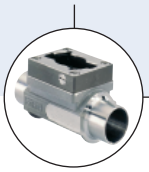
bürkert
FLUID CONTROL SYSTEMS

INLINE Flowmeter for hazardous area II 1 G/D - II 3 GD - I M1

- Flowmeter with NAMUR or NPN/PNP output signal
- Mounting, dismounting of electronics by a Quarter-Turn
- Protection- Ex: intrinsic safety approvals for use in Zone: 0, 1, 2 - Gas (G)
  20, 21, 22 - Dust (D)
  M1, M2

Type SE30 Ex can be combined with...



Type S030
INLINE sensor fitting with PVDF paddle-wheel

Type S070
Positive displacement flowmeter sensor fitting

Type 8025
Universal flow transmitter remote version

Type 8611
PI flow controller on Solenoid valve

Intrinsic safety barrier
with NAMUR input

Type 8619
multiCELL Transmitter/Controller

The intrinsic safety flowmeter SE30 Ex for continuous flow measurement is especially designed for use in neutral, slightly aggressive, solid-free liquids, in hazardous environments.

The flowmeter is made up of an electronic module and a measuring element, either a sensor fitting S030 or a sensor fitting S070, quickly and easily connected together by a Quarter-Turn.

The electronic module detects the paddle-wheel (S030) or oval gear (S070) rotation, modulates the current of the power supply line according to NAMUR standard or produces an NPN/PNP output signal (depends on model). To operate the NAMUR signal, an intrinsic safety barrier should be connected to the flowmeter SE30 Ex.
The connection to another device in the safe area depends on the used flowmeter model.

General data	
Compatibility[1a)]	with sensor fittings S030 or S070 (see corresponding data sheet)
Materials	
Housing, cover	PC (NPN/PNP version) PPS (NAMUR version) glass fibre reinforced
Cable plug	PA with silicone seal (NAMUR version), NBR seal (NPN/PNP version)
Wetted parts materials	Sensor fitting using restriction see "SAFETY INSTRUCTIONS - NOTICE OF ATEX INSTRUCTIONS", page 6
Sensor fitting S030[1a)]	
Body	Brass, stainless steel, PVDF
Paddle-wheel	PVDF
Axis and bearings	Ceramics
Seal	FKM
Sensor fitting S070[1a)]	
Body	Aluminium, stainless steel
Rotor	PPS, aluminium, stainless steel
Shaft	Stainless steel
Seal	FKM (EPDM or PTFE on request)
Electrical connection	
Namur version	Cable plug Form A acc. to EN 175301-803 (supplied)
NPN/PNP version	Cable plug Form A acc. to EN 175301-803 with 5 or 12 m cable (not supplied)
Voltage supply cable	0.5... 1.5 mm² cross section, 5... 8 mm diameter; shielded, max. 50 m length; line impedance <50 Ω

[1a)] Refer to the rubric "SAFETY INSTRUCTIONS - NOTICE OF ATEX INSTRUCTIONS", page 6 to choose the appropriate sensor fitting for the area of application

Environment	
Ambient temperature	0 to +60°C *(5°F to 140°F)* (operating and storage)
Relative humidity	≤ 80%, without condensation

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Electrical data	
Power supply[1b)]	8 - 15 V DC (NAMUR version, from connected intrinsic safety barrier) 12 - 36 V DC (NPN/PNP version)
Current consumption (with sensor)	max. 7 mA (NAMUR version); 30 mA (NPN/PNP version)
Output	Depends on the device model and application area: - 2-wire current modulation according to Namur (0.5 or 2.5 mA) - NPN/PNP (Imax. <100 mA max., 0... 300 Hz, duty cycle 1/2)
Reversed polarity (of DC)	Protected

[1b)] Refer to the rubric "SAFETY INSTRUCTIONS - NOTICE OF ATEX INSTRUCTIONS", page 6 to choose the supply adapted to the area of application

