KATflow 170

Explosion-Proof Clamp-On Ultrasonic Flowmeter

RUGGED. RESISTANT. RELIABLE.

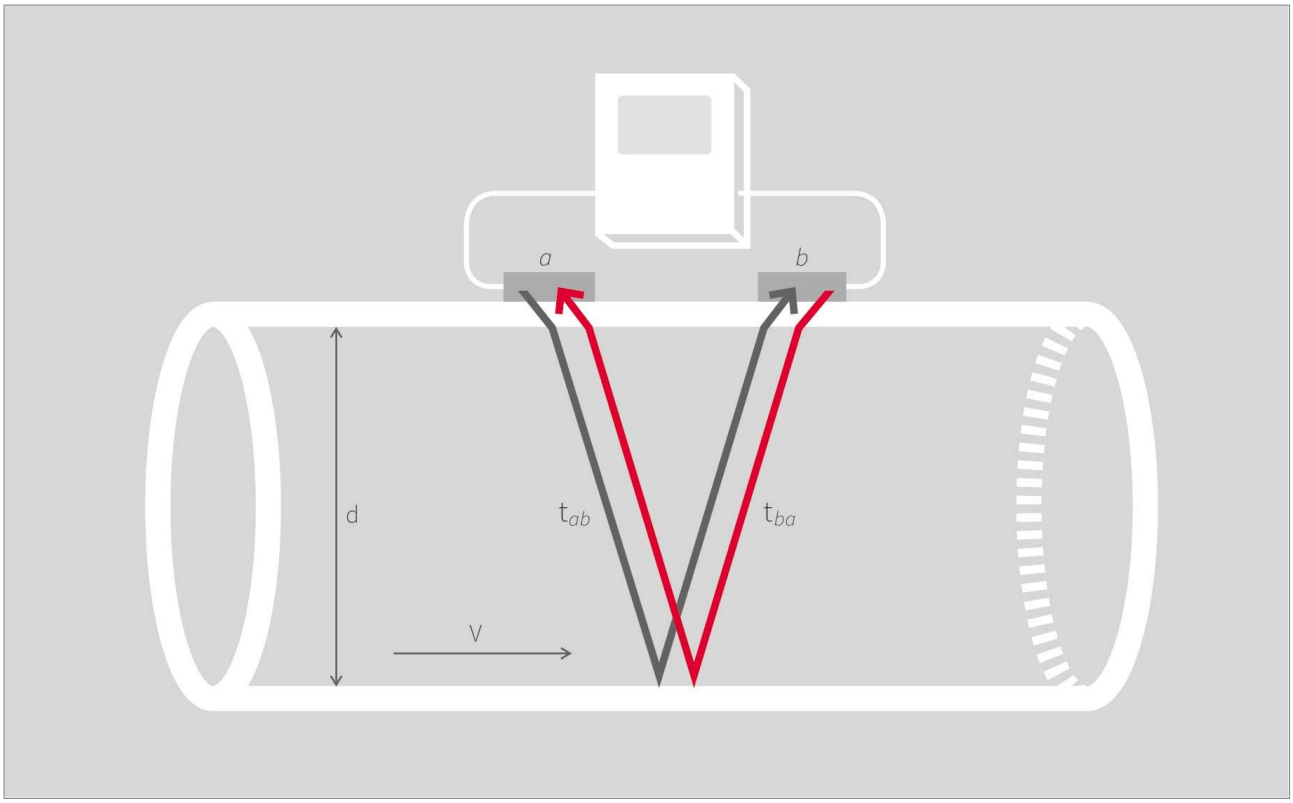
For applications where harsh environmental conditions demand a more rugged instrument, the KATflow 170 provides a corrosion-resistant option as part of a fully Ex-certified package. The flowmeter is intended for permanent operation in Zone 1 and 2 hazardous areas and is a cost-effective choice for a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

THE TECHNOLOGY BEHIND THE MEASUREMENT

The KATflow non-invasive flowmeters work on the transit time principle. Ultrasonic pulses are sent and received from a pair of sensors and travel through the pipe wall and the medium. The technology can be applied to both liquids and gases using clamp-on transducers externally mounted on the surface of the pipe. The flowmeters can measure on pipes of all standard materials over a diameter range of 10 mm to 6 500 mm.

