

# Electrical Heated Filter

## FSS-2K/H350, FSS-3SS/H350, FSS-FW/H350

Instruction Manual  
Version 1.00.02



**Dear customer,**

Thank you for buying our product. In this manual you will find all necessary information about this M&C product. The information in the manual is fast and easy to find, so you can start using your M&C product right after you have read the manual.

If you have any question regarding the product or the application, please don't hesitate to contact M&C or your M&C authorized distributor. You will find all the addresses in the appendix of this instruction manual.

For additional information about our products, please go to M&C's website [www.mc-techgroup.com](http://www.mc-techgroup.com). There you can find the data sheets and manuals of our products in German and English.

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

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Version: 1.00.2

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## 1 General Information

The product described in this instruction manual has been built and tested in our production facility.

All M&C products are packed to be shipped safely. To ensure the safe operation and to maintain the safe condition, all instructions and regulations stated in this instruction manual need to be followed. This instruction manual includes all information regarding proper transportation, storage, installation, operation and maintenance of this product by qualified personnel.

Follow all instructions and warnings closely.

Read this manual carefully before commissioning and operating the device. If you have any questions regarding the product or the application, please don't hesitate to contact M&C or your M&C authorized distributor.

## 2 Declaration of Conformity



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

### EMC-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.

### RoHS Directive

The requirements of the RoHS2 ('Restriction of Hazardous Substances 2') directive 2011/65/EU and its annexes are met.

### 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

#### Follow these safety precautions during installation, commissioning and operation of the device:

- 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

In case of a device failure, please contact immediately M&C or your M&C authorized distributor.

We have a warranty period of 12 months from the delivery date. The warranty covers only appropriately used products and does not cover the consumable parts. Please find the complete warranty conditions in our terms and conditions.

The warranty includes a free-of-charge repair in our production facility or the free replacement of the device. If you return a device to M&C, please be sure that it is properly packaged and shipped with protective packaging. The repaired or replaced device will be shipped free of delivery charges to the point of use.

## 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.



**CAUTION**

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

**CAUTION**

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.

**QUALIFIED PERSONNEL**

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



High voltages!

Protect yourself and others against damages which might be caused by high voltages.



Corrosive!

These substances destroy living tissue and equipment upon contact. Do not breathe vapors; avoid contact with skin and eyes.



Hot surface!

Contact may cause burn! Do not touch!



Wear protective gloves!

Working with chemicals, sharp objects or extremely high temperatures requires wearing protective gloves.



Wear safety glasses!

Protect your eyes while working with chemicals or sharp objects. Wear safety glasses to avoid getting something in your eyes.



Wear protective clothes!

Working with chemicals, sharp objects or extremely high temperatures requires wearing protective clothes.

## 6 Introduction

Hot sample gas very often contains solids like dust, tar or grime and water vapor. These materials cause problems for a continuous gas analysis, especially when the gas temperature falls below the dew point. The sample line will be blocked and the analyzer will be damaged. Therefore the solids have to be separated and a temperature drop below the dew point has to be prevented. For this complex of problems the electrically heated **M&C** universal filter type **FSS-../H350** was designed.

## 7 Application

The electrically heated **M&C** universal filter type **FSS-../H350** separates fine dust particles of 2 or 3  $\mu\text{m}$  or solids like tar or soot from the sample gas at operating temperatures up to 350 °C. For an efficient filtration very fine filter elements with high deep action are used. For separation of e.g. tar and soot a special filter cartridge filled up with spun-glass is used.

## 8 Technical Data

Heated filter type	FSS-2K/H350	FSS-3SS/H350	FSS-FW/H350	Version 115V AC
Part-No.	01F3035	01F3030	01F3045	01F30..-a
Filter element length 150 mm, material	Ceramic	Stainless steel SS316	Spun-glass filling	
Filter porosity	2 $\mu\text{m}$	3 $\mu\text{m}$		
Filter surface	140 cm <sup>2</sup>			
Operating pressure max.	5 bar g			
Ambient temperature/storage temperature	-20 to +60 °C			
Dead volume	130 cm <sup>3</sup>			
Gas connections	Swagelok® tube connector $\varnothing$ 6 mm, optional $\varnothing$ 1/4"			
Temperature controller	Capillary sensor thermostat included, with temperature limiter switch and low temperature alarm contact			
Operating temperature	Adjustable from +50 °C to 350 °C, set in factory 250 °C			
Temperature alarm contact	Alarm point at -30 °C below T <sub>SET</sub> change over contact, voltage free, contact rating 250 V, 3 A ~, 0,25 A =			
Power supply	230 V 50 Hz, 800 VA			115 V 60 Hz
Electrical connections	Terminals 4 mm <sup>2</sup> , 2 x cable glands PG 13			
Method of mounting	Wall mounting			
Protection classification/electrical standard	IP 54 EN60529 / EN61010, EN60519-1			
Dimensions (W x H x D)/Weight	300 x 300 x 375 mm/11 kg			
Material of sample contacting parts	Filter chamber: stainless steel 316Ti, sealing: graphite			

