KATflow 230

Portable Clamp-On Ultrasonic Flowmeter

POWERFUL. PRACTICAL. PORTABLE.

The KATflow 230 is easily portable but incorporates an advanced specification for situations which require comprehensive measurement features coupled with easy operation. The flowmeter has two measurement channels, which allow it to monitor two pipes simultaneously or to improve accuracy in non-ideal conditions. The KATflow 230 can also be supplied with a variety of options to meet the most diverse application requirements.

Specification

- Pipe diameter range 10 mm to 6,500 mm
- Temperature range for sensors
  -30 °C to +250 °C (-22 °F to +482 °F)
- Robust IP 65 aluminium enclosure
- Selectable three-line LCD display and full keypad
- Battery life up to 24 hours with easily replaceable battery cartridge
- Measurement of two flows simultaneously

Features

- Dual flow monitoring with *sum*, *average*, *difference* and *maximum* calculations
- PT100 inputs for heat quantity (thermal energy) measurement
- Process output options including current, open-collector, relay
- Large data logger and software for sampling and data transfer
- Stainless steel sensors, cable and connectors as standard

Accessories

- Available with crush-proof IP 67 transport case or lightweight soft case
- Expansion box for additional input or output configuration and special solutions
- Optional pipe wall thickness gauge
- Special waterproof solution available for harsh environmental conditions
- KATdata+ software for data evaluation

Applications

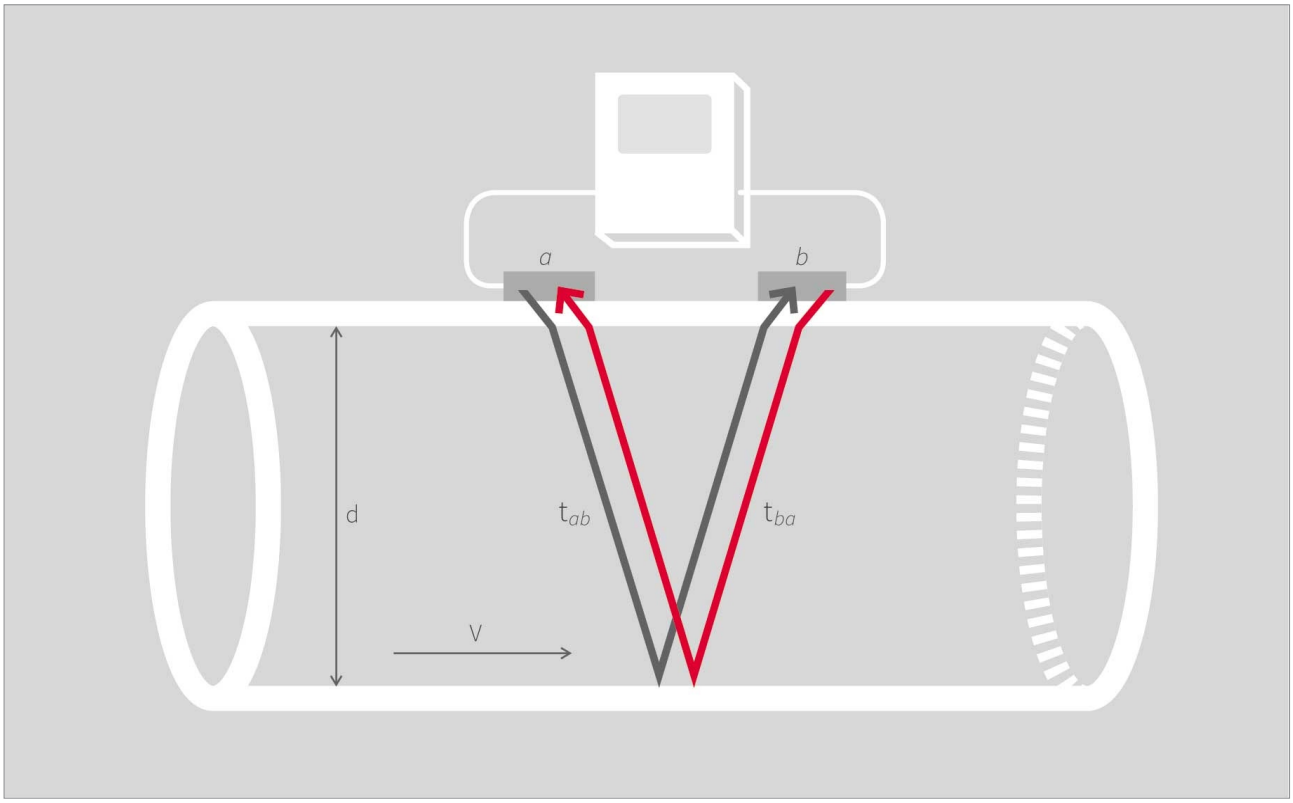
- Heating, Ventilation and Air Conditioning (HVAC) measurements
- Large pipe measurement with two sensor pairs in ‘X’ configuration
- Temporary replacement of conventional in-line flowmeters
- Building surveys on large facilities
- Efficiency monitoring of heat exchangers

