

# MF 3000

## Mass flow measurement of bulk materials



### Application

Many bulk material applications require a continuous measurement of the mass flow, e.g. for exact dosing of a material or to evaluate the flow into or out of a storage bin. However, typical measurement devices like belt scales, impact plates or bulk scales can be costly, difficult to install and need high maintenance.

The mass flow measurement MF 3000 is a unique alternative. It is designed for flow measurement in metallic pipes under pneumatic or free fall conditions. It works contact- and maintenance-free, is easy to retrofit and works with all kind of powder, dust, granules, pellets and threads.

### Scope of use

Aluminum and steel  
Animal feed  
Automotive  
Battery production  
Building materials  
Cement industry  
Ceramics industry  
Chemical industry  
Coal processing  
Detergent industry  
Fertilizer  
Flue gas cleaning  
Food industry

Glass production  
Pharmaceutical  
Pigment production  
Plastic industry  
Power plants  
Recycling  
Rubber goods  
Sand blasting  
Semiconductors  
Textiles industry  
Tobacco industry  
Washing powder  
etc.

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## Main Benefits

- Continuous real-time recording of mass flow
- Simple installation into existing production lines
- Contact-free measurement
- Does not require fittings in the material flow, does not impact the material
- Robust design for a long lifetime
- Without moving parts, maintenance-free
- High resistance to abrasion
- Dust buildup on the sensor is not measured
- Reliable results – even after years of operation

## Function

The MF 3000 sensor is installed flush in the pipeline, a welded thread is used for this purpose. The sensor generates a microwave field within the pipeline. Any particle passing reflects the microwaves and causes a change in frequency and amplitude of the reflected signal. This allows to calculate the speed and quantity of the passing material. Non-moving particles like dust accumulation are not affecting the calculation.

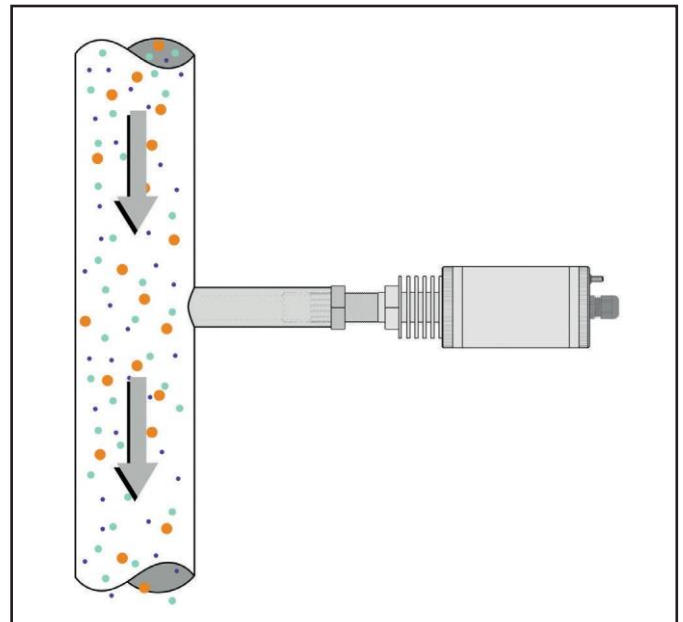
The measurement principle of the MF 3000 is unique as the sensor works contact- and maintenance-free and is easy to install and retrofit. Measurement can be very accurate, depending on the bulk material an accuracy of up to 1 % can be achieved. The measurement results are not impacted by changes of temperature, moisture or static charge.

The MF 3000 works with all kind bulk material, with grain size from approx. 1 nm to 20 mm. It can be used in metallic pipelines (or metallically shielded pipes and hoses) with a maximum diameter of 300 mm. Depending on pipe diameter a measurement is possible from 1 kg/h to several tons per hour (dilute phase). Constant material velocity, constant bulk density, and a stable di-electrical constant and particle size of the measured material are required. Vibrations and a high buildup of sticky material on the sensor surface should be prevented.

