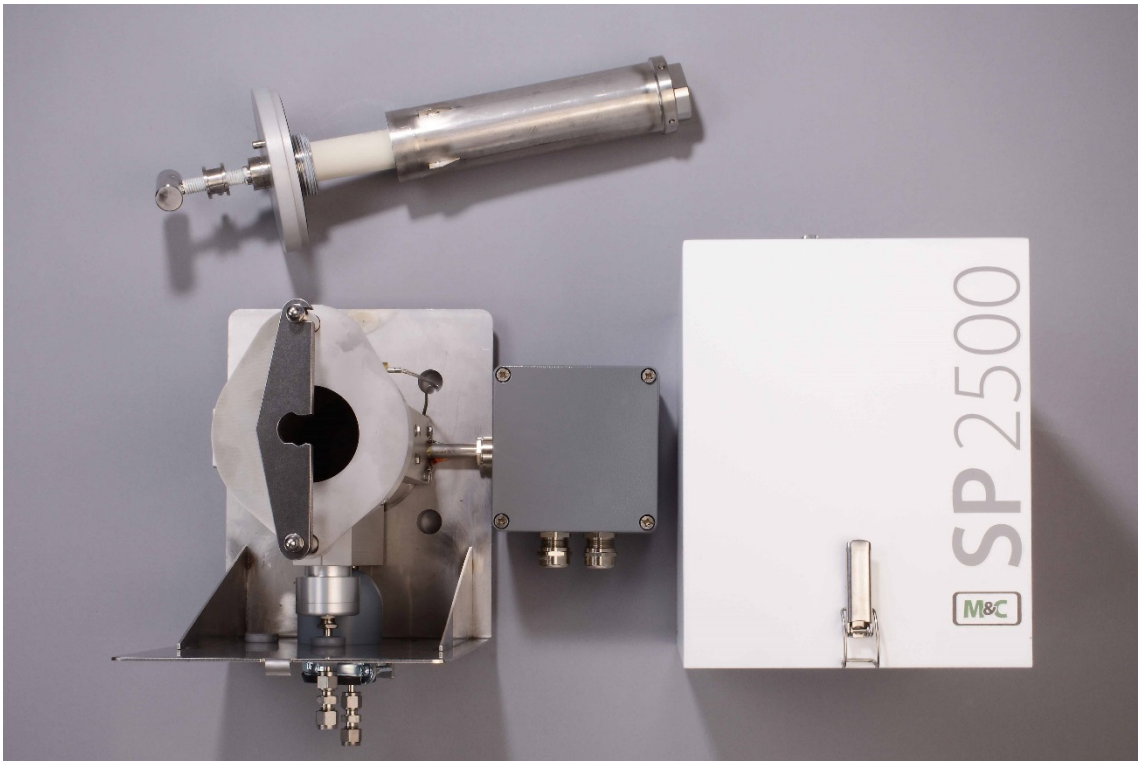
Embracing Challenge

Gas sample probe Series SP®

SP2500-H, SP2500-H/C/I/BB, SP2500-H/C/I/BB/F

Instruction Manual
Version 1.00.02



Dear customer,

Thank you for buying our product. In this instruction manual you will find all necessary information about this M&C product. The information in the instruction 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 manual.

For additional information about our products and our company, please go to M&C's website www.mc-techgroup.com. There you will find the data sheets and manuals of all our products in German and English.

Version: 1.00.02

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Head Office

M&C Tech**Group** Germany GmbH ◆ Rehhecke 79 ◆ 40885 Ratingen ◆ Germany
Telephone: 02102 / 935 - 0
Fax: 02102 / 935 - 111
E - mail: info@mc-techgroup.com
www.mc-techgroup.com

1 GENERAL INFORMATION

The product described in this instruction 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 instruction 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 instruction manual.

2 DECLARATION OF CONFORMITY

CE - Certification

The product described in this instruction 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.

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 directions and instructions regarding installation, commissioning and operation of this equipment:

Read this instruction manual before starting up and use of the equipment. The information and warnings given in this instruction 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 equipment 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 instruction 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.

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!

High voltages!

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

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

M&C **SP2500-H..** series probes are used for continuous gas sampling in dust-loaded processes at high temperatures and high gas moisture.

The probe offers the possibility to remove the preliminary filter or sample tube in the process without having to remove the probe head for cleaning purposes.

H/C/I/BB and **..-H/C/I/BB/F** series probes are used in highly dust-loaded processes. The additionally installed backpurging valve and pneumatic isolating valve in the sampled gas outlet ensure highly efficient backpurging of the filter space in the in the probe head and used preliminary filter.

For further information or personal advice, please do not hesitate to contact us or visit us online to view our wide range of products at:

7 DESCRIPTION

The probe has been designed for easy installation, safe operation, easy maintenance and diversity in application.

Depending on the particular problem, various sample tubes or preliminary filters (see data sheets 2.14 and 2.17), which are not included in the scope of supply of the probe, are screwed into the G3/4"i thread in the filter holder.

The large, ceramic deep-bed filter element (optional glass fibre elements or glass wadding fillings available) is arranged in a housing with minimal dead space outside the process area.
The probes are designed for replacement of the filter element without the need for tools; as the sample line does not need to be removed, contamination of the clean gas side is avoided.
Cleaning of the sample tube or preliminary filter takes place by withdrawing the filter part from the probe without having to remove the probe head.

