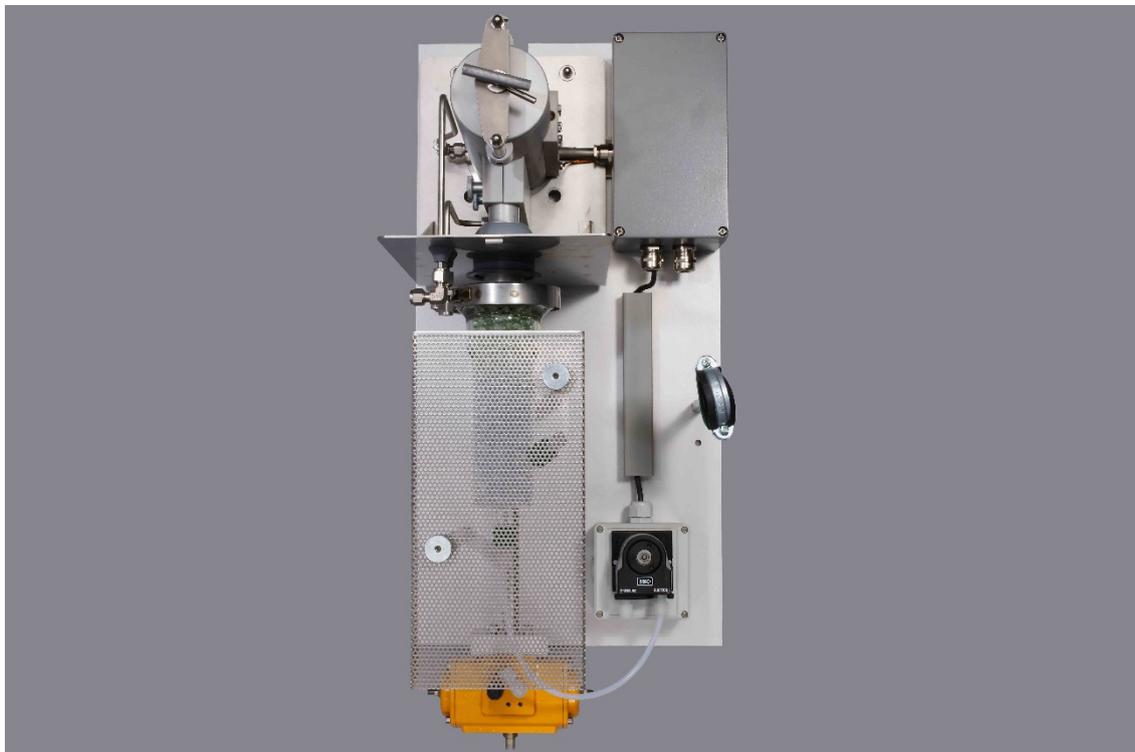


Gas Sample Probe Series SP[®]

SP 2000-H320/S, SP2000-H320/S1, SP2000-H320/S2

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.

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

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SP® is a registered trade mark.

Version: 1.00.02

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1 GENERAL INFORMATION

The product described in this 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 manual need to be followed. This 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:

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 probes SP2000-H320S, SP2000-H320/S1 and SP2000-H320/S2 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.

SKILLED STAFF

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



Hot surface!

Contact may cause burn! Do not touch!



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.



Wear protective gloves!

Working with chemicals, sharpe 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

A major problem in extractive continuous gas analysis are the accompanying substances contained in the gas, such as dust, water vapor and also gas components that form corrosive acids with condensed water vapor.

When gases are cooled down, solids can also precipitate, which would lead to the blockage of the subsequent processing.

In order to achieve a maintenance-friendly measurement, the dust must be separated without water vapor condensing. This prevents the dust from "caking" with the water and the possible formation of acids. This prevents filters and connected lines from clogging and the probe material in contact with the gas is not attacked by any acids that may be formed. In order to avoid the subsequent precipitation of solids, these must also be separated and conveyed away.

