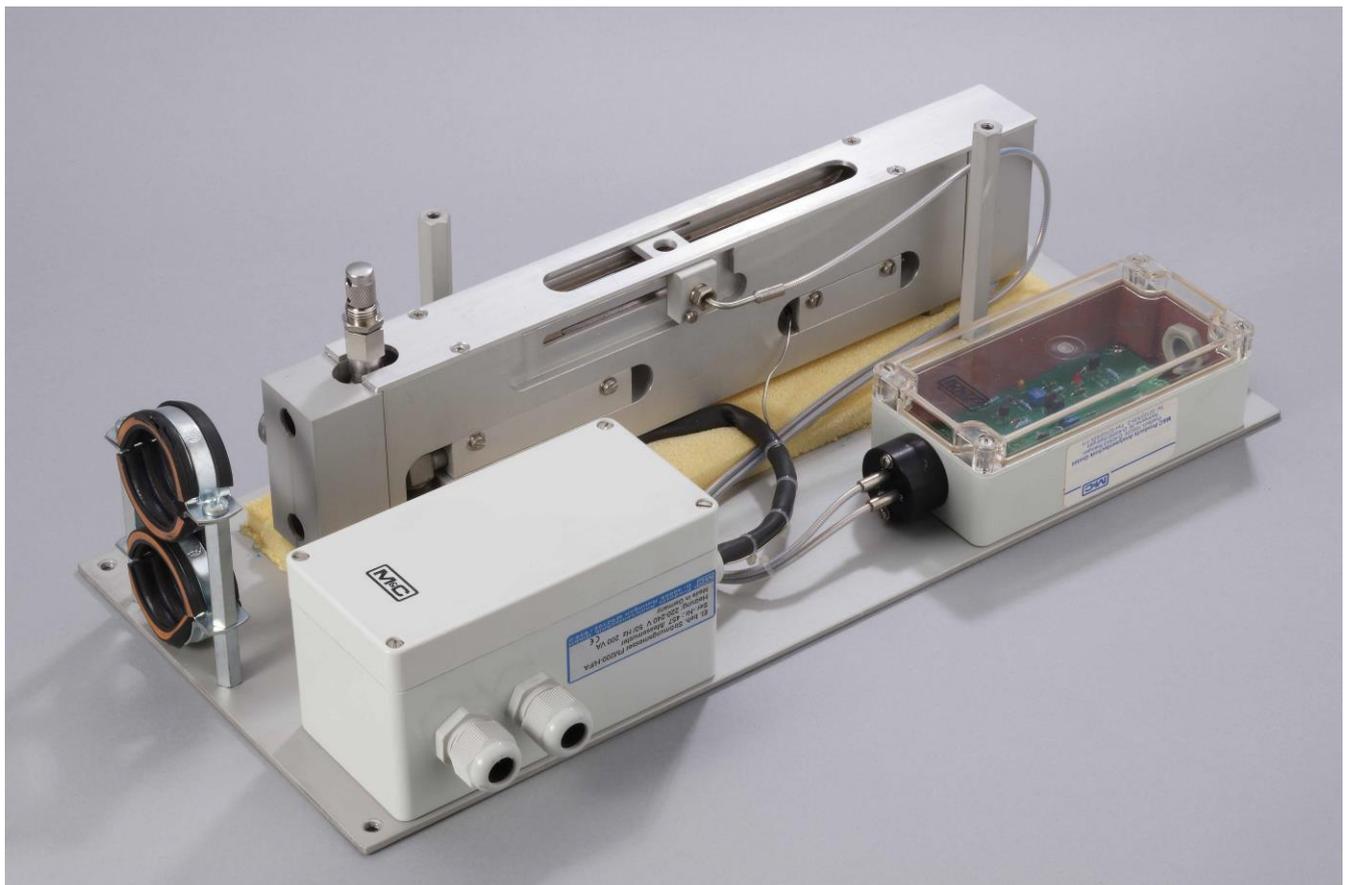


Flowmeter Series FM[®]

FM-2K, FM-200K-H, FM-200K-H/FA

Instruction Manual

Version 1.00.01





Dear customer,

we have made up this operating manual in such a way that all necessary information about the product can be found and understood quickly and easily.