Owing to the special design of the heating element of **SP2500...** series probes, the entire probe head including mounting flange can be heated adjustable to 180°C, thus ensuring reliable operation without cooling below the dew point externally. Temperature control with the standard version takes place by means of an integrated capillary sensor thermostat with excess temperature limiter and alarm function in a compact arrangement directly on the probe.

With the **SP2500-H**, backpurging or calibration gas supply takes place via an optional check valve (option C).

Additional functions of the **SP2500-H/C/I/BB(/F)**:

- The calibration gas can be supplied directly at the check valve/**C** to the probe outlet. Calibration gas supply at the probe is possible without any expensive gas loss via the otherwise open probe inlet.

- The isolating valve **/I** isolates the gas outlet of the heated filter chamber.

- The filter space, sample tube or preliminary filter can be backflushed via the check valve **/BB** projecting into the heated filter chamber.

- The filter element, and via this indirectly, the filter space and sample tube or preliminary filter can be backflushed via the check valve **/BB/F** installed in the heated chamber wall.

The following figures show the probe types **SP2500-H, ...H/C/I/BB, ...H/C/I/BB/F**.

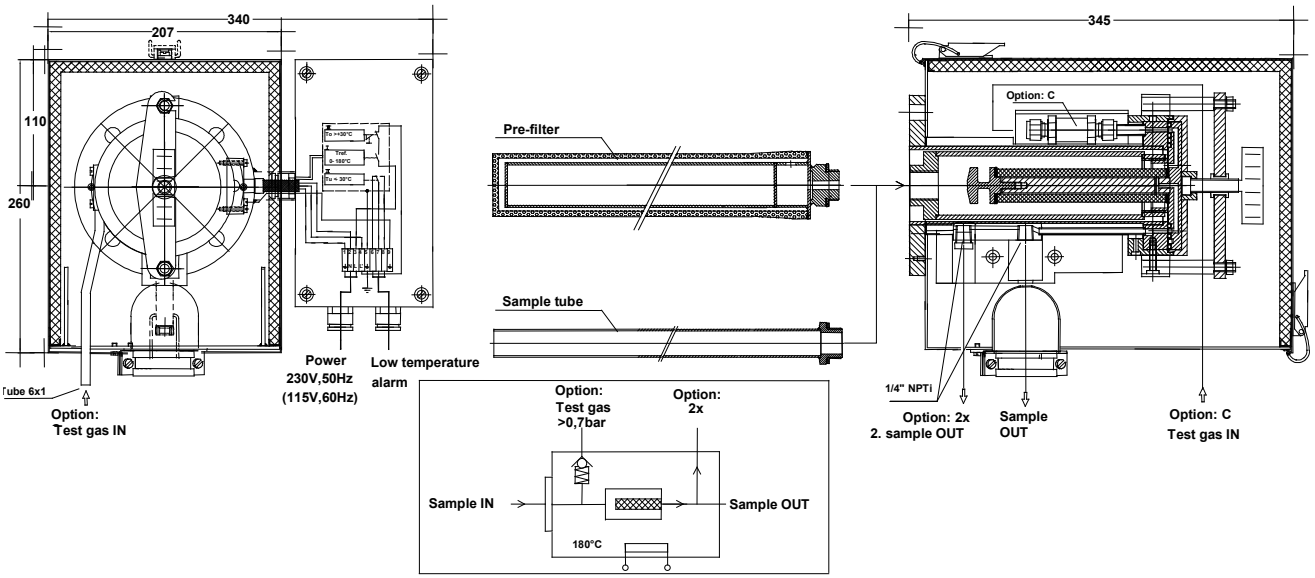


Figure 1 Probe type SP2500-H

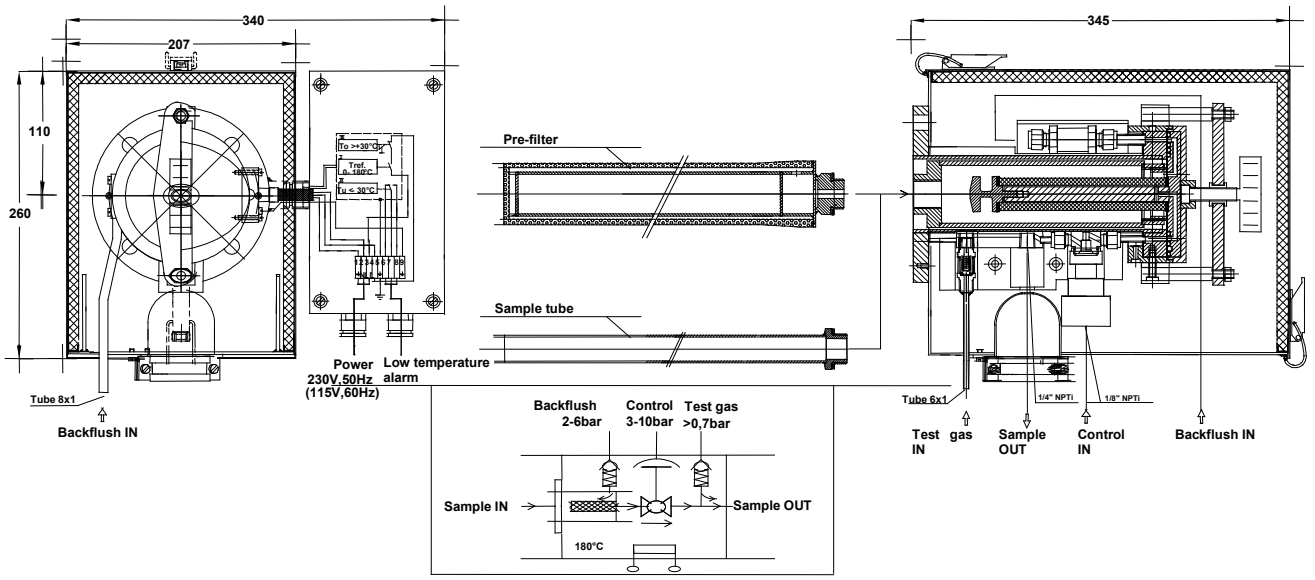


Figure 2 Probe type SP2500-H/C/I/BB

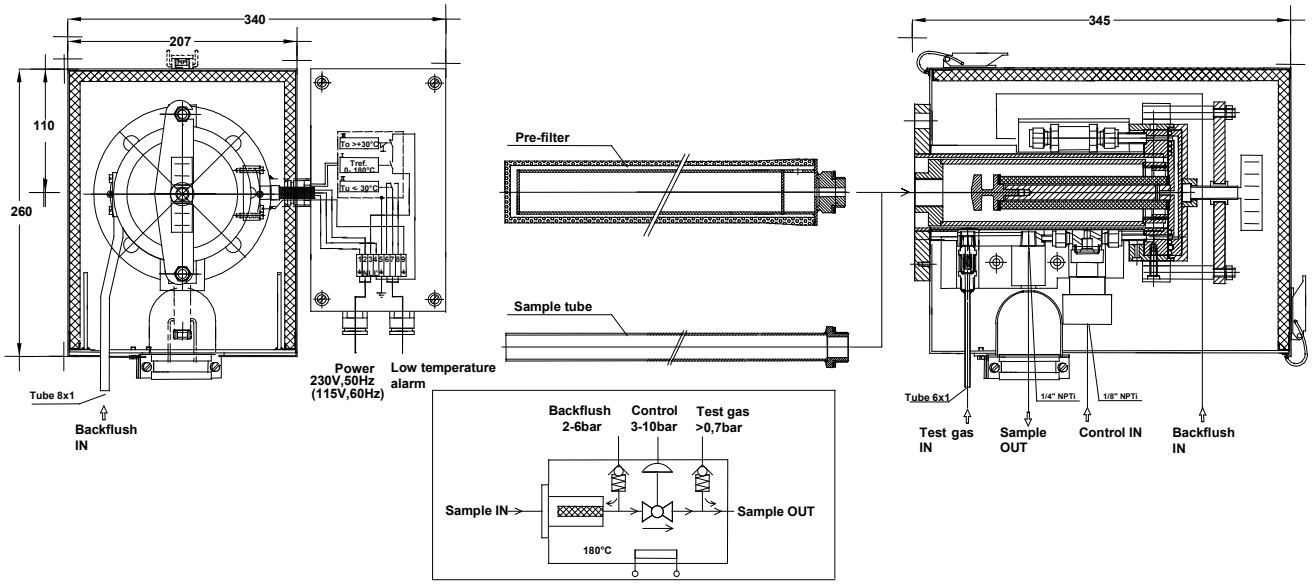


Figure 3 Probe type SP2500-H/C/I/BB/F

7.1 OPTIONS

