Aysix 150 Flowmeter

Clamp-On Ultrasonic Flowmeter

The clamp-on ultrasonic flowmeters work on the transit-time method. This is based on the principle that sound waves travelling with the flow will move faster than those travelling against it. The resulting difference in transit time is directly proportional to the flow velocity of the liquid and consequently to the volumetric flow rate.

The ultrasonic transducers (sensors) of the flow-meter are mounted on the external surface of the pipe and are used to generate and receive pulses. The flowing liquid within causes time differences in the ultrasonic signals, which are evaluated by the flowmeter to produce an accurate flow measurement. The advanced electronics of the flowmeter compensate for and adapt to changes in the flow profile and medium temperature to deliver reliable measurements.

The 150 is a fixed-installation clamp-on ultrasonic flow meter for non-invasive and non-intrusive flow measurement of liquids and liquefied gases in fully filled pipes. It can be supplied with one or two measurement channels. This enables the flowmeter to simultaneously monitor up to two separate pipes. Alternatively, a dual-channel setup can be used for a two-path mouthing configuration of the sensors on the one single pipe. Additionally, the 150 offers optional functions for heat quantity and concentration measurement with process input, output and serial communication options available.

These features are complemented by an optional internal datalogger and software for the recording and download of measured values. Thanks to its intuitive instrument menu, Setup Wizard, and Audible Sensor Positioning Assistant™ the flow-meter can be set up and its sensors correctly installed in a matter of minutes. Optional transmitter and transducer versions are available for installation in hazardous areas.

Flowmeter with one of two measurement channels, graphic LCD display, internal datalogger & input/output options

For commonly used pipe materials and diameters from 10 mm to over 3.0 mm

Intuitive menu, Setup Wizard and Audible Sensor Positioning Assistant™ for easy and quick setup and installation

Transit-time correlation measurement using dual DSP-technology for better measurement accuracy

Heat quantity measurement capability and Ex approved instrument versions

AC, DC and solar panel power supply

Features

- Lockable and sturdy IP 66 transmitter enclosure with keypad and multifunctional display
- Bi-directional measurement with totalizer function and process input, output and serial communication options including Modbus RTU and HART
- Available with optional heat quantity measurement function and PT100 clamp-on sensors for contactless metering of thermal energy consumption
- Optional sound velocity output function for contactless product recognition and interface detection; optional internal data logger for up to 100,000 measurements
- Transmitter and transducer options approved for use in hazardous area Zone 1 or 2
- Software for offline/online data transfer via RS 232 or USB cable
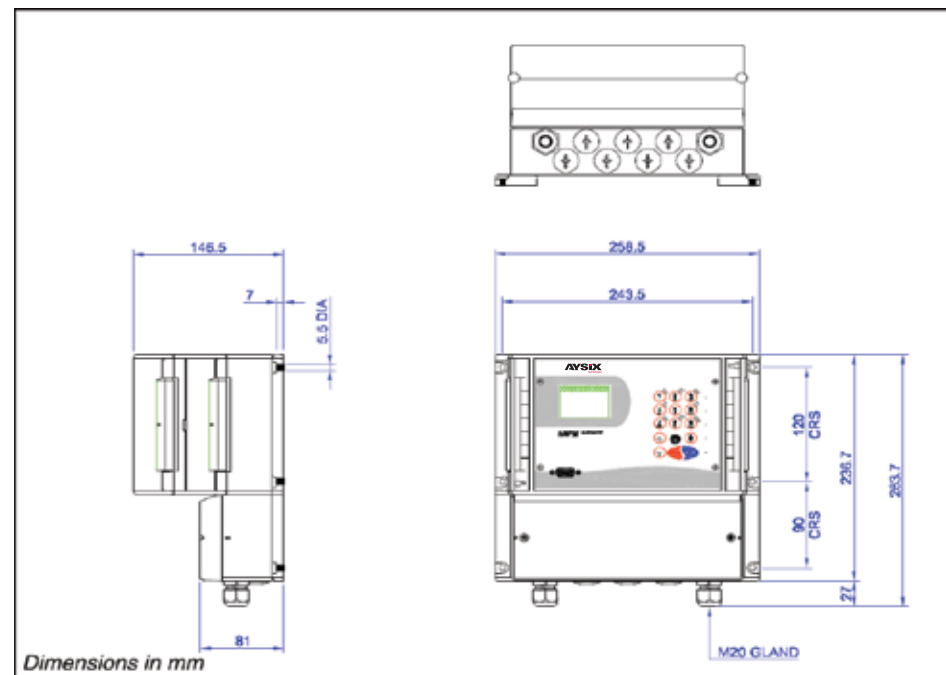
Specifications: Transmitter