Should you still have any question, please do not hesitate to contact **M&C** directly or go through your appointed dealer. Respective contact addresses are to be found in the annexe to this operating manual.

Please also contact our homepage www.mc-techgroup.com for further information about our products. There, you can read or download the data sheets and operating manuals of all **M&C** products as well as further information in German, English and French.

This Operating Manual does not claim completeness and may be subject to technical modifications.

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Version: 1.00.01

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1 GENERAL INFORMATION

The product described in this operating manual has been examined before delivery and left our works in perfect condition related to safety regulations. In order to keep this condition and to guarantee a safe operation, it is important to heed the notes and prescriptions made in this operating manual. Furthermore, attention must be paid to appropriate transportation, correct storage, as well as professional installation and maintenance work.

All necessary information a skilled staff will need for appropriate use of this product are given in this operating manual.

2 DECLARATION OF CONFORMITY



The product described in this operating manual complies with the following EU directives:

EMV-Instruction

The requirements of the EU directive 2014/30/EU “Electromagnetic compatibility“ are met.

Low Voltage Directive

The requirement of the EU directive 2014/35/EU “Low Voltage Directive“ are met.
The compliance with this EU directive has been examined according to DIN EN 61010.

Declaration of conformity

The EU Declaration of conformity can be downloaded from the **M&C** homepage or directly requested from **M&C**.

3 SAFETY INSTRUCTIONS

Please take care of the following basic safety procedures when mounting, starting up or operating this equipment:

Read this operating manual before starting up and use of the equipment. The information and warnings given in this operating manual must be heeded.

Any work on electrical equipment is only to be carried out by trained specialists as per the regulations currently in force.

Attention must be paid to the requirements of VDE 0100 (IEC 364) when setting high-power electrical units with nominal voltages of up to 1000 V, together with the associated standards and stipulations.

Check the details on the type plate to ensure that the equipment is connected to the correct mains voltage.

Protection against touching dangerously high electrical voltages:

Before opening the equipment, it must be switched off and hold no voltages. This also applies to any external control circuits that are connected.

The device is only to be used within the permitted range of temperatures and pressures.

Check that the location is weather-protected. It should not be subject to either direct rain or moisture.

The device must not be used in hazardous areas.

Installation, maintenance, monitoring and any repairs may only be done by authorized personnel with respect to the relevant stipulations.

4 WARRANTY

If the equipment fails, please contact **M&C** directly or else go through your **M&C** authorised dealer. We offer a one year warranty as of the day of delivery as per our normal terms and conditions of sale, and assuming technically correct operation of the unit. Consumables are hereby excluded. The terms of the warranty cover repair at the factory at no cost or the replacement at no cost of the equipment free ex user location. Reshipments must be send in a sufficient and proper protective packaging.

5 USED TERMS AND SIGNAL INDICATIONS



DANGER!

This means that death, severe physical injuries and/or important material damages **will occur** in case the respective safety measures are not fulfilled.



WARNING!

This means that death, severe physical injuries and/or important material damages **may occur** in case the respective safety measures are not fulfilled.



CARE!

This means that minor physical injuries **may occur** in case the respective safety measures are not fulfilled.

CARE!

Without the warning triangle means that a material damage may occur in case the respective safety measures are not met.

ATTENTION!

This means that an unintentional situation or an unintentional status may occur in case the respective note is not respected.



NOTE!

These are important information about the product or parts of the operating manual which require user's attention.

SKILLED STAFF

These are persons with necessary qualification who are familiar with installation, use and maintenance of the product.

6 INTRODUCTION

Flowmeters are used in analysis technique to control the gas flow. In dependence of the application it could be necessary to use a heated or heatable version. Especially for this applications the **M&C** flowmeters **FM-2K** and **FM-200K-H(/FA)** are designed.

7 SERIAL NUMBERS

The nameplates bearing the serial number are located on the mounting plate.



NOTE!

Always quote the device's serial number when making enquiries and ordering replacement parts.

