M-Zert
Zertifiziertes
QM-System
DIN EN ISO 9001
Zertifikat-Nr. 01017

Ultrasonic Flow Meter
stationary · portable
for liquids

KOBOLD

measuring
•
monitoring
•
analysing

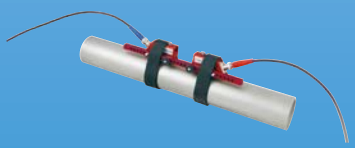
DUC

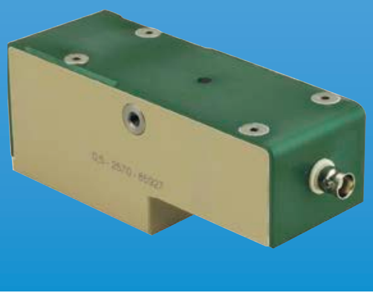
DUC-M
www.kobold.com
Made in Germany

KOBOLD
www.kobold.com

DUC-M
www.kobold.com
Made in Germany

- ● 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





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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 t1 and t2 are measured by an electronic flow transmitter. The signal from transducer A towards transducer B is accelerated by the flow (short t1). The return signal from transducer B to transducer A is decelerated by the flow (longer t2). The difference between t1 and t2 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

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.

DUC-xF stationary 2-channel flow transmitter

Flow measurement is applicable for one or two different measurement points with two pairs of ultrasonic transducers. **DUC-xF** 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 will increase the accuracy of measurement, a redundancy operation is possible and disruptive influences of gaseous flow profile will be compensated. Thermal output and heat quantity measurement is only supported in operation mode (CH1+CH2)/2.

Ultrasonic Transducers

DUC-W standard ultrasonic transducers

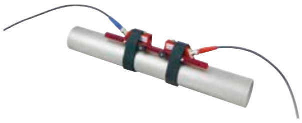
The ultrasonic transducers are mounted onto the piping and transmit and receive the ultrasonic signals that are used in the flow transmitter to calculate the volumetric flow rate.

Ultrasonic transducer DUC-Wx40 (4 MHz):

Red housing,

pipe diameters:	DN10 … DN100
Operating temperature:	-40 °C … 150 °C
Protection:	IP 68 (for stationary transducer)
Material:	PEEK/aluminium

DUC-WP40



DUC-WF40

Ultrasonic transducer DUC-Wx10 (1 MHz):

Blue housing,

pipe diameters:	DN32 … DN400
Operating temperature:	-40 °C … 150 °C
Protection:	IP 68 (for stationary transducer)
Material:	PEEK/aluminium

DUC-WP10

DUC-WF10

Ultrasonic transducer DUC-Wx05 (0,5 MHz):

Green housing,

pipe diameters:	DN200 … DN6000
Operating temperature:	-40 °C … 150 °C (with stainless steel strap) [1] -40 °C … 80 °C (with textile tightening straps)
Protection:	IP 68 (for stationary transducer)
Material:	PEEK/aluminium

DUC-WP05

DUC-WF05

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

[1] ***Attention***: stainless steel strap is only for one-time use

Technical Details

Flow transmitter DUC-MF (stationary)

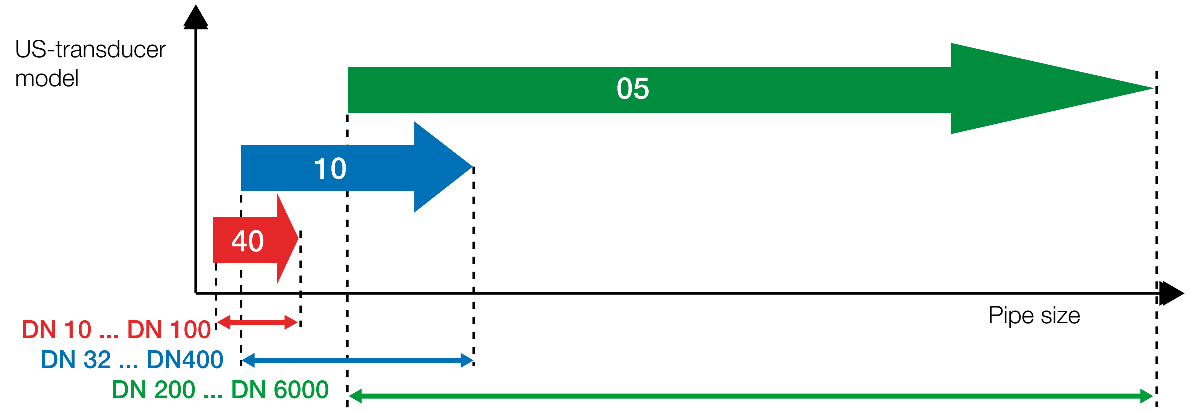
Flow transmitter DUC-MP (portable)

