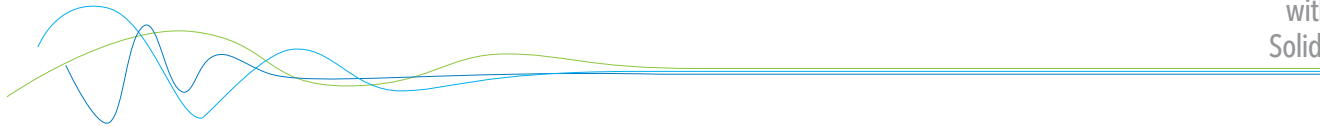


# FlowJam Plus

Material flow monitor  
with blockage detector





## **CONTENTS**

**Page**

1. Function . . . . .	3
2. Safety . . . . .	4
3. Mounting and installation . . . . .	5
3.1 Basic remarks . . . . .	5
3.2 Sensor installation . . . . .	5
3.3 Electrical connection . . . . .	6
3.4 Commissioning . . . . .	7
3.5 Troubleshooting . . . . .	10
4. Notice . . . . .	10
5. Declaration of conformity . . . . .	10
6. Technical data . . . . .	11

## 1. Function

The FlowJam *Plus* sensor is designed to detect movements of bulk solids, with a minimum speed of 0.1m/s, within the detection range (Fig. 1).

The material detection is regardless of the movement direction.

The material detection in pipes, chutes (metallic or non-metallic), hand-over points or free fall sections will be indicated by two switching states of the output relay.

Additionally to the movement detection is the FlowJam *Plus* capable to detect and indicate a plugged pipes, chutes ect. This additional information is gathered out of the "flow-signal" and will be indicated with a separate output relay.

The sensor is able to distinguish between 4 different flow conditions:

- Material flow, in a free pipe
- Material flow, in a plugged condition (e. a. slowly sagging material pile)
- No flow, in a free pipe
- No flow, in a plugged condition

The FlowJam *Plus* can be used, with a suitable microwave-adapter, in high temperature and pressure environments. But the adapter can have some effects on the plugging detection.

