OPTISONIC 7300

Technical Datasheet

Ultrasonic gas flowmeter

- Wide application range
- No moving parts and no pressure loss
- Complete solution for gasflow measurement

CONTENTS

1.1 Ultrasonic process gas flow measurement

The **OPTISONIC 7300** offers an ultrasonic measurement system dedicated for process gas flow applications. The OPTISONIC 7300 does not have the limitations that are usually associated with traditional gas flow meters like periodical recalibrations, maintenance, pressure loss and a limited flow range. The OPTISONIC 7300 combines the advantages of ultrasonic measurement in a way that it is efficient, reliable and easy to use.

① Current input option for calculation to standard conditions
② Process connections

Highlights

- Wide flow range
- Independent of gas density and composition to a large extend
- No maintenance
- No recalibration
- Integrated volume correction to standard conditions using P, T measurement
- No moving parts, no pressure loss

Industries

- Chemicals
- Petrochemicals
- Power plants
- Oil & Gas

Applications

- General process control
- Hydrocarbon gases in petrochemical plants
- Process gases in chemical plants
- Production of natural gas
- Consumption / usage of natural gas
- Usage of fuel gas
- Air flows
- Biogas

1.2 Variants

Version and some general examples

Version

- Available as compact or remote version

Connection options

- Standard flange range available up to ASME 900 lb / PN 40. Others on request.

Correction to standard conditions (optional)

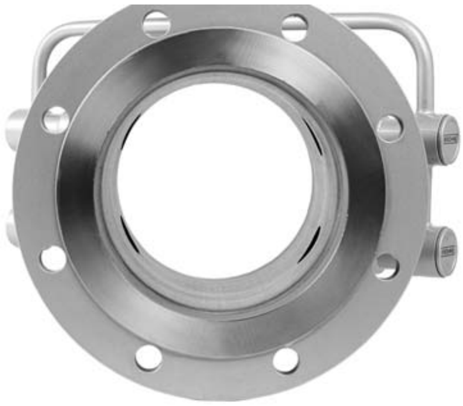
- Gas flow volume correction to standard conditions
- Using temperature and pressure inputs

GFC 300 ultrasonic signal converter

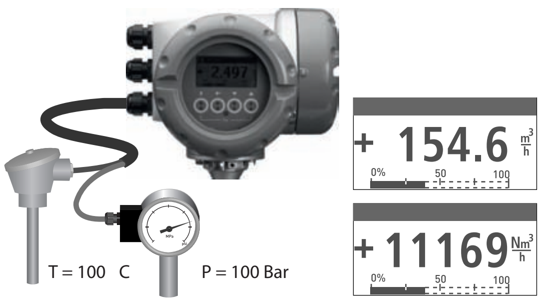
- Compact or field housing: Ex / non-Ex, IP66/67

1.3 Features

Transducer design
With the innovative patented design of the transducers, the OPTISONIC 7300 offers a superior application range. This new design allows not only a larger flow and diameter range, but also an extended range of gases that can be measured.



Dedicated to process applications
The OPTISONIC 7300 combines the advantages of ultrasonic flow measurement (free of maintenance, no recalibrations, free of obstructions and no moving parts) with a design that is dedicated for the process industry. For applications in the process industry this combination offers the optimum value in both operational as in investment costs.



Calculation to standard conditions
Gas flow is often specified in standard conditions (for example flow at 0 °C and 1 bar a). The gas flow converter GFC 300 optionally has two current inputs. If these are used for pressure and temperature input, the converter can calculate the volume flow to standard conditions. With the input of standard density also mass flow can be calculated.

Diagnostics
Important information about both the process and sensor can be provided by diagnostic values. Examples are gain for information about pollution in the sensor, velocity of sound for changes in the gas composition and signal to noise ratio for changes in the process.

1.4 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.

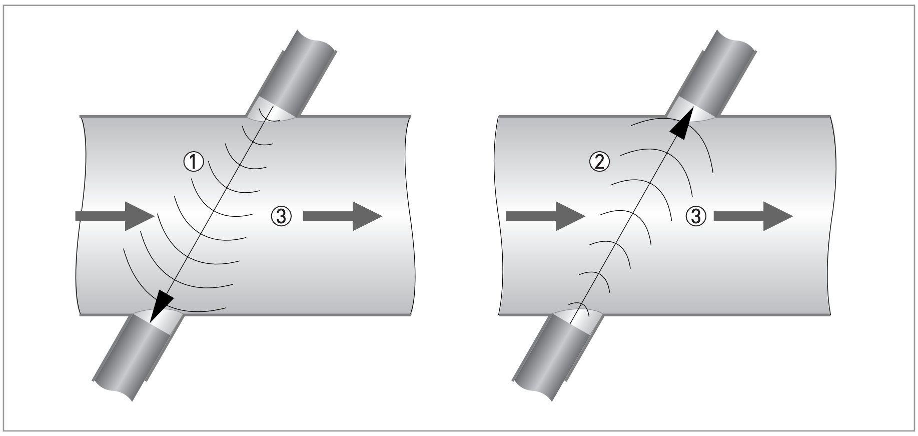


Figure 1-1: Measuring principle

① Sound wave against flow direction
② Sound wave with flow direction
③ Flow direction

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 (Download Center).*

Measuring system

Measuring principle	Ultrasonic transit time
Application range	Flow measurement of dry gases
Measured value	
Primary measured value	Transit time
Secondary measured values	Volume flow, corrected volume flow, mass flow, molar mass, flow speed, flow direction, speed of sound, gain, signal to noise ratio, reliability of flow measurement, quality of acoustic signal

Design

Features	1 or 2 path all welded flow sensor with o-ring fitted titanium transducers.
Modular construction	The measurement system consists of a measuring sensor and a signal converter.
Compact version	OPTISONIC 7300 C
Remote version	OPTISONIC 7000 F with GFC 300 F signal converter
Nominal diameter	1 path: DN50...80 / 2...3"
	2 path: DN100...600 / 4"...24"
	Larger diameters on request.
Measurement range	-30... +30 m/s / -98.4... +98.4 ft/s
Signal converter	
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, bargraph
Communication interfaces	Modbus, HART®, FF