8 POWER SUPPLY

The flowmeters can be operated on alternating current in the range from **230 V, 50Hz or 115V, 60Hz.**

9 WARNINGS AND INSTRUCTIONS



NOTE!

The instructions and warnings listed in the instructions for use must be complied with!

10 TECHNICAL DATA

Technical Data	FM-2K	FM-200K-H	FM-200K-H/FA
Part-No.	09F2105	09F2505	09F2555 **
Heated / needle valve in the inlet	no	yes	yes
Optical flow control, mono-stable **	no	no	fix between 20 - 50% of scale
Standard measuring range	25-250 l/hr air, 1.2 bar, 180°C		
Measuring ranges available	Scale: 1.6-16, 6-60, 10-100, 25-250 , 50-500, 80-800 l/hr air, 1.2 bar, 180°C		
Operating pressure / operating temperature	max. 2 bar / max. +180°C		
Ambient temperature	-40 to +180°C	-25 to +60°C	-25 to +50°C
Storage temperature	-40 to +80°C		
Gas connections	1/4" NPT i	Tube fittings Swagelok ø6mm, optional ø1/4"	
Temperature controller	-----	Capillary thermostat, integrated in electrical connection box with high temperature limiter and low temperature alarm contact	
Operating temperature	-----	adjustable from 0 to 180°C, set in factory at 180°C	
Temperature alarm contact	-----	alarm point ΔT -30°C to T_{Set} change over contact, voltage free; contact rating 250V, 3A~, 0,25A=	
Power supply	-----	230V 50Hz, 220VA optional 115V 60Hz (a)	
Electrical connections	-----	Terminals 2,5 mm ² , 2x Cable glands PG13	
Protection / Electrical standard	-----	IP 54 EN60529 / EN 61010, EN60519-1	
Dimensions	50 x 290 x 50mm (w x h x d)	250 x 500 x 140mm (w x h x d)	
Weight	0.8 kg	8 kg	8.5 kg
Dead volume / Mounting	approx. 6 cm ³ / wall mounting		
Material of sample contacting parts	glass, stainless steel 316, PTFE		

** The optical flow alarm is only equipped with pre-amplifier K-FA-H, the electronic controller must be ordered separately

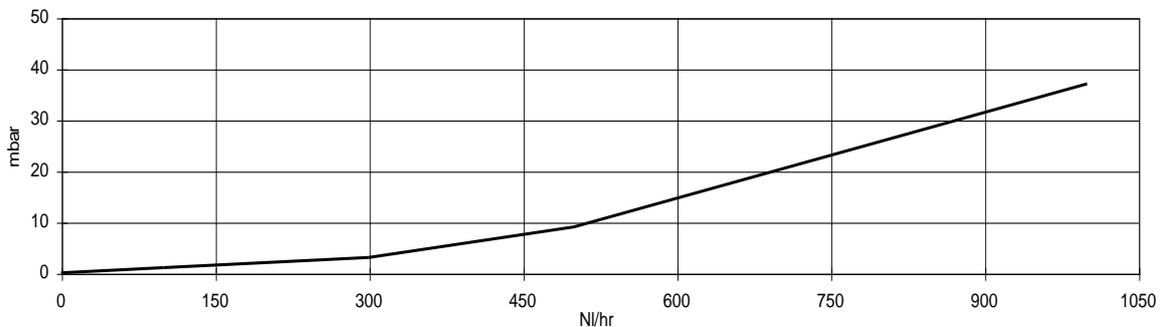


Figure 1 Flow rate in NI/hr air and differential pressure in mbar

11 APPLICATIONS

The **M&C** flowmeters **FM-2K** and **FM-200K-H(/FA)** are used in analysis technique to control gas flow up to an operating temperature of 180 °C.

Depending on the flowmeter glass tube, ranges from 16 l/h to 800 l/h can be realized.