The solution are heated **M&C** sample probes such as probes of the **SP 2000-H...** series. These probes guarantee minimum maintenance when correctly adapted to the process conditions. In case of continuous gas sampling for analytical measurements, M&C sample probes provide a fine dust filtration directly at the sampling point and, if necessary, a solids separation and removal. This avoids a large part of the otherwise necessary maintenance work on an analytical system.

As a matter of principle, the amount of gas extracted should be limited to a necessary minimum to ensure a minimum of maintenance work and a maximum of availability. This is possible by means of a downstream optimized gas conditioning with components from **M&C**.

6.1 PATENTED PROBE MODEL

The patented gas sample probe **SP2000.....**, designed in modular construction, is produced by **M&C TechGroup** Germany GmbH, D- 40885 Ratingen. **[PATENT-NO.: 41 11 377]**

6.2 SERIAL NUMBER

The type plates with the serial numbers are on the side of the electrical connection box.



NOTE!

Please always indicate the serial number of the equipment when you have questions or in case of ordering spare parts.

7 APPLICATION

The probes type **SP2000-H320/S..** are used for continuous gas sampling in processes with high dust load and high temperatures and/or high gas humidity where additionally solid particles may precipitate. **M&C** has developed these probes for eg. continuous gas sampling in waste gas of DENOX plants (SCR) where NH_3 is added to the flue gas in order to reduce the NO_x content. With temperatures of $< 300\text{ }^\circ\text{C}$, ammonium salts are produced due to the chemical reaction of NH_3 and SO_2/SO_3 in the flue gas. This salt formation inevitably leads to blockages of filters and sample lines in a relatively short time.

8 TECHNICAL DATA

Gas sample probe Type	SP2000-H320/S	SP2000-H320/S1	SP2000-H320/S2
Part number	20S5000(a)	20S5005(a)	20S5010(a)
Temperature regulation	Thermostat	FeCu-Ni (Regulator optionally)	FeCu-Ni (Regulator optionally)
Probe heating	Max. $320\text{ }^\circ\text{C}$		
Ambient temperature	$+5$ to $+60\text{ }^\circ\text{C}$ ** optionally with GFK protective housing -20 to $+60\text{ }^\circ\text{C}$		
Sealing material	Graphite		
Material probe flange sealing	Novapress		
Sampling tube/Pre filter	Optionally		
Sampling pressure max.	$0.4 - 2\text{ bar}^*$ abs.		
Volume of filter chamber	120 cm^3		
Porosity	S – 2K150 = ceramic*, 2 micron, /F-0,1GF150 = Glass fiber** 0.1 micron /F-3SS150** 3 micron, /FW = Glass fiber-filter cotton**		
Ready for work	After 2 h		
Connection gas outlet	Threaded hose coupling DN 4/6		
Connection test gas	Pipe connection $\varnothing 6\text{ mm}$ with blind plug, optionally $\varnothing 1/4''$ (a)		
Power Supply	$230\text{ V } 50/60\text{ Hz}$, 800 W, optionally $115\text{ V } 60\text{ Hz}$ (a)		
Electrical connection	Terminals max. 2.5 mm^2 , terminal range $0.75 - 4\text{ mm}$		
Standard of electrical equipment	EN 61010, EN 60519-1		
Mounting flange	DN 65 PN 6, Form B, 1.4571*, $> \text{DN}$ or ANSI possible**		
Weight	17 kg		

* = Standard ** = Option

Filter element Type	Filter porosity	Material
S-2K 150	$2\text{ }\mu\text{m}$	Ceramic *
S-3SS 150	$3\text{ }\mu\text{m}$	Stainl. Steel 1.4401
S-0,1GF 150	$0.1\text{ }\mu\text{m}$	Glass fiber
FW	-----	Glass wool

* = Standard

9 DESCRIPTION

The probes have been designed for easy mounting, safe operation, easy maintenance and a great variety of applications.

The main features of this probe are: changing the filter element without tools and without necessity of dismantling the sample line, easy cleaning of the filter housing, cleaning of the sample tube without dismantling the probe. The big surface filter element is placed inside a heated filter receiving part of stainless steel.