Display and user interface	
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 will be available at the internet homepage of the manufacturer.
Display functions	
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

Gas flow (uncorrected)	
Reference conditions (for gas calibration)	Medium: Air
	Temperature: 20°C / 68°F
	Pressure: 1 bar / 14.5 psi
Theoretical calibration (standard)	DN100...600 / 4…24": < ± 1.5% of actual measured flow rate, for 1...30 m/s
	DN50...80 / 2…3": < ± 3% of actual measured flow rate, for 1...30 m/s
Gas calibration	DN100...600 / 4…24": < ± 1% of actual measured flow rate, for 1...30 m/s
	DN50...80 / 2…3": < ± 2% of actual measured flow rate, for 1...30 m/s
Repeatability	< ± 0.2%

Operating conditions

Temperature	
Process temperature	**Compact version**
	-40...+125°C / -40...+257°F
	-40...+180°C / -40...+356°F, max. ambient temperature of 40°C / 104°F
	Remote version
	-40...+180°C / -40...+356°F
	Compact & remote version
	Carbon steel flanges acc. to EN 1092-1, min. process temperature: -10°C / +14°F
	Carbon steel flanges acc. to ASME, min. process temperature: -29°C / -20°F
	FFKM transducer o-rings, min. process temperature: -20°C / -4°F
Ambient temperature	Standard (die-cast aluminum converter housing): -40…+65°C / -40…+149°F
	Option (die-cast stainless steel converter housing): -40...+55°C / -40...+131°F
Storage temperature	-50…+70°C / -58…+158°F

Pressure	
	All sensor designs at full rating acc. to below flange standards for standard materials.
Max. pressure limited by transducer	Titanium S7.01: 150 bara
	Titanium S7.04: 101 bara
EN 1092-1	DN200…600: PN 10
	DN100…150: PN 16
	DN50...80: PN 40
ASME B16.5	2…24": 150 lb RF
	2…24": 300 lb RF
	2…24": 600 lb RF
	2...14": 900 lb RF
	Higher pressure ratings on request
Properties of medium (Other properties on request)	
Physical condition	Dry gas
Density	**Standard**
	10…45 g/mol / 1...150 kg/m^3 / 0.062...9.36 lb/ft^3
	Extended (may impose limitations on other spec's)
	2…80 g/mol / 0.2...250 kg/m^3 / 0.012...15.6 lb/ft^3

Installation conditions

Installation	For detailed information refer to *Installation* on page 25.
Inlet run	≤DN80: ≥ 20 DN
	≥DN100: ≥ 10 DN
Outlet run	≥ 3 DN
Dimensions and weights	For detailed information refer to *Dimensions and weights* on page 19.

Materials

Sensor	
NACE conformity	For standard range, all wetted materials are conform NACE MR175/103.
Flanges (wetted)	Standard: carbon steel ASTM A105 N
	Option: stainless steel 316 L, Carbon steel A350 LF2
	Other materials on request.
Tube (wetted)	Standard: carbon steel ASTM A106 Gr. B or Equivalent
	Option: stainless steel 316 L, Carbon steel A333 GR6
	Other materials on request.
Nozzles transducer holders (wetted)	Stainless steel 316 Ti (1.4571)
Transducer holders (wetted)	Stainless steel 316 L (1.4404)
Transducers (wetted)	Titanium grade 29
Transducer o-rings (wetted)	Standard: FKM / FPM
	Option: FFKM
Coating	Polyurethane

Tube transducer cabling, caps transducer holder	Stainless steel 316 L
Connection box (remote version only)	Standard: die-cast aluminium, polyurethane coated
	Option: stainless steel 316 (1.4408)
Converter/ connection-box support:	Stainless steel
Converter	
Converter housing	Standard: die-cast aluminium, polyurethane coated
	Option: stainless steel 316 (1.4408)
Field version	Standard: die-cast aluminium, polyurethane coated
	Option: stainless steel 316 (1.4408)

Electrical connections

Power supply	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 (remote version only)	2 X MR02 (shielded cable with 2 triax cores): Ø 10.6 mm
	5 m / 16 ft
	Option: 10...30 m / 33...98 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_{ext} = external voltage U_{nom} = nominal voltage U_{int} = internal voltage U_o = terminal voltage R_L = resistance of load I_{nom} = nominal current		
Current output			
Output data	Measurement of volume flow, corr. volume flow, mass flow, molar mass, flow speed, velocity of sound, gain, diagnostics 1, 2, 3, HART® communication.		
Settings	**Without HART®**		
	Q = 0%: 0…15 mA		
	Q = 100%: 10…20 mA		
	Error identification: 3…22 mA		
	With HART®		
	Q = 0%: 4…15 mA		
	Q = 100%: 10…20 mA		
	Error identification: 3…22 mA		
Operating data	**Basic I/Os**	**Modular I/Os**	**Ex-i**
Active	U_{int} = 24 VDC $I \leq 22$ mA $R_L \leq 1$ kΩ		U_{int} = 20 VDC $I \leq 22$ mA $R_L \leq 450$ Ω
			U_0 = 21 V I_0 = 90 mA P_0 = 0.5 W C_0 = 90 nF / L_0 = 2 mH C_0 = 110 nF / L_0 = 0.5 mH
Passive	$U_{ext} \leq 32$ VDC $I \leq 22$ mA $U_0 \geq 1.8$ V $R_L \leq (U_{ext} - U_o) / I_{max}$		$U_{ext} \leq 32$ VDC $I \leq 22$ mA $U_0 \geq 4$ V $R_L \leq (U_{ext} - U_o) / I_{max}$
			U_I = 30 V I_I = 100 mA P_I = 1 W C_I = 10 nF L_I = 0 mH

