Massfow with Microwave-System MF 3000T

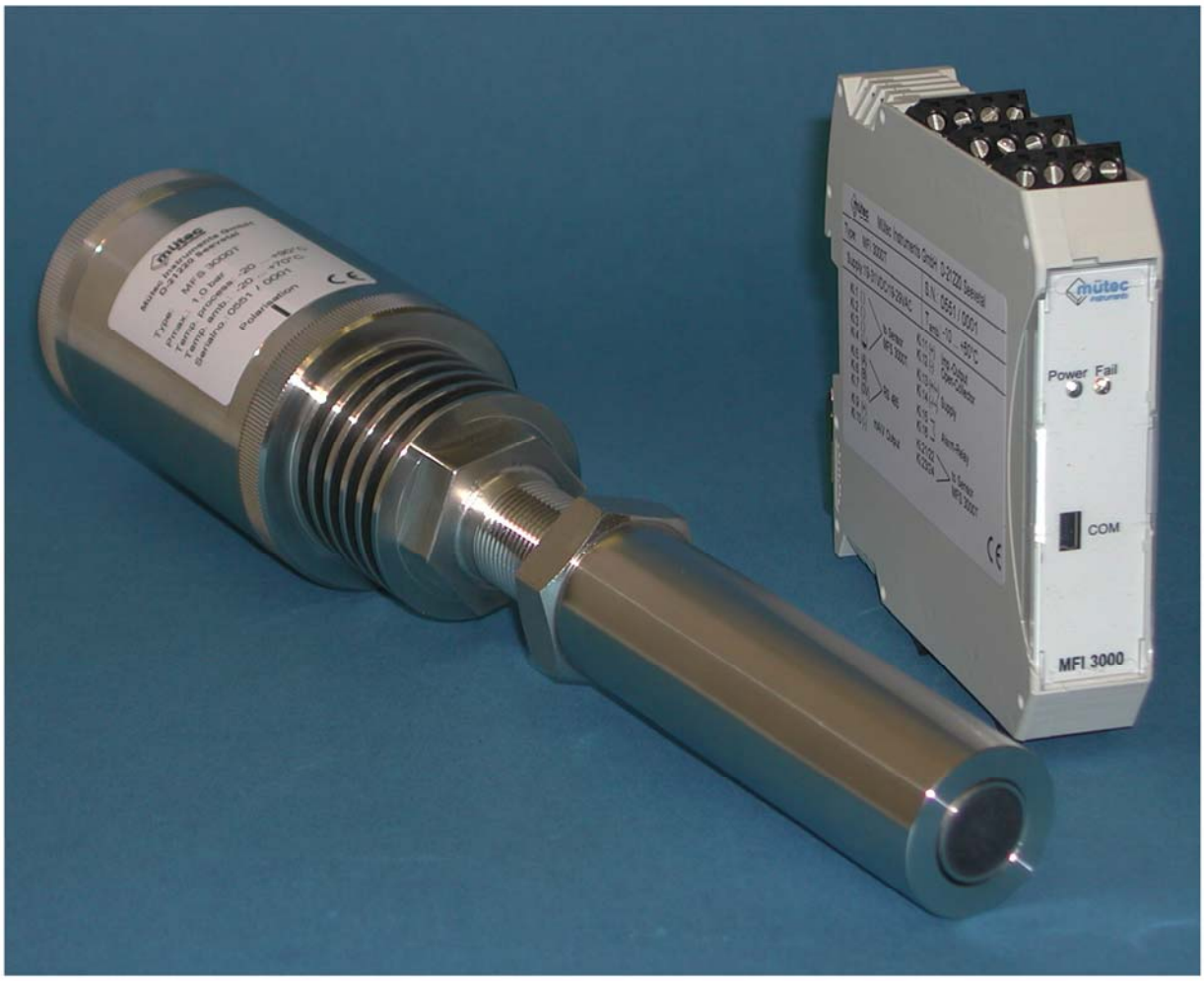

Fig.-1

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1. Safety notes

The used supply voltage and the required power has to be proofed about accordance with the indicated distribution voltage at the device before initiation.