The **M&C** gas sample probe **SP2000-H320/S** is based on the standard sample probe **SP2000-H320**. The temperature regulation of the gas sample probe **SP2000-H320/S** is made via an integrated capillary sensor thermostat adjustable from 50 to 320 °C including an excess temperature limiter and alarm in case of insufficient temperature. Optionally, the gas sample probe can be delivered with a thermocouple FeCu-Ni instead of the thermostat regulator. In this case, an external temperature regulator is not necessary (eg. 703).

According to the application, it is possible to add sample tubes and pre-filters of different sizes and versions out of the modular system of **M&C** probe accessories. All these options are to be mounted before the probe. In the outlet of the probe, the sample gas is lead via a heated connection adapter into a non-heated (SP2000-H320/S and SP2000-H320/S1) or into a heated (SP2000-H320/S and SP2000-H320/S1) collection vessel. Inside the vessel that is made of glass and filled with glass balls to enlarge the surface, the chemical reaction of the sample gas takes place and the solid particles and salts are deposited.

On the versions **SP2000-H320/S** and **SP2000-H320/S1** the condensate collected in the collection vessel is pumped out by the peristaltic pump **SR25.1G**. The condensate effects that the existing solid contaminations are withdrawn and transmitted outside. Because of the heated connection adapter and the hot gas flow, the operating temperature inside the collection vessel is increased compared to the ambient temperature.

Due to the fact that the gas components are solved to a negligible extent in the warm condensate, the application of this sampling technique in DENOX systems with a low content of NH₃ (normally a few ppm) allows the analyse of SO₂ and NO_x without important losses. These will be a few ppm only and can normally be neglected. In order to examine exactly the extent of the losses, you can feed test gas on the gas sample probe and determine the eventual measuring fault that can be calibrated afterwards. On version **SP2000-H320/S2** the collecting vessel is equipped with a heater in order to avoid chemical reactions of the sample gas components below a defined temperature as well as to avoid freezing of the condensate in case the vessel is mounted outside. A heated sample line **3/4-M** for max. 200 °C operating temperature can be connected onto the gas outlet of the collection vessel. The collection vessel is equipped with a heat isolating protection cover.

9.1 CONSTRUCTION OF THE PROBE

The complete probe is made up of the heated filter part and a sample tube or pre-filter. The filter receiving part with the surrounding heating jacket ① is fitted together to a unit with the standard mounting flange DN65 PN6 ② and the electrical connecting box mounted laterally ③.

The heat insulated covering cap ⑤ is placed on the stainless steel angle plate ④ of the mounting flange and is fixed with 2 fastening clamps. Thanks to the covering cap, the heat is distributed regularly over the probe heating and serves at the same time as weather and contact protection. In the probe outlet the connection adapter with the collecting vessel ⑥ is mounted. A mounting clamp ⑦ is available for the connection of the heated line. On the probes **SP2000-H320/S** and **SP2000-H320/S1** a peristaltic pump **SR25.1** ⑧ is mounted below the collecting vessel in order to evacuate the condensate.