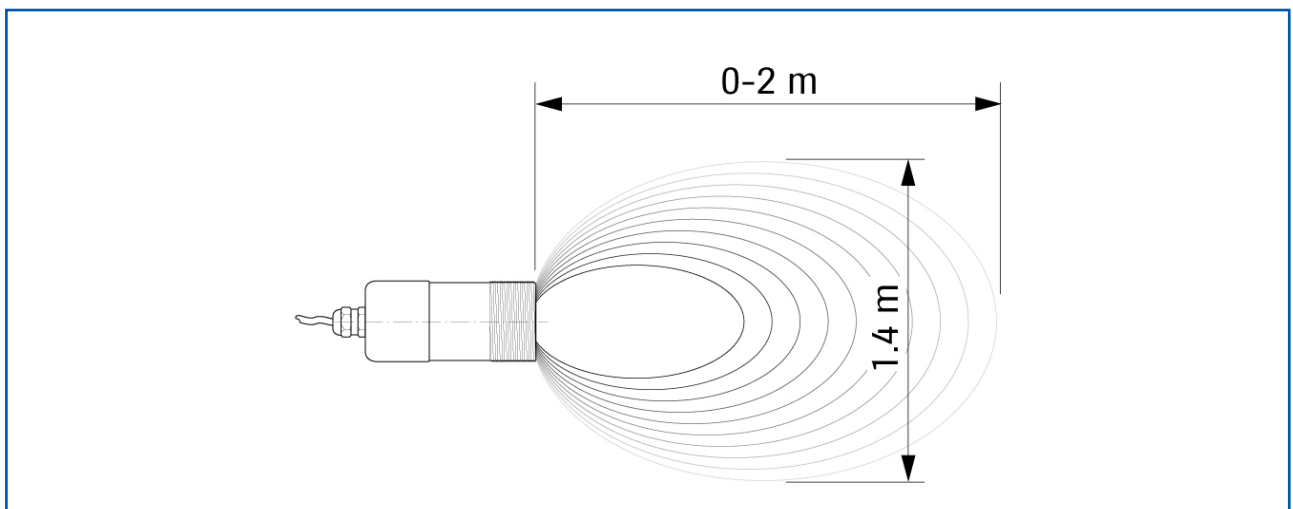


Fig. 1: Detection range

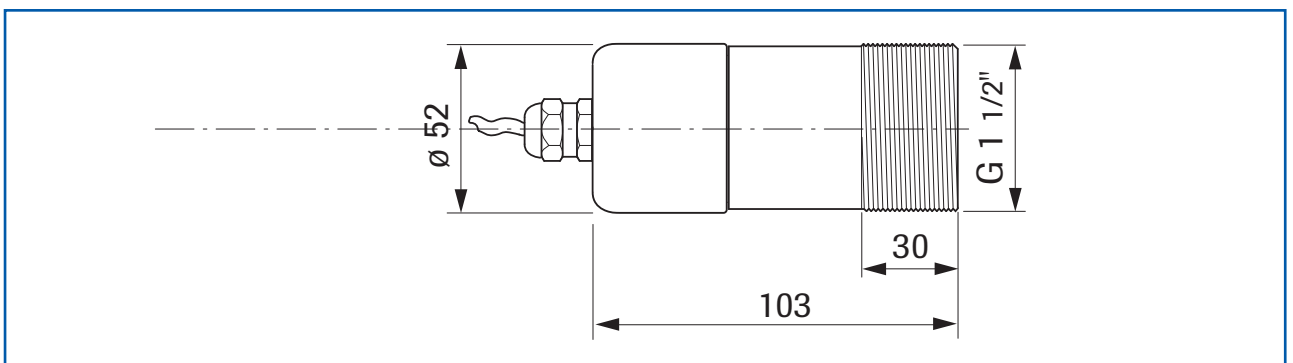


Fig. 2: Dimensional drawing

## 2. Safety

The sensor FlowJam *Plus* was designed, built and tested to be safe and was shipped in safe condition. Nevertheless persons or objects may be endangered by components of the system if these are operated in an inexpert manner. Therefore the operational instructions must be read completely and the safety notes must be followed.

In case of inexpert or irregular use, the manufacturer will refuse any liability or guarantee.

### 2.1 Regular use

- Only original spare parts and accessories of SWR engineering must be used.

### 2.2 Identification of dangers

- Possible dangers when using the sensor are marked in the operating instructions.

### 2.3 Operational safety

- The sensor must be installed by trained and authorised personnel only.
- In case of maintenance-work on the pipe or on components of the FlowJam *Plus* sensor, make sure that the piping is in unpressurized condition.
- Switch off the power supply for all maintenance, cleaning or inspection works on the tubes or on components of the FlowJam *Plus*.
- Before hot work the sensor must be removed from the installation place.
- The components and electrical connections must be checked for damages regularly. If a damage is found, it is to be repaired before further operation of the instruments.

### 2.4 Technical progress

- The manufacturer reserves the right to adapt technical data to the technical progress without particular advance notice. If you have any questions, SWR engineering will be pleased to inform you on possible changes and extensions of the operating instructions.

### 3. Mounting and installation

#### 3.1 Basic remarks

The FlowJam *Plus* has to be mounted in a 45° or 90° angle towards the flow direction of the material. Ensure to mount the sensor in a vibration free environment. If moving parts are within the detection range, please shield those, otherwise these will be detected as well and may cause false flow or plugging indications. Please install the sensor flush with the inner walls to ensure a flawless operation. In case a cavity is in front of the sensor, material can built up and loosen again, which may end up in a false indication of the plugging function. This rule apply as well for the opposite side, ensure a built-up free environment.

#### 3.2 Sensor installation

The sensor installation is in interrelation with the application.

The sensor can be mounted:

- With a G 1½" pipe socket (Fig. 3)
- With a flange (Fig. 4)
- With a pipe clamp (Fig. 5)

Before you install the FlowJam *Plus*, ensure that pressure and temperature are within the technical specifications of the device, and no further microwave-adapters (Fig. 6) are needed. If a microwave-adapter is required, ensure to mount it flush with the inner walls, if not, material could built up in such a recess and influence the plugging detection. If necessary, recesses can be filled in with non-conductive materials such ceramic, POM or equal materials.

When the FlowJam *Plus* is used at nonconductive conveying lines, the sensor can be mounted from the outside, without cut open the line. At such conditions, ensure that no gaps are in between the sensor and pipe, otherwise the FlowJam *Plus* may detect motion in close proximity. (Some rubber hoses have steel mesh embedded, or have a conductive core, these types dampen or even block the microwave. Such hoses should be avoid.)

