

Original main operating instructions



**Flow Meter
FMC 100 and FMC 250**



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1 General Information

1.1 Scope of delivery

Please check the delivery according to the delivery note.

Also check the delivery for completeness and integrity.

Do not operate damaged devices.

These operating instructions and corresponding attachments with additional information on the supplied components are part of the delivery scope.

1.2 Liability, warranty and guarantee

Upon acceptance of the product, the operating company accepts operation responsibility.

The warranty period is 12 months from the date of delivery.

According to our general terms and conditions of sale, this warranty shall only apply provided that:

- the product has been used for its intended use and in accordance with the present operating instructions.
- assembly, commissioning and operation have been carried out in a professional and appropriate manner.
- repair has only been performed by authorised and qualified persons.
- only genuine spare parts have been used.

The safety instructions highlighted in these operating instructions and in the corresponding attachments must always be observed. We will not accept liability for any damages or failures due to non-compliance with these operating instructions.

This manufacturer warranty is void for any damages and failures resulting from unauthorised alterations or modifications of the product.

1.3 Further applicable documents

In addition to these operating instructions, you are provided with the following documents:

- Attachments with additional information in accordance with the components supplied. The documents are contained in the product-specific attachments.
- Resistance chart (on request).

1.4 Storing operating instructions

These operating instructions with the related attachments must be available to the operator at all times.

1.5 Markers

These markers will help you to understand the operating instructions.

For your orientation, the following formatting is used:

- Listings of a descriptive nature are marked with the symbol "●" at the beginning of the line.
- Instructions are marked with the symbol ">" at the beginning of the line.

1.6 Safety instructions

The safety instructions are summarised in section 2. The safety instructions important for the respective chapter are listed in the individual chapters and the attachments.

- > Take a few moments to learn about the meaning of the safety signs used (section 2.1 and 2.2).

2 Safety




2.1 Symbols and signs

Safety instructions are marked by

- a safety sign and
- a danger warning

This will help you to identify potential hazards, to avoid risks and to operate the device safely. In addition, the operating instructions contain instructions for hazard avoidance. Danger warnings are classified in three categories according to the severity of a potential injury. Different signal words are used according to the severity.

The signification of the safety signs is signalled by shape and colour (DIN 4844):

Shape	Colour	Signification
	Safety colour red Contrast colour white	Prohibition sign
	Safety colour yellow Contrast colour black	Hazard warning sign
	Safety colour blue Contrast colour white	Mandatory sign

2.2 Safety signs

In this document, the following signal words are used in conjunction with safety signs to illustrate potential hazards.



Danger!

Death, severe personal injury or substantial property damage will result if proper precautions are not taken.



Warning!

Death, severe personal injury or substantial property damage may result if proper precautions are not taken.



Caution!

Minor personal injury or property damage may result if proper precautions are not taken.



Attention!

Property damage may result if proper precautions are not taken.



Information/note

Indicates information and instructions for safe and effective operation.

2.3 Intended use

Flow meters serve for convenient measuring of liquids.
Do not expose the flow meters to the weather.
Only use flow meters according to the technical data.
Only use clean liquids.

2.4 Safety instructions

All safety instructions must be observed and followed.
Failure to follow the safety instructions may lead to serious injury or death or cause environmental and/or property damage. Adherence to the safety instructions contained in these operating instructions will help you to avoid risks and to ensure that the product is used to its full potential.
Safety instructions on the activities are listed at the start of the respective chapter.
Special safety instructions on individual action steps are given under the respective action step.



Attention!

- > Make sure that the operator has read and understood the operating instructions.



Danger of poisoning from harmful substances / vapours

- > Take off spilled harmful substances.
- > Never eat or drink when filling harmful liquids.



Attention - Danger from splashing liquids!

- > The maximum operating pressure and operating temperature must not be exceeded.
- > High operating pressure may result in the containers or the hoses bursting or becoming loose. Make sure that excessive pressure does not result when filling a container.
- > Fill carefully and at an appropriate speed to avoid leakage of the liquid.



Caution!

- > Immediately inform the responsible supervisor about defects on the device.



Caution - Risk of injury!

- > Follow internal instructions.
- > Wear protective clothing (face and breathing protection, protective gloves, etc.).





Attention!

If the material of the flow meter is not resistant to the liquid to be transferred, it must not be used.

- > Observe the chemical resistance and internal instructions.



Note

- > Always replace defective parts.
- > Only use genuine spare parts.
- > When returning the pump for repair, it must be accompanied by the decontamination certificate (download at www.flux-pumps.com).

2.5 Safety information for hazardous areas



- > Avoid electrostatic charges when installing and operating this equipment.
- > Only clean with a damp cloth.
- > Only clean outside the hazardous area.



