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JUMO flowTRANS MAG S01

Electromagnetic flowmeter

for industrial applications

Brief description

The electromagnetic flowmeter JUMO flowTRANS MAG S01 was developed for industrial applications in areas such as the chemical, energy, water and wastewater, oil and gas, paper and pulp, metal, and mechanical engineering industries.

It is particularly flexible and available with a large variety of nominal widths, measuring tube linings, materials, and process connections.

The efficient and reliable transmitter stands out due to the many application possibilities, a high measuring accuracy, and simple startup.

The JUMO flowTRANS MAG S01 provides users with an inexpensive flowmeter that is tailored precisely to your requirements, has a short delivery time, and includes simple and easily understandable documentation.

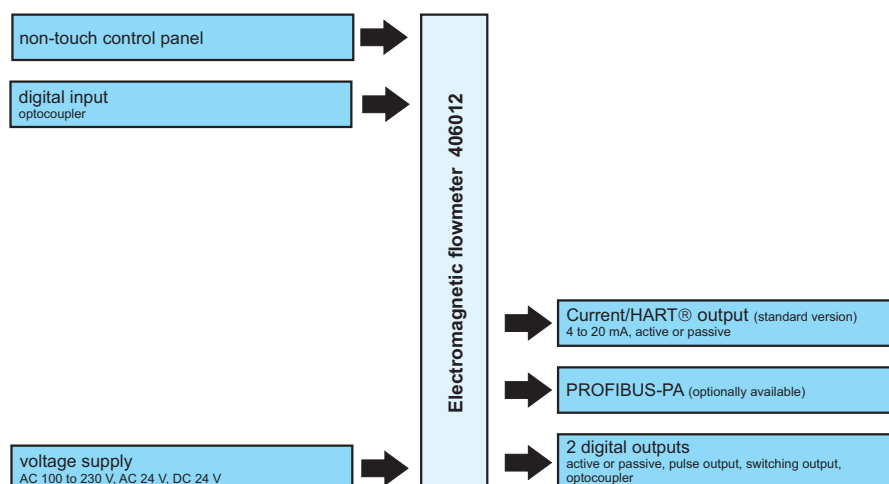


compact design



remote mount design

Block diagram



Special features

- High degree of accuracy
- Extremely simple operation
- State-of-the-art diagnosis for empty pipe detection
- Simpler and quicker fault rectification thanks to diagnosis-based help texts
- Digital communication via HART protocol (standard) or PROFIBUS-PA (option)
- Nominal pressure: PN 10, 16, 40, CL150, CL300
- Process connection: flange according to DIN/EN, ASME
- Lining: hard rubber, PTFE
- Medium temperature: up to 130 °C (266 °F)

Approvals/approval marks (see "Technical data")



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Description

General information

The JUMO flowTRANS MAG S01 was developed with particular consideration for the growing requirements that are placed on modern flowmeters. The modular device concept offers flexibility, cost-effective operation, and excellent reliability with a long operating life and minimal maintenance costs.

Diagnostics functions

State-of-the-art diagnostics functions such as "empty pipe detection" and "sensor measurement" monitor the functional capability of the device and the process.

The limit values for the diagnosis parameters can be adjusted on-site. If these limit values are exceeded, an alarm is issued.

The diagnosis data can be extracted via a state-of-the-art Device Type Manager (DTM) for further analysis. Critical states can therefore be detected at an early stage and countermeasures can be taken.

This enables higher productivity and avoids down times.

Status messages are classified in accordance with the NAMUR requirements.

In the event of a fault, a diagnosis-based help text is displayed which makes it significantly easier and quicker to rectify the fault. This provides maximum process reliability.

Sensor

Self-cleaning, double-sealing polished measuring electrodes increase the reliability and measurement performance of the device.

The high excitation frequency of the sensor means that the JUMO flowTRANS MAG S01 has a fast response time as a flow metering system. State-of-the-art filter methods that separate the measurement signal from the interference signal enable precise measurement with outstanding accuracy even under difficult conditions (max. measurement deviation 0.2 % of the measured value).

Startup

The latest memory technology in the sensor eliminates the need to check the assignment of the sensor and transmitter. The transmitter detects the sensor automatically using the built-in "SensorMemory". Once the voltage supply is switched on, the transmitter carries out self-configuration. The sensor data and the measuring-point specific parameters are loaded automatically. Potential errors are thus eliminated and startup is quick and reliable.

Operation

The parameters pre-set in the plant are changed via the user-friendly display and non-contact operating buttons – quickly and easily without the need to open the housing. The easy setup function also guides inexperienced users smoothly through the configuration, step by step.

The softkey functionality makes it as easy to use as a modern cell phone. During configuration, the admissible setting range of the relevant parameter is shown on the display and inadmissible entries are rejected.

Transmitter

The back-lit display can be turned without additional tools. The contrast is adjustable and the display is fully configurable. The size of the characters, the number of lines, and the resolution of the display (decimal points) are variable. In multiplex mode, several display appearances can be flexibly preconfigured and called up in succession.

The intelligent module design of the transmitter slot enables simple dismantling without unscrewing cables or removing connectors.

Whether it is for counting pulses (active or passive), 20 mA (active or passive), status output (active or passive) – the universal transmitter always offers the right signal. The HART protocol is standard here.

Alternatively to the HART® protocol, the transmitter can be equipped with PROFIBUS-PA as an option.

Conformities

The JUMO flowTRANS MAG S01 complies with the device standard for the process industry. It meets the various NAMUR requirements. In addition, the flowmeter is a universal device in terms of the Pressure Equipment Directive. In accordance with the NAMUR requirement, the evaluation is performed according to Category III for pipelines. This means that the JUMO flowTRANS MAG S01 can be used universally. Costs are reduced and reliability is improved.

Function overview

The following table provides an overview of the most important functions.

Measuring accuracy
0.4 % (optional 0.2 %) of the measured value
Additional software functions
Measuring units, editable counters
Graphic display
Line recorder function
Fieldbus
PROFIBUS-PA (optional)

Device version

The JUMO flowTRANS MAG S01 is available in a compact and remote mount design type.

Compact: sensor and transmitter form one mechanical unit.

Remote mount: sensor and transmitter are placed in separate housings.

The housings are available as single-compartment or dual-compartment housings, depending on the requirements concerning the Ex-protection type.

Overview of available versions:

	JUMO flowTRANS MAG S01	
	Compact	Remote mount
Standard		
No Ex-protection	Single-compartment housing	Single-compartment housing
Ex-protection		
Zone 2, 21, 22	Single-compartment housing	Single-compartment housing
Ex-protection		
Zone 1, 21, 22	Dual-compartment housing	Dual-compartment housing

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Technical data

Design

JUMO flowTRANS MAG S01 – compact design

406012/1-0 (without Ex-protection)	406012/1-1 (Ex-protection zone 2)	406012/1-1 (Ex-protection zone 1)
Transmitter: single-compartment housing sensor: Steel housing Aluminum housing 	Transmitter: single-compartment housing sensor: Aluminum housing 	Transmitter: dual-compartment housing sensor: Aluminum housing 
	ATEX/IECEx Gas zone 2 Dust zone 21, 22	ATEX/IECEx Gas zone 1 Dust zone 21, 22



IMPORTANT (NOTE)!

The scope of delivery for the compact design type includes the sensor and transmitter as one mechanical unit (model 406012/1-0 or 406012/1-1).

If only the sensor model 406012/2-0 or 406012/2-1 is needed, the order code "Remote mount design (sensor) ", page 51 should be used to generate the correct order details.

If only the transmitter model 406018/2-0 or 406018/2-1 is needed, the order code "Remote mount design (transmitter) ", page 54 should be used to generate the correct order details.

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Model number	406012/1-0, 406012/1-1
Measured value deviation	Standard: 0.4 % of the measured value Option: 0.2 % of the measured value
Nominal width range	DN 10 to 300 (3/8 to 12") - Aluminium housing DN 25 to 300 (1 to 12") - Steel housing
Process connection	Flange according to DIN 2501/EN 1092-1, ASME B16.5
Nominal pressure	PN 10, PN 16, PN 40, ASME CL150, ASME CL300
Lining	Hard rubber: DN 15 to 300 (1/2 to 12") - Aluminium housing Hard rubber: DN 40 to 300 (1 1/2 to 12") - Steel housing PTFE: DN 10 to 300 (3/8 to 12") - Aluminium housing PTFE: DN 25 to 300 (1 to 12") - Steel housing
Conductivity	> 5 µS/cm, (20 µS/cm for demineralized water)
Electrodes	Stainless steel, Hastelloy C, platinum-iridium, tantalum, titanium
Process connection material	Steel, stainless steel
Protection type	IP65, IP67 (NEMA 4X)
Medium temperature	Hard rubber: -15 to +90 °C (-5 to +194 °F) PTFE: -25 to +130 °C (-13 to +266 °F)
Approvals	
Electromagnetic compatibility	2004/108/EC – EMC (until April 19, 2016) 2014/30/EU – EMC (as of April 20, 2016)
Ex-protection	94/9/EC – ATEX (until April 19, 2016) 2014/34/EU – ATEX (as of April 20, 2016) IECEx
Pressure equipment - Conformity assessment acc. to Category III, Fluid group 1	97/23/EC (until July 18, 2016 - Mod. B+D) 2014/68/EU (as of June 1, 2015 - Art. 13) 2014/68/EU (as of July 19, 2016 - Mod. B+D)
Transmitter	
Voltage supply	AC 100 to 230 V (-15/+10 %), AC 24 V (-30/+10 %), DC 24 V (-30/+30 %)
Current output	4 to 20 mA active or passive
Pulse output	Active or passive can be set using software on-site
Switching output	Optocoupler, programmable function
Switching input	Optocoupler, programmable function
Display	Graphical display, adjustable
Housing	Compact design, available as single-compartment or dual-compartment housing, depending on the requirements concerning the Ex-protection
Communication	HART protocol (standard), PROFIBUS-PA (option)
Electrical safety	According to DIN EN 61010-1
Electromagnetic compatibility	According to DIN EN 61326-1, DIN EN 61326-2-3




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JUMO flowTRANS MAG S01 – remote mount design

406012/2-0 (without Ex-protection)	406012/2-1 (Ex-protection zone 2)	406012/1-1 (Ex-protection zone 1)
Sensor: Steel housing Aluminum housing 	Sensor: Aluminum housing 	Sensor: Aluminum housing 
	ATEX/IECEX Gas zone 2 Dust zone 21, 22	ATEX/IECEX Gas zone 1 Dust zone 21, 22

406018/2-0 (without Ex-protection)	406018/2-1 (Ex-protection zone 2)	406018/1-1 (Ex-protection zone 1)
Transmitter: single-compartment housing 	Transmitter: single-compartment housing 	Transmitter: dual-compartment housing 
	ATEX/IECEX Gas zone 2 Dust zone 21, 22	ATEX/IECEX Gas zone 1 Dust zone 21, 22



IMPORTANT (NOTE)!

The scope of delivery for the remote mount design type includes the sensor (model 406012/2-0 or 406012/2-1) and the corresponding transmitter (model 406018/2-0 or 406018/2-1) in separate housings.

If only the sensor model 406012/2-0 or 406012/2-1 is needed, the order code "Remote mount design (sensor) ", page 51 should be used to generate the correct order details.

If only the transmitter model 406018/2-0 or 406018/2-1 is needed, the order code "Remote mount design (transmitter) ", page 54 should be used to generate the correct order details.

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Sensor	406012/2-0, 406012/2-1
Measured value deviation	Standard: 0.4 % of the measured value Option: 0.2 % of the measured value
Nominal width range	DN 10 to 300 (3/8 to 12") - Aluminium housing DN 25 to 300 (1 to 12") - Steel housing
Process connection	Flange according to DIN 2501/EN 1092-1, ASME B16.5
Nominal pressure	PN 10, PN 16, PN 40, ASME CL150, ASME CL300
Lining	Hard rubber: DN 15 to 300 (1/2 to 12") - Aluminium housing Hard rubber: DN 40 to 300 (1 1/2 to 12") - Steel housing PTFE: DN 10 to 300 (3/8 to 12") - Aluminium housing PTFE: DN 25 to 300 (1 to 12") - Steel housing
Conductivity	> 5 µS/cm, (20 µS/cm for demineralized water)
Electrodes	Stainless steel, Hastelloy C, platinum-iridium, tantalum, titanium
Process connection material	Steel, stainless steel
Protection type	IP65, IP67 (NEMA 4X), IP68
Medium temperature	Hard rubber: -15 to +90 °C (-5 to +194 °F) PTFE: -25 to +130 °C (-13 to +266 °F)
Approvals	
Electromagnetic compatibility	2004/108/EC – EMC (until April 19, 2016) 2014/30/EU – EMC (as of April 20, 2016)
Ex-approvals	94/9/EC – ATEX (until April 19, 2016) 2014/34/EU – ATEX (as of April 20, 2016) IECEX
Pressure equipment (PED) – Conformity assessment acc. to Category III, Fluid group 1	97/23/EC (until July 18, 2016 - Mod. B+D) 2014/68/EU (as of June 1, 2015 - Art. 13) 2014/68/EU (as of July 19, 2016 - Mod. B+D)
Transmitter	406018/2-0, 406018/2-1
Voltage supply	AC 100 to 230 V (-15/+10 %), AC 24 V (-30/+10 %), DC 24 V (-30/+30 %)
Current output	4 to 20 mA active or passive
Pulse output	Active or passive can be set using software on-site
Switching output	Optocoupler, programmable function
Switching input	Optocoupler, programmable function
Display	Graphical display, adjustable
Housing	Remote mount design, available as single-compartment or dual-compartment housing, depending on the requirements concerning the Ex-protection
Protection type	IP65, IP67 (NEMA 4X)
Communication	HART protocol (standard), PROFIBUS-PA (option)
Electrical safety	According to DIN EN 61010-1
Electromagnetic compatibility	According to DIN EN 61326-1, DIN EN 61326-2-3

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General information

Reference conditions according to EN 29104

Medium temperature	20 °C (68 °F) ±2 K
Ambient temperature	20 °C (68 °F) ±2 K
Voltage supply	Nominal voltage according to the nameplate $U_n \pm 1 \%$, frequency $f \pm 1 \%$
Installation conditions	Upstream > 10 × DN pipe section Downstream > 5 × DN pipe section
Warm-up phase	30 min

Maximum measurement deviation

Pulse output	
Standard calibration:	±0.4 % of measured value, ±0.02 % Q_{\max} DN (DN10 to 300)
Optional calibration:	±0.2 % of measured value, ±0.02 % Q_{\max} DN (DN10 to 300)
Q_{\max} DN ⇒ See table "Nominal width and measuring range", page 8	
<p>Y Accuracy ± of measured value in [%] X Flow velocity v in [m/s], Q/Q_{\max}DN [%]</p>	
Analog output effect	Same as pulse output plus ±0.1 % of measured value + 0.01 mA

Repeatability, response time

Repeatability	≤ 0.11 % of the measured value $t_{\text{meas}} = 100 \text{ s}$ $v = 0.5 \text{ to } 10 \text{ m/s}$
Response time Current output with an attenuation of 0.02 seconds	For a step function 0 to 99 % 5 $t \geq 200 \text{ ms}$ at 25 Hz excitation frequency 5 $t \geq 400 \text{ ms}$ at 12.5 Hz excitation frequency 5 $t \geq 500 \text{ ms}$ at 6.25 Hz excitation frequency

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Nominal width and measuring range

The measuring range end value can be configured between $0.02 \times Q_{\max} \text{DN}$ and $2 \times Q_{\max} \text{DN}$.

Nominal width		Minimum measuring range end value	$Q_{\max} \text{DN}$	Maximum measuring range end value
DN	Inch "	$0.02 \times Q_{\max} \text{DN}$ ($\approx 0.2 \text{ m/s}$)	0 to $\approx 10 \text{ m/s}$	$2 \times Q_{\max} \text{DN}$ ($\approx 20 \text{ m/s}$)
10	3/8	0.9 l/min (0.24 US gal/min)	45 l/min (11.9 US gal/min)	90 l/min (23.78 US gal/min)
15	1/2	2 l/min (0.53 US gal/min)	100 l/min (26.4 US gal/min)	200 l/min (52.8 US gal/min)
20	3/4	3 l/min (0.79 US gal/min)	150 l/min (39.6 US gal/min)	300 l/min (79.3 US gal/min)
25	1	4 l/min (1.06 US gal/min)	200 l/min (52.8 US gal/min)	400 l/min (106 US gal/min)
32	1 1/4	8 l/min (2.11 US gal/min)	400 l/min (106 US gal/min)	800 l/min (211 US gal/min)
40	1 1/2	12 l/min (3.17 US gal/min)	600 l/min (159 US gal/min)	1200 l/min (317 US gal/min)
50	2	1.2 m ³ /h (5.28 US gal/min)	60 m ³ /h (264 US gal/min)	120 m ³ /h (528 US gal/min)
65	2 1/2	2.4 m ³ /h (10.57 US gal/min)	120 m ³ /h (528 US gal/min)	240 m ³ /h (1057 US gal/min)
80	3	3.6 m ³ /h (15.9 US gal/min)	180 m ³ /h (793 US gal/min)	360 m ³ /h (1585 US gal/min)
100	4	4.8 m ³ /h (21.1 US gal/min)	240 m ³ /h (1057 US gal/min)	480 m ³ /h (2113 US gal/min)
125	5	8.4 m ³ /h (37 US gal/min)	420 m ³ /h (1849 US gal/min)	840 m ³ /h (3698 US gal/min)
150	6	12 m ³ /h (52.8 US gal/min)	600 m ³ /h (2642 US gal/min)	1200 m ³ /h (5283 US gal/min)
200	8	21.6 m ³ /h (95.1 US gal/min)	1080 m ³ /h (4755 US gal/min)	2160 m ³ /h (9510 US gal/min)
250	10	36 m ³ /h (159 US gal/min)	1800 m ³ /h (7925 US gal/min)	3600 m ³ /h (15850 US gal/min)
300	12	48 m ³ /h (211 US gal/min)	2400 m ³ /h (10567 US gal/min)	4800 m ³ /h (21134 US gal/min)

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Sensor

Temperatures

The temperature range of the device depends on various factors. These factors include the medium temperature, the ambient temperature, the operating pressure, the lining material, and the approvals for the Ex-protection.

Storage temperature

-40 to +70 °C (-40 to +158 °F)

Minimum admissible pressure depending on the medium temperature

Sensor housing made of aluminum (shell housing)

Lining	Nominal width	P _{operating abs}	at T _{operating} ^a
Hard rubber	DN 15 to 300 (1/2 to 12")	0 mbar	< 90 °C (194 °F)
PTFE	DN 10 to 300 (3/8 to 12")	270 mbar	< 20 °C (68 °F)
		400 mbar	< 100 °C (212 °F)
		500 mbar	< 130 °C (266 °F)

^a Higher temperatures are admissible for CIP/SIP cleaning for a limited time (see table "Maximum admissible cleaning temperature", page 9).

