

**Originalbetriebsanleitung**  
**Original main operating instructions**  
**Notice d'instructions générale originale**



**Flüssigkeits-  
Mengenmesser FMO**

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**Flow Meter FMO**

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**Compteur volumétri-  
que FMO**

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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 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

## 1.7 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, to operate the hand nozzle efficiently 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!

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-pumpen.de](http://www.flux-pumpen.de)).

**1.8 Safety information for areas at risk from explosion**



Avoid electrostatic charges when installing and operating this equipment.

Only clean with a damp cloth.

Only clean outside of the explosion-risk area.



When using a flow meter with an PPS housing (FMO 1 P/..., FMO 2 P/... and FMO 7 P/ ...) in an area at risk from explosion, bridge the flow meter with an earth strap.

When using a metal design of flow meter in an area at risk from explosion, carry out extensive and definitive potential equalisation.

Only use hose lines with conductive screw fittings (cf. TRbF 50 Appendix B. ( $R < 106 \Omega$ )).



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 areas at risk of explosion means that it is necessary to select a signal interface permitted in areas at risk from explosion. This is not the case with all available switching amplifiers. The NAMUR\* interface is a proven one and meets all of the above requirements.



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.

(\* NAMUR = Normen Ausschuss Mess- und Regeltechnik)



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!**

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.

## 2 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 barrel pump with a flow meter and display in areas at risk of explosion.

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 as well as the flow meter FMO are both direct measuring methods and volume measuring units.

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").

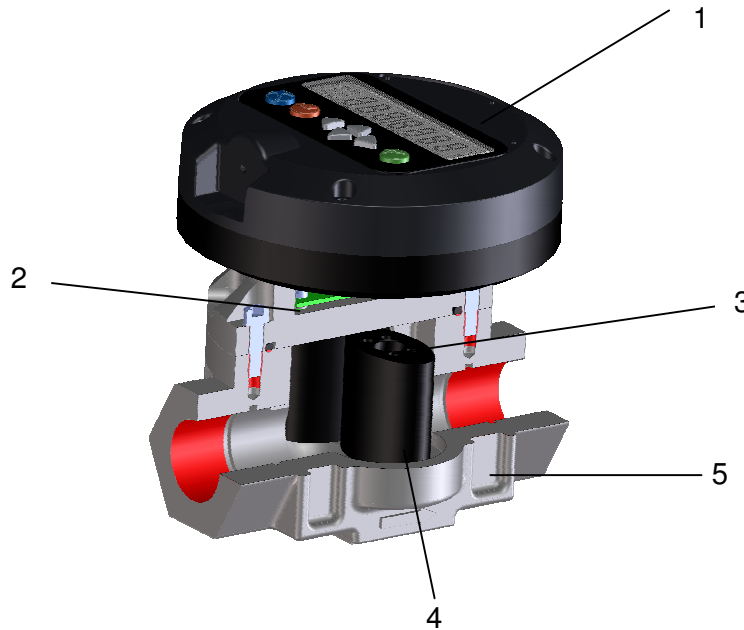
Our volume measuring units can only be used with liquids.



### 3 Description of Device

#### 3.1 FMO flow meter (oval rotor design)

Oval rotor meters are volume measuring units. Two oval shaped gearwheels interlock. The mesh point of the gears is always outside the middle of the two axles. The gearwheels are moved by the liquid. The rotating movement of the gearwheels is transferred outwards by permanent magnets and is recorded there by a sensor. This is displayed with an electronic evaluation. The volume of the measuring chamber is split differently depending on the size of the gearwheels, the toothing, the number of magnets and the number of reed sensors (cf. Technical Data table).



1	Electronic analysis unit
2	Plate with reed-sensor
3	Magnet
4	Oval rotor
5	Housing

### 3.2 Filling Accuracy with the FMO (oval rotor design)

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.

In automatic mode:

- The opening and closing times of the valves used must always be the same.
- The temperature must be constant.
- The viscosity must be constant.
- There should be no air bubbles in the liquid.

## 4 Before starting 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 liquid 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.

