

**Foxboro® Model IMT33A Magnetic Flow Signal Converter**



The IMT33A magnetic flow signal converter can be used with 9500A and 9600A magnetic flow sensors.

- ▶ Diagnostics: Process and device diagnostics, accuracy check
- ▶ One signal converter for all applications
- ▶ Exceeds requirements of VDI / VDE 2650 and NAMUR NE 107

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## 1.1 The signal converter with the highest performance

The electromagnetic signal converter **IMT33A** is designed to measure the flow velocity, conductivity, volume and mass flow of electrically conductive liquid media.

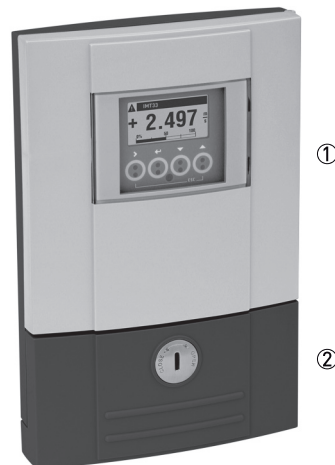
The signal converter can be combined with any measuring sensor, making it very widely used. In terms of available housing versions, there is a compact variant, in which the signal converter is connected to the measuring sensor, as well as the field, wall-mounted and 19" rack-mounted housing.

The electronics plug-in module is identical, regardless of the housing version, providing the same functionality and a standardized operating concept.



[signal converter in compact housing]

- ① Communication with any third party system possible via Foundation Fieldbus or Modbus
- ② Intuitive navigation and a wide variety of languages integrated as standard for ease of operation
- ③ Supply voltage: 100...230 VAC (standard) and 24 VDC or 24 VAC/DC (optional)



[signal converter in wall-mounted housing]

- ① Large backlit graphic display with 4 optical buttons to operate the signal converter without having to open the housing
- ② Any combination of up to 4 inputs and outputs is possible

### Highlights

- High measuring accuracy and long-term stability:  $\pm 0.15\%$  of measured value  $\pm 1$  mm/s
- Optimal zero point stability independent from product properties
- Superior process reliability thanks to standard integrated diagnostics: testing of device functions, check for compliance with specifications and application testing
- Available inputs and outputs: Current output (incl. HART<sup>®</sup>), pulse/frequency output, status output, control input and current input
- Integrated temperature and conductivity measurement
- Optionally available virtual reference offers cost savings and increased process reliability as grounding electrodes and rings are no longer needed
- One converter for all applications, and thus advantages with regard to procurement, engineering and stock-keeping

### Industries

- Water & Wastewater
- Chemicals
- Food & Beverage
- Minerals & Mining
- Pharmaceuticals
- Power plants
- Pulp & Paper

### Applications

Flow measurement of conductive liquids, acids and bases right down to difficult applications such as:

- Products with low conductivity, high solid content or entrained air
- Inhomogeneous, abrasive and corrosive products
- Rapid product change
- Sudden change in pH value
- Pulsating or turbulent flows

## 1.2 Options and variants

### Modular converter concept



(signal converter in compact housing)

The electromagnetic signal converter IMT33A comes in different variants and gives the highest performance for all applications you can think of. From networking in the water & wastewater industry to blending in the chemical industry, from batching in the food & beverage industry to transport in the paper & pulp industry.

And not to forget all of the other applications where the flow of electrically conductive liquids is to be measured. The different versions of the signal converter and measuring sensor can be put together in modules and adapted to a wide variety of applications.

### One signal converter for any application



(signal converter in field housing)

The basic variant covers over 90% of all applications, featuring a current output with HART<sup>®</sup>, pulse/frequency output, status output and control input.

In the modular input/output variant, up to four inputs and outputs can be combined in almost any way. You can also select whether they are passive or active inputs/outputs.

All inputs and outputs are galvanically isolated from each other and from the rest of the electronic equipment.

In addition, the electronics can be equipped with Fieldbus functionality (i.e. Foundation Fieldbus, Modbus, etc.) enabling communication to any third party system.

### Remote design in various versions



[signal converter in wall-mounted housing]

The signal converter in the wall-mounted housing is generally used when it is difficult to access the measuring point or when ambient conditions do not allow the use of the compact version.



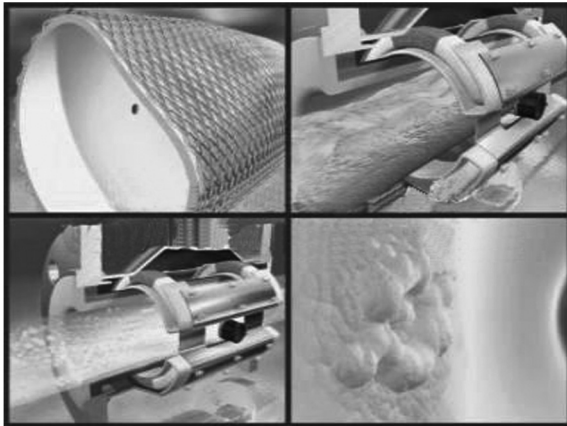
[signal converter in 19" rack-mounted housing  
(28 TE)]

The signal converter in the 19" rack-mounted housing is typically built into the central control room, away from the harsh ambient conditions that can be present at the measuring point.



[signal converter in 19" rack-mounted housing  
(21 TE)]

## Diagnostics



A part of the standard functionality is the comprehensive diagnosis, which consists of three different testing series.

### **Testing the device function**

Checking the microcontroller, memory and outputs.

### **Out-of-spec diagnosis**

Online and cyclical verification to determine whether the measuring device is still within its specifications regarding accuracy and linearity.

### **Application testing**

The detection of potential problems such as gas bubbles, electrode deposits, low conductivity, liner damage, faulty flow profile etc.



### 1.3 Measuring principle

An electrically conductive fluid flows inside an electrically insulated pipe through a magnetic field. This magnetic field is generated by a current, flowing through a pair of field coils.

Inside of the fluid, a voltage  $U$  is generated:

$$U = v * k * B * D$$

in which:

$v$  = mean flow velocity

$k$  = factor correcting for geometry

$B$  = magnetic field strength

$D$  = inner diameter of flowmeter

The signal voltage  $U$  is picked off by electrodes and is proportional to the mean flow velocity  $v$  and thus the flow rate  $q$ . A signal converter is used to amplify the signal voltage, filter it and convert it into signals for totalizing, recording and output processing.

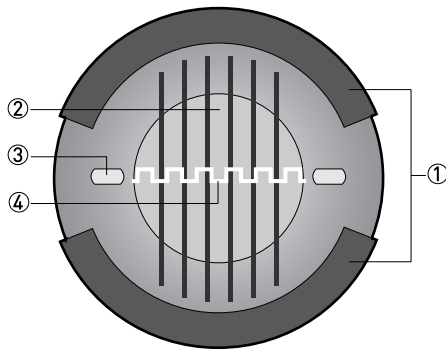


Figure 1-1: Measuring principle

- ① Field coils
- ② Magnetic field
- ③ Electrodes
- ④ Induced voltage (proportional to flow velocity)

## 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 sales office.*
- *Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website.*

### Measuring system

Measuring principle	Faraday's law of induction
Application range	Continuous measurement of current volume flow, flow velocity, conductivity, mass flow (at constant density), coil temperature of the flow sensor

### Design

Modular design	The measuring system consists of a flow sensor and a signal converter.
<b>Flow sensor</b>	
9500A	DN25...3000 / 1...120"
9600A	DN2.5...150 / 1/10...6"
	All flow sensors are also available in an Ex version.
<b>Signal converter</b>	
Compact version (C)	9500A & 9600A with IMT33A <b>C</b>
Field housing (F) - remote version	IMT33A <b>F</b>
	Compact and field housing versions are also available as Ex versions.
Wall-mounted housing (W) - remote version	IMT33A <b>W</b>
19" rack-mounted housing (R) - remote version	IMT33A <b>R</b>

<b>Options</b>	
Outputs / inputs	Current output (incl. HART®), pulse output, frequency and/or status output, limit switch and/or control input or current input (depending on the I/O version)
Totalizer	2 (optional 3) internal counters with a max. of 8 counter places (e.g. for counting volume and/or mass units)
Verification	Integrated verification, diagnostic functions: measuring device, process, measured value, empty pipe detection, stabilisation
Communication interfaces	Foundation Fieldbus, Modbus, HART®
<b>Display and user interface</b>	
Graphic display	LC display, backlit white.
	Size: 128 x 64 pixels, corresponds to 59 x 31 mm = 2.32" x 1.22"
	Display can be rotated in 90° increments.
	Ambient temperatures below -25°C / -13°F, may affect the readability of the display.
Operating elements	4 optical keys for operator control of the signal converter without opening the housing.
	Infrared interface for reading and writing all parameters with IR interface (option) without opening the housing.
Remote control	PACTware™ (incl. Device Type Manager (DTM))
	HART® Communicator
	AMS®
	All DTMs and drivers are available free of charge from the manufacturer's website.
<b>Display functions</b>	
Operating menu	Setting the parameters using 2 measured value pages, 1 status page, 1 graphics page (measured values and graphics are freely adjustable)
Language display texts (as language package)	Standard: English, French, German, Dutch, Portuguese, Swedish, Spanish, Italian
	Eastern Europe: English, Slovenian, Czech, Hungarian
	Northern Europe: English, Danish, Polish
	China: English, German, Chinese
	Russia: English, German, Russian
Units	Metric, British and US units selectable as required from lists for volume / mass flow and counting, flow velocity, electrical conductivity, temperature, pressure

### Measuring accuracy

Reference conditions	Depending on the flow sensor version.
	Refer to technical data for the flow sensor.
Maximum measuring error	±0.15% of the measured value ±1 mm/s, depending on the flow sensor
	For detailed information and accuracy curves, refer to chapter "Accuracy".
	Current output electronics: ±5 µA
Repeatability	±0.06% acc. to OIML R117

