envea

EUROTEC

OPERATING INSTRUCTIONS

FlowJam S (Ex)

BULK FLOW DETECTION





1. System overview

A measuring point consists of the following components:

- Sensor
- Evaluation unit
- G-1½" welded bracket
- Process adapter (optional)

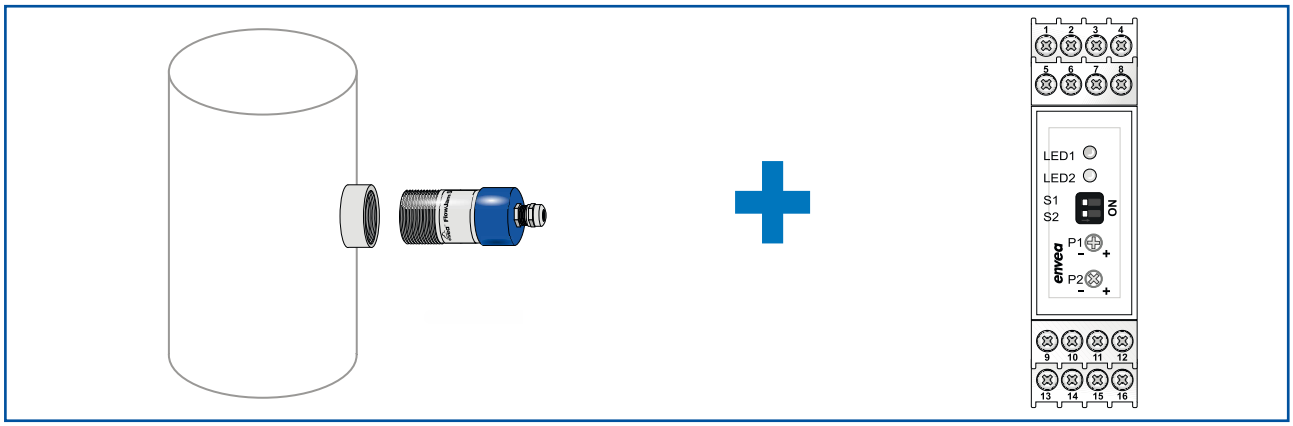


Fig. 1: System overview FlowJam S

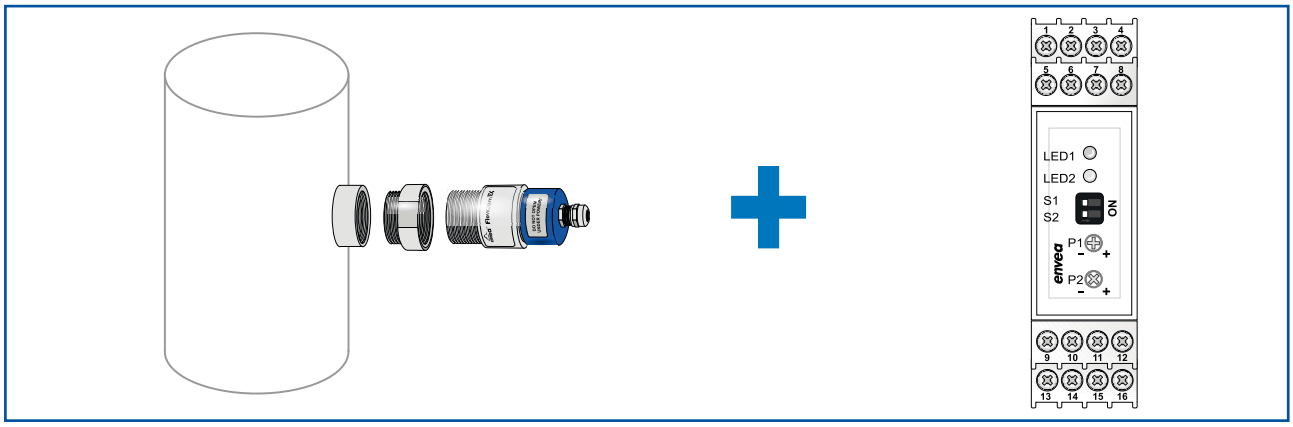


Fig. 2: System overview FlowJam S Ex

2. Function

The radar flow detector FlowJam S (Ex) indicates the flow of bulk materials which moves through the detection range at a minimal required speed of 0.1 m/s.