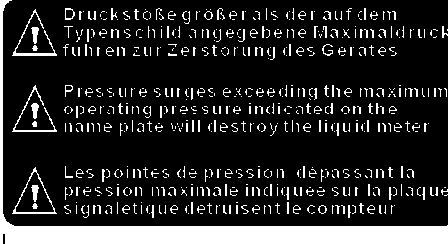


Pressure surges that are greater than the nominal pressure stated on the type plate (see technical data) can damage the flow meter.



**Important:**

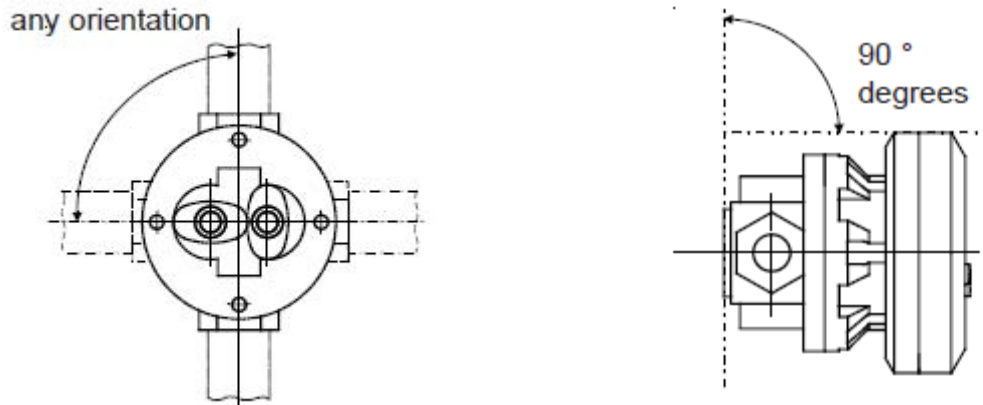
Pressure surges are produced by mass forces (content of long pipes) that are caused by quick-closing fittings!



Keep organic solvents away from the keyboard and LCD display.

## 5 Mounting Instructions

In mounting the flow meter type FMO make sure that neither the bottom nor the cover of the meter housing will be ground off by the weight of the oval rotors.



It is important that after initial installation you fill the line slowly, high speed air purge could cause damage to the oval rotors.

## 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

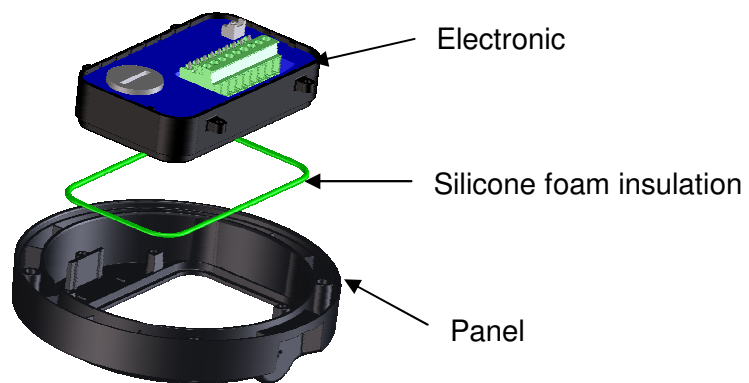
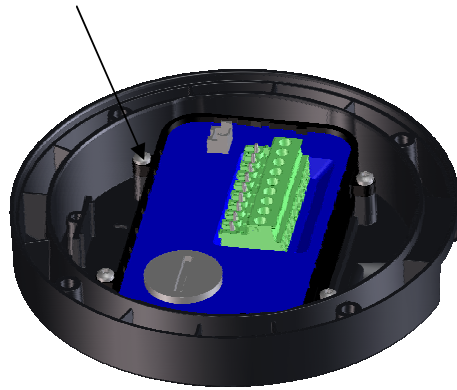
Unscrew the four Torx screws (torque max. 1.3 Nm)



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

In the case of pressure loss of 1 bar, a max. of X litres/minute can flow through.  
X = figures in table