Complete device data (sensor fitting + electronic module)	
Pipe diameter	
S030 sensor fitting	DN06 to DN65
S070 sensor fitting	DN15 to DN50
Measuring range	
S030 sensor fitting	0.5 to 1200 l/min (velocity 0.3 to 10 m/s)
S070 sensor fitting	2 to 350 l/min (viscosity > 5 cps) 3 to 300 l/min (viscosity < 5 cps)
Medium temperature max.	80°C *(176°F)*
Fluid pressure max.	
S030 sensor fitting	PN10 (PVDF), PN16 (stainless steel, brass - PN40 on request)
S070 sensor fitting	PN55 (for DN15-DN25) / PN18 (for DN40-DN50) / PN10 (for flange version)
Viscosity	
S030 sensor fitting	300 cSt. max / 1% max. pollution
S070 sensor fitting	1 Pa.s max (higher on request)
Accuracy	
S030 + Electronics SE30 Ex	
Teach-In (via remote transmitter)	±1% of Reading[2)] (at the teach flow rate value)
Standard K-factor	±2.5% of Reading[2)]
S070 + Electronics SE30 Ex	±0.5% of Reading
Linearity	±0.5% of F.S.*
Repeatability	
S030 sensor fitting	±0.4% of Reading[2)]
S070 sensor fitting	±0.3% of Reading[2)]

[2)] Under reference conditions i.e. measuring fluid = water, ambient and water temperature = 20°C *(68°F)*, applying the minimum inlet and outlet pipe straights, matched inside pipe dimensions.
* F.S. = Full scale (10 m/s)

Standards, directives and approvals	
Protection class	IP67 with connector plugged-in and tightened acc. to EN 60529
Standard and directives	
ATEX	see "SAFETY INSTRUCTIONS - NOTICE OF ATEX INSTRUCTIONS", page 6
EMC	EN 61000-6-3 EN 61000-6-2
Pressure (with S030 sensor fitting)	Complying with article 3 of Chap. 3 from 97/23/CE directive.**
NAMUR	EN 60947-5-6

**** For the 97/23/CE pressure directive, the device can only be used under following conditions (dependent on max. pressure, pipe diameter and fluid).**

Type of fluid	Conditions
Fluid group 1, §1.3.a	DN ≤ 25 only
Fluid group 2, §1.3.a	DN ≤ 32 or DN > 32 and PN*DN ≤ 1000
Fluid group 1, §1.3.b	PN*DN ≤ 2000
Fluid group 2, §1.3.b	DN ≤ 200

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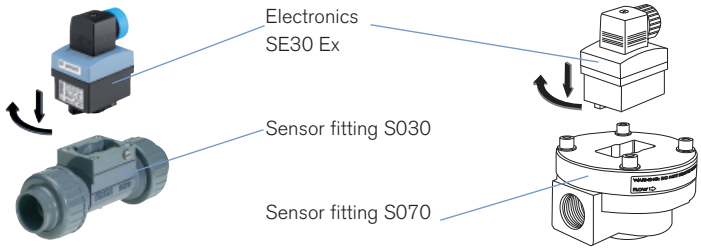
Design and principle of operation

The flowmeter is built up with an electronic module SE30 Ex associated to a sensor fitting S030 or S070 respectively with integrated measurement paddle-wheel or oval gear. This connection is made by means of a Quarter-Turn.

When liquid flows through the pipe, the paddle-wheel or of the oval gear of the sensor-fitting turns. This rotation produces a measuring signal in the electronic module.
For the Namur version, the electronic module modulates the current of the 2-wire supply line according to NAMUR standard. The modulated frequency of this signal is proportional to the flow rate. This signal is converted, by the connected type NAMUR intrinsic safety barrier, into a frequency signal on its open collector output. The electrical connection of the flowmeter is made via a cable plug (Type 2508 - supplied).
For the NPN/PNP version, the generating signal, which frequency is proportional to the flow rate, can be displayed or processed directly. The electrical connection of the flowmeter is made via a cable plug with 5 or 12 m cable (Type 2513 - not supplied, has to be ordered separately)

A conversion coefficient (K factor, available in the instruction manual of the sensor fitting S030 or S070), specific to each pipe (size and material) enables the conversion of this frequency into a flow rate.