	DUC-MF (stationary)	DUC-MP (portable)
Measuring principle	ultrasonic time-of-flight	ultrasonic time-of-flight
Physical Quantities	volume flow, flow velocity, power	volume flow, flow velocity, power
Installation	wallmount	portable
Counter	heat quantity, volume	heat quantity, volume
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[1] EN/RU/CHN[1]	EN/DE/FR, EN/ES/FR, EN/RU/CHN
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
Additional inputs for heat measurement	2 x Pt 100	2 x Pt 100
Measuring channels	1, optional 2	1
Power supply	90 - 240 V_{AC}, optional18-36 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 as for DUC-MP	measuring and diagnostic value counter
Data format	optional as for DUC-MP	text format (CSV) directly importable into all popular programs like MS Office, MS Works, etc.
Memory cycle	-	adjustable, 1 s up to 24 h
Protection	IP 65	IP 40
Cable connections	screw terminals	BNC-connection
Housing	ABS	Aluminium, ABS
Operating temperature	-20 ... 60 °C	-20 ... 60 °C
Dimensions	260 x 240 x 120 mm (W, H, D)	265 x 190 x 70 mm (W, H, D)
Weight	1.3 kg	1.5 kg
Display	QVGA (320 x 240), black and white, adjustable backlight	QVGA (320 x 240), black and white, adjustable backlight
Measuring modes[2]	CH1, CH2, CH1+CH2, CH1-CH2, (CH1+CH2)/2	-

[1] for 1-channel operation only
[2] for 2-channel operation only

1/03-2024

General Specifications Ultrasonic transducer

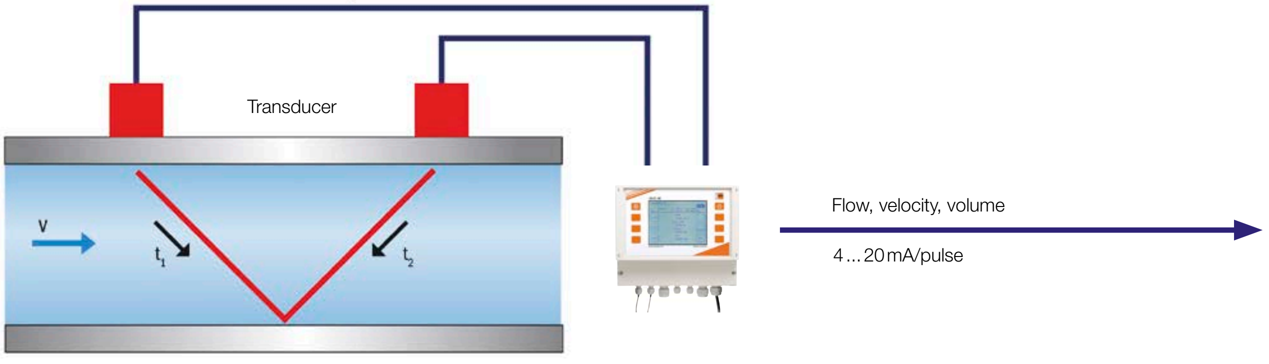

US-transducer model
05
10
40
DN 10 ... DN 100
DN 32 ... DN400
DN 200 ... DN 6000
Pipe size

