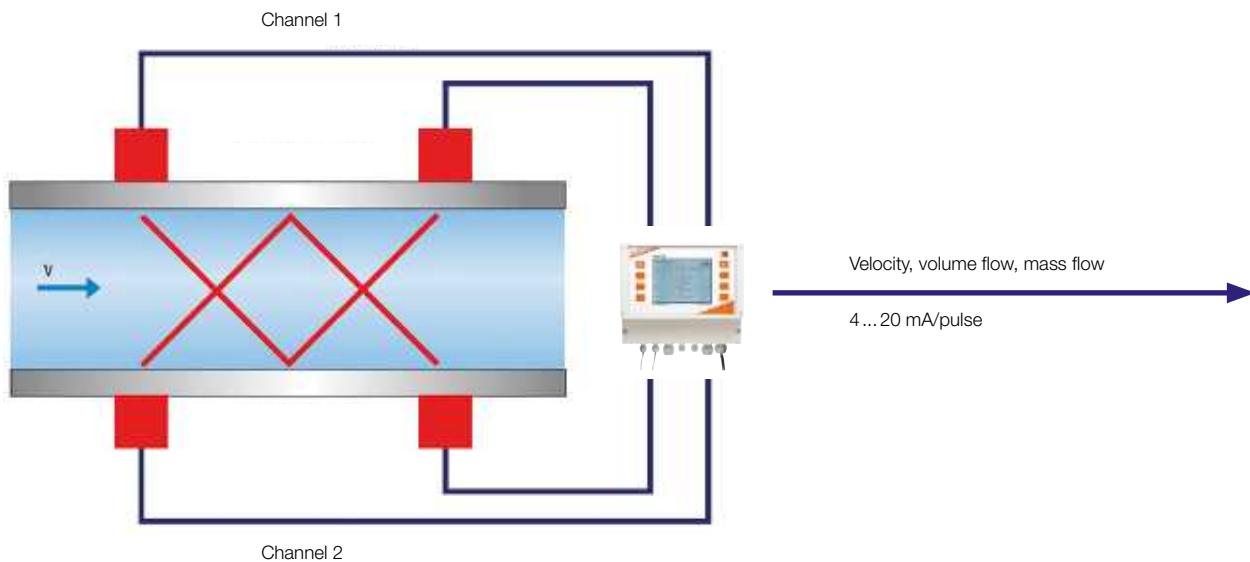
Measuring mode 2-channel system

Simultaneous measurement at 2 different measurement points with two pairs of ultrasonic transducers



Simultaneous measurement with two pairs of ultrasonic transducers at one common metering point

