

# Greenbank Energy Solutions Inc's FlowSwitch FS 510



## Agenda

1. Applications for a microwave flow monitor
2. FlowSwitch FS 510 – the gold standard in flow monitoring
3. How does it work?
4. Where can it be used?
5. What is unique about it?
6. Benefits
7. Available options
8. Technical data
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# Typical applications for a microwave flow monitor

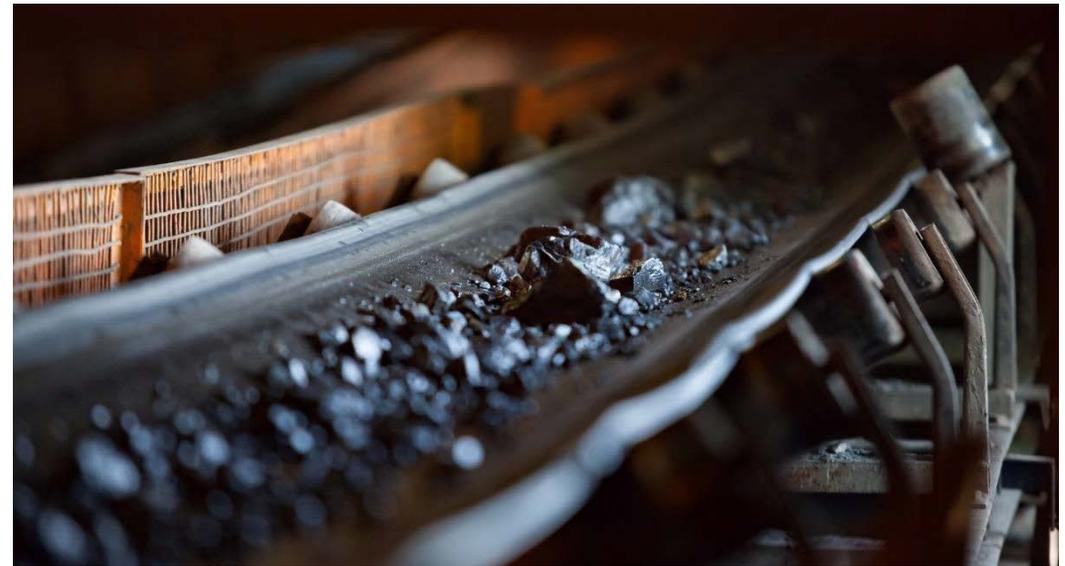


- The purpose of Greenbank's microwave FlowSwitch FS 510 is to
  - **detect flow / no-flow** of solids, granulates, powder or moving objects in pipes, chutes, conveyor belts, transfer bins, distributors, elevators, silos or in free air,
  - **identify inadequate or missing material, plugs, blockage or standstill,**
  - **trigger an alert signal or switch process equipment on or off** as required.



# Typical applications for a microwave flow monitor

- A microwave flow monitor is the best choice
  - if reliable flow monitoring is very **important for process quality**,
  - if flow monitoring shall be **contact-free**, from **distance**, through plastic windows, with **sticky material buildup on sensor** or in **dusty and steamy environment**,
  - if **easy installation and retrofit** into existing processes is important.



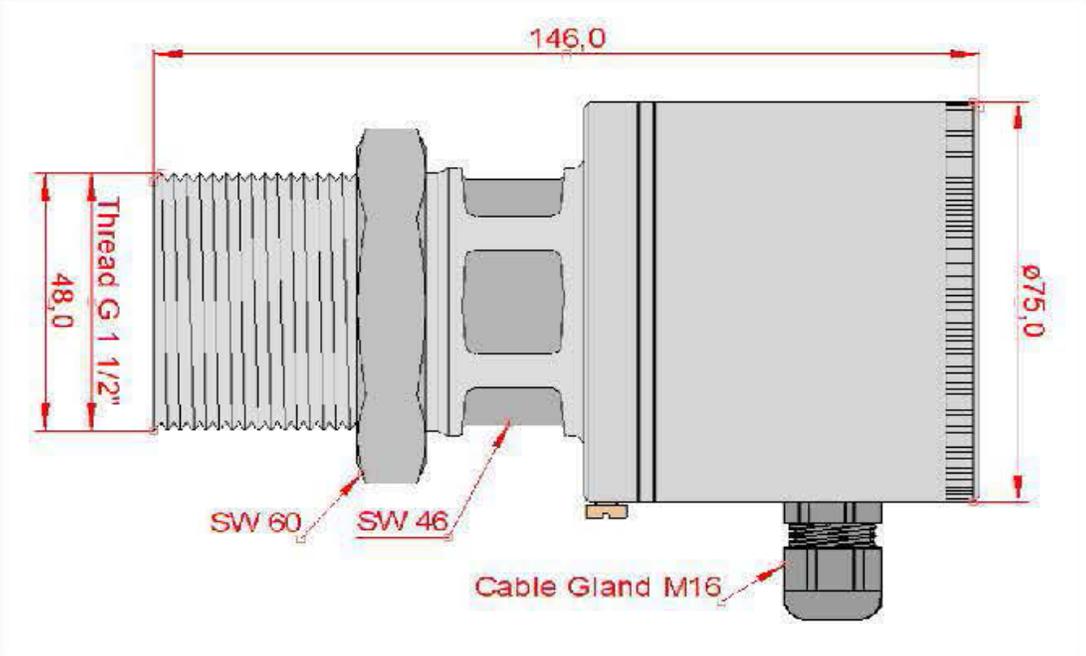
# Typical applications for a microwave flow monitor