The detection is executed by evaluating the Doppler's effect, thus independent of the flow direction.

The material flow measurement works in metallic or non-metallic tubes, ducts, free fall distances and discharge points. By using a process adapter or a separating flange, even hard conditions could be handled.

The sensor distinguishes between two conditions:

- material flow
- material jam or standstill.

The FlowJam S Ex must always be equipped with a process adapter for ATEX zone separation.

3. Safety

The FlowJam S (Ex) measuring system has a state of the art, reliable design. It was tested and found to be in a perfectly safe condition when leaving the factory. Nevertheless, the system components may present dangers to personnel and items if they are not operated correctly.

Therefore, the operating manual must be read in full and the safety instructions followed to the letter.
If the device is not used correctly for its intended purpose the manufacturer's liability and warranty will be void.

3.1 Normal use

- The measuring system may only be installed to measure the medium passing through them. It is not suitable for any other use or measuring system modifications.
- Only genuine spare parts and accessories from ENVEA Process may be used.

3.2 Identification of hazards

- Possible dangers when using the measuring system are highlighted in the operating instructions with the following symbols:



Warning!

- This symbol is used in the operating manual to denote actions which, if not performed correctly may result in death or injury.



Attention!

- This symbol is used in the operating manual to denote actions which may result in danger to property.

3.3 Operational safety

- The measuring system may only be installed by trained, authorised personnel.
- During all maintenance, cleaning and inspection work on the pipelines or FlowJam S (Ex) components, make sure that the system is in an unpressurised state.
- Switch off the power supply before performing any maintenance work, cleaning work or inspections on the pipelines or the FlowJam S (Ex) components. See the instructions in the section entitled Maintenance and care.
- The sensor must be taken out of the pipeline before any welding work is performed.
- The components and electrical connections must be inspected for damage at regular intervals. If any signs of damage are found, they must be rectified before the devices are used again.

3.4 Reliability

For any additional information concerning product reliability, please contact ENVEA Process.

3.5 Technical statement

The manufacturer reserves the right to adjust technical data concerning technical developments without notice. ENVEA Process will be delighted to provide information about the current version of the operating manual, and any amendments made.

4. Mounting and installation

4.1 Typical components of a measuring point:

- Sensor
- Evaluation unit
- G-1½" welded bracket
- Process adapter (optional)
- Manual

4.2 Required equipment

- Tested tools for installation of the welding socket
- Tested tools for the electrical connection

4.3 Sensor installation

Proceed as follows to install the sensor:

- Determine a installation site as free from vibrations as possible.
- Make sure that there are no moving parts in the detection area. If this cannot be avoided, it is strongly recommended to shield the moving parts.
- In horizontal or inclined installation situations, installation from above is recommended.
- An installation angle to the flow direction between 45 ° - 90 ° should be maintained.
- When used on delivery lines made of non-conductive material, the measurement is made through the wall. There is no need to provide a separate recess in the line. For possible interference signals to eliminate from the environment, ENVEA Process offers individual solutions.
- The measuring point can be installed in the following variants:
  - in a G-1½ "threaded connector (Fig. 3)
  - with a flange (Fig. 4)
  - with the help of a pipe clamp (Fig. 5)
  - for high-temperature and high-pressure applications with a separating flange (Fig.6)