### Operating conditions

<b>Temperature</b>	
Process temperature	Refer to technical data for the flow sensor.
Ambient temperature	Depending on the version and combination of outputs.
	It is a good idea to protect the converter from external heat sources such as direct sunlight as higher temperatures reduce the life cycle of all electronic components.
	-40...+65°C / -40...+149°F
	Ambient temperatures below -25°C / -13°F, may affect the readability of the display.
Storage temperature	-50...+70°C / -58...+158°F
<b>Pressure</b>	
Medium	Refer to technical data for the flow sensor.
Ambient pressure	Atmosphere: Height up to 2000 m / 6561.7 ft
<b>Chemical properties</b>	
Electrical conductivity	<b>Standard</b> All media except for water: $\geq 1 \mu\text{S/cm}$ (also refer to the technical data for the flow sensor) Water: $\geq 20 \mu\text{S/cm}$
Physical condition	Conductive, liquid media
Solid content (volume)	Can be used up to $\leq 70\%$
	The greater the solid content, the less accurate the measurements!
Gas content (volume)	Can be used up to $\leq 5\%$
	The greater the gas content, the less accurate the measurements!
Flow	For detailed information, refer to chapter "Flow tables".
<b>Other conditions</b>	
Protection category acc. to IEC 529 / EN 60529	C (compact version) & F (field housing): IP66/67 (acc. to NEMA 4/4X/6)
	W (wall-mounted housing): IP65/66 (acc. to NEMA 4/4X)
	R (19" rack-mounted housing (28 TE) or (21 TE)): IP20 (acc. to NEMA 1); Use: Indoor only, level of pollution 2 and relative humidity < 75%

### Installation conditions

Installation	For detailed information, refer to chapter "Installation conditions".
Inlet/outlet runs	Refer to technical data for the flow sensor.
Dimensions and weights	For detailed information refer to chapter "Dimensions and weight".

## Materials

Signal converter housing	<b>Standard</b>
	Version C and F: die-cast aluminum (polyurethane coated)
	Version W: polyamide - polycarbonate
	Version R (28 TE): aluminum, stainless steel and aluminum sheet, partially polyester-coated
	Version R (21 TE): aluminum and aluminium sheet, partially polyester-coated
	<b>Option</b>
	Versions C and F: stainless steel 316 L (1.4408)
Flow sensor	For housing materials, process connections, liners, grounding electrodes and gaskets, refer to technical data for the flow sensor.

## Electrical connection

General	Electrical connection is carried out in conformity with the VDE 0100 directive "Regulations for electrical power installations with line voltages up to 1000 V" or equivalent national regulations.
Power supply	Standard: 100...230 VAC (-15% / +10%), 50/60 Hz 240 VAC + 5% is included in the tolerance range.
	Option 1: 12...24 VDC (-55% / +30%) 12 VDC - 10% is included in the tolerance range.
	Option 2: 24 VAC/DC (AC: -15% / +10%, 50/60 Hz; DC: -25% / +30%) 12 V is <b>not</b> included in the tolerance range.
Power consumption	AC: 22 VA
	DC: 12 W
Signal cable	Only for remote versions.
	<b>DS 300 (type A)</b> Max. length: 600 m / 1968 ft (depending on electrical conductivity and flow sensor version)
	<b>BTS 300 (type B)</b> Max. length: 600 m / 1968 ft (depending on electrical conductivity and flow sensor version)
	<b>Type LIYCY (only FM, Class 1 Div. 2)</b> Max. length: 100 m / 328 ft (depending on electrical conductivity and flow sensor version)
Cable entries	Standard: M20 x 1.5 (8...12 mm) for C, F and W version; Terminal strip for R-version
	Option: ½" NPT, PF ½ for C, F and W version

Inputs and outputs

General	All outputs are electrically isolated from each other and from all other circuits.		
	All operating data and output values can be adjusted.		
Description of used abbreviations	$U_{ext}$ = external voltage; $R_L$ = load + resistance; $U_0$ = terminal voltage; $I_{nom}$ = nominal current Safety limit values (Ex i): $U_i$ = max. input voltage; $I_i$ = max. input current; $P_i$ = max. input power rating; $C_i$ = max. input capacity; $L_i$ = max. input inductivity		
<b>Current output</b>			
Output data	Volume flow, mass flow, diagnostic value, flow velocity, coil temperature, conductivity		
Settings	<b>Without HART®</b>		
	Q = 0%: 0...15 mA; Q = 100%: 10...20 mA		
	Error identification: 3...22 mA		
	<b>With HART®</b>		
	Q = 0%: 4...15 mA; Q = 100%: 10...20 mA		
	Error identification: 3.5...22 mA		
Operating data	<b>Basic I/Os</b>	<b>Modular I/Os</b>	<b>Ex i I/Os</b>
Active	$U_{int, nom} = 24 \text{ VDC}$ $I \leq 22 \text{ mA}$ $R_L \leq 1 \text{ k}\Omega$		$U_{int, nom} = 20 \text{ VDC}$ $I \leq 22 \text{ mA}$ $R_L \leq 450 \Omega$
			$U_0 = 21 \text{ V}$ $I_0 = 90 \text{ mA}$ $P_0 = 0.5 \text{ W}$ $C_0 = 90 \text{ nF} / L_0 = 2 \text{ mH}$ $C_0 = 110 \text{ nF} / L_0 = 0.5 \text{ mH}$ Linear characteristics
Passive	$U_{ext} \leq 32 \text{ VDC}$ $I \leq 22 \text{ mA}$ $U_0 \geq 1.8 \text{ V}$ $R_L \leq (U_{ext} - U_0) / I_{max}$		$U_{ext} \leq 32 \text{ VDC}$ $I \leq 22 \text{ mA}$ $U_0 \geq 4 \text{ V}$ $R_L \leq (U_{ext} - U_0) / I_{max}$
			$U_i = 30 \text{ V}$ $I_i = 100 \text{ mA}$ $P_i = 1 \text{ W}$ $C_i = 10 \text{ nF}$ $L_i \sim 0 \text{ mH}$

<b>HART®</b>			
Description	HART® protocol via active and passive current output		
	HART® version: V5		
	Universal HART® parameter: completely integrated		
Load	≥ 250 Ω at HART® test point; Note maximum load for current output!		
Multi-Drop operation	Yes, current output = 4 mA		
	Multi-Drop address adjustable in operation menu 1...15		
Device drivers	Available for HART Communicator, AMS®, FDT/DTM		
Registration (HART Communication Foundation)	Yes		
<b>Pulse output or frequency output</b>			
Output data	Pulse output: volume flow, mass flow		
	Frequency output: volume flow, mass flow, diagnostic value, flow velocity, coil temperature, conductivity		
Function	Adjustable as pulse or frequency output		
Pulse rate/frequency	Adjustable final value: 0.01...10000 pulse/s or Hz		
Settings	Pulses per volume or mass unit or max. frequency for 100% flow		
	Pulse width: setting automatic, symmetric or fixed (0.05...2000 ms)		
Operating data	Basic I/Os	Modular I/Os	Ex i I/Os
Active	-	$U_{nom} = 24 \text{ VDC}$  $f_{max}$ in operating menu set to $f_{max} \leq 100 \text{ Hz}$ : $I \leq 20 \text{ mA}$  open: $I \leq 0.05 \text{ mA}$  closed: $U_{0, nom} = 24 \text{ V}$ at $I = 20 \text{ mA}$	
		$f_{max}$ in operating menu set to $100 \text{ Hz} < f_{max} \leq 10 \text{ kHz}$ : $I \leq 20 \text{ mA}$  open: $I \leq 0.05 \text{ mA}$  closed: $U_{0, nom} = 22.5 \text{ V}$ at $I = 1 \text{ mA}$ $U_{0, nom} = 21.5 \text{ V}$ at $I = 10 \text{ mA}$ $U_{0, nom} = 19 \text{ V}$ at $I = 20 \text{ mA}$	

Operating data	Basic I/Os	Modular I/Os	Ex i I/Os
Passive	$U_{ext} \leq 32 \text{ VDC}$ $f_{max}$ in operating menu set to $f_{max} \leq 100 \text{ Hz}$ : $I \leq 100 \text{ mA}$ $R_{L, max} = 47 \text{ k}\Omega$ $R_{L, min} = (U_{ext} - U_0) / I_{max}$ 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 $I \leq 100 \text{ mA}$		-
	$f_{max}$ in operating menu set to $100 \text{ Hz} < f_{max} \leq 10 \text{ kHz}$ : $I \leq 20 \text{ mA}$ $R_{L, max} = 47 \text{ k}\Omega$ $R_{L, min} = (U_{ext} - U_0) / I_{max}$ 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	Passive to EN 60947-5-6
		open: $I_{nom} = 0.6 \text{ mA}$ closed: $I_{nom} = 3.8 \text{ mA}$	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>Low flow cut-off</b>			
Function	Switching point and hysteresis separately adjustable for each output, counter and the display		
Switching point	Current output, frequency output: 0...20%; set in increments of 0.1 Pulse output: Unit is volume flow or mass flow and not limited		
Hysteresis			
<b>Time constant</b>			
Function	The time constant corresponds to the elapsed time until 63% of the end value has been reached according to a step function.		
Settings	Set in increments of 0.1.		
	0...100 s		



<b>Status output / limit switch</b>			
Function and settings	Adjustable as automatic measuring range conversion, display of flow direction, counter overflow, error, switching point or empty pipe detection		
	Valve control with activated dosing function		
	Status and/or control: ON or OFF		
Operating data	Basic I/Os	Modular I/Os	Ex i I/Os
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	$U_{ext} \leq 32 \text{ VDC}$ $I \leq 100 \text{ mA}$ $R_{L, max} = 47 \text{ k}\Omega$ $R_{L, min} = (U_{ext} - U_0) / I_{max}$ 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 $I \leq 100 \text{ mA}$	$U_{ext} = 32 \text{ VDC}$ $I \leq 100 \text{ mA}$ $R_{L, max} = 47 \text{ k}\Omega$ $R_{L, min} = (U_{ext} - U_0) / I_{max}$ 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: $I_{nom} = 4.5 \text{ mA}$ $U_i = 30 \text{ V}$ $I_i = 100 \text{ mA}$ $P_i = 1 \text{ W}$ $C_i = 10 \text{ nF}$ $L_i = 0 \text{ mH}$