Ultrasonic transducers for transit time measurement

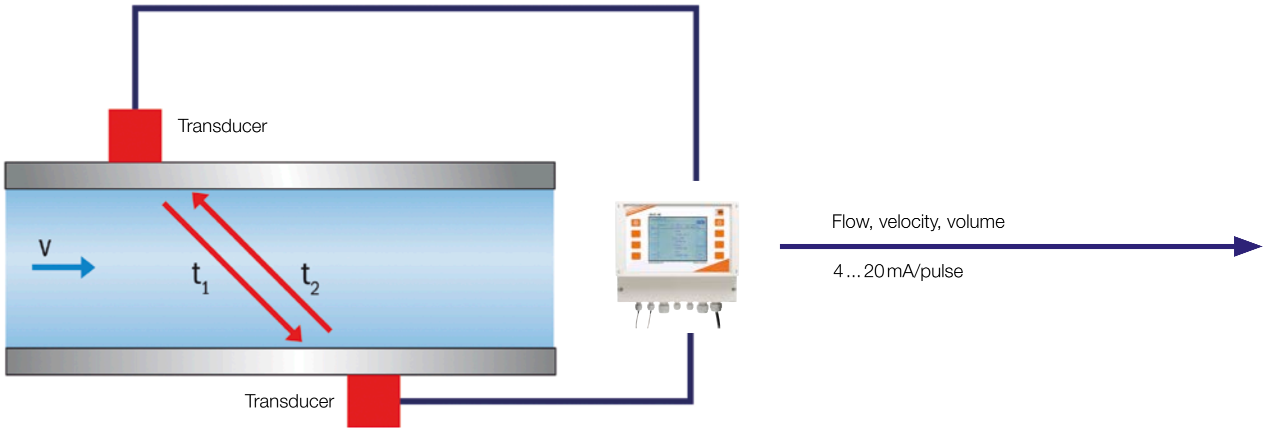
Model	Description		Media temperature	Pipe sizes
DUC-WP40		**portable**	-40 … 150 °C	DN 10 … DN 100
DUC-WP10			-40 … 150 °C	DN 32 … DN 400
DUC-WP05			-40 … 80 °C -40 … 150 °C (optional)	DN 200 … DN 6000
DUC-WF40		**stationary**	-40 … 150 °C	DN 10 … DN 100
DUC-WF10			-40 … 150 °C	DN 32 … DN 400
DUC-WF05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

Mounting arrangement of the ultrasonic transducer

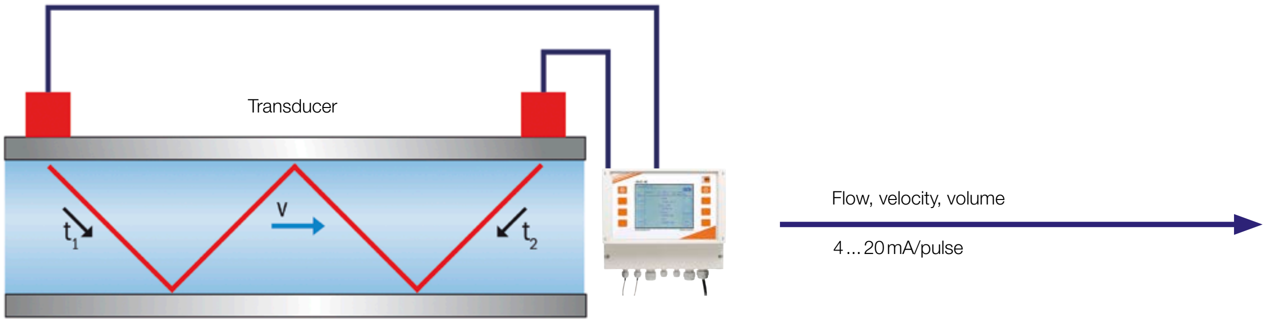
Mounting in V-mode (standard)