The key principle of the method is that sound waves travelling with the flow will move faster than those moving against. The subsequent difference in the transit time of these signals is measured precisely as it is proportional to the flow velocity of the medium and consequently the flow rate. The flowmeter then compensates for elements that could influence measurements such as flow profile, pipe material and changes in fluid in order to provide reliable results.

Clamp-on flowmeters can be used on media as varied as purified water or toxic chemical effluent, natural gas or air and offer the user many advantages over inline measurement technologies. There is no need to cut the pipe, no shutdown to the system, no risk of leakage and consequently they provide considerable cost savings especially on large pipes. The reliable KATflow instruments have seen success in a vast array of applications from measurements on submarines, to installations on systems destined for use in space.



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*.

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 IP66 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
- IP68 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
- Ex-certified Pt 100 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

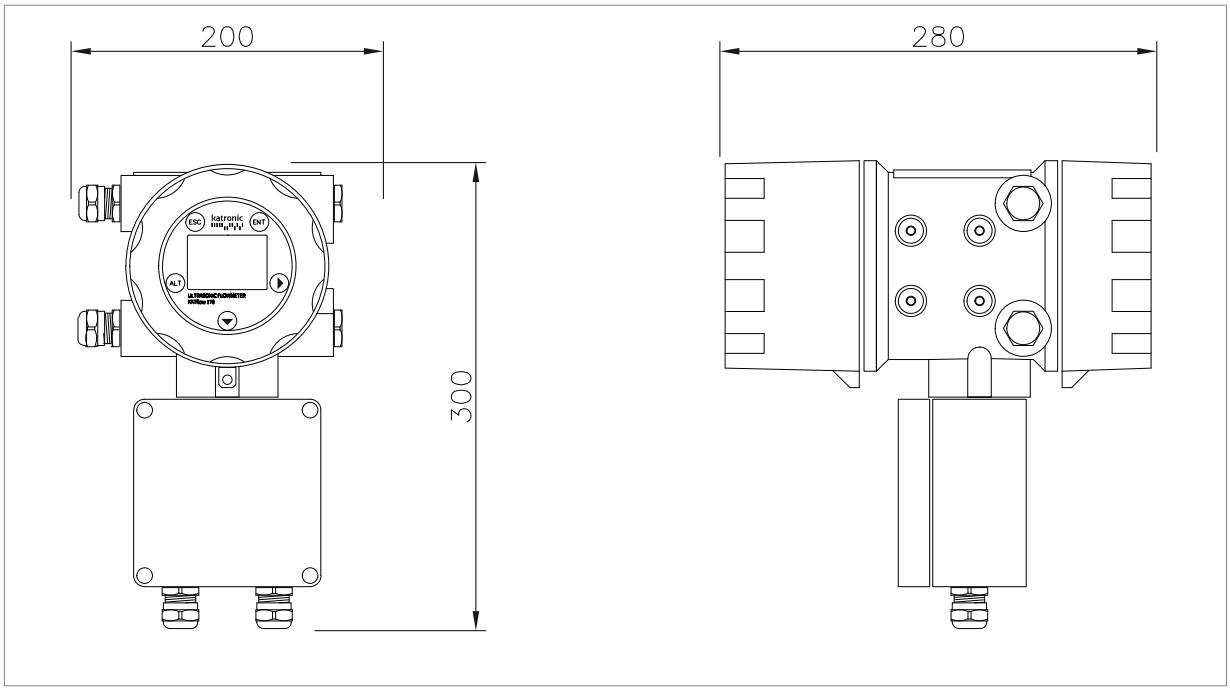
- Produced water measurements
- Methanol and water injection systems
- Product and interface detection systems
- Measurement of refined products
- Tanker unloading systems
- Oil blending skids