HART®			
Description	HART® protocol via active and passive current output		
	HART® version: V5		
	Universal HART® parameter: completely integrated		
Load	≥ 250 Ω t HART® test point: Note maximum load for current output!		
Multidrop	Yes, current output = 4 mA		
	Multidrop addresses adjustable in operation menu 1...15		
Device drivers	DD for FC 375/475, AMS, PDM, FDM, DTM for FDT		
Pulse or frequency output			
Output data	Volume flow, corr. volume flow, mass flow, molar mass, flow speed, velocity of sound, gain, diagnostics 1,2,3.		
Function	Adjustable as pulse of frequency output		
Settings	For Q = 100%: 0.01... 10000 pulses per second or pulses per unit volume.		
	Pulse width: adjustable as automatic, symmetric or fixed (0.05...2000 ms)		
Operating data	Basic I/Os	Modular I/Os	Ex-i
Active	-	U_{nom} = 24 VDC	-
		f_{max} in operating menu set to: **f_{max} ≤ 100 Hz:** I ≤ 20 mA $R_{L, max}$ = 47 kΩ open: I ≤ 0.05 mA closed: $U_{0,nom}$ = 24 V at I = 20 mA	
		F_{max} in operating menu set to: **100 Hz < f_{max} ≤ 10 kHz:** I ≤ 20 mA R_L ≤ 10 kΩ for f ≤ 1 kHz R_L ≤ 1 kΩ for f ≤ 10 kHz open: I ≤ 0.05 mA closed: $U_{0,nom}$ = 22.5 V at I = 1 mA $U_{0,nom}$ = 21.5 V at I = 10 mA $U_{0,nom}$ = 19 V at I = 20 mA	

Passive	$U_{ext} \leq 32$ VDC		-
	f_{max} in operating menu set to: **$f_{max} \leq 100$ Hz:** $I \leq 100$ mA $R_{L, max} = 47$ kΩ $R_{L, max} = (U_{ext} - U_0) / I_{max}$ open: $I \leq 0.05$ mA at $U_{ext} = 32$ VDC closed: $U_{0, max} = 0.2$ V at $I \leq 10$ mA $U_{0, max} = 2$ V at $I \leq 100$ mA		
	f_{max} in operating menu set to: **100 Hz < $f_{max} \leq 10$ kHz:** $I \leq 20$ mA $R_L \leq 10$ kΩ for $f \leq 1$ kHz $R_L \leq 1$ kΩ for $f \leq 10$ kHz $R_{L, max} = (U_{ext} - U_0) / I_{max}$ open: $I \leq 0.05$ mA at $U_{ext} = 32$ VDC closed: $U_{0, max} = 1.5$ V at $I \leq 1$mA $U_{0, max} = 2.5$ V at $I \leq 10$ mA $U_{0, max} = 5.0$ V at $I \leq 20$ mA		
NAMUR	-	Passive to EN 60947-5-6 open: $I_{nom} = 0.6$ mA closed: $I_{nom} = 3.8$ mA	Passive to EN 60947-5-6 open: $I_{nom} = 0.43$ mA closed: $I_{nom} = 4.5$ mA
			$U_I = 30$ V $I_I = 100$ mA $P_I = 1$ W $C_I = 10$ nF $L_I = 0$ mH

<table>
<tr><th colspan="4">Status output / limit switch</th></tr>
<tr><td rowspan="2">Function and settings</td><td colspan="3">Settable as indicator for direction of flow, overflow, error, operating point.</td></tr>
<tr><td colspan="3">Status and/or control: ON or OFF</td></tr>
<tr><td>Operating data</td><td>Basic I/Os</td><td>Modular I/Os</td><td>Ex-i</td></tr>
<tr><td>Active</td><td>-</td><td>U_{int} = 24 VDC

I ≤ 20 mA

$R_{L, max}$ = 47 kΩ

open:
I ≤ 0.05 mA
closed:
$U_{0, nom}$ = 24 V at
I = 20 mA</td><td>-</td></tr>
<tr><td>Passive</td><td>U_{ext} ≤ 32 VDC

I ≤ 100 mA

$R_{L, max}$ = 47 kΩ
$R_{L, max}$ = (U_{ext} - U_0) / I_{max}

open:
I ≤ 0.05 mA at
U_{ext} = 32 VDC
closed:
$U_{0, max}$ = 0.2 V at
I ≤ 10 mA
$U_{0, max}$ = 2 V at
I ≤ 100 mA</td><td>U_{ext} = 32 VDC

I ≤ 100 mA

$R_{L, max}$ = 47 kΩ
$R_{L, max}$ = (U_{ext} - U_0) / I_{max}

open:
I ≤ 0.05 mA at
U_{ext} = 32 VDC
closed:
$U_{0, max}$ = 0.2 V at
I ≤ 10 mA
$U_{0, max}$ = 2 V at
I ≤ 100 mA</td><td>-</td></tr>
<tr><td rowspan="2">NAMUR</td><td rowspan="2">-</td><td rowspan="2">Passive to
EN 60947-5-6

open:
I_{nom} = 0.6 mA
closed:
I_{nom} = 3.8 mA</td><td>Passive to
EN 60947-5-6

open:
I_{nom} = 0.43 mA
closed:
I_{nom} = 4.5 mA</td></tr>
<tr><td>U_I = 30 V
I_I = 100 mA
P_I = 1 W
C_I = 10 nF
L_I = 0 mH</td></tr>
</table>

Control input			
Function	Set value of the outputs to "zero", counter and error reset, range change.		
Operating data	Basic I/Os	Modular I/Os	Ex-i
Active	-	U_{int} = 24 VDC Terminals open: $U_{0, nom}$ = 22 V Terminals bridged: I_{nom} = 4 mA On: $U_0 \geq$ 12 V with I_{nom} = 1.9 mA Off: $U_0 \leq$ 10 V with I_{nom} = 1.9 mA	-
Passive	$U_{ext} \leq$ 32 VDC I_{max} = 6.5 mA at $U_{ext} \leq$ 24 VDC I_{max} = 8.2 mA at $U_{ext} \leq$ 32 VDC Contact closed (On): $U_0 \geq$ 8 V with I_{nom} = 2.8 mA Contact open (Off): $U_0 \leq$ 2.5 V with I_{nom} = 0.4 mA	$U_{ext} \leq$ 32 VDC I_{max} = 9.5 mA at $U_{ext} \leq$ 24 V I_{max} = 9.5 mA at $U_{ext} \leq$ 32 V Contact closed (On): $U_0 \geq$ 3 V with I_{nom} = 1.9 mA Contact open (Off): $U_0 \leq$ 2.5 V with I_{nom} = 1.9 mA	$U_{ext} \leq$ 32 VDC $I \leq$ 6 mA at U_{ext} = 24 V $I \leq$ 6.6 mA at U_{ext} = 32 V On: $U_0 \geq$ 5.5 V or $I \geq$ 4mA Off: $U_0 \leq$ 3.5 V or $I \leq$ 0.5 mA U_I = 30 V I_I = 100 mA P_I = 1 W C_I = 10 nF L_I = 0 mH
NAMUR	-	Active to EN 60947-5-6 Contact open: $U_{0, nom}$ = 8.7 V Contact closed (On): I_{nom} = 7.8 mA Contact open (off): $U_{0, nom}$ = 6.3 V with I_{nom} = 1.9 mA Identification for open terminals: $U_0 \geq$ 8.1 V with $I \leq$ 0.1 mA Identification for short circuited terminals: $U_0 \leq$ 1.2 V with $I \geq$ 6.7 mA	-