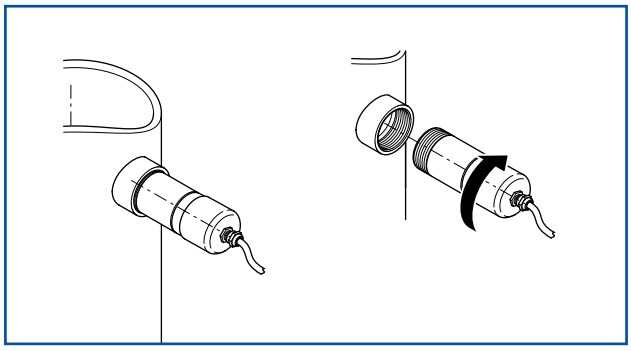


Fig. 3: Thread mounting

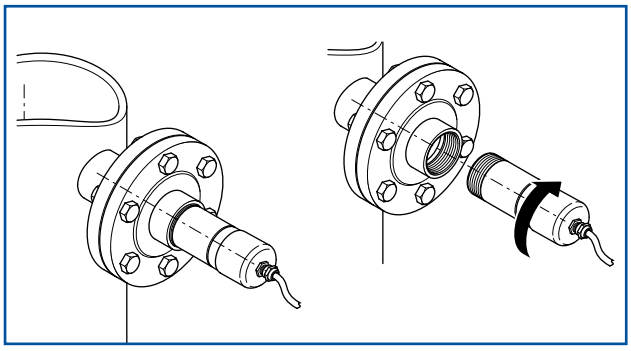


Fig. 4: Flange mounting

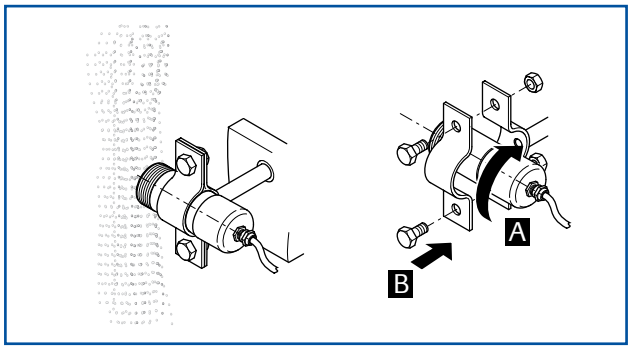


Fig. 5: Mounting with pipe clamp

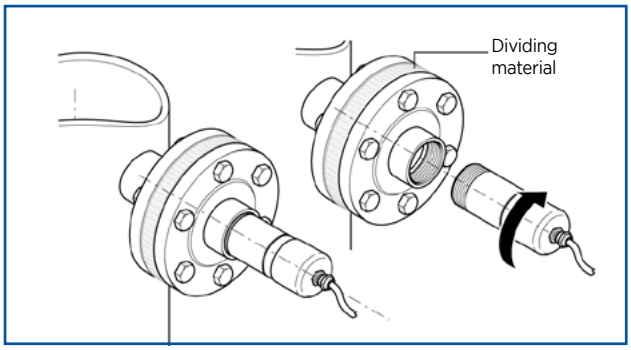


Fig. 6: mounting with separating flange

4.4 Installation of the sensor on conveyor belts

If possible, the installation on conveyor belts is to be executed in the area of the discharge point.

If the installation is above a conveyor belt, then the FlowJam S (Ex) has to be installed at an angle of approx. 70 - 80° (fig. 7), in order to use the changing surface profile of the bulk material flow.