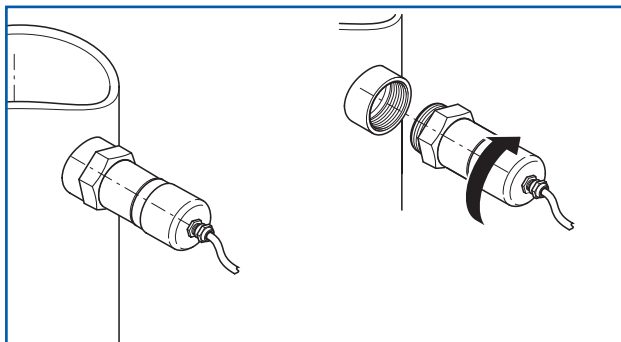


Fig. 3: Thread mounting

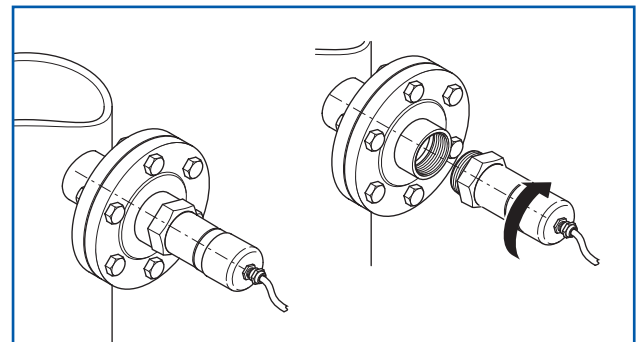


Fig. 4: Flange mounting

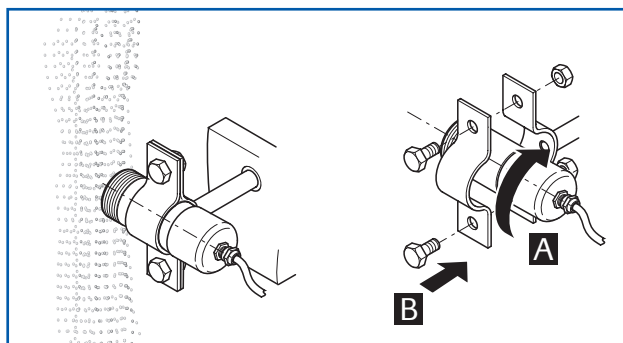


Fig. 5: Mounting with pipe clamp

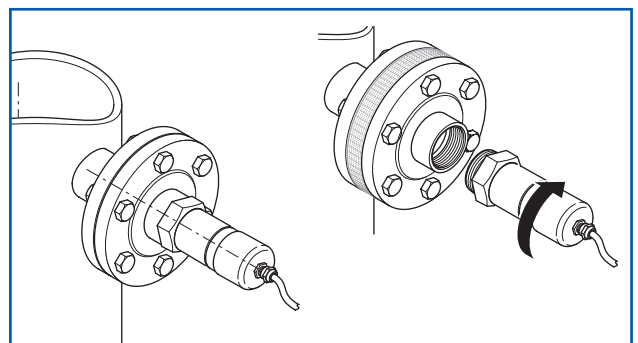


Fig. 6: Mounting with separating flange

### 3.3 Electrical connection

We recommend for the wire connection a double insulated, shielded cable with a wire cross section of minimum 0,75 mm<sup>2</sup> (19 AWG). The sensor is equipped with an EMC cable gland, connect the cable shield with the gland. To calibrate the sensor, a 4 wired cable, between the transmitter and sensor is crucial. If the transmitter will be later used to evaluate only, a shielded 2 wire cable is enough. If a 2 wire cable configuration want to be used, calibrate the FlowJam *Plus* together with the transmitter and a short 4 wire cable, at the designated installation point. After a successful calibration, the transmitter can be installed in different location.

This way of calibration is practical if an existing, FlowJam with converter, system needs to be exchanged. A calibration with a 2 wire configuration, afterwards, is not possible.

