



## OPTISONIC 6300 **Technical Datasheet**

### Ultrasonic clamp-on flowmeter

- Robust industrial clamp-on construction
- Immediate start-up
- All in one concept



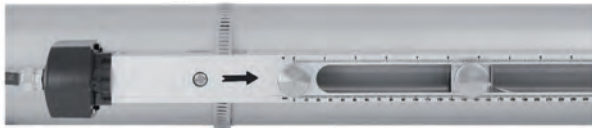
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## 1.1 Clamp-on technology

The **OPTISONIC 6300** stands for continuity and long term reliability. Flow measurement can be done anywhere and start-up is immediate. The new **OPTISONIC 6300** clamp-on flowmeter for liquids with its robust industrial construction and regreasing concept provides a revolutionary solution for easy handling. It can be fitted on the outside of piping to measure the flow rate of liquids.

The clamp-on flowmeter is a combination of one up to two OPTISONIC 6000 clamp-on sensor(s) and one UFC 300 ultrasonic signal converter.

The overall functionality of the clamp-on flowmeter is the continuous measurement of actual volume flow, mass flow, flow speed, velocity of sound, gain, SNR and diagnosis value.



**Highlights**

- Minimised uncertainty
- Optimised reliability
- Minimal maintenance
- Efficient regreasing concept
- Easy sensor mounting
- Installation wizard
- All in one system

**Industries**

- Chemicals
- Petrochemicals
- Power plants
- Water
- Oil & Gas
- Semi-conductor
- Food & Beverages
- Pharmaceuticals

**Applications**

- Chemical addition
- General process control
- Cooling water circuits
- Broad range of refined hydrocarbons
- Potable water
- De-ionized and demineralized water
- Sanitary flow rate measurements
- Purified water

## 1.2 Variants

The **OPTISONIC 6300** is an ultrasonic clamp-on flowmeter that can be fitted on the outside of piping to measure the flowrate of liquids. The flowmeter consists of a combination of one or two clamp-on sensor(s) and one ultrasonic signal converter:

**OPTISONIC 6000 + UFC 300 = OPTISONIC 6300**

### Different versions and some general examples



#### Small version (aluminum, including cover)

- chemical addition applications
- cooling circuits



#### Medium version (aluminum, including cover)

- purified water applications
- hydrocarbons



#### Large version (aluminum, including cover)

- all water applications
- especially for large pipe sizes



### Optional stainless steel sensor (small / medium)

- for corrosive environments
- off-shore
- nuclear power plants



### Optional eXtended Temperature sensor (XT, small / medium)

- refineries
- chemical plants
- energy applications
- food and beverage

**UFC 300 ultrasonic signal converter****UFC 300 W**

- wall mounted
- Polyamide-polycarbonate housing
- non-Ex
- IP65

**UFC 300 F**

- field version
- die-cast aluminum or stainless steel housing
- (non-)Ex
- IP66/67

### 1.3 Measuring principle

- Like canoes crossing a river, acoustic signals are transmitted and received along a diagonal measuring path.
- A sound wave going downstream with the flow travels faster than a sound wave going upstream against the flow.
- The difference in transit time is directly proportional to the mean flow velocity of the medium.

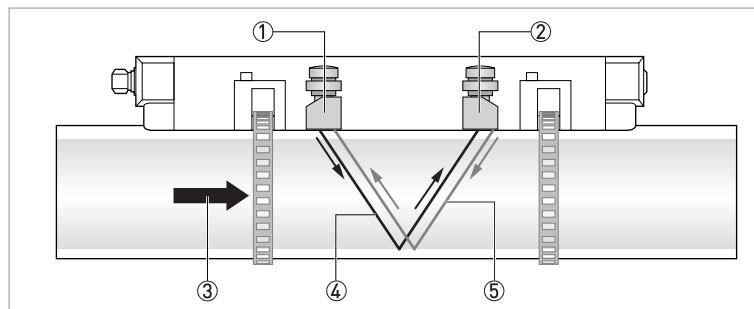


Figure 1-1: Measuring principle

- ① Transducer A
- ② Transducer B
- ③ Flow velocity
- ④ Transit time from transducer A to B
- ⑤ Transit time from transducer B to A



## 2.1 Technical data

- The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local representative.
- Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website (Downloadcenter).

### Measuring system

Measuring principle	Ultrasonic transit time
Application range	Flow measurement of liquids
<b>Measured value</b>	
Primary measured value	Transit time
Secondary measured value	Volume flow, mass flow, flow speed, flow direction, speed of sound, gain, signal to noise ratio, diagnosis value, reliability of flow measurement, quality of acoustic signal

### Design

	The measurement system consists of a measuring sensor and a signal converter. It is only available as separate version.
<b>Signal converter</b>	
Wall-mounted housing (W) - remote version	UFC 300 W (general purpose)
Field housing (F) - remote version	UFC 300 F (Option: Ex version)
<b>Measuring sensor</b>	
Standard	Small, medium or large version in aluminum
Optional	Small / medium stainless steel version Small / medium XT (eXtended Temperature).
<b>Diameter ranges</b>	
Small	DN15...100 / ½...4"
	Outer diameter must be at least 20 mm / 0.79".
Medium	DN50...400 / 2...16"
Large	DN200...4000 / 8...160"
	Outer diameter must be smaller than 4300 mm / 169.29".
<b>Options</b>	
Inputs / outputs	Current (incl. HART®), pulse, frequency and/or status output, limit switch and/or control input (depending on the I/O version)
Counters	2 internal counters with a max. of 8 counter places (e.g. for counting volume and/or mass units)
Self diagnostics	Integrated verification, diagnosis functions: flowmeter, process, measured value, empty pipe detection, bargraph

<b>Display and user interface</b>	
Graphic display	LC display, backlit white
	Size: 128x64 pixels, corresponds to 59x31 mm = 2.32"x1.22"
	Display turnable in 90° steps
	The readability of the display could be reduced at ambient temperatures below -25°C / -13°F.
Operator input elements	4 optical keys for operator control of the signal converter without opening the housing.
	Option: Infrared interface (GDC)
Remote control	PACTware® including Device Type Manager (DTM)
	All DTM's and drivers are available at the internet homepage of the manufacturer.
<b>Display functions</b>	
Menu	Programming of parameters at 2 measured value pages, 1 status page, 1 graphic page (measured values and descriptions adjustable as required)
Language of display texts	English, French, German
Units	Metric, British and US units selectable from list / free unit