Control input			
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	Basic I/Os	Modular I/Os	Ex i I/Os
Active	-	$U_{int} = 24 \text{ VDC}$  Ext. contact open: $U_{0, nom} = 22 \text{ V}$  Ext. contact closed: $I_{nom} = 4 \text{ mA}$  Contact closed (on): $U_0 \geq 12 \text{ V}$ with $I_{nom} = 1.9 \text{ mA}$  Contact open (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: $U_0 \geq 5.5 \text{ V}$ with $I \geq 4 \text{ mA}$  Off: $U_0 \leq 3.5 \text{ V}$ with $I \leq 0.5 \text{ mA}$  $U_i = 30 \text{ V}$ $I_i = 100 \text{ mA}$ $P_i = 1 \text{ W}$ $C_i = 10 \text{ nF}$ $L_i = 0 \text{ mH}$
NAMUR	-	Active to EN 60947-5-6  Terminals open: $U_{0, nom} = 8.7 \text{ V}$  Contact closed (on): $U_{0, nom} = 6.3 \text{ V}$ with $I_{nom} > 1.9 \text{ mA}$  Contact open (off): $U_{0, nom} = 6.3 \text{ V}$ with $I_{nom} < 1.9 \text{ mA}$  Detection of cable break: $U_0 \geq 8.1 \text{ V}$ with $I \leq 0.1 \text{ mA}$  Detection of cable short circuit: $U_0 \leq 1.2 \text{ V}$ with $I \geq 6.7 \text{ mA}$	-

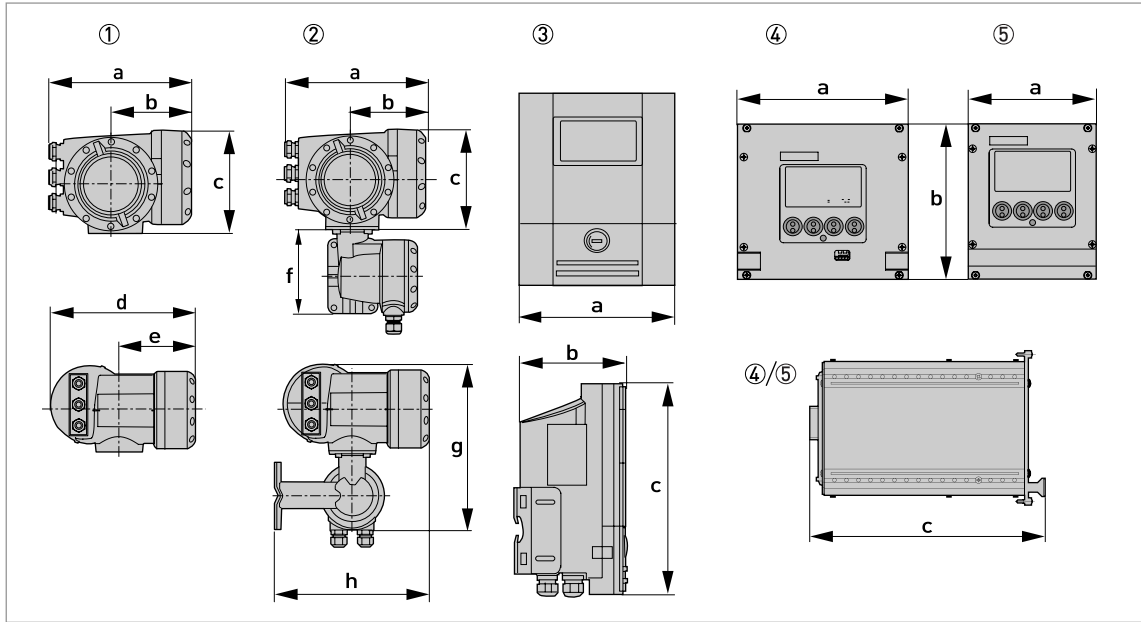
<b>Current input</b>			
Function	A connected external sensor delivers the values (temperature, pressure or current) to the current input.		
Operating data	<b>Basic I/Os</b>	<b>Modular I/Os</b>	<b>Ex i I/Os</b>
Active	-	$U_{int, nom} = 24 \text{ VDC}$ $I \leq 22 \text{ mA}$ $I_{max} \leq 26 \text{ mA}$ (electronically limited) $U_{0, min} = 19 \text{ V}$ at $I \leq 22 \text{ mA}$ No HART®	$U_{int, nom} = 20 \text{ VDC}$ $I \leq 22 \text{ mA}$ $U_{0, min} = 14 \text{ V}$ at $I \leq 22 \text{ mA}$ No HART®
			$U_0 = 24.5 \text{ V}$ $I_0 = 99 \text{ mA}$ $P_0 = 0.6 \text{ W}$ $C_0 = 75 \text{ nF} / L_0 = 0.5 \text{ mH}$ No HART®
Passive	-	$U_{ext} \leq 32 \text{ VDC}$ $I \leq 22 \text{ mA}$ $I_{max} \leq 26 \text{ mA}$ (electronically limited) $U_{0, max} = 5 \text{ V}$ at $I \leq 22 \text{ mA}$ No HART®	$U_{ext} \leq 32 \text{ VDC}$ $I \leq 22 \text{ mA}$ $U_{0, max} = 4 \text{ V}$ at $I \leq 22 \text{ mA}$ No HART®
			$U_i = 30 \text{ V}$ $I_i = 100 \text{ mA}$ $P_i = 1 \text{ W}$ $C_i = 10 \text{ nF}$ $L_i = 0 \text{ mH}$ No HART®
<b>FOUNDATION Fieldbus</b>			
Description	Galvanically isolated acc. to IEC 61158		
	Current consumption: 10.5 mA		
	Permissible bus voltage: 9...32 V; in Ex application: 9...24 V		
	Bus interface with integrated reverse polarity protection		
	Link Master function (LM) supported		
	Tested with Interoperable Test Kit (ITK) version 5.1		
Function blocks	3 x analogue Input, 2 x integrator, 1 x PID		
Output data	Volume flow, mass flow, velocity, coil temperature, conductivity, electronics temperature		
<b>Modbus</b>			
Description	Modbus RTU, Master / Slave, RS485		
Address range	1...247		
Supported function codes	03, 04, 16		
Broadcast	Supported with function code 16		
Supported Baud rate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud		

### Approvals and certificates

CE	The device fulfils the statutory requirements of the EC directives. The manufacturer certifies that these requirements have been met by applying the CE marking.
Electromagnetic compatibility (EMC)	2004/108/EC in conjunction with EN 61326-1 (A1, A2)
European pressure equipment directive	PED 97/23 (only for compact versions)
Non-Ex	Standard
<b>Hazardous areas</b>	
<b>Option (only Compact version)</b>	
ATEX	II 2 GD Ex d [ia] IIC T6...T3
	II 2 GD Ex de [ia] IIC T6...T3
	II 2 GD Ex e [ia] IIC T6...T3
	II 3 G Ex nA [nL] IIC T4...T3
<b>Option (only Field version)</b>	
ATEX	II 2 GD Ex de [ia] IIC T6
	II 2(1) GD Ex de [ia] IIC T6
NEPSI	Ex de [ia] IIC T6
<b>Option (only Compact and Field versions)</b>	
FM / CSA	Class I, Div. 2, Group A, B, C and D
	Class II, Div. 2, Group F and G
SAA (in preparation)	Aus Ex zone 1/2
TIIS (in preparation)	Zone 1/2
<b>Other standards and approvals</b>	
Shock and vibration resistance	IEC 68-2-3
NAMUR	NE 21, NE 43, NE 53

## 2.2 Dimensions and weights

### 2.2.1 Housing



- ① Compact version (C)
- ② Field housing (F) - remote version
- ③ Wall-mounted housing (W) - remote version
- ④ 19" rack-mounted housing 28 TE (R) - remote version
- ⑤ 19" rack-mounted housing 21 TE (R) - remote version

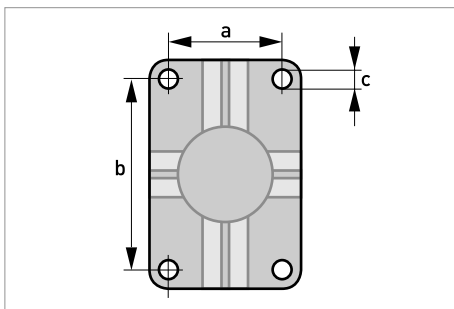
### Dimensions and weights in mm and kg

Version	Dimensions [mm]							Weight [kg]
	a	b	c	d	e	g	h	
C	202	120	155	260	137	-	-	4.2
F	202	120	155	-	-	295.8	277	5.7
W	198	138	299	-	-	-	-	2.4
R	142 (28 TE)	129 (3 HE)	195	-	-	-	-	1.2
	107 (21 TE)	129 (3 HE)	190	-	-	-	-	0.98

Dimensions and weights in inch and lb

Version	Dimensions [inch]							Weight [lb]
	a	b	c	d	e	g	h	
C	7.75	4.75	6.10	10.20	5.40	-	-	9.30
F	7.75	4.75	6.10	-	-	11.60	10.90	12.60
W	7.80	5.40	11.80	-	-	-	-	5.30
R	5.59 (28 TE)	5.08 (3 HE)	7.68	-	-	-	-	2.65
	4.21 (21 TE)	5.08 (3 HE)	7.48	-	-	-	-	2.16

