KATflow 170
Clamp-On ATEX Ultrasonic Flowmeter

RUGGED. RESISTANT. RELIABLE.

For applications where harsh environmental conditions demand a more rugged instrument, the KATflow 170 provides a corrosion-resistant option as part of a fully ATEX-certified package. The flowmeter is intended for permanent operation in Zone 1 and 2 hazardous areas and is a cost-effective choice for a variety of metering applications. The KATflow 170 demonstrates that even the most complex technical requirements can be met with straightforward solutions.

Fixed Installation

-50°C +115°C

Specification

- Pipe diameter range 10 mm to 3,000 mm
- Temperature range for sensors -50 °C to +115 °C (-58 °F to +239 °F), higher temperatures available on request
- Robust IP 66 unit with LCD display and glass-fronted keypad
- Epoxy-coated aluminium or stainless steel enclosure
- Magnetic pen for safe and easy programming
- Measurement of two flows simultaneously

Features

- Suitable for installation in hazardous areas
- Dual flow monitoring with *sum*, *average*, *difference* and *maximum* calculations
- IP 68 stainless steel sensors as standard
- Process output options including current, open-collector, relay
- Communication options RS 485, Modbus RTU, Profibus PA and HART* compatible output
- ATEX-certified PT100 probe for temperature compensation

Accessories

- Optional sound velocity output function
- Stainless steel bracket for either pipe or wall mounting
- KATdata+ software for data evaluation

Applications

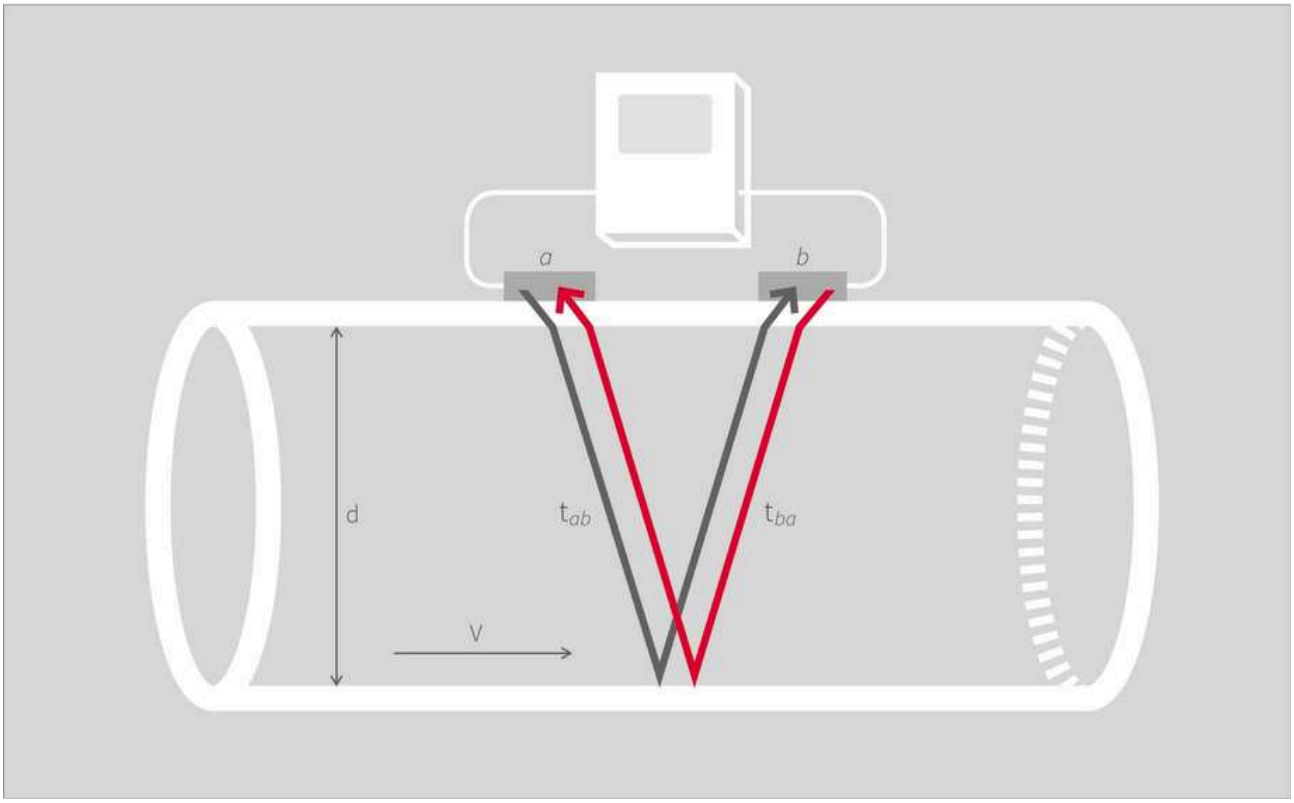
- Produced water measurements
- Methanol and water injection systems
- Product and interface detection systems
- Measurement of refined products
- Tanker unloading systems
- Oil blending skids