Sensor housing made of steel

Lining	Nominal width	P _{operating abs}	at T _{operating} ^a
Hard rubber	DN 40 to 300 (1 1/2 to 12")	600 mbar	< 80 °C (176 °F)
PTFE	DN 25 to 300 (1 to 12")	270 mbar	< 20 °C (68 °F)
		400 mbar	< 100 °C (212 °F)
		500 mbar	< 130 °C (266 °F)

^a Higher temperatures are admissible for CIP/SIP cleaning for a limited time (see table "Maximum admissible cleaning temperature", page 9).

Maximum admissible cleaning temperature

CIP cleaning	Lining Sensor	T _{max}	T _{max} minutes	T _{Amb}
Steam cleaning	PTFE	150 °C (302 °F)	60	25 °C (77 °F)
Liquids	PTFE	140 °C (284 °F)	60	25 °C (77 °F)

If the ambient temperature is > 25 °C, the difference must be subtracted from the max. cleaning temperature. T_{max} - Δ °C.

(Δ °C = T_{Amb} - 25 °C)

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Maximum ambient temperature depending on the medium temperature



IMPORTANT (NOTE)!

If the device is used in potentially explosive areas, the additional "Temperature data for operation in zone 1 ", page 38 and "Temperature data for operation in zone 2 ", page 44 must be taken into account.

Compact design					
Lining	Flange material	Ambient temperature		Medium temperature	
		Minimum	Maximum	Minimum	Maximum
Hard rubber	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	90 °C (194 °F)
Hard rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)	-15 °C (5 °F)	90 °C (194 °F)
PTFE	Steel	-10 °C (14 °F)	60 °C (140 °F) 45 °C (113 °F)	-10 °C (14 °F)	90 °C (194 °F) 130 °C (266 °F)
PTFE	Stainless steel	-20 °C (-4 °F)	60 °C (140 °F) 45 °C (113 °F)	-25 °C (-13 °F)	90 °C (194 °F) 130 °C (266 °F)

Remote mount design					
Lining	Nominal width	Ambient temperature		Medium temperature	
		Minimum	Maximum	Minimum	Maximum
Hard rubber	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	90 °C (194 °F)
Hard rubber	Stainless steel	-15 °C (5 °F)	60 °C (140 °F)	-15 °C (5 °F)	90 °C (194 °F)
PTFE	Steel	-10 °C (14 °F)	60 °C (140 °F)	-10 °C (14 °F)	130 °C (266 °F)
PTFE	Stainless steel	-25 °C (-13 °F)	60 °C (140 °F)	-25 °C (-13 °F)	130 °C (266 °F)

Protection type according to EN 60529

Compact design (internal transmitter)	IP65, IP67 (NEMA X4)
Remote mount design (external transmitter)	IP65, IP67 (NEMA X4), IP68

Pipeline vibration according to EN 60068-2-6

Valid for:

Compact design (With aluminum transmitter housing)	In the range 10 to 58 Hz max. 0.15 mm (0.006") amplitude
	In the range 58 to 150 Hz max. 2 g acceleration
Remote mount design (Sensor)	In the range 10 to 58 Hz max. 0.15 mm (0.006") amplitude
	In the range 58 to 150 Hz max. 2 g acceleration

Insertion length

The flanged devices comply with the insertion lengths specified according to VDI/VDE 2641, ISO 13359 or according to DVGW (work sheet W420, design WP, ISO 4064 short).

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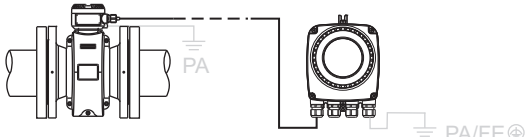
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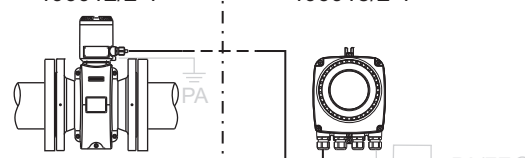
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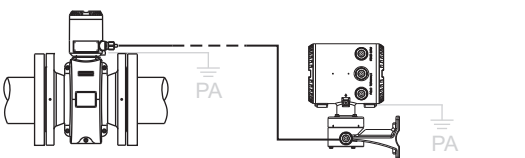


Signal cable length and preamplifier

For devices in the remote mount design, the electrical connection between the transmitter and sensor is made via a signal cable.

Transmitter housing design	Single-compartment housing	Ex-zone 2 or outside of Ex-area	
Maximum signal cable length^a		406012/2-0 406012/2-1	406018/2-0 406018/2-1
Without preamplifier	50 m (164 ft)		
With preamplifier	200 m (656 ft)		
Scope of delivery^b	5 m (16.4 ft) included		
Signal cable, part no.	00648906		

Transmitter housing design	Single-compartment housing	Ex-zone 1	Ex-zone 2 or outside of Ex-area
Maximum signal cable length^a		406012/2-1	406018/2-1
Without preamplifier	50 m (164 ft)		
With preamplifier	-		
Scope of delivery^b	5 m (16.4 ft) included		
Signal cable, part no.	00648906		

Transmitter housing design	Dual-compartment housing	Ex-zone 1	
Maximum signal cable length^a		406012/2-1	406018/2-1
Without preamplifier	10 m (164 ft)		
With preamplifier	-		
Scope of delivery^b	10 m (32.8 ft) permanently installed		
Signal cable, part no.	00648907		

^a At a minimum conductivity for the measurement medium of $\geq 5 \mu\text{S/cm}$

^b Other available signal cable lengths \Rightarrow see "Available signal cable lengths", page 56

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Materials – sensor housing made of aluminum (shell housing)



Housing parts	Standard	Option
Housing Nominal width: DN 10 to 300 (3/8 to 12")	Dual-shell housing for aluminum casting, painted, paint coat, $\geq 80 \mu\text{m}$ thick, RAL 5013 (cobalt blue)	-
Terminal box	Aluminum alloy, painted, $\geq 80 \mu\text{m}$ thick, RAL 5013 (cobalt blue)	-
Measuring pipe	Stainless steel ^a	-
Cable fitting^b	Polyamide	-

Parts not in contact with the medium	Standard	Option
Process connection Nominal width: DN 10 to 15 (3/8 to 1/2") Nominal width: DN 20 to 300 (3/4 to 12")	Stainless steel ^c Steel, galvanized ^d	- Stainless steel ^b

Parts in contact with the medium	Standard	Option
Lining	PTFE, hard rubber	-
Measuring and grounding electrode for: Hard rubber PTFE	CrNi steel 1.4571 (AISI 316 Ti) CrNi steel 1.4571 (AISI 316 Ti), Hastelloy C-4 (2.4610), titanium, tantalum, platinum-iridium	Hastelloy C-4 (2.4610), titanium, tantalum, platinum-iridium -

^a 1.4301, 1.4307, 1.4404, 1.4435, 1.4541, 1.4571

ASTM materials:

Grade TP304, TP304 L, TP316 L, TP321, TP316 Ti, TP317 L, 0Cr18Ni9, 00Cr18Ni10, 0Cr17Ni14Mo2, 0Cr27Ni12Mo3, 0Cr18Ni10Ti

^b Cable fitting with M20 \times 1.5 or NPT thread.

^c 1.4301 (AISI 304), 1.4307, 1.4404 (AISI 316 L), 1.4435 (AISI 316 L), 1.4541 (AISI 321), 1.4571 (AISI 316 Ti), ASTM A182 F304, ASTM A182 F304 L, ASTM A182 F316 L, ASTM A182 F321, ASTM A182 F316 Ti, ASTM A182 F316, 0Cr18Ni9, 0Cr18Ni10, 0Cr17Ni13Mo2, 0Cr27Ni12-Mo3, 1Cr18Ni9Ti, 0Cr18Ni12Mo2Ti

^d 1.0038, 1.0460, 1.0570, 1.0432, ASTM A105, Q255A, 20#, 16Mn

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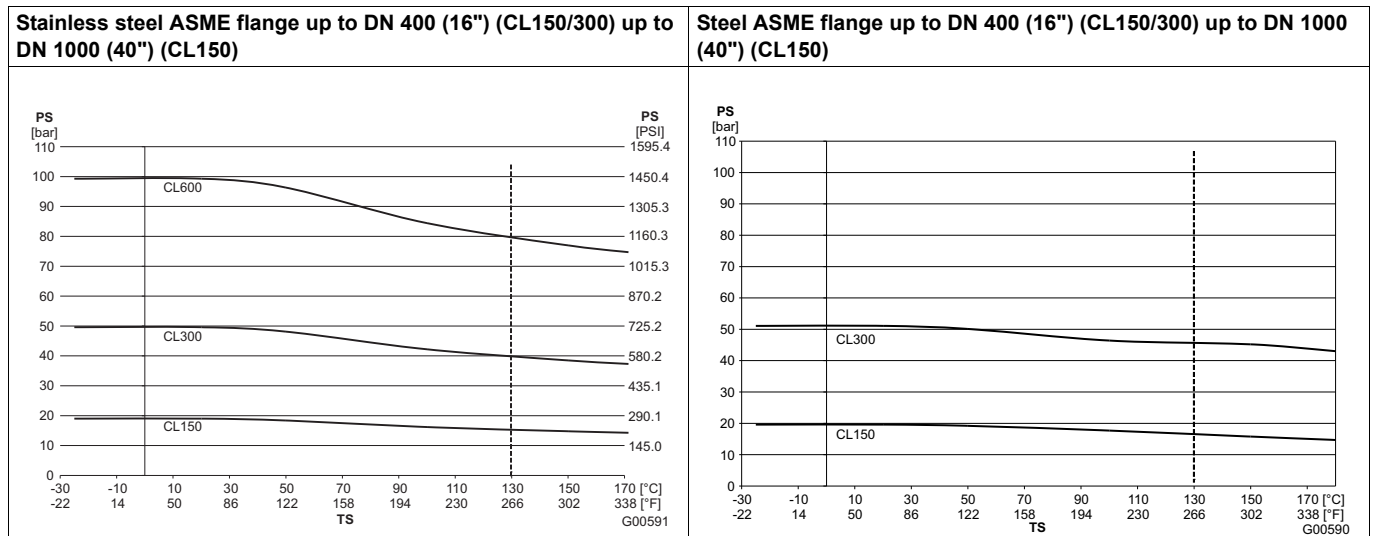
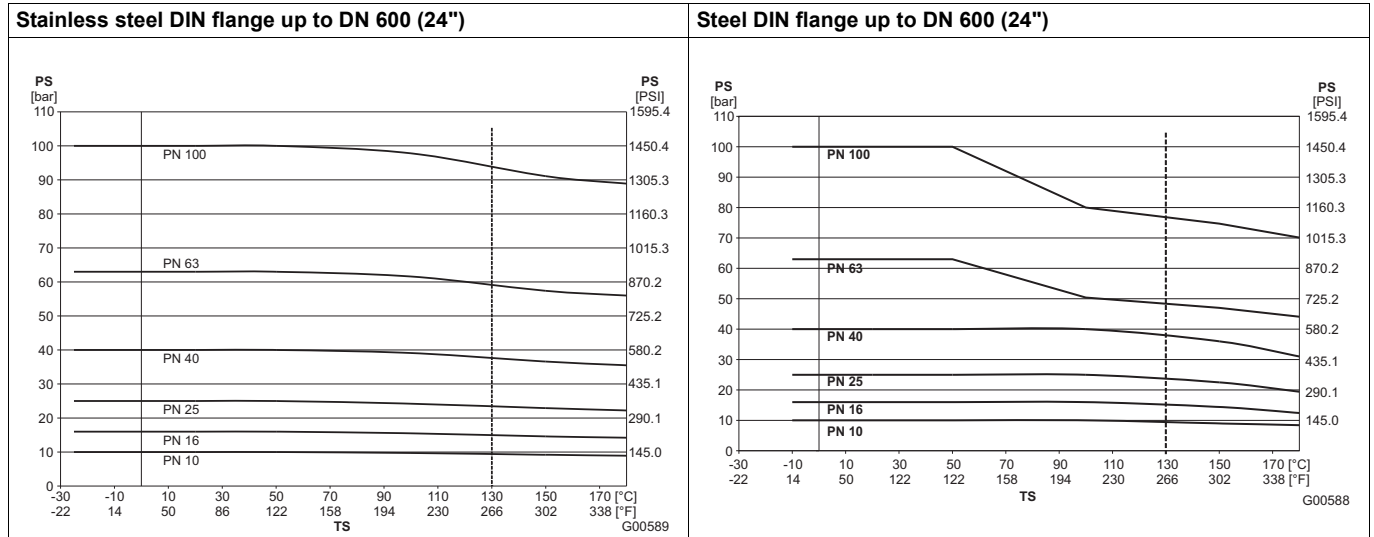
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Material load – sensor housing made of aluminum (shell housing)

Limits for the admissible fluid temperature (TS) and admissible pressure (PS) are determined by the used liner and flange materials of the device (see device nameplate).



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Materials – sensor housing made of steel

		
Housing parts	Standard	Option
Housing + measuring pipe^a Nominal width: DN 25 to 300 (1 to 12")	Steel, painted, paint coat, $\geq 80 \mu\text{m}$ thick, RAL 5013 (cobalt blue)	-
Terminal box	Aluminum alloy, painted, $\geq 80 \mu\text{m}$ thick, RAL 5013 (cobalt blue)	-
Cable fitting^b	Polyamide	-
Parts not in contact with the medium	Standard	Option
Process connection Nominal width: DN 25 to 300 (1 to 12")	Steel, painted ^c	-
Parts in contact with the medium	Standard	Option
Lining	PTFE, hard rubber	-
Measuring and grounding electrode for: Hard rubber - starting with a nominal width of: DN 40 (1 1/2") PTFE	CrNi steel 1.4571 (AISI 316 Ti) CrNi steel 1.4571 (AISI 316 Ti), Hastelloy C-4 (2.4610), titanium, tantalum, platinum-iridium	Hastelloy C-4 (2.4610), titanium, tantalum, platinum-iridium -

^a The measuring pipe is made of the following materials:

1.4301, 1.4307, 1.4404, 1.4435, 1.4541, 1.4571

ASTM materials:

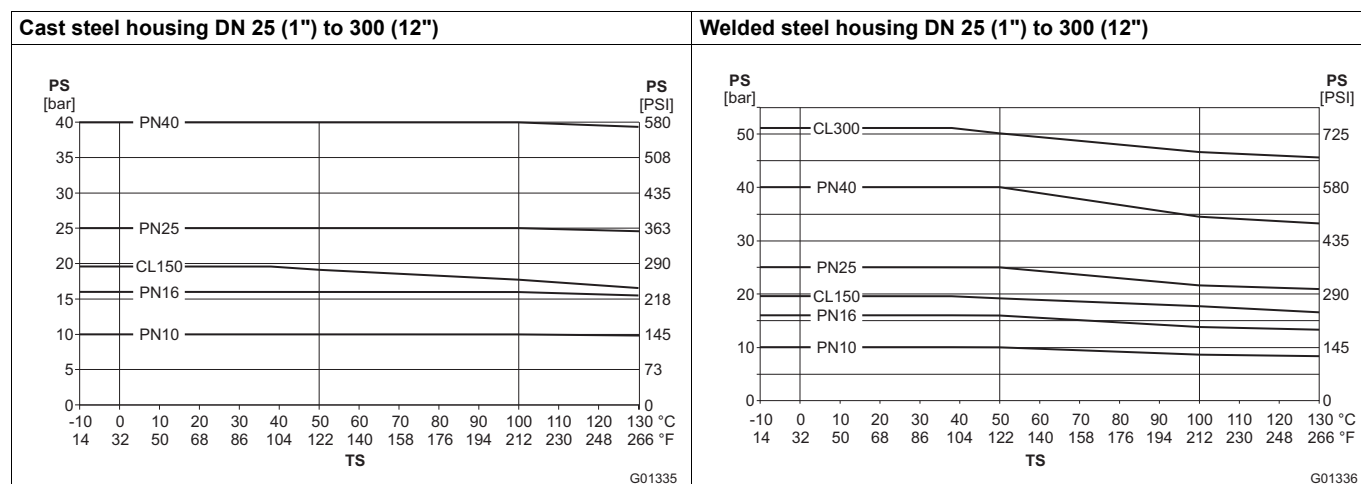
Grade TP304, TP304 L, TP316 L, TP321, TP316 Ti, TP317 L, 0Cr18Ni9, 00Cr18Ni10, 0Cr17Ni14Mo2, 0Cr27Ni12Mo3, 0Cr18Ni10Ti

^b Cable fitting with M20 \times 1.5 or NPT thread.

^c 1.0038, 1.0460, 1.0570, 1.0432, ASTM A105, Q255A, 20#, 16Mn

Material load – sensor housing (steel)

Limits for the admissible fluid temperature (TS) and admissible pressure (PS) are determined by the used liner and flange materials of the device (see device nameplate).



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Transmitter

Electrical properties

Voltage supply	AC 100 to 230 V (-15 %/+10 %) AC 24 V (-30 %/+10 %) DC 24 V (-30 %/+30 %), harmonics < 5 %
Supply frequency	47 to 64 Hz
Excitation frequency	6.25 Hz, 7.5 Hz, 12.5 Hz, 15 Hz, 25 Hz, 30 Hz (50/60 Hz voltage supply)
Power consumption	Sensor including transmitter AC S ≤ 20 VA (switch-on current 8.8 A at AC 230 V) DC P ≤ 12 W (switch-on current 5.6 A)
Electrical connection	Screw terminals (maximum 2.5 mm ² – AWG 14)

Galvanic isolation

Current output, digital output (DO1 and DO2), and digital input are galvanically isolated from the sensor input circuit and each other. The same applies for the signal outputs of the versions with PROFIBUS-PA.

Empty pipe detection

Requirements for the function:

- Conductivity of the medium to be measured of ≥ 20 µS/cm
- Signal cable length of ≤ 50 m (164 ft)
- Sensor without preamplifier
- Nominal width DN ≥ DN 10

Mechanical features

Compact design	
Housing	Aluminum casting, painted
Paint	Paint coat ≥ 80 µm thick, RAL 5013 (cobalt blue)
Cable fitting	Polyamide
Remote mount design	
Housing	Aluminum casting, painted
Paint	Paint coat ≥ 80 µm thick, middle section RAL 5013 (cobalt blue) Front lid/rear lid RAL 5013 (cobalt blue)
Cable fitting	Polyamide
Weight	4.5 kg (9.92 lb)

Temperatures

Storage temperature	-40 to +70 °C (-40 to +158 °F)
Ambient temperature	-20 to +60 °C (-4 to +140 °F)

Protection type

Transmitter housing	IP65, IP67 (NEMA 4X)
---------------------	----------------------

Vibration according to EN 60068-2

Valid for:

Remote mount design (Transmitter)	In the range 10 to 58 Hz max. 0.15 mm (0.006") amplitude ^a In the range 58 to 150 Hz max. 2 g acceleration ^a
--------------------------------------	---

^a = Peak load



Mounting

Grounding

The grounding of the sensor is important both for safety reasons and for the electromagnetic flowmeter to function properly. The grounding screws of the sensor should be connected to protection conductor potential. For measurement reasons, this should be identical to the medium potential as far as possible.