## Installation and Commissioning

The key for an accurate measurement with the MF 3000 is to identify a position in the pipeline where particles are airborne and most evenly distributed. This can be achieved best in vertical pneumatic pipelines, freefall applications or – with some limitations – in horizontal pneumatic pipes. It is important to keep a distance to bends, blowers, valves, tapers and branches. Rods and disc reflectors can be installed in the pipeline to ensure an even distribution of the material.

A precise calibration is important to achieve a high measurement accuracy. Up to 24 calibration curves can be stored for different materials or conditions. Reference data is captured by weighting the conveyed material, emptying a known quantity and measuring the required time or by deriving the volume information from a theoretical flow rate of the conveying system. Up to 10 calibration points can be saved per curve, at least a min/max calibration with two data points is strongly recommended. The device is equipped with an analog output for the mass flow, a relay for alarm signals, a pulse output for connecting a counter, a RS485 Modbus interface and an USB port.



The MF 3000 generates a microwave field in a metallic pipeline, any passing particle reflects the waves, changes their frequency and is measured.

### Robust and stable

The whole device is optimized for reliability and long life-time. Each sensor is sealed and tested under extreme temperatures. The electronic is encapsulated and IP65 rated. As the MF 3000 has no moving parts and the sen-

sor surface can optionally be built out of Teflon or ceramic, there is virtually no tear and wear.

A high temperature and an ATEX option for zone 20/21 (dust) or zone 2 (gas) are available.

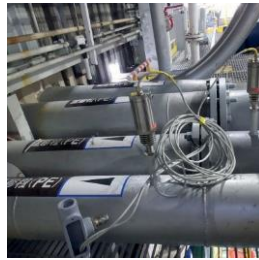
### Successful installations (extract)



Lime /  
Calcium carbonate



Adsorber /  
flue gas cleaning



Plastic granulate



Carbon fibre



Mineral wool



Fertilizer



Iron-II-Sulfate



Coal dust / coke



Wood dust



Jet medium



Wheat



Oat Flakes



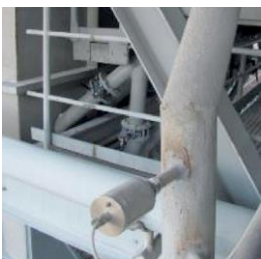
Soybean flour



Corn



Tobacco



Silica



Lithium



Cellulose



Aluminium oxid

## Technical Data Sensor

Housing material	Stainless steel (1.4307 or 1.4571 as option)
Sensor surface	K = PA C = Ceramic (optional) T = Teflon (optional)
Ambient temperature	-10°C to +70°C
Process temperature	-20°C to +90°C (K, C) -20°C to +100°C (T) and surface temperature max 135°C 0°C to +150°C (Non-ATEX with high temp option 1) 0°C to +450°C (Non-ATEX with high temp option 2)
Process pressure	6 bar (30 bar temporarily)
Transmit frequency range	24,150 to 24,250 GHz
Protection class	IP65
Ex-area / ATEX zone	Zone 20/21 and Zone 2 (optional)
Cable length	3 m as standard, other cable lengths on request
Dimension and weight	D 60 x 280 mm; 1300 g

## Technical Data Transistor

Measured mass flow	~ 1 kg/h to several tons per hour, limited by pipe diameter, max. D=300
Grain size	approx. 1 nm – 20 mm
Indicator	0 – 1023 digits
Accuracy	Up to 1 % (depending on the product)
Average & Filter Value	1 – 500 sec
Savable Calibration	Up to 24 calibration curves
Ambient temperature	-10°C to +60°C
Protection class	IP20
Supply voltage	24 VAC (50-60 Hz) with +/-20 %; 24 VDC with -20 % / +30 %; max. 2 W
Input	1x RS485 (from sensor)
Output	1x Analog output for mass flow value (0/4-20 mA; 0-10V) 1x Alarm relay for Max / Min or sensor fault 1x Pulse output for counting 1x USB for notebook connection 1x RS485 with MODBUS protocol for connection with PLC
Dimension & weight	22,5 x 115 x 100 mm without clamps; 150 g