Transducer
v
t_1
t_2
Flow, velocity, volume
4…20mA/pulse

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

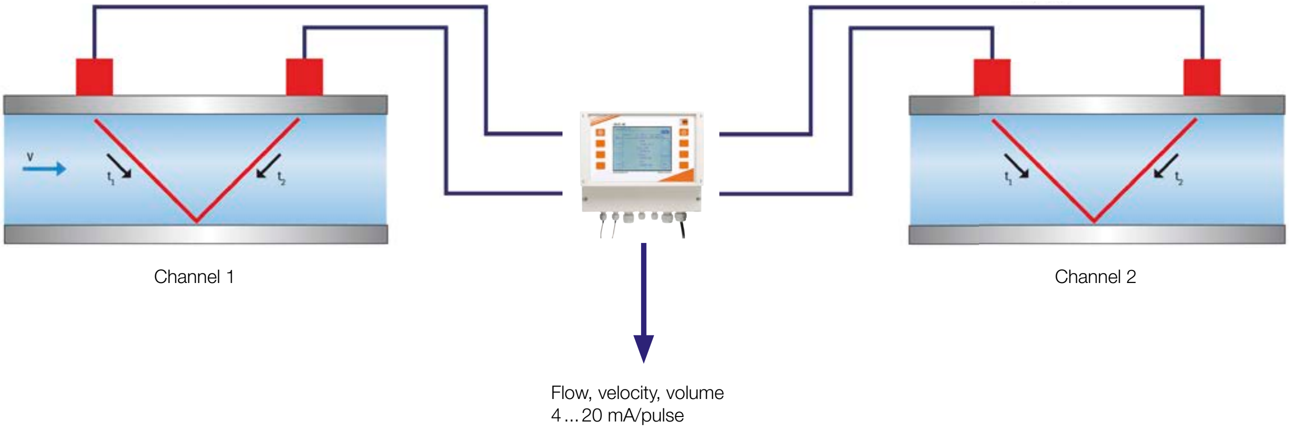

Transducer
v
t_1
t_2
Transducer
Flow, velocity, volume
4…20mA/pulse

Mounting in W-mode (for pipe dimensions < DN 32)


