

**Clamp-On Ultrasonic Ex Flowmeter**

**Flowmeter with one or two measurement channels, graphic LCD display, internal datalogger and input/output options**

**For commonly used pipe materials and diameters from 10 mm to over 3.0 m**

**Intuitive menu, Setup Wizard and *Audible Sensor Positioning Assistant*™ for easy and quick setup and installation**

**Transit-time correlation measurement using dual DSP-technology for better measurement accuracy**

**Dedicated Ex solution for hazardous area Zones 1 and 2 with glass-fronted keypad**

**Optional stainless steel enclosure**

**Features**

Robust IP 66 transmitter enclosure with glass-fronted keypad and multifunctional display

Bi-directional measurement with totalizer function and process input, output and serial communication options including Modbus RTU and HART\*

Available with optional inputs for PT100 sensors for temperature compensated metering

Optional sound velocity output function for contactless product recognition and interface detection; optional internal data logger for up to 100,000 measurements

Transmitter and transducers approved for use in hazardous area Zones 1 and 2

KATdata+ software for offline/online data transfer via serial interface options

Optional stainless steel transmitter enclosure for increased weatherability

**Description**

The KATflow clamp-on ultrasonic flowmeters work on the transit-time method. This is based on the principle that sound waves travelling with the flow will move faster than those travelling against it. The resulting difference in transit time is directly proportional to the flow velocity of the liquid and consequently to the volumetric flow rate.

The ultrasonic transducers (sensors) of the flowmeter are mounted on the external surface of the pipe and are used to generate and receive pulses. The flowing liquid within causes time differences in the ultrasonic signals, which are evaluated by the flowmeter to produce an accurate flow measurement. The advanced electronics of the flowmeter compensate for and adapt to changes in the flow profile and medium temperature to deliver reliable measurements.

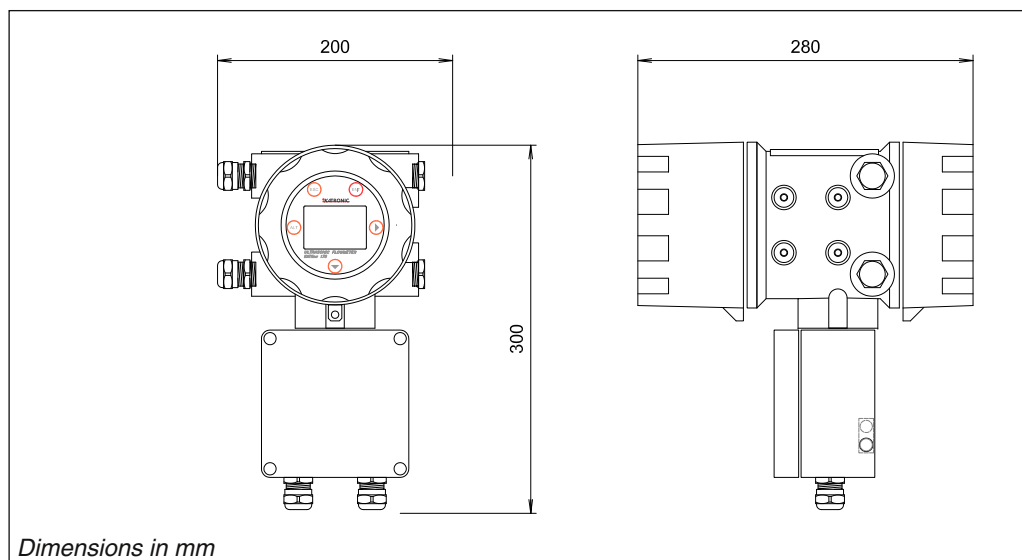
The KATflow 170 is a fixed-installation clamp-on ultrasonic Ex flowmeter for non-invasive and non-intrusive flow measurement of liquids and liquefied gases in fully filled pipes. It can be supplied with one or two measurement channels. This enables the flowmeter to simultaneously monitor up to two separate pipes. Alternatively, a dual-channel setup can be used for a two-path mounting configuration of the sensors on one single pipe. Additionally, the KATflow 170 offers optional functions for temperature compensated flow metering and concentration measurement with process input, output and serial communication options available. These features are complemented by an optional internal datalogger and software for the recording and download of measured values. Thanks to its intuitive instrument menu, Setup Wizard and *Audible Sensor Positioning Assistant*™ the flowmeter can be set up and its sensors correctly installed in a matter of minutes. The flowmeter is approved for operation in Zones 1 and 2, and programmed with a magnetic pen through a glass-fronted keypad for increased safety.

