

KATflow 180 G

Gas Clamp-On Ultrasonic Flowmeter

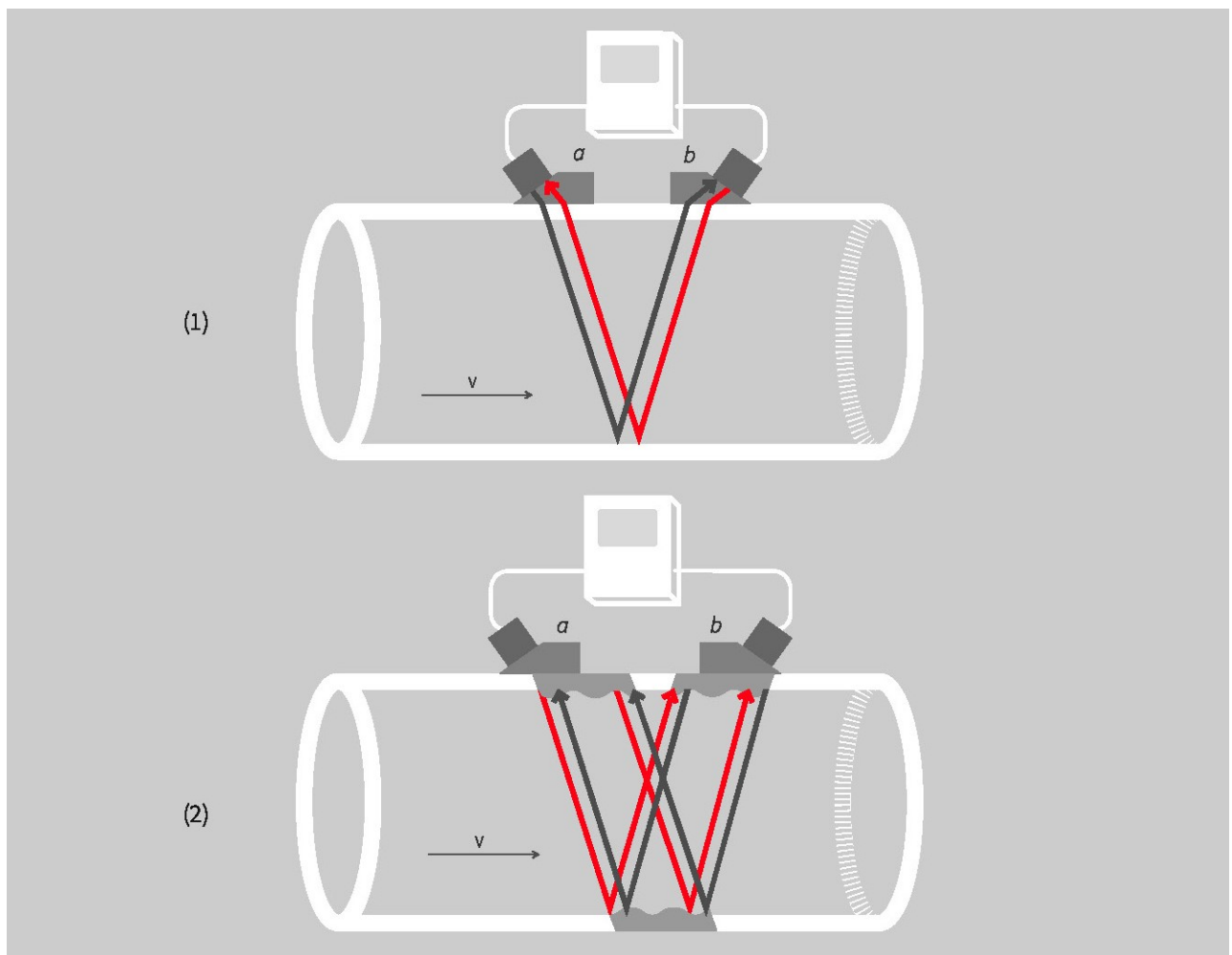
MEASUREMENT FROM AMMONIA TO XENON

Our Katronic™ range flowmeters are well established for liquid flow applications and can now be applied for the non-invasive measurement of gases. The new method not only provides measurements at high pressure gas flows but also down to atmospheric conditions even in steel pipes which was impossible until recently. This unique innovation is achieved through advances in sensor technology, powerful sophisticated electronics, adaptive filtering techniques and innovative signal processing algorithms using Digital Signal Processors (DSPU's).