Performance	Measurement Principle:	Ultrasonic transit-time difference correlation
	Flow Velocity Range:	0.01 ... 25 m/s
	Resolution:	0.25 mm/s
	Repeatability:	0.15% of measured value, ±0.015 rnls
	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
	Measurement Rate:	1 Hz as standard, higher rates on application
	Response Time:	1 s, 70m/s (optional)
	Damping of Displayed Value:	0 ...99 s (selectable by user)
	Gaseous and Solid Content of Liquid Media:	< 10% of volume

General	Enclosure Type:	Wall mounted
	Degree of Protection:	IP 66 according to EN 60529
	Operating Temperature:	-10 ... 60 °C (14 to 140 °F)
	Housing Material:	Polycarbonate (UL94 V-0)
	Measurement Channels:	1 or 2
	Calculation Functions:	Average, difference, sum, highest (dual-channel use only)
	Power Supply:	100 ... 240 V AC 50/60 Hz
		9 ... 36 V DC
		Special solutions (e.g. solar panel, batter) upon 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
	Operating Languages:	English, German, French, Spanish, Russian

Drawings

Dimensions in mm

Specifications: Transmitter (Continued)

Images

Aysix 150 close-up

Aysix 150 wall-mounted with transducers

Communication	Type:	RS 232, USB converter cable (optional), RS 485 (optional), Modbus RTU (optional)
	Transmitted Data:	Measured and totalized value, parameter set and configuration, loggged data
Internal data logger	Storage Capcity:	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 totalized values, parameter sets
KATdata+ software	Functionality:	Download of measured value/parameter sets, graphical presentation, list format, export to third party software, online transfer of measured data
	Operating Systems:	Windows 7, Vista, XP, NT, 2000, Linux, Mac (optional)
Quantity & units of measurements	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 (only with heat quantity measurement option)
	Heat Quantity:	J, kJ, MJ (only with heat quantity measurement option)
	Temperature:	°C (only with heat quantity measurement option)

Specifications: Transmitter (Continued)

Process inputs (galvanically isolated)	Temperature:	PT100 (clamp-on sensors), four-wire circuit, measurement rante -50 ... 400 °C (-58 ... 752 °F), resolution 0.1 K, accuracy ± 0.2 K (one, two or four inputs available)
	Current:	0/4 ... 20 mA active or 0/4 ... 20 mA passive, U = 30 V, R_1 = 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%
	Voltage:	0 ... 10 V, R_{Load} = 1000 Ω
	Frequency:	0 ... 10 kHz, 24 V/4 mA
	HART:	0/4 ... 20 mA, 24 V DC, R_{GND} = 220 Ω
	Digital Open-Collector:	Value 0.01 ... 1000/unit, width 1 ... 990 ms, U = 24 V, I_{max} = 4mA
	Digital relay:	Form C (SPDT-CO) contacts, U = 48 V, I_{max} = 250 mA

Specifications: PT100 Clamp-On Sensors

Process inputs **logger**	Type:	PT100 (clamp-on)
	Measurement range:	-30 ... 250 °C (-22 ... 482 °F)
	Design:	4-wire
	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
	Response time:	50s
	Dimensions of sensor head:	20 (h) x 15 (w) x 15 (d) mm
	Material of sensor head:	Aluminum
	Material cable jacket:	PTFE
	Cable length:	3 m