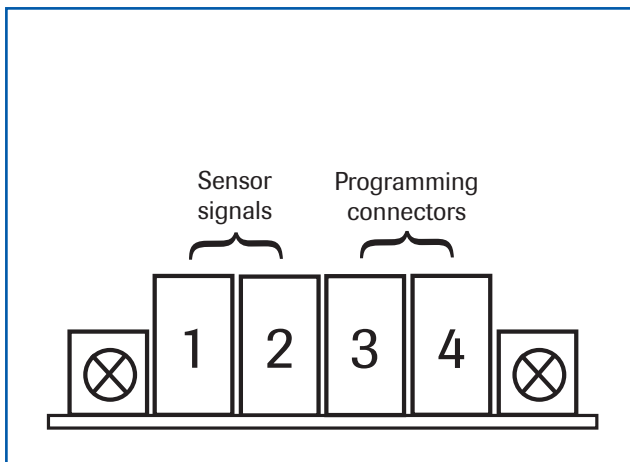


Fig. 7: Wiring diagram for sensor

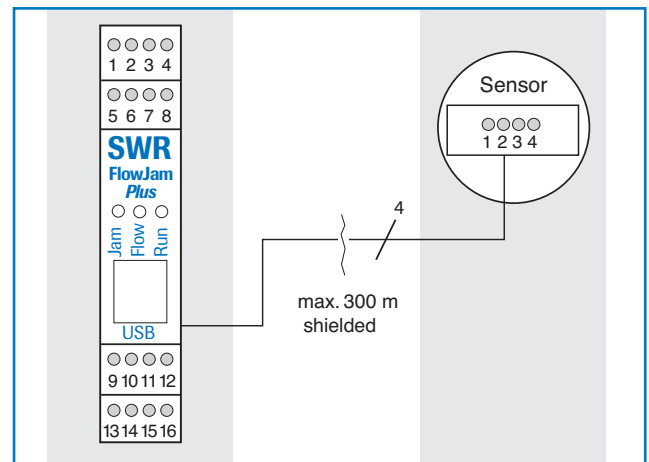


Fig. 8: Sensor pin assignment

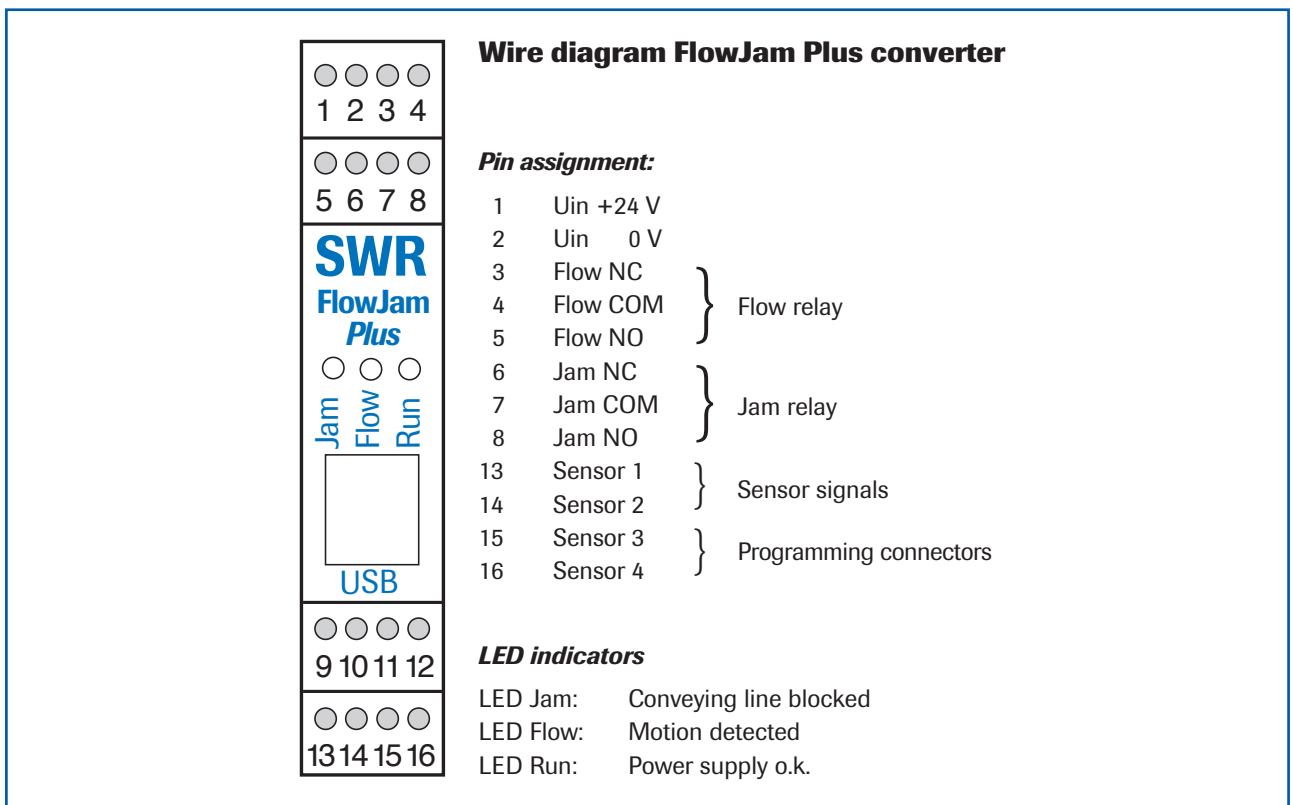


Fig. 9: Block diagram

### 3.4 Commissioning

The FlowJam *Plus* system will be calibrated with the included software.

System requirements:

- Windows PC
- USB-connector

The PC software will be found on the included CD (V1.6 or later).

Installation:

1. Locate and execute the installation routine "FJ custom" (V5.66 or later).
2. Wire up the sensor and transmitter.
3. Power up the system, check for the lit RUN LED.
4. Connect the PC or Laptop via USB to the transmitter (Fig. 10).
  - 4.1. Since Windows 7, the USB drivers should be installed automatically. If not you can find the drivers at the FTDI homepage. Chip name: "FT232RL".