Type	Viscosity in [mPas]								
	<1000	<3000	<4000	<5000	<10000	<25000	<50000	<100000	<500000
FMO 1	1,7	-	-	-	-	-	-	-	-
FMO 2	8,3	-	-	-	-	-	-	-	-
FMO 4	30	27	24	21	15	12	9	6	3
FMO 7	80	-	-	-	-	-	-	-	-
FMO 10	120	108	96	84	60	48	36	24	12
FMO 40	240	215	195	170	120	95	70	45	20
FMO 50	350	315	280	245	175	140	105	70	35

### 9.2 Technical data

Type	Flow rate		Particles	Calibration constant	
	< 5 mPas	> 5 mPas	maximum	[Litre/Impulse]	[Impulse/Litre]
FMO 1 <sup>*1</sup> ...	15 - 100 L/h	10 - 100 L/h	0,12	0,00100	1000
FMO 2 <sup>*1</sup> ...	40 - 500 L/h	30 - 500 L/h	0,12	0,00250	400
FMO 4	4 - 25 L/min	2 - 30 L/min	0,28	0,0089286	112
FMO 7 <sup>*1</sup> ...	8 - 70 L/min	3 - 80 L/min	0,28	0,0192308	52
FMO 10 ...	10 - 100 L/min	6 - 120 L/min	0,28	0,0277778	36
FMO 40 ...	15 - 220 L/min	10 - 240 L/min	0,28	0,0689655	14,5
FMO 50 ...	30 - 300 L/min	15 - 350 L/min	0,46	0,1497006	6,68

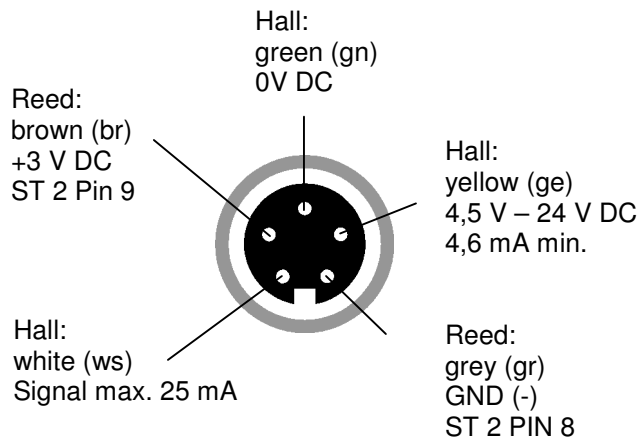
<sup>\*1</sup> FMO 1; FMO 2 and FMO 7 up to 1000 mPas

Type	Accuracy	Viscosity
FMO 1; FMO 2	± 1,0%	Up to 1000 mPas
FMO 7	± 0,5%	Up to 1000 mPas
FMO 4 to FMO 50 <sup>*2</sup>	± 0,5%	Up to 500.000 mPas

<sup>\*2</sup> from 1000 mPas on with special oval rotors

Type	Material Meter body	Material Oval rotors	Temperature of liquid	Operating pressure				
				FMO1; FMO2	FMO 7	FMO 4 to FMO 50	FMO 40 ../FL	FMO 50 ../FL
FMO .../P/P	PPS	PPS	Up to 80 °C	5 bar	10 bar	-	-	-
FMO .../S/P	Stainless steel 316L	PPS	Up to 80 °C	10 bar	-	55 bar	16 bar	16 bar
FMO .../S/S	Stainless steel 316L	Stainless steel 316L	Up to 120 °C	10 bar	-	55 bar	16 bar	-
FMO .../AL/P	Aluminium	PPS	Up to 80 °C	-	-	55 bar	16 bar	16 bar

### 9.3 Plug connection with FMO 1 and FMO 2 in hall/reed version



The shielding of the cable is “black”.

When the FLUXTRONIC is connected with the FMO 1 or 2 the Reed switch is connected as pulse generator. At the plug connector ST2 the brown line must only be connected with PIN 9 and the grey line only with PIN 6. The connection lines of the hall sensor cannot be used and must not be connected with ST 2.

The lines that are not used (green, yellow and white) can be isolated with a shrinkable tube so that no incidental contact occurs.



#### Attention!

The hall sensor must not be used in explosion risk areas.