The following list shows the options available. The diversity of options and modular design of **M&C** gas sample probes ensure optimum probe selection to suit the particular process and ambient conditions.

Description	Part No.
Basic typeSP2500H, heated to 0 - 180 °C, with weatherproof cover, Material stainless steel 316Ti	20S3510
Basic type SP2500-H/C/I/BB, heated to 180 °C, with weatherproof cover, Material stainless steel 316Ti	20S3520
Basic type SP2500-H/C/I/BB/F, heated to 0 – 180 °C, with weatherproof cover, Material stainless steel 316Ti	20S3500
Power supply 115 V/60 Hz/115 V	20S9030
Type with second sampled gas outlet 1/4" NPT i*/2x*	20S9015
Type with backpurging/calibration gas supply valve (C*), opening pressure 0.7 bar, tube 8 mm*	20S9435
Type with glass filter element 0,1GF150, filter fineness 0.1 µm, seal PTFE/GF150	20S9020
Type with PT100 sensor instead of capillary controller, without thermostat/PT100	20S9025
Type with thermocouple Fe-CuNi (type J) instead of capillary controller, without thermostat/Fe-CuNi	20S9027
Type with thermocouple Ni-CrNi (type K) instead of capillary controller, without thermostat/Ni-CrNi	20S9028
Type with second PT100 sensor/2-PT100	20S9026
Type with special intermediate flange adapter DN..PN 6 or ANSI..150 lbs/DN	20S9004
Support tube adapter type SP2500H/SA500 for supporting the installation of long sample tubes and preliminary filters with extension tube, including flange gasket, material 316Ti	20S9433
Type with gas pre-heater GVW1, material: stainless steel (data sheet No. 2.23) /GVW1	20S9058
Connection of gas pre-heater to connection “BB“ and gas inlet/GVW	20S9062
Type with steam heating without regulating and valves Instead of capillary controller/D	20S9033