Images

PT100 sensor fixed to pipe

*Aysix 150 for heat quantity measurement application using PT100 sensors*

Specifications: Hazardous Area Transmitter Enclosure

General

Enclosure Type:	Wall mounted (additional to Aysix 150 transmitter)
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 coat
Dimensions:	358 (h) x 278 (w) x 268 (d) m
Weight:	Approx. 20.0 kg (with Aysix 150 transmitter)
Ex certification code:	Ex II 2 GD Ex-d IIB+ H2 T4/T5/T6 IP65/66/67
Ex certification number:	CESI 01 ATEX 027

Drawings & images

Dimensions in mm
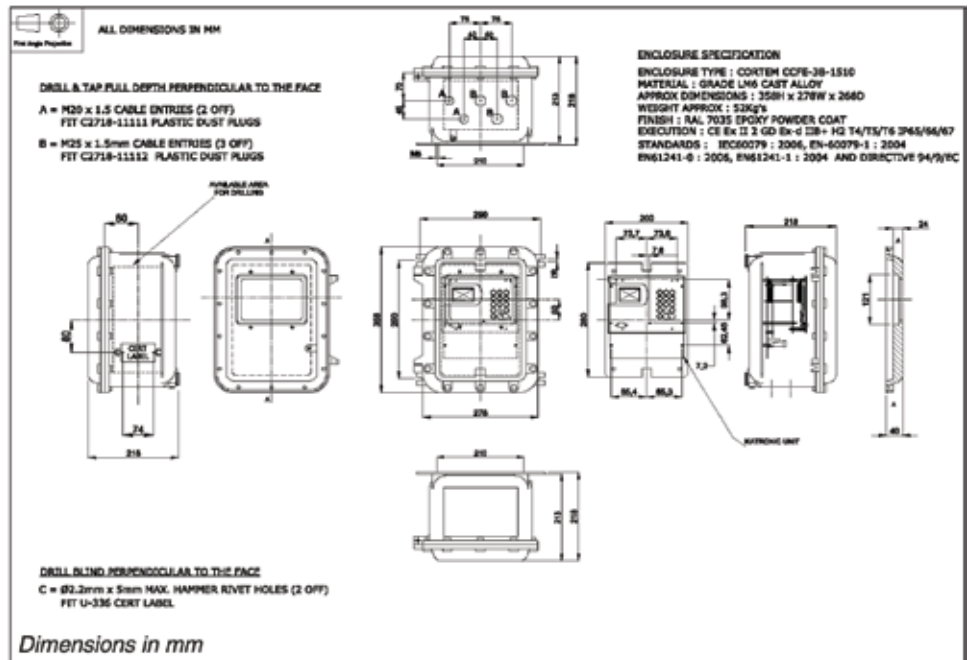
*Aysix 150 in closed Ex enclosure*

Aysix 150 in opened Ex enclosure

Specifications: Transducers

K1L, K1N, K1E

Pipe Diameter Range: 50 ... 3000 mm for type K1N/E
50 ... 6500 mm for type K1L
Dimension of Sensor Heads: 60 (h) x 30 (w) x 34 (d) mm
Materials 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 ... 200 °C (-22 ... 392 °F), for short periods
up to 300 °C (572 °F)
Degree of Protection: IP 66 acc. EN 60529, (IP 67 and IP 68 upon request)
Standard Cable Lengths: Type K1L: 5.0m, Type K1N/E: 4.0m