## Specification: Transmitter

<b>Performance</b>	Measurement principle	:	Ultrasonic transit-time difference correlation
	Flow velocity range	:	0.01 ... 25 m/s
	Resolution	:	0.25 mm/s
	Repeatability	:	0.15 % of measured value, $\pm 0.015$ m/s
	Accuracy	:	<i>Volume flow</i> $\pm 1 \dots 3$ % of measured value depending on application $\pm 0.5$ % of measured value with process calibration <i>Flow velocity</i> $\pm 0.5$ % of measured value
	Turn down ratio	:	1/100 (equals 0.25 ... 25 m/s)
	Measurement rate	:	10 ... 1000 Hz
	Response time	:	1 s standard, 90 ms optional
	Damping of displayed value	:	0 ... 99 s (selectable by user)
	Gaseous and solid content of liquid media	:	< 10 % of volume

<b>General</b>	Enclosure type	:	Explosion-proof field housing, pipe-mounted
	Degree of protection	:	IP 66 according to EN 60529
	Operating temperature	:	-20 ... 60 °C (-4 ... 140 °F)
	Housing material	:	Copper-free aluminium, polyurethane and epoxy coated; stainless steel (optional)
	Protection concept	:	Flame-proof (d), increased safety (e)
	Ex certification code	:	II 2G Ex de IIB T6
	Ex certification number	:	EPS 11 ATEX 1355 X
	Measurement channels	:	1 or 2
	Calculation functions	:	Average, difference, sum, highest (dual-channel use only)
	Power supply	:	100 ... 240 V AC 50/60 Hz 9 ... 36 V DC Special solutions (e.g. solar panel, battery powered upon request)
	Display	:	LCD graphic display, 128 x 64 dots, backlit
	Dimensions	:	270 (h) x 140 (w) x 280 (d) mm, without cable glands and mounting support
	Cable glands	:	Power supply M20 x 1.5, process inputs/outputs 2 x M20 x 1.5, communication M20 x 1.5, sensors 2 x M20 x 1.5
	Weight	:	Approx. 4.0 kg
	Power consumption	:	< 5 W
	Operating languages	:	English, German, French, Dutch, Russian, others on request

## Drawings



## Specification: Transmitter (continued)

### Images



*KATflow 170 pipe-mounted*



*KATflow 170 close-up*

<b>Communication</b>	Type	:	RS 485 (optional), Modbus RTU (optional)
	Transmitted data	:	Measured and totalized value, parameter set and configuration, logged data
<b>Internal data logger</b>	Storage capacity	:	Approx. 30,000 measurements (each comprising up to 10 selectable measurement units), logger size 5 MB Approx. 100,000 measurements (each comprising up to 10 selectable measurement units), logger size 16 MB
	Logged data	:	All measured and totalized values, parameter sets
<b>KATdata+ software</b>	Functionality	:	Download of measured values/parameter sets, graphical presentation, list format, export to third party software, online transfer of measured data
	Operating systems	:	Windows 7, Vista, XP, NT, 2000 Linux Mac (optional)
<b>Quantity &amp; units of measurement</b>	Volumetric flow rate	:	m <sup>3</sup> /h, m <sup>3</sup> /min, m <sup>3</sup> /s, l/h, l/min, l/s, USgal/h (US gallons per hour), USgal/min, USgal/s, bbl/d (barrels per day), bbl/h, bbl/min
	Flow velocity	:	m/s, ft/s, inch/s
	Mass flow rate	:	g/s, t/h, kg/h, kg/min
	Volume	:	m <sup>3</sup> , l, gal (US gallons), bbl
	Mass	:	g, kg, t
	Temperature	:	°C (only with temperature compensation)

## Specification: Transmitter (continued)

<b>Process inputs</b> (galvanically isolated)	Temperature	:	PT100 (clamp-on sensors), four-wire circuit, measurement range -50 ... 400 °C (-58 ... 752 °F), resolution 0.1 K, accuracy $\pm 0.2$ K (one input available)
	Current	:	0/4 ... 20 mA active or 0/4 ... 20 mA passive, U = 30 V, $R_i = 50 \Omega$ , accuracy 0.1 % of measured value
<b>Process outputs</b> (galvanically isolated)	Current	:	0/4 ... 20 mA active/passive ( $R_{Load} < 500 \Omega$ ), 16 bit resolution, U = 30 V, accuracy = 0.1 %
	Voltage	:	0 ... 10 V, $R_{Load} = 1000 \Omega$
	Frequency	:	0 ... 10 kHz, 24 V/4 mA
	HART*	:	0/4 ... 20 mA, 24 V DC, $R_{GND} = 220 \Omega$
	Digital Open-Collector	:	Value 0.01 ... 1000/unit, width 1 ... 990 ms, U = 24 V, $I_{max} = 4$ mA
	Digital relay	:	Form C (SPDT-CO) contacts, U = 48 V, $I_{max} = 250$ mA