Quarter-Turn Technology

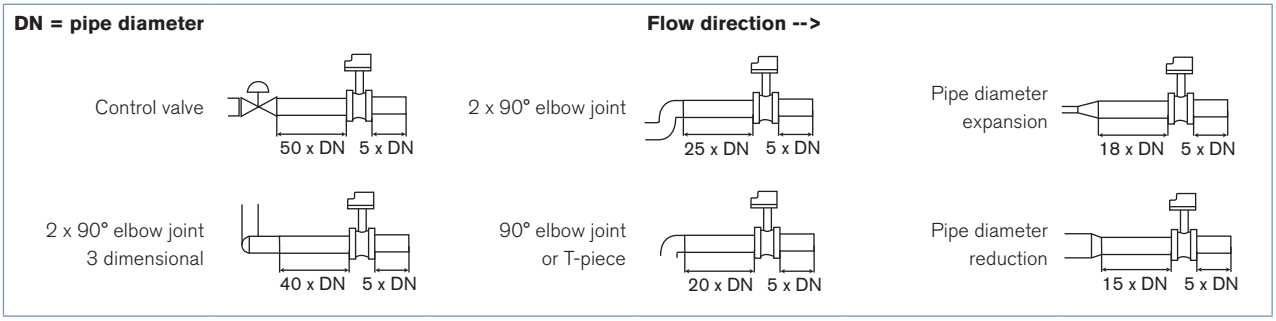


Installation into S030 sensor fitting

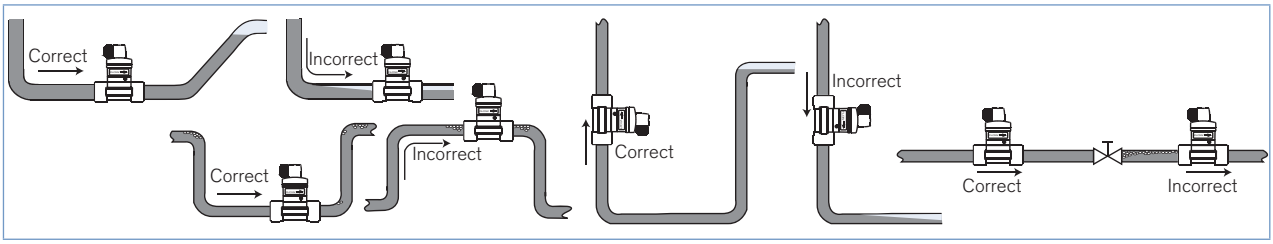
The SE30 Ex electronics can easily be installed into any Bürkert INLINE sensor fitting system S030 with integrated PVDF paddle-wheel.
Minimum straight upstream and downstream distances must be observed. According to the pipe's design, necessary distances can be bigger or use a flow conditioner to obtain the best accuracy.

For more information, please refer to EN ISO 5167-1.

EN ISO 5167-1 specifies the straight inlet and outlet distances that must be complied with when installing sensor fittings in pipelines in order to achieve calm flow conditions. The most important layouts that could lead to turbulence in the flow are shown below, together with the associated minimum inlet and outlet distances. These ensure calm, problem-free measurement conditions at the measurement point.



The device can be installed into either horizontal or vertical pipes.



Pressure and temperature ratings must be respected according to the selected sensor fitting material.
The suitable pipe size is selected using the diagram Flow/Velocity/DN.

The device is not designed for gas flow measurement.

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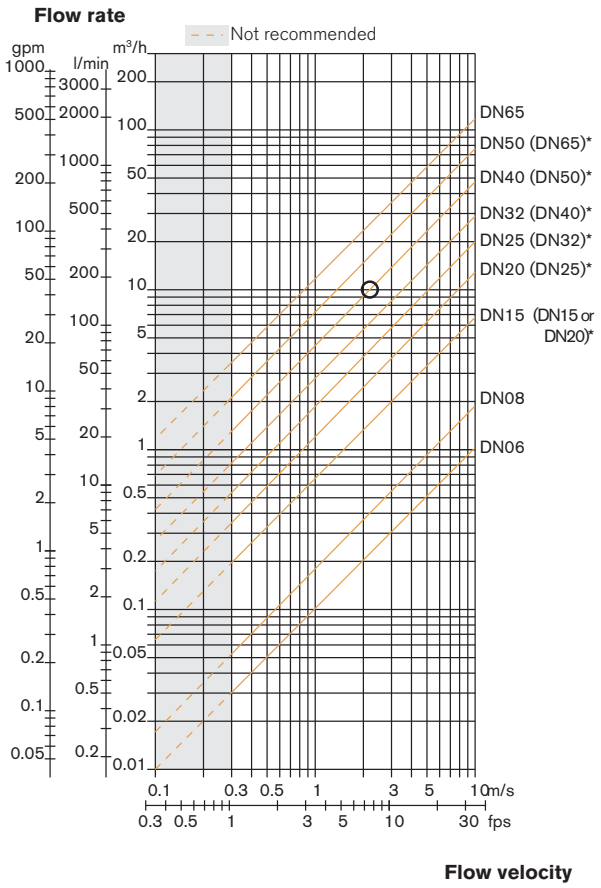
Diagram Flow/Velocity/DN

Example:

