

# 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 simul-

taneously 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.



# Katronic

## Your Solution Starts With Our Product

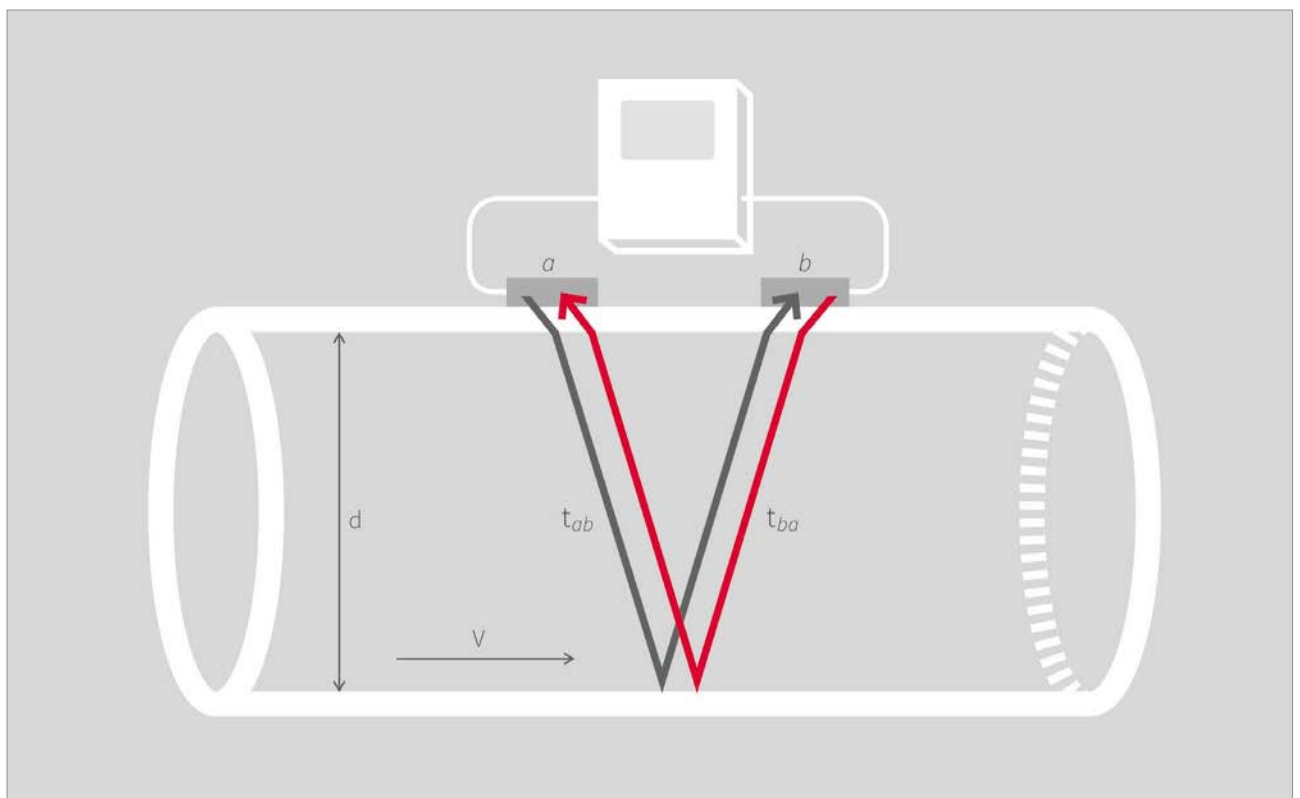
### THE TECHNOLOGY BEHIND THE MEASUREMENT

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*.

