ENVIRONMENTAL MONITORING SOLUTIONS
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# KATflow 150

## Advanced Clamp-On Ultrasonic Flowmeter

### FAST. FLEXIBLE. FUNCTIONAL.

The KATflow 150 is the premier product for flexibility and performance, providing the user with a comprehensive specification and a list of configuration options. The practical modular design and the wide variety of different transducer types available ensure this instrument is suitable for everything from simple water flow measurements to energy flow monitoring and automated process control.

Fixed Installation

-30 °C +250 °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), higher temperatures available on request
- Lockable and sturdy IP 66 polycarbonate flowmeter enclosure
- Selectable three-line LCD display and full keypad
- Up to ten input or output slots available
- Measurement of two flows simultaneously


## Features

- Dual flow monitoring with *sum*, *average*, *difference* and *maximum* calculations
- Process output options including current, open-collector, relay
- Communication options RS 485, Modbus RTU, Profibus PA and HART* compatible output
- Current inputs for temperature, pressure and density compensation
- Large data logger and software for sampling and data transfer
- Optional heat quantity (thermal energy) measurement functionality

## Accessories

- PT100 transducers or analogue temperature inputs for heat quantity measurement and temperature compensation
- Additional secondary enclosure for ATEX applications
- Optional sound velocity output function

## Applications

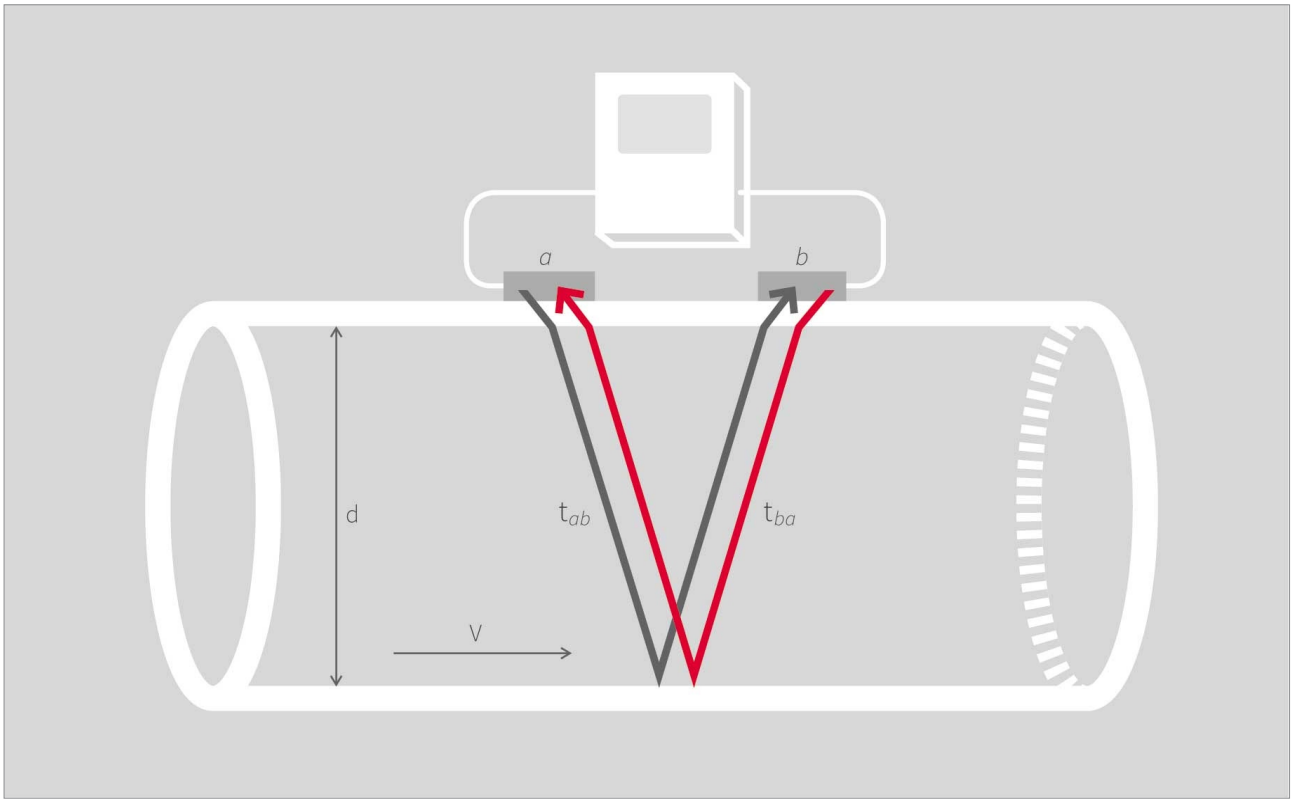
- Heating, Ventilation and Air Conditioning (HVAC) measurements
- Large pipe measurement with two sensor pairs in ‘X’ configuration
- Product recognition and interface detection systems
- ATEX measurements with Ex-certified transducers
- Effluent and wastewater measurements
- Automated process control