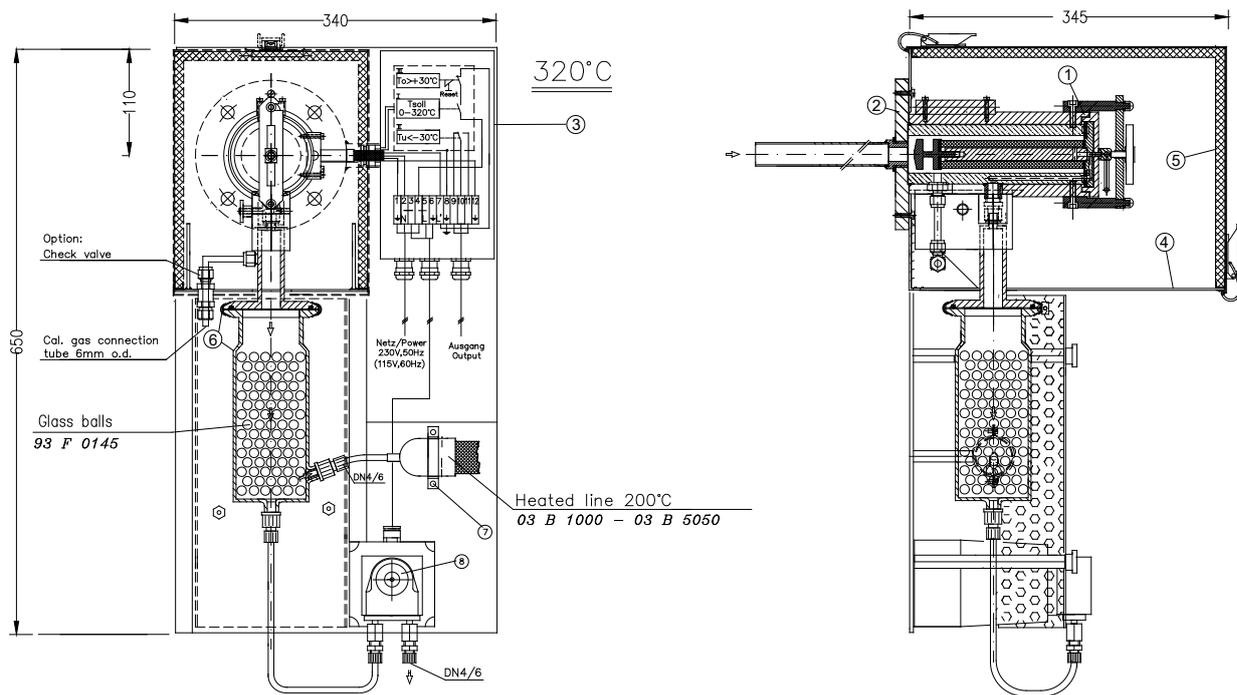


Figure 1 Probe construction eg. version SP2000-H320/S1

10 RECEIPT OF GOODS AND STORAGE

- The gas sample probe and any special accessories 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.

The gas sample probe is normally delivered in two packaging units:

1. The gas sample probe with the screws, nuts and flange seal required for mounting;
2. Sample tube or pre-filter, if applicable with extension tube.



NOTE!

The equipment should be stored in a protected, frost-free room!

11 PREPARATION AND INSTALLATION

- Select the optimal sampling point in accordance with the generally applicable guidelines of consult the competent persons.
- Locate the sampling point in such a way that there is adequate space for inserting and removing the probe and pay attention to the insertion length of the probe tube!

- Make certain that the probe is easily accessible so that you can carry out any subsequent maintenance work without trouble.
- Make sure that the bleeder connection at site is made up and insulated so that the connection's temperature is always above the dew point or above the acid dew point in order to avoid corrosion and blockage problems as well as washing out effects. If this is not possible, a heated sample tube **SP35 / SP30** is recommended for cold connections.
- If the ambient temperature in the area of the connections is $>80^{\circ}\text{C}$ due to radiant heat, then a radiant heat reflection plate must be mounted to protect the probe.
- The mounting flange connection of the connection piece should comply with DN65 PN6. If other connection sizes are required, a special adapter flange can be supplied as option. Instead of a flange connection mounting, the probe can also be mounted using a R2" adapter on a corresponding threaded sleeve connection. The required minimum flange size or the minimum connection piece diameter depends on the outside diameter of the used sample tube or pre-filter.