The Technology Behind the Measurement

The KATflow non-invasive flowmeters work on the transit time ultrasonic principle. This involves sending and receiving ultrasonic pulses from a pair of sensors and examining the time difference in the signal. Katronic uses clamp-on transducers that are mounted externally on the surface of the pipe and which generate pulses that pass through the pipe wall. The flowing liquid within causes time differences in the ultrasonic signals, which are then evaluated by the flowmeter to produce an accurate flow measurement.

The key principle of the method applied is that sound waves travelling with the flow will move faster than those travelling against it. The difference in the transit time of these signals is proportional to the flow velocity of the liquid and consequently the flow rate.

Since elements such as flow profile, type of liquid and pipe material will have an effect on the measurement, the flowmeter compensates for and adapts to changes in the medium in order to provide reliable results. The instruments can be used in a variety of locations, from measurements on submarines to installations on systems destined for use in space, and on process fluids as different as purified water in the pharmaceutical sector and toxic chemical effluent. The flowmeters will operate on various pipe materials and diameters over a range of 10 mm to 6,500 mm.



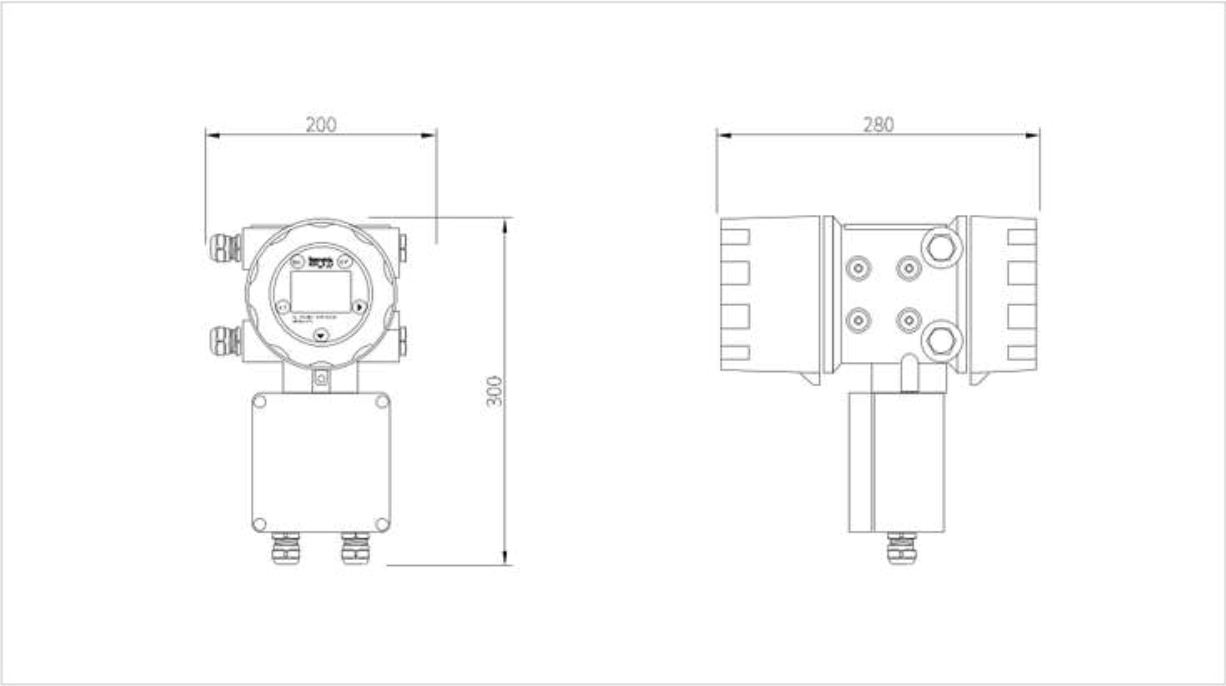
Sensors a and b work alternately to send and receive ultrasonic pulses. The sound waves ab travelling with the flow move faster than those travelling against it ba.