THE TECHNOLOGY BEHIND THE MEASUREMENT

The non-invasive measurement of gas flow is more difficult than for liquids owing to the high damping characteristics of the gaseous media. These properties mean that traditional transit-time techniques using Shear Wave sensors can only be applied for higher pressure gas pipelines. In order to successfully measure low pressure applications alternative Lamb Wave transducers should be considered instead. This method involves ultrasonic signals being excited into the pipe at the resonance frequency of the pipe wall and material which causes the pipe to become both the transmitting and sensing device. By operating in this way higher receiving signal amplitudes can be achieved thereby compensating for the signal attenuation of the gas. The active transmission area of the pipe wall created is several times the length of the actual transducer, resulting in broader signal characteristics which allow measurements over a wider range of operating conditions. This is important as temperature, pressure and gas composition can change and the flowmeter needs to be able to adapt to these variations.



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 . Sensor mounting arrangements for Shear Wave (1) and Lamb Wave (2) signal evaluation shown.

Specification

- Pipe diameter range 25 mm to 1500 mm
- Temperature range for safe area sensors
-20 °C to +135 °C (-4 °F to 275 °F), for Ex-sensors
-40 °C to +80 °C (-40 °F to +176 °F)
- Robust IP 66 unit with OLED display and glass-fronted keypad
- Pressure range 1 bar (absolute) to unlimited maximum
- Flow velocities 0.1 m/s to 75 m/s
- All commonly used pipe materials

Features

- Suitable for installation in safe and/or hazardous areas
- Shear and Lamb Wave IP 68 stainless steel sensors
- Process output options including current, open-collector, relay
- Communication option Modbus RTU, Modbus TCP/IP
- Inputs for temperature, pressure and gas compressibility factor available
- Web-based data evaluation, instrument setup via wired, wireless or GSM connection

Applications

- Measurement on natural gas pipelines
- Natural gas storage installations
- Control of compressor stations
- Sour gas measurements
- Synthesised gas flow measurements
- Compressed air flow measurements

Media

Air, argon, carbon monoxide, ethane, ethylene, helium, hydrogen, natural gas, nitrogen, nitrous oxide, oxygen, process gas, propane, saturated steam, sour gas