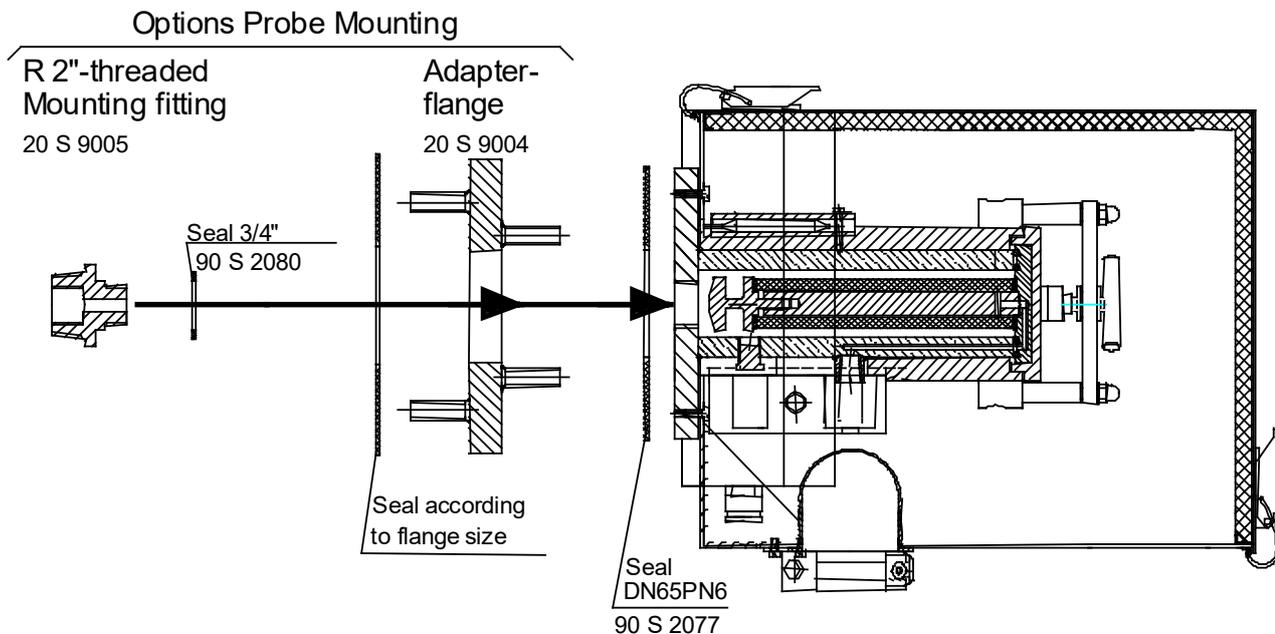


Figure 2 Mounting possibilities

The following photos show how to execute the above mentioned steps.