For plastic lines or pipelines with insulating lining, the grounding is via a grounding plate or grounding electrode. If the pipe section is not free from external interference voltages, it is recommended that one grounding plate is fitted in front of the sensor and one is fitted behind the sensor.

Grounding plates are available upon request ⇒ see "Grounding plates", page 57.

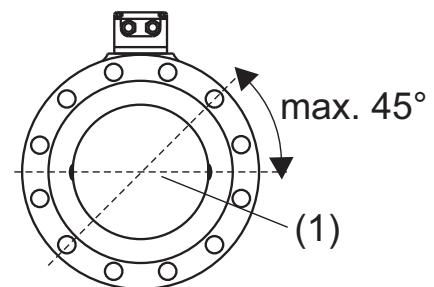
Installation

General information

- The measuring pipe must always be full.
- The flow direction must match the identification marking ⇒ see "Flow direction", page 17.
- The maximum torque for all flange screws must be observed. These must be selected according to factors including temperature, pressure, screw and seal material, and the relevant regulations in each case.
- Install the devices without any mechanical tension (torsion, bending).
- Fit flange devices with plane-parallel counterflanges only using the appropriate seals.
- Use a flange seal made from a material that is compatible with the medium and the medium temperature.
- Seals may not extend into the flow area, since any turbulence affects the device accuracy.
- The pipeline must not exert any inadmissible forces or torque on the device.
- Only remove the sealing plugs in the cable fittings when installing the electrical cables.
- Install remote mount transmitters at a location that is largely free of vibration.
- Do not expose the transmitter to direct sunlight; provide sun protection if necessary.

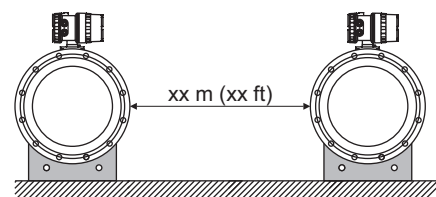
Electrode axis

- Electrode axis (1) horizontal if possible or rotated max. 45°.



Minimum clearance

- Maintain a minimum clearance of 0.7 m (2.3 ft) between the devices to prevent any mutually interference.



G01349

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Inlet section, outlet section

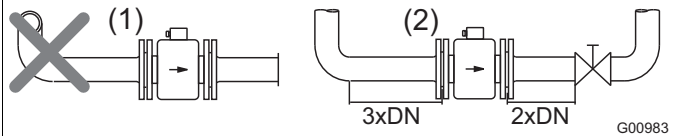
The measuring principle is independent of the flow profile as long as turbulence does not extend into the measurement zone, e.g. downstream from double elbows (1), in case of tangential inflow or where gate valves are partially open upstream of the sensor.

In these cases, measures must be taken to normalize the flow profile.

- Do not install fittings, elbows or valves, etc. directly upstream of the sensor (1).
- Flaps must be installed so that the flap blade does not extend into the sensor.
- Valves or other shut-off devices should be mounted in the outlet section (2).

Experience has shown that a straight inlet section of $3 \times \text{DN}$ and a straight outlet section of $2 \times \text{DN}$ is sufficient in most cases (DN = nominal width of the transmitter – see the adjacent figure).

For test stands, the reference conditions of $10 \times \text{DN}$ for the straight inlet and $5 \times \text{DN}$ for the straight outlet must be provided according to EN 29104/ISO 9104.



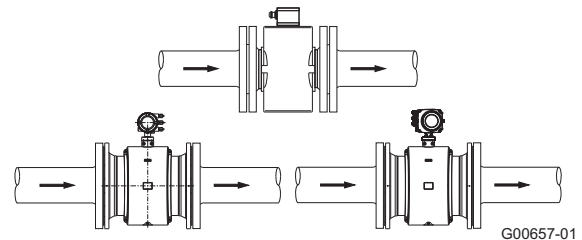
Flow direction

The device records the flow in both directions.

Default setting: forward flow direction

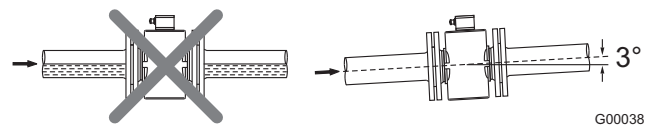
Identification marking:

- Arrow direction on the device
- Alignment of the sensor housing during initial startup (default setting) as displayed in the adjacent figures



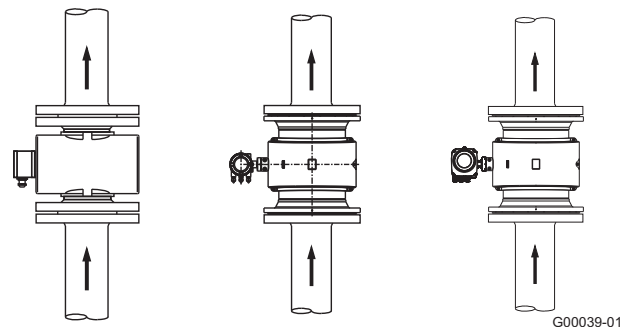
Horizontal flow direction

- Measuring pipe must always be full.
- Ensure the line is slightly inclined for degassing.



Vertical flow direction

- Vertical installation for measuring abrasive substances, the preferred flow direction is from bottom to top.



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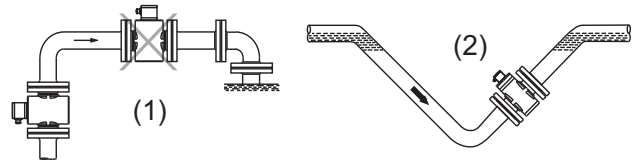
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Free inlet, free outlet

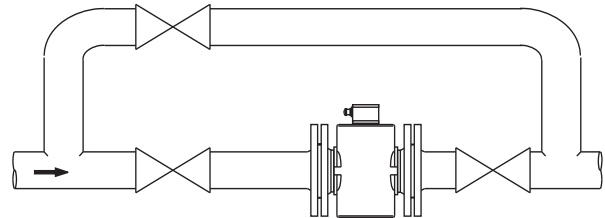
- For a free outlet, do not install the measuring device at the highest point or in the draining side of the pipeline, as the measuring pipe runs empty or air bubbles can form (1).
- For free inlets or outlets, provide a culvert (downward routing of the pipe) so that the pipeline is always full (2).



G00040

Heavily contaminated measurement media

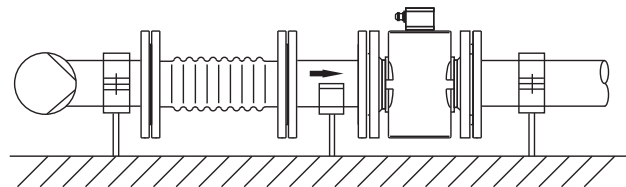
- We recommend a bypass connection, according to the figure, for heavily contaminated media so that the system can continue operating without any interruptions during mechanical cleaning.



G00042

Installation near pumps

- We recommend using mechanical vibration compensators for sensors that are installed near pumps or other equipment generating vibrations.



G00561

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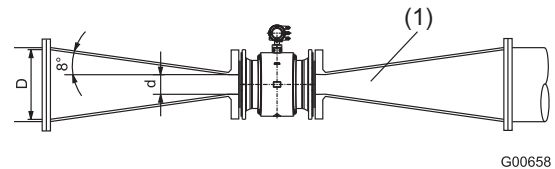
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Installation in pipelines with larger nominal widths

Determine the resulting pressure loss when using reducers (1):

1. Determine the diameter ratio d/D
2. Refer to the flow nomograph for the flow velocity (adjacent figure).
3. Read the pressure loss on the Y-axis in the flow nomogram.



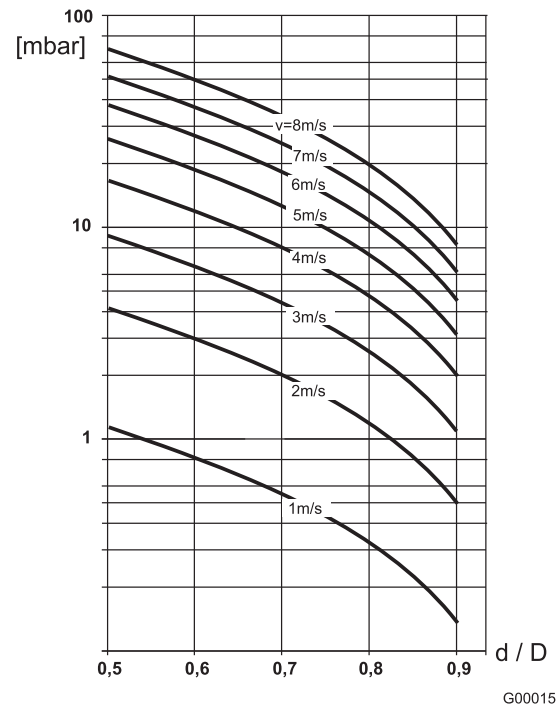
(1) Flange transition piece

(d) Inner diameter of the flowmeter

(D) Inner diameter of the pipeline

Nomograph for pressure loss calculations

For flange transition piece with $\alpha/2 = 8^\circ$



(V) Flow velocity [m/s]

(Δp) Pressure loss [mbar]

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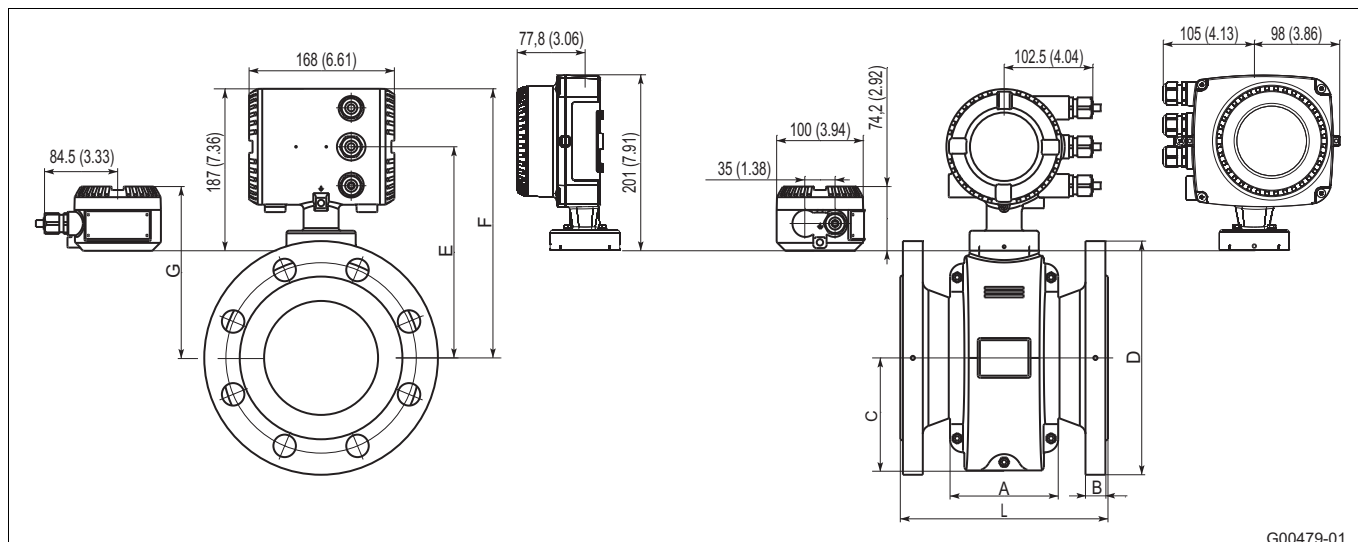
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Dimensions

Dimensions for flange DN 10 to 125 (3/8 to 5")

Sensor housing made of aluminum (shell housing)



G00479-01

Dimensions ^a in mm (inch)									
DN	Process connection ^b	D	L ^c	F ^d	C	E ^d	G ^d	A	B
10 (3/8) ^e	EN 1092-1 PN 10 to 40	90 (3,54)	200 (7,87)	255 (10,04)	82 (3,23)	188 (7,40)	143 (5,63)	113 (4,45)	19 (0,75)
	ASME B 16.5 CL150	89 (3,50)							14,2 (0,56)
	ASME B 16.5 CL300	96 (3,78)							17,3 (0,68)
15 (1/2)	EN 1092-1 PN 10 to 40	95 (3,74)	200 (7,87)	255 (10,04)	82 (3,23)	188 (7,40)	143 (5,63)	113 (4,45)	19 (0,75)
	ASME B 16.5 CL150	89 (3,50)							14,2 (0,56)
	ASME B 16.5 CL300	96 (3,78)							17,3 (0,68)
20 (3/4)	EN 1092-1 PN 10 to 40	105 (4,13)	200 (7,87)	255 (10,04)	82 (3,23)	188 (7,40)	143 (5,63)	113 (4,45)	21 (0,83)
	ASME B 16.5 CL150	98 (3,86)							15,7 (0,62)
	ASME B 16.5 CL300	118 (4,65)							18,7 (0,74)
25 (1)	EN 1092-1 PN 10 to 40	115 (4,53)	200 (7,87)	255 (10,04)	82 (3,23)	188 (7,40)	143 (5,63)	113 (4,45)	21 (0,83)
	ASME B 16.5 CL150	108 (4,25)							17,2 (0,68)
	ASME B 16.5 CL300	124 (4,88)							20,5 (0,81)
32 (1 1/4)	EN 1092-1 PN 10 to 40	140 (5,51)	200 (7,87)	262 (10,31)	92 (3,62)	195 (7,68)	150 (5,91)	113 (4,45)	21 (0,83)
	ASME B 16.5 CL150	118 (4,65)							18,7 (0,74)
	ASME B 16.5 CL300	134 (5,28)							22,1 (0,87)
40 (1 1/2)	EN 1092-1 PN 10 to 40	150 (5,91)	200 (7,87)	262 (10,31)	92 (3,62)	195 (7,68)	150 (5,91)	113 (4,45)	21 (0,83)
	ASME B 16.5 CL150	127 (5,00)							20,5 (0,81)
	ASME B 16.5 CL300	156 (6,14)							23,6 (0,93)

^a For DN 65, PN 16 acc. to EN 1092-1 please order PN 40.

^b Other pressure levels upon request.

^c Tolerance L: +0/-3 mm (+0/-0,118")

^d The dimensions change as in the following table according to the device version:

^e Connecting flange: 1/2".

Device version	Dimension E, F in mm (Zoll)	Dimension G in mm (Zoll)
Without Ex-protection	0	0
Ex-protection zone 2	0	0
Ex-protection zone 1	+74 (+2,91)	+47 (+1,85)

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Dimensions ^a in mm (Zoll)									
DN	Process connection ^b	D	L ^c	F ^d	C	E ^d	G ^d	A	B
50 (2)	EN 1092-1 PN 10 to 40	165 (6,50)	200 (7,87)	268 (10,55)	97 (3,82)	201 (7,91)	156 (6,14)	115 (4,53)	23 (0,91)
	ASME B 16.5 CL150	153 (6,02)							22,1 (0,87)
	ASME B 16.5 CL300	165 (6,50)							25,4 (1,00)
65 (2 1/2)	EN 1092-1 PN 16	185 (7,28)	200 (7,87)	279 (10,98)	108 (4,25)	212 (8,35)	156 (6,57)	104 (4,09)	22 (0,87)
	EN 1092-1 PN 40	185 (7,28)							26 (1,02)
	ASME B 16.5 CL150	178 (7,01)							25,4 (1,00)
	ASME B 16.5 CL300	191 (7,52)							28,4 (1,12)
80 (3)	EN 1092-1 PN 10 to 40	200 (7,87)	200 (7,87)	279 (10,98)	108 (4,25)	212 (8,35)	167 (6,57)	104 (4,09)	28 (1,10)
	ASME B 16.5 CL150	191 (7,52)							26,9 (1,06)
	ASME B 16.5 CL300	210 (8,27)							31,4 (1,24)
100 (4)	EN 1092-1 PN 10 to 16	220 (8,66)	250 (9,84)	301 (11,85)	122 (4,80)	234 (9,21)	189 (7,44)	125 (4,92)	24 (0,94)
	EN 1092-1 PN 25 to 40	235 (9,25)							28 (1,10)
	ASME B 16.5 CL150	229 (9,02)							27,4 (1,08)
	ASME B 16.5 CL300	254 (10,00)							35,8 (1,41)
125 (5)	EN 1092-1 PN 10 to 16	250 (9,84)	250 (9,84)	311 (12,24)	130 (5,12)	244 (9,61)	199 (7,83)	125 (4,92)	25 (0,98)
	EN 1092-1 PN 25 to 40	270 (10,63)							29 (1,14)
	ASME B 16.5 CL150	254 (10,00)							27,9 (1,09)
	ASME B 16.5 CL300	280 (11,02)							39,1 (1,54)

^a For DN 65, PN 16 acc. to EN 1092-1 please order PN 40.

^b Other pressure levels upon request.