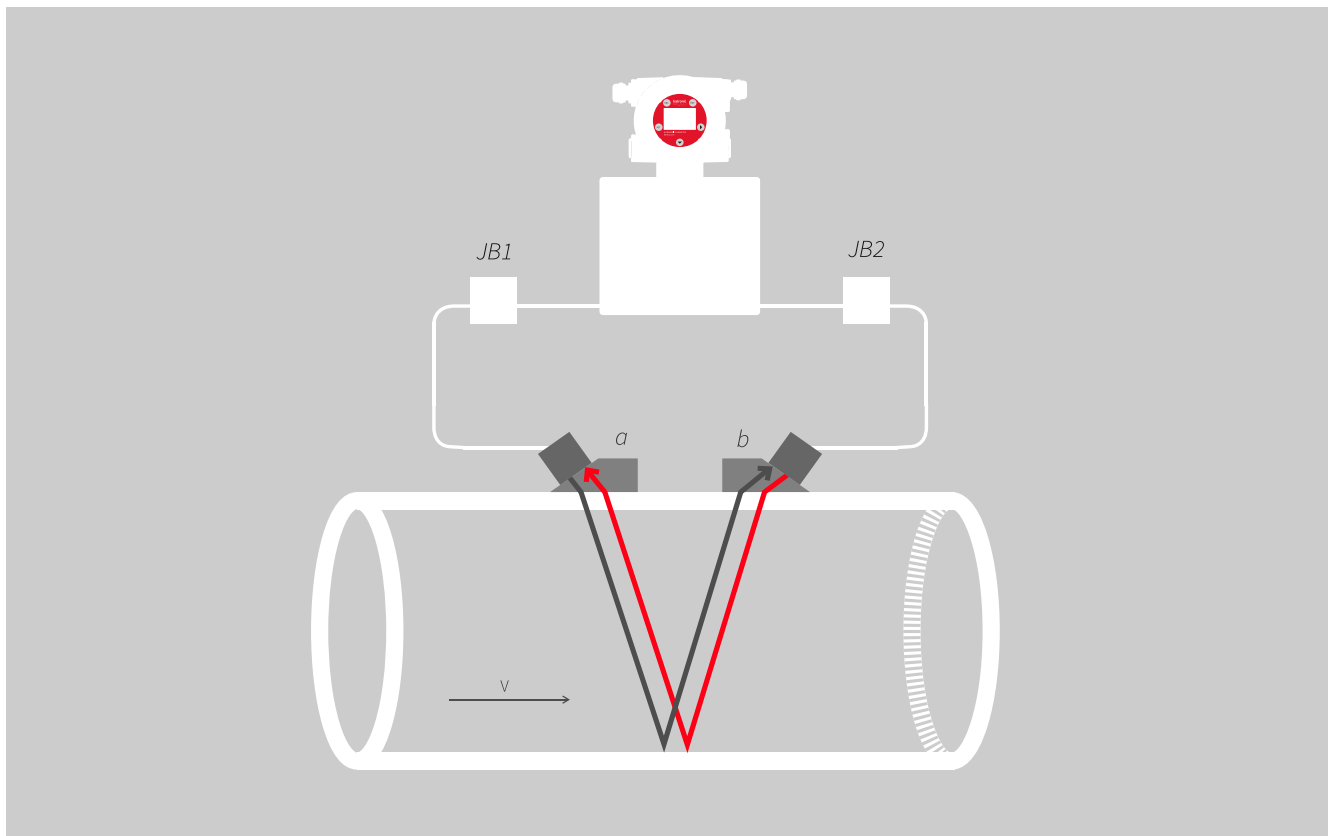


FLOWMETERING SYSTEM

Performance

| | |
|-----------------------------|--|
| Measurement principle | Ultrasonic correlation transit-time difference |
| Flow velocity range | 0.1 ... 75 m/s |
| Resolution | 0.25 mm/s |
| Repeatability | 0.15 % of measured value, ± 0.015 m/s |
| Accuracy | Volume flow: $\pm 1 \dots 3$ % of measured value depending on application |
| Turn down ratio | 1/200 (equivalent to 0.35 ... 75 m/s) |
| Measurement rate | 100 Hz (standard) |
| Response time | 1 s (standard), 90 ms (optional) |
| Damping of displayed value | 0 ... 99 s (selectable by user) |
| Pressure range | 0.1 MPa (1 bar) to unlimited maximum |
| Liquid content of gas media | < 5 % of volume |

System diagram

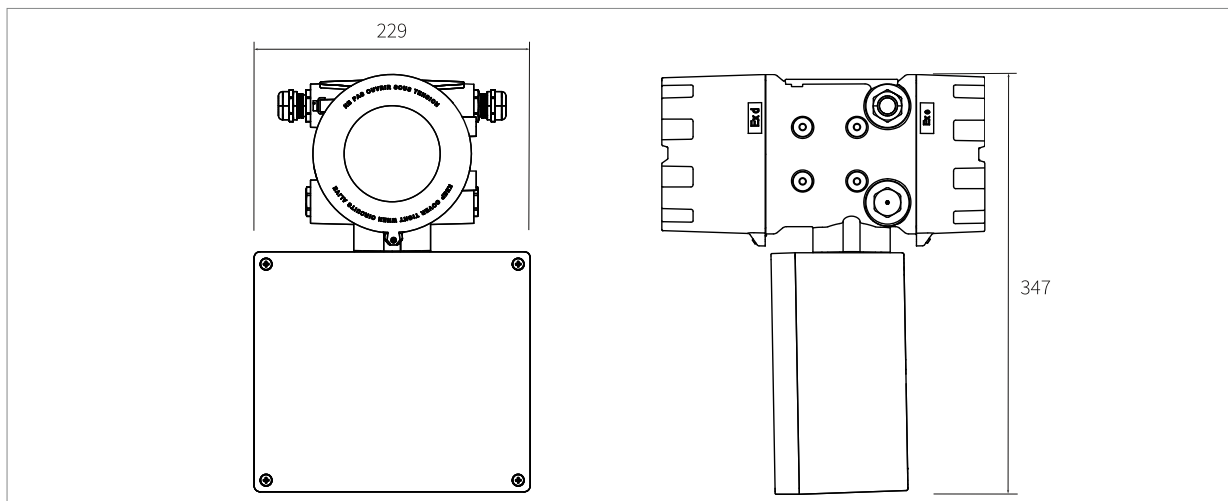


KATflow 180 G (system diagram)