* only SP2500-H

8 TECHNICAL DATA

Technical data SP ® series	SP2500-H	SP2500-H/C/I/BB	SP2500-H/C/I/BB/F
Part No.	**20S3510**	**20S3520**	**20S3530**
Integrated backpurging	No	Via filter space	Via filter element
Weatherproof cover	Yes		
Electrical connection	Terminals; max. 4 mm², 2 x PG13.5 cable gland		
Degree of protection of terminal box	IP 54 EN 60529		
Power supply	230 V 50/60 Hz, 800 W or 115 V 60 Hz, 800 W (fuse 10 A)		
Material of medium contacted parts	Stainless steel 316Ti, 316L, FKM*, Graphite**		
Ambient temperature	-20 to +60 °C*** /PT100, /Fe-CuNi,/Ni-CrNi** = -20 to +80 °C		
Operating temperature	0 - 180°C* /PT100** /Fe-CuNi** /Ni-CrNi**		
Process pressure	0.4 to 6 bar abs.		
Ready for operation	After 40 min		
Alarm contact rating	250 V 3 A~, 0.25 A=, operating point: ΔT 30 °C** to $T_{nominal}$		
Sample gas outlet connection	1/4"-NPT* internal, for tube connection Ø 6, 8 or 10 mm**		
Calibration gas backpurging connection	1/4“ NPT i*/C**	Back purging: tube 8 mm, calibration gas: tube 6 mm	
Isolating valve/I connection		1/8“ NPT i	
Control air pressure range		3 – 10 bar	
Filter space volume	280 cm^3		
Filter fineness	S-2K150= ceramic*, 2µm, /F-0,1GF150= glass fiber**, 0.1µm, /FW= glass fiber/spun glass**		
Mounting flange	DN 65 PN 6, Form B, 1.4571* >DN or ANSI possible**		
Weight	Approx. 17 kg*		
Electrical equipment standard	EN 61010, EN 60519-1		

* Standard
** Optional
*** At high ambient temperatures, the PT100 (Part No. 20S9025) or thermocouple Fe-CuNi or Ni-CrNi (Art. No. 20S9027 or 20S9028) option should be selected instead of the thermostat. The use of an additional electronic thermostat is necessary (see also data sheet 4.3).

9 DIMENSIONS

The following illustration shows the dimensions of the **SP2500-H..** probe.

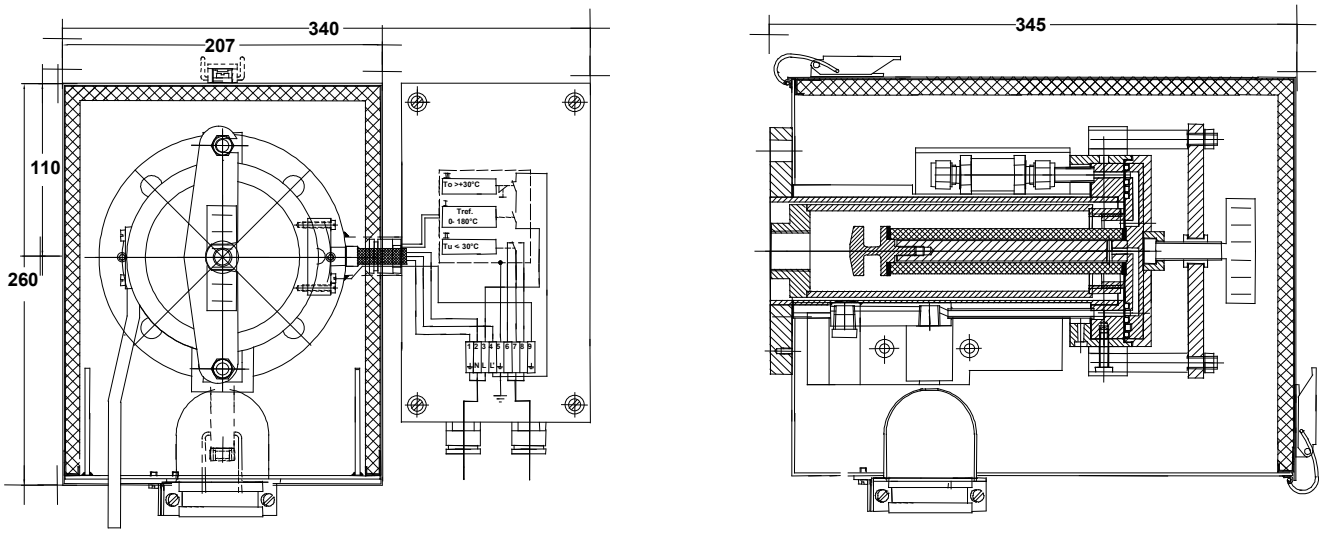


Figure 4 Dimensions (mm) of SP2500-H.. probe

10 RECEIPT AND STORAGE

- The probe and any special accessories should immediately be unpacked carefully upon delivery and against the delivery note.
- The delivery should be checked for any transport damage and the transport insurer immediately notified of any damage.

Note The probe should be stored protected from frost.

11 INSTALLATION INFORMATION

When carrying out installation, the safety rules and regulations for the prevention of accidents must be observed – this applies similarly to subsequent operation. The information in Chapter 3 “Important safety information” must be observed in particular.

The following applies:

- Select an optimal sample point according to the general guidelines or agree on a sample point with the responsible authorities.
- The sample point should be arranged so that sufficient space for installation and removal of the probe is available; the insertion length of the sample tube should be taken into account.
- Easy access to the probe must be ensured for any necessary maintenance.
- The sample nozzle locally should be dimensioned so that the nozzle temperature is always above the acid dew point to prevent corrosion and blockages.
- If the ambient temperature in the area of the nozzle is higher than 60°C due to the radiated heat, a radiant heat reflective plate must be installed in the area of the nozzle locally to protect the probe.
- The nozzle mounting flange connection should be DN65 PN6 or 3“ANSI (115V version). For other connection dimensions, an optional intermediate flange adapter is available. The necessary, minimum flange sizes or minimal nozzle diameter depends on the sample tube used or the preliminary filter diameter.
- It is recommended to mount the probe horizontally with an angle of inclination of 10° with respect to the process.