- **Typical industries and applications** for this equipment are:

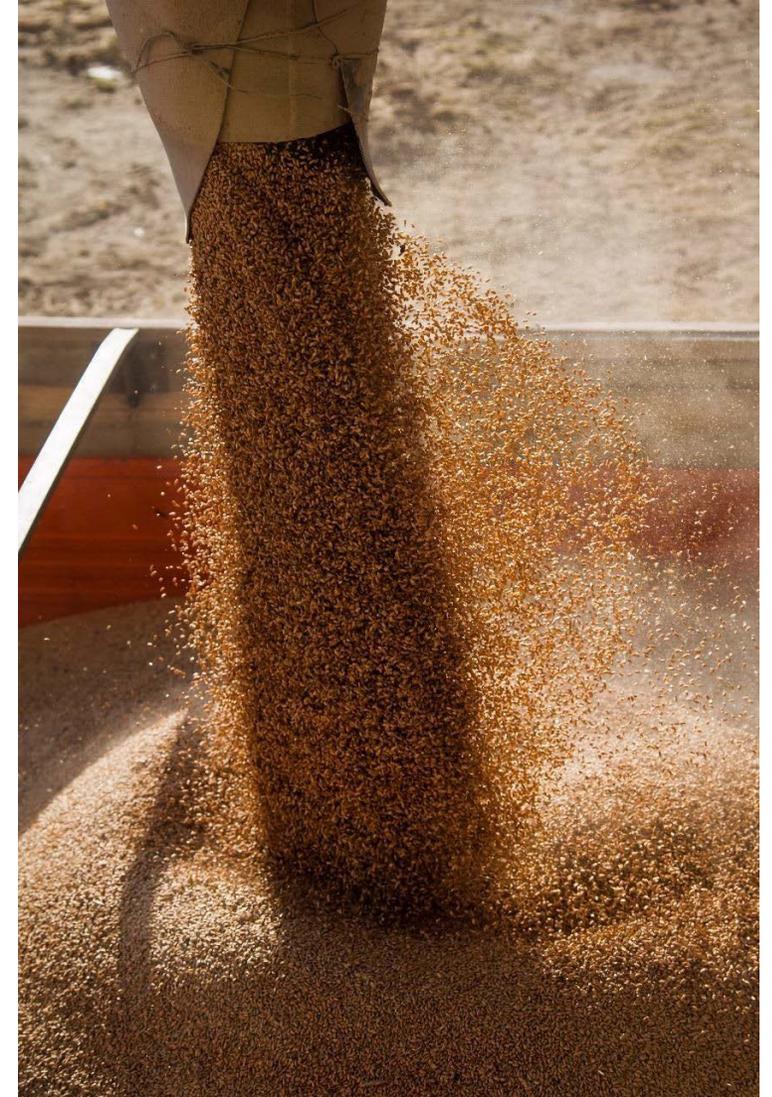
- Agriculture industry
- Air treatment / dosing of active carbon
- Animal feed production
- Biomass
- Cement industry
- Chemistry
- Coal plants
- Coating
- Foundries
- Gypsum Incineration
- Lime plants
- Minerals
- Plastic Manufacturing
- Power Plants
- Silo loading / unloading
- Steel industry
- Truck unloading
- Wood & Pellets