For security reasons only the cables that are used should be connected.

If, for example, only signal S1 is used, only the green line PIN 4 (+ NAMUR) and the white line PIN 8 (- NAMUR) should be connected.



## 10 EC Declaration of Conformity

FLUX-GERÄTE GMBH  
Talweg 12 · D-75433 Maulbronn



### EG-Konformitätserklärung EC Declaration of Conformity Déclaration de Conformité CE

Hiermit erklären wir,  
We hereby declare,  
Nous déclarons par la présente,

FLUX-GERÄTE GMBH,  
Talweg 12,  
75433 Maulbronn

dass das nachfolgend bezeichnete Produkt aufgrund seiner Konzipierung und Bauart sowie in der von uns in Verkehr gebrachten Ausführung den einschlägigen grundlegenden Sicherheits- und Gesundheitsanforderungen der EG - Richtlinie entspricht.  
Bei einer nicht mit uns abgestimmten Änderung des Produktes verliert diese Erklärung ihre Gültigkeit.

that the following designated product complies with the pertinent fundamental safety and health requirements of the EC Directive in terms of its design and construction and in terms of the version marketed by us.  
This declaration loses its validity in the event of a modification to the product not agreed with us.

que le produit désigné ci-après répond aux exigences fondamentales courantes en matière de sécurité et de santé de la directive CE aussi bien sur le plan de sa conception et de son type de construction que dans la version mise en circulation par nos soins.  
Cette déclaration perd sa validité en cas de modification du produit que nous n'avons pas approuvée.

Bezeichnung des Produktes : Flüssigkeits-Mengenmesser  
Description of the product: Flow Meters  
Désignation du produit : Compteurs volumétriques

Produkttyp: FMC (1), (2)  
Product type: FMO (1), (2)  
Type de: FMJ (1)

Serien-Nr.: Siehe Typenschild am Gerät  
Serial no.: Refer to nameplate on the device  
N° de série: Voir plaque signalétique sur l'appareil

Eingehaltene EG-Richtlinien : (1) EG-Richtlinie EMV 2004/108/EG  
(2) EG-Richtlinie betreffend Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen 94/9/EG

Pertinent EC-Directives : (1) EC Electromagnetic Compatibility Directive 2004/108/EC  
(2) EC Directive concerning equipment and protective systems intended for use on potentially explosive atmospheres 94/9/EC

Directives CE courantes : (1) Directive CE Compatibilité Electromagnétique d'Appareils 2004/108/CE  
(2) Directive CE concernant les appareils et les systèmes de protection destinés à être utilisés en atmosphères explosibles 94/9/CE

Angewandte harmonisierte Normen insbesondere: EN ISO 12100-1, EN ISO 12100-2  
Applied harmonised standards in particular:  
Normes harmonisées appliquées en particulier :


Bevollmächtigter für die Zusammenstellung der Technischen  
Unterlagen:  
Authorised person for the compilation of the technical  
documents:  
Mandataire pour la constitution du dossier technique:

Inge Konrad  
FLUX-GERÄTE GMBH  
Talweg 12  
75433 Maulbronn

Datum / Hersteller - Unterschrift:  
Angaben zum Unterzeichner  
Date / manufacturer - signature  
Details of the signatory:  
Date / Signature du fabricant  
Renseignements du signataire :

23.03.2011

Klaus Hahn

  
Geschäftsführer  
Managing Director  
Directeur

# 11 EC-Type-Examination Certificate



**Physikalisch-Technische Bundesanstalt**  
Braunschweig und Berlin



(1) **EC-TYPE-EXAMINATION CERTIFICATE**  
(Translation)

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 94/9/EC**



(3) EC-type-examination Certificate Number:

**PTB 11 ATEX 2005**

(4) Equipment: FLUX-Liquid Flow Meter type FM.../.../...

(5) Manufacturer: FLUX-GERÄTE GMBH

(6) Address: Talweg 12, 75433 Maulbronn, Germany

(7) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential assessment and test report PTB Ex 11-20327.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

**EN 60079-0:2009**

**EN 60079-11:2007**

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-type-examination Certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

(12) The marking of the equipment shall include the following:

II 2 G Ex ia IIB T6 Gb

Zertifizierungssektor Explosionsschutz  
On behalf of PTB:

Braunschweig, March 4, 2011

Dr.-Ing. U. Johannsmeyer  
Direktor und Professor



ZSEx10100e.dot

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EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.