12 DESCRIPTION

The **M&C** flowmeters **FM-2K** and **FM-200K-H(/FA)** consist of a vertical cone shaped glass tube with a free movable float ball inside. The sample gas, flowing from the bottom to the top, lifts the float ball as far as an annular gap appears between the tube wall and the float ball and the forces on the ball are compensated. The position of the float ball is related to a scale on the flow meter tube. The **FM-2K** is a basic heat resistant version for installation in heated systems.

The electrically heated version **FM-200K-H(/FA)** is equipped with an integrated needle valve and is fixed on a mounting plate, decoupled from heat and covered with an insulated enclosure. The heater consists of a heating element with high capacity. The temperature is adjustable on the integrated thermostat up to 180 °C with high temperature limiter and low temperature alarm.

The window of the heat insulated enclosure guarantees a proper reading-out.

The electrical connection box with integrated thermostat is installed outside the enclosure on the mounting plate. A flow control is possible consisting of fibre-optical light guides **FO1**, the sensor head **FA2-H** and the pre-amplifier **K-FA-H** which is installed on the mounting plate as well. The electronic controller **FA...** (option) has to be mounted externally. – See data sheet **5-6.10.2**. –

In order to avoid cold spots, the connecting fittings are equally heated by means of double-ended thermal conducting jaws. The electrically heated sample lines type **3/4/5-N/M/H** – see data sheet **2-6.1** – are fixed with mounting brackets.

Part numbers:

09F2105	FM-2K	heatable up to 180°C
09F2505	FM-200K-H	el. heated up to 180°C with needle valve
09F2555	FM-200K-H/FA	heated, with needle valve and flow control

13 DELIVERY

The flowmeter Series **FM**[®] is normally delivered in one packaging unit:

The flowmeter Series **FM**[®] should be removed carefully from the packaging and checked immediately for completeness against the delivery note.

Check the goods for any damage incurred during transport and if necessary inform your transport insurer of any damage.

14 PREPARATION AND INSTALLATION

Locate the flowmeter Series **FM**[®] in such a way that there is adequate space for removing the cover and replacing the glass tube. Fix the aluminium plate with 4 screws.

Make certain that the flowmeter Series **FM**[®] is easily accessible so that you can carry out any subsequent maintenance work without trouble.

15 MOUNTING

- Loosen the two screws beside the window
- Remove the cover of the flowmeter
- Disconnect the thermal conductivity jaws on the bottom of the flowmeter in two parts by loosening the screws, two each



NOTE!

Make sure that the connection is leak proof!

- Connect the sample lines at the fittings
- assemble the two thermal conductivity jaws on the bottom once again
- Put the cover of the flowmeter on top and screw it

16 ELECTRICAL CONNECTION



WARNING!

When connecting the equipment, please ensure that the supply voltage is identical with the information provided on the model type plate.



NOTE!

Attention must be paid to the requirements of IEC 364 (DIN VDE 0100) when setting high-power electrical units with nominal voltages of up to 1000 V, together with the associated standards and stipulations.

A main switch and matching fuse must be provided externally!

The main circuit must be equipped with a fuse corresponding to the nominal current (over current protection), for electrical details see technical data.

- Remove the lid of the electrical connection box. The electrical connection layout is located in the lid.
- Insert the mains cable (min. 3 x 1.5 mm²) through the cable gland and connect to the appropriate terminals.
- Insert the signal cable through the cable gland and connect to the appropriate terminals.
- Screw lid back on.