  - 4.2. After a successful driver installation, a "USB Serial Port (COM X)" (Fig. 11) has to appear in the device manager -> Ports (COM & LPT) (the device manager can be found in the control panel).
  - 4.3. The COM Port needs to be in a range from 1-10, otherwise it's not possible to use the SWR software. It can be changed manually, to do so: Right click on the "USB Serial Port (COM X)" Properties -> Port Settings -> Advanced -> COM Port Number.



Fig. 10: DIN Rail electronic FlowJam Plus

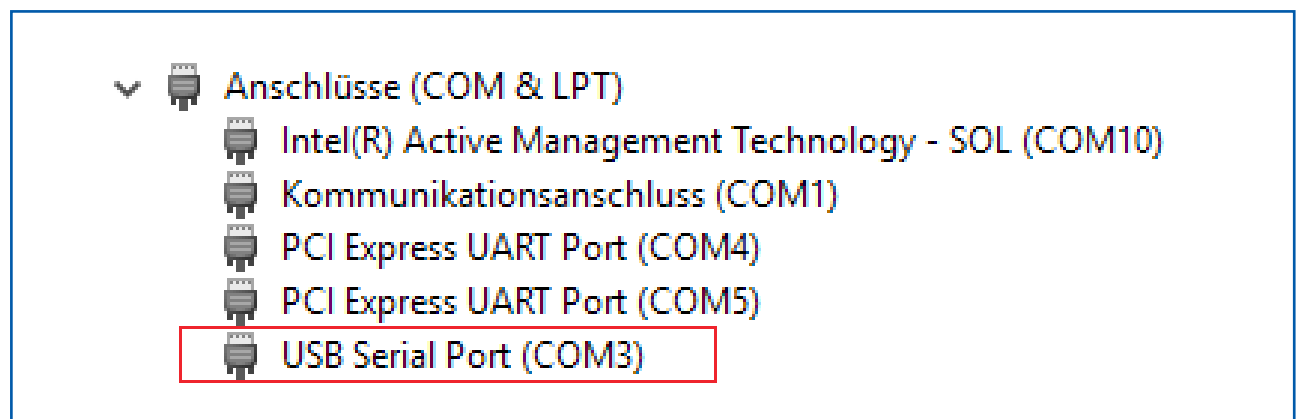
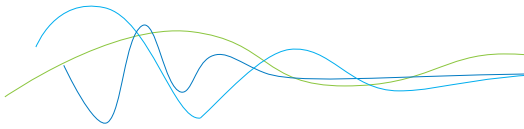


Fig. 11: USB Serial Port at the device manager



5. Start the software and find the matching COM Port in the “System” register. Sensor address 1 is factory default
6. Start the communication by clicking the “ON” check-box. Cyclic Query turn green and start to count up (Fig. 12)