Note

The suitability of the probe must be verified prior to installation by comparison with the available operating parameters (see rating plate).

12 INSTALLATION

M&C SP2500-H.. probes are designed for stationary use and with correct selection of the sample point and proper installation, they will give many years of trouble-free service with minimum maintenance.

12.1 PROBE ASSEMBLY

- Remove the probe cover after opening the two toggle-type fasteners.
- Place the flange gasket on the sample nozzle.
- Bolt together the mounting support and probe flange with the supplied nuts and bolts.

When using the support tube adapter (for supporting the installation of long sample tubes or preliminary filters when the probe is installed in a horizontal position), bolt the same between the nozzle flange and special flange with the threaded bolts.
The supplied sliding segment must be screwed to the sample tube or extension tube of the preliminary filter about 450mm away from the G3/4“t connecting thread.

If the sample nozzle does not correspond to the standard flange connection DN65 PN6, the optional supplied adapter flange must be fitted to the probe in the same manner.

Note

In the preferred probe mounting position, the sample gas outlet points downwards (does not make any difference to the function of the probe).
It is recommended to mount the probe with a slight downward inclination with respect to the process to enable any precipitated droplets to flow back to the process.

- Remove the heat conducting plates at the sample gas outlet after loosening the knurled screw. For connection of the sample line, screw in an appropriately dimensioned union with **1/4"-NPT** connecting thread using PTFE sealing tape.

Caution

The fittings must be tightened carefully to avoid damaging the internal components.
The fittings must not be overtightened.
In the event of leaks, the fittings must not be tightened further. The respective fitting should be removed completely and retightened.
Check unions for leaks.

12.2 FITTING PRELIMINARY FILTER OR SAMPLE TUBE

The **SP2500-H..** probe offers the possibility of fitting or removing the preliminary filter or sample tube in the process without having to remove the probe head.

For this purpose, the filter housing covers must be removed as follows:

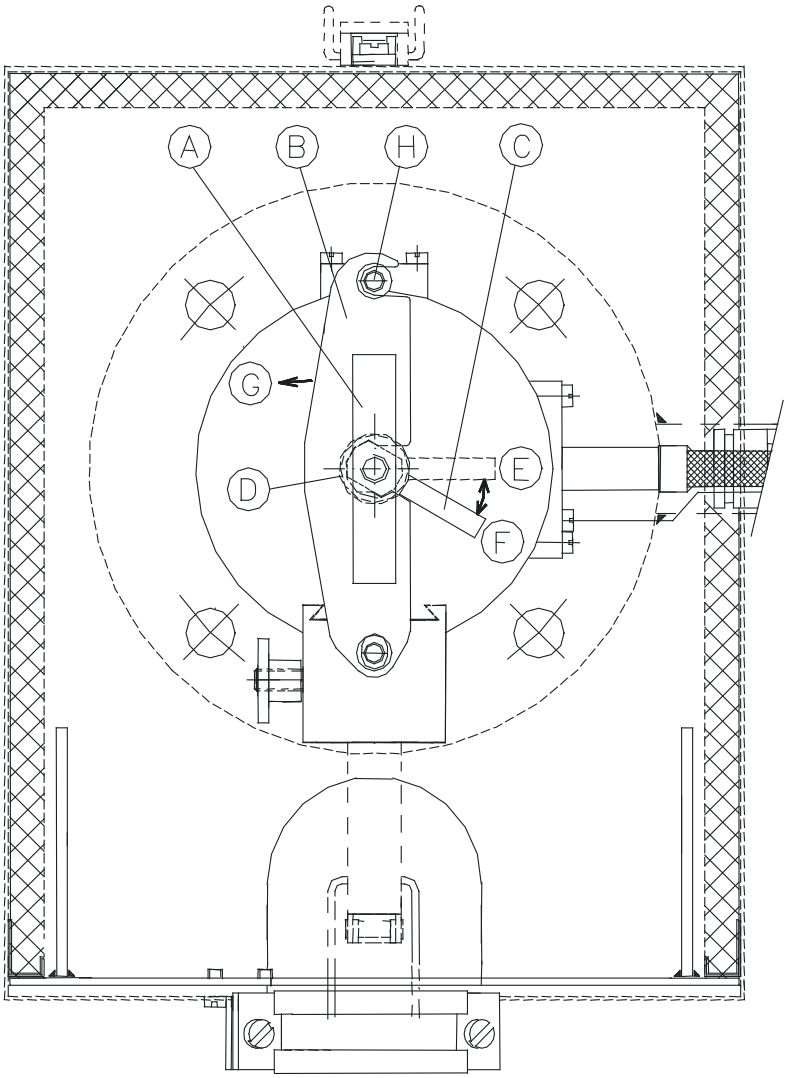


Figure 5 Schematic diagram of filter housing cover

- Turn handle **A** about one full turn anticlockwise, so that the cover is lifted.
- Place handle **C** in position **E.**
- Swing out clamp **B** to the left (in the direction of **G**);
- Remove the filter housing cover with handle **A**.

The following figures show the described steps.