Transducer
t_1
v
t_2
Flow, velocity, volume
4…20mA/pulse

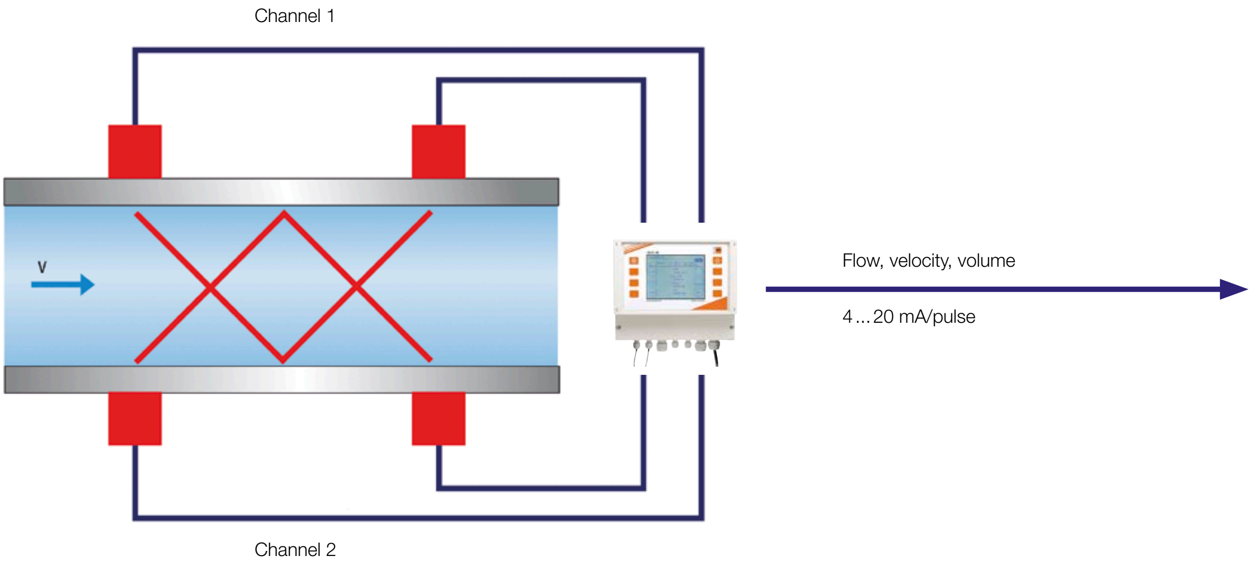
Measuring mode 2-channel system

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


v
t1
t2
Channel 1
Channel 2
Flow, velocity, volume
4 ... 20 mA/pulse

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

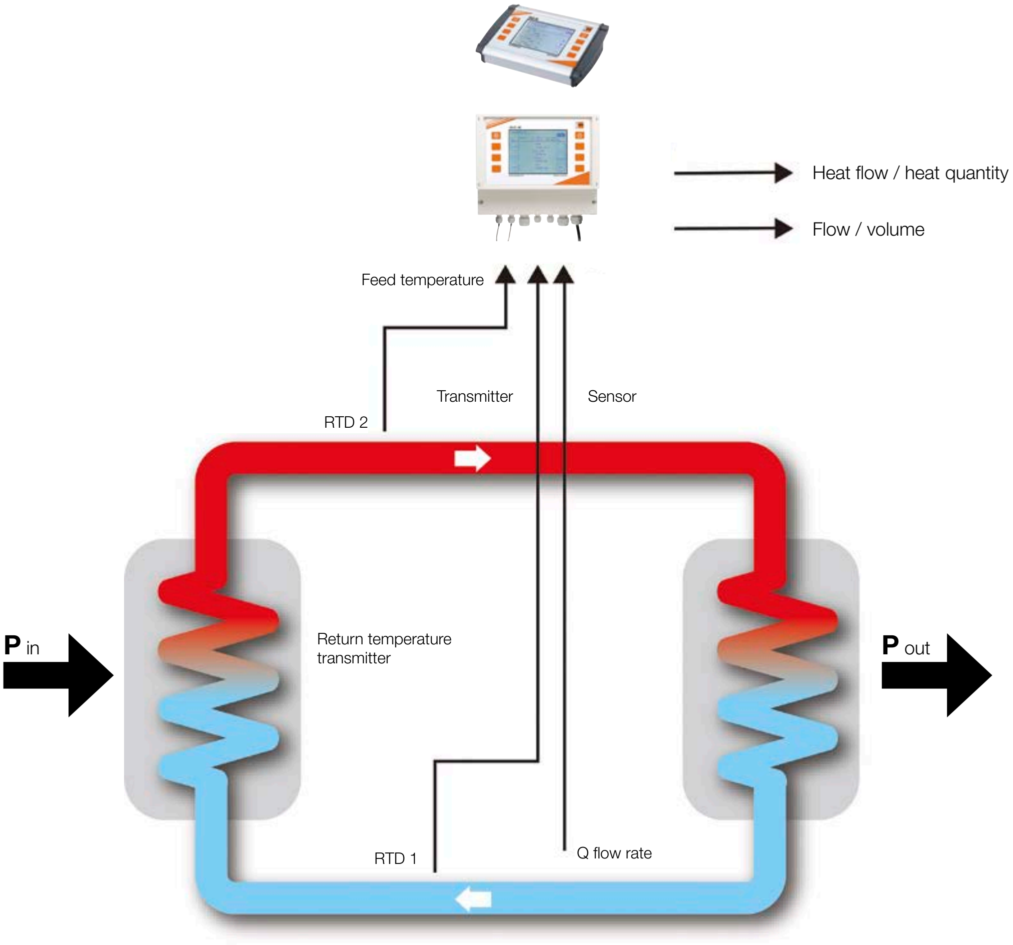
(Compensation of cross-flow effect on measurement, redundancy operation and higher accuracy)


Channel 1
v
Flow, velocity, volume
4 ... 20 mA/pulse
Channel 2

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.


Heat flow / heat quantity
Flow / volume
Feed temperature
Transmitter
Sensor
RTD 2
P in
Return temperature transmitter
P out
RTD 1
Q flow rate

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) (on request)	**D** = EN/DE/FR **S** = EN/ES/FR[1] **C** = EN/RU/CHN[1]	**00** = none **R2** = RS232 **R4** = RS485 **RL** = data logger
	P = portable	**1** = 1-channel	**0** = 100 ... 240 V_{AC}	**0** = none		**00**[3] = none

[1] Only with 1-channel
[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 Transducer (Example **DUC-W F 40 0 10**)