FLOWMETER

Performance

Measurement principle	Ultrasonic time difference correlation principle
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
Transit time measurement rate	100 Hz (standard)
Output update time	1 s, faster rates on application
Signal damping	0 ... 99 s
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	IP66 according to DIN EN 60529
Temperature limits	Temperature class T6: -20 ... +60 °C (-4 ... +140 °F)
Housing material	Copper-free aluminium, epoxy and polyurethane-coated Stainless steel (optional)
Type of protection	Flameproof enclosure "d", increased safety "e"
Marking	II 2G Ex db eb IIC T6 Gb (aluminium) II 2G Ex db eb IIB T6 Gb (stainless steel)
Certificate number	IBExU17ATEX1001X/IECEx IBE 17.0001X
Measurement channel	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	280 (h) x 140 (w) x 270 (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. 5,3 kg
Power consumption	< 5 W
Operating languages	Czech, Dutch, English, French, German, Italian, Romanian, Russian, Spanish, Turkish (others on request)

Images

KATflow 170 in operation

KATflow 170 (aluminium enclosure)

Communication

Serial interface	RS 485 (optional), Modbus RTU (optional), HART® compatible output, Profibus PA (optional)
Data	Instantaneous measured value, parameter set and configuration, logged data

Internal data logger

Storage capacity	In excess of one million data points (16 MB)
Logged data	Up to ten selected variables

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 10, 11 Linux, Mac (optional)

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, MJ (with heat quantity measurement option)
Temperature	T_{in} , T_{out} , CU (housing temperature) in °C

Process inputs (galvanically isolated)

Temperature	Pt 100 (clamp-on sensors), three- or four-wire circuit Measurement range: -50 ... +400 °C (-58 ... +752°F), resolution: 0.01 K, accuracy: ±0.02 K
Current	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 and 4 ... 20 mA passive options Active: U = 30 V, R_{Load} < 500 Ω, 16 bit resolution, accuracy: 0.1 % of measured value Passive: U = 9 ... 30 V, R_{Load} < 500 Ω, 16 bit resolution, accuracy: 0.1 % of measured value
Digital optical open-collector	Function: Alarm or Totaliser Totaliser value: 0.01 ... 1 000/unit, width: 1 ... 990 ms, U = 24 V, I_{max} = 4 mA, NO and NC contacts
Digital relay	Function: Alarm or Totaliser Totaliser value: 0.01 ... 1 000/unit, width: 1 ... 990 ms, U = 48 V, I_{max} = 250 mA, NO and NC contacts
Voltage	Range: 0 ... 10 V, R_{Load} = 1 kΩ, C_{Load} = 200 pF, resolution: 16 bit, accuracy: 0.1 % of measured value
Analogue frequency (passive)	2 Hz ... 10 kHz, U = 24 V, I_{max} = 4 mA
HART®	HART-compatible output: 4 process variables selectable (PV, SV, TV and FV) Analogue: 4 ... 20 mA passive, R_{Load} = 220 Ω, U = 24 V, accuracy: 0.1 % of measured value