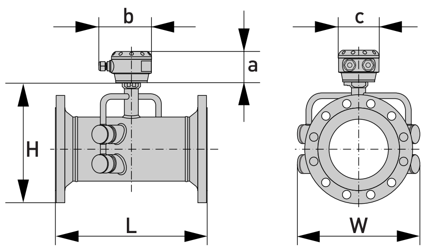
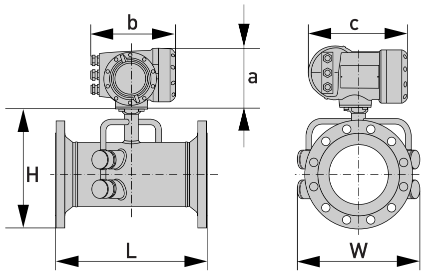
Low-flow cutoff			
On	0...±9.999 m/s; 0...20.0%, settable in 0.1% steps, separately for each current and pulse output.		
Off	0...±9.999 m/s; 0...19.0%, settable in 0.1% steps, separately for each current and pulse output.		
Time constant			
Function	Can be set together for all flow indicators and outputs, or separately for: current, pulse and frequency output, limit switches and the 3 internal counters.		
Time setting	0…100 seconds, settable in 0.1 second steps.		
Current input			
Function	For conversion to standard conditions, input from external temperature and pressure transmitters is required.		
Operating data	Basic I/Os	Modular I/Os	Ex i
Active	-	U_{int} = 24 VDC I ≤ 22 mA I_{max} ≤ 26 mA (electronically limited) $U_{0, min}$ = 19 V at I ≤ 22 mA	U_{int} = 20 VDC I ≤ 22 mA $U_{0, min}$ = 14 V at I ≤ 22 mA
			No HART®
		No HART®	U_0 = 24.1 V I_0 = 99 mA P_0 = 0.6 W C_0 = 75 nF / L_0 = 0.5 mH
			No HART®
Passive	-	U_{ext} ≤ 32 VDC I ≤ 22 mA I_{max} ≤ 26 mA (electronically limited) $U_{0, max}$ = 5 V at I ≤ 22 mA	U_{ext} ≤ 32 VDC I ≤ 22 mA $U_{0, max}$ = 4 V at I ≤ 22 mA
			No HART®
		No HART®	U_I = 30 V I_I = 100 mA P_I = 1 W C_I = 10 nF L_I =0 mH
			No HART®

FOUNDATION Fieldbus	
Discription	Galvanically isolated acc. to IEC 61158
	Current consumption: 10.5 mA
	Permisseble 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 5.2
Function blocks	6 x analoque input, 2 x integrator, 1 x PID, 1 x arithmetic
Output data	Volume flow, corr. volume flow, mass flow, molar mass, enthalpy flow, spec. enthalpy, density, flow speed, process temperature, process pressure, electronic temperature, velocity of sound (av.), gain (av.), SNR (av.), velocity of sound 1-3, gain 1-3, SNR 1-3
MODBUS	
Description	Modbus RTU, Master / Slave, RS485 (galvanically isolated)
Transmission procedure	Half duplex, asynchronous
Address range	1…247
Supported function codes	01, 03, 04, 05, 08, 16, 43
Broadcast	Supported with function code 16
Supported Baudrate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Baud

Approvals and certificates

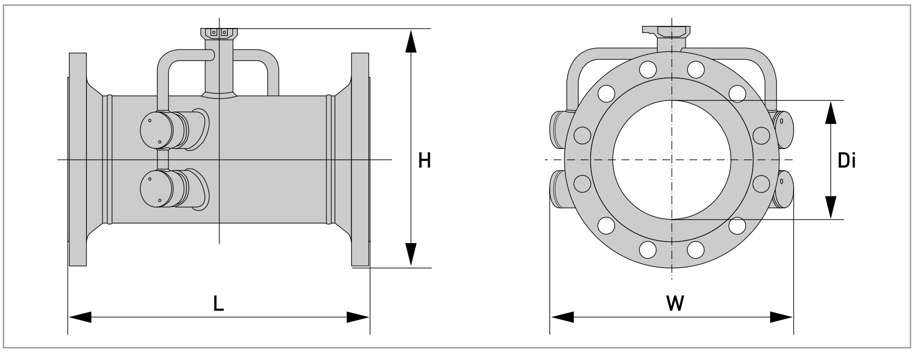
CE	
	This device fulfills the statutory requirements of the EC directives. The manufacturer certifies successful testing of the product by applying the CE mark.
Electromagnetic compatibility	Directive: 2004/108/EC, NAMUR NE21/04
	Harmonized standard: EN 61326-1 : 2006
Low Voltage Directive	Directive: 2006/95/EC
	Harmonized standard: EN 61010 : 2001
Pressure Equipment Directive	Directive: 97/23/EC
	Category I, II, III or SEP
	Fluid group 1
	Production module H
Other approvals and standards	
Non-Ex	Standard
Hazardous areas	
	For detailed information, please refer to the relevant Ex documentation.
ATEX	PTB 10 ATEX 1052
Protection category acc. to IEC 529 / EN 60529	**Signal converter**
	Compact (C): IP66/67 (NEMA 4X/6)
	Field (F): IP66/67 (NEMA 4X/6)
	All flow sensors
	IP67 (NEMA 6)
Shock resistance	IEC 68-2-27
Vibration resistance	IEC 68-2-64

2.2 Dimensions and weights

Remote version		a = 77 mm / 3.1" b = 139 mm / 5.5" ① c = 106 mm / 4.2" Total height = H + a
Compact version		a = 155 mm / 6.1" b = 230 mm / 9.1" ① c = 260 mm / 10.2" Total height = H + a

① The value may vary depending on the used cable glands.