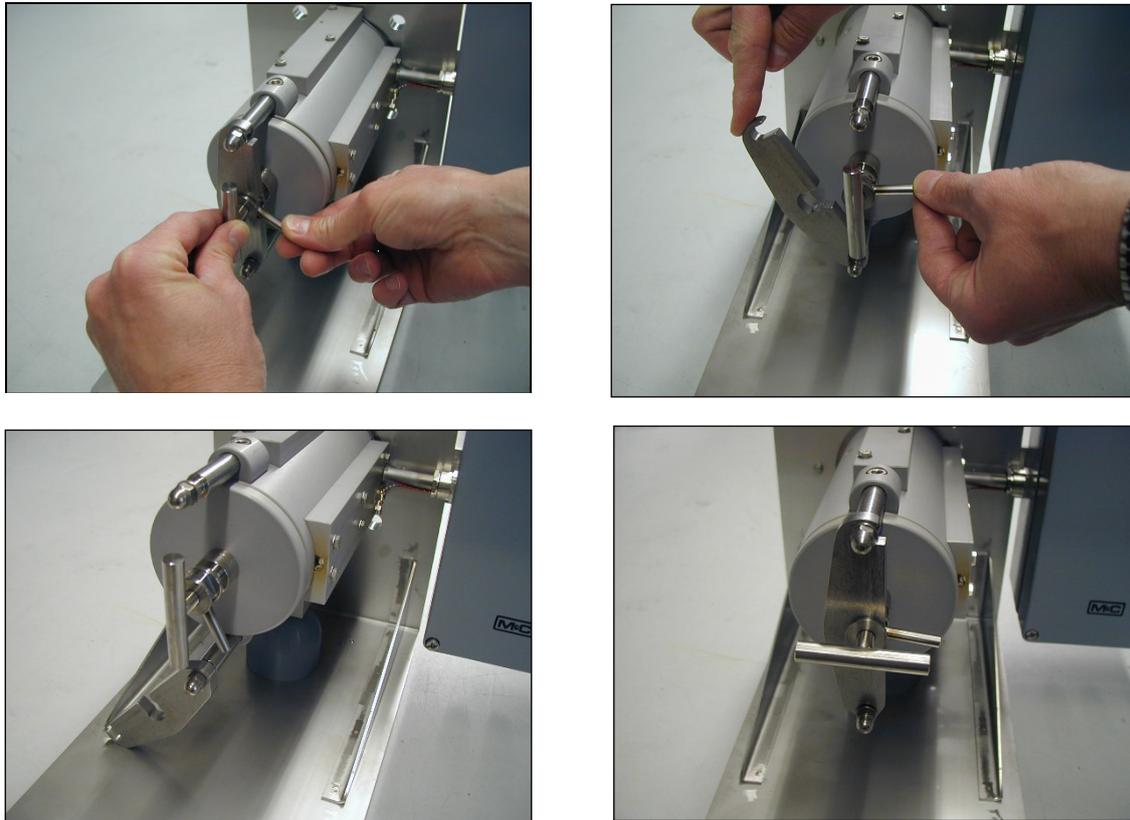


Figure 4 Dismounting of the filter housing lid

- Check on the filter screw **I** whether the filter element **J** has been screwed hand-tight (see figure 20).
- Then put in again the filter receiving part, set the handle **C** into position **E**, swing the clamp clip back again and tighten the lid with the locking handle **A**.

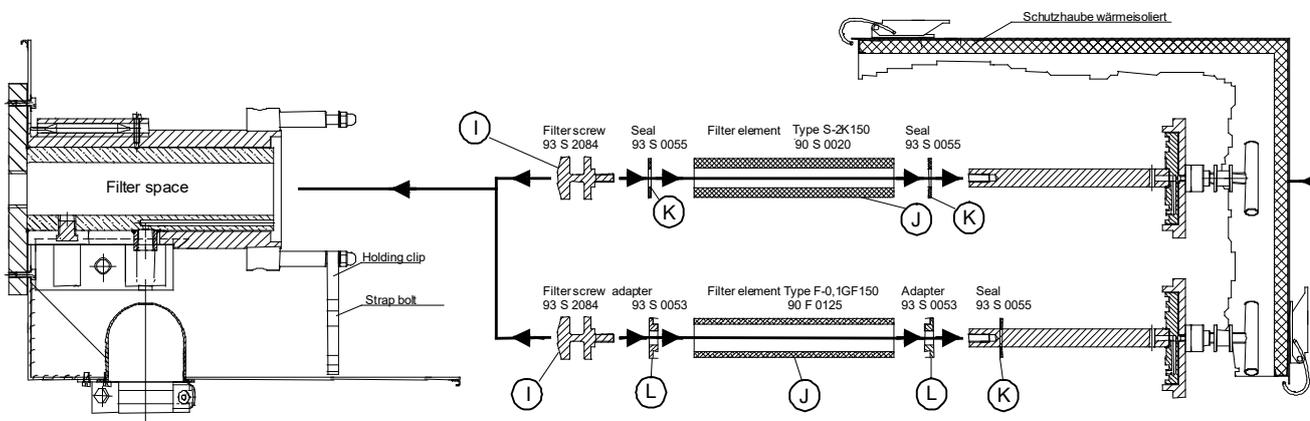


Figure 5 Filter element receiving part

12.2 TEMPERATURE REGULATOR

On version **SP2000-H320/S** the temperature regulation is effected by the capillary thermostat mounted inside the connecting box. The range of regulation is from 50 to 320 °C.

On the versions **SP2000-H320/S1** and **SP2000-H320/S2** the regulation is made by means of an external electronic regulator. **M&C** supplies appropriate temperature regulators, eg. **Type 703G** (see data sheet 2-5.1) or **Type 703G double** that can be mounted separately or directly on the gas sample probe (max. ambient temperature +45 °C).