Technical Data: Flowmeter

Performance

Measurement principle	Ultrasonic transit-time difference
Flow velocity range	0.01 ... 25 m/s
Resolution	0.25 mm/s
Repeatability	0.15 % of measured value, ±0.015 m/s
Accuracy	Volume flow: ±1 ... 3 % of measured value depending on application ±0.5 % of measured value with process calibration Flow velocity (mean): ±0.5 % of measured value
Turn down ratio	1/100 (equivalent to 0.25 ... 25 m/s)
Measurement rate	1 Hz (standard)
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

Images



KATflow 170 (dimensions in mm)

General

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*, *maximum* (dual-channel use only)
Power supply	100 ... 240 V, AC 50/60 Hz 9 ... 36 V DC Special solutions on 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	< 10 W
Operating languages	English, French, German, Dutch, Spanish, Italian, Russian, Czech, Turkish, Romanian (others on request)

Communication

Type	RS 485 (optional), Modbus RTU (optional)
Transmitted data	Measured and totalised value, parameter set and configuration, logged data

Internal data logger

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 totalised values, parameter sets

KATdata+ software

Functionality	Download of measured values/parameter sets, graphical presentation, list format, export to third party software, online transfer of measured data
Operating systems	Windows 8, 7, Vista, XP, NT, 2000 Linux

Quantity and units of measurement

Volumetric flow rate	m^3/h, m^3/min, m^3/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^3, l, gal (US gallons), bbl
Mass	g, kg, t
Heat flow	W, kW, MW (with heat quantity measurement option)
Heat quantity	J, kJ, kW/h (with heat quantity measurement option)
Temperature	°C (with heat quantity measurement option)

Process inputs (galvanically isolated)

Temperature	PT100 (clamp-on sensors), three- or four-wire circuit, measurement range: -50 ... +250 °C (-58 ... +482 °F), resolution: 0.1 K, accuracy: ±0.2 K
Current	0/4 ... 20 mA active or 0/4 ... 20 mA passive, U = 30 V, R_i = 50 Ω, accuracy: 0.1 % of measured value

Process outputs (galvanically isolated)

Current	0/4 ... 20 mA active/passive (R_{Load} < 500 Ω), 16 bit resolution, U = 30 V, accuracy: 0.1 %
Digital open-collector	Value: 0.01 ... 1000/unit, width: 1 ... 990 ms, U = 24 V, I_{max} = 4 mA
Digital relay	2 x Form A SPST (NO and NC), U = 48 V, I_{max} = 250 mA
Voltage	0 ... 10 V, R_{Load} = 1000 Ω
Frequency	2 Hz ... 10 kHz, 24 V/4 mA
HART® compatible	0/4 ... 20 mA, 24 V DC, R_{GND} = 220 Ω

