



OPERATING INSTRUCTIONS

ProGap 2.0-BS (Ex)

LEVEL DETECTION WITH FILLING STREAM DETECTION



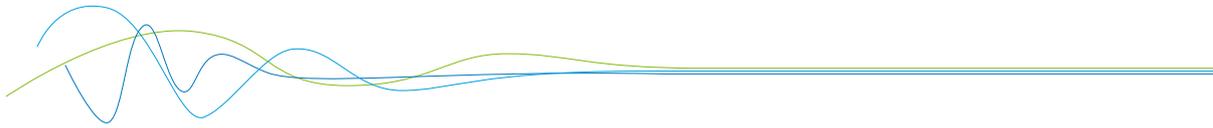
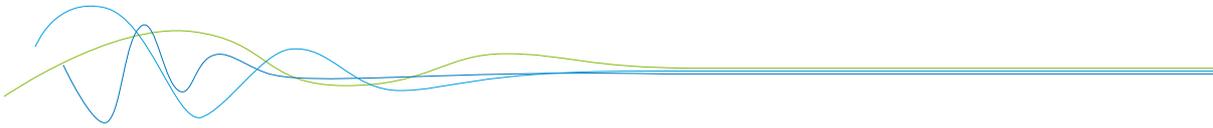


TABLE OF CONTENTS

	Page
1. System overview	3
2. Function.	3
3. Safety	4
3.1 Normal use	4
3.2 Identification of hazards	4
3.3 Operational safety.	4
3.4 Technical statement.	4
4. Mounting and installation.	5
4.1 Typical components of a measurement point	5
4.2 Required equipment	5
4.3 Sensor installation.	5
4.4 Mounting of the Evaluation unit.	6
5. Use in hazardous areas	7
6. Electrical connection	8
6.1 Electrical connection of sender	8
6.2 Electrical connection of receiver	8
6.3 Electrical connection of Evaluation unit	8
7. Commissioning.	9
7.1 Basic settings	9
7.2 Menu description	9
7.3 Menu structure	10
7.4 Start-up procedure	11
8. Error signalling	11
9. Notes	12
10. Default settings	12
11. Impuls output	13
12. Technical data	14



1. System overview

A measuring point consists of the following components:

- G-1½” welded bracket for assembly of the units
- 2 x lock nut for locking the sender and receiver unit
- Process adapter (optional)
- Sender unit
- Receiver unit
- Evaluation unit