Portable  $-30^{\circ}\text{C}$   $+250^{\circ}\text{C}$



## 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

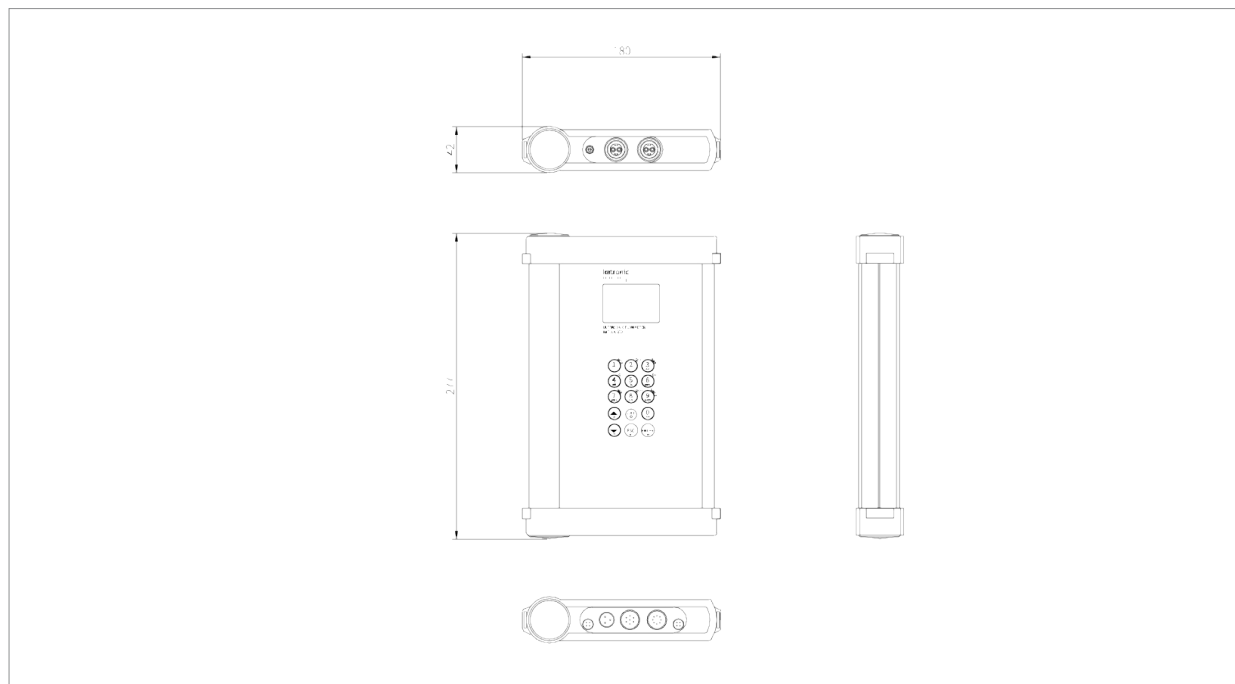


## FLOWMETER

### 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, $\pm 0.015$ m/s
Accuracy	Volume flow: $\pm 1 \dots 3$ % of measured value depending on application $\pm 0.5$ % of measured value with process calibration Flow velocity (mean): $\pm 0.5$ % of measured value
Turn down ratio	1/100 (equivalent to 0.25 ... 25 m/s)
Measurement rate	100 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	<i>Average, difference, sum, maximum</i> (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 <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
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)
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#### Process outputs\* (galvanically isolated)

Current	0/4 ... 20 mA active ( $R_{Load} < 500 \Omega$ ), 16 bit resolution, U = 30 V, accuracy: 0.1 %
Digital open-collector	Value: 0.01 ... 1000/unit, width: 1 ... 990 ms, U = 24 V, $I_{max} = 4 \text{ mA}$
Digital relay	Form A SPST (NO), U = 48 V, $I_{max} = 250 \text{ mA}$

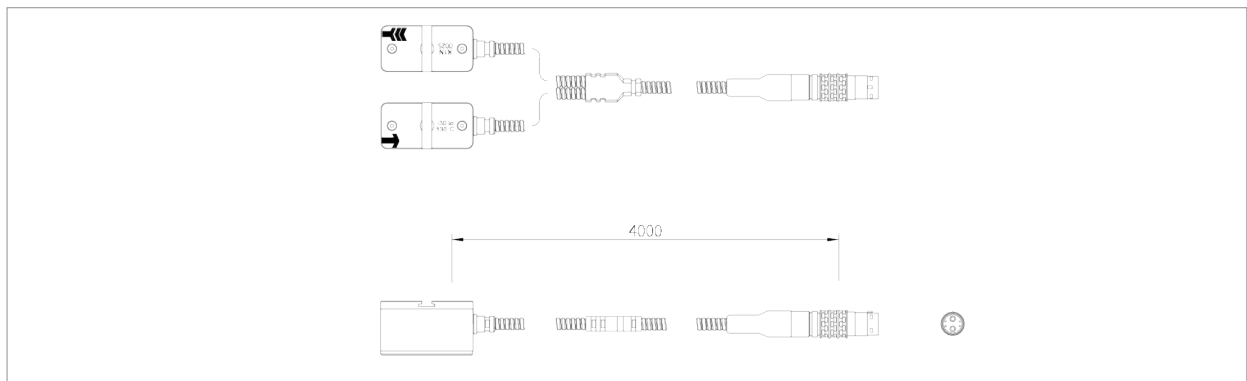
\* Further process outputs available on application.