^c Tolerance L: +0/-3 mm (+0/-0,118")

^d The dimensions change as in the following table according to the device version:

Device version	Dimension E, F in mm (Zoll)	Dimension G in mm (Zoll)
Without Ex-protection	0	0
Ex-protection zone 2	0	0
Ex-protection zone 1	+74 (+2,91)	+47 (+1,85)

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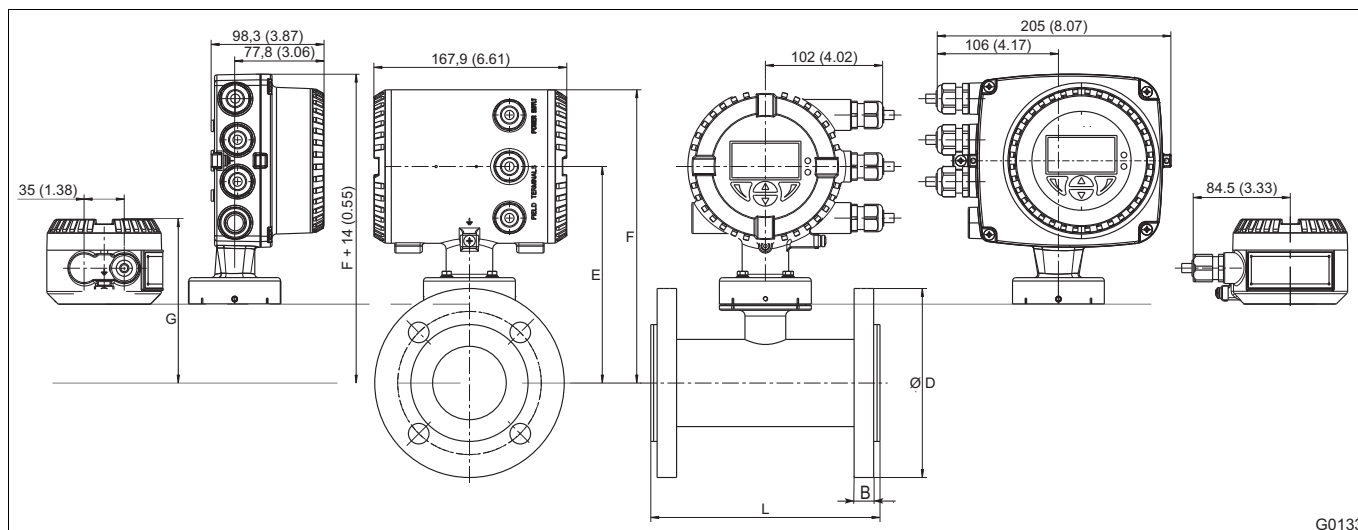
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Dimensions for flange DN 25 to 300 (1 to 12")

Sensor housing made of steel



G0133

Dimensions in mm (inch)							
DN	Process connection ^a	D	L ^b	F ^c	E ^d	G ^d	B
25 (1)	EN 1092-1 PN 10 to 40	115 (4,53)	200 (7,84)	244 (9,61)	177 (6,97)	131 (5,16)	23 (0,91)
	ASME B 16.5 CL150	115 (4,53)					23 (0,91)
	ASME B 16.5 CL300	124 (4,88)					20 (0,79)
32 (1 1/4)	EN 1092-1 PN 10 to 40	150 (5,91)	200 (7,84)	249 (9,80)	182 (7,17)	136 (5,35)	21 (0,83)
	ASME B 16.5 CL150	150 (5,91)					21 (0,83)
	ASME B 16.5 CL300	134 (5,28)					21 (0,83)
40 (1 1/2)	EN 1092-1 PN 10 to 40	150 (5,91)	200 (7,84)	254 (10,0)	187 (7,36)	141 (5,55)	21 (0,83)
	ASME B 16.5 CL150	150 (5,91)					21 (0,83)
	ASME B 16.5 CL300	156 (6,14)					23 (0,91)
50 (2)	EN 1092-1 PN 10 to 40	165 (6,50)	200 (7,84)	257 (10,12)	190 (7,48)	144 (5,67)	24 (0,94)
	ASME B 16.5 CL150	165 (6,50)					24 (0,94)
	ASME B 16.5 CL300	165 (6,50)					25 (0,98)
65 (2 1/2)	EN 1092-1 PN 10 to 40	185 (7,28)	200 (7,84)	271 (10,67)	204 (8,03)	158 (6,22)	28 (1,10)
	ASME B 16.5 CL150	185 (7,28)					28 (1,10)
	ASME B 16.5 CL300	191 (7,52)					28 (1,10)
80 (3)	EN 1092-1 PN 10 to 40	205 (8,07)	200 (7,84)	275 (10,83)	208 (8,19)	162 (6,38)	27 (1,06)
	ASME B 16.5 CL150	205 (8,07)					27 (1,06)
	ASME B 16.5 CL300	210 (8,27)					31 (1,22)
100 (4)	EN 1092-1 PN 10 to 40	235 (9,25)	250 (9,84)	306 (12,05)	239 (9,41)	193 (7,60)	27 (1,06)
	EN 1092-1 PN 25 to 40	235 (9,25)					29 (1,14)
	ASME B 16.5 CL150	235 (9,25)					27 (1,06)
	ASME B 16.5 CL300	254 (10,00)					35 (1,38)

^a Other pressure levels upon request.

^b Tolerance L: +0/-3 mm (+0/-0,118")

^c The dimensions change as in the following table according to the device version.

Device version	Dimension E, F in mm (inch)	Dimension G in mm (inch)
Without Ex-protection	0	0
Ex-protection zone 2	0	0
Ex-protection zone 1	+74 (+2.91)	+47 (+1.85)

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Dimensions in mm (inch)							
DN	Process connection ^a	D	L ^b	F ^c	E ^d	G ^d	B
125 (5)	PN 10 to 40	270 (10,63)	250 (9,84)	318 (12,52)	251 (9,88)	205 (8,07)	36 (1,42)
	PN 25 to 40	270 (10,63)					31 (1,22)
	CL150	270 (10,63)					36 (1,42)
	CL300	280 (11,02)					38 (1,50)
150 (6)	PN 10 to 40	300 (11,81)	300 (11,81)	339 (13,35)	272 (10,71)	226 (8,90)	29 (1,14)
	PN 25 to 40	300 (11,81)					33 (1,30)
	CL150	300 (11,81)					29 (1,14)
	CL300	381 (15,00)					40 (1,57)
200 (8)	PN 10 to 40	340 (13,39)	350 (13,78)	364 (14,33)	297 (11,69)	252 (9,92)	33 (1,30)
	PN 25 to 40	340 (13,39)					34 (1,34)
	CL150	343 (13,50)					34 (1,34)
	CL300	381 (15,00)					46 (1,81)
250 (10)	PN 10 to 16	395 (15,55)	450 (17,72)	390 (15,35)	323 (12,72)	278 (10,94)	35 (1,38)
	PN 25 to 40	395 (15,55)					35 (1,38)
	CL150	407 (16,02)					35 (1,38)
	CL300	445 (17,52)					51 (2,00)
300 (12)	PN 10 to 16	445 (17,52)	500 (19,68)	415 (16,34)	348 (15,12)	303 (11,93)	38 (1,50)
	PN 25 to 40	445 (17,52)					38 (1,50)
	CL150	483 (19,02)					38 (1,50)
	CL300	521 (20,51)					55 (2,17)

^a Other pressure levels upon request.

^b Tolerance L: DN 25 to 200 +0/-3 mm (+0/-0.118"), DN 250 to 300 +0/-5 mm (+0/-0.197")

^c The dimensions change as in the following table according to the device version.

Device version	Dimension E, F in mm (inch)	Dimension G in mm (inch)
Without Ex-protection	0	0
Ex-protection zone 2	0	0
Ex-protection zone 1	+74 (+2.91)	+47 (+1.85)

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Weight - Sensor housing

Dimensions in mm (inch)		Weight approx. kg (lb)			
DN	Process connection	Sensor housing made of aluminum (shell housing)		Sensor housing made of steel	
		Compact design	Remote mount design	Compact design	Remote mount design
10 (3/8)	EN 1092-1 PN 10 to 40	7 (15)	5 (11)	-	-
	ASME B 16.5 CL150				
	ASME B 16.5 CL300				
15 (1/2)	EN 1092-1 PN 10 to 40	7 (15)	5 (11)	-	-
	ASME B 16.5 CL150				
	ASME B 16.5 CL300				
20 (3/4)	EN 1092-1 PN 10 to 40	8 (18)	6 (13)	-	-
	ASME B 16.5 CL150				
	ASME B 16.5 CL300				
25 (1)	EN 1092-1 PN 10 to 40	9 (20)	7 (15)	9 (20)	7 (15)
	ASME B 16.5 CL150				
	ASME B 16.5 CL300				
32 (1 1/4)	EN 1092-1 PN 10 to 40	10 (22)	8 (18)	10 (22)	8 (18)
	ASME B 16.5 CL150				
	ASME B 16.5 CL300				
40 (1 1/2)	EN 1092-1 PN 10 to 40	11 (24)	9 (20)	11 (24)	9 (20)
	ASME B 16.5 CL150				
	ASME B 16.5 CL300				
50 (2)	EN 1092-1 PN 10 to 40	12 (26)	10 (22)	12 (26)	10 (22)
	ASME B 16.5 CL150				
	ASME B 16.5 CL300				
65 (2 1/2)	EN 1092-1 PN 16	15 (33)	13 (29)	15 (33)	13 (29)
	EN 1092-1 PN 40				
	EN 1092-1 PN 10 to 40	-	-		
	ASME B 16.5 CL150	13 (29)	11 (24)	13 (29)	11 (24)
	ASME B 16.5 CL300	15 (33)	13 (29)	15 (33)	13 (29)
80 (3)	EN 1092-1 PN 10 to 40	17 (38)	15 (33)	17 (38)	15 (33)
	ASME B 16.5 CL150				
	ASME B 16.5 CL300				
100 (4)	EN 1092-1 PN 10 to 16	19 (42)	17 (38)	19 (42)	17 (38)
	EN 1092-1 PN 25 to 40	23 (51)	21 (46)	23 (51)	21 (46)
	ASME B 16.5 CL150	21 (46)	19 (42)	21 (46)	19 (42)
	ASME B 16.5 CL300	30 (66)	28 (62)	30 (66)	28 (62)
125 (5)	EN 1092-1 PN 10 to 16	22 (49)	20 (44)	22 (49)	20 (44)
	EN 1092-1 PN 25 to 40	29 (64)	27 (60)	29 (64)	27 (60)
	ASME B 16.5 CL150	22 (49)	20 (44)	22 (49)	20 (44)
	ASME B 16.5 CL300	35 (77)	33 (73)	35 (77)	33 (73)
150 (6)	EN 1092-1 PN 10 to 16	33 (73)	31 (68)	33 (73)	31 (68)
	EN 1092-1 PN 25 to 40	39 (86)	37 (82)	39 (86)	37 (82)
	ASME B 16.5 CL150	33 (73)	31 (68)	33 (73)	31 (68)
	ASME B 16.5 CL300	47 (104)	45 (99)	47 (104)	45 (99)
200 (8)	EN 1092-1 PN 10 to 16	41 (90)	39 (86)	41 (90)	39 (86)
	EN 1092-1 PN 25 to 40	43 (95)	41 (90)	43 (95)	41 (90)
	ASME B 16.5 CL150	50 (110)	48 (106)	50 (110)	48 (106)
	ASME B 16.5 CL300	72 (158)	70 (154)	72 (158)	70 (154)

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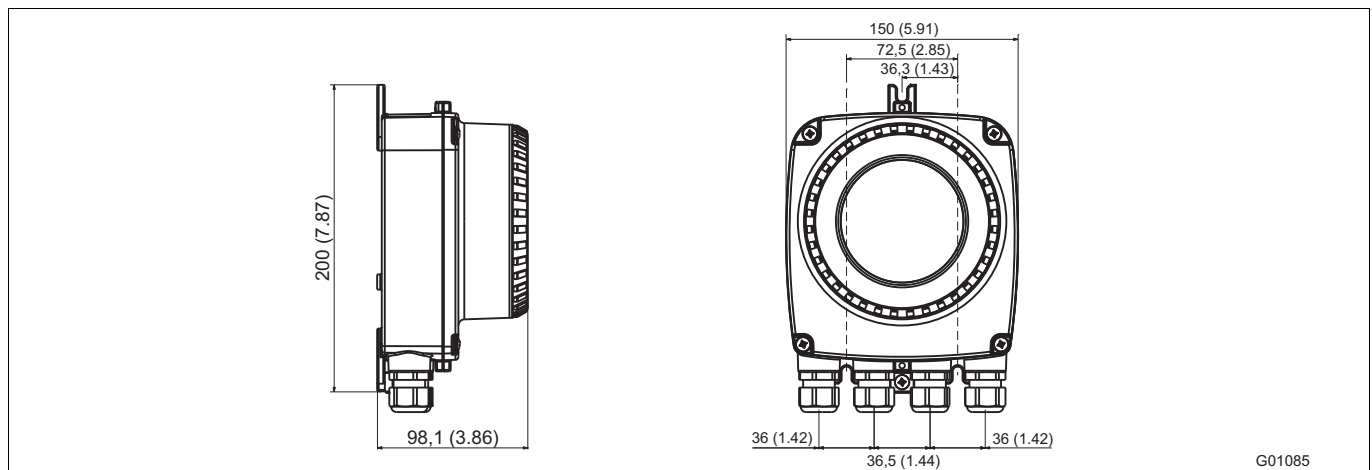
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Dimensions in mm (inch)		Weight approx. kg (lb)			
		Sensor housing made of aluminum (shell housing)		Sensor housing made of steel	
DN	Process connection	Compact design	Remote mount design	Compact design	Remote mount design
250 (10)	EN 1092-1 PN 10 to 16	61 (135)	59 (130)	61 (135)	59 (130)
	EN 1092-1 PN 25 to 40	65 (143)	63 (139)	65 (143)	63 (139)
	ASME B 16.5 CL150	70 (154)	68 (150)	70 (154)	68 (150)
	ASME B 16.5 CL300	105 (232)	103 (227)	105 (232)	103 (227)
300 (12)	EN 1092-1 PN 10 to 16	74 (163)	72 (159)	74 (163)	72 (159)
	EN 1092-1 PN 25 to 40	80 (176)	78 (172)	80 (176)	78 (172)
	ASME B 16.5 CL150	105 (232)	103 (227)	105 (232)	103 (227)
	ASME B 16.5 CL300	150 (331)	148 (326)	150 (331)	148 (326)

Dimensions of single-compartment housing transmitter model 406018/2-0 and 401618/2-1

For use in Ex-zone 2 and outside of the Ex-area

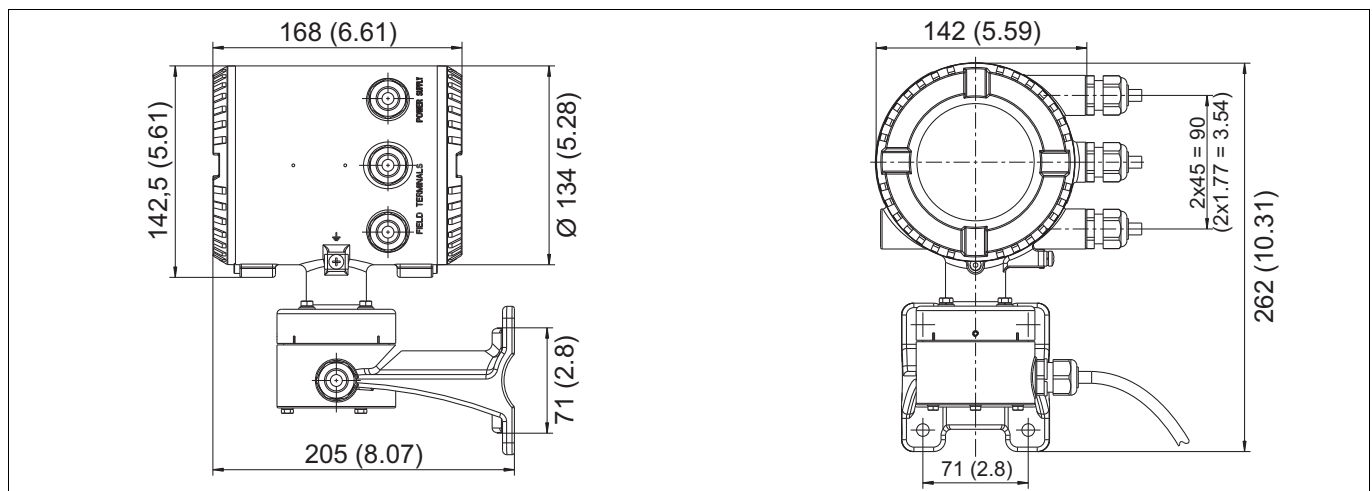


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Dimensions in mm (inch)

Dimensions of dual-compartment housing transmitter model 406018/2-1

For use in Ex-zone 1



Dimensions in mm (inch)

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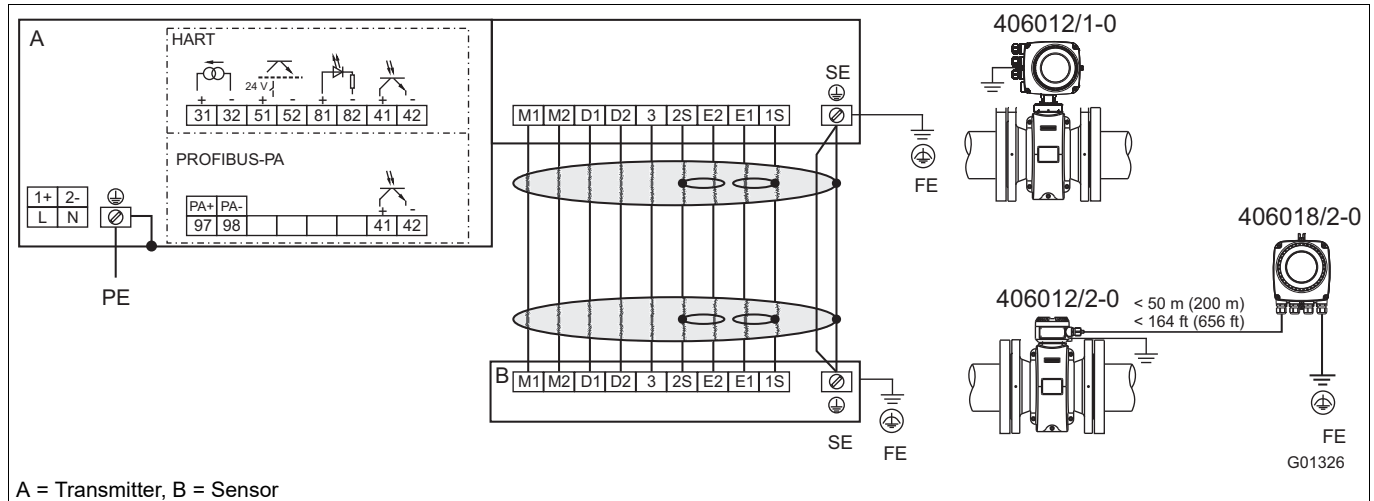
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Connection diagram

Electrical connection

Model 406012/1-0, 406012/2-0, and 406018/2-0 without explosion protection – HART protocol and PROFIBUS-PA



Voltage supply

Alternating voltage (AC)		Direct voltage (DC)	
Terminal	Function	Terminal	Function
L	Phase	1+	+
N	Neutral conductor	2-	-
PE	Protection conductor (PE)	PE	Protection conductor (PE)

Signal cable connection (for devices with remote mount design only)

Terminal	Function	Wire color
M1	Magnet coil	Brown
M2	Magnet coil	Red
D1	Data line	Orange
D2	Data line	Yellow
SE	Shielding	-
E1	Signal line	Violet
1S	Shield of E1	-
E2	Signal line	Blue
2S	Shield of E2	-
3	Measurement potential	Green