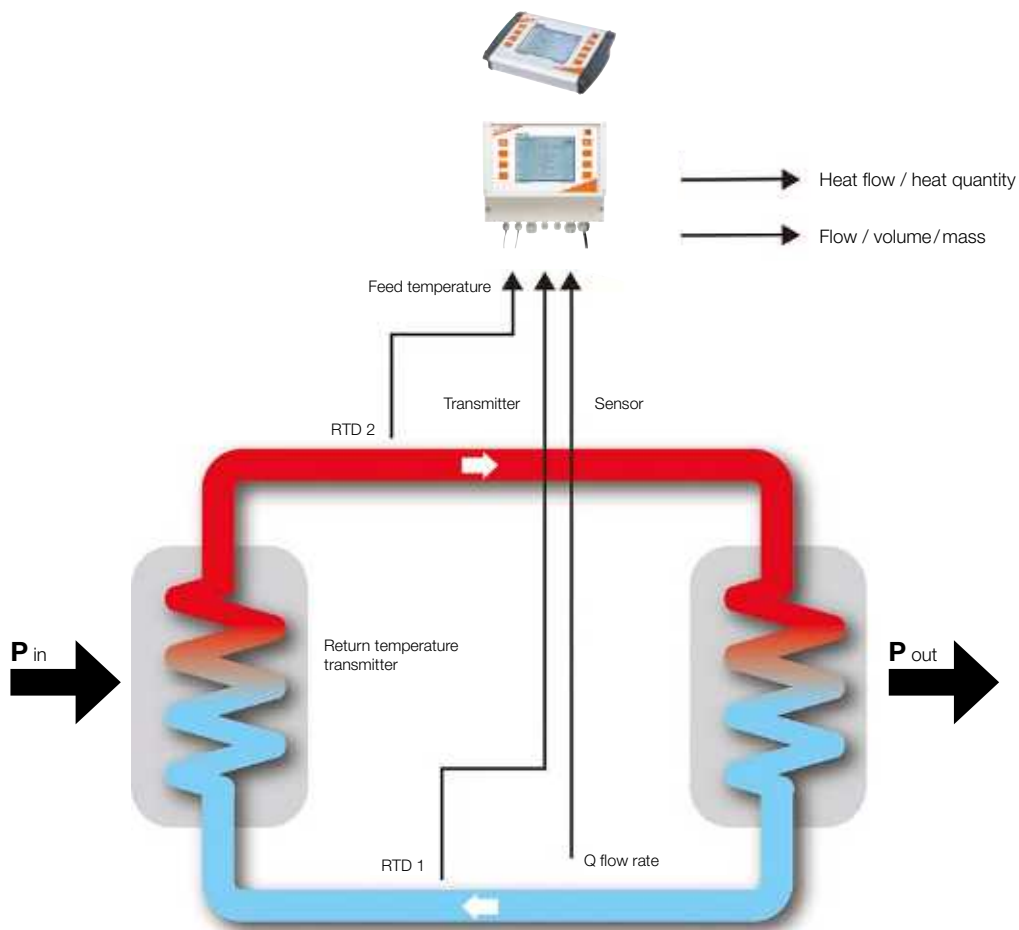
(Compensation of cross-flow effect on measurement, redundancy operation and higher accuracy)



Measurement of heat quantity

DUC-M is more than a flowmeter. Together with external temperature sensors it can also measure the heat transfer of your media. Only two optional Pt100 have to be connected to DUC-MF 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.



Order Details Transmitter (Example DUC-M F 1 0 0 D R2)

Model	Version	Channel	Supply	Ex-approval	Language packages	Options ²⁾
DUC-M	F = stationary	1 = 1-channel 2 = 2-channel	0 = 90 ... 240 V _{AC} 7 = 18 ... 36 V _{DC}	0 = none E = ATEX Exd (suitable for zone 1 and 2)	D = EN/DE/FR S = EN/ES/FR C = EN/RU/CHN	00 = none R2 = RS232 R4 = RS485 RL = data logger
	P = portable	1 = 1-channel	0 = 100 ... 240 V _{AC}	0 = none	P = EN/DE/PL	00 ³⁾ = none

²⁾ Combination of option R2 with RL or option R4 with RL can be ordered ³⁾ DUC-MP has data logger as standard

Order Details Accessories / Spare Parts (Example DUC-Z F P1)

Model	Version	Description
DUC-Z	F = stationary	MS = mounting rails suitable for transducer DUC-WF10 (max. DN400), max.150 °C PT = PT100, surface contact, 1 pair, cable length 5 m, incl. stainless steel strap up to DN 900 P1 = PT100, surface contact, 1 pair, cable length 10 m, incl. stainless steel strap up to DN 900 P2 = PT100, surface contact, 1 pair, cable length 20 m, incl. stainless steel strap up to DN 900 WK = factory calibration 1 MHz or 4 MHz, 5-point on pipe size DN50 WR = factory recalibration 1 MHz or 4 MHz 5-point on pipe size DN50 10 = coupling foil 2 pair for DUC-WF10 21 = coupling foil 2 pair for DUC-WF40 05 = coupling foil 1 pair for DUC-WF05 SB = short mounting rails (spacer short bar) suitable for DUC-WF40, max. 150 °C EB = stainless steel strap (1 pair) suitable for ultrasonic transducer DUC-WF40, DUC-WF10 (max. DN400) <