## 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

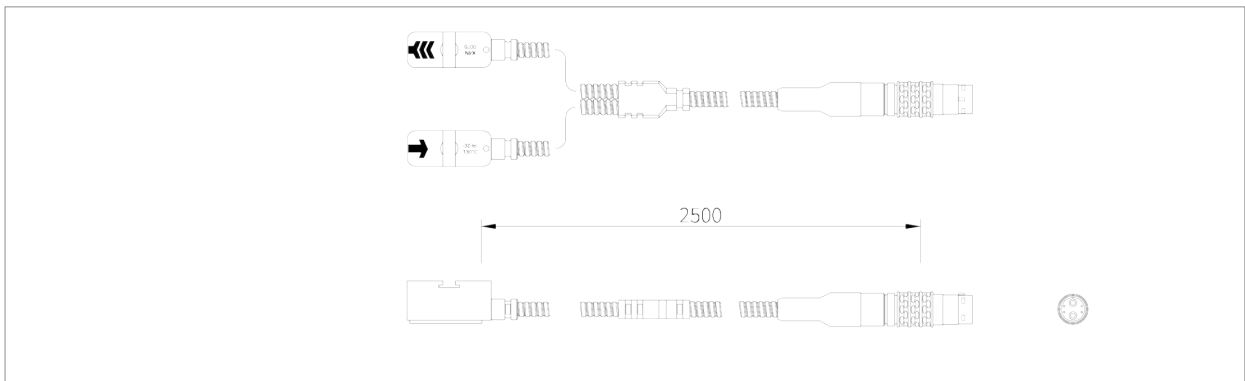


K1N/E transducers with ODU/LEMO connector

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



K4L transducers



K4N/E transducers with ODU/LEMO connector



## TRANSDUCER MOUNTING ACCESSORIES

### General

Diameter range and mounting types

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

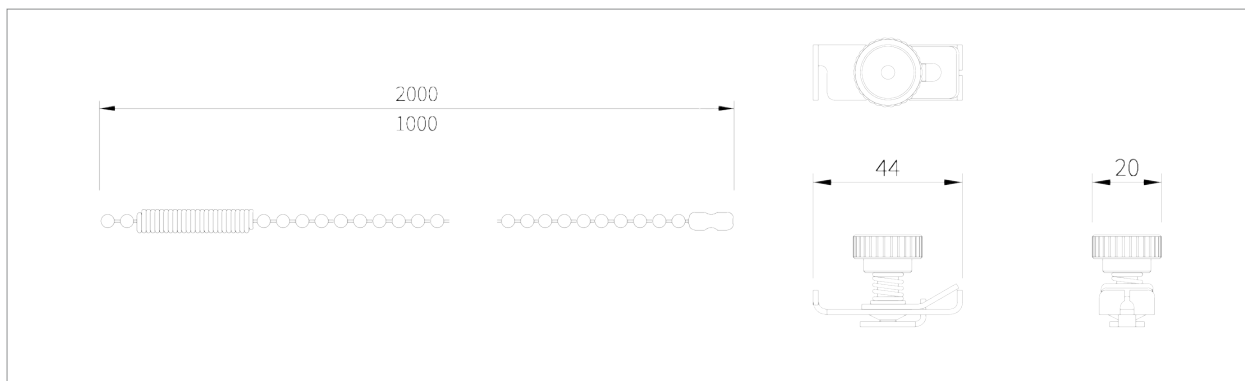
Clips and chains, chain length 1 m,  
stainless steel: DN 15 ... 310