# FlowSwitch FS 510 – the gold standard in flow monitoring



## FlowSwitch FS 510 – How does it work?

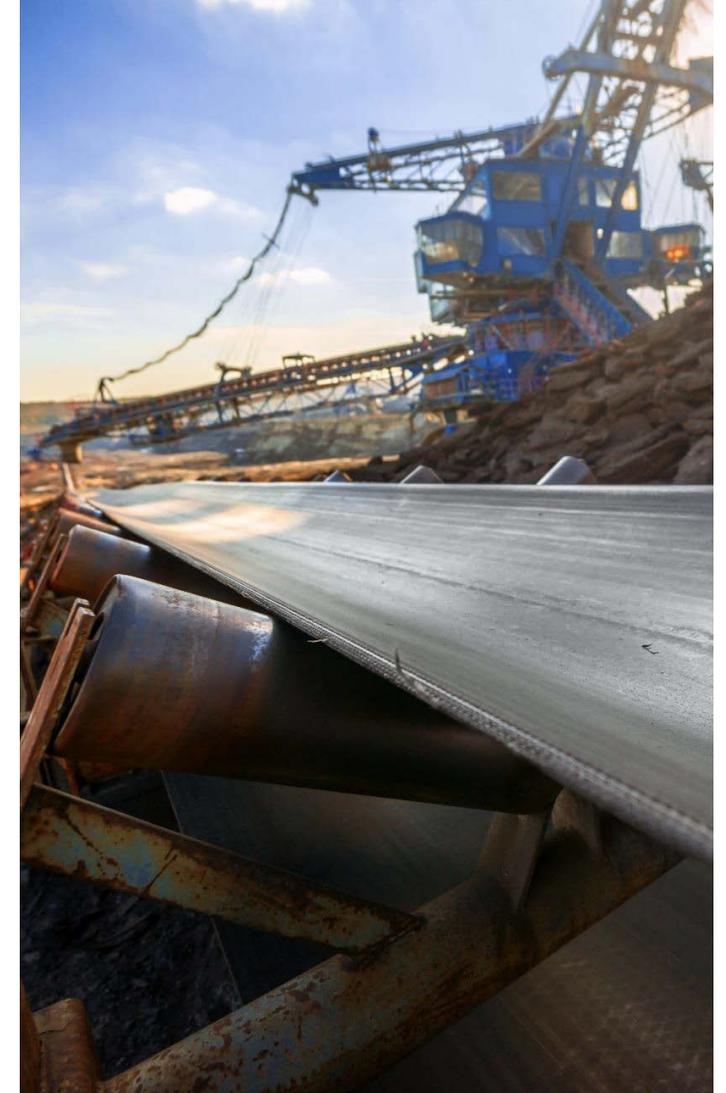
- The measurement principle of the FlowSwitch FS 510:
  - The sensing head transmits a **low-power, non-invasive microwave beam**
    - The beam is reflected from the flowing particles or product
    - The frequency and amplitude of the reflected signal is analyzed and allows to identify whether the product is moving and how much is passing (Doppler effect)
    - If a certain value is reached, a **relay is switched**
    - The measurement is **very reliable** and **sensitive**
    - Any **product and material** can be detected