- > When using a PP, ETFE or PVDF flow meter in a hazardous area, bridge the flow meter with an earth strap.
- > When using a metal design of flow meter in a hazardous area, carry out extensive and definitive potential equalisation.
- > The hose connected to the outlet of the drum pump hose must not exceed a resistance of 10^6 ohms between the hose ends. Only use hose lines with conductive screw fittings (cf. TRbF 50 Appendix B. ($R < 10^6 \Omega$))



If motors and/or valves are to be switched with the flow meter, a switching amplifier (FSV) is needed.

The use of the electronic analysis unit FLUXTRONIC® in hazardous areas means that it is necessary to select a signal interface permitted in hazardous areas. This is not the case with all available switching amplifiers. The NAMUR* interface is a proven one and meets all of the above requirements. (* NAMUR = **N**ormenausschuss **M**ess- und **R**egeltechnik / committee for measuring and control techniques in the chemical industry)



If you are using your own switching amplifier, it is imperative that you note the certificates of conformity of the display electronics and the switching amplifier you are using.



The switching amplifier and the external units connected to it should only be installed, operated and serviced by trained and qualified personnel.



Power should only be switched on once the units have been installed and live parts cannot be touched.



Danger to life from touching live parts.

- > Always keep switching cabinets locked.
- > Do not undertake any work on live parts.
- > Change loose connections and any damaged, scorched or burnt through cables immediately. Only undertake any work when the main switch has been disconnected and shut off.
- > Ensure that no cables are trapped or squashed. Ensure that the cables are laid in such a way that they do not lead to any trip hazards or can be damaged.
- > All work may only be undertaken by skilled personnel who have been instructed and trained on the system.
- > Only authorised personnel with a key or tool are allowed to access the switching cabinets.
- > We recommend that the power supply is fitted with an FI safety switch in damp areas.
- > Power should only be switched on once the equipment has been installed and live parts cannot be touched.



Information when transporting in explosion-protected areas

Avoid electrostatic charges when transporting.
Note internal operating instructions.

3 General information on the device

The flow meter consists of two main components:
The electronic analysis unit FLUXTRONIC® and the measuring unit itself.
The measuring unit can either be a nutating disc meter, an oval rotor meter or some other measuring unit that delivers pulses by volume.



The electronic analysis unit FLUXTRONIC® is explosion-protected and can therefore be used in an explosion-protected drum pump with a volume meter and display in hazardous areas.

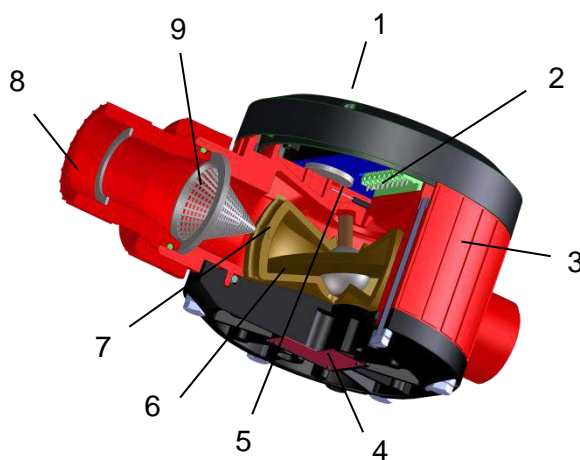


There are many options for measuring the volume of a liquid during a filling process. Essentially a choice must be made between direct methods and indirect methods. An indirect method is the rotor meter, for instance. This is effectively measuring the flow speed. The volume can be calculated using a defined cross-section on the inside of the measuring device. This method requires calming sections upstream and downstream of the measuring device to avoid turbulence. The flow speed cannot be determined correctly if there is too much turbulence in the measuring device. With the direct methods, it is possible to choose between volume measuring units and mass measuring units. The flow meter FMC is a direct measuring method and volume measuring unit. This means, in turn, that all influences that affect the volume of the liquid to be measured also affect the measurement (for example temperature, gas inclusions ...). For this reason, it is essential with these measuring units that the system is always completely filled with liquid (so-called "full hose system"). Our volume measuring units can only be used with liquids.

4 Description of Device

4.1 The FMC Nutating Disc Meter

With this flow meter, the liquid must flow through a measuring chamber. A disc is arranged in the measuring chamber in such a way that it is displaced into a nutating movement by the liquid flowing through. A magnetic pin is arranged in the middle of this disc that then makes a circular movement. The magnetic pin completes one revolution when the measuring chamber is filled and emptied once. The magnetic field influences a reed sensor arranged outside of the FMC housing, which closes a contact as soon as a certain field strength is reached, thereby making it possible to achieve a contactless transfer from the inside of the measuring unit to the outside. The central arrangement of the sensor results in the contact being closed after every half revolution of the magnet and thus the pulses stop when the measuring chamber is half full (0.05 l/pulse with FMC and 0.125 l/pulse with FMC 250).