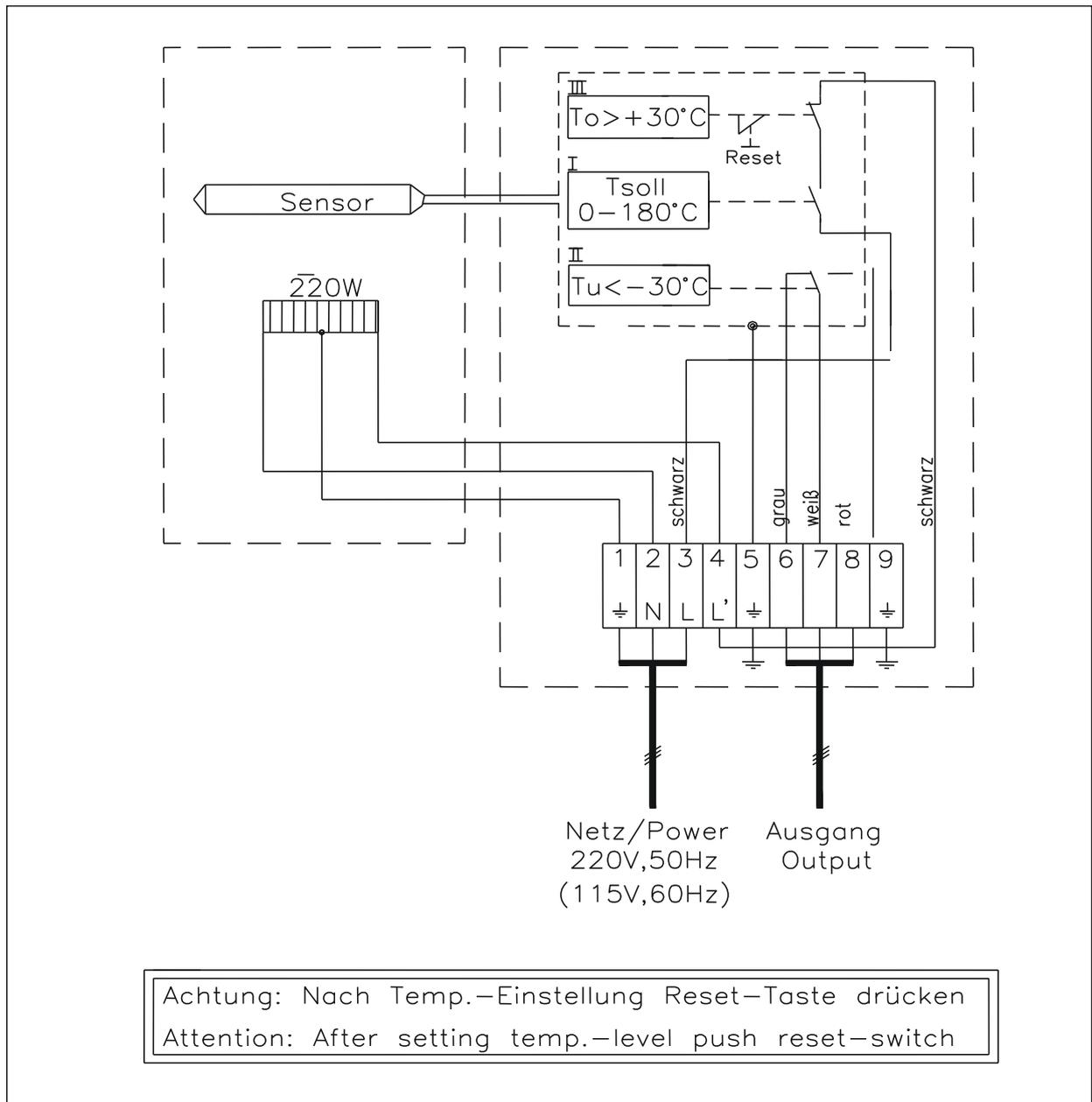


Figure 2 Electrical connections for FM-200K-H/(FA)

17 STARTING

- Before starting up check whether the mains power supply voltage corresponds with the information stated on the type plate.
- Switch on mains power supply.
- The total heating-up time is approximately 30 min. The flowmeter then is ready for operation

18 MAINTENANCE



NOTE!

The safety instructions specific to the plant and process are to be consulted prior to any maintenance work!

It is difficult to give any recommendations as to a particular maintenance cycle. Depending on your process conditions, a meaningful maintenance cycle must be elaborated for the specific application.

Check from time to time, if the flowmeter glass is soiled.



WARNING!

**Aggressive condensate is .
Wear protective glasses and proper protective clothing!**



High surface temperatures! Wear protective gloves!