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.



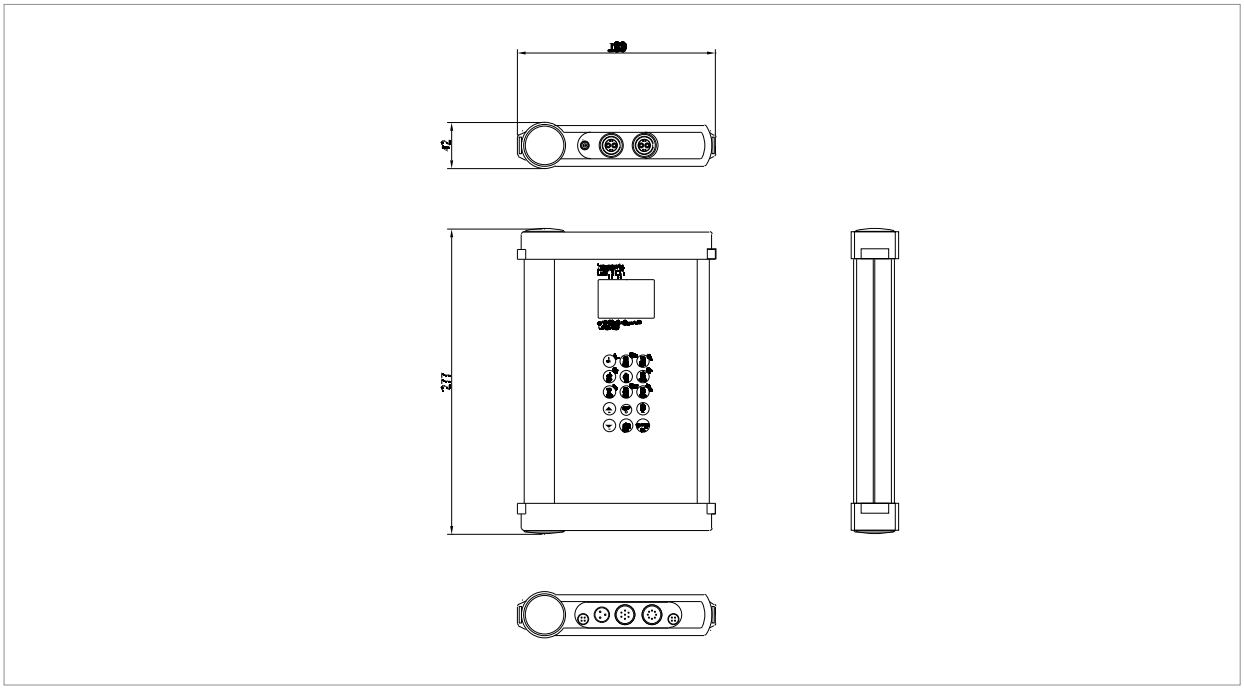
Sensors *a* and *b* work alternately to send and receive ultrasonic pulses. The sound waves *ab* travelling with the flow move faster than those travelling against it *ba*.

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
Damping of displayed value	0 ... 99 s (selectable by user)
Gaseous and solid content of liquid media	< 10 % of volume

Images



KATflow 230 (dimensions in mm)