**Measuring accuracy**

Reference conditions	Medium: water
	Temperature: 20°C / 68°F
	Straight inlet section: 10 DN
Maximum measuring error	±1% of the measured value for DN≥50 mm / 2" and v > 0.5 m/s / 1.5 ft/s
	±3% of the measured value for DN<50 mm / 2" and v > 0.5 m/s / 1.5 ft/s
Repeatability	<±0.2%

**Operating conditions**

<b>Temperature</b>	
Process temperature	Standard version: -40...+120°C / -40...+248°F
	XT version: -40...+200°C / -40...+392°F
Ambient temperature	Sensor: -40...+70°C / -40...+158°F
	Signal converter: -40...+60°C / -40...+140°F (ambient temperature 55°C / 131°F and higher: protect electronics against self-heating, because an increase in the electronics temperature in 10°C / 50°F steps leads to a corresponding reduction of the electronics' service life by a factor of two).
Storage temperature	-50...+70°C / -58...+158°F
<b>Pipe specifications</b>	
Material	Metal, plastic, ceramic, asbestos cement, internal / external coated pipes (coatings and liners fully bonded to pipe wall)
Pipewall thickness	< 200 mm / 7.87"
Liner thickness	< 20 mm / 0.79"

<b>Media properties</b>	
Physical condition	Liquids
Viscosity	< 100 cSt (general guideline)
	For detailed information please contact your local representative.
Permissible gas content (volume)	≤ 2%
Permissible solid content (volume)	≤ 5%
Recommended flow velocity	0.5...20 m/s
<b>Other conditions</b>	
Protection category acc. to IEC 529 / EN 60529	W (Wall) version signal converter: IP 65 (acc. to NEMA 4/4x)
	F (Field) version signal converter: IP 66/67 (acc. to NEMA 4x/6)
	All sensors: IP 67 (acc. to NEMA 6)
Vibration resistance	IEC 68-2-64
Shock resistance	IEC 60068-2-27

### Installation conditions

Measurement configuration	Single path, single pipe or dual path / dual pipe
Inlet run	≥ 10 DN straight length
Outlet run	≥ 5 DN straight length
Dimensions and weights	See chapter "Dimensions and weights"

### Materials

Sensor	<b>Standard</b>
	Anodised aluminum
	<b>Option stainless steel / eXtended Temperature (small / medium version)</b>
	Rail construction: 1.4404 (AISI 316L) Cable connection: 1.4404, PSU with FKM O-ring
Converter	<b>Standard</b>
	F version: die-cast aluminum, polyurethane coated W version: polyamide-polycarbonate
	<b>Option</b>
	F version: stainless steel 316 L (1.4408)

### Electrical connections

Voltage	Standard: 100...230 VAC (-15% / +10%), 50/60 Hz
	Option: 24 VAC/DC (AC: -15% / +10%; DC: -25% / +30%)
Power consumption	AC: 22 VA
	DC: 12 W
Signal cable	double shielded, 2 internal triax, available lengths:
	5 m / 15 ft (standard), maximum length 30 m / 90 ft
Cable entries	Standard: M20 x 1.5
	Option: ½" NPT, PF ½

## Inputs and outputs

General	All in- and outputs are galvanically isolated from each other and from all other circuits		
Description of used abbreviations	$U_{\text{ext}}$ = external voltage; $R_L$ = load + resistance; $U_0$ = terminal voltage; $I_{\text{nom}}$ = nominal current		
<b>Current output</b>			
Output data	Measurement of volume and mass (at constant density), HART <sup>®</sup> communication		
Settings	<b>Without HART<sup>®</sup></b>		
	Q = 0%: 0...20 mA; Q = 100%: 10...21.5 mA		
	Error identification: 0...22 mA		
	<b>With HART<sup>®</sup></b>		
	Q = 0%: 4...20 mA; Q = 100%: 10...21.5 mA		
	Error identification: 3.5...22 mA		
Operating data	<b>Basic I/Os</b>	<b>Modular I/Os</b>	<b>Ex-i</b>
Active	$U_{\text{int,nom}} = 24 \text{ VDC}$ $I \leq 22 \text{ mA}$ $R_L \leq 1 \text{ k}\Omega$		$U_{\text{int,nom}} = 20 \text{ VDC}$ $I \leq 22 \text{ mA}$ $R_L \leq 450 \Omega$
			$U_0 = 21 \text{ V}$ $I_0 = 90 \text{ mA}$ $P_0 = 0.5 \text{ W}$ $C_0 = 90 \text{ nF} /$ $L_0 = 2 \text{ mH}$ $C_0 = 110 \text{ nF} /$ $L_0 = 0.5 \text{ mH}$
Passive	$U_{\text{ext}} \leq 32 \text{ VDC}$ $I \leq 22 \text{ mA}$ $U_0 \geq 1.8 \text{ V at } I = 22 \text{ mA}$		$U_{\text{ext}} \leq 32 \text{ VDC}$ $I \leq 22 \text{ mA}$ $U_0 \geq 4 \text{ V}$ $R_L \leq (U_{\text{ext}} - U_0) / I_{\text{max}}$
			$U_1 = 30 \text{ V}$ $I_1 = 100 \text{ mA}$ $P_1 = 1 \text{ W}$ $C_1 = 10 \text{ nF}$ $L_1 \sim 0 \text{ mH}$
<b>HART<sup>®</sup></b>			
Description	HART <sup>®</sup> protocol at active and passive current output		
	HART <sup>®</sup> version: V5		
	Universal HART <sup>®</sup> parameter fully integrated		
Load	$\geq 250 \Omega$ Please observe maximum value for current output		
Multidrop	Yes, current output = 4 mA		
	Multidrop addresses programmable in menu 1...15		
Device drivers	FDT/DTM		