- To clean the flowmeter glass remove cover lid.
- Unscrew the aluminium lid.
- Disconnect the thermal conductivity jaws on the top and at the bottom of the flowmeter in two parts by loosening the screws, two each.
- Disconnect the 2 sample lines.
- Disconnect the tube at the top of the flowmeter.
- Take out the flowmeter including needle valve.
- Loosen the 3 hexagon screws on the upper and lower adapter, until you can pull them out.
- Pull out the glass, check and clean it.
- Check O-rings on top and bottom and change if necessary.
- Assemble the flowmeter in reverse sequence.



NOTE!

**Prior to carrying out maintenance work on electrical parts, mains voltage should be disconnected from all poles!
This also applies to any external control circuits, which may be connected.**

19 SPARE PARTS LIST

Wear, tear and replacement part requirements depend on specific operating conditions. The recommended quantities are based on experience and they are not binding.

Flowmeter Series FM [®]						
((C) Consumable parts (R) Recommended spare parts (S) Spare parts						
					Recommended quantity being in operation [years]	
Part No.	Indication	C/R/S	1	2	3	
91 F 1040	Spare o-ring set for flowmeter FM..-HT 2 pcs. PTFE spiral o-rings type MAA 612-01-05-1	R	1	1	2	
90 S 2042	O-ring (11) for and FM-2K, FM-200K/H Material: Viton.	R	1	1	2	
91 F 2000	Cartridge heater HLPSR, 100mm, 230VAC/220W	R	1	1	1	
91 F 2000a	Cartridge heater HLPSR, 100mm, 115VAC/200W	R	1	1	1	
90 P 5020	Thermostat (0-180°C) for FT-...-H2	R	1	1	1	