General

Enclosure type	Portable
Degree of protection	IP 65 according to EN 60529
Operating temperature	-10 ... +60 °C (+14 ... +140 °F)
Housing material	Extruded aluminium, Al MG Si 0.5, lids die-cast zinc alloy GD-Zn AL 4 CU 1
Measurement channels	1 or 2
Calculation functions	*Average*, *difference*, *sum*, *maximum* (dual-channel use only)
Power supply	Internal rechargeable batteries: 8 x NiMH AA 2850 mAh Power adapter: 100 ... 240 V AC input, 9 V DC output External battery pack: 12 V 105 Ah, 25 kg (optional)
Operating time	Up to 24 h with fully charged internal batteries
Display	LCD graphic display, 128 x 64 dots, backlit
Dimensions	266 (h) x 168 (w) x 37 (d) mm
Weight	Approx. 2.0 kg
Power consumption	< 5 W
Operating languages	English, French, German, Dutch, Spanish, Italian, Russian, Czech, Turkish, Romanian (others on request)

Communication

Type	RS 232 , USB cable (optional)
Transmitted data	Measured and totalised value, parameter set and configuration, logged data

Images

KATflow 230 in crush-proof IP 67 transport case

KATflow 230 in operation

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: -30 ... +250 °C (-22 ... +482 °F), resolution: 0.1 K, accuracy: ±0.2 K (two or four inputs available)

Process outputs* (galvanically isolated)

Current	0/4 ... 20 mA active (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	Form A SPST (NO), U = 48 V, I_{max} = 250 mA

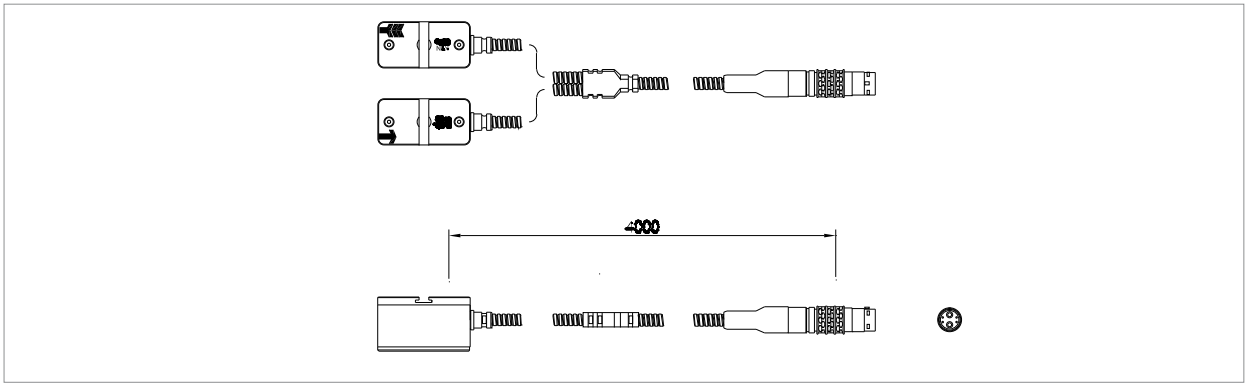
* Further process outputs available on application.

Technical Data: Transducers

K1L, K1N, K1E

Pipe diameter range	50 ... 3,000 mm for type K1N/E 50 ... 6,500 mm for type K1L
Dimensions of sensor heads	60 (h) x 30 (w) x 34 (d) mm
Material of sensor heads	Stainless steel
Material of cable conduits	Type K1L: PVC Type K1N/E: Stainless steel
Temperature range	Type K1L: -30 ... +80 °C (-22 ... +176 °F) Type K1N: -30 ... +130 °C (-22 ... +266 °F) Type K1E: -30 ... +250 °C (-22 ... +482 °F) (for short periods up to 300 °C (572°F))
Degree of protection	IP 66 according to EN 60529 (IP 67 and IP 68 on request)
Standard cable lengths	Type K1L: 5.0 m Type K1N/E: 4.0 m