2.2.1 Gas flow sensor, carbon steel



EN 1092-1

Nominal size		Dimensions [mm]				Approx weight [kg]
DN	PN [Bar]	L	H	W	Di ①	
200	PN 10	460	368	429	207	46
250	PN 10	530	423	474	261	66
300	PN 10	580	473	517	310	81
350	PN 10	610	519	542	341	109
400	PN 10	640	575	583	392	141
450	PN 10	620	625	623	442	170
500	PN 10	670	678	670	493	202
600	PN 10	790	784	780	593	278

① Di = inner diameter at flange face. Inner tube diameter may be smaller.

Nominal size		Dimensions [mm]				Approx weight [kg]
DN	PN [Bar]	L	H	W	Di ①	
100	PN 16	490	254	337	107	24
125	PN 16	520	283	359	133	32
150	PN 16	540	315	387	159	35

① Di = inner diameter at flange face. Inner tube diameter may be smaller.

Nominal size		Dimensions [mm]				Approx weight [kg]
DN	PN [Bar]	L	H	W	Di ①	
50	PN 40	320	196	300	54.5	11
65	PN 40	350	216	313	70.3	14
80	PN 40	480	230	324	82.5	19

① Di = inner diameter at flange face. Inner tube diameter may be smaller.

ASME 150 lb

Nominal size	Dimensions								Approx weight	
	L		H		W		Di ①			
	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[lb]	[kg]
2"	14.2	360	7.5	190	11.8	300	2.1	53	22	10
2½"	15.0	380	8.3	210	12.2	310	2.5	63	33	15
3"	20.5	520	8.9	226	12.8	324	3.1	78	44	20
4"	21.7	550	10.1	258	13.3	337	4.0	102	64	29
5"	23.2	590	11.2	285	14.1	364	5.1	128	84	38
6"	24.4	620	12.2	312	15.2	387	6.1	154	90	41
8"	21.2	540	14.5	369	16.9	429	8.1	206	130	59
10"	24.0	610	16.9	428	18.7	474	10.3	260	185	84
12"	26.4	670	19.4	492	20.4	512	12.2	311	266	121
14"	28.7	730	21.0	534	21.3	540	13.4	340	352	160
16"	30.3	770	23.3	591	23.5	597	15.4	391	462	210
18"	30.7	780	25.0	635	25.0	635	17.5	441	570	259
20"	32.7	830	27.3	693	27.5	699	19.3	489	607	304
24"	35.8	910	31.5	801	32.0	813	23.3	591	904	411

① Di = inner diameter at flange face. Inner tube diameter may be smaller.

ASME 300 lb

Nominal size	Dimensions [inches]								Approx weight	
	L		H		W		Di ①			
	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[lb]	[kg]
2"	15.0	380	7.7	196	11.8	300	2.1	53	27	12
2½"	15.4	390	8.5	217	12.2	310	2.5	63	38	17
3"	21.3	540	9.3	235	12.8	324	3.1	78	53	24
4"	22.4	570	10.7	271	13.3	337	4.0	102	86	39
5"	24.0	610	11.7	298	14.1	364	5.1	128	115	52
6"	25.2	640	13.0	331	15.0	387	6.1	154	146	66
8"	22.0	560	15.3	388	16.6	429	8.0	203	207	94
10"	25.2	640	17.6	448	18.3	474	10.0	255	309	140
12"	28.0	710	20.1	511	20.5	521	11.9	303	452	205
14"	29.9	760	22.0	559	23.0	584	13.1	333	609	276
16"	31.9	810	24.3	616	25.5	648	15.0	381	785	356
18"	33.1	840	26.5	673	28.0	711	16.9	428	926	420
20"	36.6	930	28.8	731	30.5	775	18.8	478	1237	561
24"	38.2	970	33.5	851	36.0	914	22.6	575	1715	778

① Di = inner diameter at flange face. Inner tube diameter may be smaller.

ASME 600 lb

Nominal size	Dimensions [inches]								Approx weight	
	L		H		W		Di ①			
	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[lb]	[kg]
2"	15.7	400	7.7	196	11.5	300	1.9	49	33	15
2½"	16.1	410	8.5	217	12.0	310	2.3	59	44	20
3"	22.0	560	9.3	235	12.5	324	2.9	74	66	30
4"	24.4	620	11.1	281	13.1	337	3.8	97	119	54
5"	26.0	660	12.7	323	14.1	359	4.8	122	183	83
6"	27.2	690	13.8	350	15.0	374	5.8	146	223	101
8"	24.4	620	16.1	408	16.5	421	7.6	194	333	151
10"	27.2	690	18.3	479	20.0	508	9.6	243	531	241
12"	28.3	720	20.9	530	22.0	559	11.4	289	655	297
14"	29.9	760	22.4	568	23.7	603	12.5	317	798	362
16"	32.7	830	25.0	635	27.0	686	14.3	364	1105	501
18"	34.6	880	27.1	689	29.3	743	16.1	409	1389	630
20"	35.4	900	29.5	750	32.0	813	17.9	456	1695	769
24"	38.2	970	34.0	864	37.0	640	21.6	548	2438	1106