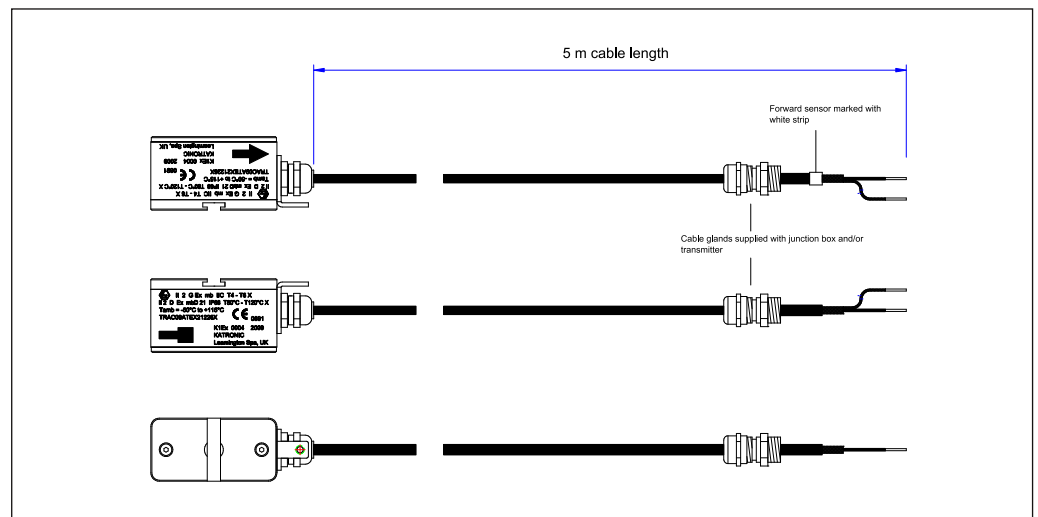
## Specification: PT100 clamp-on sensors

<b>General</b>	Type	:	PT 100 (clamp-on)
	Degree of protection	:	IP 66 acc. EN 60529
	Protection concept	:	Flame-proof ( Ex d)
	Ex certification code	:	II 2G Ex d IIC T6 Gb
	Ex certification number	:	KDB 08 ATEX 135
	Measurement range	:	-50 ... 250 °C (-58 ... 482 °F)
	Circuitry	:	4-wire (others on request)
	Accuracy T	:	$\pm(0.15 \text{ °C} + 2 \times 10^{-3} \times T [\text{°C}])$ , class A
	Accuracy $\Delta T$	:	$\leq 0.1$ K ( $3 \text{ K} < \Delta T < 6 \text{ K}$ ), corresponding to EN 1434-1
	Response time	:	50 s
	Dimensions of sensor head	:	190 (h) x 120 (w) x 90 (d) mm
	Material of sensor head	:	Copper-free aluminium, polyurethane and epoxy coated; stainless steel (optional)
	Material cable jacket	:	PTFE
Cable length	:	To suit assembly	

## Specification: Hazardous area transducers

<b>K1Ex and K4Ex</b>	Pipe diameter range	:	10 ... 250 mm for type K4Ex 50 ... 3000 mm for type K1Ex
	Dimensions of sensor heads	:	60 (h) x 30 (w) x 34 (d) mm
	Material of sensor heads	:	Stainless steel
	Material of cable conduits	:	PTFE
	Temperature range	:	-50 ... 115 °C (-4 ... 248 °F)
	Standard cable length	:	5.0 m
	Degree of protection	:	IP 68 acc. EN 60529
	Ex certification code	:	II 2G Ex mb II T4 - T6 X, II 2D Ex mbD 21 IP68 T80°C - T120°C X
	Ex certification number	:	TRAC 09 ATEX 21226 X
	Ex protection method	:	Encapsulation (m), high level of protection (b)
	Note	:	The transducers are approved for use in hazardous areas classified as Ex Zone 1 and 2. They are connected directly to the transmitter or via extension cables and Ex approved junction boxes.