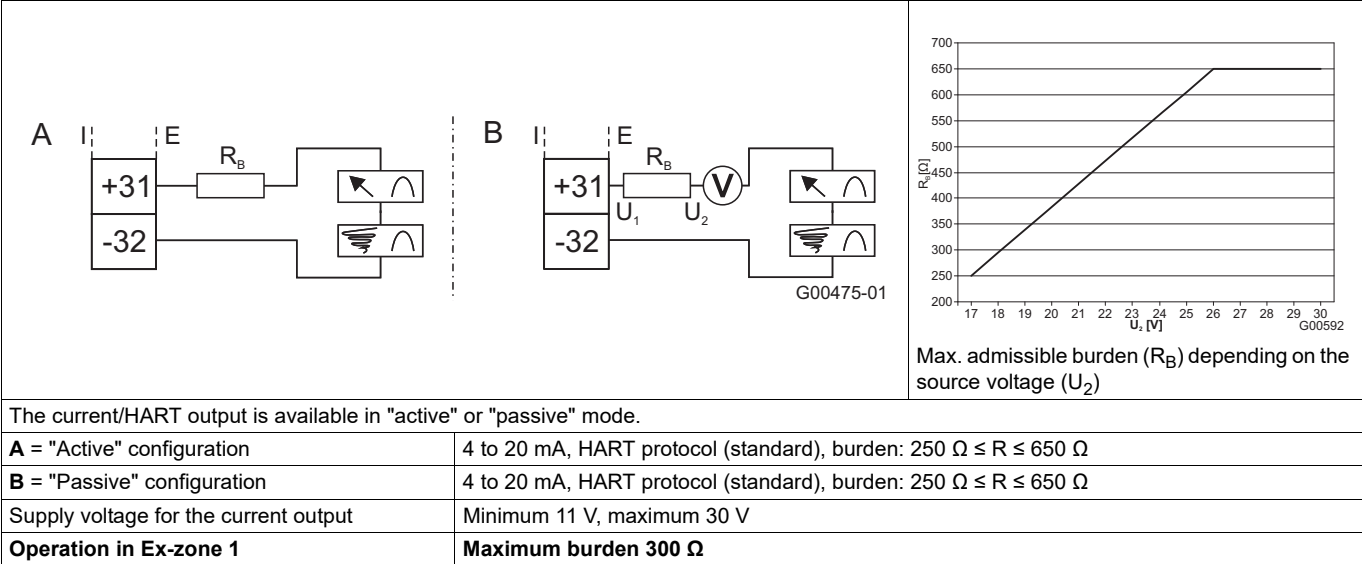
Input and output connection

Terminal	Function
31/32	Current/HART output - The current output is available in "active" or "passive" mode.
97/98	PROFIBUS-PA (PA+/PA-) - According to IEC 61158-2
51/52	Digital output DO1 active/passive - Function can be configured using software on-site as "Pulse output" or "Binary output". The default setting is "Pulse output".
81/82	Digital input/contact input - Function can be configured using software on-site as "External output switch-off", "External totalizer reset", "External totalizer stop", or "Other".
41/42	Digital output DO2 passive - Function can be configured using software on-site as "Pulse output" or "Binary output". The default setting is "Binary output", flow direction signaling.
FE	Functional ground

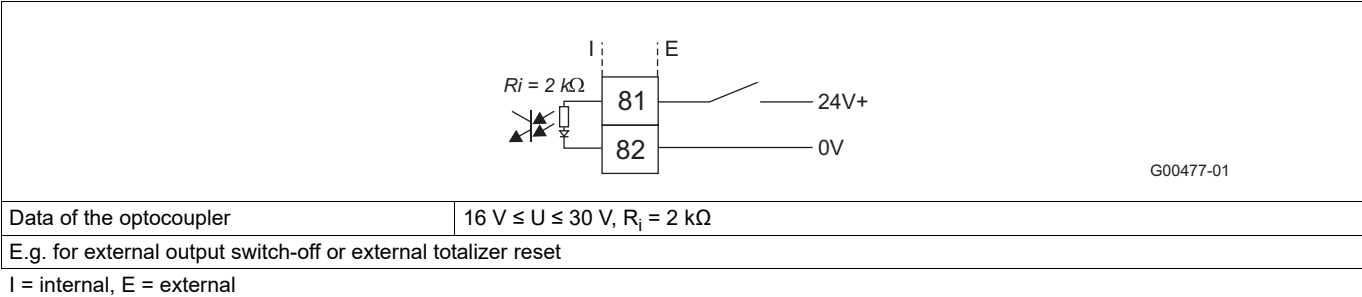


Electrical data

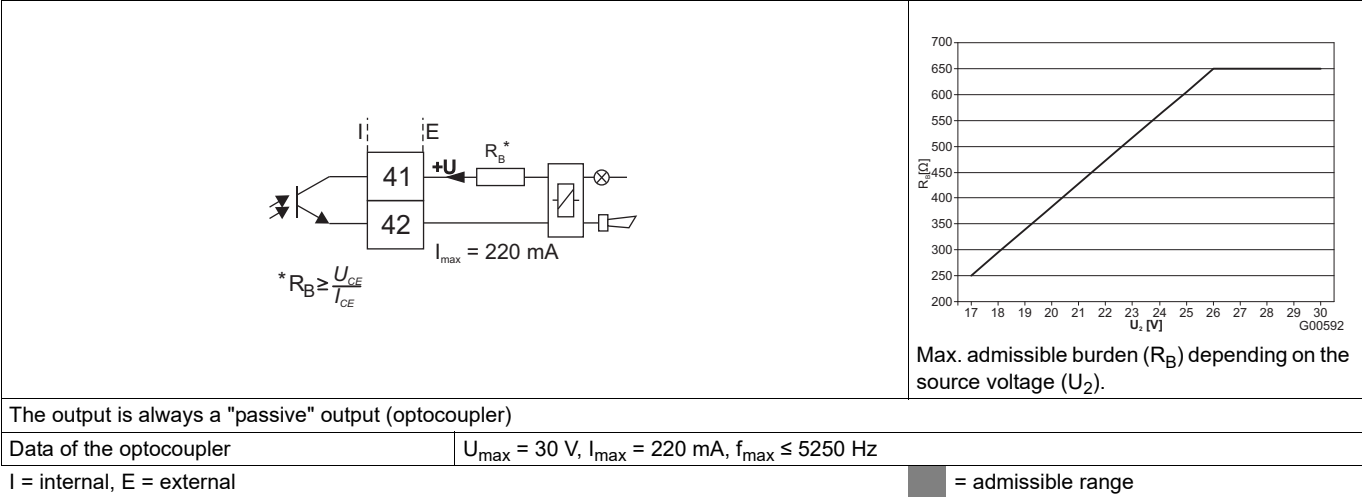
Current/HART output



Digital input DI1

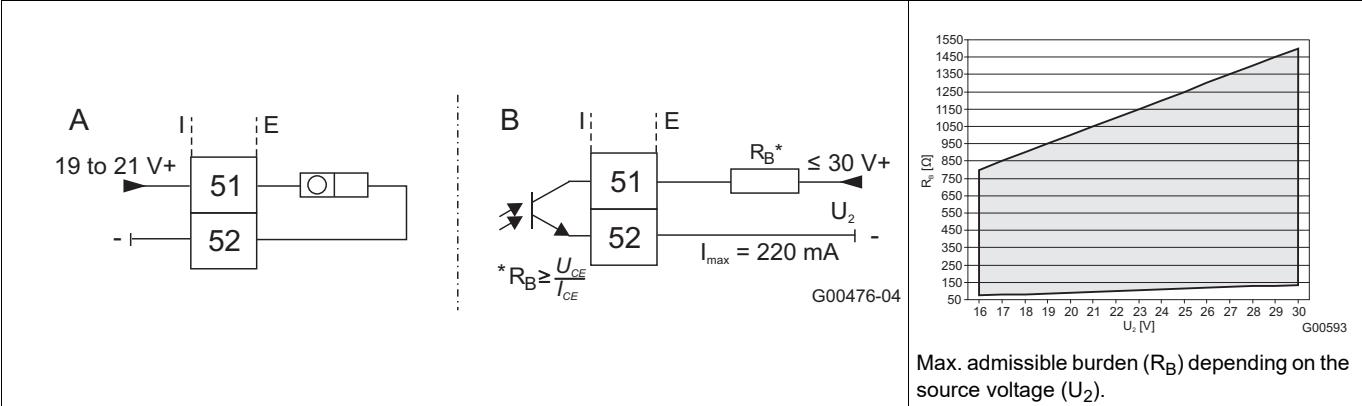


Digital output DO2





Digital output DO1



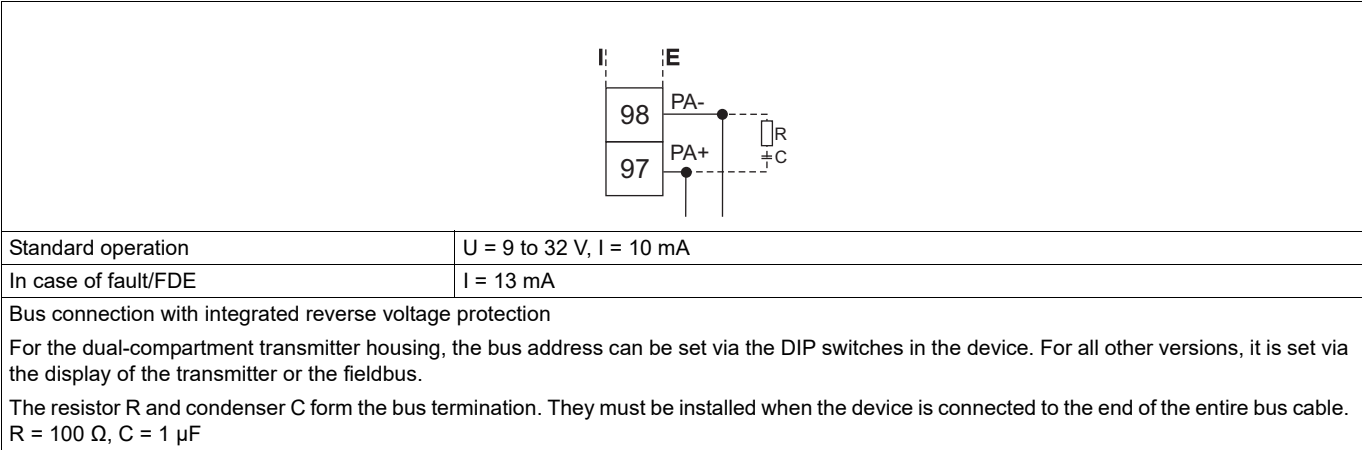
The output can be configured as an "active" or a "passive" output. For a transmitter with the dual-compartment housing, the configuration is performed using the software. For a transmitter with the single-compartment housing, the configuration is performed using jumpers on the transmitter backplane.

A = "Active" configuration	$U = 19 \text{ to } 21 \text{ V}$, $I_{\text{max}} = 220 \text{ mA}$, $f_{\text{max}} \leq 5250 \text{ Hz}$
B = "Passive" configuration	$U_{\text{max}} = 30 \text{ V}$, $I_{\text{max}} = 220 \text{ mA}$, $f_{\text{max}} \leq 5250 \text{ Hz}$
Configuration as pulse output	Maximum pulse frequency: 5250 Hz Pulse width: 0.1 to 2000 ms The pulse factor and pulse width are interdependent and are calculated dynamically.
Configuration as switching output	Function: system alarm, empty pipe alarm, max./min. alarm, flow direction signaling, other

I = internal, E = external

▨ = admissible range

PROFIBUS-PA (PA+/PA-) according to IEC 61158-2



I = internal, E = external

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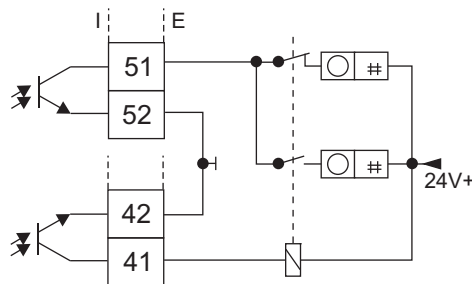
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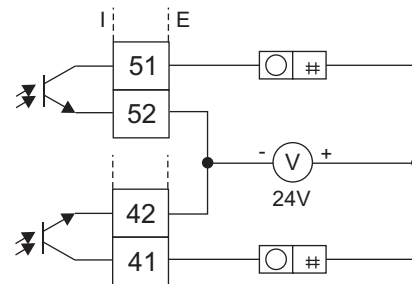
Connection examples

Digital output DO1 and DO2

Separate forward and reverse pulses



Separate forward and reverse pulses (connection type)

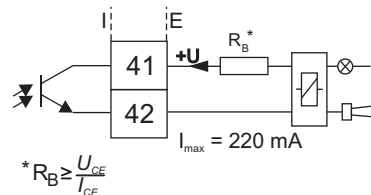


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I = internal, E = external

Digital output DO2

E.g. for system monitoring, max./min. alarm, empty pipe alarm, forward/backward signal, or counting pulses (can be configured using software)

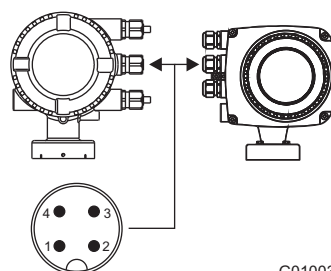


G00792-01

I = internal, E = external

Digital communication – PROFIBUS-PA

Connection via M12 plug (only in non-potentially explosive areas!)



G01003-01

Pin assignment (view from front showing pin insert and pins):

- PIN 1 = PA+
- PIN 2 = nc
- PIN 3 = PA-
- PIN 4 = Shield

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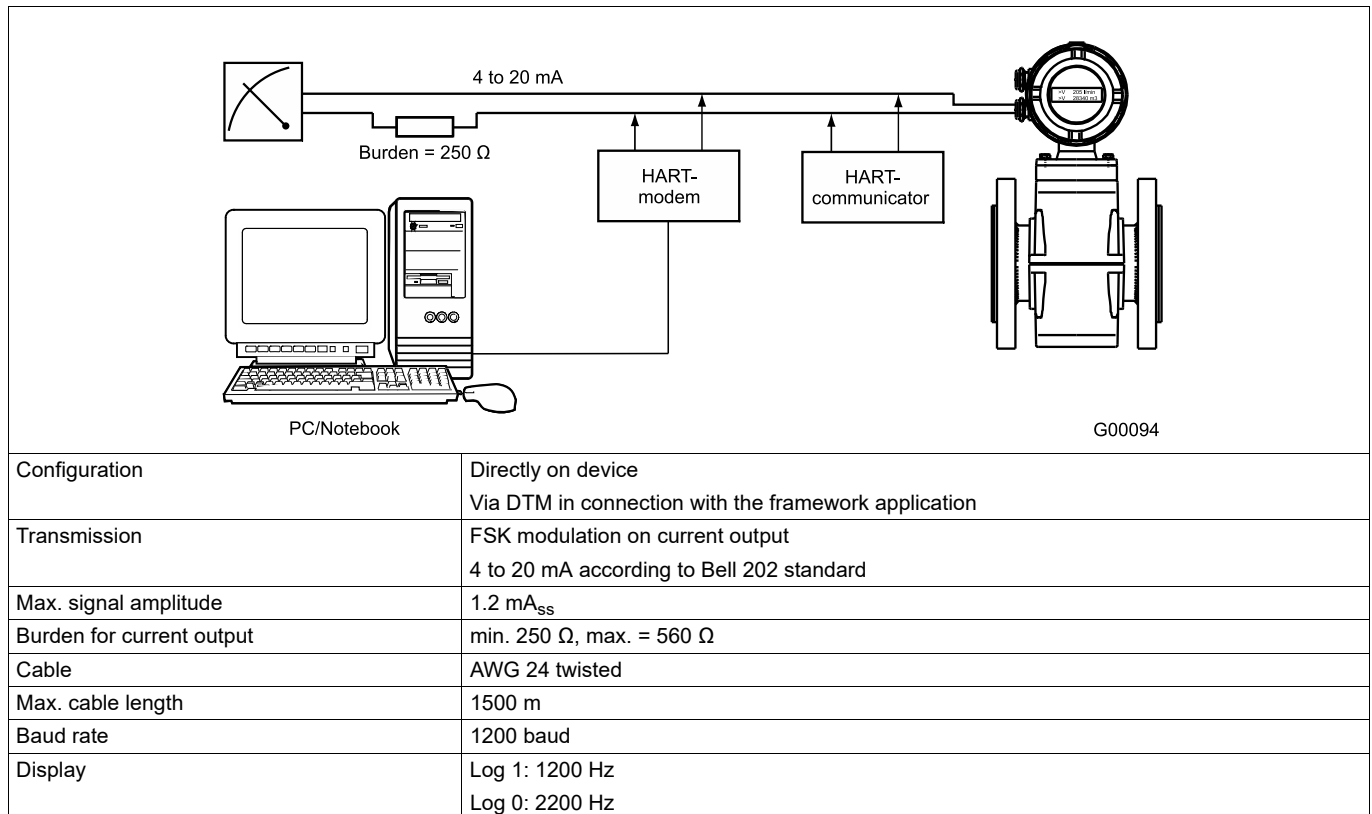
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Digital communication

HART protocol

The transmitter uses HART protocol (HART 5) for digital communication.



For further information ⇒ see the separate interface description.

System integration

The communication (configuration, parameterization) can be carried out in conjunction with the DTM (Device Type Manager) available for the device and the corresponding framework applications according to FDT 1.2.1.

The necessary device DTM is included on the CD and can be downloaded from www.jumo.de.

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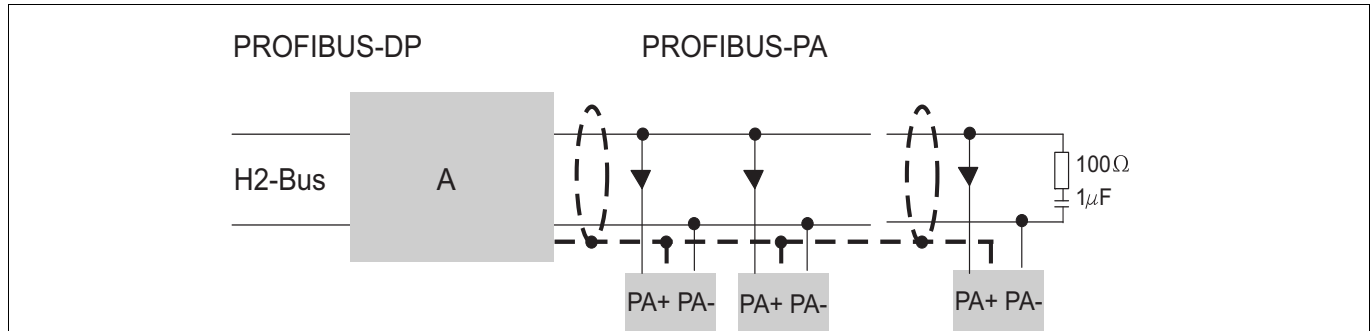
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PROFIBUS-PA protocol

The interface complies with profile 3.01 (standard PROFIBUS, EN 50170, DIN 19245 [PRO91]).