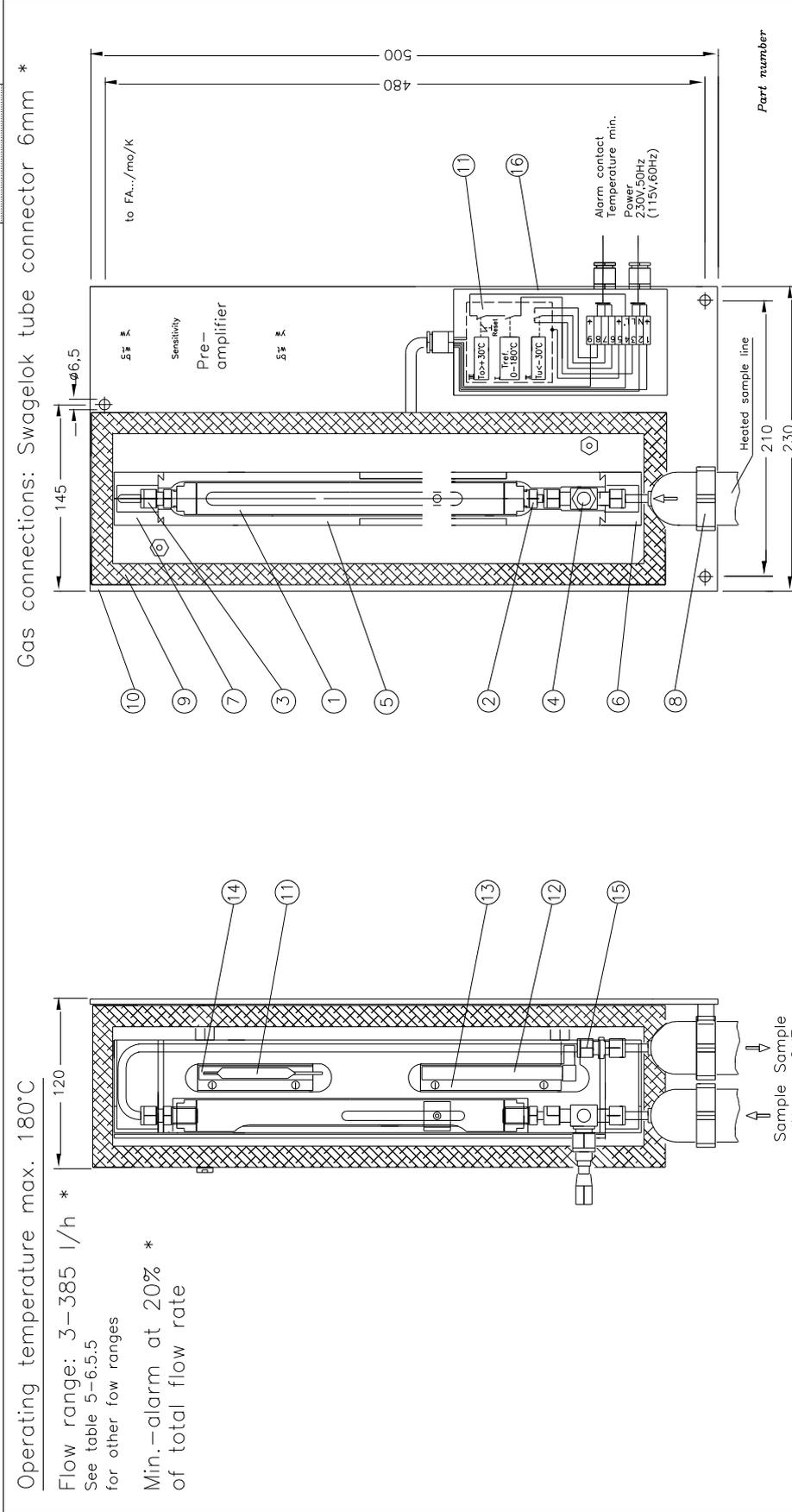
20 APPENDIX

- Heated Flowmeter FM200-H/FA
Drawing No. : **22491021**
- Heated Flowmeter FM200-H
Drawing No.. : **22491011**



Further product documentation can be seen and downloaded from our home page:
www.mc-techgroup.com

Electr. heated flowmeter FM-200 H/FA incl. monostable flow alarm



Item	Description	Type	Part-No	Material	Item	Description	Type	Part-No	Material
1	Flowmeter	FM-2		SS316, glass	14	Al-body for thermostate			Anodized AL
2	Adapter	SS6-MTA-1-4		SS316	15	Union			SS316
3	Union	SS6-MO-1-4		SS316	16	Terminal box			SS6MO-6
4.1	Needle valve ≤ 1000	SS-6MG-MM		SS316,PTFE	17	Pre amplifier incl. adapter			K-FA-H mono 02E4010
4.2	Needle valve >1000	SS-Gl-MM		Anodized AL	18	Fibre light guide			F01 02E4060
5	Al-body		93S0010	*	19	Holder for fibre light guide			Anodized AL
6	Thermal conductivity jaw (bottom)		90P3000	Anodized AL	20				