### Drawings and images



Transducers K1Ex and K4Ex with direct cable connection



K1Ex transducer pair



K1Ex certification code and number

**Specification: Transducer mounting accessories**

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<b>General</b>	Diameter range and mounting types	:	<i>Clamping set (metal collar with screw), stainless steel DN 10 ... DN 40 Metallic straps and clamps DN 15 ... DN 310 Metallic straps and clamps DN 25 ... DN 3000 Metallic straps and clamps DN 1000 ... DN 3000 (6500) Metallic mounting rail and straps (available upon request) DN 50 ... DN 250 or DN 50 ... DN 3000</i>
	Mounting fixture for flexible hoses	:	Custom made mounting bracket, stainless steel (available upon request)

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**Images**



*Transducers mounted using strap and clamps*



*Metallic mounting rail with optional cover (example)*

## Configuration code: Transmitter and accessories

KF170	Ultrasonic flow meter KATflow 170, operating instructions
<b>Number of measurement channels</b>	
1	1 measurement channel
2	2 measurement channels <sup>1)</sup>
<b>Internal code</b>	
03	Internal code
<b>Power supply</b>	
1	100 ... 240 V AC, 50/60 Hz
2	9 ... 36 V DC
Z	Special (please specify)
<b>Enclosure type</b>	
1	Ex enclosure, glass-fronted, copper-free aluminium, epoxy coated, II 2G Ex de IIB T6
2	Ex enclosure, glass-fronted, stainless steel, II 2G Ex de IIB T6
Z	Special (please specify)
<b>Communication</b>	
0	Without
1	RS 485 serial interface
2	Modbus RTU protocol
Z	Special (please specify)
<b>Process inputs/outputs (select a maximum of 4 slots)</b>	
N	Without
C	Current output, 0/4 ... 20 mA, active (source)
P	Current output, 0/4 ... 20 mA, passive (sink)
D	Digital output, Open-Collector
R	Digital output, relay
H	HART* output, 0/4 ... 20 mA
V	Voltage output, 0 ... 10 V
F	Frequency output, 0 ... 10 kHz
A	1 x PT100 input for temperature compensation (select TC function) <sup>2)</sup>
B	Current input, 0/4 ... 20 mA, active or passive (source/sink)
<b>Internal data logger</b>	
0	Without
1	30,000 measurements
2	100,000 measurements
Z	Special (please specify)
<b>Temperature compensation (TC)</b>	
0	Without
1	With TC incl. 1 x PT100 sensor, 3 m cable <sup>2)</sup>
Z	Special (please consult factory)
<b>Sound velocity output (SVO) <sup>3)</sup></b>	
0	Without
1	With SVO
<b>PT100 cable extension</b>	
0	Without
PTJ	With 1 x junction box for PT100 sensor
<b>PT100 extension cable length in m</b>	
000	Without
___	With extension cable (specify length in m)
<b>Optional items</b>	
	Without (leave space blank)
PM	With 2 inch pipe mounting bracket
TA	With stainless steel tag (specify text)
SW	KATdata+ download software

**KF170 - 1 -03- 1 - 1 - 0 -CD - 0- 0-0 -0 - 000 /** (example configuration)

The configuration is customised by choosing from the above-listed options and is expressed by the resulting code at the bottom of the table.

1) For simultaneous measurement on two separate pipes or for measurement on one single pipe in a two-path sensor mounting configuration.

2) For temperature compensation in cases of significant changes in medium temperature during measurement.

3) For contactless product recognition and interface detection.

## Configuration code: Transducers and accessories

K1	Transducer pair, pipe diameter range 50 ... 3000 mm
K4	Transducer pair, pipe diameter range 10 ... 250 mm
Z	Special (please consult factory)
<b>Temperature range</b>	
Ex	Process temperature -50 ... 115 °C, including acoustic coupling paste (II 2G Ex mb II T4 - T6)
Z	Special (please consult factory)
<b>Internal code</b>	
1	Internal code
<b>Degree of protection</b>	
3	IP 68 (standard)
Z	Special (please specify)
<b>Transducer mounting accessories</b>	
0	Without
3	Clamping set DN 10 ... 40
4	Metallic straps and clamps DN 15 ... 310
5	Metallic straps and clamps DN 25 ... 3000
6	Metallic straps and clamps DN 1000 ... 6500
7	Metallic mounting rail and straps DN 50 ... 250 (transducer type K4)
8	Metallic mounting rail and straps DN 50 ... 3000 (transducer type K1)
Z	Special (please consult factory)
<b>Stainless steel tag</b>	
0	Without
1	With stainless steel tag (please specify text to be engraved)
<b>Transducer connection type and extension cable length</b>	
O	Without connector or junction box
C 000	Wired transducer connection to flowmeter
JX	Extension via ATEX junction box
C 005	With extension cable, 5 m length
C 010	With extension cable, 10 m length
C ____	With extension cable, (specify length in m)
Z	Special (please specify)
<b>Optional items</b>	
	Without (leave space blank)
CA	5-point calibration with certificate

**K1Ex - 1 - 3 - 5 0 - JX - C 010 /** (example configuration)

The configuration is customised by selecting the above-listed options and is expressed by the resulting code at the bottom of the table.