EN

Competence in Solids

SWR engineering

FlowJam

Bulk Flow Detection

Operating Instructions

SWR engineering Messtechnik GmbH

1 General comment

The radar flow detector *FlowJam* indicates the flow of bulk materials which move through the detection range (fig. 1) 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, which can be in metallic or nonmetallic tubes, wells, free fall distances and discharge points, is indicated by a relais.

The sensor distinguishes between two
conditions

- material flow
- material jam or standstill.

FlowJam can be adapted to extreme process conditions like high temperature by a seperating flange equipped with a window especially for microwaves.

The operation of *FlowJam* is postage-free.

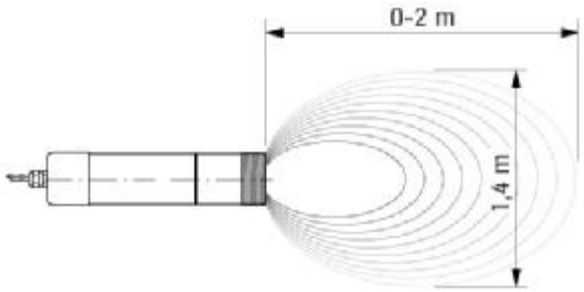

Fig. 1: Detection range

2 Technical data

housing	stainless steel 1.4541
protective system	IP 65
max. ambient temperature	-20…+60 °C
dimensions	see Fig. 2
max. working pressure	1 bar
defection range	0 - 2 m (dependent on application)
min. required material speed for detection	0.1 m/s
power supply	12 - 24 VAC 12 - 24 VDC
power consumption	approx. 1.5 VA
current consumption	70 mA bei 24 V
relay • max. voltage • max. current • capacity	 42 V AC/DC 2A AC/DC 60 VA, 50 W
fall-delay time	1s…15s (continously adjustable)
measuring frequency	K-Band 24.125 GHz ± 100 MHz
transmitting power	max. 5 mW
approvals	FTZ and PTT
weight	approx. 1.0 kg

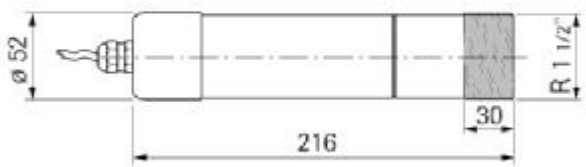

Fig. 2: Dimensioned drawing

3 Installation

3.1 Basic remarks

FlowJam has to be mounted at an angle between 45° and 90° to the flow direction of the bulk material.

Be careful to mount the sensor in an absolutely vibration-free area and that no parts within the detection range are moving, because this might be detected as a material flow.
Moving parts within the area of detection have to be screened.

3.2 Installation of the sensor in general

The installation of the sensor depends on the conditions of the site.

For example, the sensor can be
• screwed directly into an existing thread type R11/2” (fig. 3)
• fixed by a flange (fig. 4)
• mounted with the help of a pipe clamp (fig. 5)

Before installation, make sure that neither the medium temperature nor the pressure within the piping or the container require additional measures like e.g. the mounting of a separating flange pervious for microwaves (fig. 6).

When used with dielectric tubes, detection is carried out via the side of the tube. It is not necessary to make a separate hole into the tube.

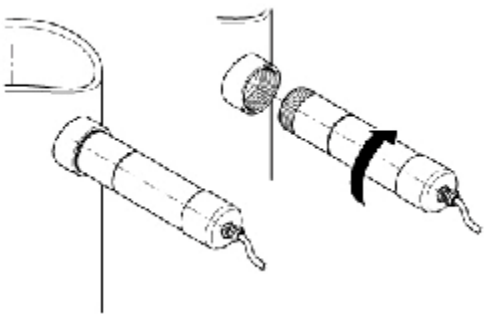

Fig. 3: Thread mounting

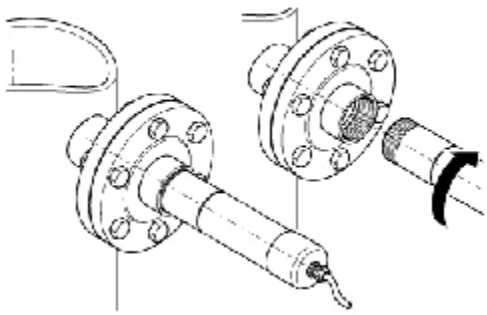

Fig. 4: Flange mounting

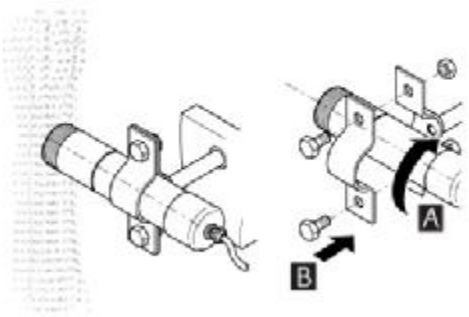

Fig. 5: Mounting with pipe clamp

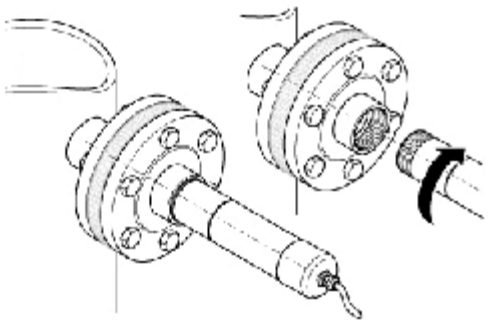

Fig. 6: Mounting with separating flange

3.3 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 *FlowJam* is installed directly above a conveyor belt or if the bulk material to be detected does not show much profile, the sensor should be mounted at an angle of approx. 70 - 80°
(fig. 7).