Images



K1N/E transducers

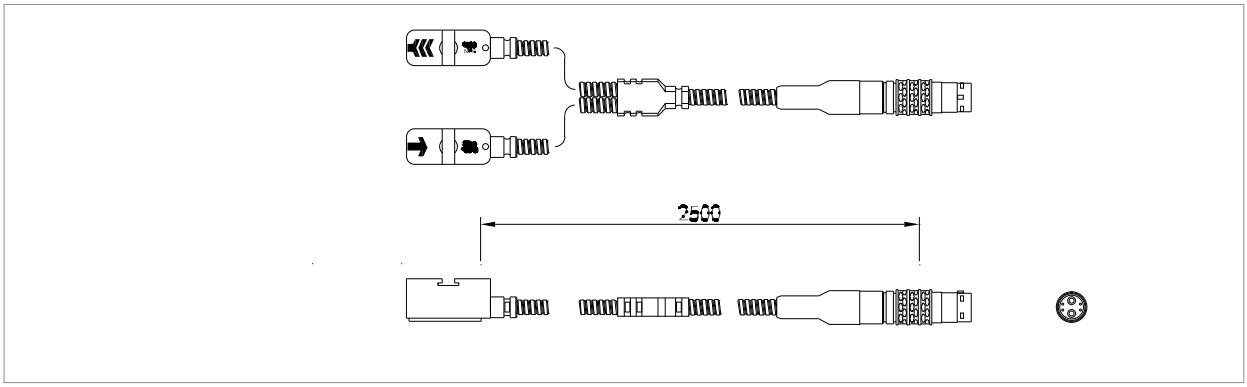
K1L transducers

K1N/E transducers with ODU/LEMO connector

K4L, K4N, K4E

Pipe diameter range	10 ... 250 mm for type K4N/E 10 ... 250 mm for type K4L
Dimensions of sensor heads	43 (h) x 18 (w) x 22 (d) mm
Material of sensor heads	Stainless steel
Material of cable conduits	Type K4L: PVC Type K4N/E: Stainless steel
Temperature range	Type K4L: -30 ... +80 °C (-22 ... +176 °F) Type K4N: -30 ... +130 °C (-22 ... +266 °F) Type K4E: -30 ... +250 °C (-22 ... +482 °F) (for short periods up to +300 °C (+572 °F))
Degree of protection	IP 66 according to EN 60529 (IP 67 and IP 68 on request)
Standard cable lengths	Type K4L: 5.0 m Type K4N/E: 2.5 m

Images



K4N/E transducers

K4N/E transducers with ODU/LEMO connector

K4L transducers

Technical Data: Transducer Mounting Accessories

General

Diameter range and mounting types

Clamping set (metal strap with screw), stainless steel: DN 10 ... DN 40

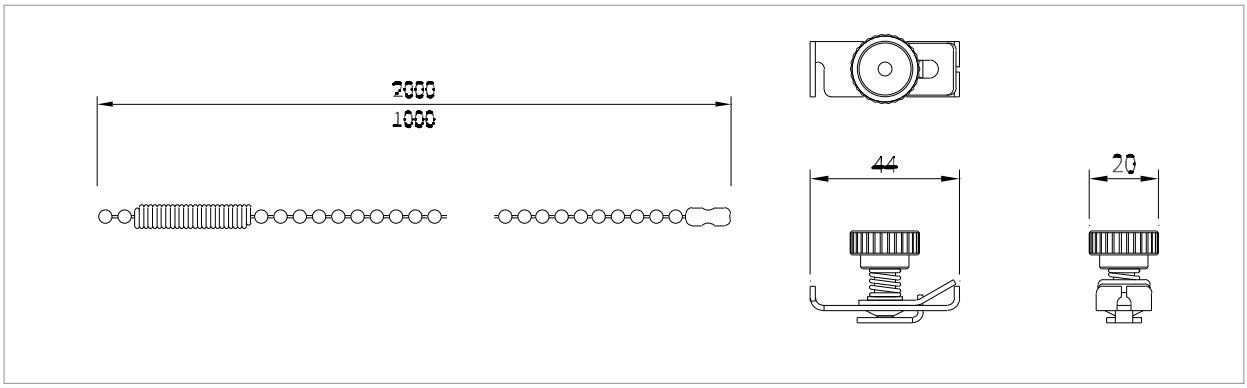
Clips and chains, chain length 1 m, stainless steel: DN 15 ... DN 310

Clips and chains, chain length 2 m, stainless steel: DN 25 ... DN 600

Clips and chains, chain length 4 m (2 x 2 m), stainless steel: DN 25 ... DN 1,200

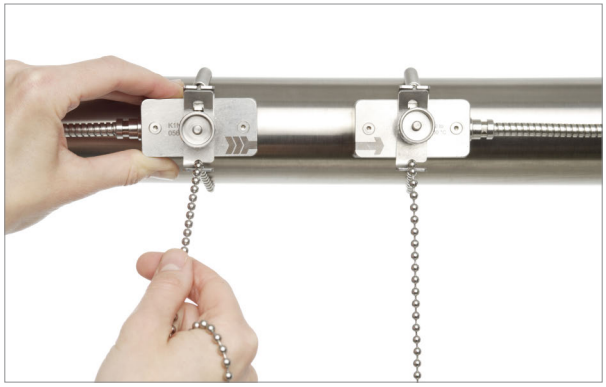
Textile tension straps, up to 15 m in length: DN 1,000 ... DN 3,000 (6,500)