- Flow: 10 m³/h
- Ideal flow velocity: 2...3 m/s

For these specifications, the diagram indicates a pipe size of DN40 [or DN50 for (*) mentioned sensor fittings]



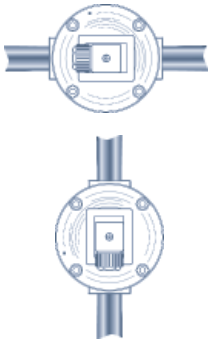
*** for following sensor fittings with process connection:**
- **external threads acc. to SMS 1145**
- **weld ends acc. to SMS 3008, BS 4825/ASME BPE or DIN 11850 Series 2**
- **Clamp acc. to SMS 3017/ISO 2852, BS 4825/ASME BPE or DIN 32676**

Installation into S070 sensor fitting

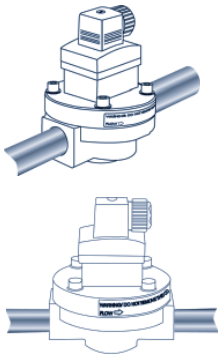
The sensor fitting can be installed in any orientation as long as **the rotor shafts are always in a horizontal plane** (see figures below) and **the flow of the fluid is in the direction of the arrow marked on the body**.

The pipe must be filled with liquid and free from air bubbles. Avoid air purge of the system which would cause damages and to prevent damage from dirt or foreign matter, we strongly recommend the installation of a 250 µm strainer as close as possible to the inlet side of the meter.

Correct installation



Incorrect installation



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Overview of hazardous areas depending on SE30 Ex flowmeter models (according to ATEX)

This equipment can be installed in some potentially explosive atmospheres (surface industries or mines depending on the model) and is in compliance with the 94/9/CE directives.	Equipment for explosive atmospheres (surface industries) - GROUP II					
	Very high level of protection		High level of protection		Normal level of protection	
	Gas Zone **0** Explosive atmospheres present continuously, long periods or frequently	**D**ust Zone **20** Explosive atmospheres present continuously, long periods or frequently	**G**as Zone **1** Explosive atmospheres are likely to occur	**D**ust Zone **21** Explosive atmospheres are likely to occur	**G**as Zone **2** Explosive atmospheres are unlikely to occur or present only infrequently and for a short period only	**D**ust Zone **22** Explosive atmospheres are unlikely to occur or present only infrequently and for a short period only
CATEGORY 1 **SE30 Ex - Namur II 1 G/D (Item no. 552 901)** EEx ia IIC T6 - IP6X T80°C associated with PVDF, brass, stainless steel or aluminium sensor fittings	to use with intrinsic safety barrier with Namur input* 	to use with intrinsic safety barrier with Namur input* 	to use with intrinsic safety barrier with Namur input* 	to use with intrinsic safety barrier with Namur input* 	to use with intrinsic safety barrier with Namur input* 	to use with intrinsic safety barrier with Namur input* 
CATEGORY 3 **SE30 Ex - II 3 GD - NPN/PNP (Item no. 552 353)** Ex nA IIC T4 Gc Ex tc IIIC T135°C Dc IP6X associated with PVDF, brass, stainless steel or aluminium sensor fittings	**Not to be used**	**Not to be used**	**Not to be used**	**Not to be used**	to use with a 12 - 36 V supply source	to use with a 12 - 36 V supply source
	Equipment for explosive atmospheres (Mines) - GROUP I					
	Firedamp mines zone M1 Very high level of protection		**Firedamp mines zone M2** High level of protection			
CATEGORY 1 **SE30 Ex - Namur I M1 (Item no. 553 455)** EEx ia only associated with brass or stainless steel sensor fittings	to use with intrinsic safety barrier with Namur input*  and with a mechanical protection cover 		to use with intrinsic safety barrier with Namur input*  and with a mechanical protection cover 			

*** Note:** The open circuit voltage for the NAMUR input must be included between 8 and 15 V.

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Safety orders - Notice of ATEX instructions

The appropriate SE30 Ex model is dependent of the installation environment.