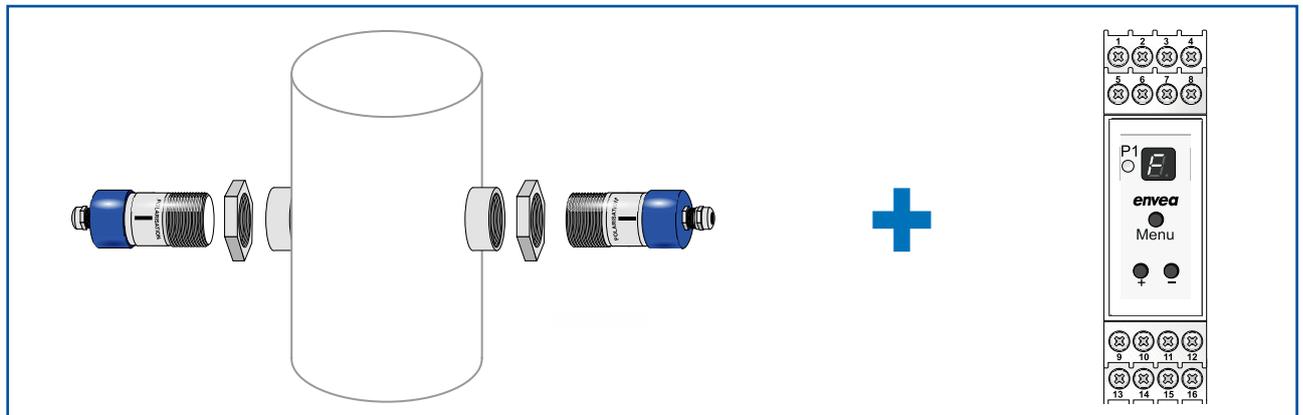


Fig. 1: Overview of measuring point: ProGap 2.0-BS

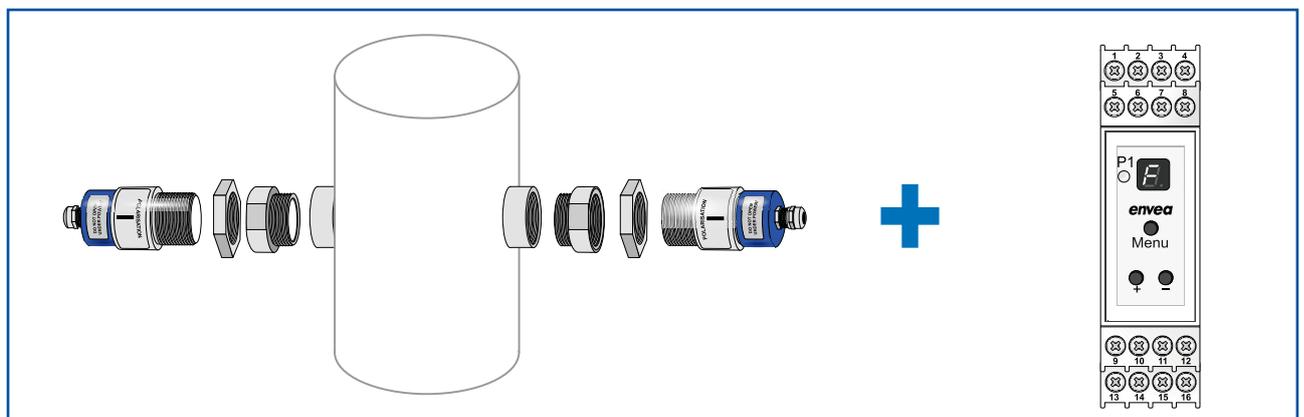


Fig. 2: Overview of measuring point: ProGap 2.0-BS Ex

2. Function

The microwave barrier is a contact-free measuring method and can be used on both metallic and non-metallic pipes, tanks, shafts, chutes, bellows etc. As non-conductive materials such as plastics are able to penetrate, it can be used for detection from outside or through a window. In this way, the measurement can be fully decoupled from the process – to measure aggressive, abrasive or coarse materials for instance. In very difficult conditions – i.e. temperatures up to 200 °C, pressure to 20 bar as well as all dust Ex zones – the ProGap 2.0-BS can be used with the aid of a process adapter. The filling stream detection can only be guaranteed for metallically shielded tanks.

3. Safety

The ProGap 2.0-BS dust sensor has a state-of-the-art, reliable design and has been tested and found to be in a perfectly safe condition when it left 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 become void.

3.1 Normal use

- Only genuine spare parts and accessories from ENVEA Process may be used.

3.2 Identification of hazards

- The operating manual refers to possible dangers when using the microwave barrier.



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 microwave barrier may only be installed by trained, authorised personnel.
- During all maintenance, cleaning and inspection work on pipes or ProGap 2.0-BS 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 pipes.
- The microwave barrier must be removed before welding work.
- The components and electrical connections must be inspected for damage at regular intervals. If any signs of damage are found, this damage must be rectified before the devices are used again.

3.4 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 measurement point:

- G-1½" welded bracket for assembly of the units
- 2 x lock nut for locking the units
- Process adapter (optional)
- Sender unit
- Receiver unit
- Evaluation unit

4.2 Required equipment

- Tested tools for the electrical connection
- 60-mm open-ended spanner for lock nut
- Teflon tape for ensuring leak tightness

4.3 Sensor installation

Proceed as follows to install the sensor:

- Determine a installation site as free from vibrations as possible.
- We recommend a distance of 15 cm from adjacent walls.
- Weld on the sensor socket so that the faces of the sender and receiver are opposite each other on the same level.
- It must be strictly ensured that the sensor socket is free of dirt and deposits.
- If the measuring point is not installed directly, the sensor socket can be closed with a cover with G-1½" thread.
- It must be strictly ensured that the sender and receiver have the same orientation and are aligned precisely to one another. (Polarisation label)
- **Exceptional case:** For distances up to 400 mm, the transmitter should be rotated 90° to attenuate the signal.
- Once aligned, the sender and receiver unit must be locked with the lock nut.
- A maximum spacing between the sender and receiver of 25 m must not be exceeded.
- If the sender and receiver cannot be installed opposite, installation on one side is possible (Fig. 3).
- If the material to be measured has a low bulk density or a low DK value, the sender and receiver can be mounted on one side of the line (Fig. 3).

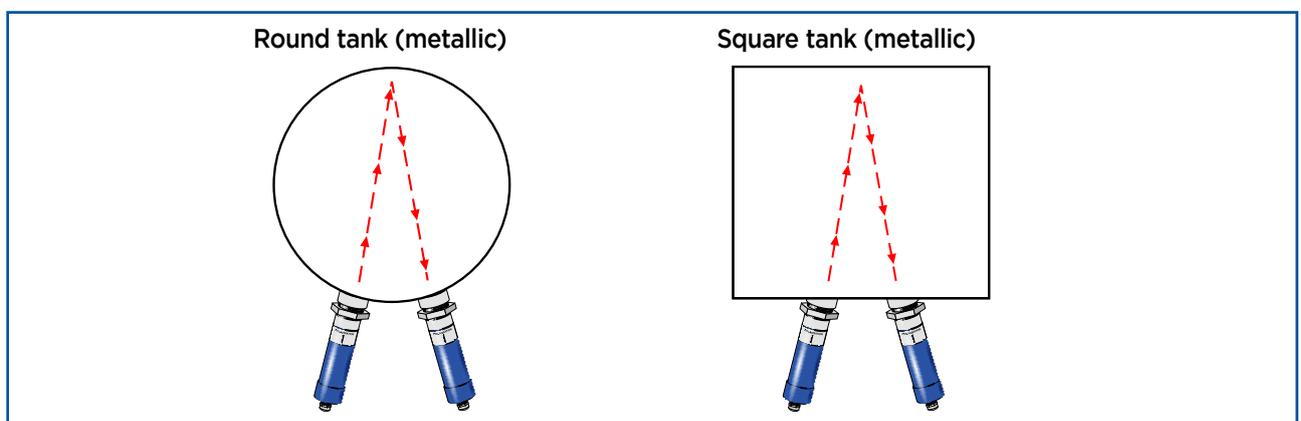
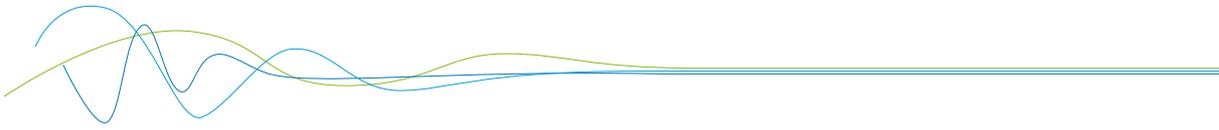


Fig. 3: Installation of the measuring point on one side



4.4 Mounting of the Evaluation unit

The Evaluation unit can be installed at a maximum distance of 300 m from the sender and receiver unit. The cable should be two-core, twisted and shielded. A minimum cross section of 0.75 mm² should be maintained. For distances longer than 100 m, the cross-section should be adjusted to 1.5 mm².