Images



Mounting clip and chains for use with portable flowmeter

Mounting clip

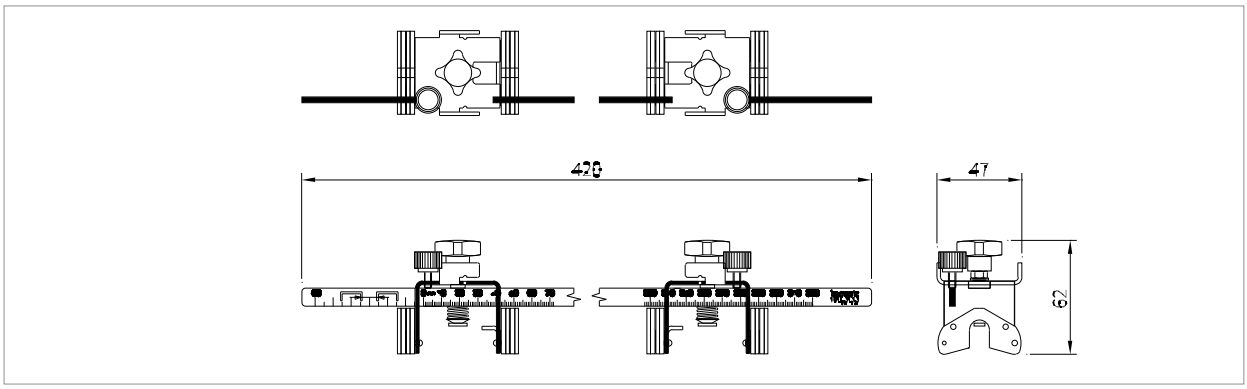


Transducers mounted using chains and clips

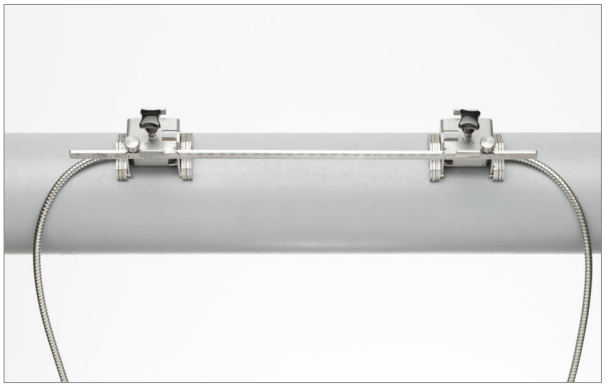
General

Diameter range and mounting types	Mounting fixture, rail and magnets (for type K4): DN 10 ... DN 250 Mounting fixture, rail and magnets (for type K1): DN 50 ... DN 3,000
Mounting fixture for flexible hoses	Custom made mounting bracket, stainless steel (available on request)