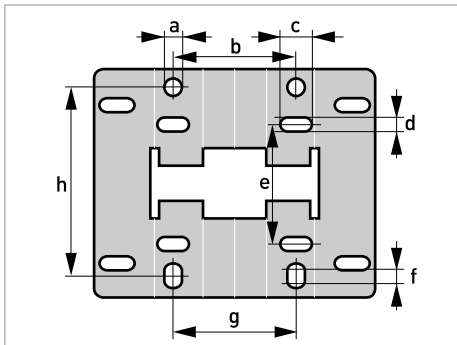
2.2.2 Mounting plate, field housing



Dimensions in mm and inch

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

### 2.2.3 Mounting plate, wall-mounted housing



Dimensions in mm and inch

	[mm]	[inch]
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

## 2.3 Flow tables

Flow rate in m/s and m<sup>3</sup>/h

v [m/s]	Q <sub>100 %</sub> in m <sup>3</sup> /h			
	0.3	1	3	12
DN [mm]	Min. flow	Nominal flow		Max. flow
2.5	0.005	0.02	0.05	0.21
4	0.01	0.05	0.14	0.54
6	0.03	0.10	0.31	1.22
10	0.08	0.28	0.85	3.39
15	0.19	0.64	1.91	7.63
20	0.34	1.13	3.39	13.57
25	0.53	1.77	5.30	21.21
32	0.87	2.90	8.69	34.74
40	1.36	4.52	13.57	54.29
50	2.12	7.07	21.21	84.82
65	3.58	11.95	35.84	143.35
80	5.43	18.10	54.29	217.15
100	8.48	28.27	84.82	339.29
125	13.25	44.18	132.54	530.15
150	19.09	63.62	190.85	763.40
200	33.93	113.10	339.30	1357.20
250	53.01	176.71	530.13	2120.52
300	76.34	254.47	763.41	3053.64
350	103.91	346.36	1039.08	4156.32
400	135.72	452.39	1357.17	5428.68
450	171.77	572.51	1717.65	6870.60
500	212.06	706.86	2120.58	8482.32
600	305.37	1017.90	3053.70	12214.80
700	415.62	1385.40	4156.20	16624.80
800	542.88	1809.60	5428.80	21715.20
900	687.06	2290.20	6870.60	27482.40
1000	848.22	2827.40	8482.20	33928.80
1200	1221.45	3421.20	12214.50	48858.00
1400	1433.52	4778.40	14335.20	57340.80
1600	2171.46	7238.20	21714.60	86858.40
1800	2748.27	9160.9	27482.70	109930.80
2000	3393.00	11310.00	33930.00	135720.00
2200	4105.50	13685.00	41055.00	164220.00



	Q <sub>100 %</sub> in m <sup>3</sup> /h			
v [m/s]	0.3	1	3	12
DN [mm]	Min. flow	Nominal flow		Max. flow
2400	4885.80	16286.00	48858.00	195432.00
2600	5733.90	19113.00	57339.00	229356.00
2800	6650.10	22167.00	66501.00	266004.00
3000	7634.10	25447.00	76341.00	305364.00

## Flow rate in ft/s and US gallons/min

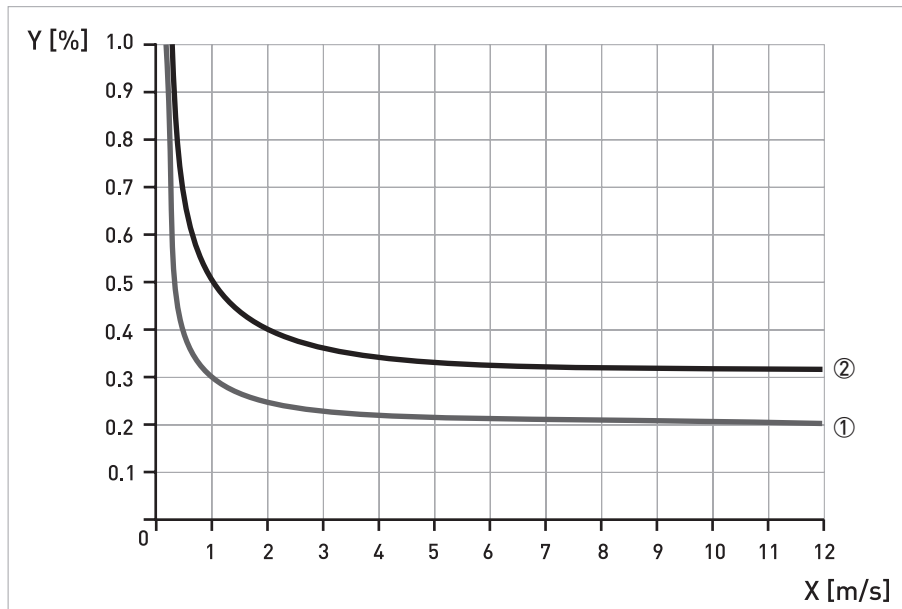
	Q <sub>100 %</sub> in US gallons/min			
v [ft/s]	1	3.3	10	40
DN [inch]	Min. flow	Nominal flow		Max. flow
1/10	0.02	0.09	0.23	0.93
1/8	0.06	0.22	0.60	2.39
1/4	0.13	0.44	1.34	5.38
3/8	0.37	1.23	3.73	14.94
1/2	0.84	2.82	8.40	33.61
3/4	1.49	4.98	14.94	59.76
1	2.33	7.79	23.34	93.36
1.25	3.82	12.77	38.24	152.97
1.5	5.98	19.90	59.75	239.02
2	9.34	31.13	93.37	373.47
2.5	15.78	52.61	159.79	631.16
3	23.90	79.69	239.02	956.09
4	37.35	124.47	373.46	1493.84
5	58.35	194.48	583.24	2334.17
6	84.03	279.97	840.29	3361.17
8	149.39	497.92	1493.29	5975.57
10	233.41	777.96	2334.09	9336.37
12	336.12	1120.29	3361.19	13444.77
14	457.59	1525.15	4574.93	18299.73
16	597.54	1991.60	5975.44	23901.76
18	756.26	2520.61	7562.58	30250.34
20	933.86	3112.56	9336.63	37346.53
24	1344.50	4481.22	13445.04	53780.15
28	1829.92	6099.12	18299.20	73196.79
32	2390.23	7966.64	23902.29	95609.15
36	3025.03	10082.42	30250.34	121001.37

	Q <sub>100</sub> % in US gallons/min			
v [ft/s]	1	3.3	10	40
DN [inch]	Min. flow	Nominal flow		Max. flow
40	3734.50	12447.09	37346.00	149384.01
48	5377.88	17924.47	53778.83	215115.30
56	6311.60	21038.46	63115.99	252463.94
64	9560.65	31868.51	95606.51	382426.03
72	12100.27	40333.83	121002.69	484010.75
80	14938.92	49795.90	149389.29	597557.18
88	18075.97	60252.63	180759.73	723038.90
96	21511.53	71704.38	215115.30	860461.20
104	25245.60	84151.16	252456.02	1009824.08
112	29279.51	97597.39	292795.09	1171180.37
120	33611.93	112038.64	336119.31	1344477.23

## 2.4 Measuring accuracy

### Reference conditions

- Medium: water
- Temperature: +20°C / +68°F
- Pressure: 1 bar / 14.5 psi
- Inlet section: ≥ 5 DN



X [m/s]: flow velocity

Y [%]: deviation from the actual measured value (mv)

	DN [mm]	DN [inch]	Accuracy	Curve
9500A / 9600A	10...1600	3/8...80	0.2% of mv + 1 mm/s	①
9500A	>1600	>64	0.3% of mv + 2 mm/s	②
9600A	<10	<3/8	0.3% of mv + 2 mm/s	②

### 3.1 Intended use

The electromagnetic flowmeters are designed exclusively to measure the flow and conductivity of electrically conductive, liquid media.

*For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.*

*If the device is not used according to the operating conditions (refer to chapter "Technical data"), the intended protection could be affected.*

*This device is a Group 1, Class A device as specified within CISPR11:2009. It is intended for use in industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in other environments, due to conducted as well as radiated disturbances.*

### 3.2 Installation specifications

*The following precautions must be taken to ensure reliable installation.*

- *Make sure that there is adequate space to the sides.*
- *Protect the signal converter from direct sunlight and install a sun shade if necessary.*
- *Signal converters installed in control cabinets require adequate cooling, e.g. by fan or heat exchanger.*
- *Do not expose the signal converter to intense vibrations. The measuring devices are tested for a vibration level in accordance with IEC 68-2-64.*

### 3.3 Mounting of the compact version

*The signal converter is mounted directly on the flow sensor. For installation of the flowmeter, please observe the instructions in the supplied product documentation for the flow sensor.*

### 3.4 Mounting the field housing, remote version

#### *Remarks for sanitary applications*

- *To prevent contamination and dirt deposits behind the mounting plate, a cover plug must be installed between the wall and the mounting plate.*
- *Pipe mounting is not suitable for sanitary applications!*

*Assembly materials and tools are not part of the delivery. Use the assembly materials and tools in compliance with the applicable occupational health and safety directives.*

#### 3.4.1 Pipe mounting

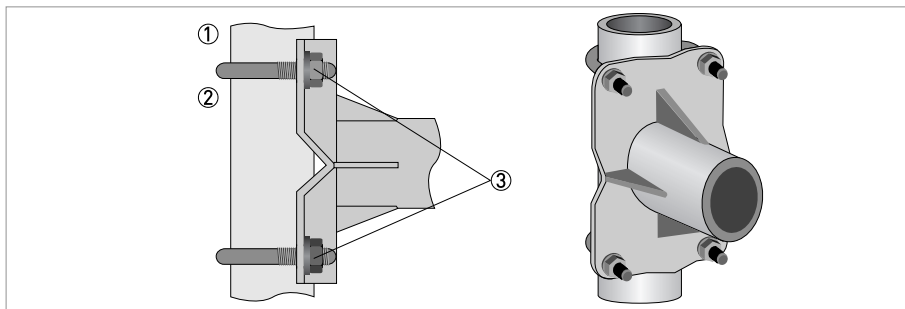


Figure 3-1: Pipe mounting of the field housing

- ① Fix the signal converter to the pipe.
- ② Fasten the signal converter using standard U-bolts and washers.
- ③ Tighten the nuts.