A temperature rise of the housing during operation is normal and quite safe.

The equipment shouldn't be covered and not be located next to heating facilities or direct sun irradiation during operation.

If it has to be assumed that a safe and risk less operation is not longer possible, the equipment must be taken out of operation and safeguarded against unintentional operation. Reasons for this assumption can be:

- visible damage of the equipment
- if the equipment contains loose parts
- Failure of the electrical function

Before the equipment can be put again into operation, it is absolutely necessary to carry out a professional piece examination as per DIN EN 61010, part 1.
For safety and guarantee reasons, this examination should be carried out at the manufacturer.

The equipment must be separated from all voltage sources during opening and closing of the housing. If a measuring or a compensation is unavoidable at the open equipment under tension, then this may happen only by an expert who is familiar with the thus obliged dangers.

Definite application:

The measuring instrument MF 3000T serves as flow meter for solid matter bulk material in free fall or pneumatic transport lines.

The maximum ambient temperature area for the sensor of -20 °C to +70 °C and for the transmitter -10 °C to +60 °C may not be exceeded.

Installation and initiation:

The connection plans of plug connectors are indicated clearly on the type plate.

The assembly/dismantling, the installation, the operating and the maintenance has to be carried out by qualified staff only according to the automation industry considering the relevant specifications and the MF3000T instruction manual.

At the installation the technical data and the connection value have to be observed.

Care:

Wiping off, only with a dry cloth. Not using any solvents.

2. System structure

The MF3000T-System consists a cylindric Flow-sensor with welding flange, a DIN-rail transmitter and software MF-SMART. The process interface occurs by the welding branch, in which the sensor is screwed flush with the inside of the pipe. The sensor is connected to the transmitter by 6 conductor cable. The sensor contains an analog exit, an impuls exit, an alarm exit, one RS232 and two RS 485 interfaces.