## 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.



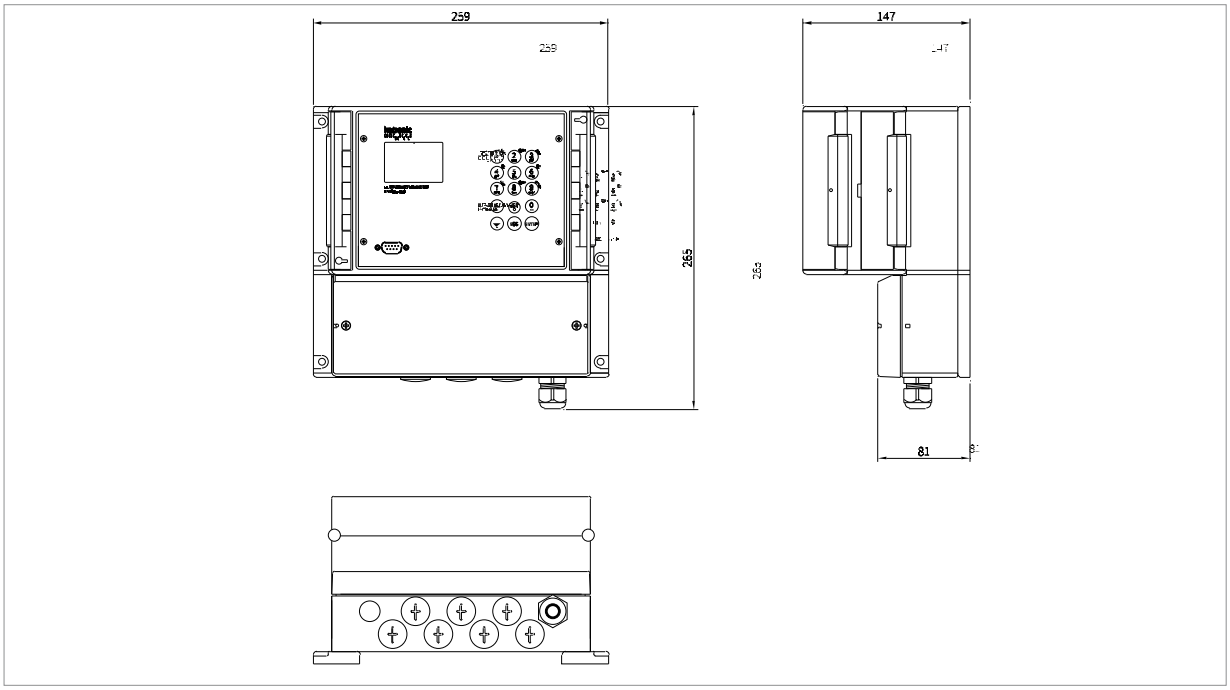

Sensors *a* and *b* work alternately to send and receive ultrasonic pulses. The sound waves *ab* travelling with the flow move faster than those travelling against it *ba*.