<b>Pulse or frequency output</b>			
Output data	Volume or mass counting		
Function	Can be set as a pulse output or frequency output		
Settings	For Q = 100%: 0.01...10000 pulses per second or pulses per unit volume		
	Pulse width: setting automatic, symmetric or fixed (0.05...2000 ms)		
Operating data	<b>Basic I/Os</b>	<b>Modular I/Os</b>	<b>Ex-i</b>
Active	-	$U_{nom} = 24 \text{ VDC}$	-
		<b><math>f_{max} \leq 100 \text{ Hz}</math>:</b> $I \leq 20 \text{ mA}$ open: $I \leq 0.05 \text{ mA}$ closed: $U_{0,nom} = 24 \text{ V}$ at $I = 20 \text{ mA}$	
Passive	$U_{ext} \leq 32 \text{ VDC}$	<b><math>f_{max} \leq 100 \text{ Hz}</math>:</b> $I \leq 100 \text{ mA}$ open: $I \leq 0.05 \text{ mA}$ at $U_{ext} = 32 \text{ VDC}$ closed: $U_{0,max} = 0.2 \text{ V}$ at $I \leq 10 \text{ mA}$ $U_{0,max} = 2 \text{ V}$ at $I \leq 100 \text{ mA}$	-
		<b><math>100 \text{ Hz} &lt; f_{max} \leq 10 \text{ kHz}</math>:</b> $I \leq 20 \text{ mA}$ open: $I \leq 0.05 \text{ mA}$ at $U_{ext} = 32 \text{ VDC}$ closed: $U_{0,max} = 1.5 \text{ V}$ at $I \leq 1 \text{ mA}$ $U_{0,max} = 2.5 \text{ V}$ at $I \leq 10 \text{ mA}$ $U_{0,max} = 5.0 \text{ V}$ at $I \leq 20 \text{ mA}$	
NAMUR	-	Passive to EN 60947-5-6 open: $I_{nom} = 0.6 \text{ mA}$ closed: $I_{nom} = 3.8 \text{ mA}$	Passive to EN 60947-5-6 open: $I_{nom} = 0.43 \text{ mA}$ closed: $I_{nom} = 4.5 \text{ mA}$
			$U_I = 30 \text{ V}$ $I_I = 100 \text{ mA}$ $P_I = 1 \text{ W}$ $C_I = 10 \text{ nF}$ $L_I \sim 0 \text{ mH}$

<b>Status output / limit switch</b>			
Function and settings	Settable as automatic measuring range change, indicator for direction of flow, overflow, error, operating point or empty pipe detection		
	Valve control with activated dosing function		
	Status and/or control: ON or OFF		
Operating data	<b>Basic I/Os</b>	<b>Modular I/Os</b>	<b>Ex-i</b>
Active	-	$U_{int} = 24 \text{ VDC}$ $I \leq 20 \text{ mA}$ open: $I \leq 0.05 \text{ mA}$ closed: $U_{0, nom} = 24 \text{ V}$ at $I = 20 \text{ mA}$	-
Passive	$U_{ext} \leq 32 \text{ VDC}$ $I \leq 100 \text{ mA}$ open: $I \leq 0.05 \text{ mA}$ at $U_{ext} = 32 \text{ VDC}$ closed: $U_{0, max} = 0.2 \text{ V}$ at $I \leq 10 \text{ mA}$ $U_{0, max} = 2 \text{ V}$ at $I \leq 100 \text{ mA}$	$U_{ext} = 32 \text{ VDC}$ $I \leq 100 \text{ mA}$ $R_{L, max} = 47 \text{ k}\Omega$ open: $I \leq 0.05 \text{ mA}$ at $U_{ext} = 32 \text{ VDC}$ closed: $U_{0, max} = 0.2 \text{ V}$ at $I \leq 10 \text{ mA}$ $U_{0, max} = 2 \text{ V}$ at $I \leq 100 \text{ mA}$	-
NAMUR	-	Passive to EN 60947-5-6 open: $I_{nom} = 0.6 \text{ mA}$ closed: $I_{nom} = 3.8 \text{ mA}$	Passive to EN 60947-5-6 open: $I_{nom} = 0.43 \text{ mA}$ closed: $I_{nom} = 4.5 \text{ mA}$
			$U_I = 30 \text{ V}$ $I_I = 100 \text{ mA}$ $P_I = 1 \text{ W}$ $C_I = 10 \text{ nF}$ $L_I = 0 \text{ mH}$

<b>Control input</b>			
Function	Hold value of the outputs [e.g. for cleaning work], set value of the outputs to "zero", counter and error reset, range change.		
	Start of dosing when dosing function is activated.		
Operating data	<b>Basic I/Os</b>	<b>Modular I/Os</b>	<b>Ex-i</b>
Active	-	$U_{int} = 24 \text{ VDC}$ Terminals open: $U_{0, nom} = 22 \text{ V}$ Terminals bridged: $I_{nom} = 4 \text{ mA}$ On: $U_0 \geq 12 \text{ V}$ with $I_{nom} = 1.9 \text{ mA}$ Off: $U_0 \leq 10 \text{ V}$ with $I_{nom} = 1.9 \text{ mA}$	-
Passive	$8 \text{ V} \leq U_{ext} \leq 32 \text{ VDC}$ $I_{max} = 6.5 \text{ mA}$ at $U_{ext} \leq 24 \text{ VDC}$ $I_{max} = 8.2 \text{ mA}$ at $U_{ext} \leq 32 \text{ VDC}$ Contact closed (On): $U_0 \geq 8 \text{ V}$ with $I_{nom} = 2.8 \text{ mA}$ Contact open (Off): $U_0 \leq 2.5 \text{ V}$ with $I_{nom} = 0.4 \text{ mA}$	$3 \text{ V} \leq U_{ext} \leq 32 \text{ VDC}$ $I_{max} = 9.5 \text{ mA}$ at $U_{ext} \leq 24 \text{ V}$ $I_{max} = 9.5 \text{ mA}$ at $U_{ext} \leq 32 \text{ V}$ Contact closed (On): $U_0 \geq 3 \text{ V}$ with $I_{nom} = 1.9 \text{ mA}$ Contact open (Off): $U_0 \leq 2.5 \text{ V}$ with $I_{nom} = 1.9 \text{ mA}$	$U_{ext} \leq 32 \text{ VDC}$ $I \leq 6 \text{ mA}$ at $U_{ext} = 24 \text{ V}$ $I \leq 6.6 \text{ mA}$ at $U_{ext} = 32 \text{ V}$ On: $U_0 \geq 5.5 \text{ V}$ or $I \geq 4 \text{ mA}$ Off: $U_0 \leq 3.5 \text{ V}$ or $I \leq 0.5 \text{ mA}$  $U_I = 30 \text{ V}$ $I_I = 100 \text{ mA}$ $P_I = 1 \text{ W}$ $C_I = 10 \text{ nF}$ $L_I = 0 \text{ mH}$
NAMUR	-	Active to EN 60947-5-6 Contact open: $U_{0, nom} = 8.7 \text{ V}$ Contact closed (On): $I_{nom} = 7.8 \text{ mA}$ Contact open (off): $U_{0, nom} = 6.3 \text{ V}$ with $I_{nom} = 1.9 \text{ mA}$ Identification for open terminals: $U_0 \geq 8.1 \text{ V}$ with $I \leq 0.1 \text{ mA}$ Identification for short circuited terminals: $U_0 \leq 1.2 \text{ V}$ with $I \geq 6.7 \text{ mA}$	-
<b>Low-flow cutoff</b>			
On	0...±9.999 m/s; 0...20.0%, settable in 0.1% steps, separately for each current and pulse output		
Off	0...±9.999 m/s; 0...19.0%, settable in 0.1% steps, separately for each current and pulse output		
<b>Time constant</b>			
Function	Can be set together for all flow indicators and outputs, or separately for: current, pulse and frequency output, and for limit switches and the 3 internal counters		
Time setting	0...100 seconds, settable in 0.1 second steps		