## 3.4.2 Wall mounting

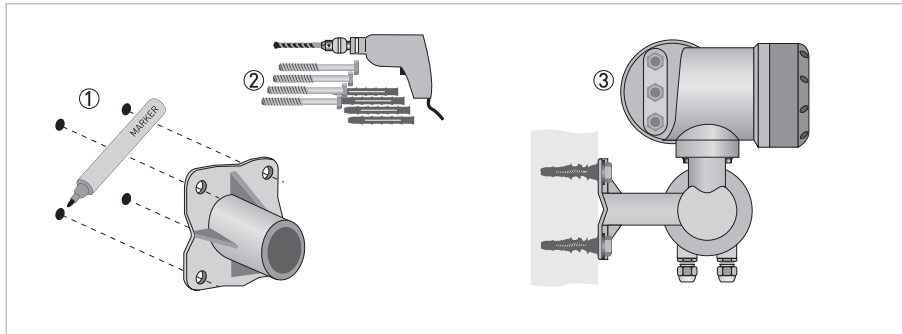
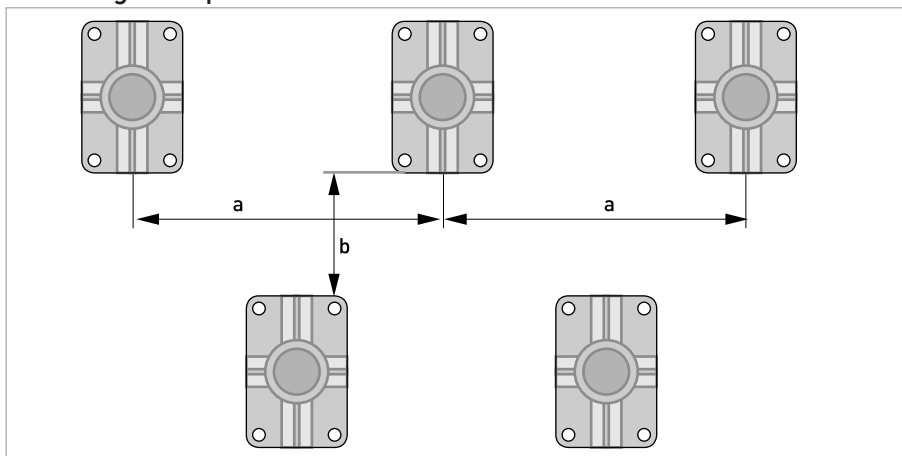


Figure 3-2: Wall mounting of the field housing

- ① Prepare the holes with the aid of the mounting plate. For further information refer to *Mounting plate, field housing* on page 22.
- ② Use the mounting material and tools in compliance with the applicable occupational health and safety directives.
- ③ Fasten the housing securely to the wall.

#### Mounting multiple devices next to each other



$a \geq 600 \text{ mm} / 23.6''$   
 $b \geq 250 \text{ mm} / 9.8''$

### 3.5 Mounting the wall-mounted housing, remote version

*Assembly materials and tools are not part of the delivery. Use the assembly materials and tools in compliance with the applicable occupational health and safety directives.*

#### 3.5.1 Pipe mounting

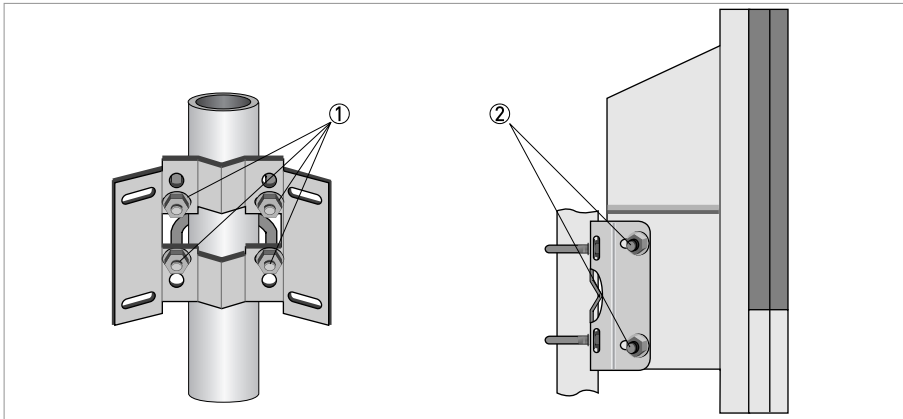


Figure 3-3: Pipe mounting of the wall-mounted housing

- ① Fasten the mounting plate to the pipe with standard U-bolts, washers and fastening nuts.
- ② Screw the signal converter to the mounting plate with the nuts and washers.

## 3.5.2 Wall mounting

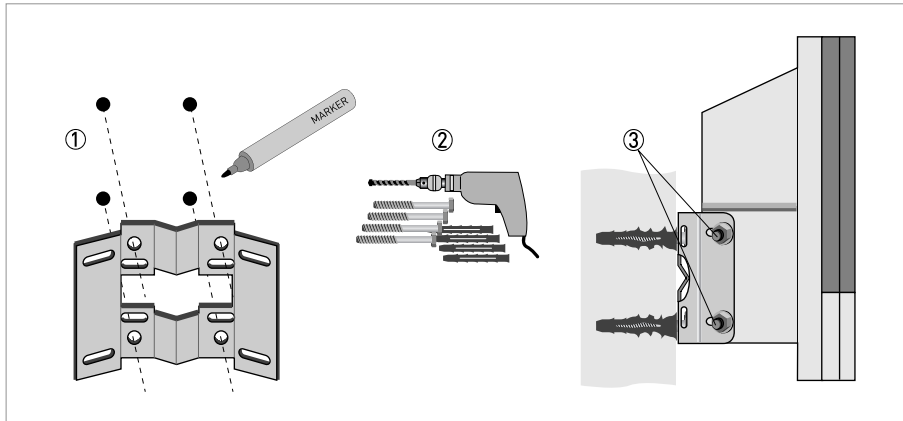
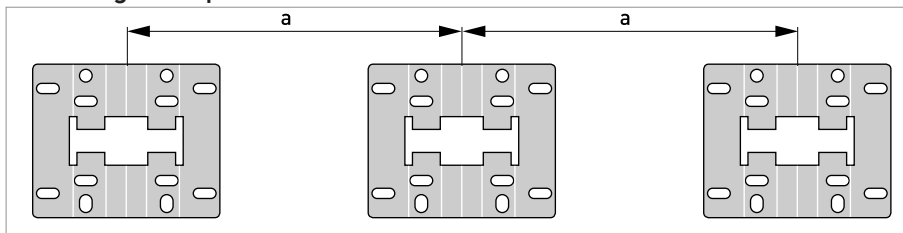


Figure 3-4: Wall mounting of the wall-mounted housing

- ① Prepare the holes with the aid of the mounting plate. For further information refer to *Mounting plate, wall-mounted housing* on page 23.
- ② Fasten the mounting plate securely to the wall.
- ③ Screw the signal converter to the mounting plate with the nuts and washers.

#### Mounting multiple devices next to each other



$a \geq 240 \text{ mm} / 9.4''$



## 4.1 Important notes on electrical connection

*Electrical connection is carried out in conformity with the VDE 0100 directive "Regulations for electrical power installations with line voltages up to 1000 V" or equivalent national regulations.*

- Use suitable cable entries for the various electrical cables.
- The flow sensor and signal converter have been configured together at the factory. For this reason, please connect the devices in pairs.
- If delivered separately or when installing devices that were not configured together, set the signal converter to the DN size and GK/GKL of the flow sensor.

## 4.2 Preparing the signal and field current cables

*Assembly materials and tools are not part of the delivery. Use the assembly materials and tools in compliance with the applicable occupational health and safety directives.*

The electrical connection of the outer shield is different for the various housing variants. Please observe the corresponding instructions.

### 4.2.1 Signal cable A (type DS 300), construction

- Signal cable A is a double-shielded cable for signal transmission between the flow sensor and signal converter.
- Bending radius:  $\geq 50 \text{ mm} / 2''$

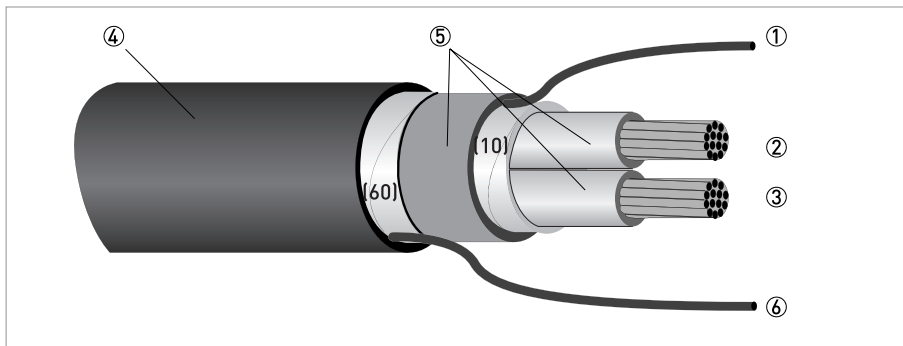


Figure 4-1: Construction of signal cable A

- ① Stranded drain wire (1) for the inner shield (10),  $1.0 \text{ mm}^2 \text{ Cu}$  / AWG 17 (not insulated, bare)
- ② Insulated wire (2),  $0.5 \text{ mm}^2 \text{ Cu}$  / AWG 20
- ③ Insulated wire (3),  $0.5 \text{ mm}^2 \text{ Cu}$  / AWG 20
- ④ Outer sheath
- ⑤ Insulation layers
- ⑥ Stranded drain wire (6) for the outer shield (60)

4.2.2 Length of signal cable A

For temperatures of the medium above 150°C / 300°F, a special signal cable and a ZD intermediate socket are necessary. These are available including the changed electrical connection diagrams.