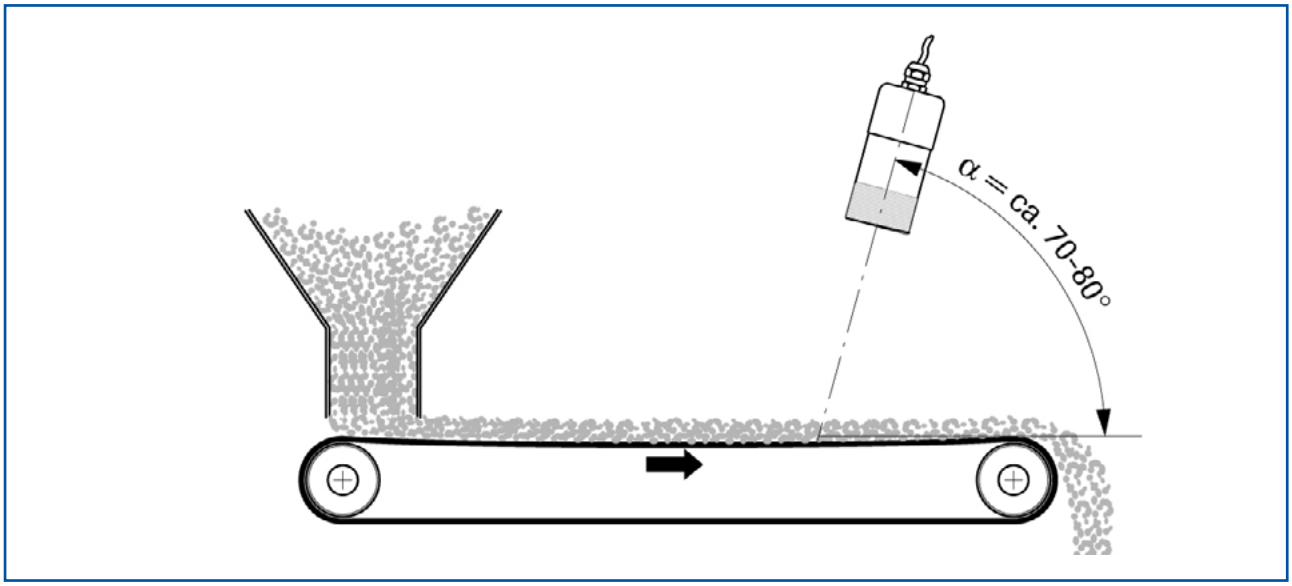


Fig. 7: Installation above conveyor belt

5. Use in hazardous areas

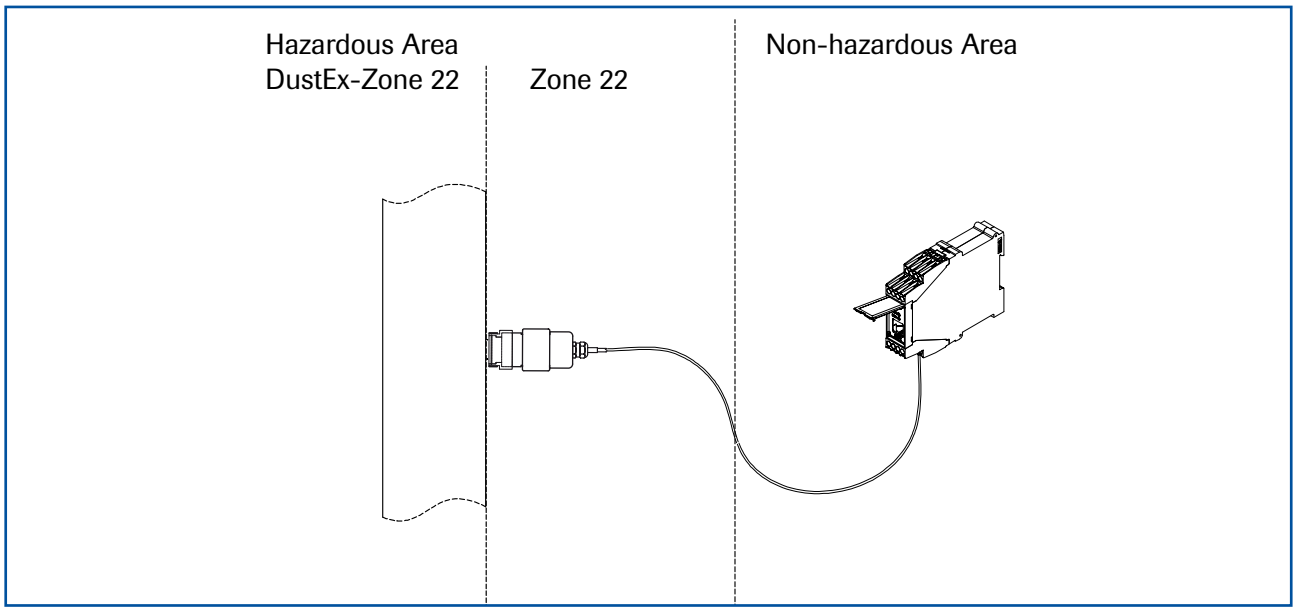
Marking DustEx: **II 3D Ex tc IIIC T85 °C Dc**