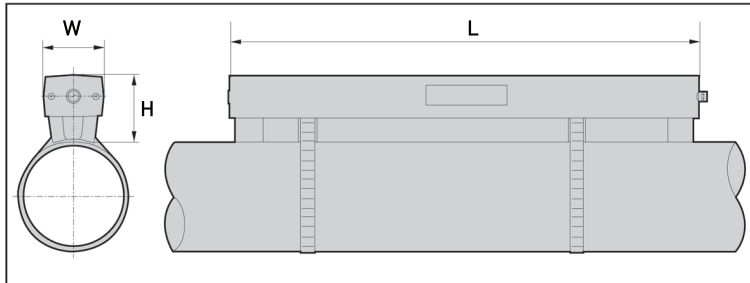
## Approvals and certificates

<b>Hazardous areas</b>	
ATEX	<b>Sensor:</b>
	PTB 06 ATEX 2045 X
	II 2 G Ex ia IIC T6...T4 (XT Version: II 2 G Ex ia IIC T6...T2)
	<b>Converter (F version only):</b>
	PTB 06 ATEX 2046 X
	II 2(1) G Ex de [ia] IIC T6 or II 2 G Ex de [ia] IIC T6 II 2(1) G Ex d [ia] IIC T6 or II 2 G Ex d [ia] IIC T6
FM - Class I, DIV 1/2	Option (F version): approval ID = 3029326
	Pending for stainless steel / eXtended Temperature version.
CSA - GP / Class I, DIV 1/2	Option (F version): approval certificate = 1956404 (LR 105802)
	Pending for stainless steel / eXtended Temperature version.
<b>Other approvals and standards</b>	
Electromagnetic compatibility	Directive: 89/336/EEC, NAMUR NE21/04
	Harmonized standard: EN 61326-1: 2006
Low Voltage Directive	Directive: 2006/95/EC
	Harmonized standard: EN 61010: 2001



## 2.2 Dimensions and weights

### 2.2.1 Clamp-on sensor and cable box



Version	Dimensions [mm]			Approx. weight (without cable / strip) [kg]
	L	H	W	
Small	496.3	71	63.1	2.7
Medium	826.3	71	63.1	3.6
Large	496.3 ①	71 ①	63.1 ①	2.7 ①
Small - stainless steel / XT ②	493	65.5	48	2.1
Medium - stainless steel / XT ②	823	65.5	48	2.7

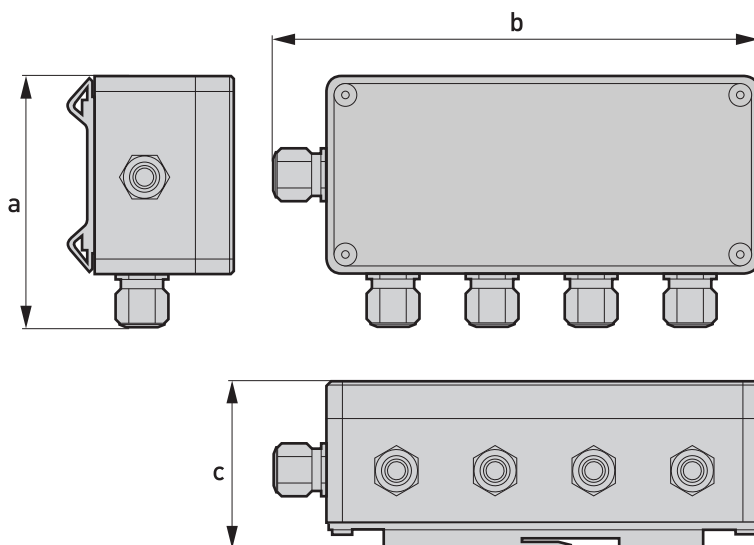
① value for one of the 2 delivered rails

② delivered without cover

Version	Dimensions [inches]			Approx. weight (without cable / strip) [lbs]
	L	H	W	
Small	19.5	2.8	2.5	6.0
Medium	32.5	2.8	2.5	7.9
Large	19.5 ①	2.8 ①	2.5 ①	6.0 ①
Small - stainless steel / XT ②	19.4	2.6	1.9	4.6
Medium - stainless steel / XT ②	32.4	2.6	1.9	6.0

① value for one of the 2 delivered rails

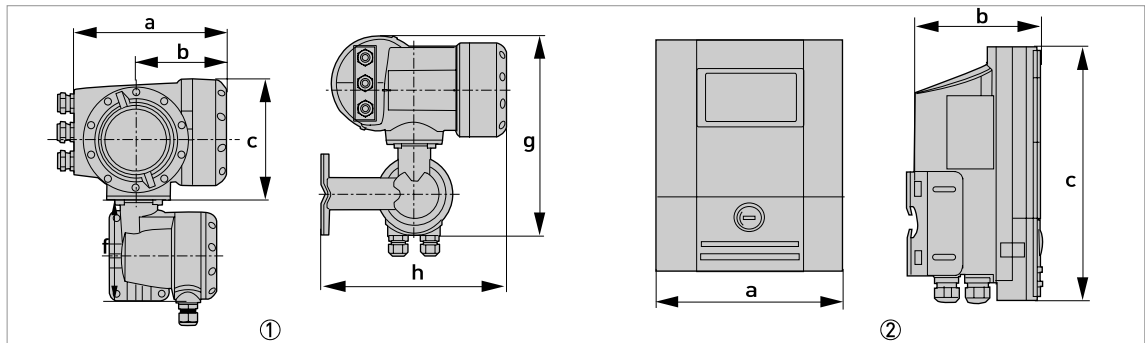
② delivered without cover



	Dimensions [mm]			Approx. weight without cable/metal [kg]
	a	b	c	
Cable box	102	197	67	0.85