Images

KATflow 170 in operation

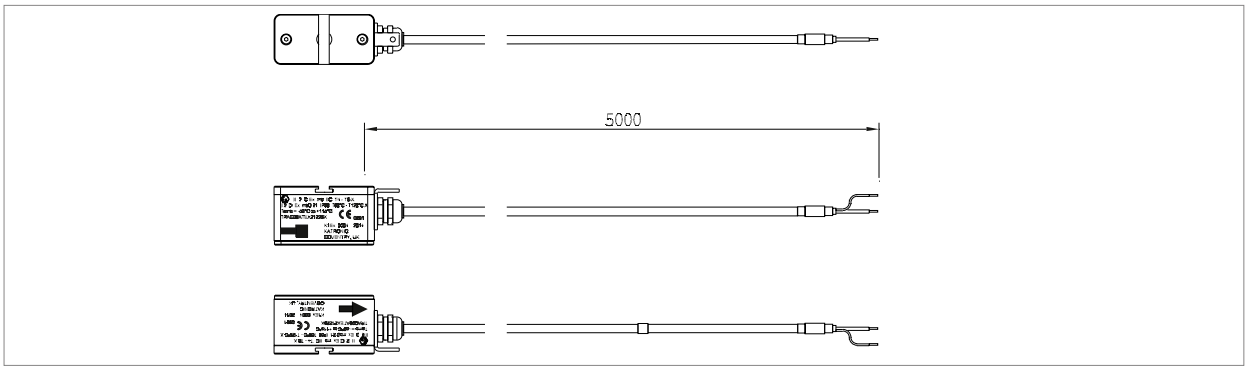
KATflow 170 with stainless steel enclosure

HAZARDOUS AREA TRANSDUCERS

K1Ex, 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	Temperature class T4: -50 ... +115 °C (-58 ... + 239 °F) Temperature class T5: -50 ... +90 °C (-58 ... + 194 °F) Temperature class T6: -50 ... +75 °C (-58 ... + 167 °F)
Standard cable lengths	5.0 m
Degree of protection	IP68 according to DIN EN 60529
Ex-certification code	Gas groups: II 2G Ex mb IIC T4 - T6 X Dust groups: II 2D Ex mb D 21 IP68 T80 °C - T120 °C X
Ex-certification number	TRAC09ATEX21226X
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

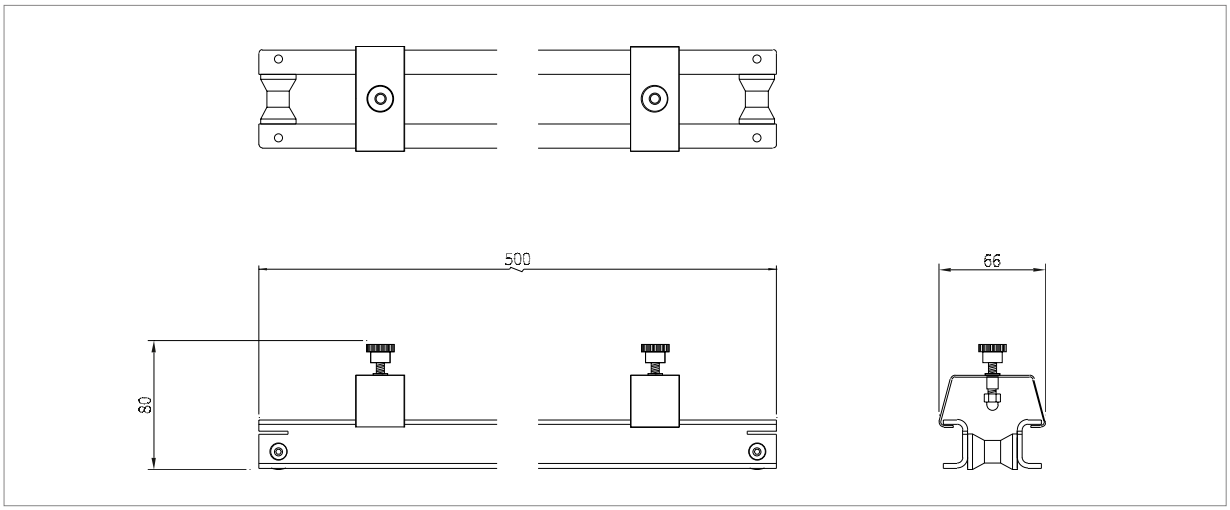
MOUNTING ACCESSORIES

General

Diameter range and mounting types

Clamping set (metal strap with screw), stainless steel: DN 10 ... 40
Metallic straps and clamps: DN 40 ... 100
Metallic straps and clamps: DN 100 ... 3 000
Metallic mounting rail and straps (available on request): DN 50 ... 250 or DN 50 ... 3 000