Model SE30 Ex Namur (Item no. 552 901) Group II - Category 1 for potentially explosive zones of gas (0, 1 and 2) and dust (20, 21 and 22)

ATEX marking identification and ATEX installation zones

CE 0102 ⟨Ex⟩ II 1 GD Ex ia IIC T6
Ex iaD 20 IP6X T80°C
ambient T: 0°C ≤ Ta ≤ 60°C

LCIE 04 ATEX 6070 X

- **Special conditions for a safe use**

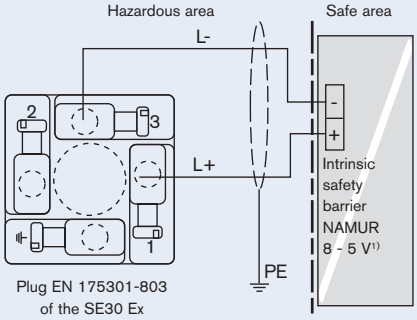
The device is intrinsic safety certified according to EN 60079-0 (2006); EN 60079-11 (2007); EN 61241-0 (2004); EN 61241-11 (2007). It may be installed in potentially explosive atmospheres: zones 0, 1 or 2 and zones 20, 21 or 22.

The connector can only be connected to certified intrinsic safety equipment.
This combination must be compatible with intrinsic safety rules (see electrical safety data in the table under the adjacent connection diagram).

The ambient temperature of use must always be between these limits: from 0 to +60°C.

Compatible mechanical assembly and fluid connections:

Use PVDF, brass, stainless steel or aluminium sensor fitting only.
Any other connection is prohibited.



Earth the shielding of the cable on side of the measuring exploitation

¹⁾ Use an appropriate power supply which complies with the following electrical specifications

Electrical safety data	
Ui (V)	≤ 15 V
Ii (mA)	≤ 50 mA
Pi (mW)	≤ 188 mW
Ci	≤ 1.2 nF
Li	≅ 0

Model SE30 Ex Namur (Item no. 553 455) Group I - Category 1 for firedamp mines M1

- **ATEX marking identification and ATEX installation zones**

CE 0102 ⟨Ex⟩ I M1 Ex ia
ambient T: 0°C ≤ Ta ≤ 60°C

LCIE 04 ATEX 6070 X

- **Special conditions for a safe use**

The device is intrinsic safety certified for firedamp mines according to EN 60079-0 (2006); EN 60079-11 (2007); EN 61241-0 (2004); EN 61241-11 (2007).
It may be installed in potentially explosive atmospheres: zone M1.

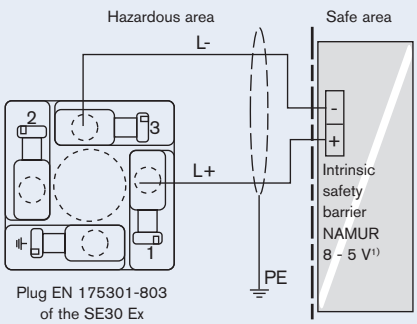
The connector can only be connected to certified intrinsic safety equipment.
This combination must be compatible with intrinsic safety rules (see electrical safety data in the table under the adjacent connection diagram).

The ambient temperature of use must always be between these limits: from 0 to +60°C

Compatible mechanical assembly and fluid connections:

Use brass or stainless steel sensor fitting only.
Any other connection is prohibited.

The appliance must be protected from a mechanical damage. Mechanical protection with order code 553 519 must be used. This protection is mounted on the flowmeter by using an appropriate bracket (not included in our delivery).



Earth the shielding of the cable on side of the measuring exploitation

¹⁾ Use an appropriate power supply which complies with the following electrical specifications

Electrical safety data	
Ui (V)	≤ 15 V
Ii (mA)	≤ 50 mA
Pi (mW)	≤ 188 mW
Ci	≤ 1.2 nF
Li	≅ 0

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Safety orders - Notice of ATEX instructions

Model SE30 Ex NPN/PNP (Item no. 552 353) Group II - Category 3 for potentially explosive zones of gas (2) and dust (22)

▪ ATEX marking identification and ATEX installation zones

CE 0102 ⟨Ex⟩ II 3 GD
Ex nA IIC T4 Gc
Ex tc IIIC T135°C Dc IP6X
ambient T: 0°C ≤ Ta ≤ 50°C