Power supply (observe type plate)	Voltage range Power supply 24 V DC supplied by Evaluation unit	Max. power consumption 1.5 W
Category	II 3D Sensor in Zone 22	
Housing protection class	Sensor = IP65 / Evaluation unit = IP40	

Safety information for installation in explosive areas

1. Observe installation and safety instructions.
2. Install according to manufacturer's instructions and applicable standards.
3. Do not operate the device outside the electrical and thermal parameters.
4. Mount the housing cover and cable entries properly to ensure the housing protection class.
5. Use cable glands and cable entries that are suitable for Category II 3D.
6. A process adapter **must** be used for installation of the FlowJam S Ex in an Ex zone.

Thermal data	Category 3 (Zone 22)
Maximum permissible ambient temperature	- 20 °C . . . + 60°C
Maximum surface temperature, sensor, at +60 °C ambient temperature	+ 80 °C
Maximum process temperature, at +60 °C ambient temperature, when using a Tecapeek process adapter	+ 220 °C
Maximum process temperature, at +60 °C ambient temperature, when using a POM process adapter	+ 80 °C



6. Electrical connection

The Evaluation unit can be installed at a maximum distance of 300 m from the sensor.
ENVEA Process recommend an insulated, shielded cable with a minimum cross-section of 0.75 mm².
From a cable length of 100 m, the cable cross-section must be enlarged to 1.5 mm². The cable diameter should not exceed 10 mm. The system has an EMC screw connection. This serves for mounting a cable shield. The shield should only be mounted on the sensor side.

6.1 Electrical connection Sensor

1	Power supply +12 V DC
2	Power supply 0 V DC
J1	Sensor sensitivity

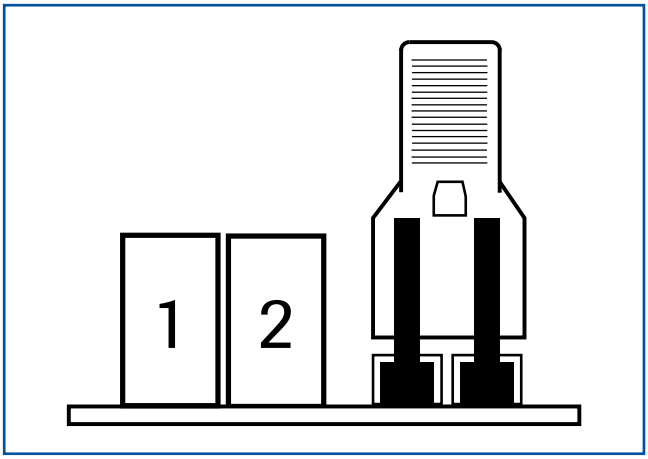


Fig. 9: Electrical connection: Sensor

6.2 Electrical connection Evaluation unit

The Evaluation unit is available in two versions. With relay contact without current output, as well as with relay contact and active current output.
The current output could be used for monitoring the material flow as a uncalibrated trend.

1	NA
2	NA
3	Power supply 0 V DC
4	Power supply +24 V DC
5	NA
6	Relay output NC
7	Relay output COM
8	Relay output NO
9	NA
10	NA
11	Power supply sensor 0 V DC
12	Power supply sensor +12 V DC
13	NA
14	NA
15	*Current output - (active)*
16	*Current output + (active)*

