

Baghouse Filter Dust detector

Agenda

1. Applications for filter monitor
2. The tribo-electrical principle - How does a FlowSwitch work?
3. The products in detail - FS 700, FS 710 and FS 750
4. Comparison of the products
5. Options available
6. Benefits
7. Tips for Installation
8. Limitations
9. References
10. Comparison with other measurement principles

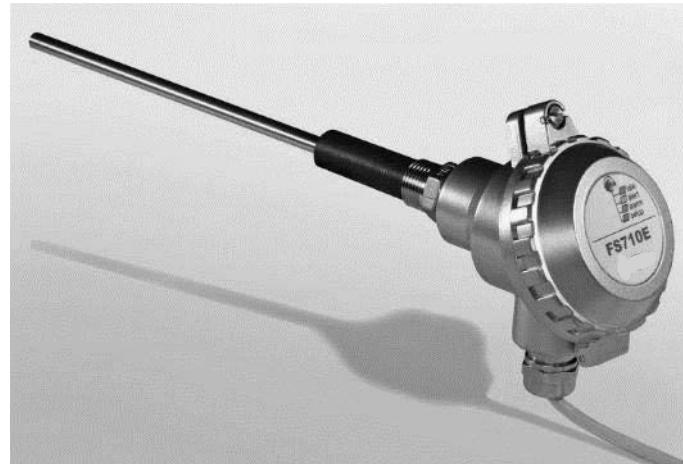
Greenbank offers a full program of dust monitors



Mütec's customers can choose between three different dust monitors for filter break detection:



FlowSwitch FS 700



FlowSwitch FS 710



FlowSwitch FS 750

Typical applications for dust monitors



The purpose of our dust monitor / filter break detector is

- to measure the dust concentration **after a bag / cartridge filter unit** (on the clean air site),
- to **identify at an early stage if a filter is damaged** (by cracks, fractures or assembly errors) or when it brakes,
- to allow the operator to replace a damaged or broken filter quickly – without loosing production time and without polluting the shopfloor or environment.



Typical applications for dust monitors



Dust monitors / filter break detectors are especially important

- if **air is heavily contaminated** to reduce cleaning of following ducts
- if **air is recirculated** to keep it 100% clean and ensure nothing gets contaminated
- if air is exhausted and **external emission limits are strict** (no police filter necessary!)
- if the **dust shall be collected and reused** in the production
- if the following ducts shall not be regarded as **Ex-area**



Typical applications for dust monitors



Typical industries for this equipment are:

- wood industry
- paper industry
- medical and pharmaceutical industry
- chemical industry
- cement manufacturing
- smelter, aluminum & steel manufacturing
- bakeries and flower processing
- mills
- fertilizer production
- glass production
- surface cleaning processes
- power stations and others.

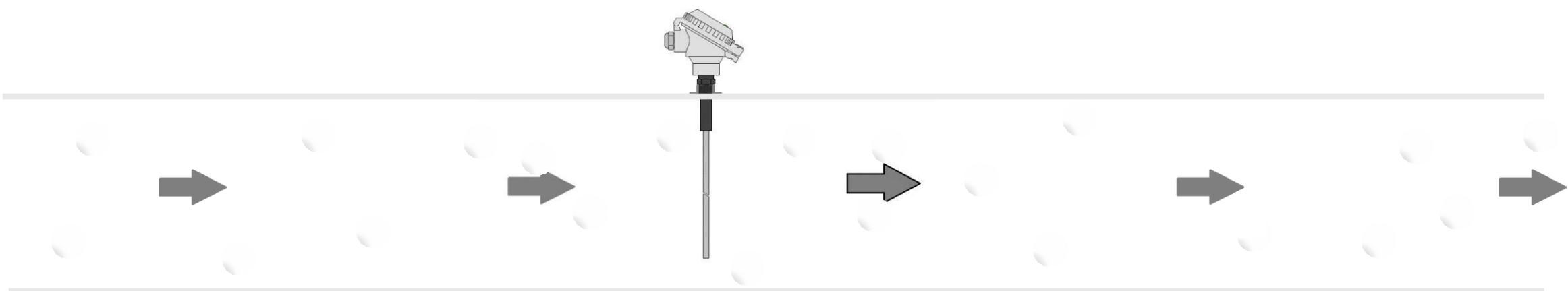


How does a FlowSwitch work?