Drawings & images

K1N/E transducers

K1L transducers

K1N/E transducers
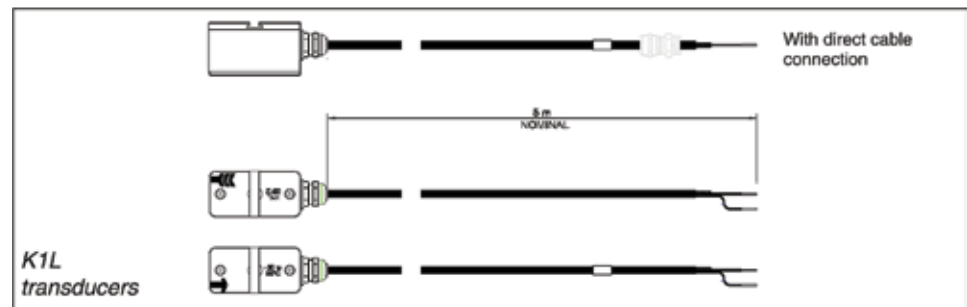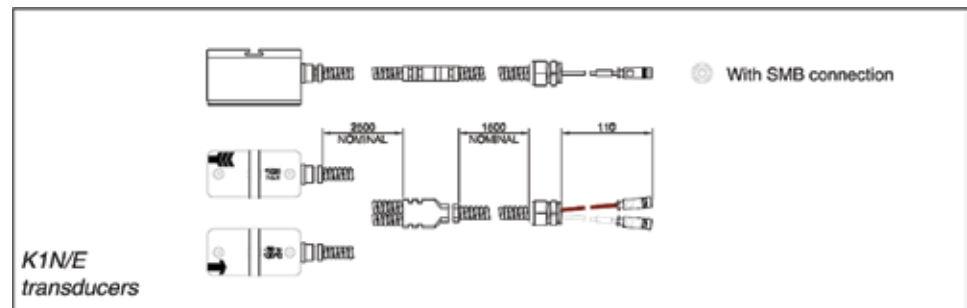
K1L transducers

Specifications: Transducers (Continued)

K4L, K4N, K4E

Pipe Diameter Range:	10 ... 250 mm for type K4N/E
	10 ... 250 mm for type K4L
Dimension of Sensor Heads:	43 (h) x 18 (w) x 22 (d) mm
Materials 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 ... 200 °C (-22 ... 392 °F), for short periods up to 300 °C (572 °F)
Degree of Protection:	IP 66 acc. EN 60529, (IP 67 and IP 68 upon request)
Standard Cable Lengths:	Type K4L: 5.0m, Type K4N/E: 2.5m

Drawings & images

With SMB connector

K4N/E transducers

With direct cable connection
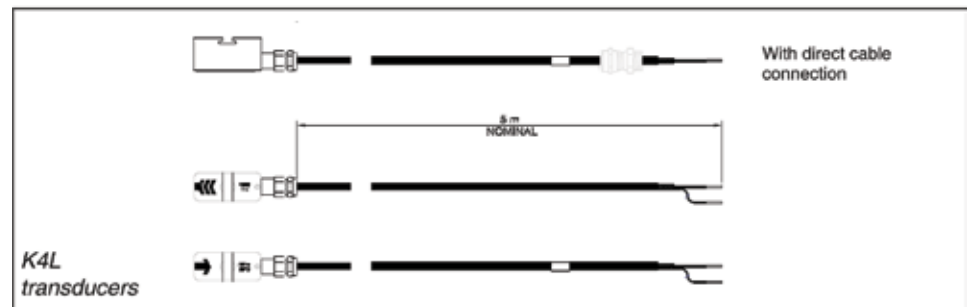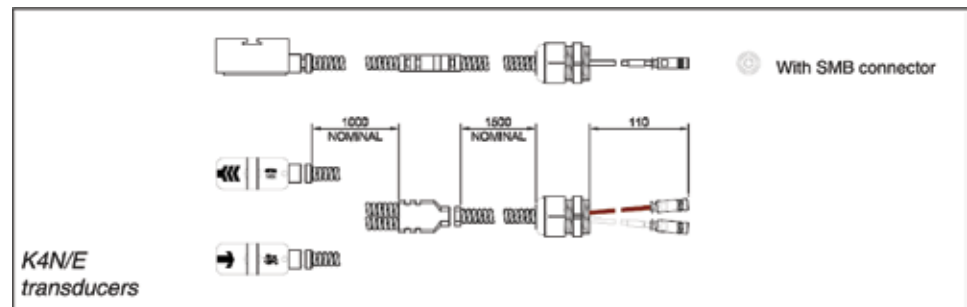
K4L transducers