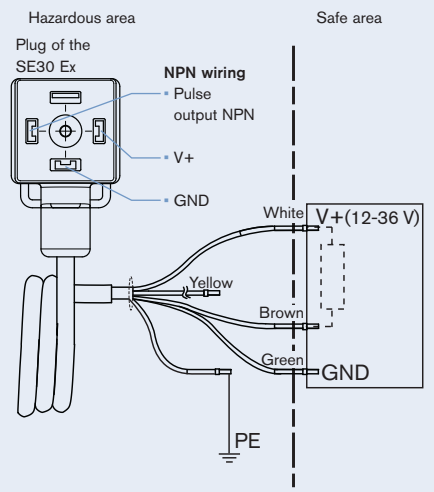
INERIS 04 ATEX 3015X

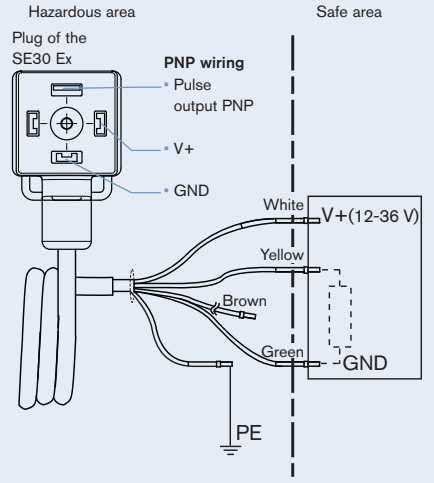
▪ Special conditions for a safe use

The device is ATEX certified according to EN 60079-0 (2009), EN 60079-15 (2013) and EN 60079-31 (2009).
It may be installed in potentially explosive atmospheres: zones 2 or 22.

The connector may be connected to a 12 - 36 V supply source.

The ambient temperature of use must always be between these limits: from 0 to +50°C.





Compatible mechanical assembly and fluid connections:

PVDF, brass, stainless steel, aluminium sensor fittings can be used. Any other connection is prohibited.

Electrical safety data on power supply line (L+/L-)	
U max.	36 V
I max.	30 mA
P max.	108 mW

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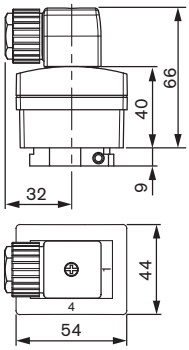
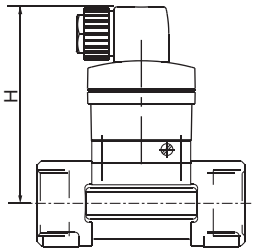
Dimensions [mm]

Electronics SE30 Ex - Version NAMUR with cable plug (supplied)

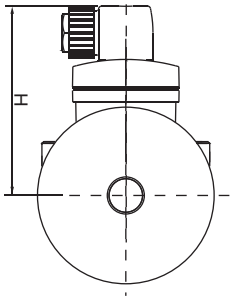


Mounted on S030 sensor fitting



DN	H
06	96
08	96
15	101
20	98
25	98
32	102
40	106
50	112
65	112

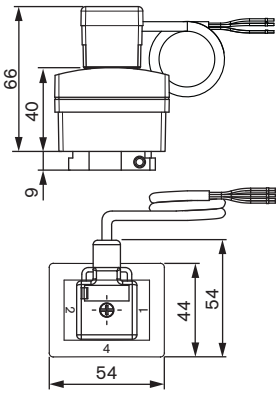
Mounted on S070 sensor fitting



Orifice	H
15*	101
25	116
40	133
50	151

* Only with threaded connection

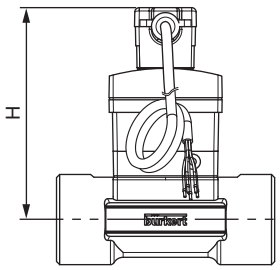
Electronics SE30 Ex - Version NPN/PNP with cable plug with 5 or 12 m cable (not supplied)



NOTE:
Cable plug type 2513 has to be ordered separately.

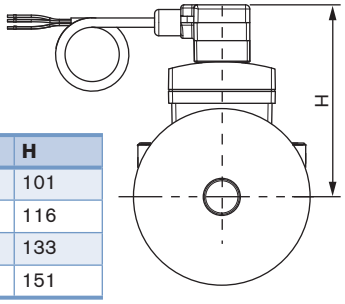
The cable output is **always oriented perpendicularly** to the pipe.

Mounted on S030 sensor fitting



DN	H
06	96
08	96
15	101
20	98
25	98
32	102
40	106
50	112
65	112

Mounted on S070 sensor fitting



Orifice	H
15*	101
25	116
40	133
50	151

* Only with threaded connection

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Ordering chart - flowmeter Type SE30 Ex for sensor fitting S030 or S070 (has to be ordered separately)

Specifications	Voltage supply	Outputs	Electrical connection	Item no.
SE30 Ex - Namur II 1 G/D for explosive gas and dust environments: zones 0, 1 or 2 and 20, 21 or 22	8 - 15 V DC - via an intrinsic safety barrier with NAMUR input*	Namur current modulation - 2-wire	1 cable plug EN 175301-803	552 901
SE30 Ex - II 3 GD for explosive gas and dust environments: zones 2 or 22	12 - 36 V DC	NPN / PNP	1 cable plug EN 175301-803	552 353
SE30 Ex - Namur I M 1 for fiery mines	8 - 15 V DC - via an intrinsic safety barrier with NAMUR input*	Namur current modulation - 2-wire	1 cable plug EN 175301-803	553 455

* The open circuit voltage for the NAMUR input must be included between 8 and 15 V.