1	Electronic analysis unit
2	Reed sensor
3	Housing
4	Type plate
5	Magnetic pin
6	Nutating disc
7	Measuring chamber
8	Connecting section
9	Screen

4.2 Filling Accuracy with the FMC Nutating Disc Meter

The accuracy of the filling process depends on the precision of the nutating disc and its bearing, as well as the precision of the measuring chamber. All of the components involved in the measuring process are made from different plastics with our design.

In addition, various different combinations of plastics are used to be able to measure as many liquids as possible.

Sufficiently large gaps must be provided between the moving parts to compensate for manufacturing tolerances, material changes, for instance volumetric expansion of the plastic due to temperature changes or swelling due to chemical processes. This results in a fundamental inaccuracy of the measuring units.

A minimum flow rate is needed to operate the measuring unit, as construction-related friction must be overcome to move the nutating disc and there are also gaps through which the liquid can flow without the nutating disc moving.

Tests have shown that 100 % operation cannot be achieved when flow speeds of less than 5 l/min are used.

The influence of friction and the gaps is so great at between 5 l/min and 20 l/min that there is no linear relationship between the flow rate and measuring accuracy. It is then necessary to maintain the flow rate constant and determine the deviation at this operating point. This deviation from the actual measuring volume can be compensated for with a calibration constant.

A virtually linear error can be assumed at a measuring range of between 20 l/min and 120 l/min. A calibration constant can therefore be applied to the entire range. The FLUXTRONIC® can convert the switching processes of the sensor into the volume and display this.

A pre-requisite for as precise a filling process as possible is that the entire system is always completely filled with liquid ("full hose system").

The following points must be taken into consideration to ensure that the above accuracy is achieved:

- Fill without interruption.
- The flow speed must be constant.
- The flow volume should not exceed or fall below the flow volume for which the unit is designed.
- The temperature must be constant.
- The viscosity must be constant.
- There should be no air bubbles in the liquid.
- The opening and closing times of the valves used must always be the same.

5 Before starting operation



To avoid contamination, we recommend a cleaning prior to initial operation.

Check the chemical resistance to the liquid and to any possible cleaning agents.

The flow meter must be installed without any mechanical tension.

When installed stationary within a plant, fit the flow meter into the pipework with pipe connections on both sides. In the event of a defect, the flow meter can be simply and quickly removed and re-fitted.

A T-section should also be used downstream of the second pipe fitting on the flow meter to

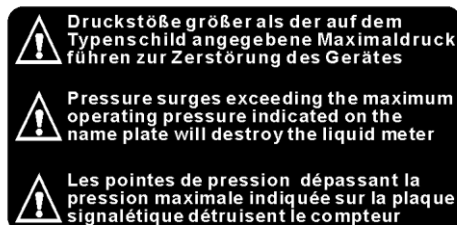
1. Allow for calibration without having to dismantle it.
2. Shut off the pipe work so that the unit can be removed with ease.



Pressure surges that are greater than the nominal pressure stated on the specification plate (see technical data) can damage the flow meter.



Important:
Pressure surges are produced by mass forces (content of long pipes) that are caused by quick-closing fittings!



Keep organic solvents away from the keyboard and LCD display.

6 Commissioning



Attention!

If the material of the flow meter is not resistant to the liquid to be transferred, it must not be used.

- > Observe the chemical resistance and internal operating instructions.



Note!

Check if the materials of the flow meter are appropriate for the applications.



Note!

Generally replace a defect signalling cable.

7 In operation

Regularly check the flow meter for function.

8 Repair



Warning!

When non-approved spare-parts are used persons can be hurt and the machine/equipment can be damaged.

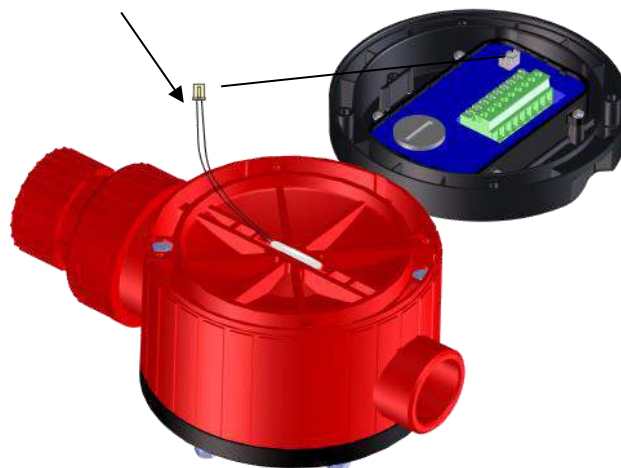
- > Only use spare and wear parts that are approved by the manufacturer.
- > Depressurise the system.
- > Separate pump from current.
- > Empty hose, flow meter and valves.
- > Always replace defective parts.
- > Only use genuine spare parts