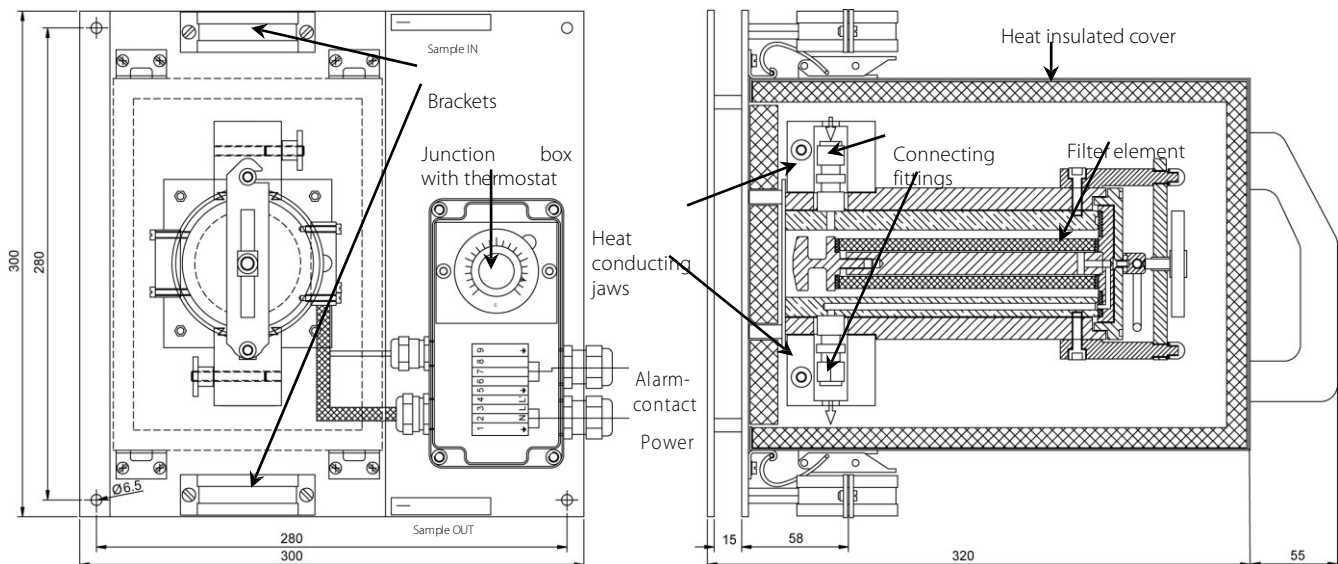


## 9 Description

The **M&C** filter **FSS../H350** is mounted thermally isolated on a plate. The stainless-steel filter body with integrated filter element, alternatively of ceramic, stainless steel or special spun glass, is completely covered by a heated metal enclosure. The high-capacity heating element is controlled by an incorporated compact capillary sensor thermostat in a temperature range of +50 °C to 350 °C. The thermostat is equipped with an temperature limiter switch with reset key, releasing at 30 °C above set-temperature, and a voltage-free low temperature alarm contact at 30 °C below set-temperature.

In order to avoid cold spots, the welded connecting fittings are heated up with the filter by means of two heat conducting jaws. Outside the lagged cap a junction box is mounted which contains the thermostat as well as the terminals for electrical connection. Two brackets fix the heated lines.

The complete conception guarantees a safe operation and a simple maintenance. No tools are needed for replacing the filter element, during the heated sample lines remain in their position.



**Figure 1 Electrical heated universal filter FSS../H350**

## 10 Reception and Storage

The device is a complete pre-installed unit.

- Immediately after arrival take the device and possible special accessories carefully out of the packaging material.
- Compare the goods with the items listed on the delivery note.
- Check the goods for any damage caused during delivery and, if necessary, notify your transport insurance company without delay of any damage discovered.

**CAUTION**            **The device must be stored in a weather protected frost-free area!**

## 11 Installation Instructions

The filter **FSS-../H350** is suitable for wall mounting. The aluminium mounting plate is fixed with 4 screws (s. Fig. 1).

**QUALIFIED PERSONNEL** The installation has to be carried out by skilled staff!



Locate the universal filter series **FSS-../H350** in such a way that there is adequate space for removing the cover and replacing the filter elements. Make sure that the universal filter series **FSS-../H350** is easily accessible to carry out any subsequent maintenance work without trouble.