Flow sensor	Nominal size		Min. electrical conductivity [ $\mu\text{S}/\text{cm}$ ]	Curve for signal cable A
	DN [mm]	[inch]		
9500A	25...150	1...6	20	A1
	200...2000	8...80	20	A2
9600A	2.5...150	1/10...6	1	A1

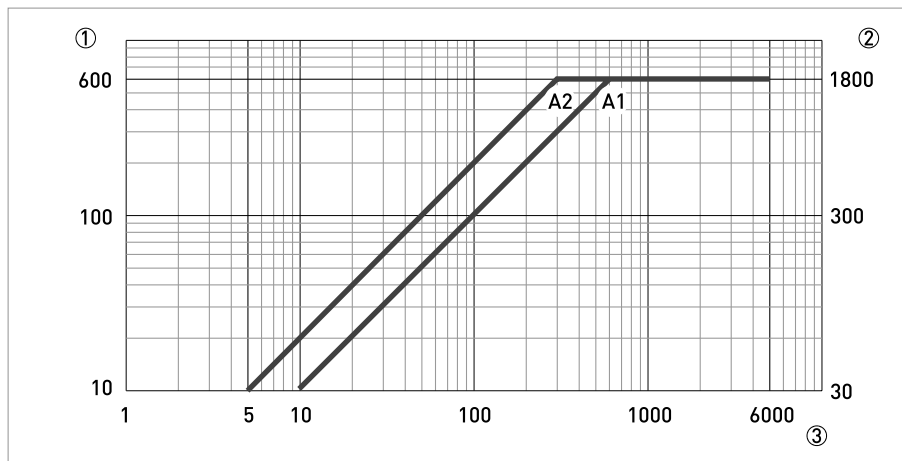


Figure 4-2: Maximum length of signal cable A

- ① Maximum length of signal cable A between the flow sensor and signal converter [m]
- ② Maximum length of signal cable A between the flow sensor and signal converter [ft]
- ③ Electrical conductivity of the medium being measured [ $\mu\text{S}/\text{cm}$ ]

### 4.2.3 Signal cable B (type BTS 300), construction

- Signal cable B is a triple-shielded cable for signal transmission between the flow sensor and signal converter.
- Bending radius:  $\geq 50 \text{ mm} / 2''$

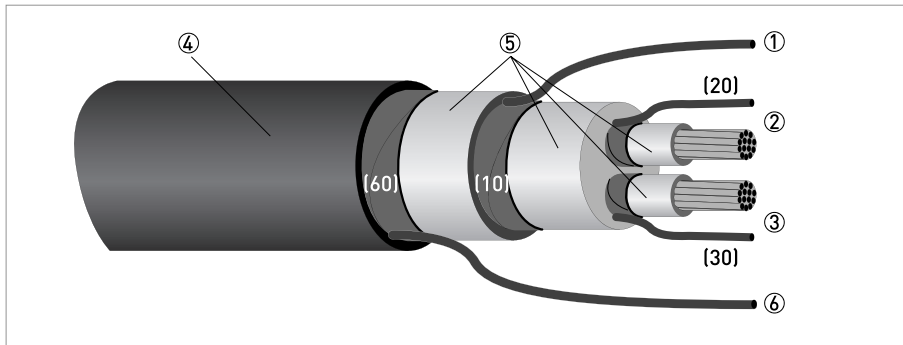


Figure 4-3: Construction of signal cable B

- ① Stranded drain wire for the inner shield (10), 1.0 mm<sup>2</sup> Cu / AWG 17 (not insulated, bare)
- ② Insulated wire (2), 0.5 mm<sup>2</sup> Cu / AWG 20 with stranded drain wire (20) of shield
- ③ Insulated wire (3), 0.5 mm<sup>2</sup> Cu / AWG 20 with stranded drain wire (30) of shield
- ④ Outer sheath
- ⑤ Insulation layers
- ⑥ Stranded drain wire (6) for the outer shield (60), 0.5 mm<sup>2</sup> Cu / AWG 20 (not insulated, bare)

4.2.4 Length of signal cable B

For temperatures of the medium above 150°C / 300°F, a special signal cable and a ZD intermediate socket are necessary. These are available including the changed electrical connection diagrams.

Flow sensor	Nominal size		Min. electrical conductivity [ $\mu\text{S}/\text{cm}$ ]	Curve for signal cable B
	DN [mm]	[inch]		
9500A	25...150	1...6	20	B3
	200...2000	8...80	20	B4
9600A	2.5...15	1/10...1/2	10	B1
	25...150	1...6	1	B3

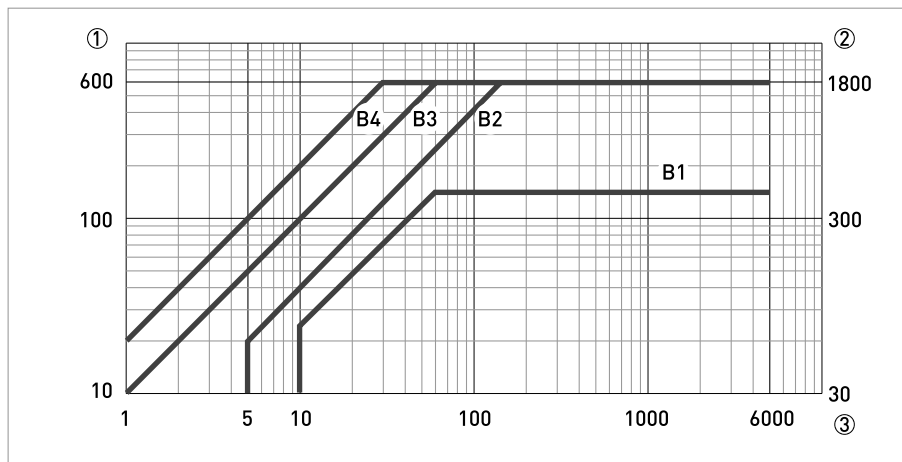


Figure 4-4: Maximum length of signal cable B

- ① Maximum length of signal cable B between the measuring sensor and signal converter [m]
- ② Maximum length of signal cable B between the measuring sensor and signal converter [ft]
- ③ Electrical conductivity of the medium being measured [ $\mu\text{S}/\text{cm}$ ]

### 4.3 Connecting the signal and field current cables

*Cables may only be connected when the power is switched off.*

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

*For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.*

*Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.*

### 4.3.1 Connection diagram for flow sensor, field housing

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

- If a shielded field current cable is used, the shield must **NOT** be connected in the housing of the signal converter.
- The outer shield of signal cable A or B in the signal converter housing is connected via the strain relief terminal.
- Bending radius of signal and field current cable:  $\geq 50 \text{ mm} / 2''$
- The following illustration is schematic. The positions of the electrical connection terminals may vary depending on the housing version.

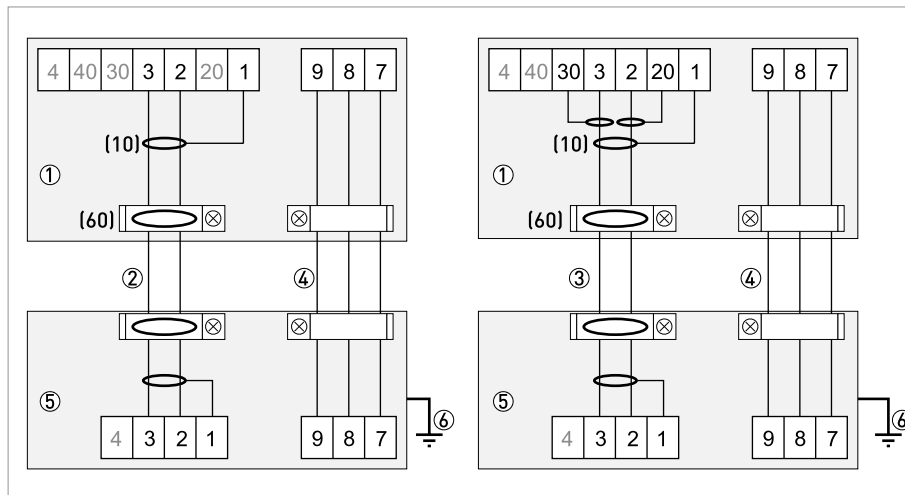


Figure 4-5: Connection diagram for flow sensor, field housing

- ① Electrical terminal compartment in housing of the signal converter for signal and field current cable
- ② Signal cable A
- ③ Signal cable B
- ④ Field current cable C
- ⑤ Connection box of flow sensor
- ⑥ Functional ground FE

### 4.3.2 Connection diagram for flow sensor, wall-mounted housing

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

- If a shielded field current cable is used, the shield must **NOT** be connected in the housing of the signal converter.
- The outer shield of the signal cable is connected in the signal converter housing via the stranded drain wire.
- Bending radius of signal and field current cable:  $\geq 50 \text{ mm} / 2''$
- The following illustration is schematic. The positions of the electrical connection terminals may vary depending on the housing version.

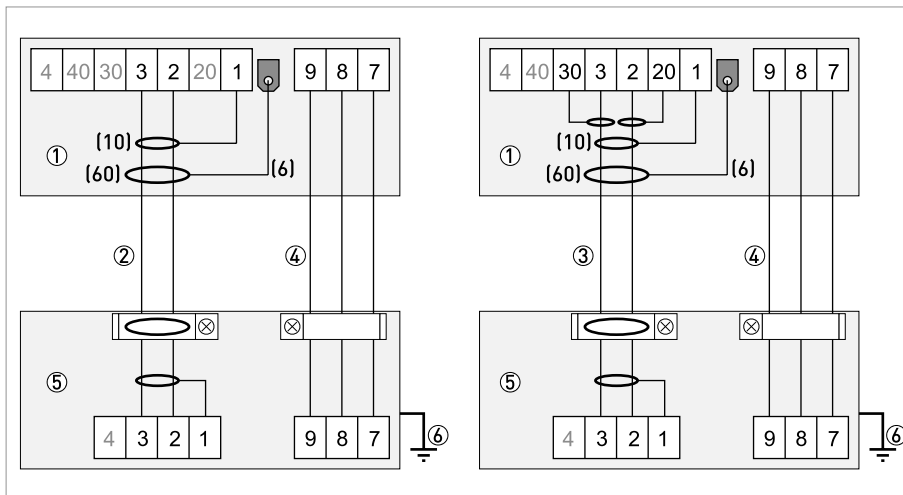


Figure 4-6: Connection diagram for flow sensor, wall-mounted housing

- ① Electrical terminal compartment in housing of the signal converter for signal and field current cable
- ② Signal cable A
- ③ Signal cable B
- ④ Field current cable C
- ⑤ Connection box of flow sensor
- ⑥ Functional ground FE

### 4.3.3 Connection diagram for flow sensor, 19" rack-mounted housing (28 TE)

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

- If a shielded field current cable is used, the shield must **NOT** be connected in the housing of the signal converter.
- The outer shield of the signal cable is connected in the signal converter housing via the stranded drain wire.
- Bending radius of signal and field current cable:  $\geq 50 \text{ mm} / 2''$
- The following illustration is schematic. The positions of the electrical connection terminals may vary depending on the housing version.