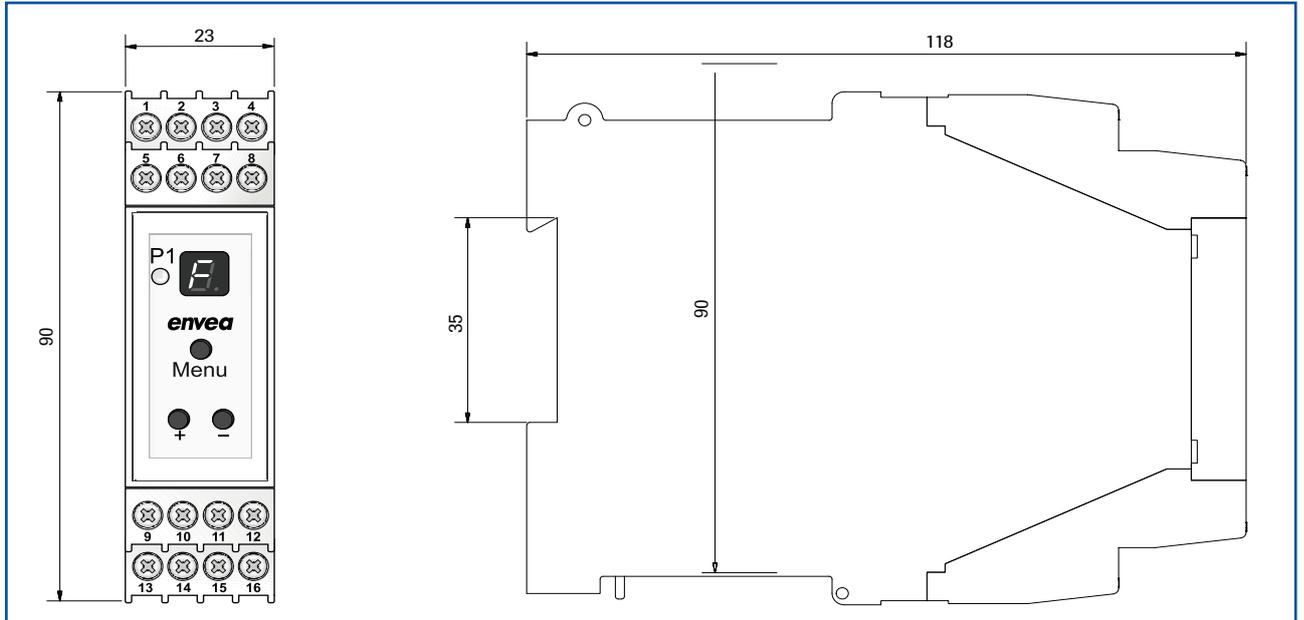


Fig. 4: Dimensions of Evaluation unit in DIN Rail housing

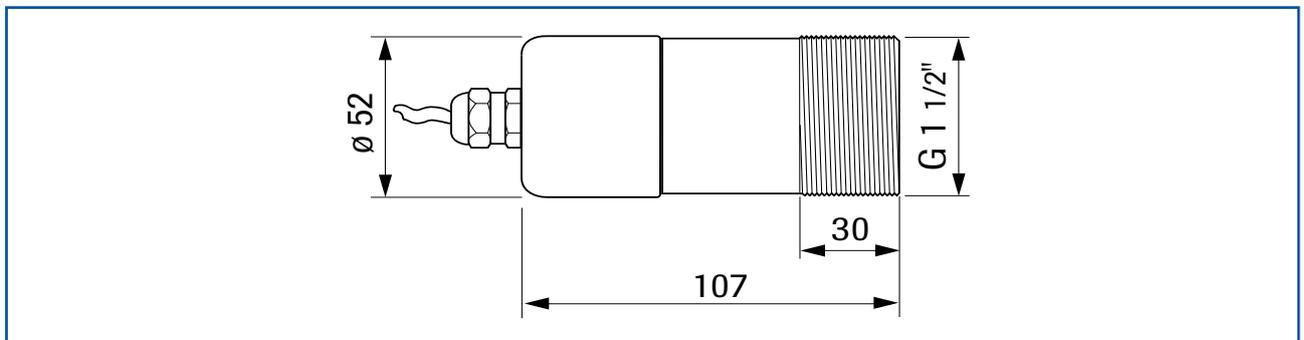


Fig. 5: Dimensions of sender and receiver unit: ProGap 2.0-BS

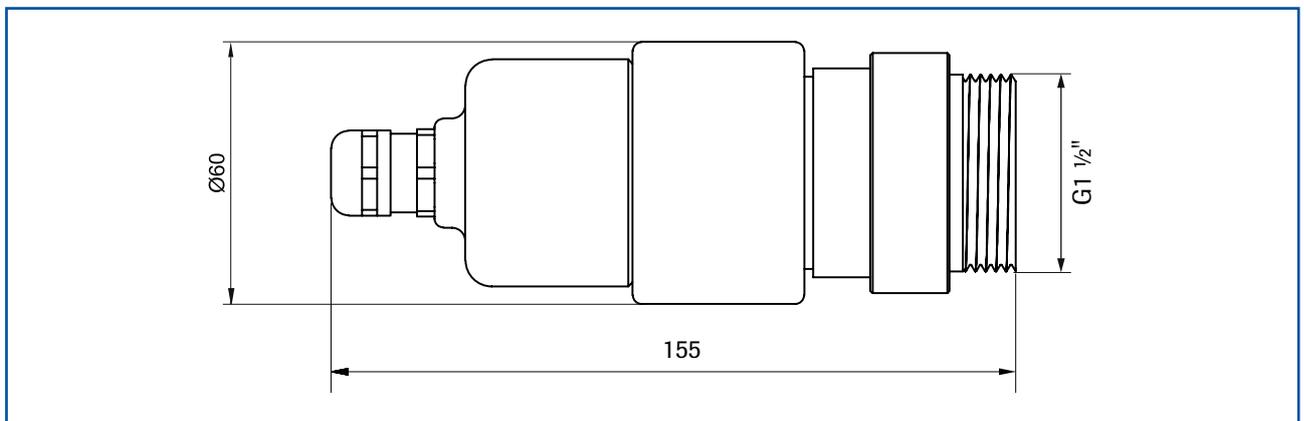
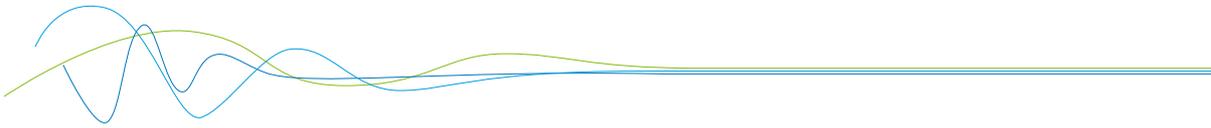


Fig. 6: Dimensions of sender and receiver unit: ProGap 2.0-BS Ex