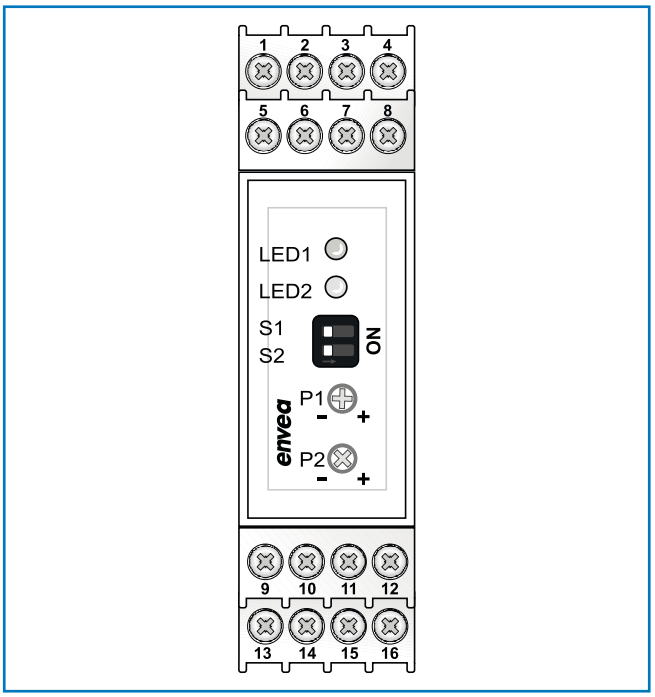


Fig. 10: Electrical connection: Evaluation unit

6.3 Components

Status LED

LED 1 red The frequency of the red LED provide an information about the strength of the measuring signal:

- Fast blinking = high measuring signal
- Slow blinking = low measuring signal
- Continuous blinking = Information about an sensor defect
- LED off = no measuring signal

LED 2 green The green LED provide an information about the switching state of the relay contact:

- LED on = relay is energized
- LED off = relay is dropped

The display is independent of the state of dipswitch S1.

Dipswitch

S1 The position of dipswitch S1 determines, whether the relay is energized or dropped at material flow.

Position ”1” (left site) causes alarm in case of material flow:

- material flow: - relay is energized
  - contacts 7 + 8 closed
- no material flow: - relay is dropped
  - contacts 6 + 7 closed

Position ”2” (right site) causes alarm when there is no material flow:

- material flow: - relay is dropped
  - contacts 6 + 7 closed
- no material flow: - relay is energized
  - contacts 7 + 8 closed

S2 Dip switch S2 can be used to set the sensitivity of the measuring signal in addition to J1.

Position on the right: measuring signal is set to insensitive

Position on the left: measuring signal is set to sensitive

Potentiometer

P1 Setting the switching threshold based on the sensitivity

Left stop = high switching threshold, therefore low sensitivity
Right stop = low switching threshold, therefore high sensitivity

P2 Setting the hold time of the relay contact

Left stop = 0.25 s
Right stop = 15 s

Sensor: In addition to the dipswitch S2, the jumper J1 can be used to set the measurement signal more sensitively.

Jumper J1	Jumper set	Sensor is set to insensitive
	Jumper pulled	Sensor is set to sensitive

7. Commissioning

The threshold to which the relay should alarm is set with potentiometer P1. The measurement signal should set in a way that a clear distinction between material flow and no material flow could be made.

Method:

Put the sensor into operation so that there is a material flow. LED 1 must now light up depending on the material flow. If it is not lit, switch S2 to the left. If the LED 1 still does not light up, the jumper J1 on the sensor electronics has to be removed. Removing the jumper doubles the sensitivity of the sensor.

If the material is detected, the dipswitch S1 can be used to select whether the alarm relay should be energized (left position) or dropped (right position) when the material flows.

The threshold for the alarm relay is set via potentiometer P1. For setting the correct threshold, P1 must be turned to the right until LED 2 lights up and the relay contact has switched.

If the material flow is interrupted, LED 1 should turn off and the relay and LED 2 should dropped latest after the set delay time has expired.

The relay holding time is set with the potentiometer P2, in the range 0.25 - 15 s, to the application requirements.