Model	Version	Frequency (NW)	Ex-approval	Cable length
DUC-W	**F** = stationary **V**[1] = stationary, PVC	**40** = 4 MHz (DN10 ... DN100) **10** = 1 MHz (DN32 ... DN400) **05** = 0,5 MHz (DN200 ... DN6000)	**0** = none **E** = ATEX Exd (suitable for zone 1 and 2)[1) 2)]	**10** = 10 m **20** = 20 m **30** = 30 m **40** = 40 m **50** = 50 m **XX**[3] = other (multiple of 10 m)
	P = portable		**0** = none	**03**[4] = 3 m

[1] On request [2] Not for PVC transducer [3] Max. length 250 m
[4] If the transducer is ordered as a spare part, the cable is **not** included in the scope of delivery

Delivery Scope for portable Transmitter

Following accessories are included in shipment:

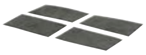
1. Hard-shell carrying case
2. Operating manual on CD, Quickstart printed
3. Analogue output cable Mini DIN, crocodile clips 0.5 m
4. Relay / pulse output cable Mini DIN crocodile clips, 0.5 m
5. USB cable
6. Signal cable (1 pair), BNC-connection, 3 m
7. Measuring tape

Delivery Scope for Transducer (portable and stationary)

Following accessories are included in shipment:

1. Mounting rail (not for DUC-Wx 05)
2. Coupling foil for stationary, ultrasonic coupling gel for portable device
3. Suitable mounting accessories, such as strap or chains, depending on the transducer type

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

Model	Version	Description
DUC-Z	**F** = stationary	**MS** = mounting rails suitable for transducer DUC-WF10 (max. DN 400), 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 DN 50
		WR = factory recalibration 1 MHz or 4 MHz 5-point on pipe size DN 50
		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) **BE** = stainless steel strap (1 pair) suitable for ultrasonic transducer DUC-WF05
		DE = venting unit for gaseous liquids, pipe connection max. DN 25
	P = portable	**KG** = ultrasonic coupling gel, tube, 21 g
		MS = mounting rails suitable for transducer DUC-WP10 (max. DN 400), max. 150 °C
		SB = short mounting rails (spacer short bar) suitable for DUC-WP40, max. 150 °C
		MK = clamping chains (1 pair) suitable for DUC-WP10 (max. DN 400), max. 150 °C
		BT = textile tightening straps suitable for transducer DUC-WP05, max. 80 °C
		PT = PT100, 1 pair, Mini DIN, cable length 5 m, incl. stainless steel strap up to DN 900
		WK = factory calibration 1 MHz or 4 MHz 5-point on pipe size DN 50
		WR = factory recalibration 1 MHz or 4 MHz 5-point on pipe size DN 50
	U	**WD** = wall thickness gauge (Universal) *Technical details see description **DUC-ZUWD***

DUC-ZUWD
4.00
ULTRASONIC THICKNESS GAUGE

Description DUC-ZUWD

With the precise wall thickness gauge DUC-ZUWD reliable measurements of pipe wall thicknesses become a matter of minutes. Switch on, put in your pipe data and press transducer onto your pipe – that’s it.

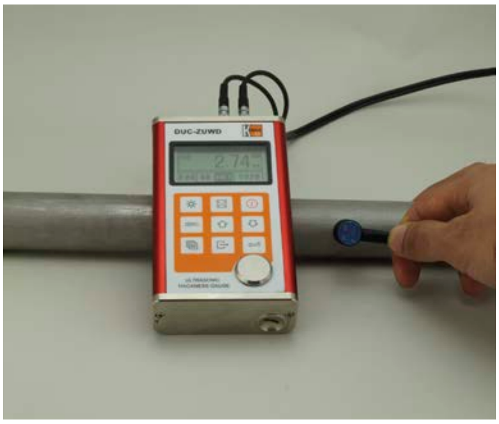
DUC-ZUWD determines the thickness of a structure or a pipe by accurately measuring the time required for an ultrasonic signal to travel through the thickness of the material, reflect from the back or inside surface, and be returned to the transducer. The measured two-way transit time of the ultrasonic together with the specific speed of sound of your material is used to accurately measure the wall thickness. The resolution is 0.1 mm!