A = Segment coupler (including bus supply and termination)

PROFIBUS-PA ID no.:	0x3430
Alternative standard ID no.:	0x9700 or 0x9740
Configuration	Directly on device Via DTM in connection with the framework application
Transmission signal	According to IEC 61158-2
Cable	Shielded, twisted (Types A or B are preferred according to IEC 61158-2)
Bus topology	<ul style="list-style-type: none"> Tree and/or line structure Bus termination: passive on both ends of the main bus line (RC element $R = 100 \Omega$, $C = 1 \mu F$)
Voltage and current consumption	<ul style="list-style-type: none"> Average current consumption: 10 mA In case of a fault, the FDE (fault disconnection electronic) function integrated into the device ensures that the current consumption can rise to a maximum of 13 mA. The upper limit of the current is electronically limited. The voltage on the bus line must be in the range between DC 9 and 32 V.

For further information ⇒ see the separate interface description.

System integration

JUMO provides device GSD files for system integration.

The necessary device DTM is included on the CD and can be downloaded from www.jumo.de.

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Operation in potentially explosive areas zone 1, 21, 22

General information

The following models are approved for operation in potentially explosive areas according to ATEX/IECEx zone 1, 21, 22:

JUMO flowTRANS MAG S01 – compact design	JUMO flowTRANS MAG S01 – remote mount design	
406012/1-1	406012/2-1 – Sensor	406018/2-1 – Transmitter
Transmitter: dual-compartment housing Sensor: Aluminum housing 	Transmitter: - Sensor: Aluminum housing 	Transmitter: dual-compartment housing Sensor: - 
ATEX/IECEx Gas zone 1 Dust zone 21, 22	ATEX/IECEx Gas zone 1 Dust zone 21, 22	ATEX/IECEx Gas zone 1 Dust zone 21, 22



IMPORTANT (NOTE)!

For details about the ATEX/IECEx approvals ⇒ see chapter "Technical data", page 3



IMPORTANT (NOTE)!

The transmitter and sensor housing must be connected to the potential equalization PA before the protection conductor PE is connected. Before connecting the protection conductor PE, the operator must ensure that no potential differences can occur between the potential equalization PA and protection conductor PE.



IMPORTANT (NOTE)!

For the voltage supply, signal inputs, and signal outputs, only use cables with a specification of at least 70 °C (158 °F).

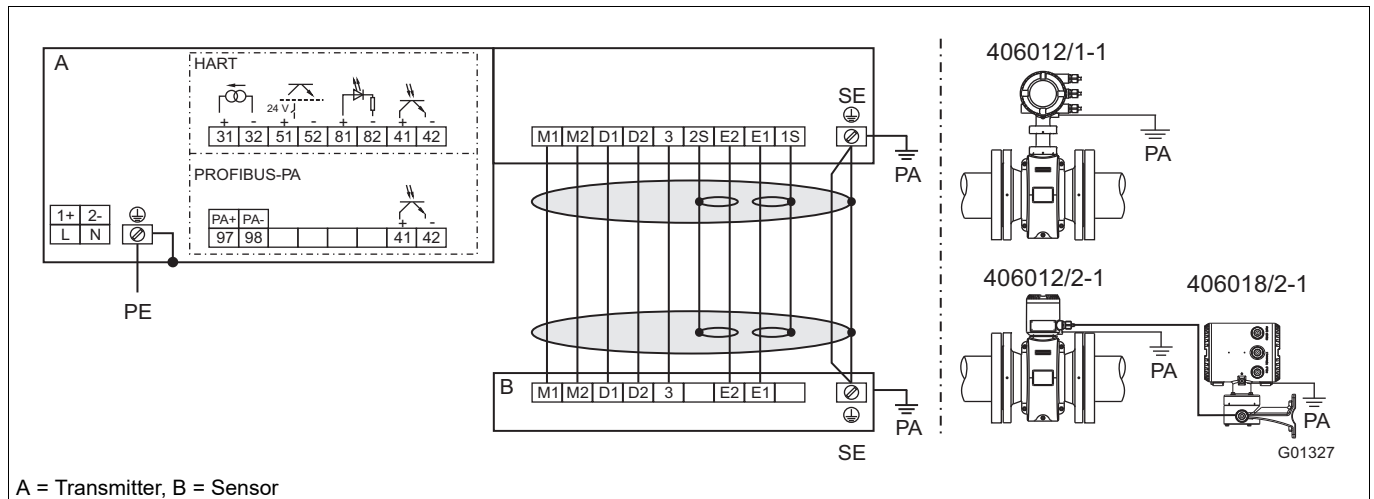
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Model 406012/1-1, 406012/2-1 with 406018/2-1 in zone 1 - HART protocol and PROFIBUS-PA



Voltage supply

Alternating voltage (AC)		Direct voltage (DC)	
Terminal	Function	Terminal	Function
L	Phase	1+	+
N	Neutral conductor	2-	-
PE	Protection conductor (PE)	PE	Protection conductor (PE)

Signal cable connection (for devices with remote mount design only)

Terminal	Function	Wire color
M1	Magnet coil	Brown
M2	Magnet coil	Red
D1	Data line	Orange
D2	Data line	Yellow
SE	Shielding	-
E1	Signal line	Violet
1S	Shield of E1	-
E2	Signal line	Blue
2S	Shield of E2	-
3	Measurement potential	Green

Input and output connection

Terminal	Function
31/32	Current/HART output - The current output is available in "active" or "passive" mode. The configuration must be specified when ordering the unit, since the configuration cannot be changed on-site.
97/98	PROFIBUS-PA (PA+ PA-) - According to IEC 61158-2
51/52	Digital output DO1 active/passive - Function can be configured using software on-site as "Pulse output" or "Binary output". The default setting is "Pulse output".
81/82	Digital input/contact input - Function can be configured using software on-site as "External output switch-off", "External totalizer reset", "External totalizer stop", or "Other". Only available in conjunction with "passive" current output.
41/42	Digital output DO2 passive - Function can be configured using software on-site as "Pulse output" or "Binary output". The default setting is "Binary output", flow direction signaling.
PA	Potential equalization (PA)

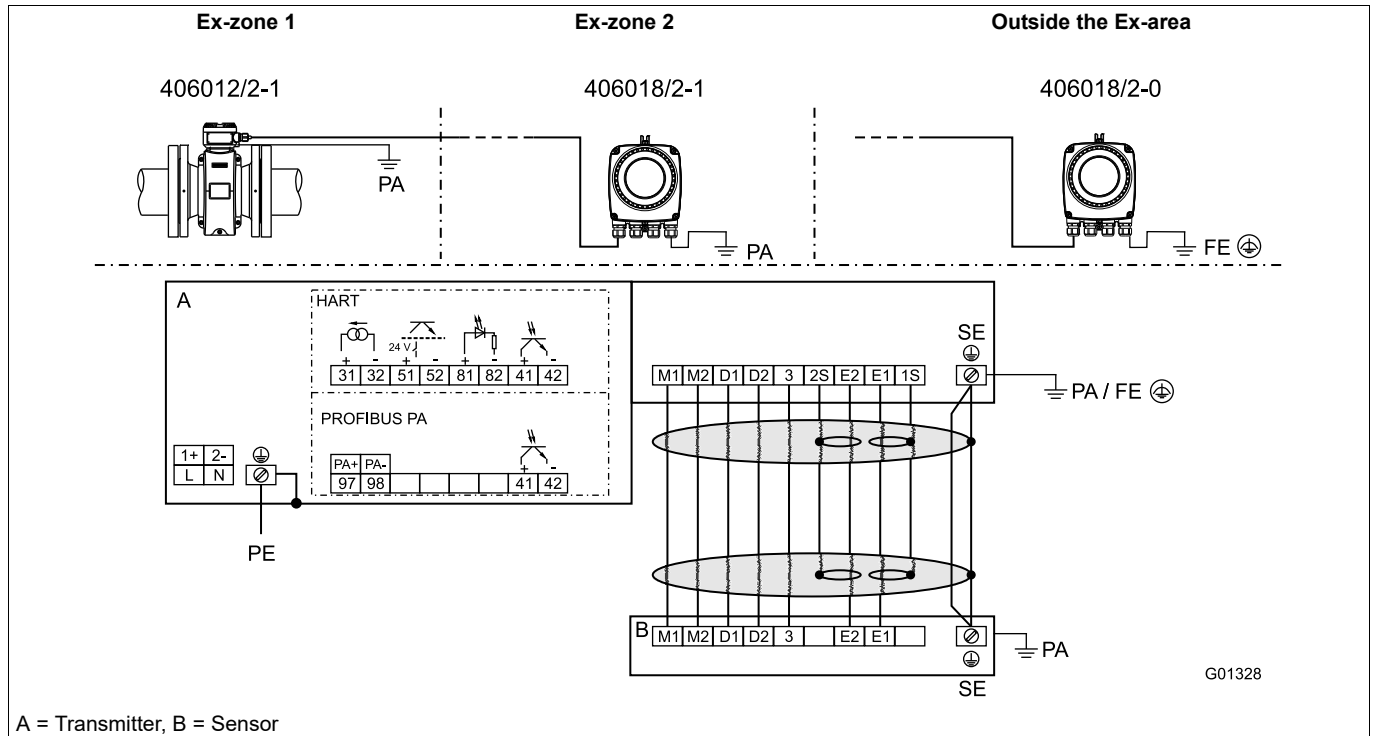
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Model 406012/2-1 in zone 1 with 406018/2-1 in zone 2 or with 406018/2-0 outside of the Ex-area – HART protocol and PROFIBUS-PA



A = Transmitter, B = Sensor

Voltage supply

Alternating voltage (AC)		Direct voltage (DC)	
Terminal	Function	Terminal	Function
L	Phase	1+	+
N	Neutral conductor	2-	-
PE	Protection conductor (PE)	PE	Protection conductor (PE)

Signal cable connection

Terminal	Function	Wire color
M1	Magnet coil	Brown
M2	Magnet coil	Red
D1	Data line	Orange
D2	Data line	Yellow
SE	Shielding	-
E1	Signal line	Violet
1S	Shield of E1	-
E2	Signal line	Blue
2S	Shield of E2	-
3	Measurement potential	Green



Input and output connection

Terminal	Function
31/32	Current/HART output - The current output is available in "active" or "passive" mode.
97/98	PROFIBUS-PA (PA+/PA-) - According to IEC 61158-2
51/52	Digital output DO1 active/passive - Function can be configured using software on-site as "Pulse output" or "Binary output". The default setting is "Pulse output".
81/82	Digital input/contact input - Function can be configured using software on-site as "External output switch-off", "External totalizer reset", "External totalizer stop" or "Other".
41/42	Digital output DO2 passive - Function can be configured using software on-site as "Pulse output" or "Binary output". The default setting is "Binary output", flow direction signaling.
PA	Potential equalization (PA)
FE	Functional ground (only for transmitters outside potentially explosive area)

Electrical data

Operation in zone 1 – devices with HART protocol

When operating in potentially explosive areas, observe the following electrical data for the transmitter signal inputs and outputs. For the current output version (active/passive), see the identification marking in the device's terminal box.



IMPORTANT (NOTE)!

Special connection conditions:

The output circuits are designed so that they can be connected to intrinsically safe and non-intrinsically safe electrical circuits. Intrinsically safe and non-intrinsically safe electrical circuits may not be combined. Potential equalization is required for intrinsically safe electrical circuits.

The rated voltage of the non-intrinsically safe electrical circuits is $U_M = 60 \text{ V}$.

If the rated voltage $U_M = 60 \text{ V}$ is not exceeded when non-intrinsically safe electrical circuits are connected, the intrinsic safety is maintained.

Model: 406012/1-1 or 406018/2-1 (dual-compartment housing)

Inputs and outputs	Operating data		Ex-data – ignition protection type Ex i, IS											
	U_N [V]	I_N [mA]	U_O [V]	U_I [V]	I_O [mA]	I_I [mA]	P_O [mW]	P_I [mW]	C_O [nF]	C_I [nF]	C_{OPA} [nF]	C_{IPA} [nF]	L_O [mH]	L_I [mH]
Current output active Terminal 31/32	30	30	20	60	100	425 ^a	500	2000 ^a	210	8.4	195	24	6	0.065
Current output passive Terminal 31/32	30	30		60		500 ^a		2000 ^a		8.4		24		170
Digital output DO2 passive Terminal 41/42	30	220		60		425 ^{ab} 500 ^{ac}		2000 ^a		3.6		3.6		170
Digital output DO1 passive Terminal 51/52	30	220		60		425 ^{ab} 500 ^{ac}		2000 ^a		3.6		3.6		170
Digital input DI^d passive Terminal 81/82	30	10		60		500 ^a		2000 ^a		3.6		3.6		170

^a Intrinsically safe single-channel or multichannel barriers (supply isolators) with resistance characteristic curve must be used.

^b For "active" current output.

^c For "passive" current output.

^d Only available in conjunction with passive current output.

All inputs and outputs are galvanically isolated from each other and from the voltage supply.



Operation in zone 1 – devices with PROFIBUS-PA

When operating in potentially explosive areas, observe the following electrical data for the transmitter signal inputs and outputs. For the (PROFI-BUS-PA) version, see the identification marking in the device's terminal box.



IMPORTANT (NOTE)!

For devices in zone 1, the bus termination must comply with the FISCO model (Fieldbus Intrinsically Safe COnccept) or the explosion protection regulations. For devices in zone 2, the bus termination must comply with the FNICO model (Fieldbus NonIncendive COnccept) or the explosion protection regulations.



IMPORTANT (NOTE)!

Special connection conditions:

The output circuits are designed so that they can be connected to intrinsically safe and non-intrinsically safe electrical circuits. Intrinsically safe and non-intrinsically safe electrical circuits may not be combined. Potential equalization is required for intrinsically safe electrical circuits.

The rated voltage of the non-intrinsically safe electrical circuits is $U_M = 60 \text{ V}$.

If the rated voltage $U_M = 60 \text{ V}$ is not exceeded when non-intrinsically safe electrical circuits are connected, the intrinsic safety is maintained.

Model: 406012/1-1, 406018/2-1 (dual-compartment housing)

The fieldbus and the digital output can be connected in zone 1 in three different variants.

Variante 1: Intrinsically safe fieldbus connection according to FISCO, intrinsically safe digital output connection

Signal inputs and outputs	Operating data		Ex-data – Ex i, IS, and FISCO					
	U_N [V]	I_N [mA]	U_i [V]	I_i [mA]	P_i [mW]	C_i [nF]	C_{iPA} [nF]	L_i [μH]
Digital output DO2 passive Terminal 41/42	30	220	60	200 ^a	5000 ^a	3.6	3.6	0.17
Fieldbus Terminal 97/98	32	30	17	380	5320	1	1	5

^a Single-channel or multichannel barriers (supply isolators) with resistance characteristic curve must be used.

Variante 2: Intrinsically safe fieldbus connection (not according to FISCO!), intrinsically safe digital output connection

Signal inputs and outputs	Operating data		Ex-data – Ex i, IS, and FISCO					
	U_N [V]	I_N [mA]	U_i [V]	I_i [mA]	P_i [mW]	C_i [nF]	C_{iPA} [nF]	L_i [μH]
Digital output DO2 passive Terminal 41/42	30	220	60	200 ^a	5000 ^a	3.6	3.6	0.17
Fieldbus Terminal 97/98	32	30	60	500	5000	1	1	5

^a Single-channel or multichannel barriers (supply isolators) with resistance characteristic curve must be used.

Variante 3: Fieldbus connection according to FNICO (zone 2), digital output connection (zone 2)

Signal inputs and outputs	Operating data		Ex-data – Ex n, NI, and FNICO					
	U_N [V]	I_N [mA]	U_i [V]	I_i [mA]	P_i [mW]	C_i [nF]	C_{iPA} [nF]	L_i [μH]
Digital output DO2 passive Terminal 41/42	30	220	-	-	-	-	-	-
Fieldbus Terminal 97/98	32	30	60	500 ^a	5000 ^a	1	1	5

^a Single-channel or multichannel barriers (supply isolators) with resistance characteristic curve must be used.

All inputs and outputs are galvanically isolated from each other and from the voltage supply.



Temperature data for operation in zone 1

Temperature data for operation in zone 1

Model designation	Surface temperature
406012/1-1	70 °C (158 °F)
406012/2-1	85 °C (185 °F)
406018/2-1 (dual-compartment housing)	70 °C (158 °F)

The surface temperature depends on the medium temperature.

With an increasing medium temperature > 70 °C (158 °F) or > 85 °C (185 °F), the surface temperature also increases to the level of the medium temperature.



IMPORTANT (NOTE)!

The maximum admissible medium temperature depends on the lining and flange material and is limited by the operating data in table 1 and the explosion-relevant technical data in tables 2 and 3.

Table 1: Medium temperature depending on the lining and flange material

Model 406012/1-1 and 406012/2-1

Materials		Medium temperature (operating data)	
Lining	Flange	Minimum	Maximum
Hard rubber	Steel	-10 °C (14 °F)	90 °C (194 °F)
Hard rubber	Stainless steel	-15 °C (5 °F)	90 °C (194 °F)
PTFE	Steel	-10 °C (14 °F)	130 °C (266 °F)
PTFE	Stainless steel	-25 °C (-13 °F)	130 °C (266 °F)

Table 2: Medium temperature (Ex-data) model 406012/1-1



IMPORTANT (NOTE)!

If the installation location for the device is classified as a potentially explosive area for gases and dust, the temperature data in the "Gas & dust" columns in the table must be taken into consideration.

If the installation location for the device is only classified as a potentially explosive area for gases, the temperature data in the "Gas" column in the table must be taken into consideration.

Nominal width	Temperature class	Ambient temperature											
		-20 °C to +40 °C				-20 °C to +50 °C				-20 °C to +60 °C			
		Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated	
		Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust
DN 10 to DN 100	T1	130 °C								90 °C	30 °C	80 °C	40 °C
	T2	130 °C								90 °C	30 °C	80 °C	40 °C
	T3	130 °C								90 °C	30 °C	80 °C	40 °C
	T4	120 °C								90 °C	30 °C	80 °C	40 °C
	T5	85 °C								70 °C	30 °C	80 °C	40 °C
	T6	70 °C								70 °C	30 °C	80 °C	40 °C
DN 125 to DN 300	T1	130 °C								90 °C	30 °C	70 °C	40 °C
	T2	130 °C								90 °C	30 °C	80 °C	40 °C
	T3	130 °C								90 °C	30 °C	80 °C	40 °C
	T4	125 °C								90 °C	30 °C	80 °C	40 °C
	T5	90 °C								90 °C	30 °C	80 °C	40 °C
	T6	75 °C								75 °C	30 °C	75 °C	40 °C

Not thermally insulated: the sensor is not surrounded by pipe insulating material.

Thermally insulated: the sensor is surrounded by pipe insulating material.