# FlowSwitch FS 510 – How does it work?

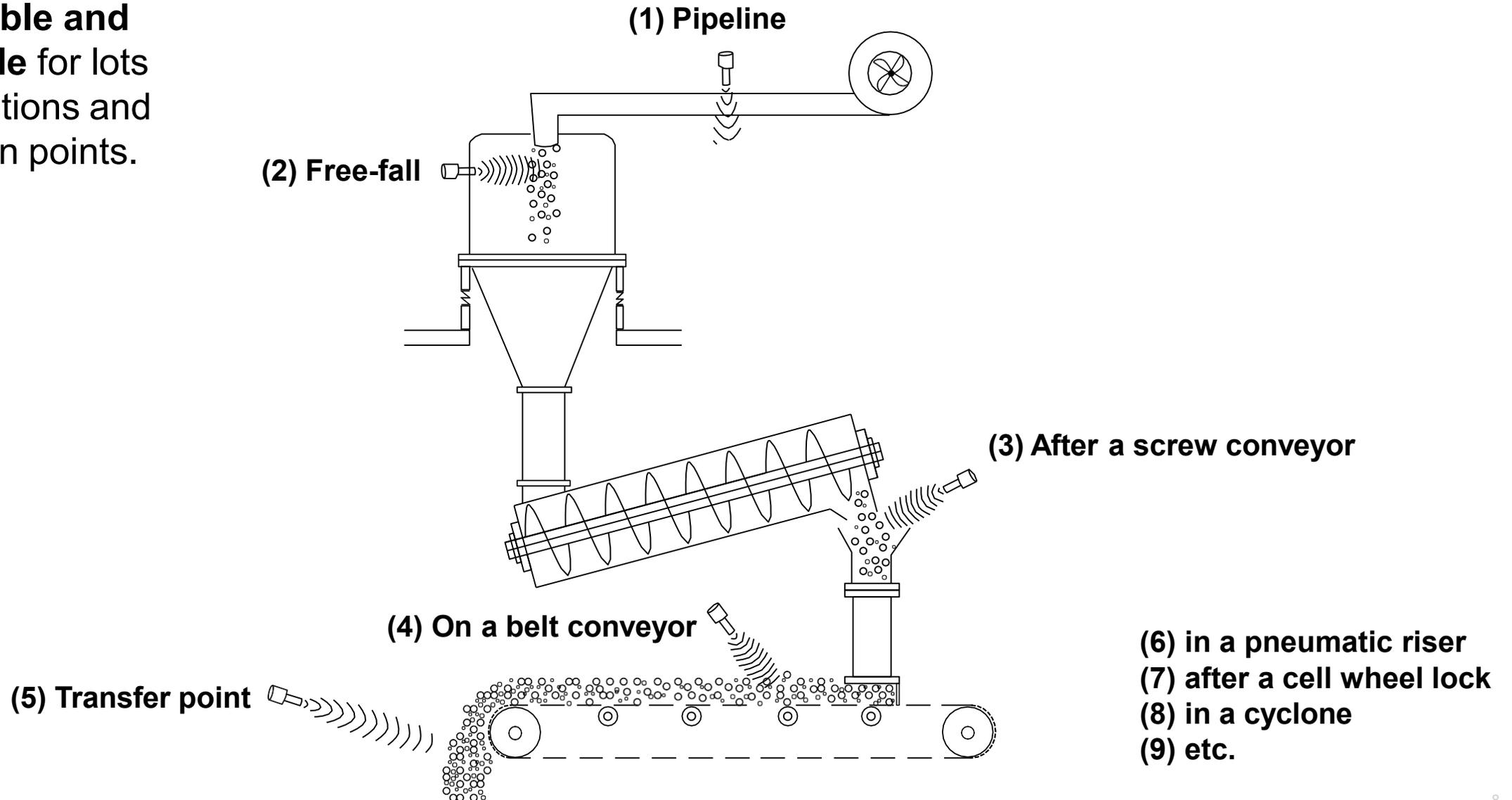


- The measurement principle of the FlowSwitch FS 510:
  - **Contact-free** measurement, does **not interfere with the material**
  - Works within a **distance of several metres** (depending on the material)
  - Works with material moving **very slowly or with high speed**, works with any kind of grain and particle size
  - **Dirt and material stuck on the sensor face** does not distract measurement
  - Microwaves can **permeate non-conducting material** and are not blocked by plastic or ceramic pipes and safety windows
  - **No moving parts, wear- and maintenance-free**, also with **abrasive material**



# FlowSwitch FS 510 – Where can it be used?

Very **flexible** and **adjustable** for lots of applications and installation points.



# FlowSwitch FS 510 – What is unique about it?



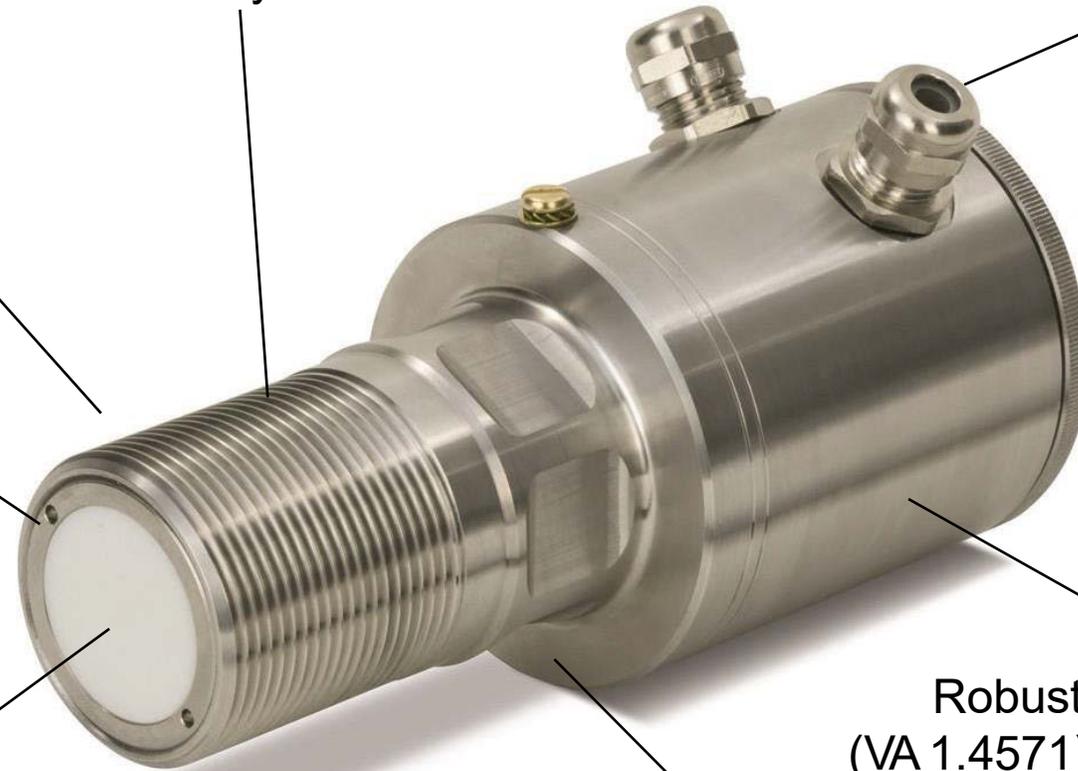
7 different socket types for any application (steel, V2A, V4A with different lengths and angles)

External G 1½" thread for easy installation

Flow / no-flow signal at relay contact output

Well-protected design, insulation for IP65

Integrated control electronic, no separate transmitter



Robust stainless steel construction (VA 1.4571), suitable for many applications

Teflon or optional ceramic surface to withstand abrasive materials and for high pressure applications

Compact design, only D75 x 146 mm, can easily be retrofitted into existing processes