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

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

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

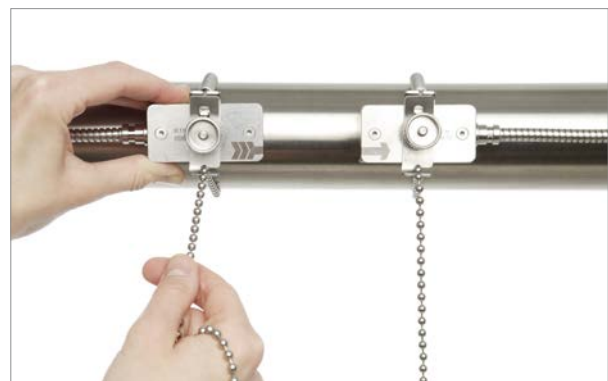
### Images



Mounting clip and chains for use with portable flowmeter



Mounting clip



Transducers mounted using chains and clips

General

Diameter range and mounting types

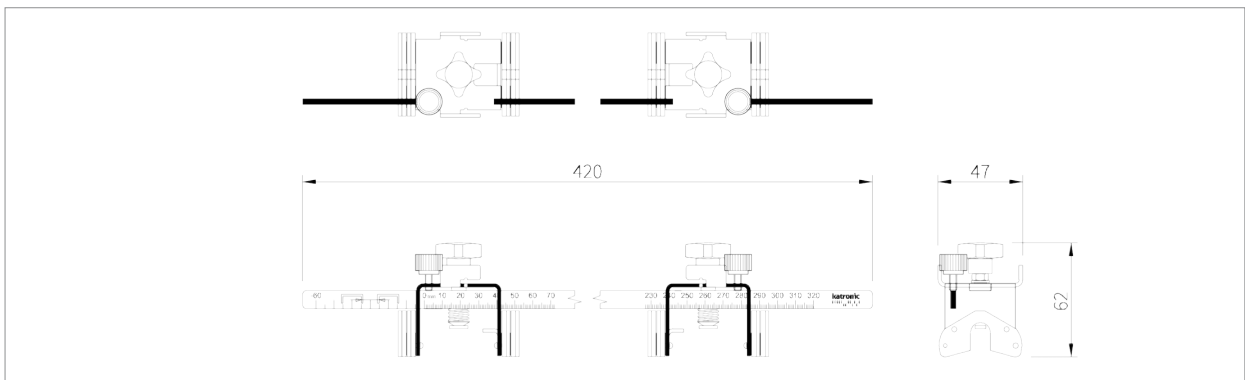
Mounting fixture, rail and magnets (for type K4 ):  
DN 10 ... 250

Mounting fixture, rail and magnets (for type K1 ):  
DN 50 ... 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



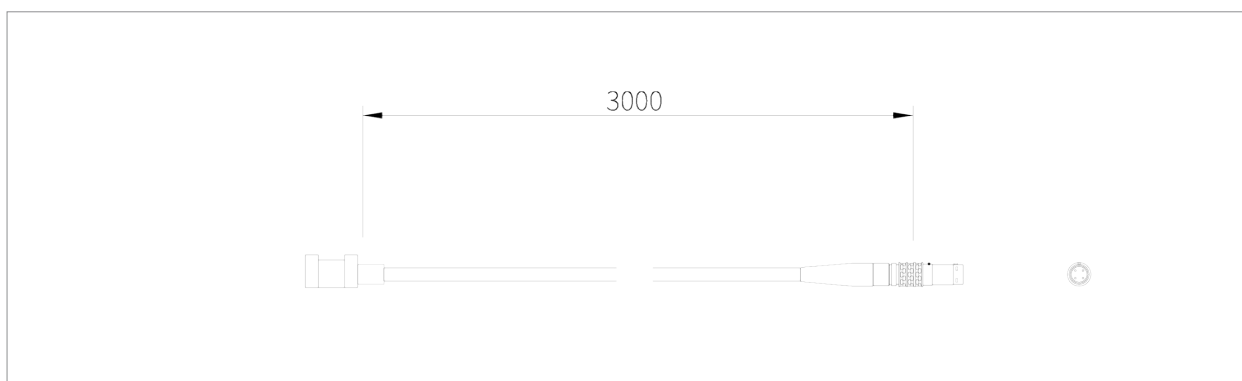
Example of mounting fixture for flexible hoses

## PT100 CLAMP-ON SENSORS

### General

Type	PT100 (clamp-on sensors)
Measurement range	-30 ... +250 °C (-22 ... +482 °F)
Circuits	4-wire
Accuracy T	$\pm(0.15 \text{ °C} + 2 \times 10^{-3} \times T \text{ [°C]})$ , class A
Accuracy $\Delta T$	$\leq 0.1 \text{ K}$ ( $3 \text{ K} < \Delta T < 6 \text{ K}$ ) 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