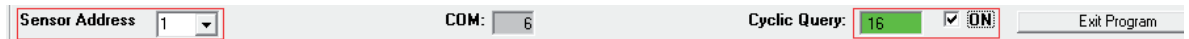


Fig. 12: Communication bar of commissioning software

7. After a successful connection the software should display a pop-up “Parameter read successful”. If this pop-up does appear, change to the register “Flow” and load the parameters manually.
8. Change the register to “Trend”. There will be the “Flow-values” and “Jam-values” trends displayed. The left “Y” scale represents the “Flow-value”, and the right “Y” scale represents the “Jam-value”. If the scaling boxes kept blank, the software will auto-scale the trends.
9. To verify the „Flow-value“, start the conveying, and observe the trend in the software. The “Flow-value” should rise and should stay approx. on the same level. After a few minutes, the conveying should be stopped again, and the “Flow-value” drop. Ensure not to produce a plug, and that there are no residuals in front of the sensor.

An example of a typical trend is shown in figure 13 below.

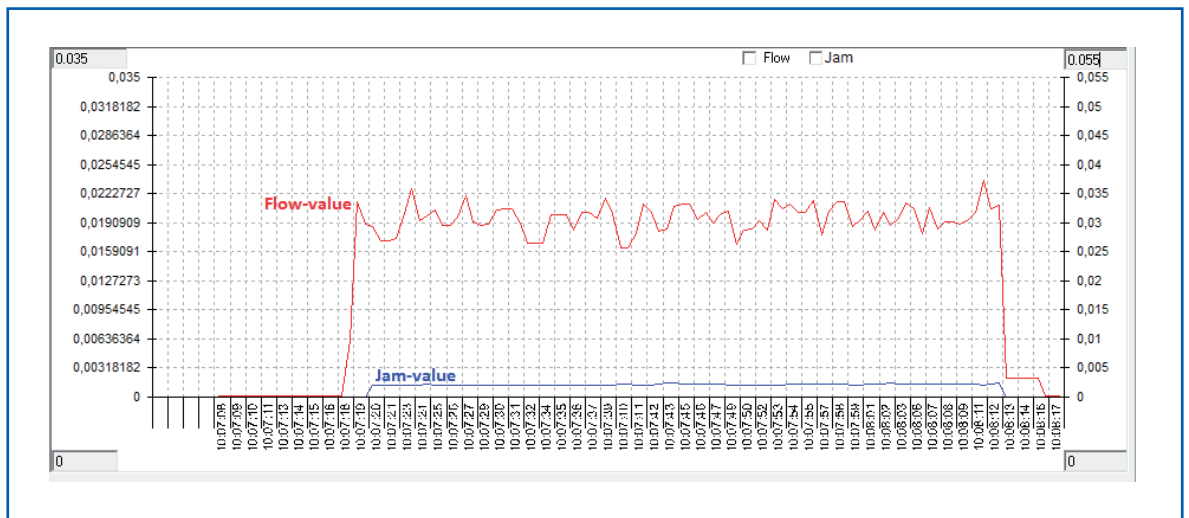


Fig. 13: Flow trend - without plugging

10. If possible, create now a blockage and let the pipe fill up with material. This blockage should be visible in the trends, similar like in figure 14. Unlike the previous trend in figure 13, at the end, the “Jam-value” should rise vice versa to the “Flow-value”. If a forced blockage is not acceptable, you can skip this point, and the FlowJam Plus will use the factory defaults.