	Dimensions [inches]			Approx. weight without cable/metal [lbs]
	a	b	c	
Cable box	4.01	7.76	2.64	1.87

## 2.2.2 Housing



- ① Field housing (F) - remote version  
 ② Wall-mounted housing (W) - remote version

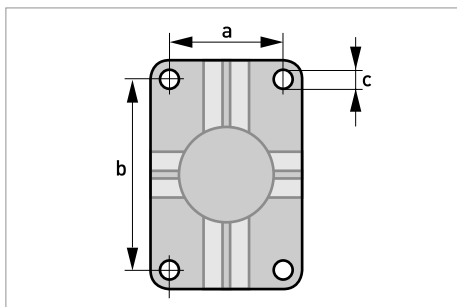
## Dimensions and weights in mm and kg

Version	Dimensions [mm]					Weights [kg]
	a	b	c	g	h	
F	202	120	155	295.8	277	5.7
W	198	138	299	-	-	2.4

## Dimensions and weights in inches and lbs

Version	Dimensions [inches]					Weights [lbs]
	a	b	c	g	h	
F	7.75	4.75	6.10	11.60	10.90	12.60
W	7.80	5.40	11.80	-	-	5.30

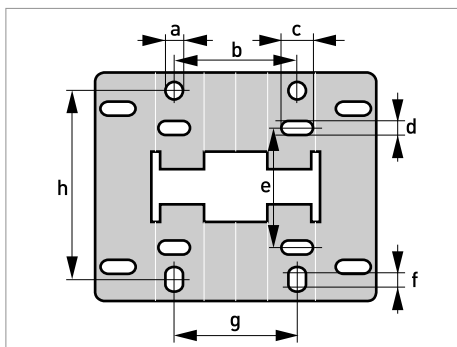
2.2.3 Mounting plate, field housing



Dimensions in mm and inches

	[mm]	[inches]
a	60	2.4
b	100	3.9
c	Ø9	Ø0.4

2.2.4 Mounting plate, wall-mounted housing



Dimensions in mm and inches

	[mm]	[inches]
a	Ø9	Ø0.4
b	64	2.5
c	16	0.6
d	6	0.2
e	63	2.5
f	4	0.2
g	64	2.5
h	98	3.85

### 3.1 Intended use

The overall functionality of the clamp-on flowmeter is the continuous measurement of actual volume flow, mass flow, flow speed, velocity of sound, gain, SNR and diagnosis value.

### 3.2 Environmental requirements

- Pollution degree 2
- Protection class I
- Humidity: 5...80 % RH
- Temperature: -40...+60°C / -40...+140°F operating and -50...+70°C / -58...+158°F storage
- Suitable for indoor and outdoor use and certified for operating up to an altitude of 2000 m / 6562 ft
- IP class 66/67

*The device should be protected from corrosive chemicals or gases and dust / particles accumulation.*

### 3.3 Installation requirements signal converter

- Allow 10...20 cm / 3.9...7.9" of space at the sides and rear of the signal converter to permit free air circulation.
- Protect signal converter against direct solar radiation, install a sunshield if necessary.
- Signal converters installed in switchgear cabinets require adequate cooling, e.g. by fan or heat exchanger.
- Do not expose the signal converter to intense vibration.

### 3.4 Installation requirements sensor

*To avoid measuring errors and malfunctioning of the flowmeter due to gas or air inclusions or an empty pipe, please observe the following precautions.*

*Since gas will collect at the highest point of a pipe, installation of the flowmeter at that location should be avoided at all times. Also installation in a down going pipe should be avoided since a completely filled pipe may not be guaranteed due to cascading effects. Additionally flow profile distortion is possible.*

*If you program the diameter, please note that you use the outer diameter of the pipe.*

### 3.4.1 Inlet, outlet and recommended mounting area

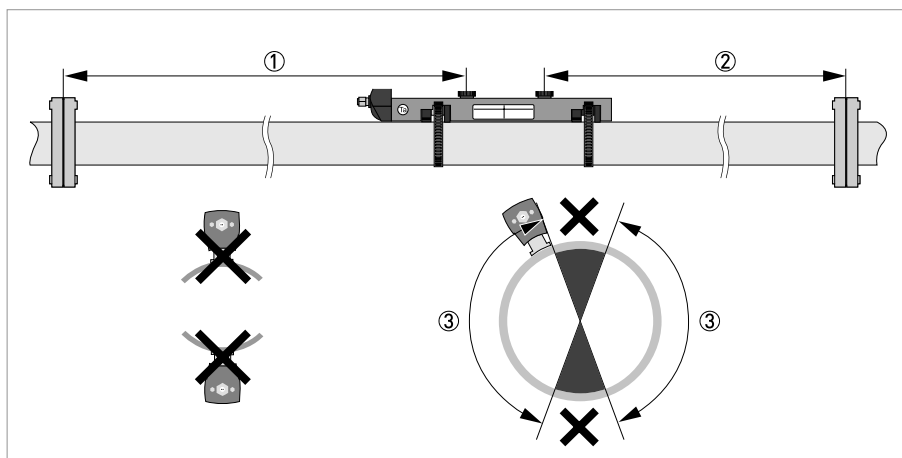


Figure 3-1: Inlet, outlet and recommended mounting area

- ① Min. 10 DN
- ② Min. 5 DN
- ③ OK, 120°

***Especially for XT (eXtended Temperature) versions:***

- *Always install the sensor at a non-insulated part of the pipe. Remove any insulation if necessary!*
- *Bend radius of cable plus connection box needs 10 cm / 4" additional non insulated pipe section.*
- *Always wear protection gloves.*

### 3.4.2 Long horizontal pipes

- Install on slightly ascending pipe section.
- If not possible, ensure adequate velocity to prevent air, gas or vapor from collecting in upper part.
- In partially filled pipes, the clamp-on flowmeter will report incorrect flow rates, or not measure.