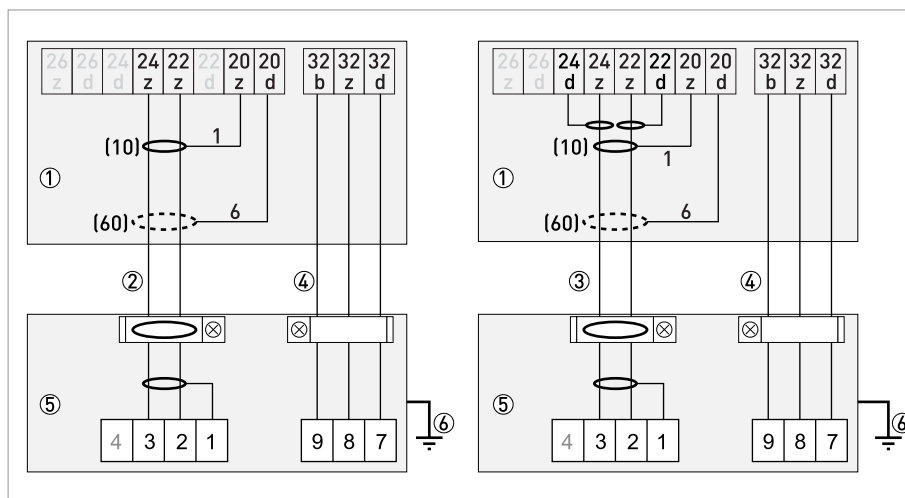


Figure 4-7: Connection diagram for flow sensor, 19" rack-mounted housing (28 TE)

- ① Electrical terminal compartment in housing of the signal converter for signal and field current cable
- ② Signal cable A
- ③ Signal cable B
- ④ Field current cable C
- ⑤ Connection box of flow sensor
- ⑥ Functional ground FE



#### 4.3.4 Connection diagram for flow sensor, 19" rack-mounted housing (21 TE)

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

- If a shielded field current cable is used, the shield must **NOT** be connected in the housing of the signal converter.
- The outer shield of the signal cable is connected in the signal converter housing via the stranded drain wire.
- Bending radius of signal and field current cable:  $\geq 50 \text{ mm} / 2''$
- The following illustration is schematic. The positions of the electrical connection terminals may vary depending on the housing version.

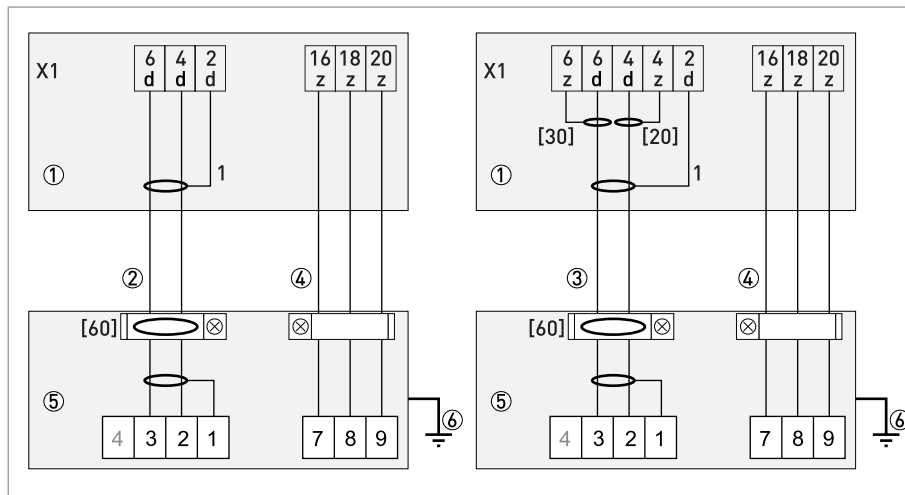


Figure 4-8: Connection diagram for flow sensor, 19" rack-mounted housing (21 TE)

- ① Electrical terminal compartment in housing of the signal converter for signal and field current cable
- ② Signal cable A
- ③ Signal cable B
- ④ Field current cable C
- ⑤ Connection box of flow sensor
- ⑥ Functional ground FE

## 4.4 Power supply connection

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

*For devices used in hazardous areas, additional safety notes apply; please refer to the Ex documentation.*

- The protection category depends on the housing versions (IP65...67 to IEC 529 / EN 60529 or NEMA4/4X/6).
- The housings of the devices, which are designed to protect the electronic equipment from dust and moisture, should be kept well closed at all times. Creepage distances and clearances are dimensioned to VDE 0110 and IEC 664 for pollution severity 2. Supply circuits are designed for overvoltage category III and the output circuits for overvoltage category II.
- Fuse protection ( $I_N \leq 16$  A) for the infeed power circuit, as well as a separator (switch, circuit breaker) to isolate the signal converter must be provided close to the device. The separator must conform to IEC 60947-1 and IEC 60947-3 and must be marked as the separator for this device.

**100...230 VAC (tolerance range: -15% / +10%)**

- Note the power supply voltage and frequency (50...60 Hz) on the nameplate.
- The protective ground terminal **PE** of the power supply must be connected to the separate U-clamp terminal in the terminal compartment of the signal converter.  
For 19" rack-mounted housing please refer to the connection diagrams.

*240 VAC + 5% is included in the tolerance range.*

**12...24 VDC (tolerance range: -55% / +30%)**

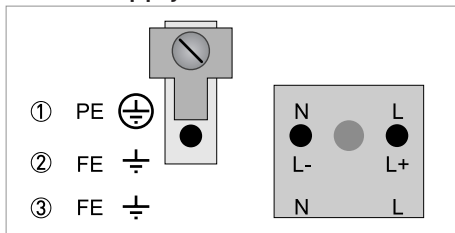
- Note the data on the nameplate!
- When connecting to functional extra-low voltages, provide a facility for protective separation (PELV) (acc. to VDE 0100 / VDE 0106 and/or IEC 364 / IEC 536 or relevant national regulations).

*12 VDC - 10% is included in the tolerance range.*

**24 VAC/DC (tolerance range: AC: -15% / +10%; DC: -25% / +30%)**

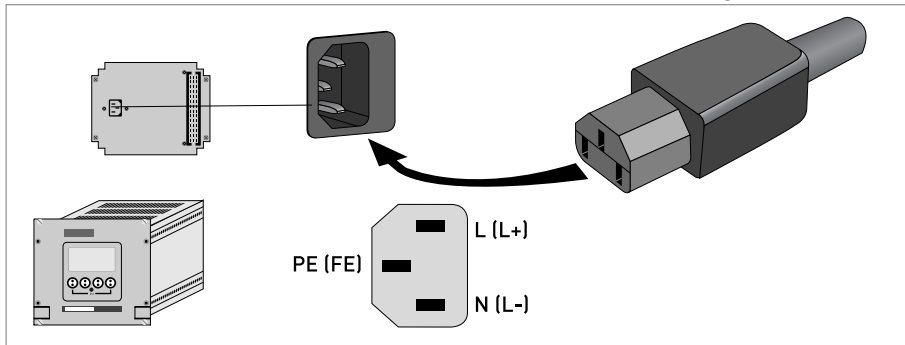
- AC: Note the power supply voltage and frequency (50...60 Hz) on the nameplate.
- DC: When connecting to functional extra-low voltages, provide a facility for protective separation (PELV) (acc. to VDE 0100 / VDE 0106 and/or IEC 364 / IEC 536 or relevant national regulations).

*12 V is **not** included in the tolerance range.*

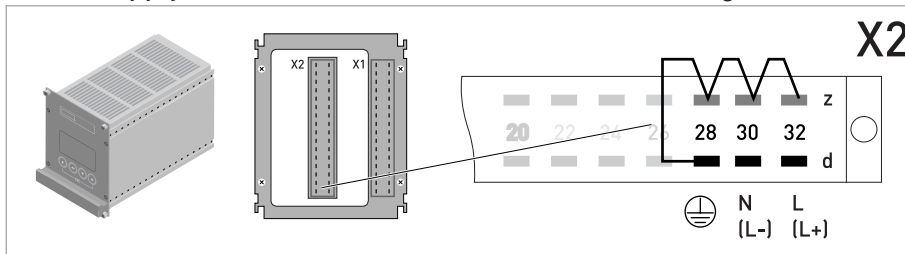
**Power supply connection (excluding 19" rack-mounted housing)**

- ① 100...230 VAC [-15% / +10%], 22 VA
- ② 24 VDC [-55% / +30%], 12 W
- ③ 24 VAC/DC (AC: -15% / +10%; DC: -25% / +30%), 22 VA or 12 W

Power supply connection for 19" rack-mounted housing (28 TE)



Power supply connection for 19" rack-mounted housing (21 TE)



*For safety reasons the manufacturer has connected the 28d contacts internally to the 28z, 30z and 32z contacts. You are advised to also connect contacts 28z, 30z and 32z to the external protective conductor.*

*The protective conductor contacts must not be used to loop through the PE connection.*

## 4.5 Inputs and outputs, overview

### 4.5.1 Combinations of the inputs/outputs (I/Os)

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

#### Basic version

- Has 1 current output, 1 pulse output and 2 status outputs / limit switches.
- The pulse output can be set as status output/limit switch and one of the status outputs as a control input.

#### Ex i version

- Depending on the task, the device can be configured with various output modules.
- Current outputs can be active or passive.
- Optionally available also with Foundation Fieldbus.

#### Modular version

- Depending on the task, the device can be configured with various output modules.

#### Bus systems

- The device allows intrinsically safe and non intrinsically safe bus interfaces in combination with additional modules.
- For connection and operation of bus systems, please note the separate documentation.

#### Ex option

- Please refer to the separate instructions for connection and operation of the Ex devices.