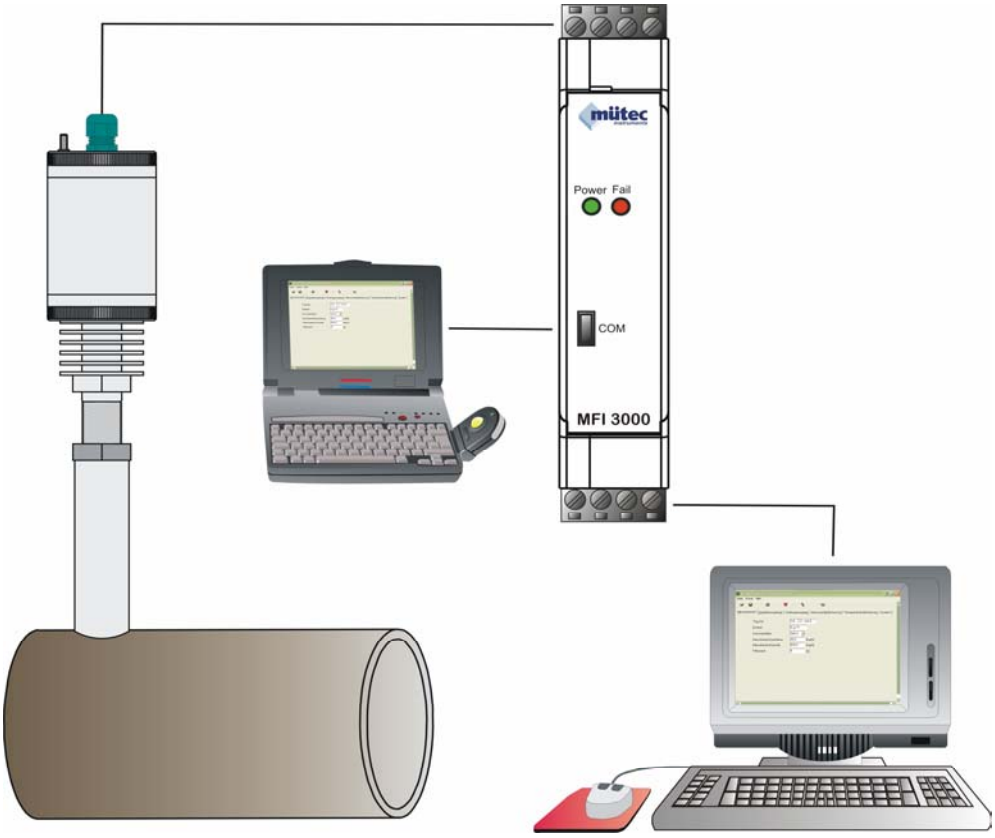


Fig.-2

Flow-Sensor MF 3000T

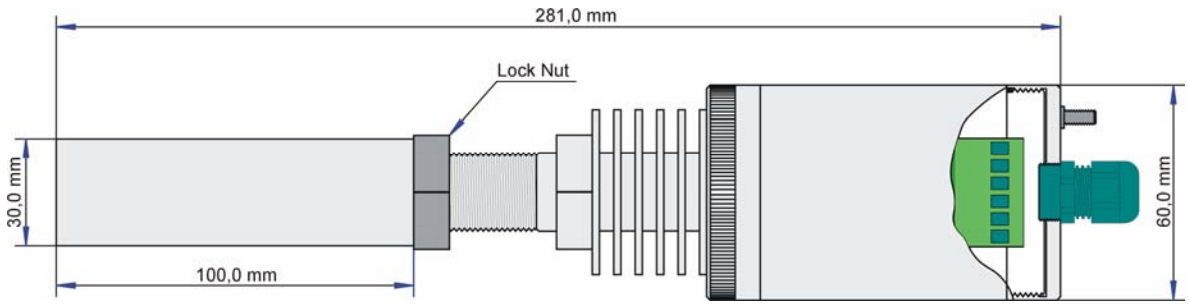


Fig.-3

3. Function

The MF 3000T system is conceived for the flow measuring of solid substances in metallic pipelines. It makes the flange mount possible at vertical pipes at the free fall transport and at horizontal pipes at the pneumatic material transport. Equipped with the newest microwave technology a modern PHEMT oscillator use the supply current reduces himself through what for the MF 3000T probe on some as 25 mA. The working frequency of the probe lies in the internationally free available frequency area between 24.00 ... 24.25 GHz, in which the sent out or the emitted top performance are less of 10 mW.
A at the pipe welded installation flange, through which the pipe wall will be rebored afterwards, serves as a mechanical admission for the MF 3000T-Sensor. From the flush mounted MF 3000T inside of the pipe, the micro wave will be radiated into the metallic pipeline which seems to be a measuring chamber.
The radiated wave fronts meet to the flowing solid substances and lead to a frequency displacement (Doppler effect) of the reflected signal. The intermediate frequency signals which frequency and amplitude are proportional to speed and size of the solid substance parts, will be collected and used as basic for the calculation of the solid substance quantity.
Deposits at the pipe wall will not influence the measurement.
Placed in a stainless steel housing, the measuring sensor and the heat valve will be connected to the MF 3000T transmitter by a 6 wire line and can be parameterized and calibrated online by RS485 interface.
The raw measuring value of the solid substance quantity and the temperature will be transmitted for analyze to the MF 3000T transmitter. The result is available as a analogue value at
0/4-20mA- or 0/2-10 V- signal or as digital process value by the RS485 interface.
A passive pulse output enables the external integration of the solid substance quantity.
A relay output is used as the min/max/alarm or can be used for sensor monitoring.
After parameterization and calibration of the MF 3000T system, the measuring value can be observed at the online-mask or by using the data logger of the software **MF-SMART** .