# 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:<br>±1 ... 3 % of measured value depending on application<br>±0.5 % of measured value with process calibration<br>Flow velocity (mean):<br>±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 150 (dimensions in mm)

## General

| | |
|---|---|
| Enclosure type | Wall mounted |
| Degree of protection | IP 66 according to EN 60529 |
| Operating temperature | -10 ... +60 °C (+14 ... +140 °F) |
| Housing material | Polycarbonate (UL94 V-0) |
| Measurement channels | 1 or 2 |
| Calculation functions | *Average*, *difference*, *sum*, *maximum* (dual-channel use only) |
| Power supply | 100 ... 240 V AC, 50/60 Hz<br>9 ... 36 V DC<br>Special solutions (e.g. solar panel, battery) on request |
| Display | LCD graphic display, 128 x 64 dots, backlit |
| Dimensions | 237 (h) x 258 (w) x 146 (d) mm |
| Weight | Approx. 2,3 kg |
| Power consumption | < 10 W |
| Operating languages | English, French, German, Dutch, Spanish, Italian, Russian, Czech, Turkish, Romanian (others on request) |

## Images

KATflow 150 with transducer pair

KATflow 150 in operation

## Communication

| | |
|---|---|
| Type | RS 232, USB cable (optional), RS 485 (optional), Modbus RTU (optional), HART* compatible (optional), Profibus PA |
| 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<br>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<br>Linux |

## Quantity and units of measurement

| | |
|---|---|
| Volumetric flow rate | $m^3/h$, $m^3/min$, $m^3/s$, l/h, l/min, l/s<br>USgal/h (US gallons per hour), USgal/min, USgal/s<br>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 |
| 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 |

## Technical Data: Hazardous Area Enclosure

### General

| | |
|---|---|
| Enclosure type | Wall mounted (additional to KATflow 150 flowmeter) |
| Degree of protection | IP 66 according to EN 60529 |
| Operating temperature | -20 ... +40 °C (-4 ... +104 °F) |
| Housing material | Grade LM6 cast alloy |
| Finish | RAL 7035 epoxy powder coated |
| Dimensions | 358 (h) x 278 (w) x 218 (d) mm |
| Weight | Approx. 20.0 kg (with KATflow 150 flowmeter) |
| Ex-certification code | II 2G/D Ex d IIB T4 - T6 IP67 |
| Ex-certification number | CESI 01 ATEX 063 |

## Technical Data: Hazardous Area Transducers

### K1Ex and K4Ex

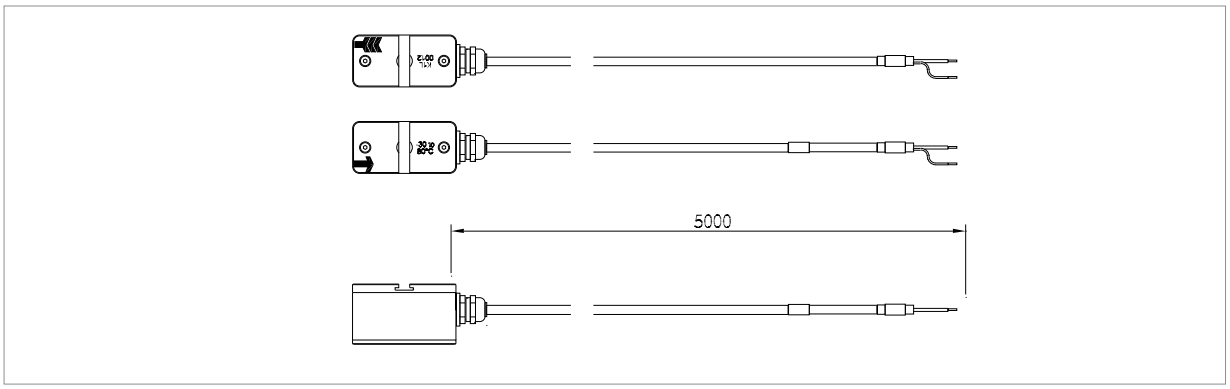
| | |
|---|---|
| Pipe diameter range | 10 ... 250 mm for type K4Ex<br>50 ... 3,000 mm for type K1Ex |
| Dimensions of sensor heads | 60 (h) x 30 (w) x 34 (d) mm |
| Material of sensor heads | Stainless steel |
| Material of cable conduits | PTFE |
| Temperature range | -50 ... +115 °C (-58 ... +239 °F) |
| Standard cable length | 5.0 m |
| Degree of protection | IP 68 according to EN 60529 |
| Ex-certification code | II 2G Ex mb IIC T4 - T6 X<br>II 2D Ex mbD 21 IP68 T80 °C - T120 °C X |
| Ex-certification number | TRAC 09 ATEX 21226 X |
| Ex-protection method | Encapsulation (m), ignition source control (b) |
| Note | The transducers are approved for use in hazardous areas classified as Ex-Zone 1 and 2. They are connected to the flowmeter via extension cables and Ex-approved junction boxes. The flowmeter can be installed in a safe area or, if equipped with the additional Ex-enclosure, together with the transducers in a hazardous environment. |