5. Use in hazardous areas

Marking DustEx:



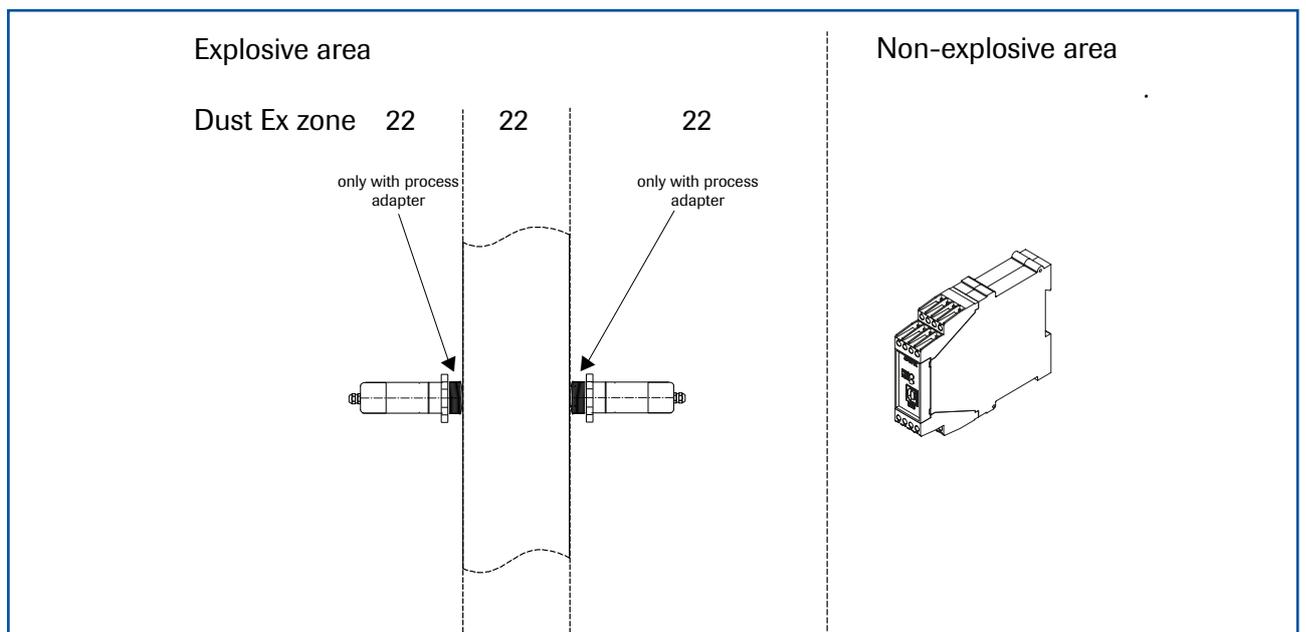
II 3D Ex tc IIIC T85 °C Dc

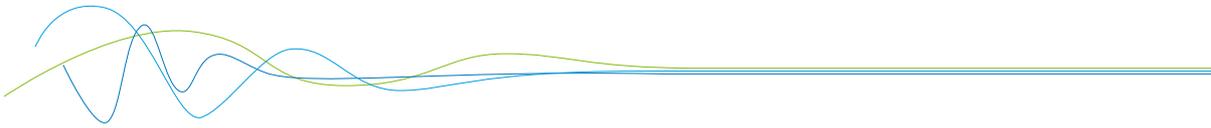
Power supply (observe type plate)	Voltage range Power supply 24 V DC supplied by Evaluation unit	Max. power consumption 1.5 W
Category	II 3D Sensor in Zone 22	
Housing protection class	Sensor = IP65 / Evaluation unit = IP40	