With the enhanced tribo-electrical measurement principle:

- Particles collide permanently with each other and are charged in a natural way
- These particles are detected from the sensor via charge transfer when they are flying next to the sensor rod or touching it
- Deposits on the sensor do not affect the measurement – as they are not charged
- The more particles, the higher the transferred charge, the higher the detected concentration
- This is used to trigger alarm signals (FS 700, 710, 750) or create an analog output (FS 700, 750) which can be used to switch alarms or as trend indicator for the dust concentration



Three different FlowSwitch for different applications and price level



(1) FlowSwitch FS 710 - cost-efficient and robust

- Two alarm switches for pre and main alarm, but no analog output
- Easy automatic calibration
- Robust design, best Ex / ATEX protection, to be used maintenance-free for many years



(2) FlowSwitch FS 750 – with analog output

- Analog output (4-20 mA) to measure particle load
- Easy automatic calibration
- Robust design, best Ex / ATEX protection, to be used maintenance-free for many years, with separate transmitter



(3) FlowSwitch FS 700 – the most flexible solution

- One alarm switch OR an analog output (4-20 mA) to measure particle load
- Very flexible with rod lengths up to 800mm, process temperature up to 290°C, manual calibration and adjustable settings (sensitivity, dampening)
- Different materials available, also for food production (PTFE, FPM, silicone)



(1) FlowSwitch FS 710



(1) FlowSwitch FS 710



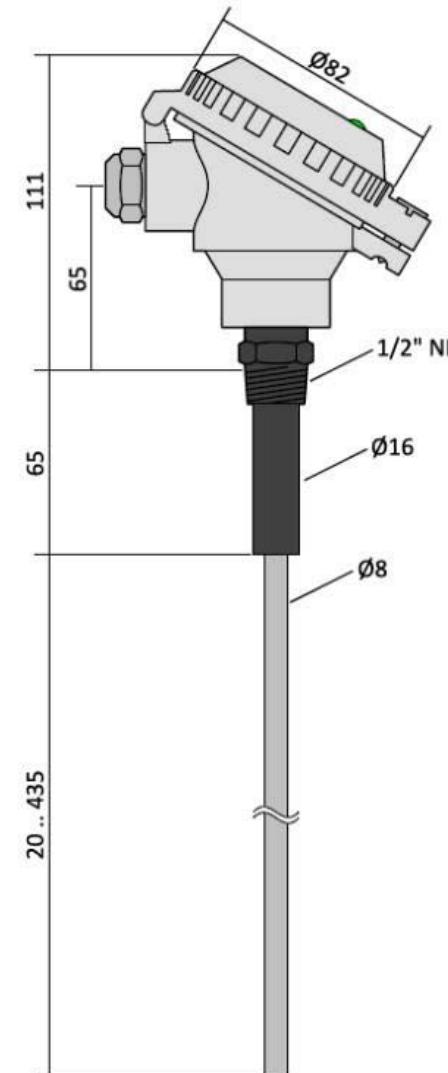
- **Very sensitive**, measures a single particle flying by
- **Triggers pre and main alarm** on two independent relays, allows the operator to replace filter in time. No analog output.
- **Design optimized for long life**, completely **free of maintenance**
- Best **Ex-area / ATEX zone 20 / 21** (rod / housing) rating on the market
- **Cost efficient and robust** – nearly 1.000 installations worldwide