The light-weight and robust transmitter makes DUC-ZUWD the perfect instrument for harsh environments within the process industry and therefore also a reliable and useful accessory for your clamp-on ultrasonic flowmeter DUC.

The long-life battery mode gives you the independence you need for your measurements. The integrated calibration sample ensures best possible accuracy and high repeatability.

Technical Details

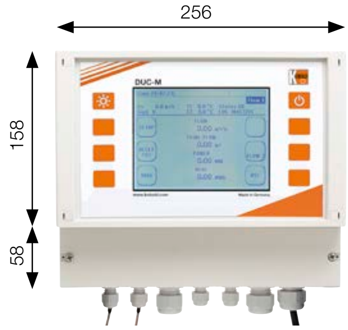
Measuring principle:	ultrasonic transit time
Measuring range:	0.75 ... 80 mm (steel)
Accuracy:	± (0.5 % of thickness + 0.04 mm)
Operating temperature:	-20 ... +70 °C
Ultrasonic transducers:	7 MHz
Supported materials:	all common pipeline materials (sound conductive, e. g. PVC, PE, steel, copper, etc.)
Display:	128 x 64 LCD with backlight
Resolution:	0.1mm
Measuring units:	metric and US
Languages:	DE, GB, IT, FR, ES
Housing material:	aluminium
Power supply:	2 x mignon type AA 1.5 V
Dimensions:	132 x 76,2 x 32 mm (H x W x D)
Weight:	345 g



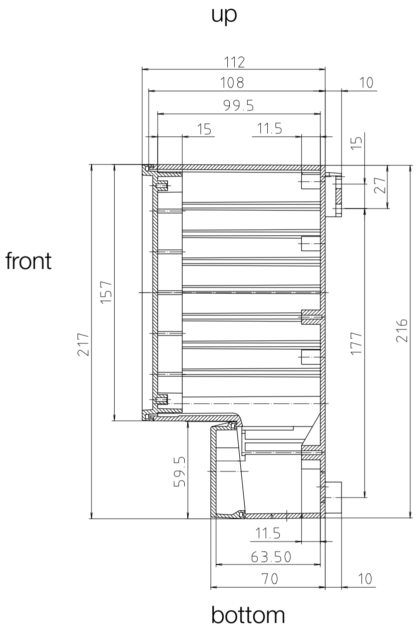
Dimensions [mm]

Transmitter DUC-MF (stationary)

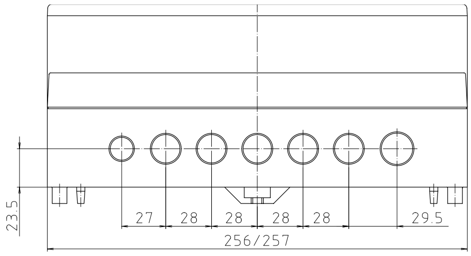
Front



Side

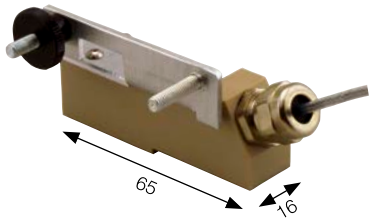

up
112
108
99.5
15
11.5
10
15
27
front
217
157
177
216
59.5
11.5
63.50
70
10
bottom

Bottom

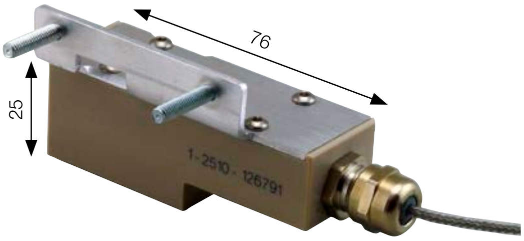

23.5
27
28
28
28
28
29.5
256/257

Transducer DUC-WF (stationary)