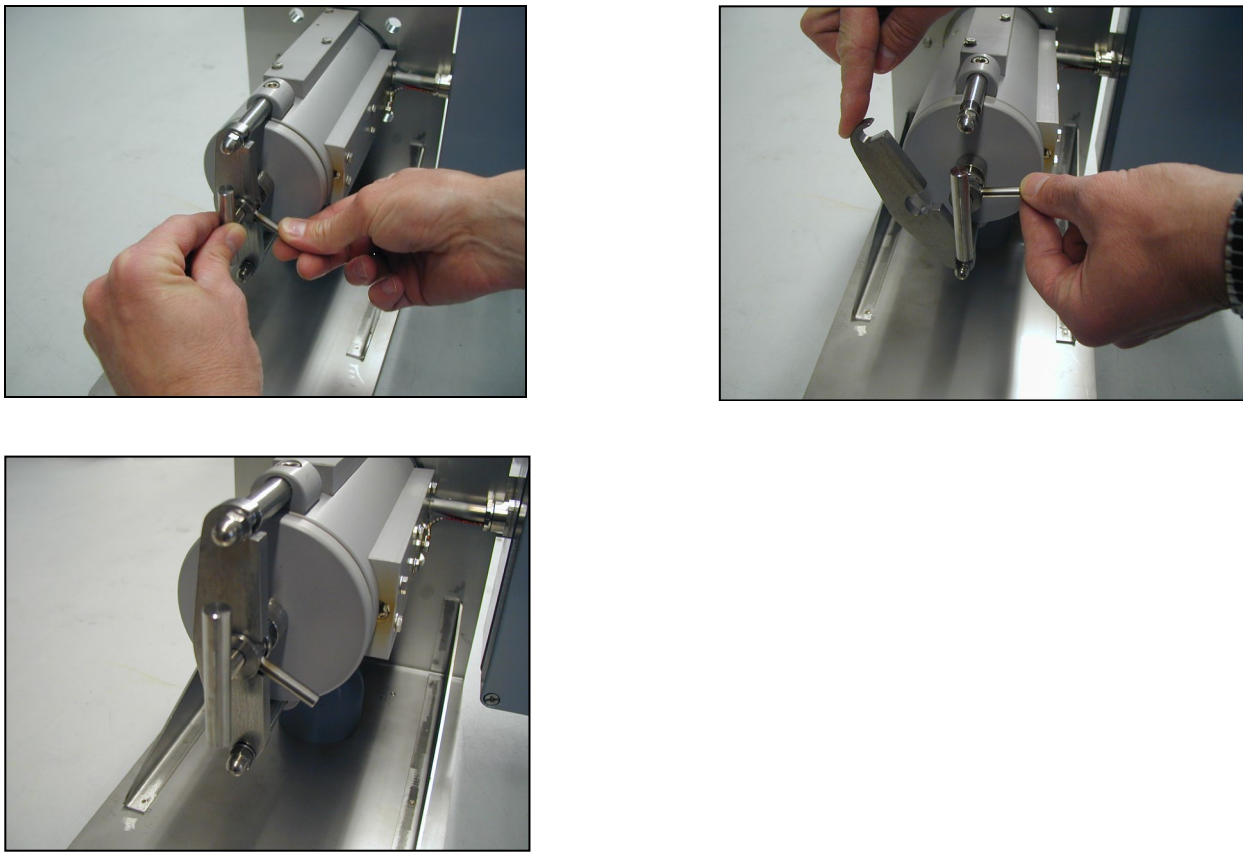


Figure 6 Removal of filter housing cover

Fitting of the preliminary filter or sample tube takes place as follows:

- Unscrew the mounting adapter ① for the preliminary filter ② or sample tube from the filter housing cover ④.

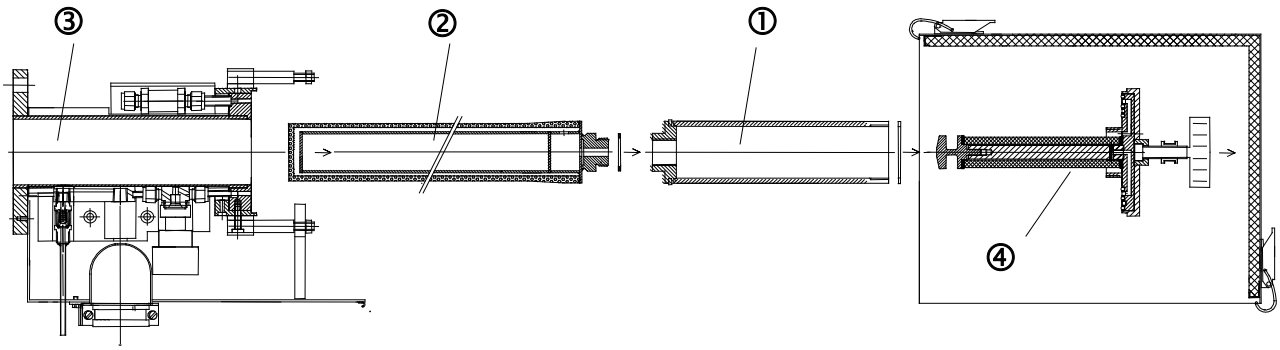


Figure 7 Fitting preliminary filter or sample tube

The filter element is now visible.