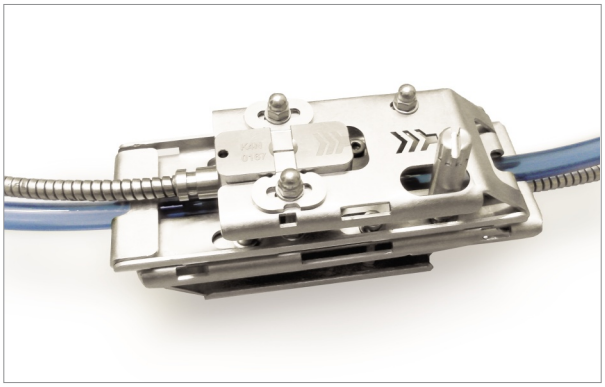
Images



Mounting fixture, rail and magnets



Mounting fixture, rail and magnets



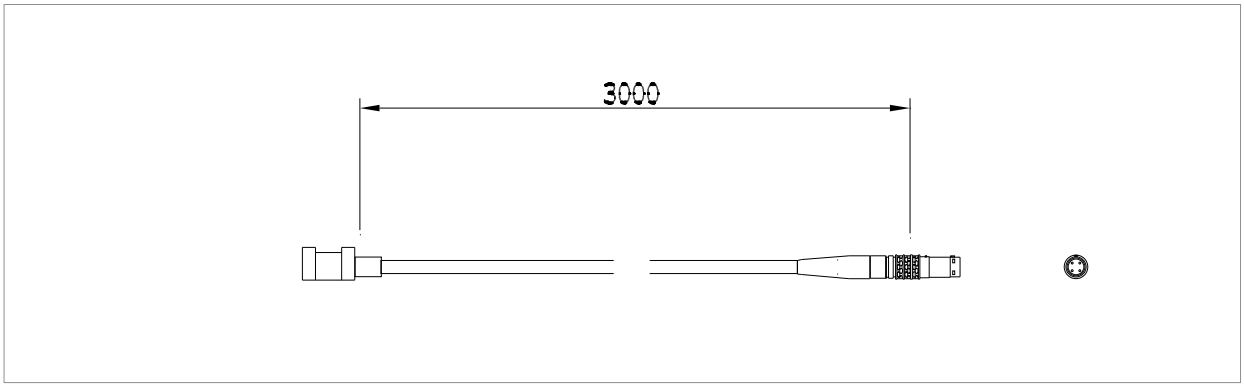
Example of mounting fixture for flexible hoses

Technical Data: PT100 Clamp-On Sensors

General

Type	PT100 (clamp-on sensors)
Measurement range	-30 ... +250 °C (-22 ... +482 °F)
Circuits	4-wire
Accuracy T	$\pm(0.15\ °C + 2 \times 10^{-3} \times T\ [°C])$, 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	20 (h) x 15 (w) x 15 (d) mm
Material of sensor heads	Aluminium
Material of cable jacket	PTFE
Cable length	3.0 m

Images



PT100 transducer (connection for junction box)

PT100 transducer fixed to pipe

PT100 with ODU/LEMO cable connection

Technical Data: Wall Thickness Gauges (optional)

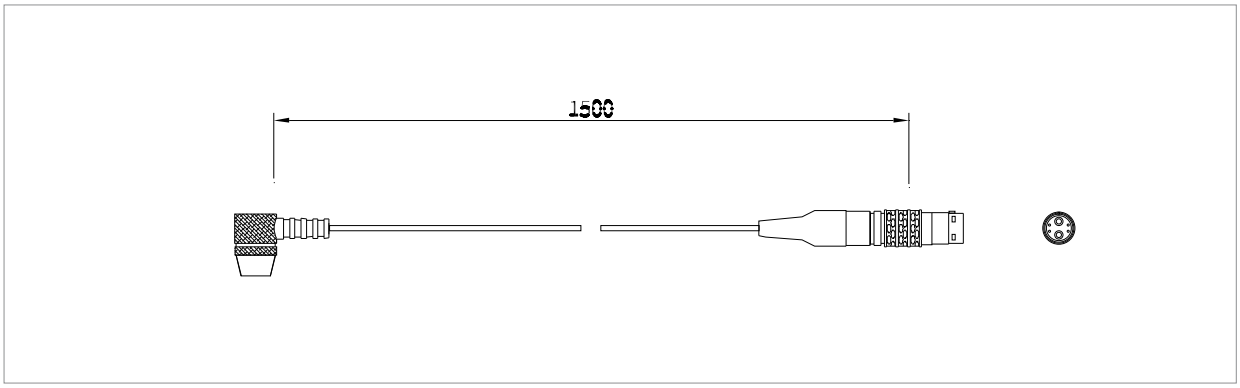
Wall thickness gauge NT

Temperature range	-20 ... +60 °C (-4 ... +140 °F)
Measuring range	1.0 ... 200 mm
Resolution	0.01 mm
Linearity	0.1 mm
Cable length	1.5 m

Wall thickness gauge HT

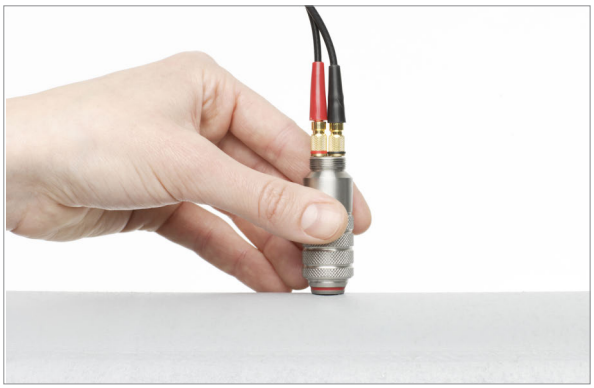
Temperature range	0 ... +500 °C (+32 ... +932 °F)
Measuring range	1.0 ... 200 mm
Resolution	0.01 mm
Linearity	0.1 mm
Cable length	1.5 m