## 4.5.2 Description of the CG number

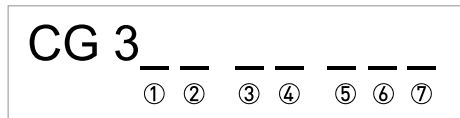


Figure 4-9: Marking (CG number) of the electronics module and input/output variants

- ① ID number: 0
- ② ID number: 0 = standard; 9 = special
- ③ Power supply option / flow sensor option
- ④ Display (language versions)
- ⑤ Input/output version (I/O)
- ⑥ 1st optional module for connection terminal A
- ⑦ 2nd optional module for connection terminal B

The last 3 digits of the CG number (⑤, ⑥ and ⑦) indicate the assignment of the terminal connections.

#### 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
I <sub>p</sub>	B	Passive current output
P <sub>a</sub> / S <sub>a</sub>	C	Active pulse output, frequency output, status output or limit switch (changeable)
P <sub>p</sub> / S <sub>p</sub>	E	Passive pulse output, frequency output, status output or limit switch (changeable)
P <sub>N</sub> / S <sub>N</sub>	F	Passive pulse output, frequency output, status output or limit switch acc. 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 acc. to EN 60947-5-6. Errors indicated on LC display. Error messages possible via status output.
IIn <sub>a</sub>	P	Active current input
IIn <sub>p</sub>	R	Passive current input
-	8	No additional module installed
-	0	No further module possible

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

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

- The grey boxes in the tables denote unassigned or unused connection terminals.
- In the table, only the final digits of the CG no. are depicted.

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

#### Basic I/Os (standard)

1 0 0		$I_p$ + HART® passive ①	$S_p / C_p$ passive ②	$S_p$ passive	$P_p / S_p$ passive ②
		$I_a$ + HART® active ①			

#### Ex i I/Os (option)

2 0 0				$I_a$ + HART® active	$P_N / S_N$ NAMUR ②
3 0 0				$I_p$ + HART® passive	$P_N / S_N$ NAMUR ②
2 1 0		$I_a$ active	$P_N / S_N$ NAMUR $C_p$ passive ②	$I_a$ + HART® active	$P_N / S_N$ NAMUR ②
3 1 0		$I_a$ active	$P_N / S_N$ NAMUR $C_p$ passive ②	$I_p$ + HART® passive	$P_N / S_N$ NAMUR ②
2 2 0		$I_p$ passive	$P_N / S_N$ NAMUR $C_p$ passive ②	$I_a$ + HART® active	$P_N / S_N$ NAMUR ②
3 2 0		$I_p$ passive	$P_N / S_N$ NAMUR $C_p$ passive ②	$I_p$ + HART® passive	$P_N / S_N$ NAMUR ②
2 3 0		$lin_a$ active	$P_N / S_N$ NAMUR $C_p$ passive ②	$I_a$ + HART® active	$P_N / S_N$ NAMUR ②
3 3 0		$lin_a$ active	$P_N / S_N$ NAMUR $C_p$ passive ②	$I_p$ + HART® passive	$P_N / S_N$ NAMUR ②
2 4 0		$lin_p$ passive	$P_N / S_N$ NAMUR $C_p$ passive ②	$I_a$ + HART® active	$P_N / S_N$ NAMUR ②
3 4 0		$lin_p$ passive	$P_N / S_N$ NAMUR $C_p$ passive ②	$I_p$ + HART® passive	$P_N / S_N$ NAMUR ②

#### FOUNDATION Fieldbus (Ex i) (option)

E 0 0				V/D+	V/D-	V/D+	V/D-
				FISCO Device		FISCO Device	
E 1 0		$I_a$ active	$P_N / S_N$ NAMUR $C_p$ passive ②	V/D+	V/D-	V/D+	V/D-
				FISCO Device		FISCO Device	
E 2 0		$I_p$ passive	$P_N / S_N$ NAMUR $C_p$ passive ②	V/D+	V/D-	V/D+	V/D-
				FISCO Device		FISCO Device	

CG no.	Connection terminals								
	A+	A	A-	B	B-	C	C-	D	D-
E 3 0		IIn <sub>a</sub> active		P <sub>N</sub> / S <sub>N</sub> NAMUR C <sub>p</sub> passive ②		V/D+	V/D-	V/D+	V/D-
						FISCO Device		FISCO Device	
E 4 0		IIn <sub>p</sub> passive		P <sub>N</sub> / S <sub>N</sub> NAMUR C <sub>p</sub> passive ②		V/D+	V/D-	V/D+	V/D-
						FISCO Device		FISCO Device	

① Function changed by reconnecting

② Changeable

#### 4.5.4 Alterable input/output versions

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

- The grey boxes in the tables denote unassigned or unused connection terminals.
- In the table, only the final digits of the CG no. are depicted.
- Term. = (connection) terminal

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

#### Modular I/Os (option)

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

#### FOUNDATION Fieldbus (option)

E __		max. 2 optional modules for term. A + B			V/D+ (2)	V/D- (2)	V/D+ (1)	V/D- (1)
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#### Modbus (option)

G __ ②		max. 2 optional modules for term. A + B				Common	Sign. B (D1)	Sign. A (D0)
H __ ③		max. 2 optional modules for term. A + B				Common	Sign. B (D1)	Sign. A (D0)

① Changeable

② Not activated bus terminator

③ Activated bus terminator



Model	Description
IMT33A	Foxboro® Model IMT33A Magnetic Flow Signal Converter
-4 -B -H -L -N -R	<b>Type</b> IMT33A Compact (Standard: aluminum) IMT33A Modular (non Ex) IMT33A Field (Standard: aluminum) IMT33A Rack IMT33A Wall (Standard: polycarbonate) IMT33A Rack Light (only Basic version) DOES NOT INCLUDE ex-I OR FF
1 4 A	<b>Power supply</b> 12-24 VDC (12- 4 VDC) 24 VDC/AC (19-29 V) (not for Rack Light) 100-230 VAC (85-250 VAC, 50/60 Hz)
0 1 2 3 5 A C D E F G T U V W X Y	<b>Ex version</b> without - non Ex Ex zone 1 (terminal compartment "d" - Compact) Ex zone 1 (terminal compartment "e" - Compact & Field) Ex zone 2 (for Compact & Field) FM Class I DIV 2 (for Compact & Field) cCSAus OL CSA Class I DIV 2 (for Compact & Field) NEPSI zone 1 (terminal compartment "d" - Compact) NEPSI zone 1 (terminal compartment "e" - Compact & Field) IECEX zone 1 (terminal compartment "d" - Compact) IECEX zone 1 (terminal compartment "e" - Compact & Field) BE-Ex EAC (Belarus "e" - Compact & Field) RU-Ex EAC (Russia "e" - Compact & Field) KA-Ex EAC (Kazakhstan "e" - Compact & Field) RU EAC (Russia) KA EAC (Kazakhstan) BE EAC (Belarus)
4 5 6 B	<b>Cable connection</b> 3 x ½" NPT (not for Rack & Rack Light) 3 x PF ½ (not for Rack & Rack Light) 3 x M20 x 1.5 (not for Rack & Rack Light) Strip tag (Rack & Rack Light only)
1 2 3 4 5 6 7 A B S X	<b>Operating manual / operating language</b> German / German English GB / English GB English US / English US French / French Without / German Without / English GB Without / French English GB / eastern Europe groupe (GB, CZ, HU, SI, SL, AL, BG & RO) English GB / northern Europe groupe (GB, DK, FI, LT, NO, PL, EE & LV) English GB / Russian Without / Russian
0	<b>Custody transfer</b> Without
0 4	<b>Process diagnostics</b> Standard Batch controlling - BC
1 2	<b>Signal converter housing</b> Standard Stainless steel 1.4408/316 (Compact & Field only)

Model	Description
1* 2 3 4 6 7 8 B C E G	<b>Communication</b> Basic IO (4-20 mA / HART + pulse / frequency + status + control output) Ex i IO: CO akt. + PO pas. (current output active + pulse output passive) Ex i IO: CO pas. + PO akt. (current output passive + pulse output passive) Module IO: (current output active + pulse output active) Module IO: (current output active + pulse output passive) Module IO: (current output active + pulse output NAMUR) Module IO: (current output passive + pulse output active) Module IO: (current output passive + pulse output passive) Module IO: (current output passive + pulse output NAMUR) Fieldbus IO: Foundation Fieldbus IO RS485 Modbus
0* 1 2 8* A B C E F G H K	<b>1st IO module</b> Without, no module possible Ex i IO: CO akt. + PO pas. (CO active + PO/Control Input passive) Ex i IO: CO pas. + PO akt. (CO passive + PO/Control Input passive) Without IO module Current output - active Current output - passive Pulse output - active / high current Pulse output - passive / high current Pulse output - passive / NAMUR Control input - active / high current Control input - active / NAMUR Control input - passive / high current
0* 8* A B C E F G H K	<b>2nd I/O module</b> Without, no module possible Without IO module Current output - active Current output - passive Pulse output - active / high current Pulse output - passive / high current Pulse output - passive / NAMUR Control input - active / high current Control input - active / NAMUR Control input - passive / high current
0 1	<b>Reference method</b> Standard Virtual reference (not for Rack & Rack Light)
0 2 3	<b>Tag plate (Field, Wall, Rack &amp; Rack Light only)</b> Standard 316/1.4401 tag plate (120 x 46 mm) 316/1.4401 tag plate (67 x 25 mm)

\*: Standard



## ORDERING INSTRUCTIONS

1. Model Number.
2. Flow Data:
  - a. Maximum, minimum, and normal flow rate.
  - b. Fluid composition and viscosity at operating temperatures.
  - c. Fluid density or relative density (specific gravity).
  - d. Maximum, minimum and normal operating temperatures.
  - e. Maximum, minimum and normal operating pressures.
  - f. Mating pipe schedule.
  - g. Type and location (distance) of upstream disturbance.
3. Calibration Information (analog output only); maximum flow rate 20 mA output.
4. Electric Classification.
5. Operational Selection and Accessories (see "Optional Selections and Accessories" section).
6. Customer Tag Data.

## FLOWEXPERTPRO SIZING APPLICATION

Mobile application    FlowExpertPro.com



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