# Technical Data: Transducers

## K1L, K1N, K1E

| | |
|---|---|
| Pipe diameter range | 50 ... 3,000 mm for type K1N/E<br>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<br>Type K1N/E: Stainless steel |
| Temperature range | Type K1L: -30 ... +80 °C (-22 ... +176 °F)<br>Type K1N: -30 ... +130 °C (-22 ... +266 °F)<br>Type K1E: -30 ... +250 °C (-22 ... +482 °F)<br>(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<br>Type K1N/E: 4.0 m |

## Images




K1L transducers

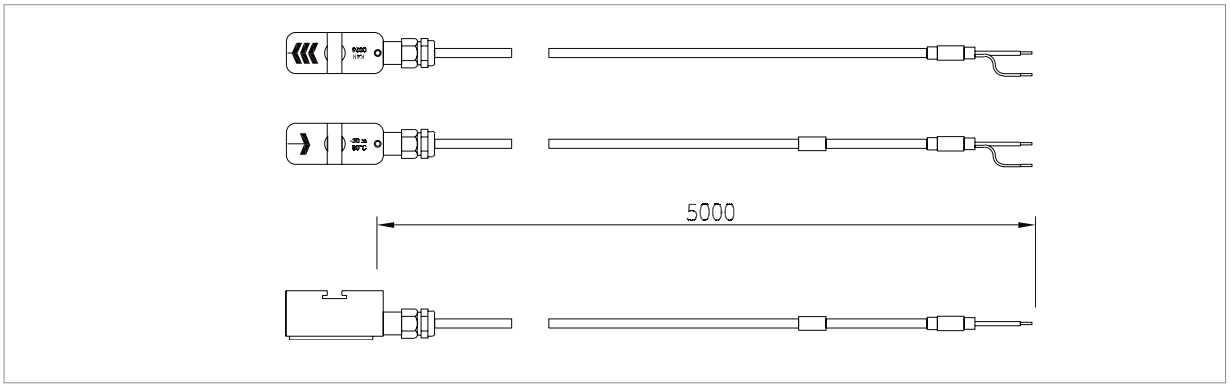
K1L transducers

K1N/E transducers

### K4L, K4N, K4E

| | |
|---|---|
| Pipe diameter range | 10 ... 250 mm for type K4N/E<br>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<br>Type K4N/E: Stainless steel |
| Temperature range | Type K4L: -30 ... +80 °C (-22 ... +176 °F)<br>Type K4N: -30 ... +130 °C (-22 ... +266 °F)<br>Type K4E: -30 ... +250 °C (-22 ... +482 °F)<br>(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<br>Type K4N/E: 2.5 m |

### Images




K4N/E transducers


K4L transducers


K4N/E transducers

### Extension cable

| | |
|---|---|
| Available lengths | 5.0 ... 100 m |
| Cable type | Coaxial |
| Material cable jacket | TPE |
| Operating temperature | -40 ... +80 °C (-40 ... +176 °F) |
| Minimum bend radius | 67 mm |