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 ProGap 2.0-BS 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 sender and receiver unit. We 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 sender/receiver 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 of sender

- 1 Power supply 0 V
- 2 Power supply +24 V
- S1 Dip switch for setting the material flow monitoring (Hi/Lo)

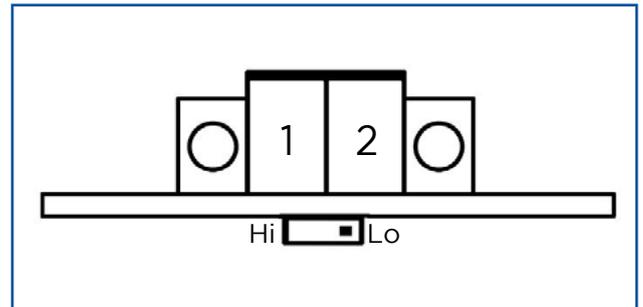


Fig. 7: Electrical connection of sender

6.2 Electrical connection of receiver

- 1 Power supply 0 V
- 2 Power supply +24 V
- S1 Dip switch for setting the level monitoring (Hi/Lo)

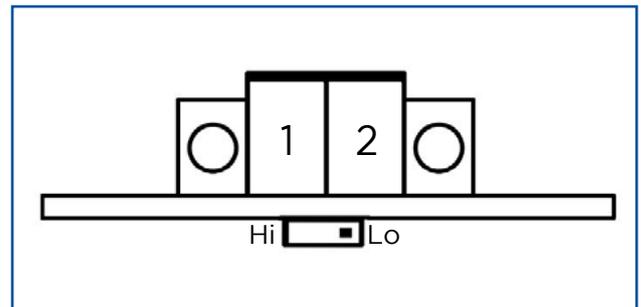


Fig. 8: Electrical connection of receiver

6.3 Electrical connection of Evaluation unit

- 1 NA
- 2 NA
- 3 Power supply +24 V
- 4 Power supply 0 V
- 5 Open collector -
- 6 Open collector +
- 7 NA
- 8 NA
- 9 Sender cable 1 (0 V)
- 10 Sender cable 2 (+24 V)
- 11 Receiver cable 1 (0 V)
- 12 Receiver cable 2 (+24 V)
- 13 NA
- 14 Relay contact NC
- 15 Relay contact COM
- 16 Relay contact NO

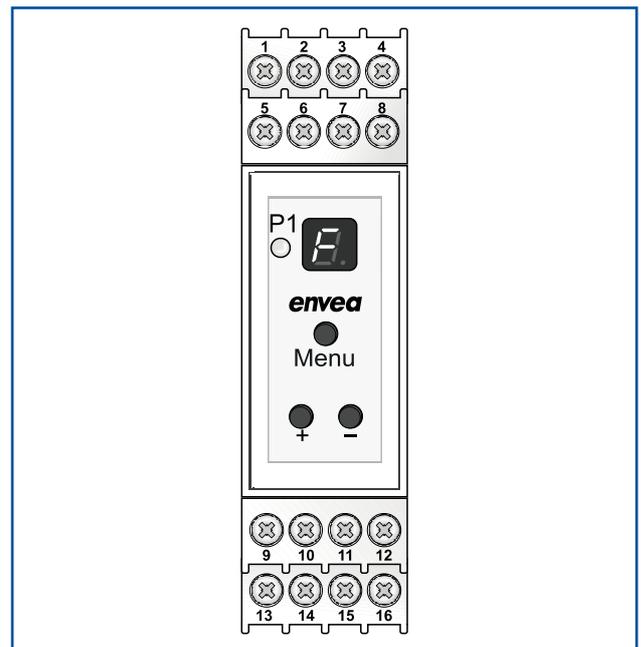


Fig. 9: Electrical connection of Evaluation unit

7. Commissioning

7.1 Basic settings

Make sure that the transmitter and receiver are installed opposite each other. At distances up to 400 mm, the transmitter should be rotated 90° to attenuate the signal. In addition, a dip-switch is installed in the transmitter via which the sensitivity of the material flow detection can be set. If the dip switch is set to “High”, even small movements of material will be detected. For a distance up to 400 mm it is recommended to select the setting “Low”.

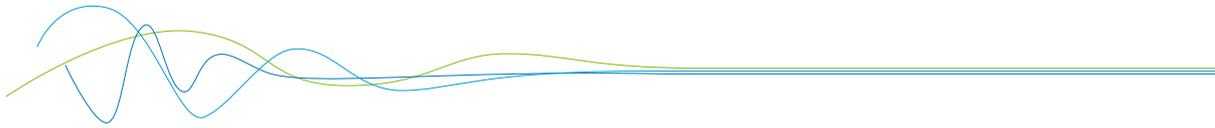
The receiver has the additional option of setting of the level monitoring via a dip-switch. If “High” is selected, larger distances can be monitored, with a distance of up to 400 mm, “Low” should be selected.

For better distinction, an “S” is printed on the transmitter board and the dip switch is red. An “E” is printed on the receiver board and the dip switch is white.