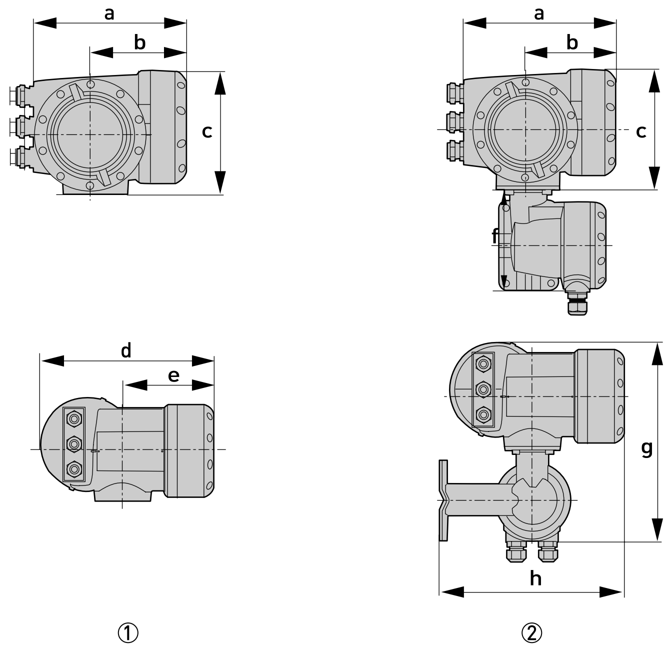
① Di = inner diameter at flange face. Inner tube diameter may be smaller.

ASME 900 lb

Nominal size	Dimensions [inches]								Approx weight	
	L		H		W		Di ①			
	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[inch]	[mm]	[lb]	[kg]
2"	17.7	450	8.7	222	11.5	300	1.7	43	64	29
2½"	18.1	460	9.6	244	12.0	310	2.3	59	86	39
3"	23.6	600	9.9	251	12.5	324	2.6	67	119	54
4"	26.8	640	11.4	290	13.0	337	3.4	87	157	71
5"	26.8	680	12.6	333	13.7	359	4.6	116	240	109
6"	28.7	730	14.3	363	15.0	381	5.5	140	335	152
8"	26.8	680	17.0	433	18.5	470	7.2	183	545	247
10"	29.9	760	19.6	498	21.5	546	9.1	230	838	380
12"	31.9	810	21.9	556	24.0	610	10.7	273	1168	530
14"	33.9	860	23.1	588	25.2	641	11.8	300	1382	627

① Di = inner diameter at flange face. Inner tube diameter may be smaller.

2.2.2 Converter housing



① Compact housing (C)
② Field housing (F)

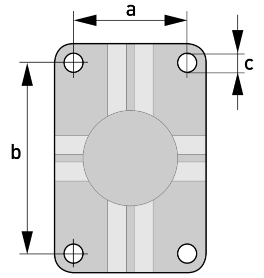
Dimensions and weights in mm and kg

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

Dimensions and weights in inches and lb

Version	Dimensions [inches]							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

2.2.3 Mounting plate, field housing



Dimensions in mm and inches

	[mm]	[inches]
a	60	2.4
b	100	3.9
c	Ø 9	Ø 0.4

3.1 Notes on installation

Inspect the cartons carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.

Do a check of the packing list to make sure that you have all the elements given in the order.

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

3.2 Intended use

Responsibility for the use of the measuring devices with regard to suitability, intended use and corrosion resistance of the used materials against the measured fluid lies solely with the operator.

The manufacturer is not liable for any damage resulting from improper use or use for other than the intended purpose.

The overall functionality of the **OPTISONIC 7300** gas flowmeter is the continuous measurement of actual volume flow, mass flow, molar mass, flow speed, velocity of sound, gain, SNR and diagnosis value.

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 secure the optimum functioning of the flowmeter, please note the following observations.

The OPTISONIC 7300 is designed for the measurement dry gasflow. Excess of liquids may disturb the acoustic signals and should thus be avoided.
The following guidelines should be observed in case occasional small amounts of liquids are to be expected:

- Install the flow sensor in a horizontal position in a slightly descending line.
- Orientate the flow sensor such that the path of the acoustic signal is in the horizontal plane.

For exchanging the transducers, please keep a free space of 1 m / 39" around the transducer.

3.4.1 Inlet and outlet

1 path flowmeter

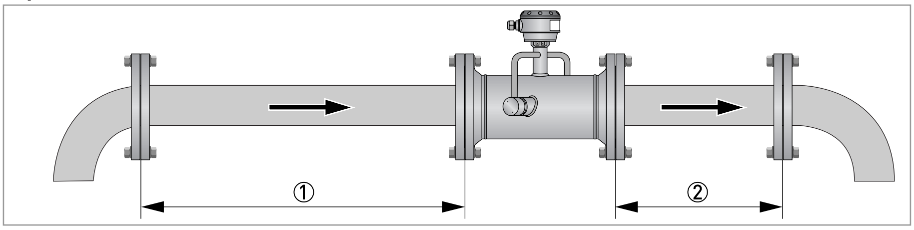


Figure 3-1: Recommended inlet and oulet for ≤ DN80/3"

① ≥ 20 DN
② ≥ 3 DN

2 path flowmeter

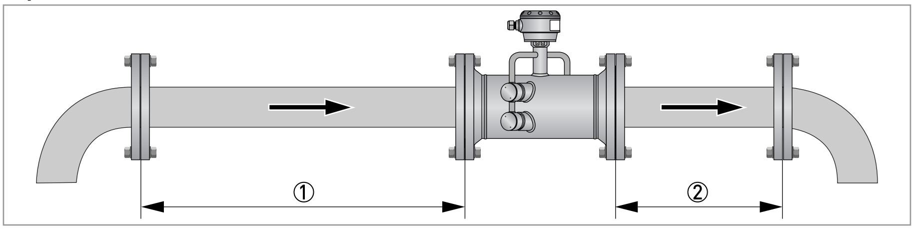


Figure 3-2: Recommended inlet and oulet for ≥ DN100/4"