7.1 Default settings

The components are set in the following positions on delivery:

- Potentiometer P1 (fine adjustment of the sensitivity): left stop = insensitive
- Dipswitch S2 (setting of sensitivity): switch on the right position = insensitive
- Potentiometer P2 (delay time): left stop = minimum delay of 0.25 s
- Jumper J1 (sensitivity sensor): set = insensitive

8. Error signalling

Error	Cause	Action
Relay contact does not switch despite a material flow	Incorrect sensor settings	Check installation situation; Set measuring point to maximum sensitivity: • P1 right stop • P2 left stop • S2 left position • J1 removed Repeat commissioning
	Distance between material and sensor too large	
	Wrong installation situation	
LED 1 lights up without an existing material flow	Incorrect sensor settings	Check installation situation; Set measuring point to maximum insensitivity: • P1 left stop • S2 right position • J1 set Repeat commissioning
	Detection of vibrations or other moving parts	
LED 1 lights up continuously	Wrong cabling between Sensor and Evaluation unit	Check cable connection, electrical connection and power supply; Contact ENVEA Process
	Sensor defect	

9. Notes

- Avoid or shield reflections from moving parts out of the process
- Avoid strong vibrations
- Various process adapters are available to protect the sensor, obey ATEX zones or solve difficult process conditions
- For optimal material flow detection, it is recommended to set P1 just above the switching threshold (LED 2 lights up)
- The FlowJam S Ex is supplied in a pressure-resistant housing and must be equipped with a process adapter.