If the sensors are installed correctly, commissioning can be started via the 7-segment display on the Evaluation unit.

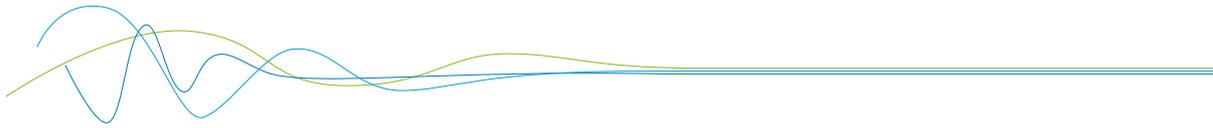
7.2 Menu description

The 7-segment display is deactivated in normal operation. Only the decimal point LED (DP) flashes continuously. If the **Menu** button is pressed for longer than 5 seconds, the Parameter Settings menu is activated. If the Parameter Settings menu is activated, the menu items are shown on the 7-segment display with numerals 1-9. After activating the menu, the **Menu** button can be used to toggle between the individual menu items. The + and - buttons are used to change parameters in the selected menu. Depending on the menu item, the response by the decimal point LED (DP-LED) will change. Menu item 9 is used to quit and save the parameter changes. The changed parameters are saved with the + button; all changes are discarded with the - button. In both cases, the menu is quit by pressing the button. If no entry is made for longer than five minutes, changed parameters will be discarded and the Parameter Settings menu closed.



7.3 Menu structure

Menu point	Function
1	<p>Sensitivity of motion detection</p> <p>DP LED lights up: High sensitivity <i>Even small movements are detected</i></p> <p>DP LED does not light up: Low sensitivity <i>Small movements are ignored</i></p> <p>Status LED P1 lights up: Motion was detected</p>
2	<p>Switching threshold of motion detection (resolution: 20 levels)</p> <p>DP LED flashes slowly: Reduced switching threshold <i>Even small movements are detected</i></p> <p>DP LED flashes rapidly: Increased switching threshold <i>Small movements are ignored</i></p> <p>Status LED P1 lights up: Motion detection is detected</p>
3	<p>Sensitivity of level detection</p> <p>DP LED lights up: High sensitivity <i>High signal strength for higher distance</i></p> <p>DP LED does not light up: Low sensitivity <i>Low signal strength for smaller distance</i></p> <p>Status LED P1 lights up: No material is detected</p>
4	<p>Switching threshold of level detection (resolution: 20 levels)</p> <p>DP LED flashes slowly: Reduced switching threshold <i>A high signal attenuation is required for alarm output</i></p> <p>DP LED flashes rapidly: Increased switching threshold <i>Even low signal attenuation leads to alarm output</i></p> <p>Status LED P1 lights up: No material was detected</p>
5	<p>Switching delay of relay and open collector (resolution: 20 levels)</p> <p>DP LED flashes slowly: Low delay (minimum: 0.5 sec)</p> <p>DP LED flashes rapidly: High delay (maximum: 10 sec)</p> <p>Status LED P1: Flashes in relation to the response delay; the switch on and off time of the LED corresponds to the actual delay time</p>
6	<p>Switching response of relay</p> <p>DP LED lights up: Relay switches if material with motion is detected (filling process)</p> <p>DP LED does not light up: Relay switches as soon as material motion is detected (flow / no flow)</p> <p>DP LED flashes rapidly: Relay switches if material without motion is detected (filling level)</p> <p>DP LED flashes slowly: Relay switches if sender and receiver detect</p> <p>Status LED P1 lights up: Selected option is fulfilled</p>
7	<p>Switching response by open collector (OC)</p> <p>DP LED lights up: OC switches if no error is detected</p> <p>DP LED does not light up: OC switches as soon as material motion is detected (flow / no flow)</p> <p>DP LED flashes rapidly: OC switches if material without motion is detected (filling level)</p> <p>DP LED flashes slowly: OC switches if sender and receiver detect</p> <p>Status LED P1 lights up: Selected option is fulfilled</p>
8	<p>Switching response of status LED</p> <p>DP LED lights up: Status LED P1 indicates the status of the relay contact</p> <p>DP LED does not light up: Status LED P1 indicates the status of the open collector</p> <p>Status LED P1: Indicates the current status</p> <p><i>If the open collector is used for error analysis, the status LED P1 always indicates the state of the relay contact.</i></p>
9	<p>Quit Settings menu</p> <p>With + button: Quit menu and save parameter changes</p> <p>With - button: Quit menu and discard parameter changes</p>



7.4 Start-up procedure

The following points should be checked before the initial start-up:

- Correct installation of the measuring point
- Correct alignment of the polarisation
- Correct connection between the sensors and Evaluation unit
- Heat-up time of at least five minutes

The parameters are set via the 7-segment display for optimal measuring value output. It must first be ensured that the receiver detects the signal from the sender. For this, the beam path between the units must be free and menu items 3 + 4 set so that LED P1 lights up (no material detection).

Once it is ensured that the sender and receiver are detecting, the settings for the motion detection can be made in menu 1 + 2. The motion detection is performed during the process and must be set so that the current material is detected in the process (LED P1 lights up). After the motion detection is set, we recommend checking again whether the receiver detects the signal from the sender during the process (Menu 3+4, LED P1 lights up).

The microwave barrier must then be interrupted completely with the material to be measured. Once the beam path is interrupted, it is necessary to check at menu items 3 + 4 that LED P1 has switched off (material detection).