Physikalisch-Technische Bundesanstalt • Bundesallee 100 • 38116 Braunschweig • GERMANY

# Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

(13)

## SCHEDULE

(14)

### EC-TYPE-EXAMINATION CERTIFICATE PTB 11 ATEX 2005

(15) Description of equipment

The Flux-Liquid Flow Meter type FM.../.../... is a part of the flow measuring system and consists of the electronic system with enclosure. The Flux-Liquid Flow Meter serves for detection and display of the quantity of substances of flowing media. The surface of the electronic enclosure of the Flux-Liquid Flow Meter complies with the requirements of electrostatic safety for equipment group IIB.

#### Electrical data

Internal supply

3 V (DC); for voltage supply approved battery type:  
VARTA Mangandioxid / Lithium, type 6032;  
IEC Design CR2032  
changing of battery only permissible outside the  
hazardous area.

Measuring input STA/STO  
(terminal X1-9, X1-7)

in type of protection Intrinsic Safety Ex ia IIC/IIB;  
maximum values:  
 $U_o = 6,7 \text{ V}$   
 $I_o = 14 \text{ mA}$   
 $P_o = 24 \text{ mW}$   
linear characteristic  
 $C_i$  negligible small  
 $L_i$  negligible small

Measuring input IMPULS  
(terminal X1-9, X1-6 or X2-1, X2-2)

in type of protection Intrinsic Safety Ex ia IIC/IIB;  
maximum values:  
 $U_o = 6,7 \text{ V}$   
 $I_o = 14 \text{ mA}$   
 $P_o = 24 \text{ mW}$   
linear characteristic  
 $C_i$  negligible small  
 $L_i$  negligible small

sheet 2/4

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.

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# Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

SCHEDULE TO EC-TYPE-EXAMINATION CERTIFICATE PTB 11 ATEX 2005

Output OK (terminal X1-5, GND)	in type of protection Intrinsic Safety Ex ia IIC/IIB; maximum values: $U_i = 13,5 \text{ V}$ $R_i = 1568 \text{ Ohm}$ $C_i$ negligible small $L_i$ negligible small
Output g S1/MVEN (terminal X1-4, GND)	in type of protection Intrinsic Safety Ex ia IIC/IIB; maximum values: $U_i = 13,5 \text{ V}$ $R_i = 1568 \text{ Ohm}$ $C_i$ negligible small $L_i$ negligible small
Output ERROR (terminal X1-3, GND)	in type of protection Intrinsic Safety Ex ia IIC/IIB; maximum values: $U_i = 13,5 \text{ V}$ $R_i = 1568 \text{ Ohm}$ $C_i$ negligible small $L_i$ negligible small
Output S2/KRIECH (terminal X1-2, GND)	in type of protection Intrinsic Safety Ex ia IIC/IIB; maximum values: $U_i = 13,5 \text{ V}$ $R_i = 1568 \text{ Ohm}$ $C_i$ negligible small $L_i$ negligible small
Output Impulse route (terminal X1-1, GND)	in type of protection Intrinsic Safety Ex ia IIC/IIB; maximum values: $U_i = 13,5 \text{ V}$ $R_i = 1568 \text{ Ohm}$ $C_i$ negligible small $L_i$ negligible small

For safety aspects, the output circuits are to be regarded as connected with each other.

(16) Assessment and test report PTB Ex 11-20327

(17) Special conditions for safe use

none

sheet 3/4

EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.

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# Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

SCHEDULE TO EC-TYPE-EXAMINATION CERTIFICATE PTB 11 ATEX 2005

- (18) Essential health and safety requirements  
met by compliance with the standards mentioned above

Zertifizierungssektor Explosionsschutz  
On behalf of PTB:

Braunschweig, March 4, 2011

  
Dr.-Ing. U. Johannsmeyer  
Direktor und Professor





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