8.1 Change of FLUXTRONIC[®], panel or seal

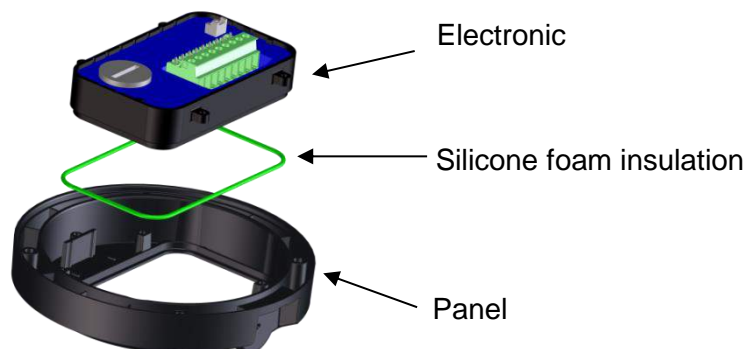
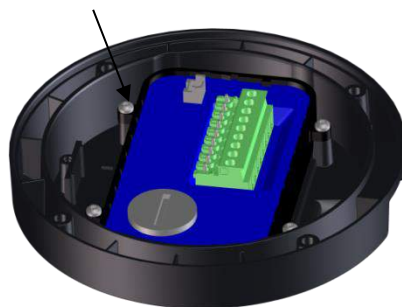
Unscrew the four Torx screws (torque max. 1.3 Nm)



Pull the plug of the reed sensor out of the electronic unit.

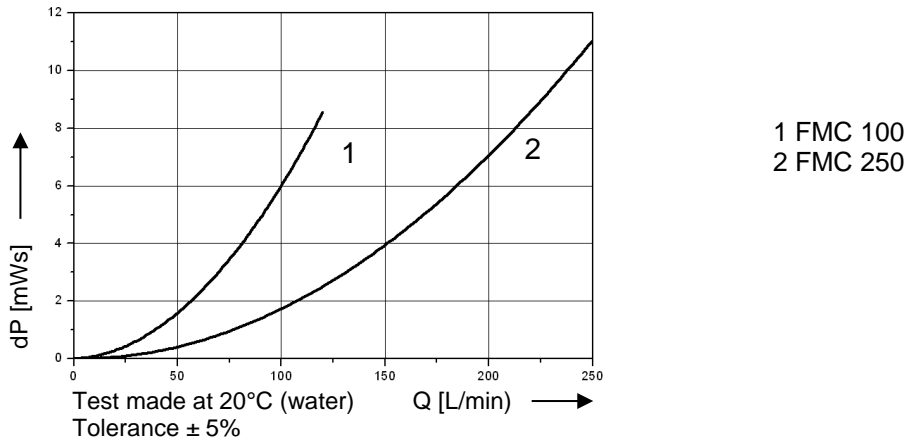


Remove the 4 Torx screws (torque max. 0.5 Nm)

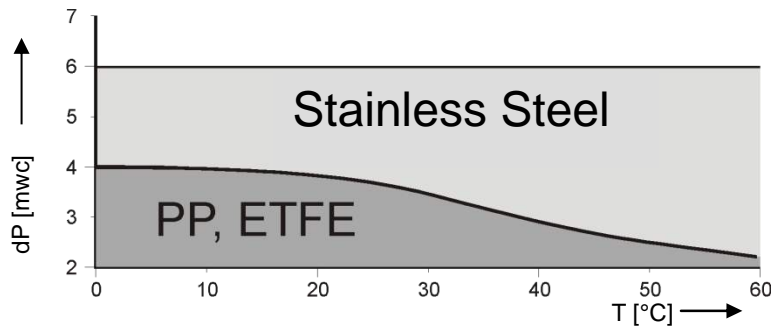


9 Technical data

9.1 Pressure loss curve



9.2 Dependency on maximum permitted pressure and temperature



9.3 Technical data

		FMC 100/PP	FMC 100/ETFE	FMC 100/S	FMC 250/PP	FMC 250/PVDF
Flow rate		10 - 100 l/min*			30 - 250 l/min	
Pressure range (max. nominal pressure)		0.1 - 4 bar max. (at water 20°C)		0.1 - 6 bar max.	0.1 - 6 bar max.	
Viscosity		Up to 2500 mPas				
Liquid temperature		Up to 60°C at max. 2 bar		Up to 80°C	Up to 60°C	
Accuracy		± 1%			± 1% between 50 l/min and 250 l/min	
Weight		1.1 kg	1.4 kg	1.7 kg	4.5 kg	9.0 kg
Material	Housing	PP	ETFE	Stainless Steel 316 Ti	PP	PVDF
	Measuring chamber	PPS	ETFE	PPS	PE	PVDF
* Smaller flow volumes on request						