Once the process parameters are set, the switch-off delay of the relay and open collector output can be set at menu item 5. In menu items 6 + 7, it is then necessary to select the desired switching response for the relay and open collector output. For a better overview, the status LED P1 can be assigned to the state of the relay contact or the open collector at menu item 8.

The open collector output must be supplied actively with a voltage (max. 30 V, 20 mA).

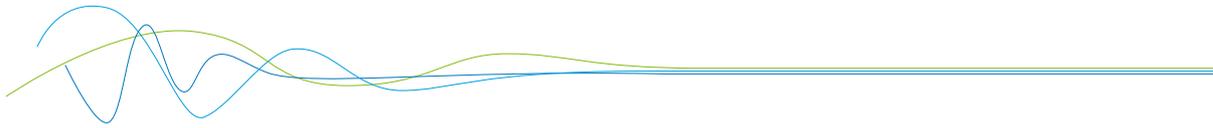
Once all parameters are set properly, these must be saved by pressing the + button at menu item 9.

The initial start-up is now completed, allowing the ProGap 2.0-BS to alarm reliably as soon as the selected limit level is reached.

8. Error signalling

Error	Cause	Action
Relay contact does not switch when filling level is reached	Low bulk density of material	Set microwave barrier for sensitivity
	Low DK value of material	Set motion detection as insensitive
	Sender and receiver do not see each other	Check installation situation, change if necessary
	Polarisation distorted	
Display of an "S" on the 7-segment display	Sender unit was not detected	Check electrical connection; Contact ENVEA Process
Display of an "E" on the 7-segment display	Receiver unit was not detected	Check electrical connection; Contact ENVEA Process
Display of a "P" on the 7-segment display	Parameter saving failed	Perform start-up again and save parameters again

If several errors are active, these are shown sequentially on the 7-segment display.



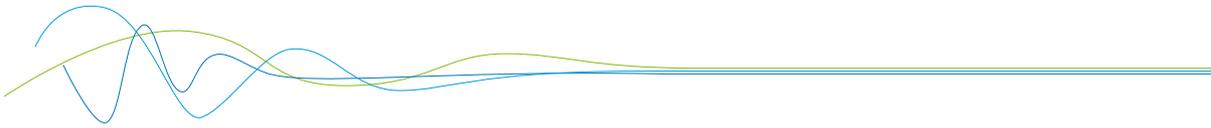
9. Notes

- If a sensor error is detected (disconnected sensor or sender/receiver mixed up), the Evaluation unit will then report “Level detected”.
- In case of a parameter error, basic settings are used and the device continues working.
- A minimum distance of 15 cm to the wall is recommended in order avoid disturbing reflections.
- In case of restricted space or material with low bulk density or low DK value, installation on one side of the vessel is possible.
- Various process parameters are available to protect the sensor, comply with ATEX zones or resolve difficult process conditions.
- If the material is not detected, even with an installation on the same side, a special attenuation foil can be obtained from ENVEA Process.
Process adapters are essential to use this foil.
- In case of distances below 400 mm, we recommend rotating the sender or receiver by 90°.
- The pipe where the measuring point is installed must be earthed.