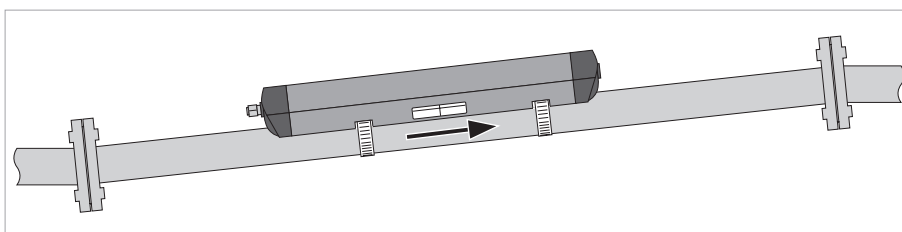


Figure 3-2: Long horizontal pipes

### 3.4.3 Open feed or discharge

Install meter on a lowered section of the pipe to ensure a full pipe condition through the meter.

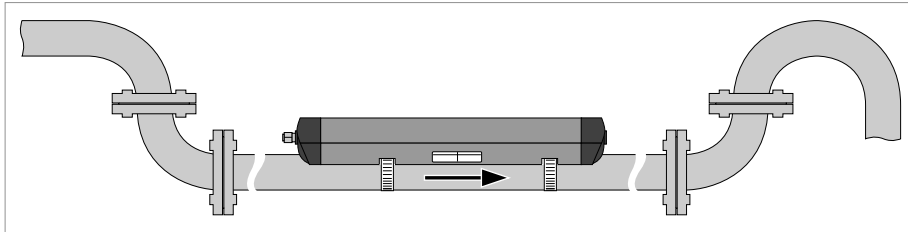


Figure 3-3: Open feed or discharge

### 3.4.4 Down going pipeline over 5 m /16 ft length

Install air vent downstream of the flow meter to prevent vacuum. Although this will not harm the meter, it may cause gases to come out of solution (cavitate) and interfere with proper measurements.

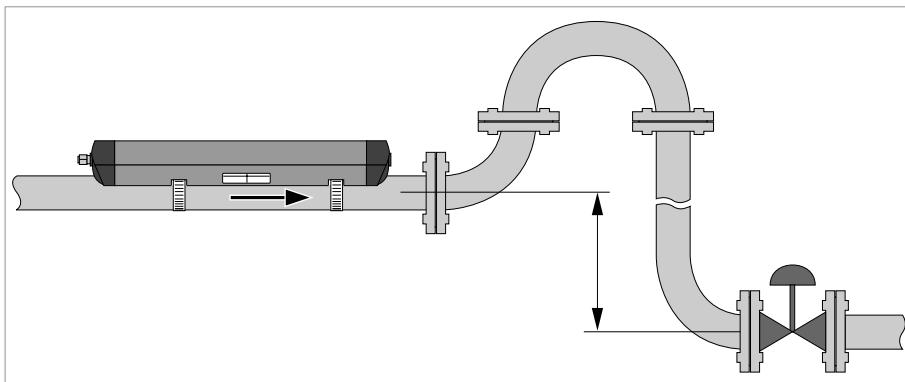


Figure 3-4: Down going pipeline over 5 m /16 ft length

### 3.4.5 Position of control valve

Always install control valves downstream of flowmeter in order to avoid cavitation or distortion of flow profile.

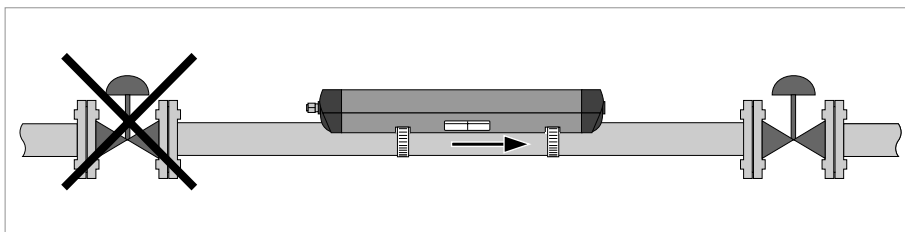


Figure 3-5: Position of control valve

### 3.4.6 Position of pump

*Never install flowmeter at a pump suction side in order to avoid cavitation or flashing in the flowmeter.*

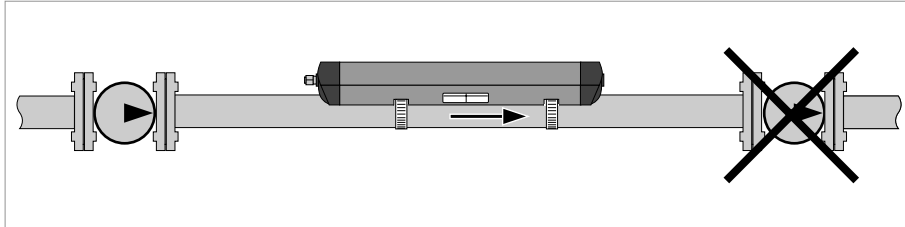


Figure 3-6: Position of pump



## 4.1 Signal cable and power supply signal converter

*The power terminals in the terminal compartments are equipped with additional hinged lids to prevent accidental contact.*

*The device must be grounded in accordance with regulations in order to protect personnel against electric shocks.*

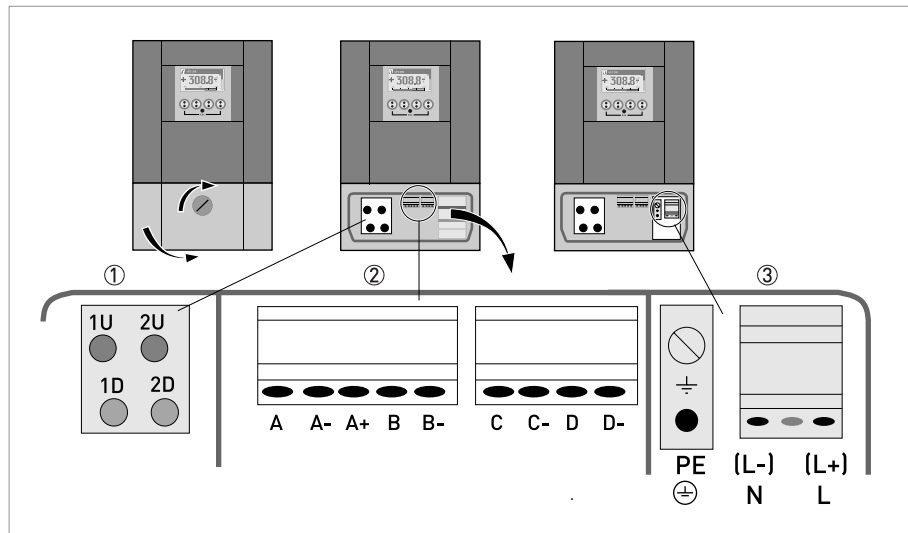


Figure 4-1: Construction of wall version

- ① Connect blue cable to 1U (to 2U for 2<sup>nd</sup> sensor) and the green cable to 1D (2D for 2<sup>nd</sup> sensor)
- ② Communication I/O
- ③ Power supply: 24 VAC/DC or 100...240 VAC