General

| | |
|-------------------------|--|
| Enclosure type | Field housing, pipe, wall or floor 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 db eb IIB T6 |
| Ex-certification number | EPS 11 ATEX 1355 X |
| Measurement channels | 1 |
| Power supply | 100 ... 240 V, AC 50/60 Hz 9 ... 36 V DC Special solutions on request |
| Display | OLED graphic display, 128 x 64 dots, backlit |
| Power consumption | < 25 W |
| Operating languages | English (others on request) |

Drawings



KATflow 180 G (dimensions in mm)

Communication

| | |
|----------------------|-------------------------------------|
| Type | Modbus RTU or Modbus TCP/IP |
| Remote communication | Ethernet (wired or wireless) or GSM |

Process variables

| | |
|------------------------|------------------------|
| Volumetric flow rate | Standard or normalised |
| Gas flow normalisation | AGA8 or GERG |

Process inputs (galvanically isolated)

| | |
|--|---|
| Temperature | Pt 100 (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 (temperature, pressure, gas composition) | 0/4 ... 20 mA active or 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 | 4 ... 20 mA, 24 V DC, R _{Load} = 220 Ω |

TRANSDUCERS

G5, G10

| | |
|----------------------------|---|
| Type G5 | 500 kHz (Ex and non-Ex) |
| Type G10 | 1 MHz (Ex and non-Ex) |
| Material of sensor heads | Stainless steel |
| Material of cable conduits | PTFE |
| Temperature range | -40 ... +80 °C (-40 ... +176 °F) (for Ex-versions) -20 ... +135 °C (-4 ... +275 °F) (for non-Ex-versions) |
| Standard cable lengths | 10.0 m |
| Degree of protection | IP 68 according to EN 60529 |
| Ex-certification code | II 2G Ex mb IIC T6 Gb |
| Ex-certification number | ZELM 04 ATEX 0212 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