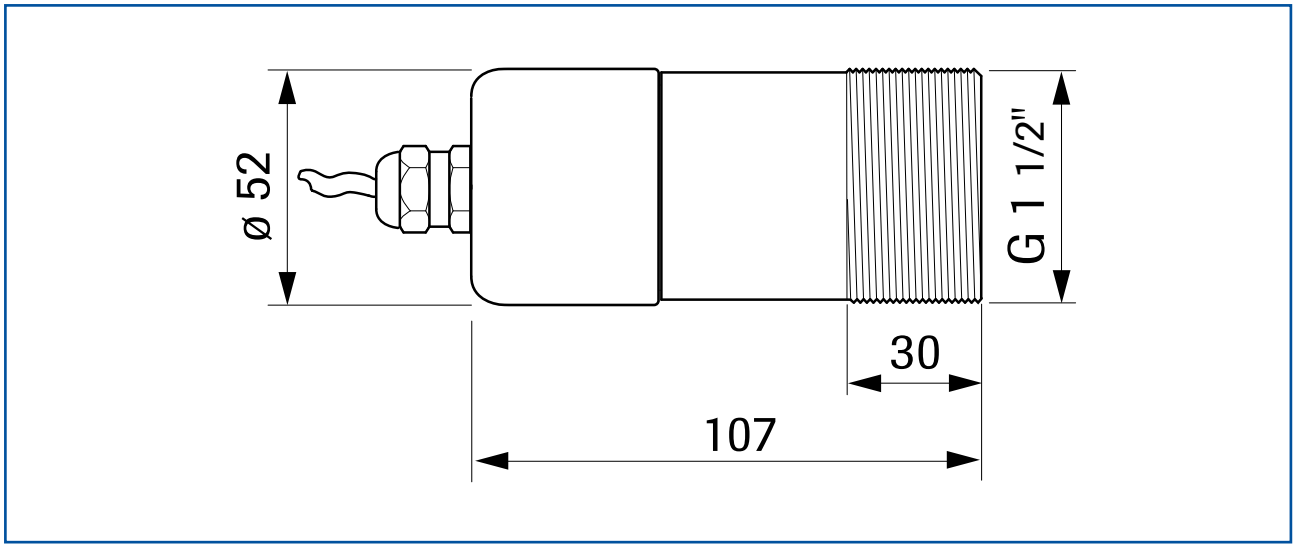


Fig. 11: Dimensions FlowJam S

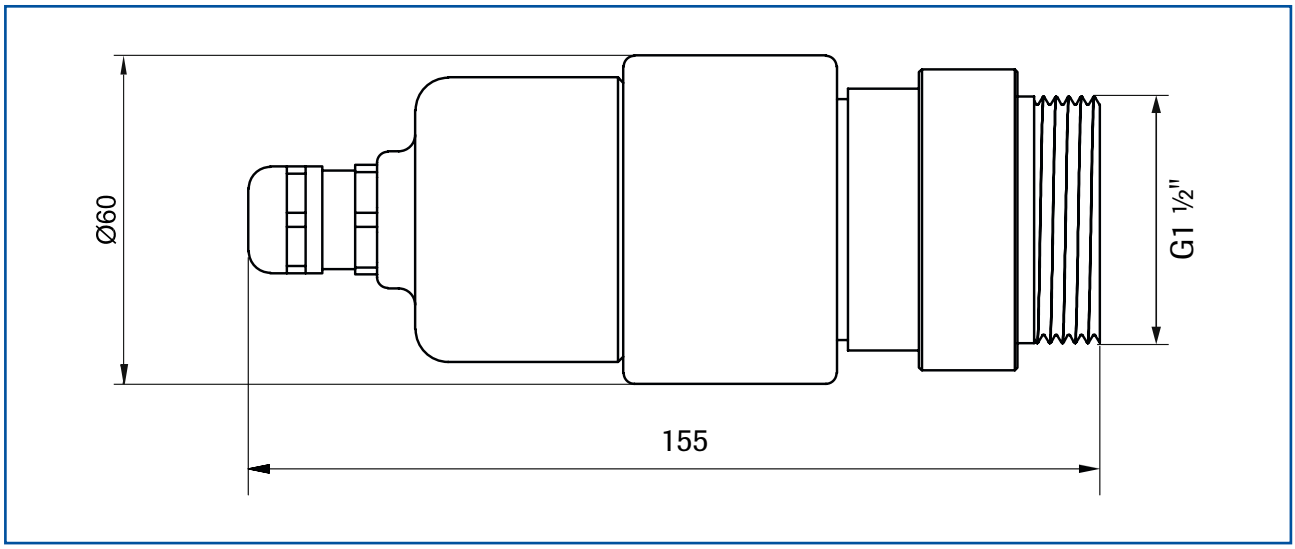


Fig. 12: Dimensions FlowJam S Ex

10. Technical data

Sensor	
Power supply	12 V DC powered by Evaluation unit
Power consumption	approx. 1.5 W
Housing	Stainless steel 1.4571
Protection system	IP65
Using in EX-Zones	Cat. 3D Ex II 3D Ex tc IIIC T85 °C Dc
Process temperature	- 20 ... + 80 °C (standard) - 20 ... + 220 °C (with process-adapter) - 20 ... + 1000 °C (with ceramic-flange)
Ambient temperature	- 20 ... + 60 °C
Working pressure	max. 20 bar (with process-adapter)
Detection range	0 ... 2 m (dependent on application)
Required material speed for detection	min. 0.1 m/s
Measuring frequency	K-Band 24.125 GHz / ± 100 MHz
Transmitting power	max. 5 mW
Dimensions FlowJam S	Housing: L 107 mm / Ø 52 mm / Thread: L 30 mm / Ø G 1
Dimensions FlowJam S Ex	Housing: L 155 mm / Ø 60 mm / Thread: L 30 mm / Ø G 1
Weight FlowJam S	approx. 560 g
Weight FlowJam S Ex	approx. 880 g

Evaluation unit	
Power supply	24 V DC ± 10 %
Power consumption	20 W / 24 VA
Protection System	IP40 according to EN 60 529
Ambient temperature	-10 ... +45 °C
Fall-delay time	250 ms ... 15 s (continuously adjustable)
Dimensions	23 x 90 x 118 (W x H x D)
Weight	Approx. 172 g
DIN rail mounting	DIN 60715 TH35
Terminal cross-section	0.2 – 2.5 mm [AWG 24-14]
Relay contact	Max. rated load: 250 V AC Max. peak current: 6 A Max. rated load 230 V AC: 250 VA Max. breaking capacity DC1: 3/110/220 V: 3/0.35/0.2 A Min. switching load: 500 mW (10 V/5 mA)
Analog output (optional)	1 x 4 ... 20 mA (0 ... 20 mA), load <500 Ω (Active)
Data backup	Flash Memory