Images

KATflow 170 with aluminium enclosure

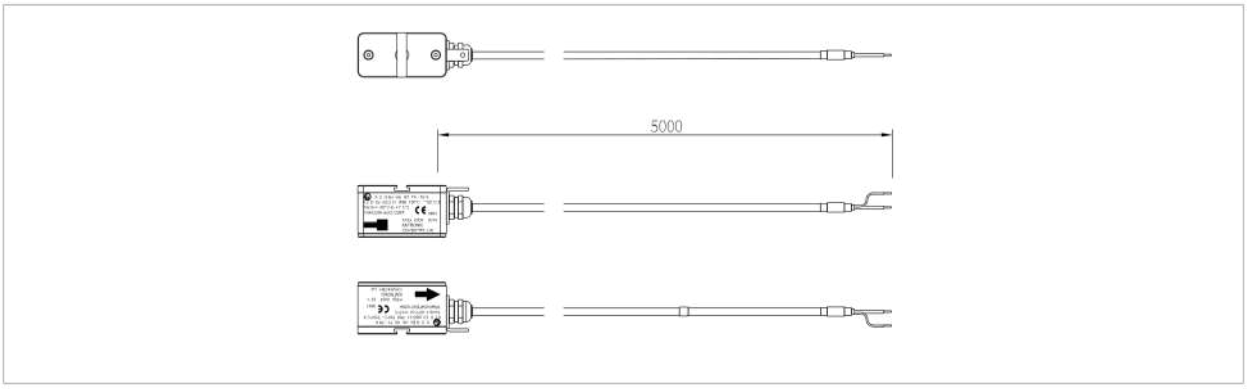
KATflow 170 in operation

Technical Data: Hazardous Area Transducers

K1Ex and K4Ex

Pipe diameter range	10 ... 250 mm for type K4Ex 50 ... 3,000 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 (-58 ... +239 °F)
Standard cable lengths	5.0 m
Degree of protection	IP 68 according to EN 60529
Ex-certification code	II 2G Ex mb IIC T4 - T6 X II 2D Ex mb D 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 flowmeter or via extension cables and Ex-approved junction boxes.

Images



K1Ex/K4Ex transducers

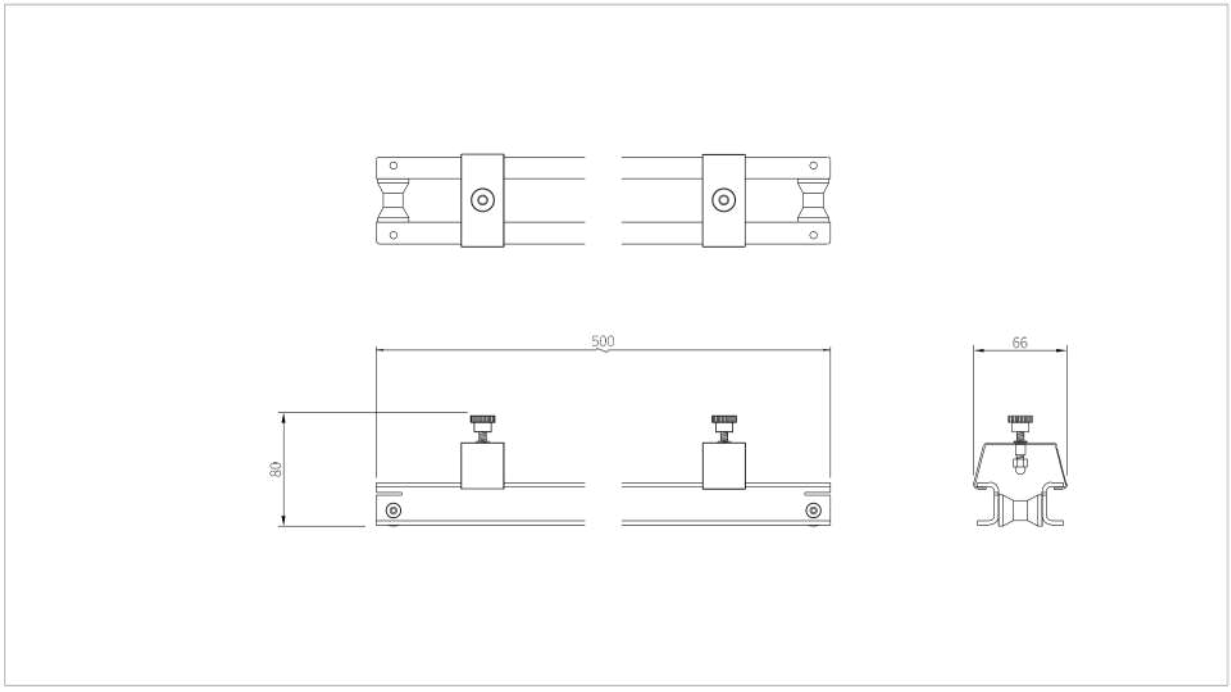
K1Ex/K4Ex transducers

K1Ex transducers mounted using straps and clamps

Technical Data: Mounting Accessories

Diameter range and mounting types	Clamping set (metal strap with screw), stainless steel: DN 10 ... DN 40 Metallic straps and clamps: DN 15 ... DN 310 Metallic straps and clamps: DN 25 ... DN 3,000 Metallic mounting rail and straps (available on request): DN 50 ... DN 250 or DN 50 ... DN 3,000