① ≥ 10 DN
② ≥ 3 DN

3.4.2 Mounting position

- Horizontally with the acoustic path in horizontal plane
- Vertically

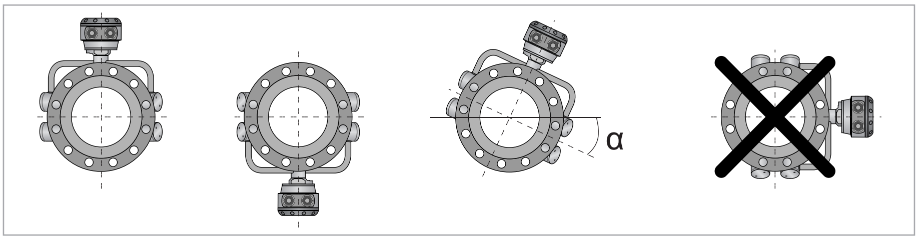


Figure 3-3: Mounting position

+15° < α < -15°

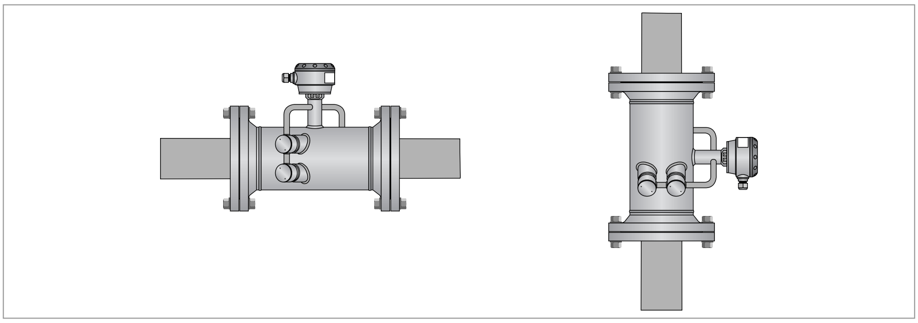


Figure 3-4: Horizontal and vertical mounting

3.4.3 Flange deviation

Max. permissible deviation of pipe flange faces:
$L_{max} - L_{min} \leq 0.5$ *mm / 0.02"*

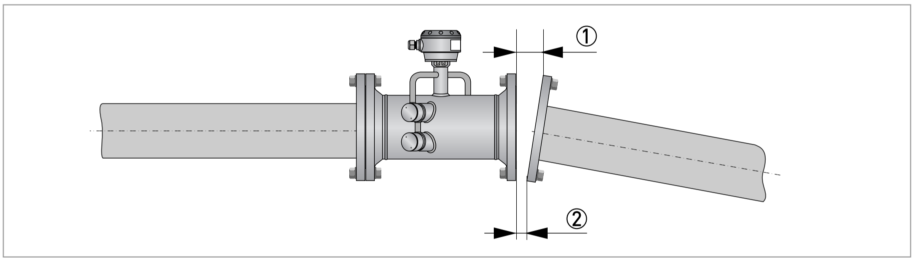


Figure 3-5: Flange deviation

① L_{max}
② L_{min}

3.4.4 T-section

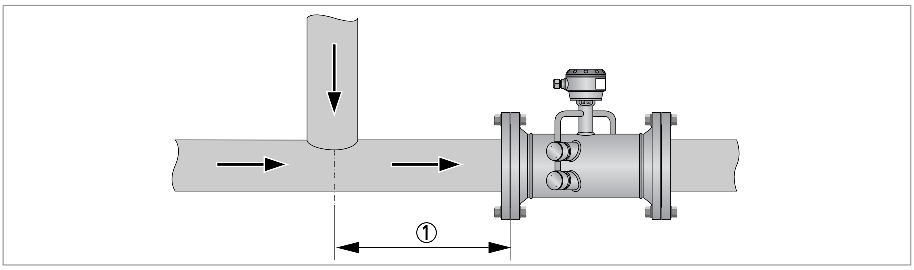


Figure 3-6: Distance behind a T-section

① ≥ 10 DN

3.4.5 Vibration

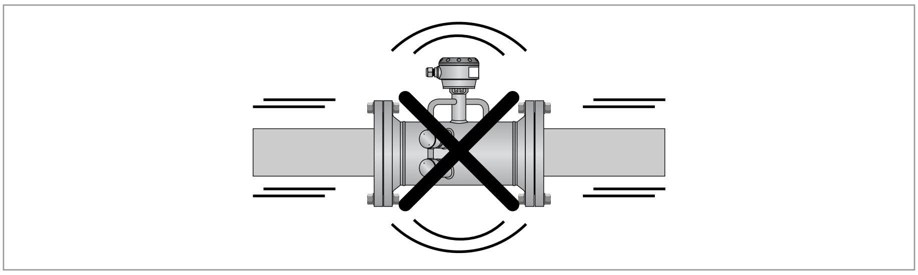


Figure 3-7: Avoid vibrations

3.4.6 Control valve

To avoid distorted flow profiles and interference caused by valve noise in the sensor, control valves or pressure reducers should not be installed in the same pipeline as the flowmeter. In case this is required, please contact the manufacturer.

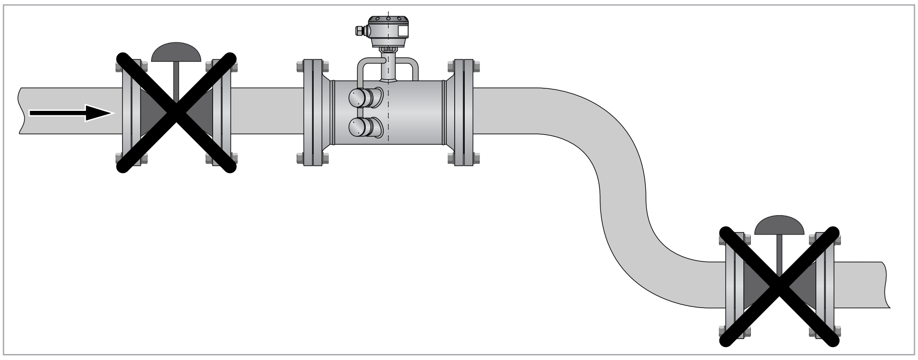


Figure 3-8: Control valve

3.4.7 Insulation

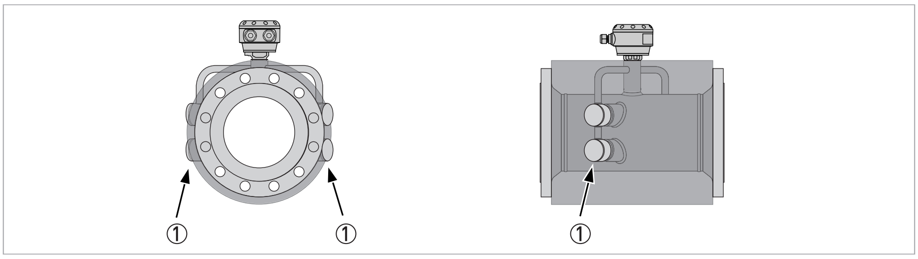


Figure 3-9: Leave vent holes free

① Vent holes

Always leave vent holes free!