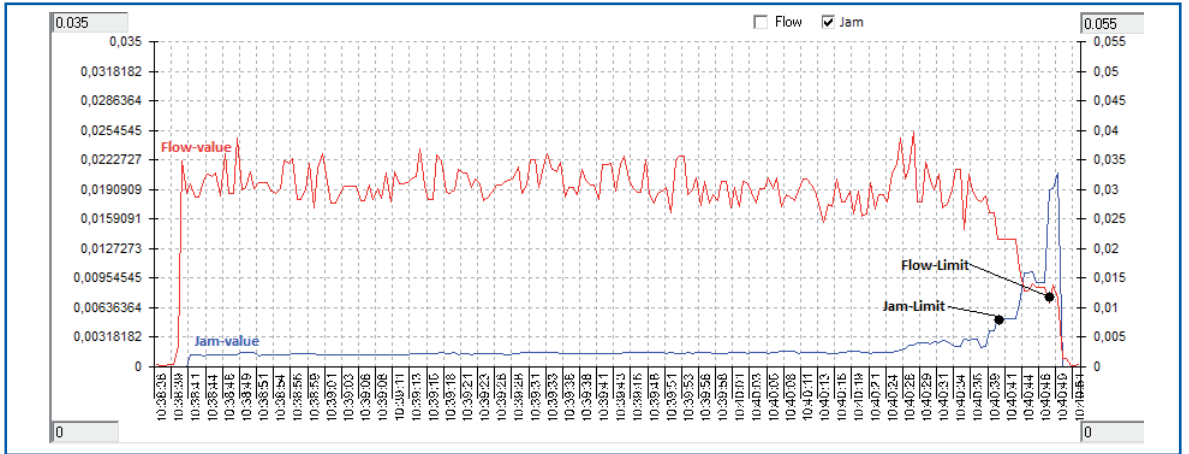


Fig. 14: Flow trend - development of a plug at the end

- The “Flow limit” and “Jam-limit” parameters can be found in the “Flow” register (Fig. 15). The previous trends can be used to adjust the “Flow/Jam-limits”. Consider that only the correct “Jam-values” will be calculated, as soon as the “Flow-limit” will be underrun. A proper example to find the right limits, is shown in figure 14. The calibrated values will be rounded by the software automatically, so the results may vary.

**FlowJam+**

	Values	Parameter	
Flow / Limit	0.000073	0.005000	Flow <input type="checkbox"/>
Full 1 / Limit	0.000000	0.006771	Jam <input checked="" type="checkbox"/>
Sensitivity	<input type="radio"/> High <input checked="" type="radio"/> Low		
<div style="border: 1px solid black; padding: 5px; display: inline-block;">Read</div> <div style="border: 1px solid black; padding: 5px; display: inline-block;">Write</div>			

Fig. 15: Options and measurands of the FlowJam Plus

- After entering the “Flow/Jam-limits” the commissioning is done.

### 3.5 Troubleshooting

If no flow indication is given, even if the “Flow-limit” is set as low as possible and the sensitivity is at high, check following:

- Material characteristics (Is it microwave permeable?)
- Position of the FlowJam *Plus*
- Distance between sensor and material

If the FlowJam *Plus* indicates flow, without any material is conveyed, it's most likely he detects motion of moving parts such screw conveyors or rotary valves or environmental vibrations.

## 4. Notice

- After the FlowJam *Plus* is powered, the start-up time is 5 seconds.
- Batches shorter than 3 seconds, will not produce reliable plugging indications.
- The Flow Jam *Plus* is not capable to distinguish between a filled or empty pipe. The sensor is able to indicate a developing plugging.
- Avoid moving parts, the microwave can be reflected and cause false indications.
- To have a reliable plugging indication, therefore a higher process safety, use both relay outputs and don't apply the “Jam” indication in the PLC, for example, until the “Flow” indication disappear. Crumbling material can cause a plugging indication, this state stays active until movement will detected again.
- Do not adjust the sensitivity to “high” except its doubtless that a flow detection won't work without. Wrong settings can lead to saturated signals and false indication.

## 5. Declaration of conformity

In accordance with the terms:

Number: 89/336/EEC

Text: Electromagnetic Compatibility

The term accordance is acquired by comply with following regulations.

Norm	Date of issue	Norm	Date of issue
DIN EN 55011	2011	DIN EN 61000-4-3	2011
DIN EN 61000-1	2016	DIN EN 61000-6-1	2016
DIN EN 61000-3-2	2015	DIN EN 61000-6-2	2016
DIN EN 61000-3-3	2014	DIN EN 61000-6-3	2011

## 6. Technical data

<b>Sensor</b>	
Housing	Stainless steel 1.4571
Protection system	IP 65
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. 1 bar (standard) / 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	Housing: L 103 mm / Ø 52 mm / Thread: L 30 mm / Ø G 1½
Weight	approx. 560 g

<b>Transmitter</b>	
Power supply	18 ... 36 V DC
Power consumption	approx. 3.5 W
Ambient temperature	- 20 ... + 60 °C
Relay <ul style="list-style-type: none"> <li>▪ Voltage</li> <li>▪ Current</li> <li>▪ Power</li> <li>▪ Max. switched current DC1: 30/110/220 V</li> </ul>	max. 250 V AC max. 6 A max. 250 VA 3/0.35/0.2 A
Communication	USB
Weight	approx. 172 g