- Check that the filter element is screwed tight and then screw on the mounting adapter ① again.
- Screw the preliminary filter ② or sample tube with appropriate seal into the ¾“ thread of the mounting adapter ①;
- Push the filter housing cover with preliminary filter or sample tube into the filter space ③ in the probe head.
- Swing clamp **B** to the right and with handle **C** bring eye bolt **D** in position **E**, so that the clamp engages in eye bolt **D** and threaded bolt **H**; if necessary, push in or pull out the filter housing cover slightly with the clamping screw **A**;
- Turn handle **C** into position **F** and tighten handle **A** hand-tight by turning clockwise.

12.3 CONNECTION OF SAMPLE LINE

Provided on the probe side for connection of the sample line is a ¼“ NPT i thread. This thread can be used for screwing in appropriate connecting unions for lines with the sizes Ø 6 mm (standard), 8 mm or 10 mm.

The sample line is connected as follows:

- Loosen the toggle-type fasteners on the insulating cover and hood and remove.
- Screw the appropriate threaded union into the probe head with sealing tape.
- Insert the line through the respective opening in the probe base plate and silicone holder.
- Connect the line to the union. For Swagelok® fittings:
  - Fully insert the liner with support sleeve into the union.
  - Tighten the union nut finger-tight.
  - Prior to tightening, mark the union nut in the 6 o’clock position.
  - Grip the body with a spanner and tighten the union nut with 11/4 turns; after a full turn, the mark must be turned further to the 9 o’clock position.

Note

When connecting hose assemblies to stainless steel unions, a supporting sleeve must always be used.
The connection must be checked for leaks.

- Refit the special hood and close with clamps.

12.4 CONNECTION OF BACKPURGING AND CALIBRATION GAS LINE

Attention The backpurging pressure must be higher than the process pressure. Pay attention to the maximum pressure level (see technical data).

SP2500-H:
For option “C”, a check valve is fitted (see Figure 1, opening pressure 0.7 bar). Connection of the backpurging or calibration gas line takes place on the underside of the probe. Provided for this purpose is a tube with the dimensions Ø 8 x 1 mm.

The connection for the optional second sample gas outlet is ¼“ NPT i. The thread is closed with a cover.

SP2500-H/C/I/BB(/F):
In the versions SP2500-H/C/BB and SP2500-H/C/BB/F, separate connections are available for calibration and backpurging gas (see Figures 2 and 3):

- Backpurging gas tube connection Ø 8 x 1 mm, und
- Calibration gas tube connection Ø 6 x 1 mm.

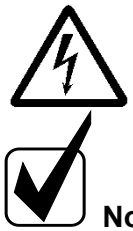
Control of the isolating valve **I** takes place separately within a pressure range of 3 to 10 bar. This valve has a 1/8“ NPT i connecting thread.

12.5 ELECTRICAL CONNECTION

Temperature adjustment of the **SP2500-H/..** series probes generally takes place with a capillary controller. The probe can also be provided with an optional PT100 or thermocouple. This requires the connection of an external thermostat.

Danger

An incorrect system voltage can damage the device. Ensure that the system voltage corresponds to the voltage shown on the rating plate prior to connection!
The probes must be mounted so that any contact with live parts is impossible!
The use of heat-resistance cable is recommended in any event!
The alarm contact excess temperature must be monitored!
In the event of an excess temperature alarm (failure of the probe heating or sensor) the sample gas supply must be interrupted to avoid damaging the probe or subsequent components.

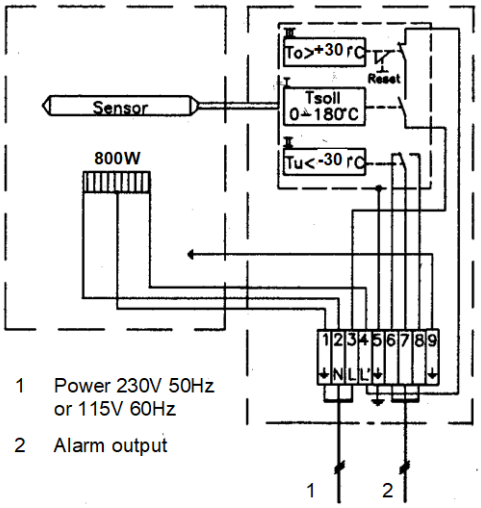


Note

For the erection of power installations with rated voltage up to 1000V, the requirements of VDE 0100 as well as relevant standards and specifications must be observed.
An external main switch must be provided.
The supply circuit of the device must be protected with a fuse corresponding to the rated current (overvoltage protection); electrical values are shown in the technical data.
When fitting a capillary or PID controller at the sample point, the maximum permissible ambient temperature must be observed (see 8.). If this temperature is exceeded, a PID controller must be provided externally and outside the temperature-critical zone.

12.5.1 VERSIONS WITH INTERNAL CAPILLARY TUBE THERMOSTAT

- Remove the connection box cover. The electrical wiring diagram shown is contained in the cover.
- Insert the mains cable (min. 3 x 1.5 mm^2) through the cable gland and connect to the appropriate terminals.
- Insert the signal cable (low temperature alarm) through the cable entry and connect to the appropriate terminals (contact position T_u indicates alarm).
- Screw the cover back in place again.