4.1 Safety instructions

All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!

Observe the national regulations for electrical installations!

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.

Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate.

4.2 Signal cable (remote versions only)

The flow sensor is connected to the signal converter via the signal cable(s). A flow sensor with one acoustic path, 1 cable is required. A flow sensor with two acoustic paths, 2 cables are required.

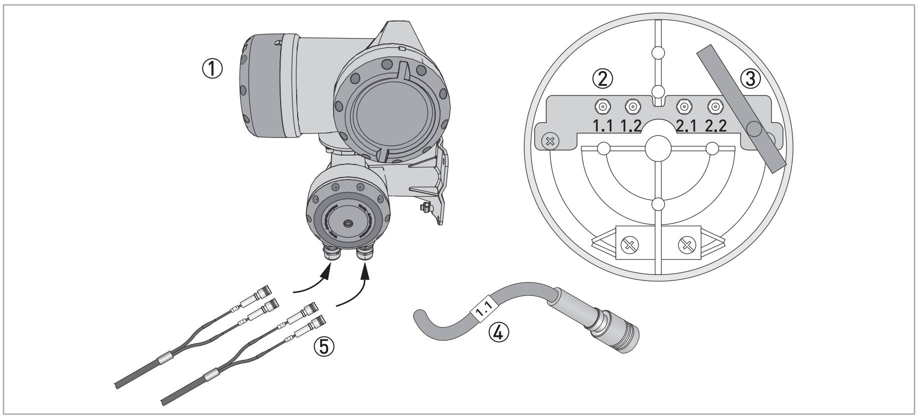


Figure 4-1: Construction field version

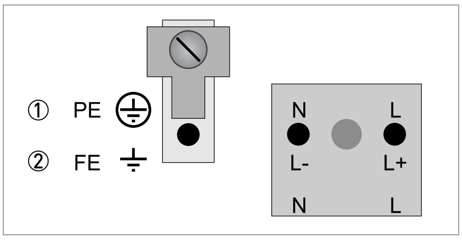
① GFC 300 F converter
② Open connection box
③ Tool for releasing connectors
④ Marking on cable
⑤ Insert cable(s) into connection box

Connect the cable on connector with similar numeral marking

4.3 Power supply

When this device is intended for permanent connection to the mains.
It is required (for example for service) to mount an external switch or circuit breaker near the device for disconnection from the mains. It shall be easily reachable by the operator and marked as the disconnecting the device for this equipment.
The switch or circuit breaker and wiring has to be suitable for the application and shall also be in accordance with the local (safety) requirements of the (building) installation (e.g. IEC 60947-1 / -3)

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



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

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

100…230 VAC

- 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

- 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).

4.4 Inputs and outputs, overview

4.4.1 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 and Profibus PA

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

- For hazardous areas, all of the input/output variants for the housing designs with terminal compartment in the Ex d (pressure-resistant casing) or Ex e (increased safety) versions can be delivered.
- Please refer to the separate instructions for connection and operation of the Ex-devices.

4.4.2 Description of the CG number

CG 3_ _ _ _ _ _ _
① ② ③ ④ ⑤ ⑥ ⑦

Figure 4-2: Marking (CG number) of the electronics module and input/output variants

① ID number: 6
② ID number: 0 = standard
③ Power supply 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. Please see the following examples.

Examples for CG number

CG 360 11 100	100...230 VAC & standard display; basic I/O: I_a or I_p & S_p/C_p & S_p & P_p/S_p
CG 360 11 7FK	100...230 VAC & standard display; modular I/O: I_a & P_N/S_N and optional module P_N/S_N & C_N
CG 360 81 4EB	24 VDC & standard display; modular I/O: I_a & P_a/S_a and optional module P_p/S_p & I_p

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
I_p	B	Passive current output
P_a / S_a	C	Active pulse output, frequency output, status output or limit switch (changeable)
P_p / S_p	E	Passive pulse output, frequency output, status output or limit switch (changeable)
P_N / S_N	F	Passive pulse output, frequency output, status output or limit switch acc. 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 acc. to EN 60947-5-6. Errors indicated on LC 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

4.4.3 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.
- Connection terminal A+ is only operable in the basic input/output version.

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

Basic in-/output (I/O) (Standard)

CG-No.	A+	A	A-	B	B-	C	C-	D	D-
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 in-/outputs (Option)

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

① Function changed by reconnecting
② Changeable

4.4.4 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 IOs (option)									
4 _ _		max. 2 optional modules for term. A + B				I_a + HART® active		P_a / S_a active ①	
8 _ _		max. 2 optional modules for term. A + B				I_p + HART® passive		P_a / S_a active ①	
6 _ _		max. 2 optional modules for term. A + B				I_a + HART® active		P_p / S_p passive ①	
B _ _		max. 2 optional modules for term. A + B				I_p + HART® passive		P_p / S_p passive ①	
7 _ _		max. 2 optional modules for term. A + B				I_a + HART® active		P_N / S_N NAMUR ①	
C _ _		max. 2 optional modules for term. A + B				I_p + HART® passive		P_N / S_N NAMUR ①	
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

Please fill in this form and fax or email it to your local representive. 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:	
Medium	
Gas composition:	
CO_2 content:	
H_2 content:	
Density:	
Velocity of sound:	
Flowrate	
Normal:	
Minimum:	
Maximum:	
Temperature	
Normal:	
Minimum:	
Maximum:	
Pressure	
Normal:	
Minimum:	
Maximum:	

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
- Products and systems for the oil & gas industry
- Measuring systems for the marine industry

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