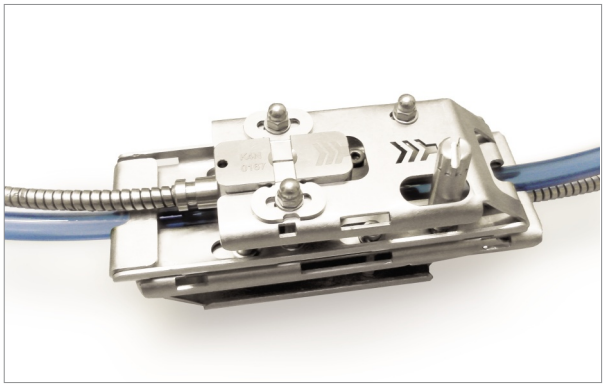
### Cable connection

| | |
|---|---|
| Connection types | Junction box, Amphenol connectors (for transducer type N) |
| Termination into transmitter | SMB connector (SubMiniature version B)<br>Direct cable connection (terminal block) |

## Technical Data: Transducer Mounting Accessories

| | |
|---|---|
| Diameter range and mounting types | Clamping set (metal strap with screw),<br>stainless steel: DN 10 ... DN 40<br>Metallic straps and clamps: DN 15 ... DN 310<br>Metallic straps and clamps: DN 25 ... DN 3,000<br>Metallic mounting rail and straps (available on request):<br>DN 50 ... DN 250 or DN 50 ... DN 3,000 |
| Mounting fixture for flexible hoses | Custom made mounting bracket, stainless steel<br>(available on request) |

### Images



Example of mounting fixture for flexible hoses

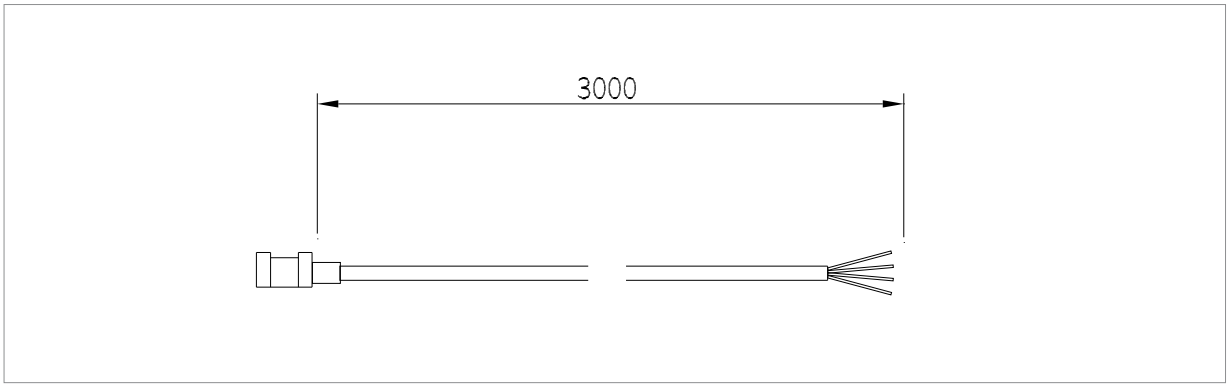
Metallic mounting rail with transducers

# Technical Data: PT100 Clamp-On Sensors

## General

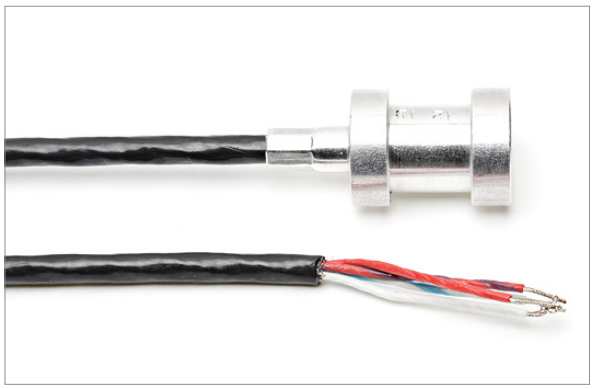
| | |
|---|---|
| Type | PT100 (clamp-on sensors) |
| Measurement range | -30 ... +250 °C (-22 ... +482 °F) |
| Circuits | 4-wire |
| Accuracy T | $\pm(0.15\ °C + 2 \times 10^{-3} \times T\ [°C])$, class A |
| Accuracy ΔT | ≤ 0.1 K (3 K < ΔT < 6 K), corresponding to EN 1434-1 |
| Response time | 50 s |
| 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