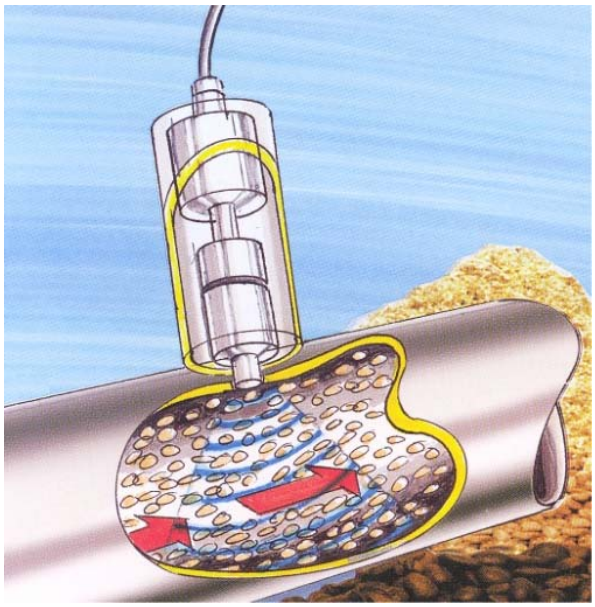


Fig.-4

Flow-sensor-assembly

Before screw in the Flow-sensor into the welding branch the total depth of welding branch and pipe thickness will be marked at the shaft of the Flow-sensor.
The measuring window shall be flush mounted with the pipe wall so that it doesn't rise into the pipe. The screw in of the Flow-sensor into the welding branch occurs until the marked line. The use of teflon ribbon is recommended for the better insulation. The polarization axis indicated on the type plate is then taken to the cover with the pipe axis. A firm attracting of the jam nut (M32) on the thread shaft fixes the Flow-sensor permanently.

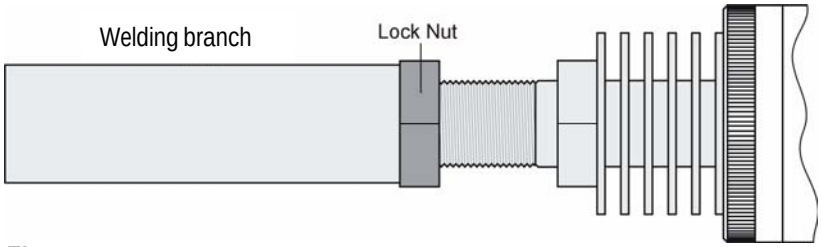
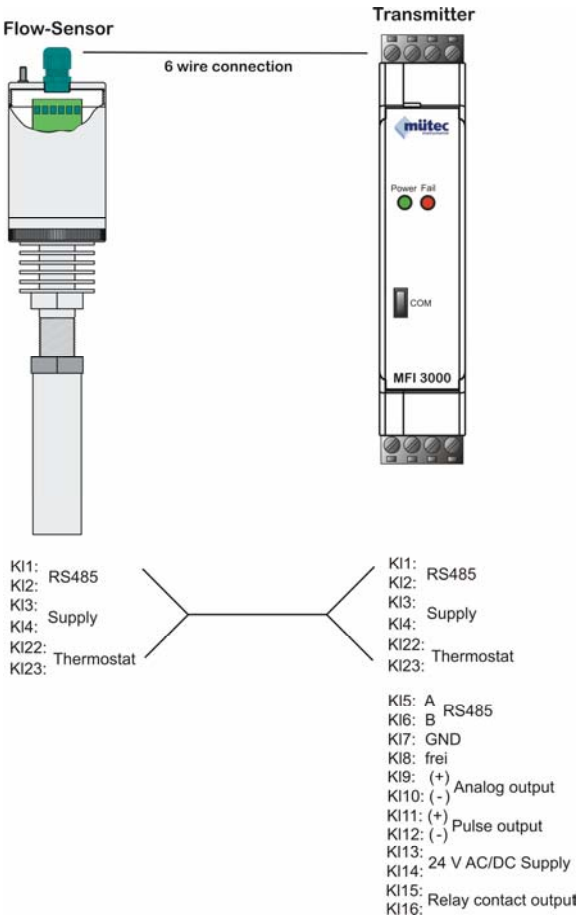


Fig.-5

Electrical connection and wiring

The DIN-rail transmitter MF 3000T always should be installed in a switch cupboard or dry room and it is to provide with 24V AC/DC. The electrical connection between the Flow-sensor and the transmitter has to be executed as a 6- line wire. For wire lengths up to 60 m a wire cross section of 0,75mm² is sufficient, beyond this it is necessary to have ≥ 1,0 mm² proportionally to wire length. As standard an unshielded cable can be used.