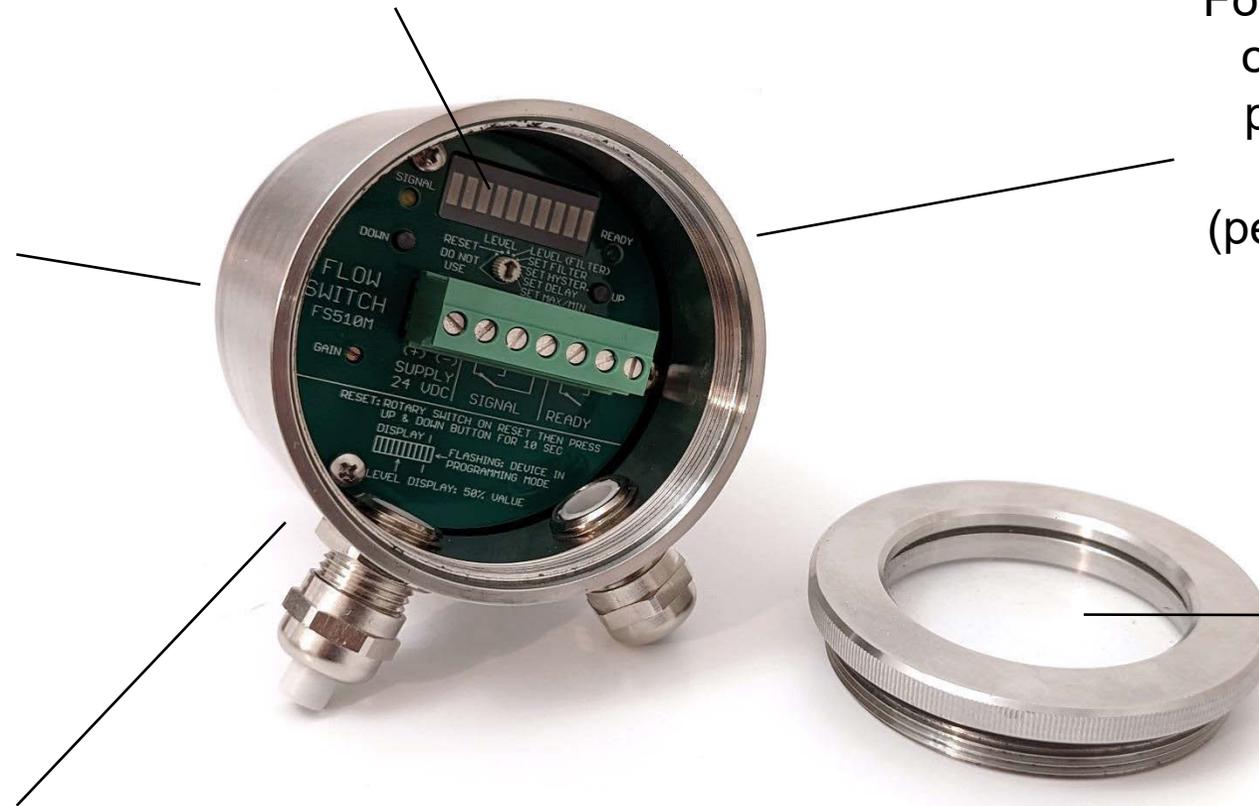
# FlowSwitch FS 510 – What is unique about it?



LED bar visualized parameters like field intensity and makes adjustment and calibration easy

For process temperatures of -20°C to +85°C and pressure up to 6/12 or optionally 30/60 bar (permanently/temporarily)

Active self-monitoring for increased reliability, alarm signal is available on an additional relay