PT100 transducer fixed to pipe



PT100 with wired cable connection

## Configuration Code: Flowmeter and Accessories

| | | |
|---|---|---|
| KF 150 | | Ultrasonic flowmeter KATflow 150, serial interface RS 232, 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 Polycarbonate (UL94 V-0), wall mounted, IP 66 |
| | | 2 Hazardous area enclosure, powder-coated LM6 cast alloy, IP 66 (II 2G/D Ex d IIB T4 - T6 IP67) |
| | | 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 8 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] |
| | | AA 2 x PT100 input for 1-channel heat quantity measurement (select HQM option no. 2)[4] |
| | | AAAA 2 x PT100 input for 2-channel heat quantity measurement (select HQM option no. 3)[4] |
| | | 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)/Heat quantity measurement (HQM)** |
| | | 0 Without |
| | | 1 With TC incl. 1 x PT100 sensor, 3 m cable[3] |
| | | 2 With 1-channel HQM incl. 2 x PT100 sensor, 3 m cable[4] |
| | | 3 With 2-channel HQM incl. 4 x PT100 sensor, 3 m cable[4] |
| | | Z Special (please consult factory) |
| | | **Sound velocity output (SVO)[5]** |
| | | 0 Without |
| | | 1 With SVO |
| | | **PT100 cable extension** |
| | | 0 Without |
| | | PTJ With 1 x junction box for PT100 sensor |
| | | 2PTJ With 2 x junction box for PT100 sensors |
| | | 3PTJ With 3 x junction box for PT100 sensors |
| | | 4PTJ With 4 x junction box for PT100 sensors |
| | | **PT100 extension cable (length in m)** |
| | | 000 Without |
| | | ___ With extension cable (specify length in m) |
| | | **Optional items** |
| | | Without (leave space blank) |
| | | Ex Suitable for connection with Ex-transducers |
| | | SW KATdata+ download software and RS 232 cable |
| | | SU KATdata+ download software and USB cable |

KF 100 - 2 - 03 - 1 - 1 - 0 - CDR - 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) 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 measurement of thermal energy consumption (for one circuit or two circuits).
5) 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** | | | | | | | | | | | |
| | L | Process temperature -30 ... +80 °C, including acoustic coupling paste | | | | | | | | | | |
| | N | Process temperature -30 ... +130 °C, including acoustic coupling paste | | | | | | | | | | |
| | E | Process temperature -30 ... +250 °C, including acoustic coupling paste | | | | | | | | | | |
| | Ex | Process temperature -50 ... +115 °C, including acoustic coupling paste (II 2G Ex mb IIC T4 - T6 X) | | | | | | | | | | |
| | 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** | | | | | | |
| | | | | | | O | Without connector or junction box (transducer type L or Ex) | | | | | |
| | | | | | | | C 000 | Wired transducer connection to flowmeter | | | | |
| | | | | | | D | Without connector or junction box (transducer type N) | | | | | |
| | | | | | | | C 000 | Direct transducer connection to flowmeter | | | | |
| | | | | | | A | Extension via Amphenol type connector (transducer type N) | | | | | |
| | | | | | | | C 010 | With extension cable, 10 m length | | | | |
| | | | | | | | C___ | With extension cable (specify length in m) | | | | |
| | | | | | | J | Extension via junction box (transducer type L or N) | | | | | |
| | | | | | | | C 005 | With extension cable, 5 m length | | | | |
| | | | | | | | C 010 | With extension cable, 10 m length | | | | |
| | | | | | | | C___ | With extension cable (specify length in m) | | | | |
| | | | | | | JX | Extension via ATEX-junction box (transducer type Ex) | | | | | |
| | | | | | | | 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 L - 1 - 1 - 5 - 0 - J - 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.

* HART® is a registered trademark of the *HART Communication Foundation*