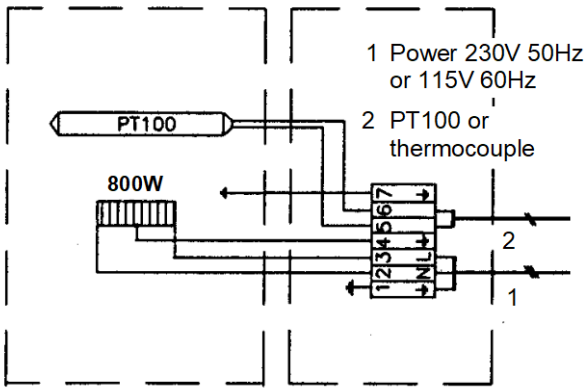


Note

The use of temperature-resistant cable is recommended!

12.5.2 VERSION WITH EXTERNAL THERMOSTAT

- Remove the cover of the connection box. The electrical wiring diagram shown is contained in the cover.
- Insert the mains cable (min. 3 x 1.5 mm^2) through the cable gland and connect to the appropriate terminals.
- Insert the temperature sensor cable through the cable entry and connect to the appropriate terminals.
- Screw the cover back in place again.



Note

Use appropriate compensating cables for thermocouples!

13 STARTING

Prior to starting the device, the system and process-specific safety measures must be observed.

For the media to be supplied, the relevant safety requirements and measures must be taken into account.

Warning

Prior to starting the device, it must be verified that the system voltage corresponds with the voltage shown on the rating plate!

Note

If the set temperature on the capillary controller should be reduced in one step by more than 30°C, the excess temperature circuit activates the thermostat (press reset button to switch on again).

The following step-by-step procedure is recommended:

- Check the set temperature on the built-in thermostat or on the external controller.

Warning

Caution: Do not touch the probe surface when in use.

The high surface temperatures that prevail are liable to cause burns.

Protective gloves must be worn and the probe must be protected to prevent unauthorised access!

- Switch on the power.

Note

The total heating time is about 40 minutes. The probe is ready to use after exceeding the lower alarm threshold value (30°C below the set value).

Caution

In the event of low temperature (failure of the probe heating), the sample gas supply must be interrupted by suitable measures!

14 CLOSING DOWN

Prior to closing down, i.e. switching off the heating, the probe should be flushed with inter gas or air in order to prevent the condensation of aggressive components from the process gas.

15 MAINTENANCE

Prior to carrying out maintenance and repairs, the system and process-specific safety measures must be observed.

Warning

Beware of aggressive condensate.

Wear safety goggles and appropriate protective clothing!

Warning

Caution: Do not touch the probe surface when in use.

The high surface temperatures that prevail are liable to cause burns.

Protective gloves must be worn, and the probe must be protected to prevent unauthorised access!

Warning

Prior to carrying out maintenance on electrical components, the power supply must be disconnected in all poles. This applies similarly to any connected alarm and control circuits!

Maintenance intervals cannot be recommended. These must be determined depending on the specific application.

Maintenance of the probe is limited mainly to replacement of the filter mats and inspection of the seals and gaskets.

Note

The probe can remain mounted for maintenance or repairs.
Replacement of the process-sided sample tube can take place with the probe head mounted.

15.1 REPLACEMENT OF FILTER ELEMENT AND SEALS

Warning

Prior to carrying out maintenance and repairs, it must be ensured that no health-endangering contaminants remain in the probe. An appropriate measure is to flush the probe with inert gas, for example.

Before replacing the filter element, the sample gas supply must be interrupted!

For replacement of the filter element or seals, the following procedure is recommended:

- Remove protective cover after opening toggle-type fasteners.
- Remove filter housing cover as described under 12.2.
- Unscrew preliminary filter or sample tube from mounting adapter ① (see Figure. 7).
- Unscrew mounting adapter.
- Unscrew filter knurled screw, inspect filter and replace if necessary.
- Inspect filter element seals and replace if necessary.
- Inspect O-tings in cover and replace if necessary.
- Clean filter space.
- Refit filter housing cover in reverse order and insert probe head.
- Lock filter housing cover as described under 12.2.
- Fit protective cover.

Note

Graphite seals in combination with the highly heated probe can only be used a single time. Important to note after fitting the filter housing cover that the U-bolt is tightened hand-tight in a cold condition and retightened when the operating temperature is reached.

16 PROPER DISPOSAL OF THE DEVICE

At the end of the service life of our products, it is important to take care of the appropriate disposal of obsolete electrical and non-electrical devices. To help protect our environment, follow the rules and regulations of your country regarding recycling and waste management.

17 SPARE PARTS LIST

The wearing and spare parts required depend on the specific operating conditions.

The following table contains some recommended spare parts for **SP2500-H/..** . series probes

Recommended spare part	
Part No.	**Description**
90S0020	Spare filter element S-2K150, ceramic, 2 µm, 150 mm
93S0045	Spare gasket (30), Viton® , for filter element S-2K150
93S1000	Spare O-ring (68), Viton® , for cover SP2500-H
93S1005	Spare O-ring (86), Viton® , for cover SP2500-H
93S1010	Spare O-ring (105), Viton® , for cover SP2500-H
93S0057	Gasket 11/2“, Novapress®, for filter holder SP2500..
90S2077	Flange gasket DN 65 PN 6B (67), for SP2000
93S0010	Spare thermostat 0 - 180 °C
93S0015	Spare heating cartridge HLP, 230 V 800 W
93S0017	Spare heating cartridge HLP, 115 V 800 W
93S0018	Heat transfer compound for fitting heating cartridge

18 ANNEX

Further product documentation can be viewed and selected on our online catalogue at: www.mc-techgroup.com.

- Sample tubes series **SP**
  Document: **2.14**

- Prefilter series **SP**
  Document: **2.17**