Metal cover or glass window in front of LED bar and switches \*

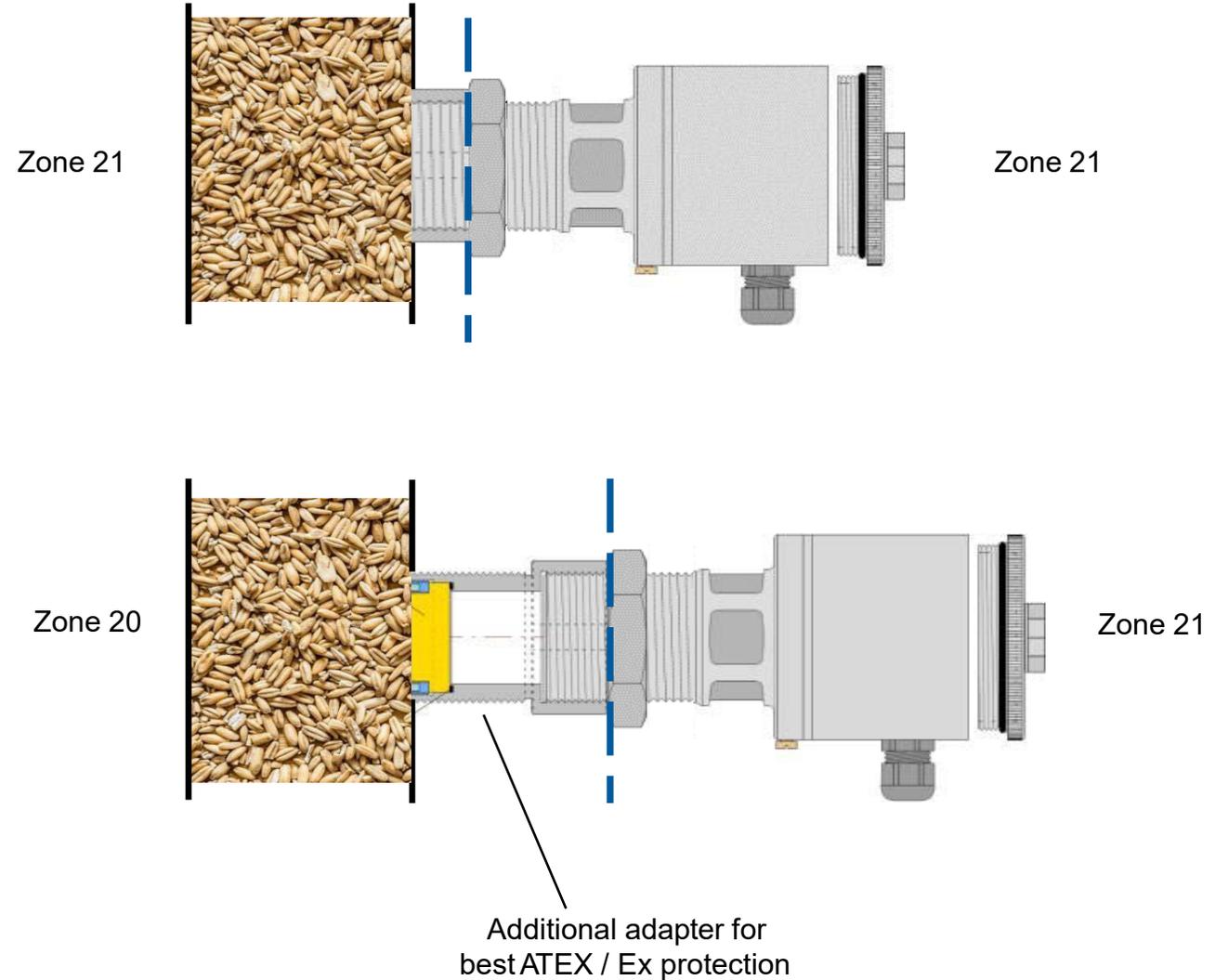
Highly flexible with adjustable amplification, filter (0-16s), hysteresis (0- +/-40%), delay (0-16s), e.g. useful to adjust sensor to non-continuous flows

\* Glass window only for Non-ATEX version

# FlowSwitch FS 510 – What is unique about it?

Two options for use in ATEX / Ex-Zone available. The FS 510 offers the **best Ex protection in the market:**

- ATEX Zone 21 or
- ATEX Zone 20 / 21  
(with additional adapter and socket)