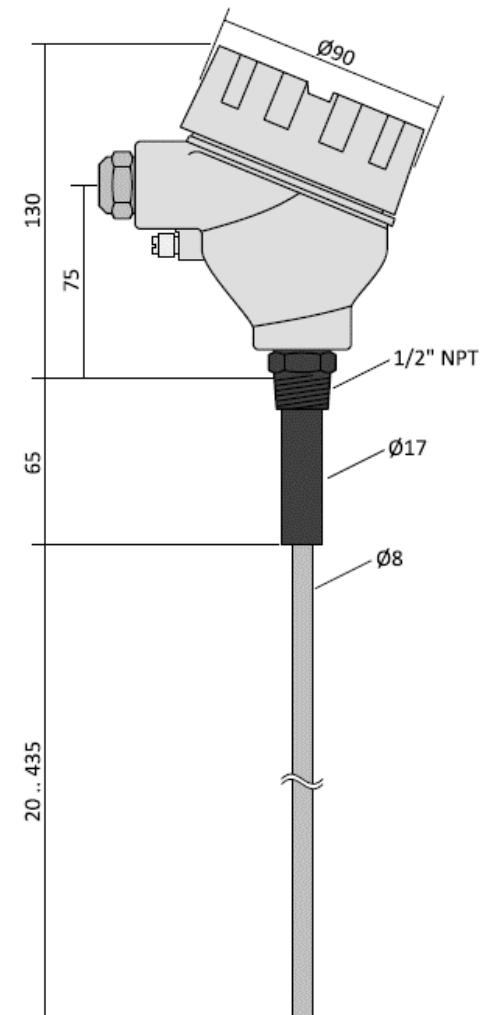
(1) FlowSwitch FS 710



- **Fast setup due to automatic calibration** (clean air measurement over 10 min, sets alarm levels automatically at 4x and 16x of the clean air particle load. Adjustment of sensitivity / amplification possible)
- A **multi-color LED** signals the dust load level, easily visible for the operator at the device (non ATEX version)
- **Compact design** with integrated control electronic, no separate transmitter.
- Easy installation with **NPT 0,5"** thread
- **Sensor rod in different lengths:** 250 mm, 500mm or customized from 85-500mm, rod can also be cut by customer to size



FS 710/750
Non ATEX version



FS 710/750
ATEX version

(2) FlowSwitch FS 750



(2) FlowSwitch FS 750



- **Very sensitive**, measures a single particle flying by
 - **Precise system** with analog output (4-20 mA) to measure the particle load (trend signal). No relay / switch included.
 - **Design optimized for long life**, completely **free of maintenance**
 - Best **Ex-area / ATEX zone 20 / 21** (rod / housing) rating on the market
 - **Cost efficient and robust** – based on the reliable and well-proven technology of the FS 710 with more than 1.000 installations worldwide