Ordering chart - spare parts for flowmeter Type SE30 Ex (has to be ordered separately)

Specifications	Item no.
Cable plug Form A acc. to EN 175301-803 with blue cable gland and silicone seal (Type 2508) for NAMUR version	167 526
Mechanical protection in stainless steel for mining application (80 x 80 x 80)	553 519
Cable plug Form A acc. to EN 175301-803 with 5 m cable and NBR seal (Type 2513) for NPN/PNP version The cable output is **always oriented perpendicularly** to the pipe.	565 558
Cable plug Form A acc. to EN 175301-803 with 12 m cable and NBR seal (Type 2513) for NPN/PNP version The cable output is **always oriented perpendicularly** to the pipe.	565 559

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Safety barrier

- 2 or 4 channels, intrinsic safety digital inputs: proximity detectors NAMUR, contacts...
- Rail mount on hat profile 35 mm
- All connections by removable screw terminals

Specifications	
Digital inputs	Each of the 4 x intrinsic safety inputs can be configured independently for a contact or a proximity detector NAMUR as per DIN 19234
Intrinsic safety inputs	Proximity detector NAMUR as per DIN 19234 or free potential contacts, relays, pressure or temperature switches or push buttons in hazardous area.
Non intrinsic safety recopy outputs Collector cut-off power	According to the type of sensor and the chosen logic: a green LED on the front panel displays a free-potential contact for each channel without common wire. 15 V - 60 mA - 0.9 VA - 350 Hz
Selection of the sensor type	Inductive / capacitive intrinsic safety certified NAMUR proximity detector or free-potential contacts.
Selection of the logic	By a mini-DIP choice of active proximity switches or when contact is NO (Normally Open) or NC (Normally Closed).
Fault detector	For all inputs configured as NAMUR, all models are provided with fault detector (broken line or short-circuit). In faulty case, the green front LED switches off, the contact of the defective channel opens and the red LED corresponding to the defective channel switches on. Other channels are not affected.
Power supply	24 V DC ±10% 230 V AC ±10% 1 front panel yellow LED is “ON” when supply is active
Consumption	5 VA

Specifications (continued)	
Connections	All connections by removable screw terminals. Supply distribution by means of a flat cable from one unit to the next one.
Classification for explosive areas	Intrinsic safety associated apparatus. It must be installed in safe area and connected to materials installed in zone 0, 1 or 2 - Gas (G) or in zone 20, 21 or 22 - Dust (D) Classification according to ATX 94/9/CE: Ⓔx I/II (M1)/(1) G/D [EEx ia] IIC Safety parameters see EC-type certificate LCIE 00ATEX 6034X
Ambient Temperature Operating Storage	 -20 to +60°C -20 to +50°C (recommended) -40 to +80°C
Dimensional and mechanical	Housing for symmetrical DIN rail (hat profile 35 mm as per standard NFC63015 / EN50022) - Depth:120 mm ; - Height: 90 mm - 145 mm overall including space for cables ; Width on rail 29.5 mm. Minimal distance between rails: 180 mm.
Installations conditions Mounting on DIN rail: Mounting inside a cabinet:	 must take into account thermal dissipation and risk of overheating generated by housings installed side by side. In case of a high concentration inherent safety barrier, we recommend to leave a free space of 10 mm between each group of 8 units (horizontal rail) and between each group of 4 units (vertical rail). It is recommended to close the electrical cabinet and to ensure a circulation of fresh air even by means of an air conditioner to keep the inside temperature at the level compatible with the recommended operating temperature among the units.