Table 3: Medium temperature (Ex-data) model 406012/2-1



IMPORTANT (NOTE)!

The standard version includes Ex-protection for gases and dust.

If the installation location for the device is classified as a potentially explosive area for gases and dust, the temperature data in the "Gas & dust" columns in the table must be taken into consideration.

If the installation location for the device is only classified as a potentially explosive area for gases, the temperature data in the "Gas" column in the table must be taken into consideration.

Nominal width	Temperature class	Ambient temperature											
		-20 °C to +40 °C				-20 °C to +50 °C				-20 °C to +60 °C			
		Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated	
		Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust
DN 10 to DN 100	T1	130 °C								110 °C	110 °C	110 °C	110 °C
	T2	130 °C								110 °C	110 °C	110 °C	110 °C
	T3	130 °C								110 °C	110 °C	110 °C	110 °C
	T4	120 °C								110 °C	110 °C	110 °C	110 °C
	T5	85 °C								85 °C	85 °C	85 °C	85 °C
	T6	70 °C								70 °C	70 °C	70 °C	70 °C
DN125 to DN300	T1	130 °C								110 °C	110 °C	110 °C	110 °C
	T2	130 °C								110 °C	110 °C	110 °C	110 °C
	T3	130 °C								110 °C	110 °C	110 °C	110 °C
	T4	125 °C								110 °C	110 °C	110 °C	110 °C
	T5	90 °C								90 °C	90 °C	90 °C	90 °C
	T6	75 °C								75 °C	75 °C	75 °C	75 °C

Not thermally insulated: the sensor is not surrounded by pipe insulating material.

Thermally insulated: the sensor is surrounded by pipe insulating material.

Special features of device version for operation in Ex-zone 1

Configuring the current output

For devices designed for use in Ex-zone 1, the current output configuration cannot be subsequently changed.

The desired configuration for the current output (active/passive) must be specified when the order is placed.

For the current output version (active/passive), see the identification marking in the device's terminal box.

Configuration of the digital outputs

For the device version for operation in Ex-zone 1, the digital outputs DO1 (51/52) and DO2 (41/42) can be configured for a connection to a NAMUR switching amplifier. In the default setting, the outputs are configured with the standard wiring (non-NAMUR).

Devices with PROFIBUS-PA only feature the digital output DO2 (41/42).



IMPORTANT (NOTE)!

This does not affect the output ignition protection type. The devices connected to these outputs must comply with the applicable regulations for explosion protection.

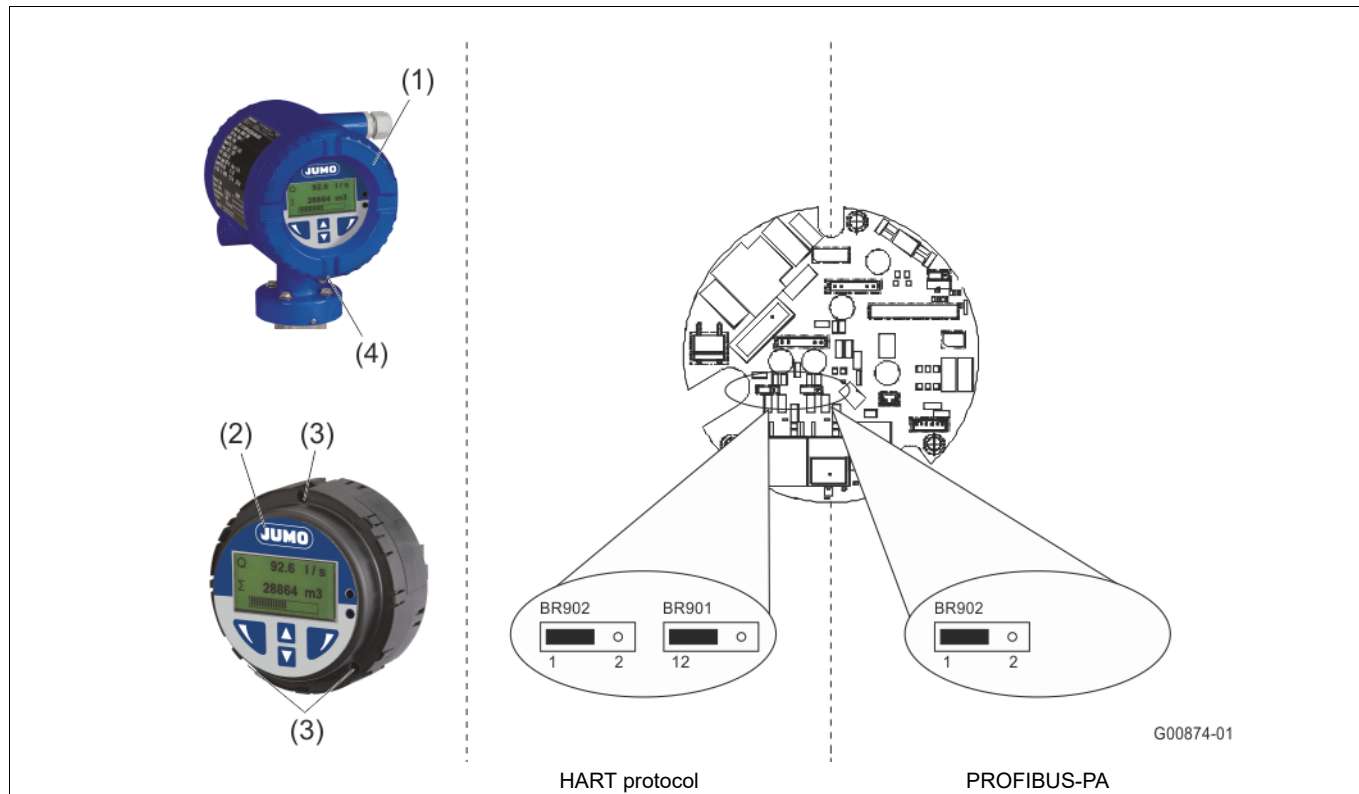
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The jumpers for configuration are located on the backplane in the transmitter housing.



BR902 for digital output DO1	BR901 for digital output DO2
BR902 in position 1: standard (non-NAMUR)	BR902 in position 1: standard (non-NAMUR)
BR902 in position 2: NAMUR	BR902 in position 2: NAMUR

Configure the digital outputs as described below:

1. Switch off the voltage supply and wait at least 20 minutes before performing the next step.
2. Screw in the lid lock (4) and open the housing lid (1).
3. Loosen the screws (3) and pull out the transmitter plug-in module (2).
4. Insert the jumpers at the required positions.
5. Re-insert the transmitter plug-in module (2) and retighten the screws (3).
6. Close the housing lid (1) and secure the lid by unscrewing the screw (4).

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Operation in potentially explosive areas zone 2, 21, 22

General information

The following models are approved for operation in potentially explosive areas according to ATEX/IECEX zone 2, 21, 22:

JUMO flowTRANS MAG S01 – compact design	JUMO flowTRANS MAG S01 – remote mount design	
406012/1-1	406012/2-1 – Sensor	406018/2-1 – Transmitter
Transmitter: dual-compartment housing Sensor: Aluminum housing 	Transmitter: - Sensor: Aluminum housing 	Transmitter: dual-compartment housing Sensor: - 
ATEX/IECEX Gas zone 2 Dust zone 21, 22	ATEX/IECEX Gas zone 2 Dust zone 21, 22	ATEX/IECEX Gas zone 2 Dust zone 21, 22



IMPORTANT (NOTE)!

For details about the ATEX/IECEX approvals ⇒ see chapter "Technical data", page 3



IMPORTANT (NOTE)!

For the voltage supply, signal inputs, and signal outputs, only use cables with a specification of at least 70 °C (158 °F).

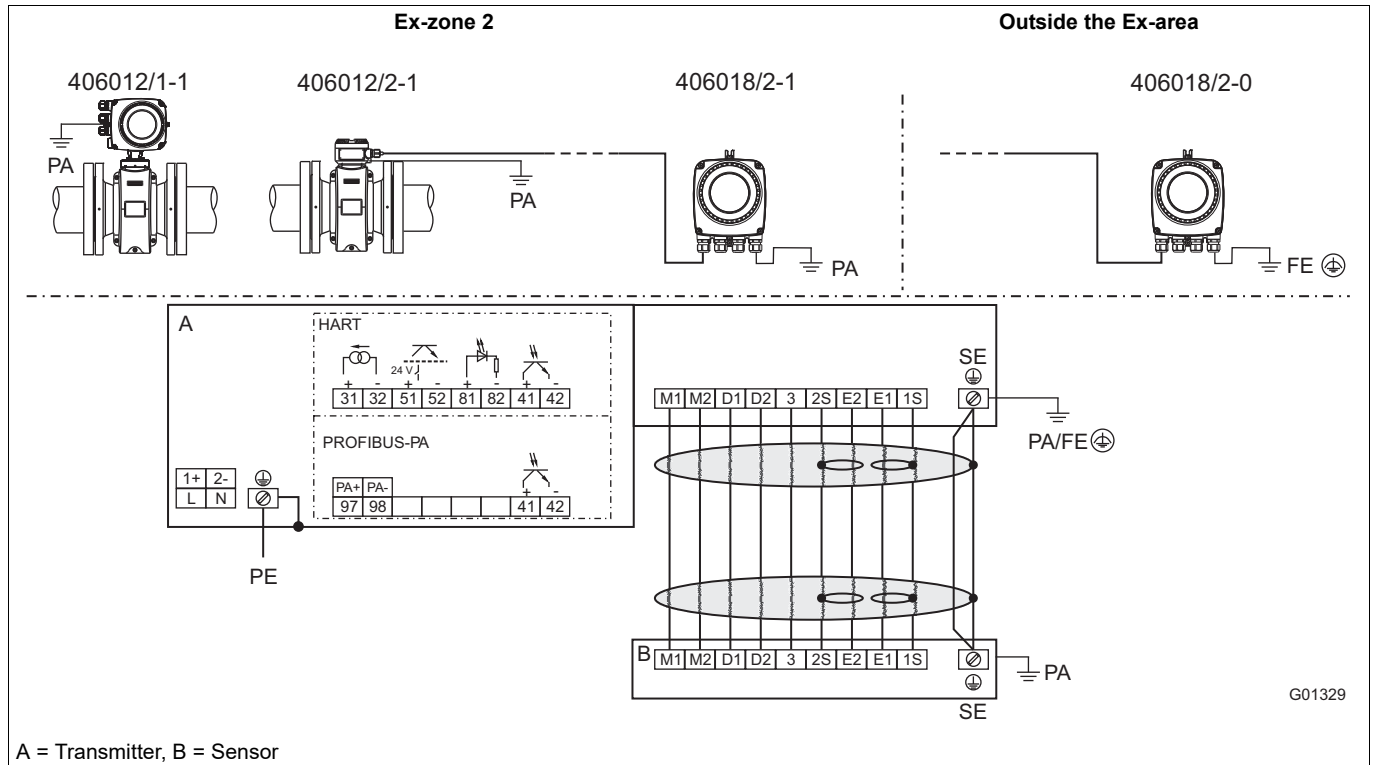
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Model 406012/1-1 and 406012/2-1 with 406018/2-1 in zone 2 and 406018/2-0 outside of the Ex-area – HART protocol and PROFIBUS-PA



Voltage supply

Alternating voltage (AC)		Direct voltage (DC)	
Terminal	Function	Terminal	Function
L	Phase	1+	+
N	Neutral conductor	2-	-
PE	Protection conductor (PE)	PE	Protection conductor (PE)

Signal cable connection (for devices with remote mount design only)

Terminal	Function	Wire color
M1	Magnet coil	Brown
M2	Magnet coil	Red
D1	Data line	Orange
D2	Data line	Yellow
SE	Shielding	-
E1	Signal line	Violet
1S	Shield of E1	-
E2	Signal line	Blue
2S	Shield of E2	-
3	Measurement potential	Green

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Input and output connection

Terminal	Function
31/32	Current/HART output - The current output is available in "active" or "passive" mode.
97/98	PROFIBUS-PA (PA+/PA-) - According to IEC 61158-2
51/52	Digital output DO1 active/passive - Function can be configured using software on-site as "Pulse output" or "Binary output". The default setting is "Pulse output".
81/82	Digital input/contact input - Function can be configured using software on-site as "External output switch-off", "External totalizer reset", "External totalizer stop", or "Other".
41/42	Digital output DO2 passive - Function can be configured using software on-site as "Pulse output" or "Binary output". The default setting is "Binary output", flow direction signaling.
PA	Potential equalization (PA)
FE	Functional ground (only for transmitters outside potentially explosive area)

Electrical data

Operation in zone 2 – devices with HART protocol

When operating in potentially explosive areas, observe the following electrical data for the transmitter signal inputs and outputs. For the current output version (active/passive), see the identification marking in the device's terminal box.

Model: 406012/1-1 and 406018/2-1 (single-compartment housing)

	Operating data		Ex-data – Ex n/NI	
Signal inputs and outputs	U_i [V]	I_i [mA]	U_i [V]	I_i [mA]
Current output active/passive				
Terminal 31/32	30	30	30	30
Digital output DO1 active/passive				
Terminal 51/52	30	220	30	220
Digital output DO2 passive				
Terminal 41/42	30	220	30	220
Digital input DI				
Terminal 81/82	30	10	30	10

All inputs and outputs are galvanically isolated from each other and from the voltage supply.

Operation in zone 2 – devices with PROFIBUS-PA

When operating in potentially explosive areas, observe the following electrical data for the transmitter signal inputs and outputs. For the (PROFIBUS-PA) version, see the identification marking in the device's terminal box.



IMPORTANT (NOTE)!

For devices in zone 2, the bus termination must comply with the FNICO model (Fieldbus NonIncendive COnccept) or the explosion protection regulations.

Model: 406012/1-1 and 406018/2-1 (single-compartment housing)

	Operating data		Ex-data – Ex n, NI, and FNICO					
Signal inputs and outputs	U_N [V]	I_N [mA]	U_i [V]	I_i [mA]	P_i [mW]	C_i [nF]	C_{iPA} [nF]	L_i [μH]
Digital output DO2 passive								
Terminal 41/42	30	220	-		-	-	-	-
Fieldbus								
Terminal 97/98	32	30	32	500 ^a	7000 ^a	1	1	5

^a Single-channel or multichannel barriers (supply isolators) with resistance characteristic curve must be used.



Temperature data for operation in zone 2

Temperature data for operation in zone 2

Model designation	Surface temperature
406012/1-1	70 °C (158 °F)
406012/2-1	85 °C (185 °F)
406018/2-1 (single-compartment housing)	70 °C (158 °F)

The surface temperature depends on the medium temperature.

With an increasing medium temperature > 70 °C (158 °F) or > 85 °C (185 °F), the surface temperature also increases to the level of the medium temperature.

Table 1: Medium temperature depending on the lining and flange material

Model 406012/1-1, 406012/2-1

Materials		Medium temperature (operating data)	
Lining	Flange	Minimum	Maximum
Hard rubber	Steel	-10 °C (14 °F)	90 °C (194 °F)
Hard rubber	Stainless steel	-15 °C (5 °F)	90 °C (194 °F)
PTFE	Steel	-10 °C (14 °F)	130 °C (266 °F)
PTFE	Stainless steel	-25 °C (-13 °F)	130 °C (266 °F)

Table 2: Medium temperature (Ex-data) model 406012/1-1



IMPORTANT (NOTE)!

If the installation location for the device is classified as a potentially explosive area for gases and dust, the temperature data in the "Gas & dust" columns in the table must be taken into consideration.

If the installation location for the device is only classified as a potentially explosive area for gases, the temperature data in the "Gas" column in the table must be taken into consideration.

Nominal width	Temperature class	Ambient temperature											
		-20 °C to +40 °C				-20 °C to +50 °C				-20 °C to +60 °C			
		Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated	
		Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust
DN 10 to DN 300	T1	130 °C	130 °C	-	-	130 °C	100 °C	-	-	80 °C	40 °C	-	-
	T2	130 °C	130 °C	-	-	130 °C	100 °C	-	-	80 °C	40 °C	-	-
	T3	130 °C	130 °C	-	-	130 °C	100 °C	-	-	80 °C	40 °C	-	-
	T4	130 °C	130 °C	-	-	130 °C	100 °C	-	-	80 °C	40 °C	-	-

Not thermally insulated: the sensor is not surrounded by pipe insulating material.

Thermally insulated: the sensor is surrounded by pipe insulating material.

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Table 3: Medium temperature (Ex-data) model 406012/2-1



IMPORTANT (NOTE)!

If the installation location for the device is classified as a potentially explosive area for gases and dust, the temperature data in the "Gas & dust" columns in the table must be taken into consideration.

If the installation location for the device is only classified as a potentially explosive area for gases, the temperature data in the "Gas" column in the table must be taken into consideration.

Nominal width	Temperature class	Ambient temperature											
		-20 °C to +40 °C				-20 °C to +50 °C				-20 °C to +60 °C			
		Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated		Not thermally insulated		Thermally insulated	
		Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust	Gas	Gas & dust
DN 10 to DN 300	T1	130 °C	130 °C	-	-	130 °C	100 °C	-	-	110 °C	110 °C	-	-
	T2	130 °C	130 °C	-	-	130 °C	100 °C	-	-	110 °C	110 °C	-	-
	T3	130 °C	130 °C	-	-	130 °C	100 °C	-	-	110 °C	110 °C	-	-
	T4	130 °C	130 °C	-	-	130 °C	100 °C	-	-	110 °C	110 °C	-	-
	T5	95 °C	95 °C	-	-	95 °C	95 °C	-	-	95 °C	95 °C	-	-
	T6	80 °C	80 °C	-	-	80 °C	80 °C	-	-	80 °C	80 °C	-	-

Not thermally insulated: the sensor is not surrounded by pipe insulating material.

Thermally insulated: the sensor is surrounded by pipe insulating material.

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Ex-relevant technical data for operation in areas with combustible dust



IMPORTANT (NOTE)!

The dust explosion protection is guaranteed in part by the housing. The housing may not be modified in any way (e.g. by removing or omitting parts).

Notes on using the device in areas with combustible dust

The device with the transmitter in a single-compartment housing is approved for use in potentially explosive areas (gas and dust).

The Ex identification marking is provided on the nameplate.

Maximum admissible surface temperature



IMPORTANT (NOTE)!

The maximum surface temperature is applicable to dust layers of up to 5 mm (0.20 inches) in thickness. This is to be used to determine the minimum admissible ignition and glow temperature for the dust atmosphere according to IEC 61241ff.

The maximum admissible surface temperature must be reduced for thicker dust layers. The dust may be electrically conductive or non-conductive. IEC 61241ff. must be observed.

Model designation	Surface temperature
406012/1-1	70 °C (158 °F) to T _{Medium}
406012/2-1	85 °C (185 °F) to T _{Medium}
406018/2-1 (single-compartment/dual-compartment housing)	70 °C (158 °F)

Minimum signal cable length



IMPORTANT (NOTE)!