Images



Metallicmountingrail

Metallic mounting rail with transducers

KATflow 170 pipe mounted with 2'' mounting frame

Technical Data: PT100 ATEX Clamp-On Sensors

General

Type	PT100 (clamp-on sensors)
Degree of protection	IP 66 according to EN 60529
Protection concept	Flame-proof (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)
Circuits	4-wire (others on request)
Accuracy T	±(0.15 °C + 2 x 10^{-3} x T [°C]), class A
Accuracy ΔT	≤ 0.1 K (3 K < ΔT < 6 K), corresponding to EN 1434-1
Response time	50 s
Dimensions of sensor heads	190 (h) x 120 (w) x 90 (d) mm
Material of sensor heads	Copper-free aluminium, polyurethane and epoxy-coated; stainless steel (optional)
Material of cable jacket	PTFE
Cable length	To suit assembly

Configuration Code: Flowmeter and Accessories

Code	Description
KF 170	Ultrasonic flowmeter KATflow 170, operating instructions
	Number of measurement channels
1	1 measurement channel
2	2 measurement channels [1]
	Internal code
03	Internal code
	Power supply
1	100 … 240 V AC, 50/60 Hz
2	9 … 36 V DC
Z	Special (please specify)
	Enclosure type
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)
	Communication
0	Without
1	RS 485 serial interface
2	Modbus RTU protocol [2]
Z	Special (please specify)
	Process inputs/outputs (select a maximum of 4 slots)
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® compatible output, 0/4 … 20 mA [2]
V	Voltage output, 0 … 10 V
F	Frequency output, 2 Hz … 10 kHz
A	1 x PT100 input for temperature compensation (select TC function) [3]
B	Current input, 0/4 … 20 mA, active or passive
Z	Special (please specify)
	Internal data logger
0	Without
1	30,000 measurements
2	100,000 measurements
Z	Special (please specify)
	Temperature compensation (TC) [3]
0	Without
1	With TC incl. 1 x PT 100 sensor, 3 m cable
Z	Special (please consult factory)
	Sound velocity output (SVO) [4]
0	Without
1	With SVO
	PT100 cable extension
0	Without
PTJ	With 1 x junction box for PT 100 sensors
	PT100 extension cable (length in m)
000	Without
___	With extension cable (specify length in m)
	Optional items
	Without (leave space blank)
PM	With 2 '' pipe mounting bracket
TA	With stainless steel tag (specify text)
SW	KATdata+ download software with RS 232 cable

KF 170 - 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 seperate pipes or for measurement on one single pipe in a two-path sensor mounting configuration.
2) Modbus and HART® compatible outputs can not be used in conjunction with other output options. Please consult factory for more information.
3) For temperature compensation in cases of significant changes in medium temperature during measurement.
4) For contactless product recognition and interface detection.

Configuration Code: Transducers and Accessories

K1	Transducer pair, pipe diameter range 50 ... 3,000 mm										
K4	Transducer pair, pipe diameter range 10 ... 250 mm										
Z	Special (please consult factory)										
	Temperature range										
	Ex	Process temperature -50 ... +115 °C, including acoustic coupling paste (II 2G Ex mb IIC T4 - T6)									
	Z	Special (please consult factory)									
		Internal code									
		1	Internal code								
			Degree of protection								
			1	IP 66 (standard)							
			2	IP 67 (please consult factory)							
			3	IP 68 (please consult factory)							
			Z	Special (please specify)							
				Transducer mounting accessories							
				0	Without						
				3	Clamping set DN 10 ... 40						
				4	Metallic straps and clamps DN 15 ... 310						
				5	Metallic straps and clamps DN 25 ... 3,000						
				7	Metallic mounting rail and straps DN 50 ... 250 (transducer type K4)						
				8	Metallic mounting rail and straps DN 50 ... 3,000 (transducer type K1)						
				Z	Special (please specify)						
					Stainless steel tag						
					0	Without					
					1	With stainless steel tag (please specify text to be engraved)					
						Transducer connection type and extension cable length					
						0	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)				
								Optional items			
									Without (leave space blank)		
								CA	5-point calibration with certificate		

K1 Ex 1 - 3 - 5 - 0 - JX - C 010 / [ ] (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.