Images



Metallic mounting rail

Metallic mounting rail with transducers

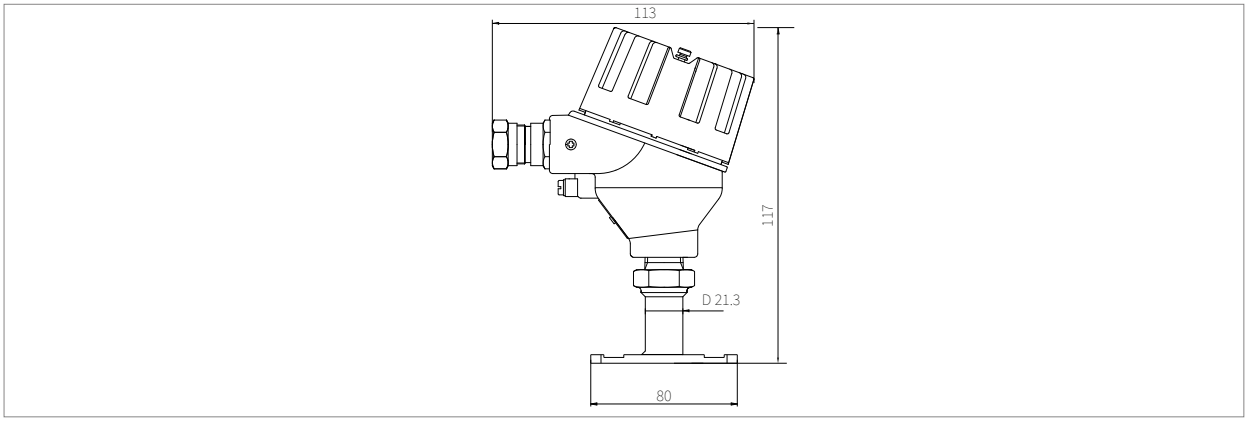
KATflow 170 pipe mounted with 2'' mounting frame

ATEX PT 100 CLAMP-ON TRANSDUCER

General

Sensor type	Pt 100 (clamp-on transducer)
Degree of protection	IP66 according to DIN EN 60529
Type of protection	Flameproof "d"
Marking	II 2G Ex d IIC T6 Gb
Certificate number	KDB 08 ATEX 135
Temperature 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
Output update 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

Images



ATEX Pt 100 transducer

ATEX Pt 100 transducer

ATEX Pt 100 transducer fixed to pipe with KATflow 170

FLOWMETER AND ACCESSORIES

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, polyurethane and epoxy-coated, II 2G Ex db eb IIC T6 Gb
	2	Ex-enclosure, glass-fronted, stainless steel, II 2G Ex db eb IIB T6 Gb
	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, 4 ... 20 mA, passive (sink)
	D	Digital output, open-collector
	R	Digitaloutput,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 Pt 100 input for temperature compensation (select TC function) [3]
	B	Current input, 0/4 ... 20 mA active or 4 ... 20 mA 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
	Z	Special (please consult factory)
		Sound velocity output (SVO) [4]
	0	Without
	1	With SVO
		Pt 100 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/USB cable

KF170 - 1 - 03- 1 - 1 - 0 - CD-0 - 0 - 0 - 000 / PM (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.

TRANSDUCERS AND ACCESSORIES

Code	Description
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
3	IP68 (standard)
Z	Special (please specify)
	Transducer mounting accessories
0	Without
3	Clamping set DN 10 ... 40
4	Metallic straps and clamps DN 40 ... 100
5	Metallic straps and clamps DN 100 ... 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
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 (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 - C010 / CA (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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