*FS 750
Non ATEX
version*

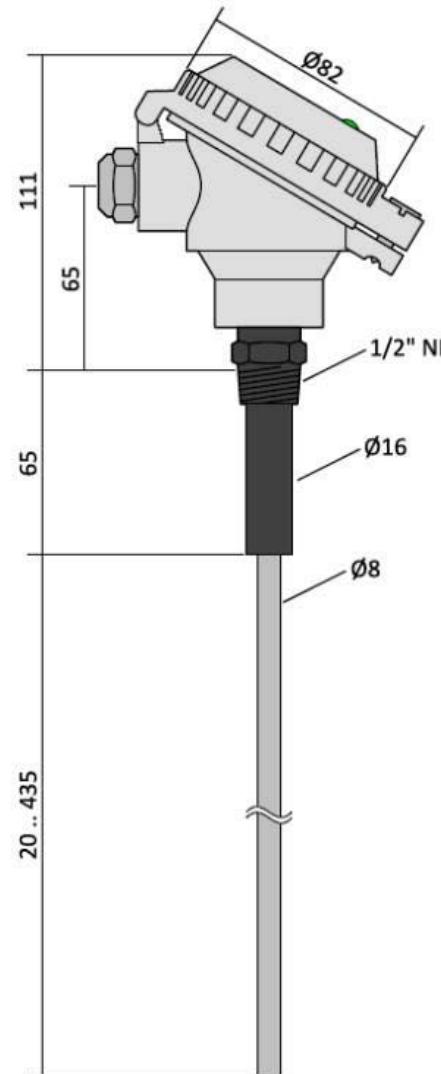


FS 750
ATEX
version

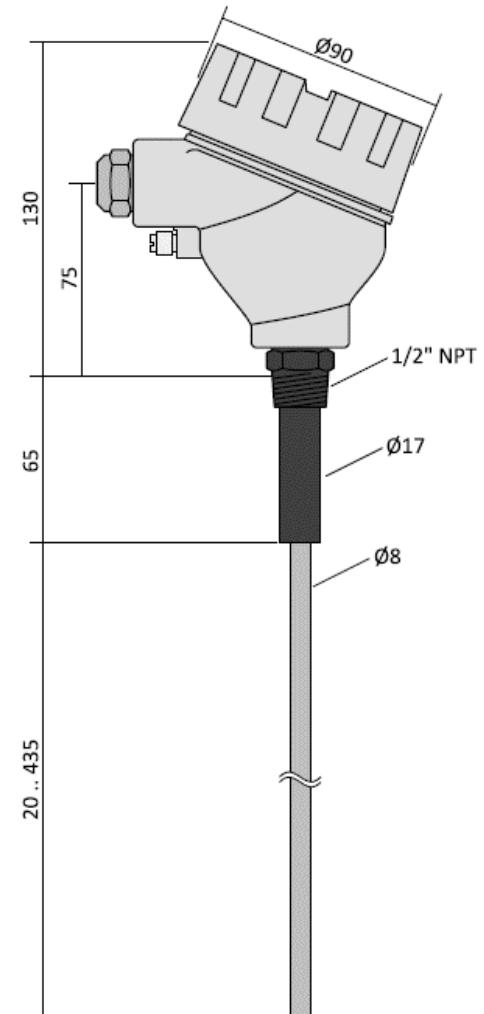
(2) FlowSwitch FS 750



- **Fast setup due to automatic calibration** (clean air measurement over 10 min, sets alarm levels automatically at 4x and 16x of the clean air particle load. Adjustment of sensitivity / amplification possible)
- A **multi-color LED** signals the dust load level, easily visible for the operator at the device (non ATEX version)
- Additional transmitter to be installed on DIN rail, with 3m pre-assembled cable
- **Easy installation with NPT 0,5" thread**
- **Sensor rod in different lengths:** 250 mm, 500mm or customized from 85-500mm, rod can also be cut by customer to size