K4N/E transducers

K4L transducers

Specifications: Transducers (Continued)
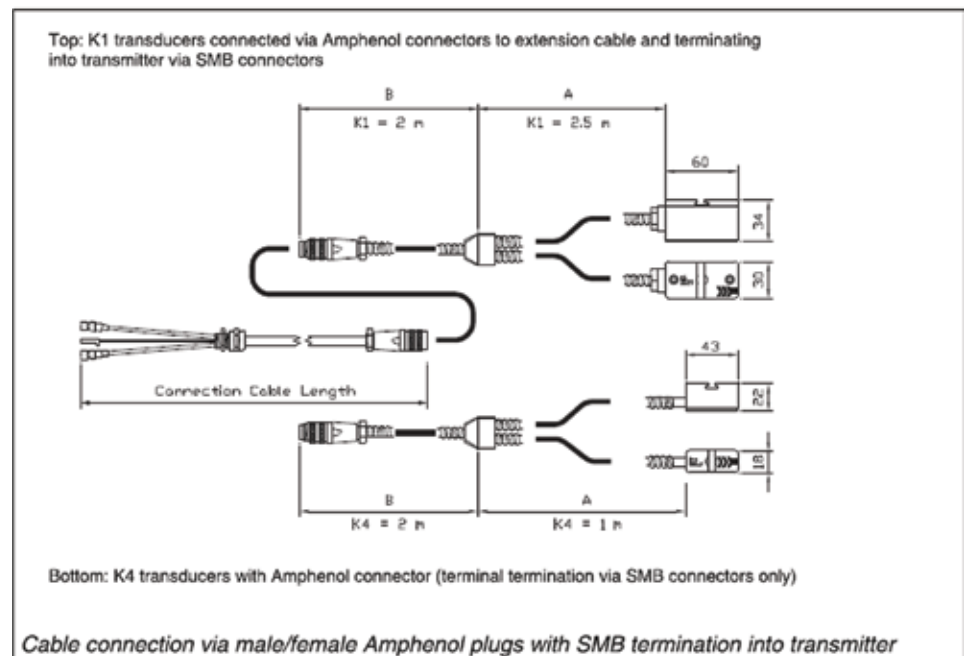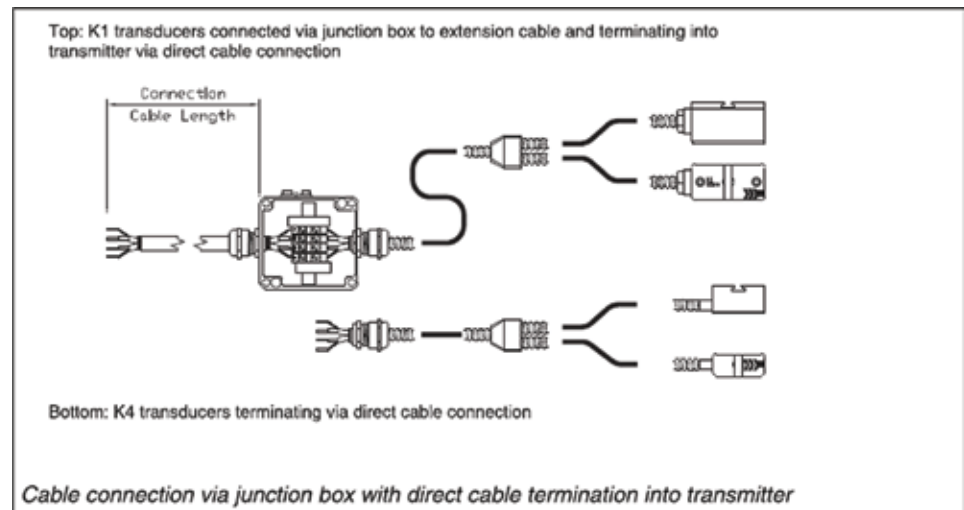
Extension cable