Operating temperature max. 180°C

Flow range: 3-385 l/h *
 See table 5-6.5.5
 for other flow ranges

Min.-alarm at 20% *
 of total flow rate

Gas connections: Swagelok tube connector 6mm *

5-6.5.11



Figure 3 Electrically heated flowmeter FM-200H/FA incl. monostable flow alarm

Electr. heated flowmeter FM-200 H

Operating temperature max. 180°C

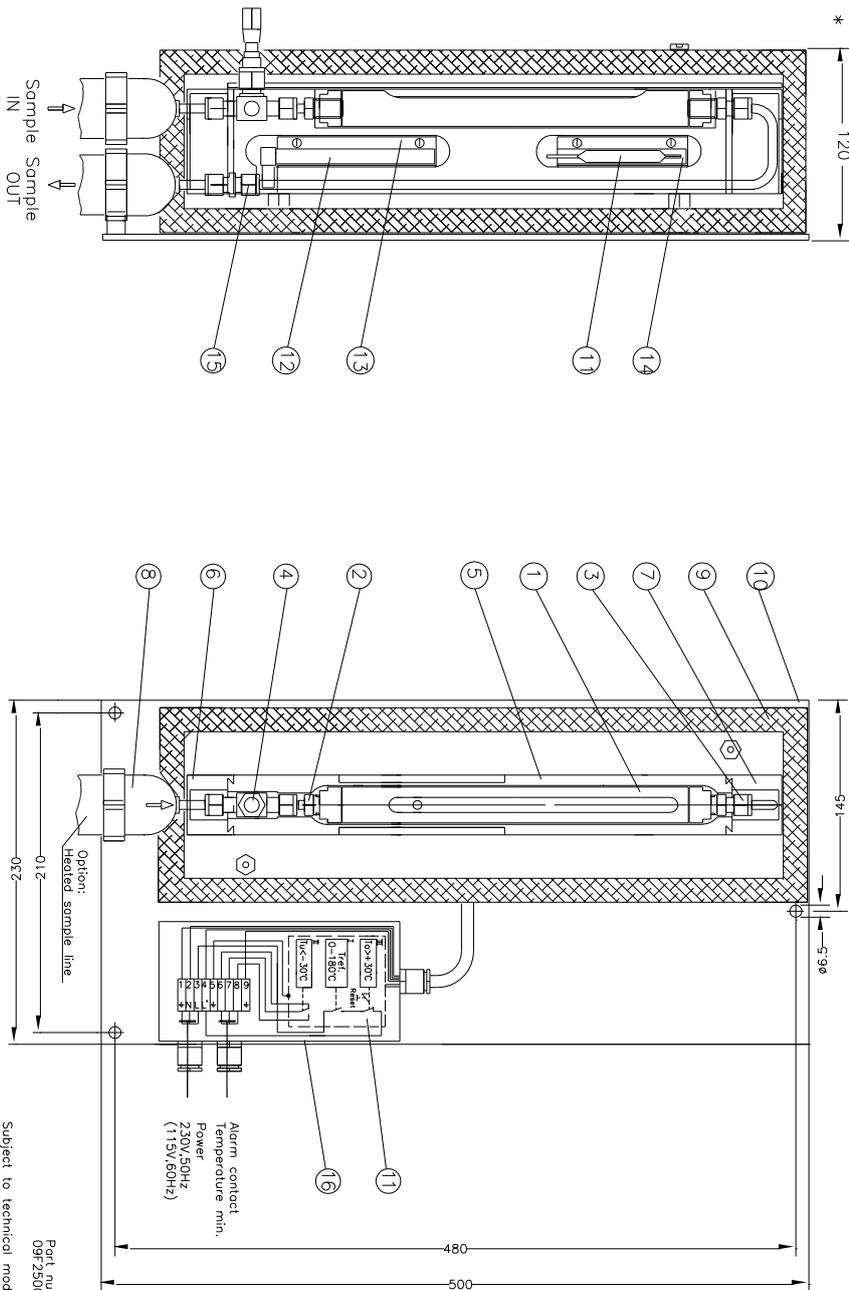
Flow range: 3–385 l/h *
See table 5–6.5.5
for other flow ranges

Gas connections: Swagelok tube connector 6mm *

5–6.5.10

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Analysetechnik mit System



Item Description	Type	Part-No	Material	Item Description	Type	Part-No	Material	Item Description	Type	Part-No	Material
1 Flowmeter	FM-2		SS316, glass	7 Thermal conductivity jaw (top)			Anodized Al	14 Al-body for thermostat	SS6MO-6		Anodized Al
2 Adaptor	SS6-WTA-1-4		SS316	8 Double-clamp			Steel	15 Union			SS316
3 Union	SS6-WO-1-4		SS316	9 protection shield isolated			pointed Steel	16 Terminal box			
4.1 Needle valve $\leq 1000 \text{ l/h}$	SS-6MG-MM		SS316, PTFE	10 Mounting plate			Anodized Al	17			
4.2 Needle valve $> 1000 \text{ l/h}$	SS-GI-MM		SS316, PTFE	11 Thermostat 0–180°C	EMF-134	93S0010	*	18			
5 Al-body			Anodized Al	12 Cartridge heater 230V,50Hz,220W		90R3000	*	19			
6 Thermal conductivity jaw (bottom)			Anodized Al	13 Al-body for cartridge heater			Anodized Al	20			

* Standard
Dimensions in mm

Subject to technical modifications
Part number 09F2500

Drawing No. 22491011/04.00

Figure 4 Electrically heated flowmeter FM-200H