FS 710/750
Non ATEX version



FS 710/750
ATEX version

(3) FlowSwitch FS 700



(3) FlowSwitch FS 700



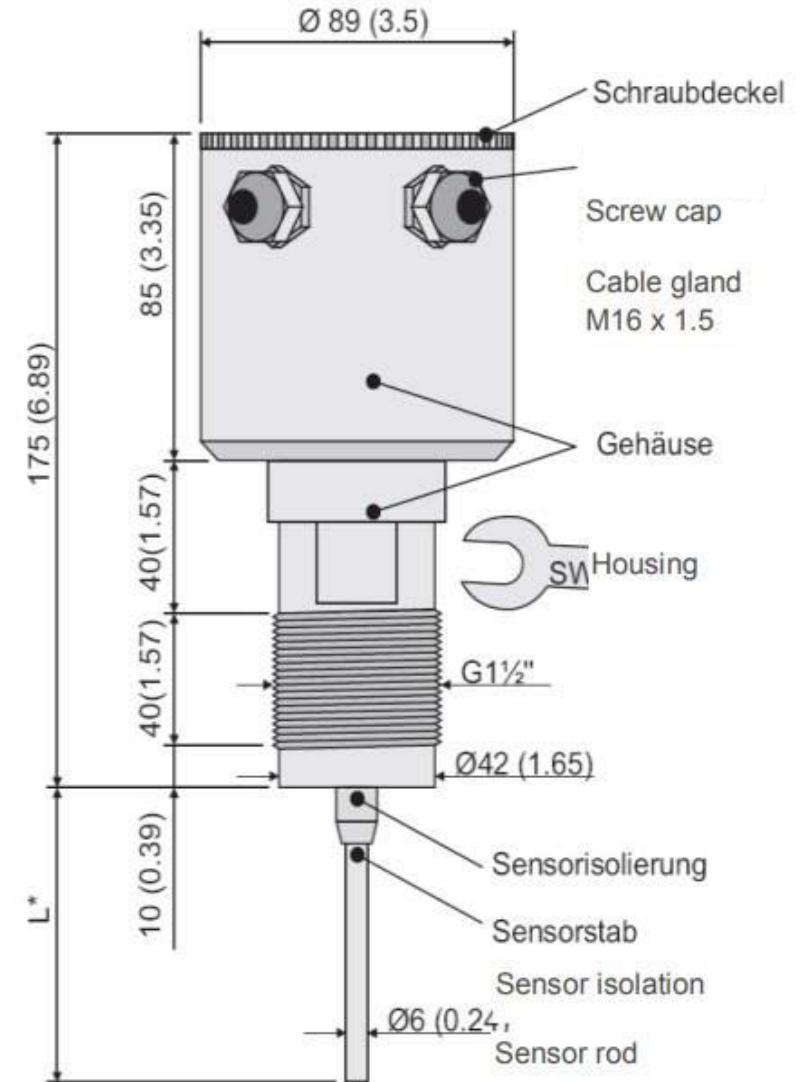
- **Proven and flexible system** – several thousand installations worldwide
- Two versions available:
 - with one **alarm switch / relay** OR
 - with an **analog output** (4-20 mA) to measure the particle load. The measured value shall be regarded as trend signal. No relay included.
- **Manual calibration**, also for short batches (10s minimum)
- **Alarm level** selectable by a trimmer on the device, adjustment of sensitivity and dampening possible
- **Sensor rod**: between 40 and 800mm, individually selectable