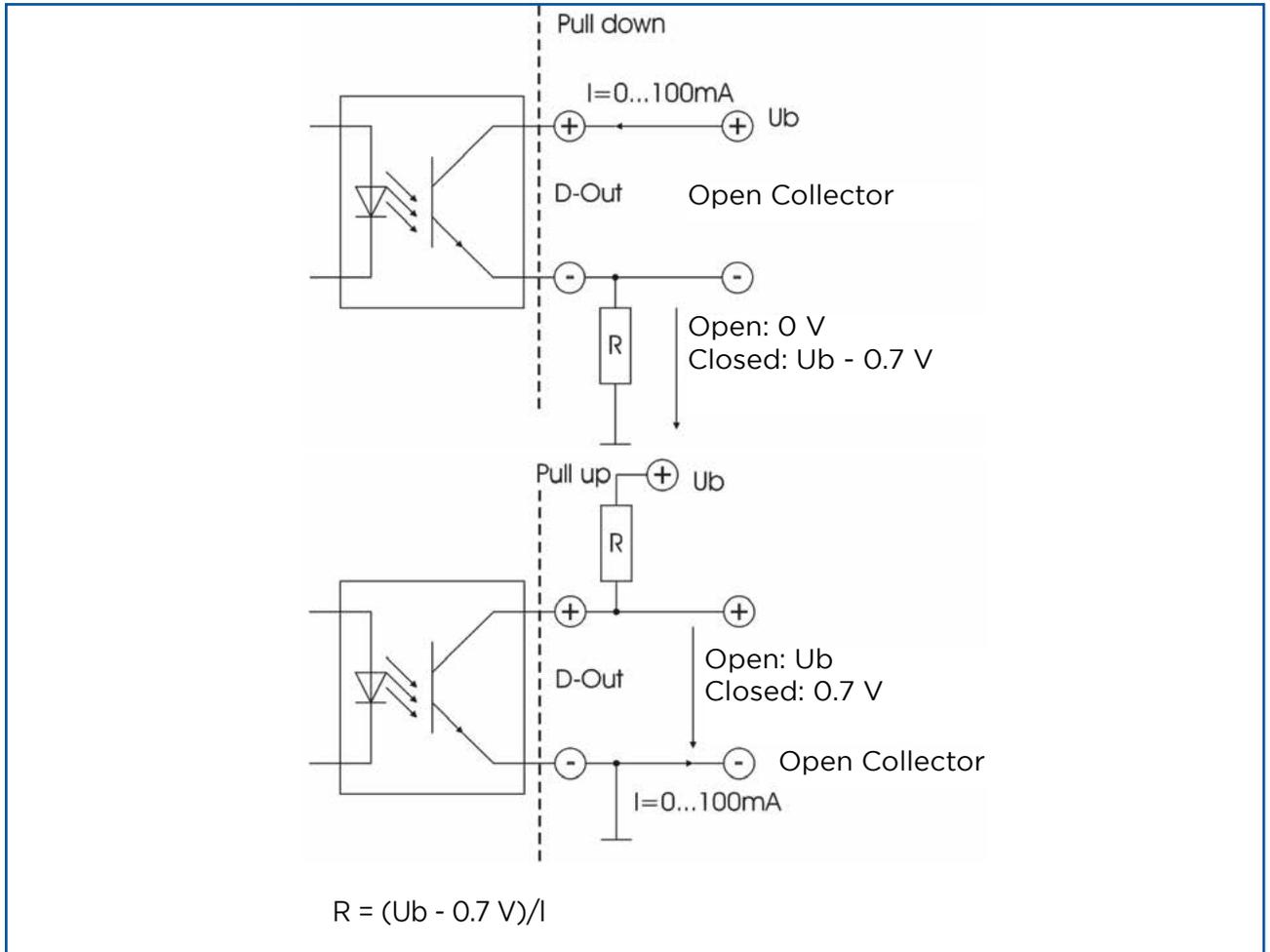
10. Default settings

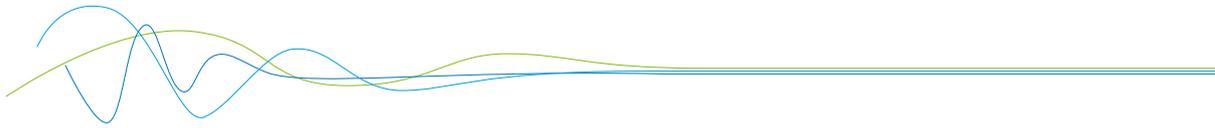
If the + and - buttons are pressed simultaneously for longer than 10 s, all parameters are reset to the default setting. If the parameters are still at the default setting “d” will flash in the display.

Menu point	Parameter	Default	Range	Description
1	Sensitivity of motion detection	1	0 - 1	High sensitivity
2	Switching threshold of motion detection	10	0 - 20	Medium threshold
3	Sensitivity of level detection	1	0 - 1	High sensitivity
4	Switching threshold of level detection	10	0 - 20	Medium threshold
5	Switching delay	1	0 - 20	Switching delay = 0.5 sec
6	Function of relay contact	1	0 - 3	Relay contact switches as soon as the sender and receiver detect
7	Function of open collector	0	0 - 3	Open collector switches upon motion detection
8	Function of LED P1	1	0 - 1	Status LED P1 indicates the status of the relay output



11. Impuls output





12. Technical data

Sensor	
Material	Housing: Stainless steel 1.4571 - sensor insulation: POM
Protection type	IP65
Using in EX-Zones	Cat. 3D  II 3D Ex tc IIIC T85 °C Dc (ONLY with process-adapter)
Process temperature	- 20 ... + 80 °C - 20 ... + 220 °C (with process adapter) - 20 ... + 1000 °C (with ceramic flange)
Ambient temperature	- 20 ... + 60°C
Operating pressure	Max. 1 bar Max. 20 bar (with process adapter)
Detection range	0.1 ... 25 m
Voltage supply	24 V DC supplied by Evaluation unit
Power consumption	Max. 20 VA
Current consumption	Max. 850 mA
Operating frequency	K band 24.125 GHz / 3 100 MHz
Transmission power	Max. 5 mW
Dimensions of ProGap 2.0-BS	Housing: L 107 mm / Ø 52 mm / thread: L 30 mm / Ø G 1
Dimensions of ProGap 2.0-BS Ex	Housing: L 155 mm / Ø 60 mm / thread: L 30 mm / Ø G 1
Cable gland	M16 (Ø 5-10 mm)
Weight of ProGap 2.0-BS	Approx. 560 g
Weight of ProGap 2.0-BS Ex	Approx. 880 g
Evaluation unit	
Supply voltage	24 V DC ± 10 %
Power consumption	3.5 W
Current consumption	120 mA at 24 V
Relay contact	Max. switching power: 250 V AC Max. inrush current: 6 A Max. switching power 230 V AC: 250 VA Max. switching current DC1: 3/110/220 V: 3/0.35/0.2 A Min. switching load: 500 mW (10 V/5 mA)
Weight	Approx. 172 g
Ambient operating temperature	- 10 ... + 45 °C
Dimensions	23 x 90 x 118 mm (W x H x D)
DIN rail fastening	DIN 60715 TH35
Connection terminals cable cross-section	0.2 - 2.5 mm ² [AWG 24-14]
Pulse output	Open collector - max. 30 V, 20 mA
Protection type	IP40



ENVEA Process GmbH

Gutedelstraße 31 · 79418 Schliengen (Germany)

Fon +49 7635 827248-0 · Fax +49 7635 827248-48 · www.envea.global

PART OF THE ENVEA GROUP