Available Lengths:	5.0 ... 100 m
Cable Type:	Coaxial
Material cable jacket:	TPE
Operating Temperature:	-40 ... 80 °C (-40 ... 176 °F)
Min. bend radius:	67 mm

Cable connection

Connection types:	Junction box, Amphenol connectors (for transducers type N)
Termination into transmitter:	SMB connector (SubMiniature version B), direct cable connection (terminal block)

Drawings

Top: K1 transducers connected via junction box to extension cable and terminating into transmitter via direct cable connection

Bottom: K4 transducers terminating via direct cable connection

Cable connection via junction box with direct cable termination into transmitter

Top: K1 transducers connected via Amphenol connectors to extension cable and terminating into transmitter via SMB connectors

Bottom: K4 transducers with Amphenol connector (terminal termination via SMB connectors only)

Cable connection via male/female Amphenol plugs with SMB termination into transmitter

Specifications: Hazardous Area Transducers

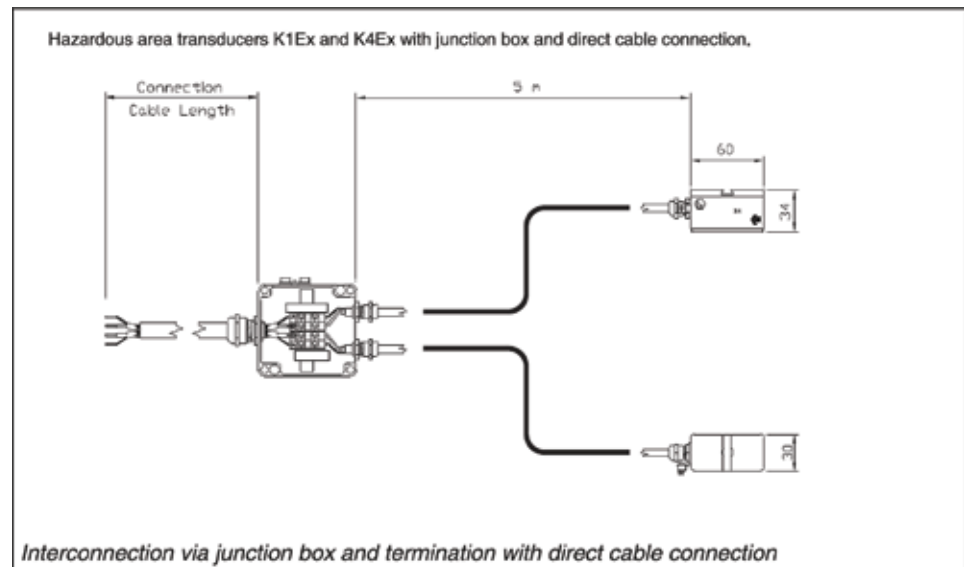**K1Ex and K4Ex**

Pipe diameter range:	10 ... 250 mm for type K4Ex
	10 ... 3000 mm for type K1Ex
Dimensions for 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 (-4 ... 248 °F)
Standard cable length:	5.0 m
Degree of protection:	IP 68 acc. EN 60529
Ex certification code:	II 2 G Ex mb IIC T4-T6 X, II 2 D Ex mbD 21
Ex certification number:	TRAC09ATEX21226X
Ex protection method:	Encapsulation
Note:	The transducers are approved for use in hazardous areas classified as Ex Zone 1 & 2. They are connected to the transmitter via extension cables and Ex approved junction boxes. The transmitter can be installed in a safe area or - if equipped with the additional Ex enclosure - together with the transducers in a hazardous environment

Drawings & Images

Hazardous area transducers K1Ex and K4Ex with junction box and direct cable connection.