Ordering chart intrinsic safety barrier

Classifications for explosive areas	Voltage supply	Outputs	Number of channels	Item no.
ATEX 94/9/CE Ⓔx I/II (M1)/(1) G/D [EEx ia] IIC	24 V DC	open collector, 15 V, 60 mA	2, with Namur input	553 456
		open collector, 15 V, 60 mA	4, with Namur input	553 457
	230 V AC	open collector, 15 V, 60 mA	2, with Namur input	553 458
		open collector, 15 V, 60 mA	4, with Namur input	553 459

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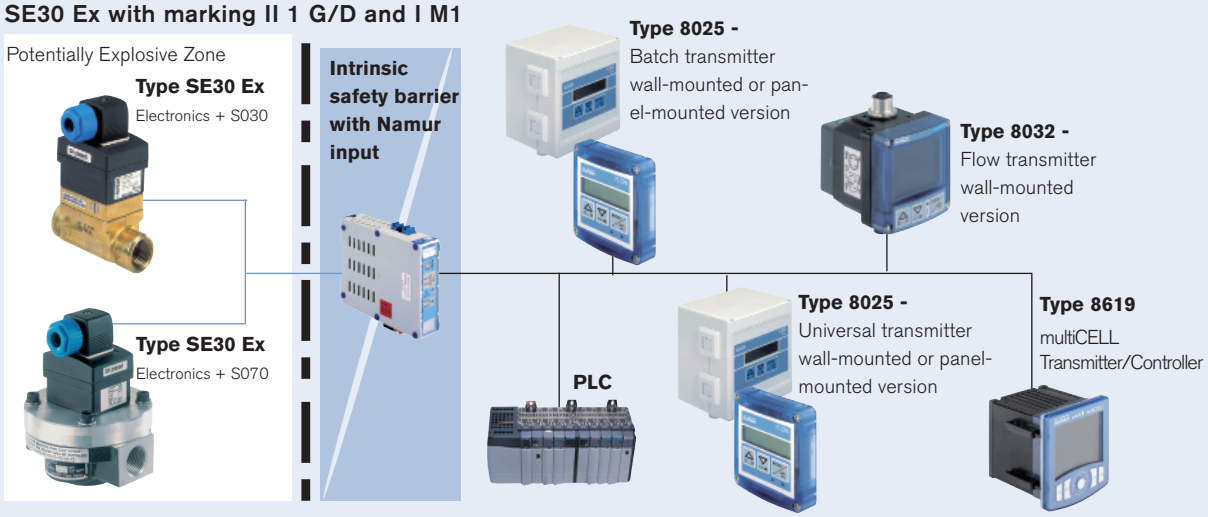
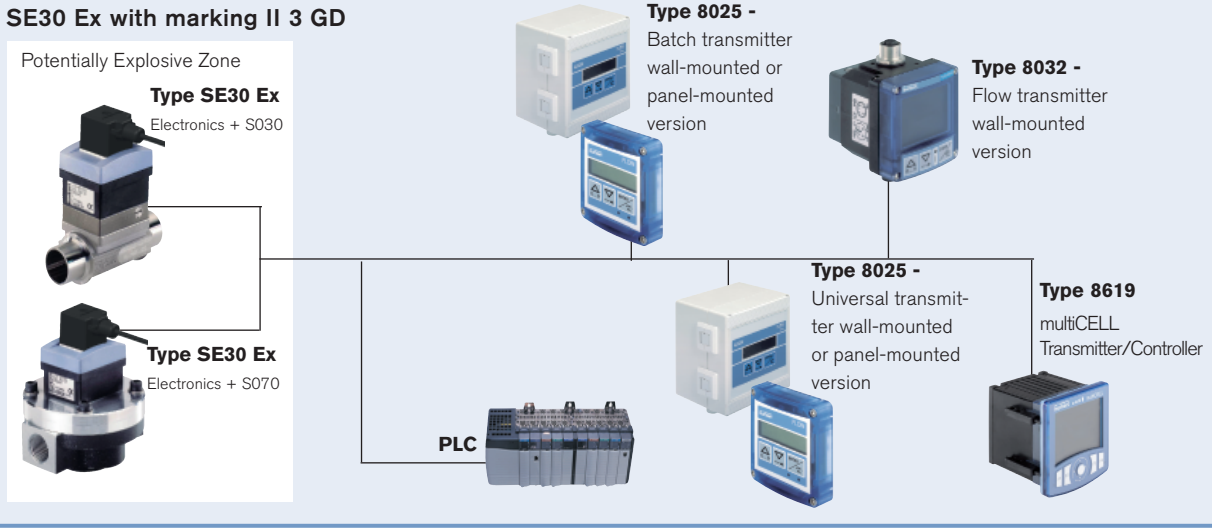
Interconnection possibilities with the flowmeter Type SE30 Ex

SE30 Ex with marking II 1 G/D and I M1



SE30 Ex with marking II 3 GD



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