Images



Wall thickness gauge NT

Wall thickness gauge NT in use (alternative design)



Wall thickness gauge HT in use

Technical Data: Transport Accessories

Crush-proof transport case

Dimensions (external)	190 (h) x 480 (w) x 385 (d) mm
Weight (empty)	3.71 kg
Degree of protection	IP 67 according to EN 60529
Outside material	Polypropylene/resin compound
Inside material	High-density polyurethane foam

Soft transport case

Dimensions (external)	175 (h) x 450 (w) x 320 (d) mm
Weight (empty)	750 g
Degree of protection	No IP rating
Outside material	Nylon
Inside material	Nylon

Images

Crush-proof IP 67 transport case

KATflow 230 soft transport case

Configuration Code: Flowmeter and Accessories

KF 230		KATflow 230, serial interface RS 232, operating instructions
		Configuration
	0	Basic unit without accessories
	1	With crush-proof transport case IP 67, power adapter/battery charging unit, measuring tape
	2	With soft case, power adapter/battery charging unit, measuring tape
		Number of measurement channels
	1	1 measurement channel
	2	2 measurement channels
		Internal code
	03	Internal code
		Power adapter
	0	Without
	1	UK
	2	US
	3	Europe
	4	Australia
	Z	Special (please specify)
		Degree of protection
	1	IP 65 (standard)
	2	IP 67 (transport case with external transducer connections)
	Z	Special (please specify)
		Process inputs/outputs (select a maximum of 4 slots)
	N	Without
	C	Current output, 0/4 ... 20 mA, active (source)
	D	Digital output, Open-Collector (pulse)
	R	Digital output, relay
	AA	2 x PT100 input for 1-channel heat quantity measurement (select HQM function no.1)[1]
	AAAA	4 x PT100 input for 2-channel heat quantity measurement (select HQM function no.2)[1]
		Internal data logger
	0	Without
	1	30,000 measurements, KATdata+ download software, RS 232 cable
	2	30,000 measurements, KATdata+ download software, USB cable
	3	100,000 measurements, KATdata+ download software, RS 232 cable
	4	100,000 measurements, KATdata+ download software, USB cable
		Wall thickness measurement
	0	Without
	2	Wall thickness gauge NT
	3	Wall thickness gauge HT
		Heat quantity measurement (HQM)[1]
	0	Without
	1	With HQM incl. 2 x PT100 sensors
	2	With HQM incl. 4 x PT100 sensors
		Sound velocity output (SVO)[2]
	0	Without
	1	With SVO
		Optional items
		Without (leave space blank)
	BA	Spare battery set and external battery charging unit
	BP	External battery pack for long-term power supply

KF 230 - 1 - 1 - 03 - 1 - 1 - C - 2 - 1 - 0 - 0 / (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 contactless measurement of thermal energy consumption (for one or two circuits).
2) For contactless product reconition 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										
	L	Process temperature -30 ... +80 °C, including acoustic coupling paste (for use with connection type PJ)									
	N	Process temperature -30 ... +130 °C, including acoustic coupling paste									
	E	Process temperature -30 ... +250 °C, including acoustic coupling paste									
	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							
				00	Without						
				30	Clamping set DN 10 ... 40						
				40	Clips and chains DN 15 ... 310						
				50	Clips and chains DN 25 ... 600						
				60	Clips and chains DN 25 ... 1,200						
				70	Textile tension straps DN 1,000 ... 6,500						
				80	Mounting fixture, rail and magnets DN 10 ... 250 (optional for transducer type K4)						
				90	Mounting fixture, rail and magnets DN 50 ... 3,000 (optional for transducer type K1)						
				Z	Special (please consult factory)						
					Transducer connection						
					P	ODU/LEMO transducer plug					
					PJ	ODU/LEMO transducer plug with junction box (for transducer type L)					
						Extension cables					
						E000	Without				
						E005	With extension cable, 5 m length				
						E010	With extension cable, 10 m length				
						E___	With extension cable (specify length in m)				
						Z	Special (please specify)				
							Optional items				
								Without (leave space blank)			
							CA	5-point calibration with certificate			

K1 N - 1 - 1 - 50 - P E000 / _____ (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.