The signal cable in potentially explosive areas may not be shorter than 5 m (16.40 ft).

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Order details

Compact or remote mount design (sensor with transmitter)

				(1)	Type
406012					JUMO flowTRANS MAG S01
				(2)	Design
				1	Compact
				2	Remote mount ^{a, b}
				(3)	Explosion protection
				0	Without Ex-protection
				1	With Ex-protection
				(4)	Nominal width
X	X	X	X	0010	DN 10
X	X	X	X	0015	DN 15
X	X	X	X	0020	DN 20
X	X	X	X	0025	DN 25
X	X	X	X	0032	DN 32
X	X	X	X	0040	DN 40
X	X	X	X	0050	DN 50
X	X	X	X	0065	DN 65
X	X	X	X	0080	DN 80
X	X	X	X	0100	DN 100
X	X	X	X	0125	DN 125
X	X	X	X	0150	DN 150
X	X	X	X	0200	DN 200
X	X	X	X	0250	DN 250
X	X	X	X	0300	DN 300
				(5)	Lining material
X	X	X	X	01	PTFE
X	X	X	X	06	Hard rubber
				(6)	Electrode version
X	X	X	X	1	Standard
X	X	X	X	5	Bullet-nose
X	X	X	X	9	Others upon request
				(7)	Measuring electrode material
X	X	X	X	02	NiMo C-4 (2.4610) – Hastelloy
X	X	X	X	03	Titanium
X	X	X	X	04	Tantalum
X	X	X	X	06	Platinum-iridium
X	X	X	X	07	Stainless steel 1.4571 (316 Ti)
X	X	X	X	10	Others upon request
				(8)	Grounding accessories
X	X	X	X	1	Standard
X	X	X	X	2	Grounding electrodes ⇨ see (7) measuring electrode material

^a If only the sensor model 406012/2-0 or 406012/2-1 is needed, the order code "Remote mount design (sensor) ", page 51 should be used to generate the correct order details.

^b If only the transmitter model 406018/2-0 or 406018/2-1 is needed, the order code "Remote mount design (transmitter) ", page 54 should be used to generate the correct order details.

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Compact or remote mount design (sensor with transmitter) – continued

					(9)	Process connection
X	X	X	X	11		Flange DIN PN 10
X	X	X	X	12		Flange DIN PN 16
X	X	X	X	14		Flange DIN PN 40
X	X	X	X	20		Flange ASME CL150
X	X	X	X	21		Flange ASME CL300
					(10)	Process connection material
X	X	X	X	01		Steel
X	X	X	X	02		Stainless steel ^a
					(11)	Certificates
X	X	X	X	1		Measuring pipe with PED approval
X	X	X	X	3		Inspection certificate 3.1 according to EN 10204
X	X	X	X	4		Pressure test according to AD2000
X	X	X	X	5		Material certification 3.1 according to EN 10204 and pressure test according to AD2000
					(12)	Calibration
X	X	X	X	1		Standard accuracy ^b
X	X	X	X	2		Enhanced accuracy ^c
					(13)	Ambient temperature for sensor
X	X	X	X	1		Standard transducer design/-20 to +60 °C (-4 to +140 °F) ^d
					(14)	Nameplate
X	X	X	X	1		Adhesive label
X	X	X	X	2		Stainless steel
X	X	X	X	9		Others upon request
					(15)	Signal cable length^e
X	X	X	X	0		None
	X	X	X	1		5 m standard cable
	X	X	X	2		10 m standard cable
	X	X	X	3		20 m standard cable
	X	X	X	4		30 m standard cable
	X	X	X	5		50 m standard cable
	X	X	X	6		80 m standard cable
	X	X	X	7		100 m standard cable
	X	X	X	8		150 m standard cable
	X	X	X	9		Others upon request
					(16)	Ex-zone
X	X	X		0		None
X	X		X	1		ATEX/IECEx zone 1 ^f
X	X		X	2		ATEX/IECEx zone 2/21

^a ⇒ See "Materials – sensor housing made of aluminum (shell housing) ", page 12

^b Standard accuracy (0.4 % of the measured value) includes 2 calibration points. If more than 2 calibration points are required, specify 3 or 5 points under "Number of test points".

^c Enhanced accuracy (0.2 % of the measured value) includes 3 calibration points. If more than 3 calibration points are required, specify 5 points under "Number of test points". Available for DN10 (3/8") to 300 (12").

^d Maximum measurement medium temperature for sensor in standard design:
 130 °C with PTFE, 90 °C with hard rubber

^e For the model 406018/2-1 in the version for Ex-zone 1, 10 m (32.81 ft) cables are permanently connected to the transmitter. For maximum signal cable lengths ⇒ see "Signal cable length and preamplifier ", page 11.

^f Only in conjunction with dual-compartment housing.

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Compact or remote mount design (sensor with transmitter) – continued

					(17)	Protection type for transmitter/sensor
X	X	X	X	1		IP67 (NEMA 4X) ^a /IP67 (NEMA 4X)
	X	X	X	2		IP67 (NEMA 4X) ^a /IP68 ^b
					(18)	Cable fitting
X	X	X	X	1		M20 × 1.5
X	X	X	X	2		1/2" NPT
					(19)	Voltage supply
X	X	X	X	1		AC 100 to 230 V, 50 Hz
X	X	X	X	2		AC/DC 24 V, 50 Hz
					(20)	Signal inputs and outputs
X	X	X		0		None
X	X	X	X	1		HART and 20 mA passive and pulse and contact input/output ^c
X	X	X	X	2		HART and 20 mA active and pulse and contact input/output ^d
X	X		X	3		HART and 20 mA active and pulse and contact output ^e
X	X	X	X	4		PROFIBUS-PA and contact output
					(21)	Default settings/diagnosis
X	X	X	X	1		Parameters: default settings; standard diagnosis activated
					(22)	Accessories
X	X	X	X	000		None
	X	X	X	001		With preamplifier, installed in sensor housing ^f
					(23)	Plug connector
X		X		002		Fieldbus M12 × 1 ^g
					(24)	Transmitter housing version
X	X	X	X	003		Single-compartment housing ^h
X	X		X	004		Dual-compartment housing ⁱ
					(25)	Supply frequency
X	X	X	X	012		50 Hz
					(26)	Further options
X		X	X	014		With Gore-Tex membrane ^j
					(27)	Number of test points
X	X	X	X	025		3 points
X	X	X	X	026		5 points
					(28)	Language of documentation
X	X	X	X	029		German
X	X	X	X	030		English
X	X	X	X	036		French
X	X	X	X	037		Spanish

^a Protection type for transmitter = IP67 (NEMA 4X) for single and dual-compartment housing.

^b Only in conjunction with external transmitter.

^c Available for version Ex-zone 2 or Ex-zone 1.

^d Available for version Ex-zone 2.

^e Available for version Ex-zone 1.

^f Preamplifier required for signal cable lengths > 50 m (160 ft). Preamplifier is not available for zone 1.

^g Only available for PROFIBUS-PA.

^h Not available for version Ex-zone 1.

ⁱ Only available for version Ex-zone 1.

^j Not available for version Ex-zone 1.

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	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
Order code	406012	/		-		-		-	
Order example	406012	/	X	-	X	-	XXXX	-	XX
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
					1				
	XX	-	XX	-	X	-	X	-	X
	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)
	X	-	X	-	X	-	X	-	X
	(28)								
	X	-	X	-	X	-	X	-	X

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Remote mount design (sensor)

		(1)	Type
		406012	JUMO flowTRANS MAG S01 – sensor
		(2)	Design
		2	Remote mount ^{a, b}
		(3)	Explosion protection
		0	Without Ex-protection
		1	With Ex-protection
		(4)	Nominal width
X	X	0010	DN 10
X	X	0015	DN 15
X	X	0020	DN 20
X	X	0025	DN 25
X	X	0032	DN 32
X	X	0040	DN 40
X	X	0050	DN 50
X	X	0065	DN 65
X	X	0080	DN 80
X	X	0100	DN 100
X	X	0125	DN 125
X	X	0150	DN 150
X	X	0200	DN 200
X	X	0250	DN 250
X	X	0300	DN 300
		(5)	Lining material
X	X	01	PTFE
X	X	06	Hard rubber
		(6)	Electrode version
X	X	1	Standard
X	X	5	Bullet-nose
X	X	9	Others upon request
		(7)	Measuring electrode material
X	X	02	NiMo C-4 (2.4610) – Hastelloy
X	X	03	Titanium
X	X	04	Tantalum
X	X	06	Platinum-iridium
X	X	07	Stainless steel 1.4571 (316 Ti)
X	X	10	Others upon request
		(8)	Grounding accessories
X	X	1	Standard
X	X	2	Grounding electrodes ⇨ see (7) measuring electrode material

^a If the transmitter model 406018/2-0 or 406018/2-1 is also required for the sensor model 406012/2-0 or 406012/2-1, the order code "Compact or remote mount design (sensor with transmitter)", page 47 should be used to generate the correct order details.

^b If only the transmitter model 406018/2-0 or 406018/2-1 is needed, the order code "Remote mount design (transmitter)", page 54 should be used to generate the correct order details.

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Remote mount design (sensor) – continued

			(9)	Process connection
X	X	11		Flange DIN PN 10
X	X	12		Flange DIN PN 16
X	X	14		Flange DIN PN 40
X	X	20		Flange ASME CL150
X	X	21		Flange ASME CL300
			(10)	Process connection material
X	X	01		Steel
X	X	02		Stainless steel ^a
			(11)	Certificates
X	X	1		Measuring pipe with PED approval
X	X	3		Inspection certificate 3.1 according to EN 10204
X	X	4		Pressure test according to AD2000
X	X	5		Material certification 3.1 according to EN 10204 and pressure test according to AD2000
			(12)	Calibration
X	X	1		Standard accuracy ^b
X	X	2		Enhanced accuracy ^c
			(13)	Ambient temperature for sensor
X	X	1		Standard transducer design/-20 to +60 °C (-4 to +140 °F) ^d
			(14)	Nameplate
X	X	1		Adhesive label
X	X	2		Stainless steel
X	X	9		Others upon request
			(15)	Signal cable length^e
X	X	0		None
X	X	1		5 m standard cable
X	X	2		10 m standard cable
X	X	3		20 m standard cable
X	X	4		30 m standard cable
X	X	5		50 m standard cable
X	X	6		80 m standard cable
X	X	7		100 m standard cable
X	X	8		150 m standard cable
X	X	9		Others upon request
			(16)	Ex-zone
X		0		None
	X	1		ATEX/IECEx zone 1 ^f
	X	2		ATEX/IECEx zone 2/21
			(17)	Protection type for sensor
X	X	1		IP67 (NEMA 4X)
X	X	2		IP68 ^g

^a ⇒ See "Materials – sensor housing made of aluminum (shell housing) ", page 12

^b Standard accuracy (0.4 % of the measured value) includes 2 calibration points. If more than 2 calibration points are required, specify 3 or 5 points under "Number of test points".

^c Enhanced accuracy (0.2 % of the measured value) includes 3 calibration points. If more than 3 calibration points are required, specify 5 points under "Number of test points". Available for DN10 (3/8") to 300 (12").

^d Maximum measurement medium temperature for sensor in standard design:
 130 °C with PTFE, 90 °C with hard rubber.

^e For the model 406018/2-1 in the version for Ex-zone 1, 10 m (32.81 ft) cables are permanently connected to the transmitter. For maximum signal cable lengths ⇒ see "Signal cable length and preamplifier ", page 11.

^f Only in conjunction with dual-compartment housing.

^g Only in conjunction with external transmitter.

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Remote mount design (sensor) – continued

			(18)	Cable fitting
X	X	1		M20 × 1.5
X	X	2		1/2" NPT
			(19)	Voltage supply
X	X	0		None
			(20)	Signal inputs and outputs
X	X	0		None
			(21)	Default settings/diagnosis
X	X	0		None
X	X	1		Parameters: default settings; standard diagnosis activated
			(22)	Accessories
X	X	000		None
X	X	001		With preamplifier, installed in sensor housing ^a
			(23)	Supply frequency
X	X	012		50 Hz
			(24)	Number of test points
X	X	025		3 points
X	X	026		5 points
			(25)	Language of documentation
X	X	029		German
X	X	030		English
X	X	036		French
X	X	037		Spanish

^a Preamplifier required for signal cable lengths > 50 m (160 ft). Preamplifier is not available for zone 1.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
Order code	406012	/		-		-		-	
Order example	406012	/	X	-	X	-	XXXX	-	XX
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
					1				
	XX	-	XX	-	X	-	X	-	X
	(19)	(20)	(21)	(22)	(23)	(24)	(25)		
	0	-	0	-	X	/	XXX	-	XXX

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Remote mount design (transmitter)

		(1)	Type
		406018	JUMO flowTRANS MAG 01 – transmitter
		(2)	Design
		2	Remote mount ^{a, b}
		(3)	Explosion protection
		0	Without Ex-protection
		1	With Ex-protection
		(4)	Ambient temperature for sensor
X	X	1	Standard transducer design/-20 to +60 °C (-4 to +140 °F)
		(5)	Nameplate
X	X	1	Adhesive label
X	X	2	Stainless steel
X	X	9	Others upon request
		(6)	Signal cable length^c
X	X	0	None
		(7)	Ex-zone
X		0	None
	X	1	ATEX/IECEEx zone 1 ^d
	X	2	ATEX/IECEEx zone 2/21
		(8)	Protection type for transmitter
X	X	1	IP67 (NEMA 4X) ^e
		(9)	Cable fitting
X	X	1	M20 × 1.5
X	X	2	1/2" NPT
		(10)	Voltage supply
X	X	1	AC 100 to 230 V, 50 Hz
X	X	2	AC/DC 24 V, 50 Hz
		(11)	Signal inputs and outputs
X	X	1	HART and 20 mA passive and pulse and contact input/output ^f
X	X	2	HART and 20 mA active and pulse and contact input/output ^g
	X	3	HART and 20 mA active and pulse and contact output ^h
X	X	4	PROFIBUS-PA and contact output
		(12)	Default settings/diagnosisⁱ
X	X	0	None/standard diagnostics functions
X	X	1	Parameters: default settings; standard diagnosis activated

^a If the sensor model 406012/2-0 or 406012/2-1 is also required for the transmitter model 406018/2-0 or 406018/2-1, the order code "Compact or remote mount design (sensor with transmitter)", page 47 should be used to generate the correct order details.

^b If only the sensor model 406012/2-0 or 406012/2-1 is needed, the order code "Remote mount design (sensor)", page 51 should be used to generate the correct order details.

^c For the model 406018/2-1 in the version for Ex-zone 1, 10 m (32.81 ft) cables are permanently connected to the transmitter. For maximum signal cable lengths ⇒ see "Signal cable length and preamplifier", page 11

^d Only in conjunction with dual-compartment housing.

^e Protection type for transmitter = IP67 (NEMA 4X) for single and dual-compartment housing.

^f Available for version Ex-zone 2 or Ex-zone 1 or without Ex-protection.

^g Available for version Ex-zone 2 or without Ex-protection.

^h Available for version Ex-zone 1.

ⁱ If the transmitter (model 406018/2-0, 406018/2-1) is ordered as a spare part or without sensor, "None/standard diagnostics functions" should be selected.

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Remote mount design (transmitter) – continued

			(13)	Plug connector
X		002		Fieldbus M12 × 1 ^a
			(14)	Transmitter housing versions
X	X	000		none
X	X	003		Single-compartment housing
	X	004		Dual-compartment housing ^b
			(15)	Further options
X	X	014		With Gore-Tex membrane ^c
			(16)	Language of documentation
X	X	029		German
X	X	030		English
X	X	036		French
X	X	037		Spanish

^a Only available for PROFIBUS-PA.

^b Only available for version Ex-zone 1.

^c Not available for version Ex-zone 1.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	
Order code	406018	/	2	-	X	-	1	-	
Order example	406018	/	2	-	X	-	1	-	
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	
	X	-	X	-	X	-	X	-	
	X	-	X	-	X	-	X	-	

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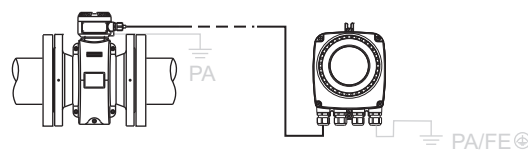
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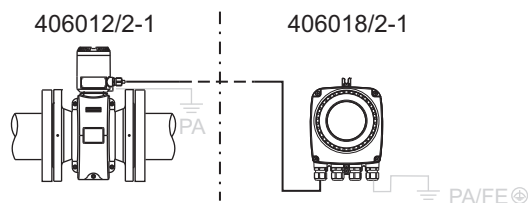
Accessories

Available signal cable lengths

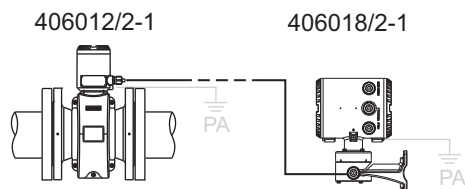
Signal cable length ^a	Part no.	Ex-zone 2 or outside of Ex-area	
5 m (16.4 ft)	00648906 (scope of delivery)	406012/2-0	406018/2-0
10 m (32.8 ft)	00648907	406012/2-1	406018/2-1
20 m (65.6 ft)	00648909		
30 m (98.4 ft)	00648910		
50 m (164.0 ft)	00648912		
80 m (262.5 ft)	00648913		
100 m (328 ft)	Upon request		
150 m (492 ft)	Upon request		



Signal cable length	Part no.	Ex-zone 1	Ex-zone 2 or outside of Ex-area
5 m (16.4 ft)	00648906 (scope of delivery)		
10 m (32.8 ft)	00648907		
20 m (65.6 ft)	00648909		
30 m (98.4 ft)	00648910		
50 m (164.0 ft)	00648912		



Signal cable length	Part no.	Ex-zone 1
5 m (16.4 ft)	00648906	
10 m (164 ft)	00648907 (permanently installed)	



^a At a minimum conductivity for the measurement medium of $\geq 5 \mu\text{S/cm}$, a preamplifier is required for cable lengths $> 50 \text{ m}$ (164 ft).



IMPORTANT (NOTE)!

Minimum signal cable length:

In potentially explosive areas with combustible dust, the signal cable must not be shorter than 5 m (16.40 ft).

Cable conduit sealing

Designation	Part no.	
Mounting set for sealing the cable conduit	00649012	



G01312

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Grounding plates

Installation in plastic lines or pipelines with insulated lining requires additional grounding via grounding plates (1). In this case it is recommended that one grounding plate is fitted in front of the device and one is fitted behind.

Designation	Part no.	
Grounding plate ^a (1)	-	

^a Available upon request for all available process connections in different materials.