PT100 transducer fixed to pipe



KATflow 230 with PT100 transducer

## WALL THICKNESS GAUGES (OPTIONAL)

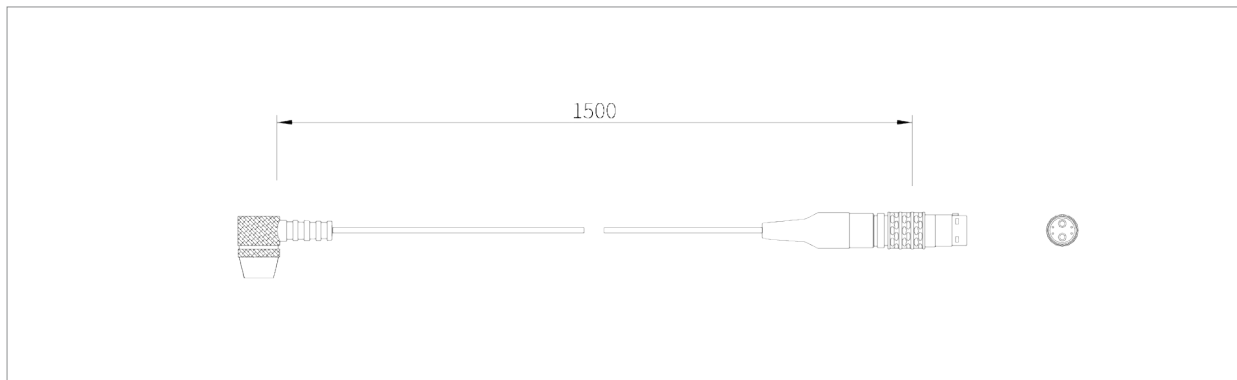
### Wall thickness gauge NT

Temperature range	-20 ... +100 °C (-4 ... +212 °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

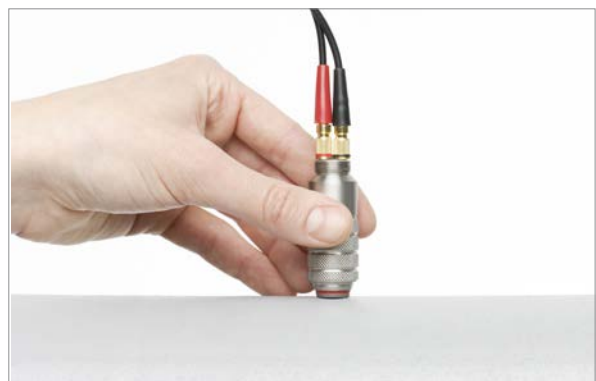
### Images



Wall thickness gauge NT



Wall thickness gauge NT in use



Wall thickness gauge HT in use

## 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

## FLOWMETER AND ACCESSORIES

KF 230	KATflow 230, serial interface RS 232, operating instructions
<b>Configuration</b>	
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
<b>Number of measurement channels</b>	
1	1 measurement channel
2	2 measurement channels
<b>Internal code</b>	
03	Internal code
<b>Power adapter</b>	
0	Without
1	UK
2	US
3	Europe
4	Australia
Z	Special (please specify)
<b>Degree of protection</b>	
1	IP 65 (standard)
2	IP 67 (transport case with external transducer connections)
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)
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) <sup>1)</sup>
AAAA	4 x PT100 input for 2-channel heat quantity measurement (select HQM function no. 2) <sup>1)</sup>
Z	Special (please specify)
<b>Internal data logger</b>	
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
<b>Wall thickness measurement</b>	
0	Without
2	Wall thickness gauge NT
3	Wall thickness gauge HT
<b>Heat quantity measurement (HQM)<sup>1)</sup></b>	
0	Without
1	With HQM incl. 2 x PT100 sensors
2	With HQM incl. 4 x PT100 sensors
<b>Sound velocity output (SVO)<sup>2)</sup></b>	
0	Without
1	With SVO
<b>Optional items</b>	
	Without (leave space blank)
BA	Spare battery set and external battery charging unit
BP	External battery pack for long-term power supply
Z	Special (please specify)

**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 recognition and interface detection.

## 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)
<b>Temperature range</b>	
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)
<b>Internal code</b>	
1	Internal code
<b>Degree of protection</b>	
1	IP 66 (standard)
2	IP 67 (please consult factory)
3	IP 68 (please consult factory)
Z	Special (please specify)
<b>Transducer mounting accessories</b>	
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)
<b>Transducer connection</b>	
P	ODU/LEMO transducer plug
PJ	ODU/LEMO transducer plug with junction box (for transducer type L)
<b>Extension cables</b>	
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)
<b>Optional items</b>	
	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.

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