## 12 Supply Connections

### 12.1 Hose Connections

The connection for sample gas inlet and outlet happens on the top and bottom of the filter. For this purpose tube connectors  $\varnothing 6$  mm ( $\varnothing 1/4$ " as option) are mounted (s. Fig. 1).

**CAUTION** Do not interchange sample inlet and outlet. The connections are marked on the weather protection shield. After connecting the sample lines, make sure that the connections are leak proof.

1. Remove the cover of the heated filter after opening the two clamping devices.
2. Disconnect the thermal conductivity jaws by loosening the knurled nuts.
3. Remove the upper part of the sample line's mounting bracket and insert the sample line into the threaded pipe joint and connect it. The temperature-resistant, stainless steel connectors supplied by M&C have a double ferrule system to ensure reliable sealing. After tightening the nuts of these connectors by hand, they should then be tightened exactly  $1/4$  of a turn using a flat spanner and are then properly mounted.

**ATTENTION** If a PTFE tube is used as sample line, an insert has to be used in the end of the tube in order to prevent the tube being pressed together.

4. Screw on the upper part of the mounting bracket and fix the heated sample line.
5. Now place the heat conducting jaws around the sample gas connection in the retaining slot and fix with the knurled nuts.

### 12.2 Electrical Connections

**QUALIFIED PERSONNEL** The electrical connections have to be carried out by skilled staff!



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

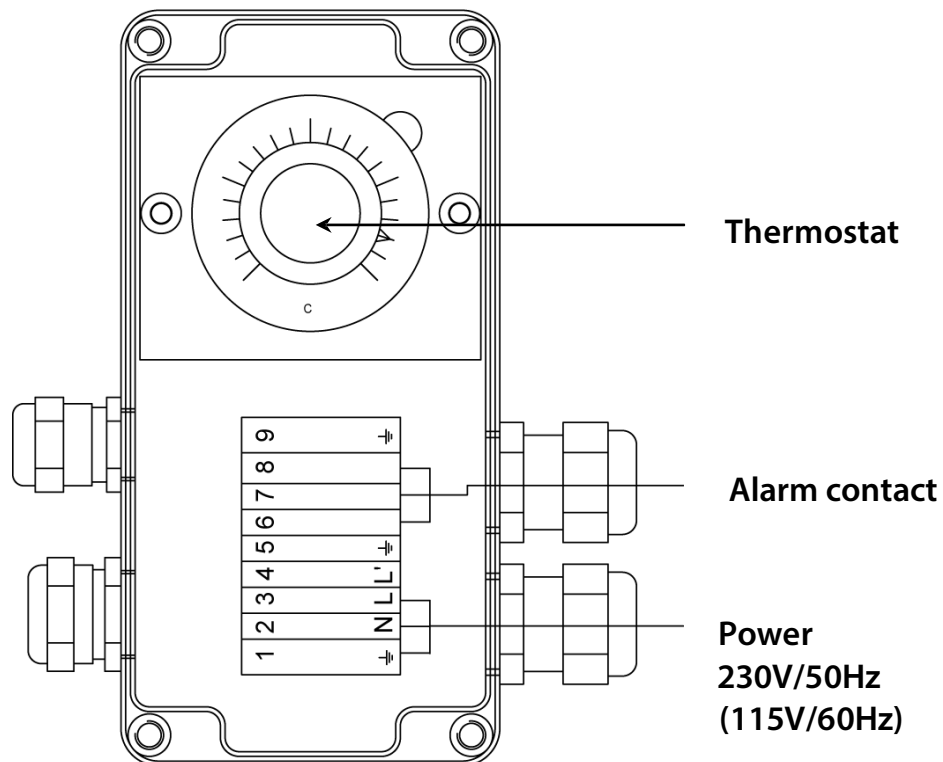
**NOTE**

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.

In any case we recommend the use of temperature resistant cable ! 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.

It is recommended to use the low temperature alarm. In case of an alarm the flow can be stopped and the components downstream the filter are safe from damage.



**Figure 2 Electrical connection of the filter FSS-../H350**

1. Remove the lid of the junction box. The electrical connection layout is located in the lid also.
2. Insert the mains cable (min. 3 x 1.5 mm<sup>2</sup>) through the lower cable gland and connect to the appropriate terminals.
3. Insert the signal cable through the upper cable gland and connect to the appropriate terminals.
4. Screw lid back on.

### 13 Commissioning

Before commissioning, the plant- and process-specific safety measures must be observed. The relevant safety regulations and measures must be taken into account for the media to be conveyed.