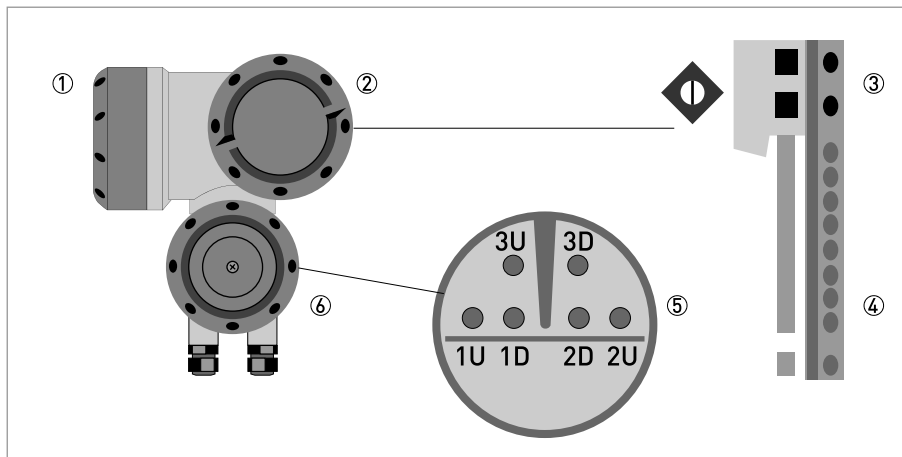


Figure 4-2: Construction (field version)

- ① Cover, electronics compartment
- ② Cover, terminal compartment for power supply and inputs/outputs
- ③ Cable entry for power
- ④ Cable entry for inputs/outputs
- ⑤ Cable entry for sensor cable
- ⑥ Cover, sensor terminal compartment

#### 100...230 VAC (-15% / +10%)

- Connect the protective ground conductor PE of the mains power supply to the separate terminal in the terminal compartment of the signal converter.
- Connect the live conductor to the L terminal and the neutral conductor to the N terminal.

#### 24 VAC/DC (-15% / +10%)

- For reasons to do with the measurement process, connect a functional ground FE to the separate U-clamp terminal in the terminal compartment of the signal converter.
- When connecting to functional extra-low voltages, provide a facility for protective separation (PELV) (VDE 0100 / VDE 0106 and/or IEC 364 / IEC 536 or relevant national regulations).

## 4.2 Inputs and outputs, overview

### 4.2.1 Fixed, non-alterable input/output versions

This measuring transducer is available with various input/output combinations.

CG-No.	Connection terminals								
	A+	A	A-	B	B-	C	C-	D	D-

#### Basic input/output (I/O) standard

1 0 0		$I_p + \text{HART}^{\text{®}}$ passive ①	$S_p / C_p$ passive ②	$S_p$ passive	$P_p / S_p$ passive ②
	$I_a + \text{HART}^{\text{®}}$ active ①				

#### EEx-i inputs/outputs (I/Os) option

2 0 0				$I_a + \text{HART}^{\text{®}}$ active	$P_N / S_N$ NAMUR ②
3 0 0				$I_p + \text{HART}^{\text{®}}$ passive	$P_N / S_N$ NAMUR ②
2 1 0		$I_a$ active	$P_N / S_N$ NAMUR $C_p$ passive ②	$I_a + \text{HART}^{\text{®}}$ active	$P_N / S_N$ NAMUR ②
3 1 0		$I_a$ active	$P_N / S_N$ NAMUR $C_p$ passive ②	$I_p + \text{HART}^{\text{®}}$ passive	$P_N / S_N$ NAMUR ②
2 2 0		$I_p$ passive	$P_N / S_N$ NAMUR $C_p$ passive ②	$I_a + \text{HART}^{\text{®}}$ active	$P_N / S_N$ NAMUR ②
3 2 0		$I_p$ passive	$P_N / S_N$ NAMUR $C_p$ passive ②	$I_p + \text{HART}^{\text{®}}$ passive	$P_N / S_N$ NAMUR ②

① function changed by reconnection

② changeable

- The grey boxes in the tables denote unassigned or unused connection terminals.
- Connection terminal A+ is only operable in the basic input/output version.

Description of abbreviations and CG identifier for possible optional modules on terminals A and B

Abbreviation	Identifier for CG No.	Description
$I_a$	A	Active current output (including HART = HART <sup>®</sup> capability)
$I_p$	B	Passive current output (including HART = HART <sup>®</sup> capability)
$P_a / S_a$	C	Active pulse, frequency, status output or limit switch (changeable)
$P_p / S_p$	E	Passive pulse, frequency, status output or limit switch (changeable)
$P_N / S_N$	F	Passive pulse, frequency, status output or limit switch according to NAMUR (changeable)
$C_a$	G	Active control input
$C_p$	K	Passive control input
$C_N$	H	Active control input to NAMUR Signal converter monitors cable breaks and short circuits as per EN 60947-5-6. Errors indicated on LCD display. Error messages possible via status output.
$IIn_a$	P	Active current input
$IIn_p$	R	Passive current input
-	8	No additional module installed
-	0	No further module possible

### 4.2.2 Alterable input/output versions

The signal converter is available with various input/output combinations.