Interconnection via junction box and termination with direct cable connection

K1Ex transducer pair

K1Ex certification code and number

Specifications: Transducer Mounting Accessories

General

Diameter range &
mounting types:

Clamping set (metal collar with screw), stainless steel
DN 10 ... DN 40
Metallic straps and clamps
DN 15 ... DN 310
Metallic straps and clamps
DN 25 ... DN 3000
Metallic straps and clamps
DN 1000 ... DN 3000 (6500)
Metallic mounting rail and straps (available upon request)
DN 50 ... DN 250 ... or DN 50 ... DN 3000

Mounting fixture for
flexible hoses:

Custom made mounting bracket, stainless steel
(available upon request)

Images

Transducers mounted using strap and clamps

Metallic mounting rail with cover (example)

Configuration Code: Transmitter & Accessories

KF150 Ultrasonic flow meter Asyix 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 (EEx d IIB T4-T6)	
Z	Special (please specify)	
Communication		
0	Without	
1	RS 485 serial interface	
2	Modbus RTU protocol	
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 (source)	
D	Digital output, Open-Collector	
R	Digital output, relay	
H	HART output, 0/4 ... 20 mA	
V	Voltage output, 0 ... 10 kHz	
F	Frequency output, 0 ... 10 kHz	
A	1 x PT100 input for tempurature compensation (select TC function) [2]	
AA	2 x PT100 input for 1-channel heat quantity measurement (select HQM option no. 2) [3]	
AAAA	4 x PT100 input for 2-channel heat quantity measurement (select HQM option no. 3) [3]	
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 [2]	
2	With HQM incl. 2 x PT100 sensor, 3 m cable [3]	
3	With HQM incl. 4 x PT100 sensor, 3m cable [3]	
Z	Special (pleasure consult factory)	
Sound Velocity output (SVO) [4]		
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 sensor	
3PTJ	With 3 x junction box for PT100 sensor	
4PTJ	With 4 x junction box for PT100 sensor	
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	KATdate+ download software and USB cable	

KF150 - 1 - 03 - 1 - 1 - 0 - CDR - 0 - 0 - 0 - 0 - 000 /   (example configuration)

The configuration is customized 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) For temperature compensation in cases of significant changes in medium temperature during measurement.
3) For contactless measurement of thermal energy consumption (1-channel for one circuit, 2-channel for two circuits).
4) For contactless product recognition and interface detection.

Configuration Code: Transducers & Accessories

K1	Transducer pair, pipe diameter range 50 ... 3000 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 ... 200 °C (300 °C), including acoustic coupling paste
- **Ex** Process temperature -50 ... 115 °C, including acoustic coupling paste (for hazardous areas, Ex II 2 G Ex mb IIC T4-T6)
- **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 consult factory)

Transducer mounting accessories

- **0** Without
- **3** Clamping set DN 10 ... 40
- **4** Clips and chains DN 15 ... 310
- **5** Clips and chains DN 25 ... 600
- **6** Clips and chains DN 25 ... 1200
- **7** Textile tension straps DN 1000 ... 6500
- **8** Mounting fixture, rail and magnets DN 10 ... 250 (optional for K4-type transducer)
- **Z** Special (please consult factory)

Stainless steel tag

- **0** Without
- **1** With stainless steel tag (please specify text to be engraved)

Transducer connection type and extension cable length

- **0** Without connector or junction box (transducer type L or Ex)
  - C 000 Wired transducer connection to flow meter
- **D** Without connector or junction box (transducer type N)
  - C 000 Direct transducer connection to flow meter
- **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 N - 1 - 1 - 5 0 - J   - C 010 /   (example configuration)

The configuration is customized by selecting the above-listed options and is expressed by the resulting code at the bottom of the table.