# FlowSwitch FS 510 – What is unique about it?



**Most robust system in the market –**  
it was built and tested for extreme environments



*Dust test of FS 510*



*Waterjet test*



*Overpressure test*



*Tested until 100bar*

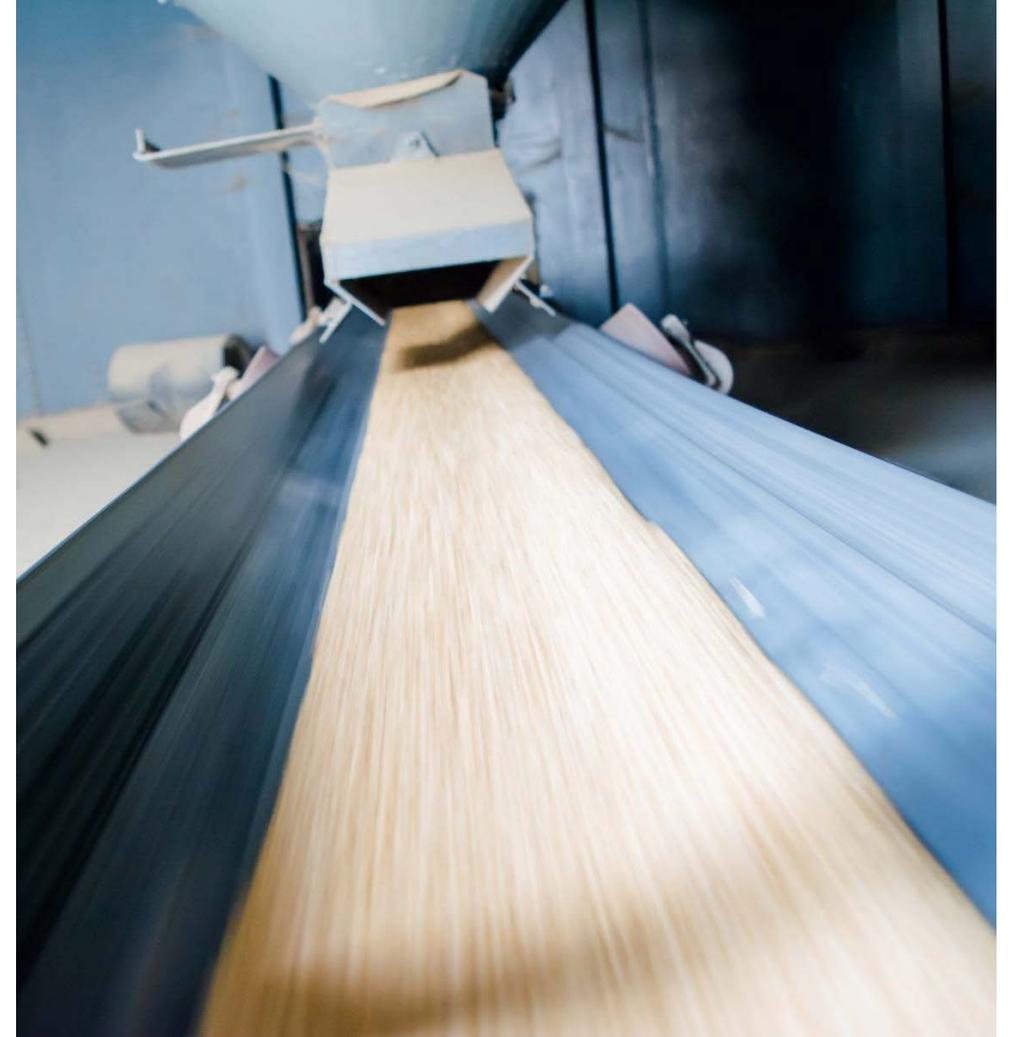
# Benefits of flow monitors

- **Detect errors and stabilize production** by preventing inadequate or missing material, plugs, blockages or standstills
- Ensure **constant product quality**
- **Reduce plant wastage and improve plant efficiency**



# Benefits of microwave-based flow monitors

- **Very reliable measurement principle**, is neither affected by material buildup on sensor nor by dust
- Can **detect smallest material movement**, works with smallest particles
- **Contact-free measurement**, does not interfere with the material, can even detect through plastic safety windows
- **Wear- and maintenance-free**, also with abrasive material
- **Very flexible**, can be used with nearly all material and at multiple installation points



# Benefits of Greenbank's FlowSwitch FS 510



- **Robust stainless-steel design**, well protected for years of operation in a harsh environments
- **100% safe operation** due to **active self-monitoring**
- **High pressure level** possible (up to 30/60 bar) - for operation in extreme environments
- **High Ex / ATEX protection class** (up to zone 20)
- **Highly adjustable** to the process, with stepless settings for amplification, filter, hysteresis and delay, **can measure continuous and non-continuous material flows**
- Very sensitive, works within a **distance of several meters** from the material.
- **Compact and easy to install / retrofit**, fast startup and intuitive adjustment with integrated LED bar



# Options available for FlowSwitch FS 510



## FlowSwitch FS 510

Sensor material	Teflon / PTFE (standard) Ceramic (140004)
Cover plate	Stainless steel without window (standard) Stainless steel with glass window (optional for Non ATEX version)
Pressure	0 - 6 bar permanently, 12 bar temporarily 0 - 30 bar permanently, 60 bar temporarily (140018)
Ex / ATEX	Non ATEX (standard) Ex / ATEX for zone 21 (V14037) Ex / ATEX for zone 20/21 (V14037) and special adapter AD 510 (V14038) necessary
Installation	Welded socket type 1 (180000): 22.5mm long ; material: steel Welded socket type 2 (140019): 22.5mm long ; material: V4A stainless steel Welded socket type 3 (140013): 48.0mm long ; material: steel Welded socket type 4 (140023): 48.0mm long ; material: V4A stainless steel Welded socket type 5 (140012): 45° angle; material: steel Welded socket type 6 (140022): 45° angle; material: V2A stainless steel Mounting plate with socket type 7 (V14031): socket to 99.5mm * 99.5mm mounting plate; material: V2A stainless steel  Type 1-4 for high conveying speed, type 5-6 for low conveying speed