Based on the formular for the Doppler frequency, the following relations can be pointed out:

$$Df = 2 (V^* \cos a /C) f_o$$

(Fig. 8)

V = resulting speed
Df = frequency shift
f_o = transmitter frequency
a = angle of the sensor to flow direction of the bulk material

Angle a approx. 90°: mainly the speed of the change of the dumping heigth is measured.
Angle a approx. 0°: mainly the material speed is measured.

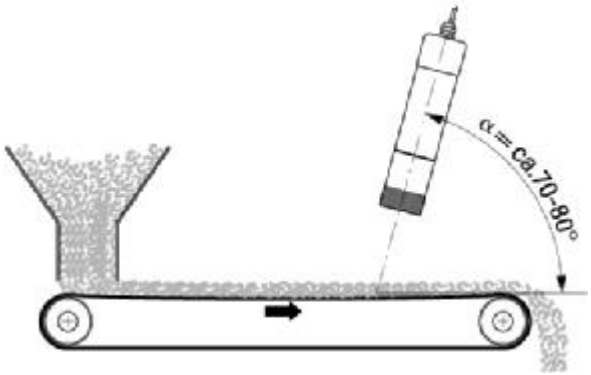

Fig. 7: Installation above conveyor belt

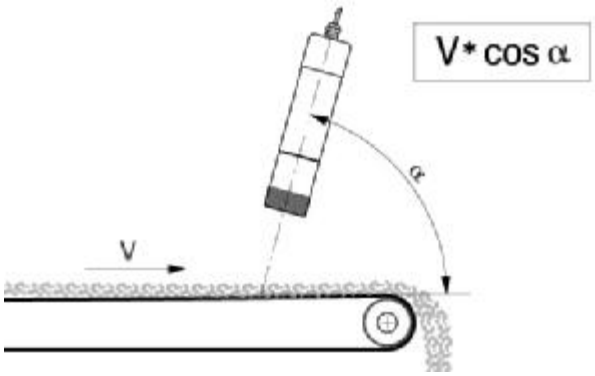

Fig. 8: Determination of sensor's angle

4 Connection

The connection of the sensor has to be carried out according to fig. 9.

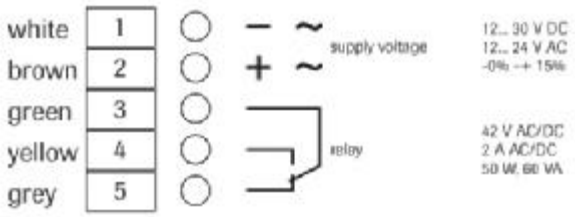

Fig. 9: Wiring diagramme

5 Inbetriebnahme

All operational controls required for the alignment are shown in fig. 10.

Switch S1

The position of switch S1 determines whether the relay is attracted up or released for material flow.

Position “2“ (off) causes alarm in case of material flow:

• material flow	- relay is attracted
	- contacts 3+4 closed
• no material flow	- relay is released
	- contacts 3+5 closed

Position “1” (on) causes alarm when there is no material flow:

• material flow	- relay is released
	- contacts 3+5 closed
• no material flow	- relay is attracted
	- contacts 3+4 closed

LED 1

The light-emitting diode LED 1 always lights up when a material flow is detected. This indication does not depend on the position of switch S1.

Adjusting sensitivity switch S2, poti P1, poti P2

Please proceed as follows:

- Poti P2 fine adjustment of sensitivity at the left lay
- Switch S2 coarse adjustment amplification to position “1” (on)
- Poti P1 delay time at the left lay

Now start your machine as to have material flow. Increase the amplification with the help of P2 until LED 1 lights up. If the range of control of P2 is not sufficient, put switch S2 into position 2 (off) and repeat the alignment procedure.

If you now interrupt the material flow, LED 1 must light off.
At last, adjust the delay time according to your requirements with poti P1 in the range of 1s...15s.

- Switch S1: change-over working current/ normally closed contact
- Poti P1: delay time relay
- Switch S2: coarse adjustment of sensitivity
- Poti P2: fine adjustment of sensitivity

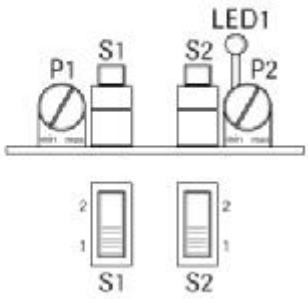

Fig. 10: Position of the operational controls

6 Troubleshooting

If LED 1 does not light up even at the largest possible amplification, it may be possible that the maximum detection range has been restricted by one of the following causes:

- properties of the material flow
- positioning of the location of installation
- distance between the sensor and the material flow is too large

If LED 1 lights up without an existing material flow and with minimal amplification adjusted on S2 and P2, it is very likely that the sensor detects the motion of other material or vibrations.

7 Notice

- Avoid reflections on moving parts of the -installation.
- Do not adjust the amplification of poti P2 higher than necessary.

8 Decleration of conformity

Conforms to the following Product Specifications:

Ref. No.	date	Ref. No.
EN 55011	Edition 90	ENV 50140
EN 60555-2	1987	EN 50141
EN 50081-1	1992	ENV 50142
EN 50082-1	1992	
pr EN 50082-1	1994	
pr EN 50082-2	1994	

The product herewith complies to requirements of the EMC Directive 89/336/EEC.