(3) FlowSwitch FS 700



- **Wide temperature range** with process temperature from -20°C to +90°C, optionally up to 130°C / 200°C / 290°C
- Optionally prepared for **Ex-area / ATEX zone 22**
- Sensor material prepared for use in **food industry** (VA 1.4571), sensor isolation either made out of PA or PTFE, seals alternatively made out of NBR, FPM or silicone.
- **Easy installation with G 1½“ thread**, connection with Tri-Clamp via adapter
- Integrated control electronic, no separate transmitter.
- Well-protected design, **insulation for IP 67**



Comparison FS 700 / FS 710 / FS 750



	(1) FS 710	(2) FS 750	(3) FS 700
Calibration		Automatically for 10min	manual
Output	2 Relays for 2 dust levels	Analog 4-20mA	1 relay OR analog 4-20mA (option)
Adjustment	Sensitivity adjustable. Dampening, hysteresis, filter time fixed.		Sensitivity and damping adjustable
LED indicators	LED indicates the alarm levels (non ATEX only)		Only internal, not visible for operator
Rod length	250mm (options: 500mm or customizable)		Customizable from 250mm to 800mm
Rod material	V4A (AISI 316L)		Steel 1.4571 (AISI 316 Ti)
Sensor isolation and seal material	PPS GF40		PA, on request PTFE NBR, on request FPM or silicone
Cable length	3m pre-assembled, no extension available		No cable supplied
Connection	NPT thread		G 1 ½" thread
Ambient temperature	-20°C to +50°C (ATEX version: -10°C to +70°C)		-20°C to +70°C
Process temperature	-20°C bis +150°C (ATEX version: -10°C to +180°C)		-20°C to +90°C, up to 290°C as option
			IP 67
Installation	With optional welding flange		With optional welding flange or with Tri-Clamp via adapter

Options available for FS 700 / FS 710 / FS 750



	(1) FS 710	(2) FS 750	(3) FS 700
Output	-		1 Relay (standard) mA output (V80003)
Rod length	250mm (Standard) L = 500mm length (V14026) X = customized length (V14032)		Between 40 and 000mm (standard) 800mm lenght (V80002)
Material sensor isolation			PA (standard) PTFE (on request) Peek (on request)
Material of seals			NBR (standard) FPM (on request)
Temperature			90° (Standard) 130°C (V22000) 200°C (V800017) 290°C (V800045)
Ex / ATEX	Non ATEX (standard) Ex / ATEX for zone 20/21 (V14035)		Non ATEX (standard) Ex / ATEX for zone 22(V80004)
Installation	Welding flange - for non ATEX (P50258) Welding flange - for ATEX (P50259)		Welding flange

Benefits



General benefits of tribo-electrical dust monitor:

- Prevents dust emissions and exhaust plumes from damaged filters
- Prevents contamination of air ducts and valves, reduces maintenance and cleaning efforts
- Ensures that the following ducts are not regarded as Ex-area
- Prevents the necessity for additional police / emergency filter
- Ensures that recirculated air is clean, the occupational emission levels are fulfilled, products and equipment are not contaminated
- Ensures that no material gets lost and the dust can be recycled
- Makes it easier to fulfill external emission limits

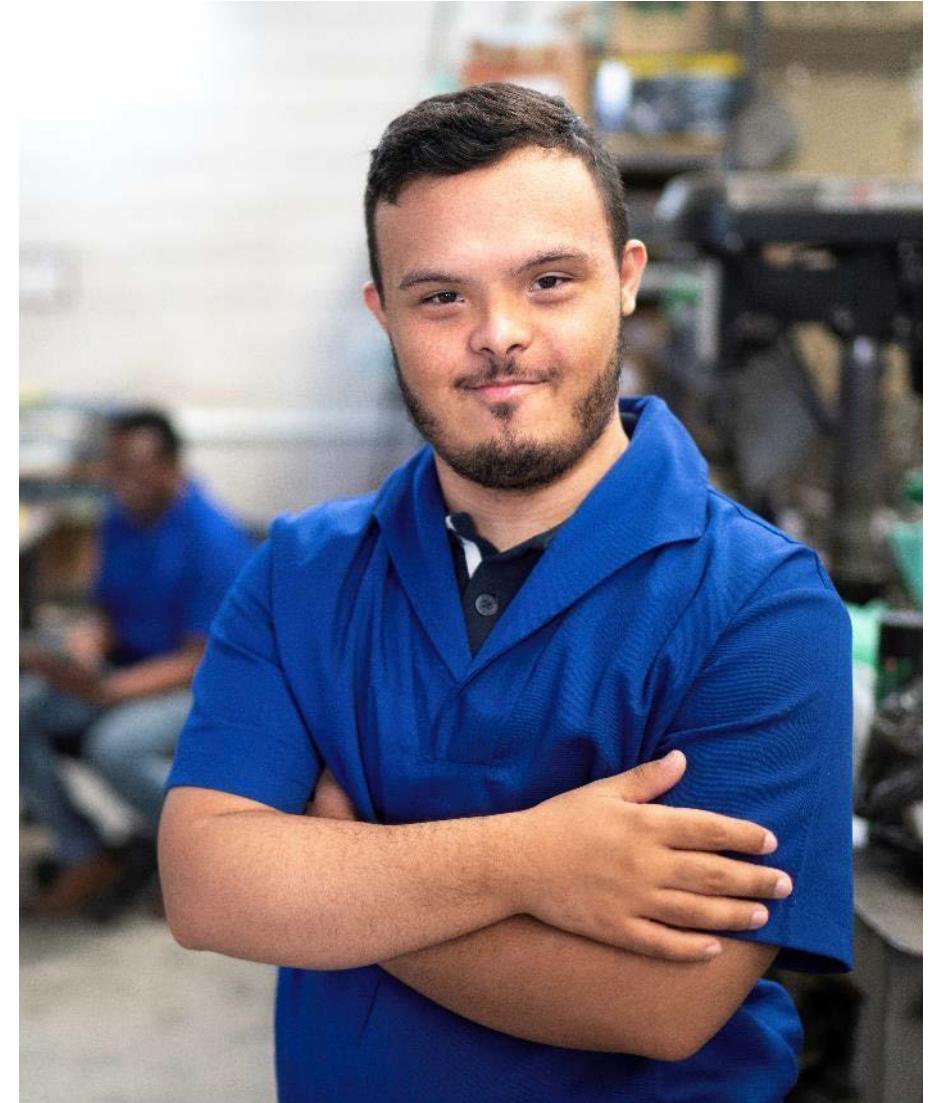


Benefits



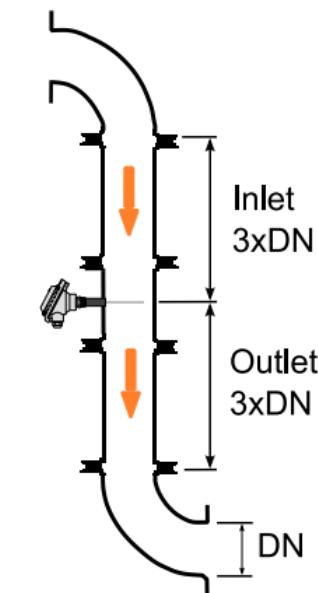
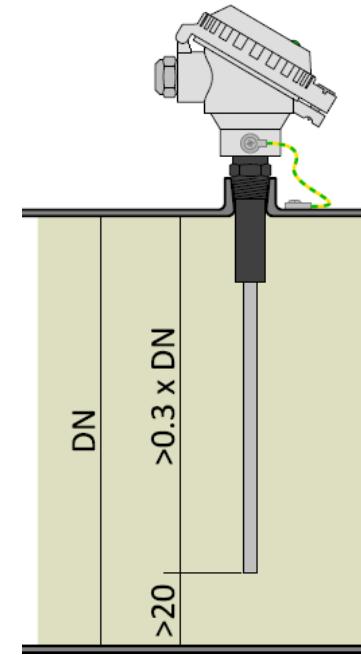
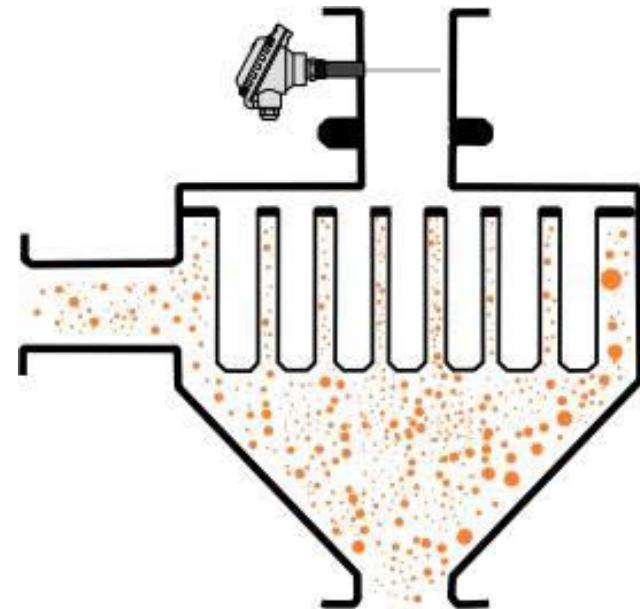
Specific benefits of the FlowSwitch family:

- Very reactive and fast detection of filter damage
- Dust collection on the rod does not affect the measurement results
- Robust design, well protected for several years of operation in a harsh environment
- Easy and fast installation into existing exhaust ducts
- Very flexible, for many applications, even the sensor rod can be shortened by customer to adopt it perfectly