KATflow 180 and G5 type transducers in operation



KATflow 180 pipe mounted with 2" mounting frame

MOUNTING ACCESSORIES

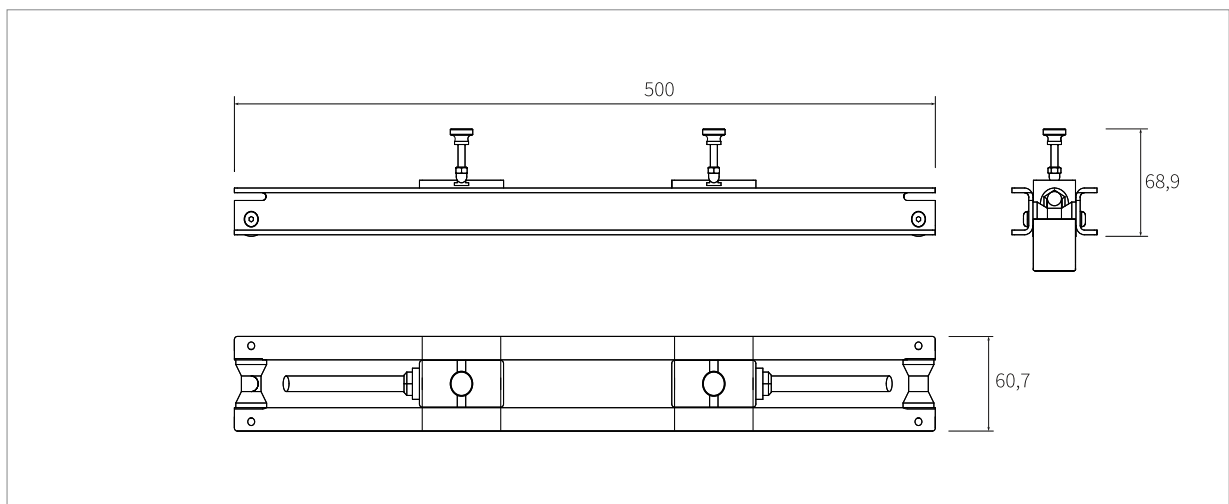
General

Diameter range and mounting types

Mounting frame and sensor protection: DN 25 ... 250

Mounting frame and sensor protection: DN 80 ... 1 500

Drawings and images



Metallic mounting rail



Metallic mounting rail with transducers



Transducer protection cover

FLOWMETER AND ACCESSORIES - Configuration Code

| | |
|---------------------------------------|--|
| KF180 | Ultrasonic flowmeter KATflow 180 , operating instructions |
| Internal code | |
| G | Internal code |
| Number of measurement channels | |
| 1 | 1 measurement channel |
| Power supply | |
| 1 | 100 ... 240 V AC, 50/60 Hz |
| 2 | 9 ... 36 V DC |
| Z | Special (please specify) |
| Enclosure type | |
| 1 | Non-Ex-enclosure, glass-fronted, copper-free aluminium, epoxy-coated, IP 66 |
| 2 | Ex-enclosure, glass-fronted, copper-free aluminium, epoxy-coated, IP 66, II 2G Ex db eb IIB T6 |
| 3 | Ex-enclosure, glass-fronted, stainless steel, IP 66, II 2G Ex db eb IIB T6 |
| Z | Special (please specify) |
| Communication | |
| 0 | Without |
| 2 | Modbus RTU ¹⁾ |
| 3 | Modbus TCP/IP |
| Z | Special (please specify) |
| Process inputs/outputs | |
| N | Without |
| C | Current output, 0/4 ... 20 mA, active (source) |
| P | Current output, 4 ... 20 mA, passive (sink) |
| D | Digital output, open-collector |
| R | Digital output, relay |
| H | HART* compatible output, 4 ... 20 mA, passive ¹⁾ |
| V | Voltage output, 0 ... 10 V |
| F | Frequency output, 2 Hz ... 10 kHz |
| A | Pt 100 input (for temperature) |
| B | Current input, 0/4 ... 20 mA, active or passive (for pressure, temperature and/or gas compressibility) |
| Z | Special (please specify) |
| Internal data logger | |
| 0 | Without |
| 1 | 30 000 measurements |
| 2 | 100 000 measurements |
| Z | Special (please specify) |
| Optional items | |
| | Without (leave space blank if no optional items required) |
| PM | With 2" pipe mounting bracket |
| FF | Floor standing mounting frame |
| TA | With stainless steel tag (specify text) |

KF180 - **G** - **1** - **1** - **1** - **0** - **CD** - **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) Modbus and HART* compatible outputs can not be used in conjunction with other output options. Please consult factory for more information.

TRANSDUCERS AND ACCESSORIES - Configuration Code

| | |
|--|--|
| G5 | Transducer pair, 500 kHz, pipe diameter range 80 ... 1 500 mm |
| G10 | Transducer pair, 1 MHz, pipe diameter range 25 ... 250 mm |
| Z | Special (please consult factory) |
| Temperature range | |
| L | Process temperature -40 ... +80 °C (-40 ... +176 °F) |
| N | Process temperature -20 ... +135 °C (-4 ... +275 °F) |
| Z | Special (please consult factory) |
| Internal code | |
| A ... J | Attribute type |
| Hazardous area approval | |
| 0 | Safe area use |
| Ex | ATEX-approval, II 2G mb IIC T6 Gb, -40 ... +80 °C (-40 ... +176 °F) |
| Degree of protection | |
| 3 | IP 68 |
| Transducer mounting accessories | |
| 7 | Stainless steel mounting rail, clamps and straps, DN 25 ... 250 (transducer type G10) |
| 8 | Stainless steel mounting rail, clamps and straps, DN 80 ... 1 500 (transducer type G5) |
| 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 |
| C000 | Wired transducer connection to flowmeter |
| JX | Extension via ATEX-junction box |
| C005 | With extension cable, 5 m length |
| C010 | With extension cable, 10 m length |
| C___ | With extension cable (please specify length in m) |
| Z | Special (please specify) |

G10 - **L** - **A** - **0** - **3** - **7 0** - **JX** - **C010** (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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