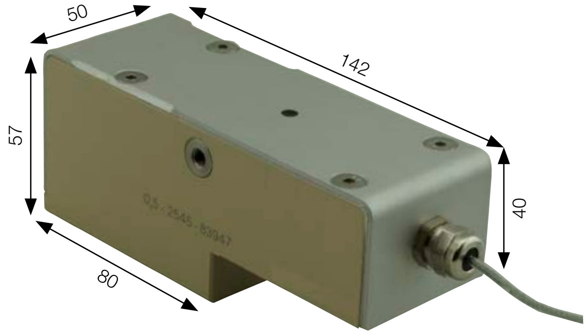
4 MHz



1 MHz



0,5 MHz

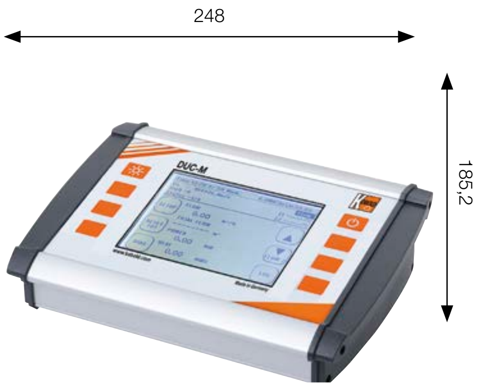

50
142
57
40
80

Weights

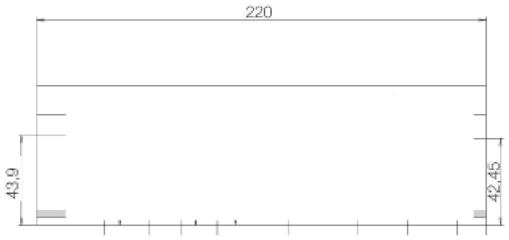
Model		Weight
Transmitter DUC-MF		1300 g
Transducer DUC-WF	4 MHz	45 g
	1 MHz	50 g
	0.5 MHz	100 g

Dimensions [mm] (continuation)

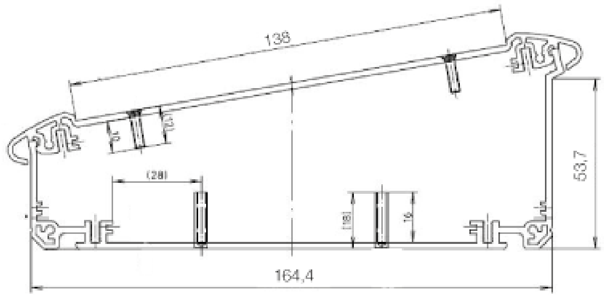
Transmitter DUC-MP (portable


248
185,2
DUC-M

Backside of aluminium body

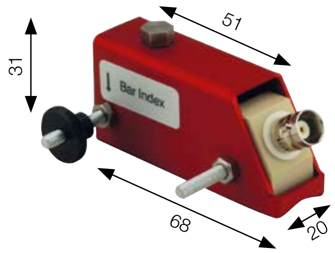

220
43,9
42,45

Sideview of aluminium body, including cover plate

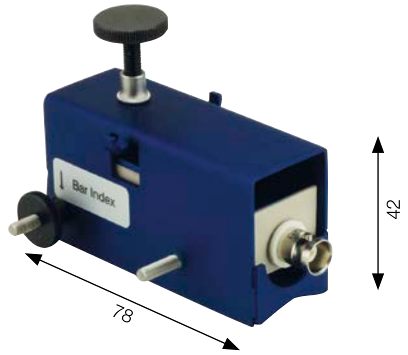

138
(28)
(18)
16
53,7
164,4

Transducer DUC-WP (portable)

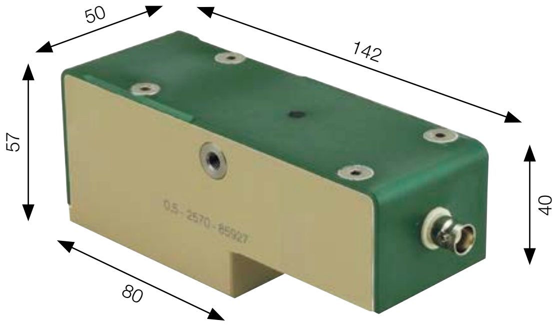
4 MHz


31
51
68
20
Bar Index

1 MHz


42
78
Bar Index

0,5 MHz


50
142
57
40
80

Weights

Model		Weight
Transmitter DUC-MP		1500 g
Transducer DUC-WP	4 MHz	45 g
	1 MHz	50 g
	0.5 MHz	100 g