7. Technical Data

Flow-Sensor MF 3000T

Medium touched parts:	stainless steel 1.4307 and PA 6.6
Process connecting:	welding flange
Housing material:	Stainl. steel 1.4307
Form of protection:	IP 65
Ambient temperature:	-20 up to +70°C
Process temperature:	-20 up to +90°C

Transmitter MF 3000T

Analog output

Current:	0 … 20 mA or 20 … 0 mA
Limit:	max. 22 mA
Load:	max. 750 Ohm
Accuracy:	0,02 % of the final value
Load influence:	< 0,01 %
Response time:	< 150 ms
Damping:	filter 1st order for (0.1 -- 99) s parameterizable
Voltage:	0 … 10 V or 10 … 0 mA
Limit:	max. 11 V
Load:	min. 50 kOhm
Accuracy:	0,02 % of the final value
Load influence:	1 % at 50 kOhm
Response time:	< 150 ms
Damping:	filter 1st order for (0.1 -- 99) s parameterizable

Pulse output

Operational mode:	Open-Collector, operating-current principle
Breaking capacity:	< 1,4 W
Turn-on voltage:	< 28 VDC
Switching current:	< 50 mA
Pulse duration:	50 ms

Alarm relay

Operational mode:	active high or active low
Alarm function:	MAX, MIN or Sensor fault
Fail-LED/red:	permanent light → limiting value alarm
Relay contact:	1 opener or closer
Breaking capacity:	max. 60 VA by alternating voltage, max. 15 W by direct voltage
Turn-on voltage:	max. 30 VDC or 125 VAC
Switching current:	max. 0,5 A
Min-Contact voltage:	10 mVDC
Min-Contact current:	10 µA
Contact material:	AG Pd + 10 µAu
Relay:	by IEC 947-5-1 / EN60947

Interfaces:

RS232:	Front socket connection (Com) for PC/Notebook
RS485:	2400, 4800, 9600 or 19200 bps, device address: 1-255

Power supply

Type:	energy supply class A.C.3 or D.C.4 by IEC 654 part 2
AC:	24 VAC, -20% to +20 %, 50-60 Hz
DC:	24 VDC, -20 % to +30 %
Power consumption:	max. 2 W + (0,3 – 8,5) W for thermostat
Power-LED/green:	good-status of the supply

Electromagnetic Compatibility

The device filled the regulations of the EMV guideline 89/336/EC as well as the standard EN61326 from 1998 and the standard of EN61326/A1 from 1999.

More Data:

Alarm-LED:	slow blink → no sensor connection fast blink → FRAM-memory error
Form of construction:	Housing for 35 mm top DIN rail (EN 50022)
Dimension:	22,5 x 99 x 114,5 mm
Ambient temperature:	-10 to +60°C
Form of protection:	IP 30
Weight:	150 g

Extras:

Read device settings	-	read in all **MF 3000T** – device data
Program parameters	-	write parameter from PC-program in **MF 3000T**
Program parameters and calibration	-	Parameter and calibration values from PC-program write in **MF 3000T**
Online-display	-	display with layout of raw measuring values (unfiltered + filtered) and integrator

PC-Settings

Interface:

COM number (RS232)	-	PC-interface with COM1 … COM10
Device address	-	**MF 3000T –** device address between 1 … 255
Baud rate	-	19200 bps (fixed)

Data logger:

File name	-	File name for stored measuring values
Acquisition rate	-	5 measuring values/h, 20 measuring values/min to 1 measuring value/s (MAX)

MF3000/RS232-Interface:

With the **MF-SMART** program it is possible to access on all parameter and variables of the system via the COM-interface of **MF 3000T** devoid of adjusting interface parameters.