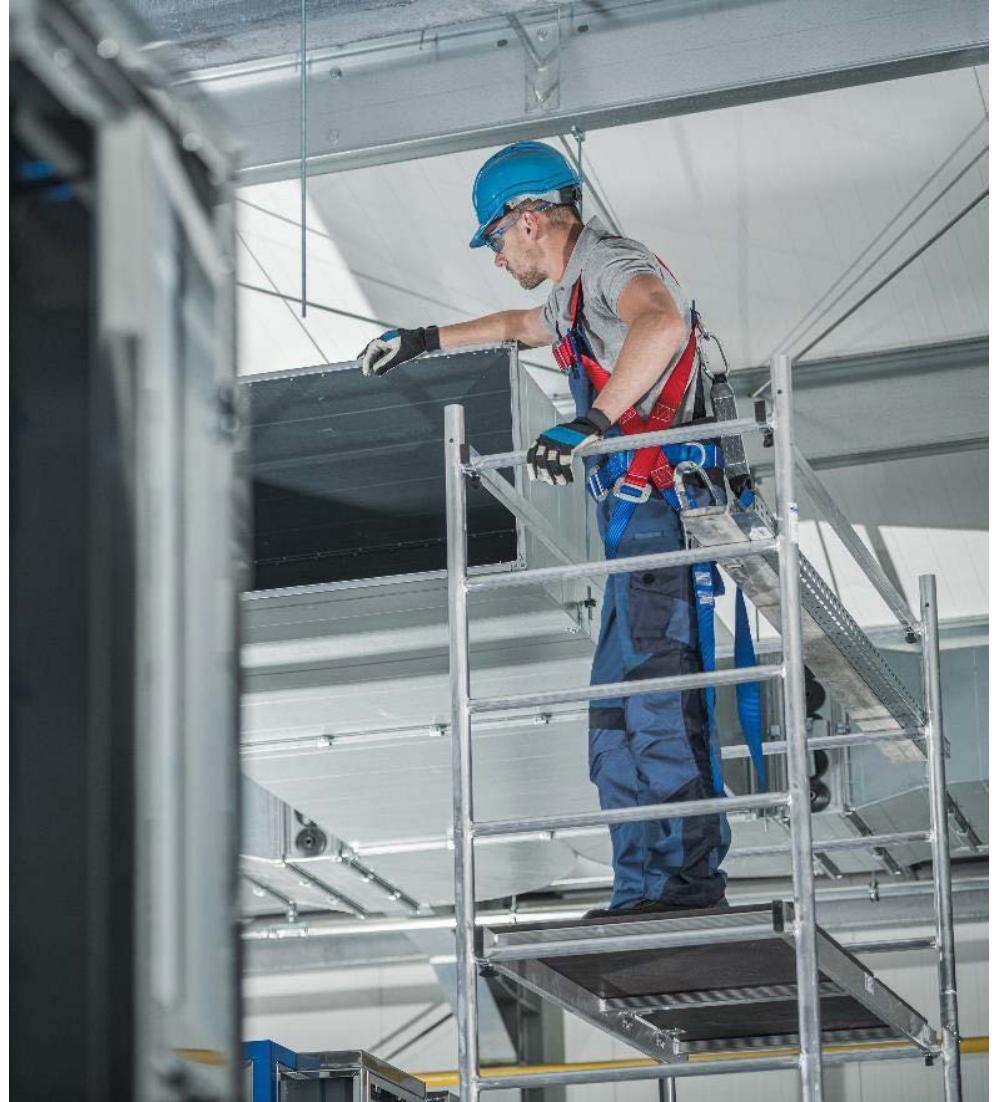
Tips for installation

- Installation is done **on the clean gas side** downstream of the filter on a duct / pipe.
- A thread bush is welded on the duct, then you bore through the duct wall and screw in the sensor
- **Sensor rod length** should be at least **1/3 of the pipe**, with min. **20mm distance to wall**
- **Straight run-in / run-out zone** without valves and flaps of a minimum of the **3-fold length of the duct diameter**



Tips for installation

- **Electrical grounding of device and duct** is critical
- Keep distance of >20m to **electrostatic filter systems**
- Works best with a **bag or cartridge filter system**
- **Any kind of dust** as long as the material
 - is electrically conductive and
 - does not build up a conductive coating between rod and pipe wall due to abrasion
- Low (>0,01 mg/m³) to high dust concentration
- Low to high humidity, but **not condensing**



Limitations



- **Limitations** of the FlowSwitch principle:
 - At this price level you can supervise filter system safely, but it is **not a calibrated device to measure absolute dust levels** precisely
 - It is **not sufficient as proof for the authorities** that legal emission are fulfilled

References



*FS 710 mounted on the air ducts
after the filtration system at trimet*

trimet

- Trimet Aluminium AG in Hamburg
- Production of aluminum oxide
- 72 FlowSwitch FS 710 installed after the bag filters
- Sensitive pre-alarm setting to allow replacement of a damaged bag before it brakes
- Main alarm triggers immediate reaction of operator to keep production process up and running
- In operation without any repairs or replacement since
 - 2012

Tribo-electrical vs differential pressure measurement



Tribo-electrical measurement

- Fast reaction, no time lag between filter damage and detection
- Very reliable

Differential pressure sensor

- Slow and sluggish measurement, not fast enough to identify a filter damage
- Helpful to identify the next cleaning cycle of a filter