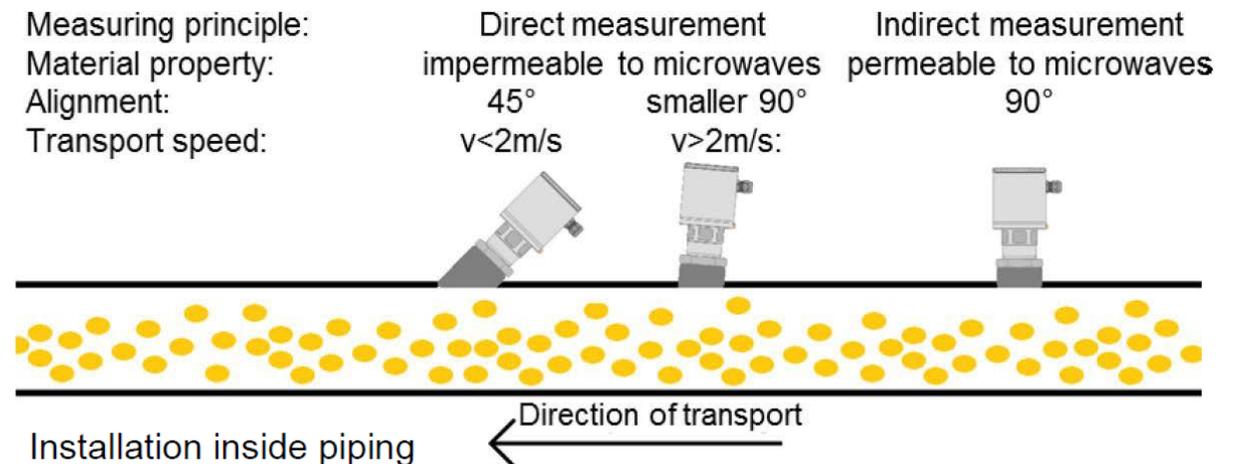
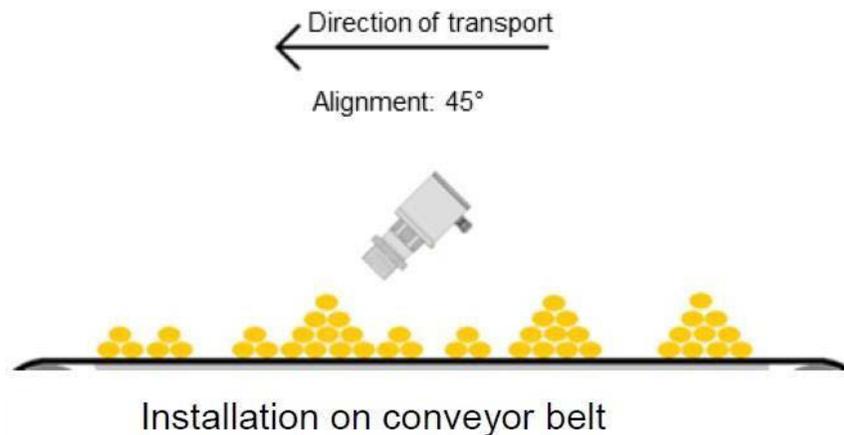
# Technical Data FlowSwitch FS 510



FlowSwitch FS 510	
Supply voltage	24 VDC (18 VDC – 30 VDC); max. 80 mA
Output	1x changeover signal contact; 1x normally open monitoring / „ready“ contact
Switching voltage, power, current	30 V AC/DC; min. 10 µA & max. (2A); 30 VA or 30 W
Cable inlets & connection	2x M16; cable glands, plugable screw terminals
Cable length	No cable supplied
Connection	G 1 ½“ external thread to screw into a socket and to be fixed with a nut
Housing material	Stainless steel (V1.4307)
Sensor surface	Teflon (PTFE), ceramic as option
Transmission frequency and power	24.125 GHz (24.00 GHz - 24.25 GHz); 10 dBm
Dimension & weight	D75 x 146mm; 1,3 kg
Ambient temperature	-20°C to +60°C (non-condensing)
Process temperature	-20°C to +85°C
Pressure	0 - 6 bar (30 bar as option) permanently 0 - 12 bar (60 bar as option) temporarily
Protection class	IP 65
Ex-area / ATEX zone	Zone 21 or Zone 20/21 as option
Adjustment	Manual adjustment of amplification, filter (0-16s), hysteresis (0- +/-40%) and delay (0-16s)

# Tips for installation

- To be installed where the highest material distribution is – with a preferably consistent material flow
- Installed in a 45° angle above a conveyor belt or flush with the inside wall of a pipe (check out the graphic below)
- When operating multiple microwave sensors in close proximity, ensure they will not interact
- Keep a distance to moving equipment like cell wheel lockers



# Relevant questions before the order



## Application Questionnaire Flow Monitoring with FlowSwitch510M

Below are some questions that are necessary to select the right unit version for your application.

**Please complete this sheet and return it to us.**

- 1.) What is the inner diameter of the delivery line?
- 2.) What is the outer diameter of the delivery line?
- 3.) What material is the delivery pipe made of?
- 4.) How is the material conveyed?  in free fall  pneumatically
- 5.) Nominal pressure PN (pressure nominal)?
- 6.) What type of bulk material is conveyed?
- 7.) What is the particle size of the bulk material?
- 8.) Is the material abrasive?  yes, very strong  yes, but weak  no
- 9.) Is the material adherent?
- 10.) What is the temperature of the material at the measuring point?
- 11.) What is the moisture content of the material at the measuring point?
- 12.) What is the flow velocity of the material or the free-fall height?
- 13.) What flow rates can be expected?

- 14.) At what quantity/concentration should the switching point be?
- 15.) Is an Ex version required?  yes  no
- 16.) Other requirements/comments:

# Limitations

- The FS 510 can reliably detect flow / no-flow, but it should not be confused with a more expensive calibrated device to measure volume or mass flow





*Flow monitoring system FS 510 mounted  
on the edge trim extraction*

- Kampf Schneid- & Wickeltechnik GmbH
- Development of cutting and wrapping machines for production of plastic foils
- 2 FlowSwitch FS 510 are installed on each foil cutting machine to monitor the continuous extraction of the cut off and separated foil edges
- The FS 510 are installed on the pneumatic lines which transport the foil edge by means of suction
- The measurement is contact-free and very reactive. The relays trigger an alarm signal.
- More than 30 FS 510 in operation in systems from Kampf, some for more than 10 years