CG-No.	Connection terminals								
	A+	A	A-	B	B-	C	C-	D	D-

#### Modular inputs/outputs option

4 __		max. 2 option modules for term. A + B	I <sub>a</sub> + HART® active	P <sub>a</sub> / S <sub>a</sub> active ①
8 __		max. 2 option modules for term. A + B	I <sub>p</sub> + HART® passive	P <sub>a</sub> / S <sub>a</sub> active ①
6 __		max. 2 option modules for term. A + B	I <sub>a</sub> + HART® active	P <sub>p</sub> / S <sub>p</sub> passive ①
B __		max. 2 option modules for term. A + B	I <sub>p</sub> + HART® passive	P <sub>p</sub> / S <sub>p</sub> passive ①
7 __		max. 2 option modules for term. A + B	I <sub>a</sub> + HART® active	P <sub>N</sub> / S <sub>N</sub> NAMUR ①
C __		max. 2 option modules for term. A + B	I <sub>p</sub> + HART® passive	P <sub>N</sub> / S <sub>N</sub> NAMUR ①

① changeable

#### Description of abbreviations and CG identifier for possible optional modules on terminals A and B

Abbreviation	Identifier for CG No.	Description
I <sub>a</sub>	A	Active current output (including HART = HART® capability)
I <sub>p</sub>	B	Passive current output (including HART = HART® capability)
P <sub>a</sub> / S <sub>a</sub>	C	Active pulse, frequency, status output or limit switch (changeable)
P <sub>p</sub> / S <sub>p</sub>	E	Passive pulse, frequency, status output or limit switch (changeable)
P <sub>N</sub> / S <sub>N</sub>	F	Passive pulse, frequency, status output or limit switch according to NAMUR (changeable)
C <sub>a</sub>	G	Active control input
C <sub>p</sub>	K	Passive control input
C <sub>N</sub>	H	Active control input to NAMUR Signal converter monitors cable breaks and short circuits as per EN 60947-5-6. Errors indicated on LCD display. Error messages possible via status output.
II <sub>n<sub>a</sub></sub>	P	Active current input
II <sub>n<sub>p</sub></sub>	R	Passive current input
-	8	No additional module installed
-	0	No further module possible

Please fill in this form and fax or email it to your local representative. Please include a sketch of the pipe layout as well, including the X, Y, Z dimensions.

### Customer information

Date	
Submitted by	
Company	
Address	
Telephone	
Fax	
E-mail	

### Flow application data

Reference information (name, tag etc)	
New application Existing application, currently using:	
Measurement objective:	
Fluid:	
<b>Flowrate</b>	
Normal:	
Minimum:	
Maximum:	
<b>Temperature</b>	
Normal:	
Minimum:	
Maximum:	
<b>Viscosity</b>	
Normal:	
Maximum:	
Continuous / pulsating flow. Description:	
Entrained air percentage (volume):	
Eintrained solids percentage (volume):	
Emulsion present (e.g. oil / water):	
Emulsion percentage product A:	
Emulsion percentage product B:	

**Piping details**

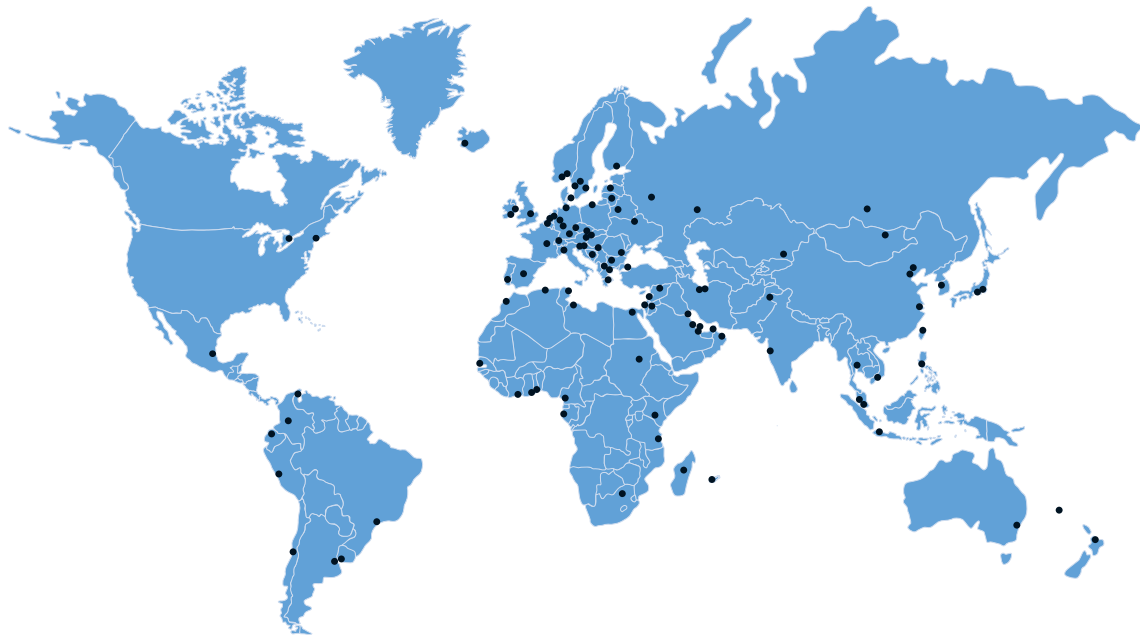
Nominal pipe size:	
Outer diameter:	
Wall thickness / schedule:	
Pipe material:	
Pipe condition (old / new / painted / internal scaling / exterior rust):	
Liner material:	
Liner thickness:	
Straight inlet / outlet section (DN):	
Upstream situation (elbows, valves, pumps):	
Flow orientation (vertical up / horizontal / vertical down / other):	

**Environment details**

Corrosive atmosphere:	
Sea water:	
High humidity (% R.H.):	
Nuclear (radiation):	
Hazardous area:	
Additional details:	

**Hardware requirements:**

Accuracy requested (percentage of rate):	
Power supply (voltage, AC / DC):	
Analog output (4-20 mA)	
Pulse (specify minimum pulse width, pulse value):	
Digital protocol:	
Options:	
Remote mounted signal converter: specify cable length:	
Accessories	



### KROHNE product overview

- Electromagnetic flowmeters
- Variable area flowmeters
- Ultrasonic flowmeters
- Mass flowmeters
- Vortex flowmeters
- Flow controllers
- Level meters
- Temperature meters
- Pressure meters
- Analysis products
- Measuring systems for the oil and gas industry
- Measuring systems for sea-going tankers

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[www.krohne.com](http://www.krohne.com)

**KROHNE**