#### QUALIFIED PERSONNEL

**The starting has to be carried out by skilled staff!**



**WARNING**



**Before starting up check whether the mains power supply voltage corresponds with the information stated on the nameplate.**

**Beware of touching the filter surface during operation. Serious burns can occur because of high surface temperatures.**

**Wear protective gloves and protect the filter from unauthorized access.**

1. Check the rated value setting on the built-in thermostat (s. Fig. 2).



**NOTE**

**If the rated value temperature needs to be lowered more than 30°C in one step duration operation, the thermostat's excess temperature switch-off is triggered (for re-start press reset key).**

2. Switch on mains power supply.



**NOTE**

**The total heating-up time is approximately 2 hours.**

**In case of low temperature alarm (failure of heating) the gas flow has to be interrupted by adequate measures!**

## 14 Shut-Down

### QUALIFIED PERSONNEL

The shut-down has to be carried out by skilled staff!



NOTE

Before shut-down, i.e. switching off the heating, the filter must be flushed with inert gas or air in order to avoid condensation of aggressive components from the process gas.

## 15 Maintenance

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

### QUALIFIED PERSONNEL

Maintenance has to be carried out by skilled staff!

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. An indication that filter-maintenance may be necessary could be shown by a constant decline in the amount of sample gas in the analysis system.

Maintenance of the filter is mainly limited to changing the filter elements and checking the seals.



WARNING



Aggressive condensate is possible.

Wear protective glasses and proper protective clothing!

Flush the filter in case of toxic gases!



For maintenance work during operation:

High surface temperatures!

Touching the filter surface can cause serious burns!

Wear protective gloves and protect the filter of unauthorized access!



The following steps are recommended removing the filter housing lid (see Figure 3):

1. Turn toggle handle "A" approx. 1 turn counter-clockwise to lift up the filter housing lid.
2. Turn handle "C" in position "E".
3. Swivel clamp "B" to the left.
4. Use the toggle handle "A" to pull the filter housing lid out of the filter area.
5. Change the filter element and possibly the seals.
6. Push the filter housing lid back into the filter area.
7. Swivel clamp "B" to the right and bring the handle "C" into position "E" so that the clamp engages in the ring bolt "D" and the threaded bolt "H". If necessary, adjust the position of the ring bolt "D" on the threaded rod of the toggle handle "A".
8. Then turn handle "C" to position "F" and hand-tighten toggle handle "A" by turning it clockwise.

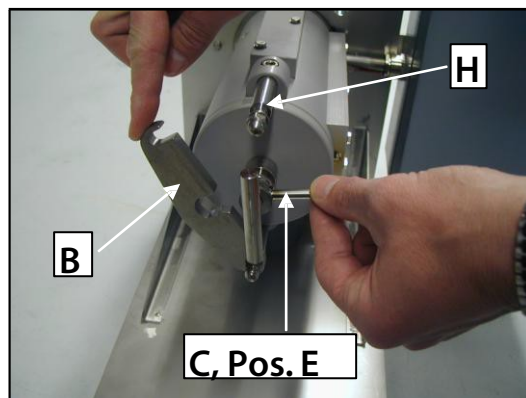
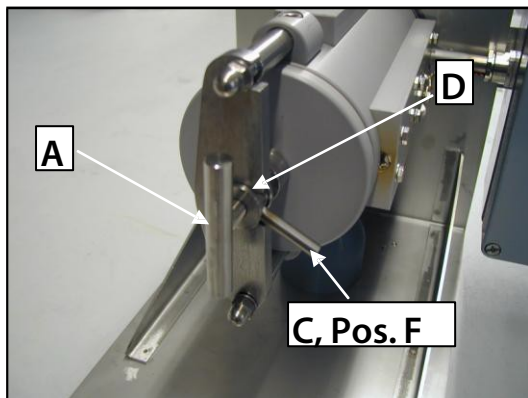


Figure 3 Dismounting the filter housing lid

## 16 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.

Electrically heated universal filter FSS-../H350 (C) consumable parts, (R) recommended spare parts, (S) spare parts		C/R/S	Recommended quantity in operation [years]		
			1	2	3
90F0020	Filter element S-2K150, ceramic, 2 µm, 150 mm	C	As required	As required	As required
90F0126	Filter element F-3SS150, SS316, 3 µm, 150 mm	C	As required	As required	As required
93S2083	Spec. spun-glass filling, high temperature resistant, 1000 g	C	As required	As required	As required
93S0030	Filter housing lid gasket, graphite	R	2	4	8
93S0011	Thermostat (0 - 320 °C)	R	1	1	1
93S0015	Heating cartridge, 160 mm, 230 V AC/800 W	R	1	1	1
93S0017	Heating cartridge, 160mm, 115 V AC/800 W	R	1	1	1
93S0055	Gasket (30) for filter element, graphite	R	As required	As required	As required

## 17 Appendix



Further product documentation can be seen and downloaded from our home page:

[www.mc-techgroup.com](http://www.mc-techgroup.com)