12.3 SCOPE OF SAMPLING TUBES AND PREFILTERS

Depending on the process gas temperature and composition, sample tubes of different materials with connector G $\frac{3}{4}$ " are applicable:

Selection of materials	Type	Max. process temperature	Max. length	Outside tube diameter (sleeve or adapter)
Stainl. Steel 1.4571	SS	600 °C	2.5 m *	25 (37) mm
Titanium	Ti	400 °C	2.5 m *	25 (37) mm
Hastelloy	HC	900 °C	2.5 m *	25 (37) mm
Inconel	IN	1100 °C	2.0 m *	25 (37) mm
Chrome-Aluminium oxide	CR	1400°C	1.2m	23 (37) mm
Kanthal	Ka	1300 °C	2.5 m *	25 (37) mm
Aluminium-Oxide	AO	1800 °C	1.5 m *	25 (55) mm
PVDF	PV	90 °C	1.5 m *	25 (37) mm
PTFE	T	160 °C	0.5 m	33 mm
Incoloy	IC	1200 °C	2.0 m *	25 (37) mm

*Standard = 1 m

Further information on sampling tubes see data sheet 2.14

In case gas has to be sampled behind wet washers, the Demister sampling tube of PVDF with connector G $\frac{3}{4}$ " has to be applied in order to evacuate the droplets:

Type	Max. Process temperature	Max. length	Outside diameter of the tube
SP32	90 °C	0.8 m *	50 mm

*Standard

In order to avoid condensation between the sampling point and the heated gas sample probe or condensation in the area of the connection piece, heated sample tubes have to be applied made of stainl. Steel with flange connection DN65 PN6.

Type	Max. Process temperature	Max. length	Outside tube diameter
SP30-H1.1, heating max. 320 °C	550 °C	2.0 m *	42.4 mm
SP30-H1.1V, heating max. 320 °C	550 °C	1 m	42.4 mm
SP30-H2, heating max. 320 °C	350 °C	2.0 m *	42.4 mm
SP35H.1, heating max. 320 °C	550 °C	0.175 m	42.4 mm
SP35H.2, heating max. 320 °C	350 °C	0.175 m	42.4 mm

*Standard = 1m

If there is a high dust load in the process gas, we urgently recommend the use of a pre-filter in order to increase the service life. They can be supplied with a volume displacement to shorten the response time. The pre-filters can be directly screwed into the probe flange or on request with extension tubes equipped with a volume displacer.

Dust load	Type	Max. Process temperature	Outside diameter of the pre-filter (with keep-off plate)
< 2 g/m ³	without, only sample tube	see above	see above
2-10 g/m ³	/V20, /V20-0,	600 °C	50 mm (60 mm)
	/V20-3, /V20-4,	600 °C	31 mm [sleeve 37 mm]
	/V20/HC, /V20-0/HC,	900 °C	50 mm (60 mm)
> 10 g/m ³	/V20-1, /V20-2	600 °C	60 mm (65 mm)
	/V20-1/HC, /V20-2/HC	900 °C	60 mm (65 mm)
	/V12-1, /V12-2, /V12-3	1000 °C	60 mm, /V12-1 = 40 mm
	/V12-1/SS, /V12-2/SS, /V12-3/SS	600 °C	60 mm, /V12-1/SS = 40 mm
	/V12-1/IC, /V12-2/IC, /V12-3/IC	1000 °C	60mm, /V12-1/IC = 40 mm
	/V20-T	200 °C	40 mm

Further information on the pre-filters see data sheet 2.17.

12.4 MOUNTING OF THE PROBE WITH EXTENSION TUBE OR PREFILTER

The installation position is horizontally. When using the sample tube type **SP32** eg. for sampling behind wet washers, it is absolutely required to mount the probe with a gradient of 10° so that the separated droplets can flow back into the process!

- Put the flange seal ① between the sample flange and the probe flange.
- In case the heated sample tube type **SP30/35** or the ceramic pre-filter type **V12..** are used, you must screw first the probe with its flange ② (with threaded bolt welded inside). Here too, the flange seal has to be put between both flanges.
- If the flange on the bleeder connection does not correspond to the standard flange connection DN65 PN6, please use the optionally delivered adapter flange (figure 2) and mount it the same way to the probe.
- The sample tube or the pre-filter ③ with thread G^{3/4}"a are to be screwed into the G3/4" inside thread in the flange of the probe either directly or together with an extension tube ④ and the flat seal 3/4" and tighten.
- Introduce the process internal sampling part of the complete probe unit into the bleeder connection (pipe) and screw the probe onto the bleeder connection (pipe) by using the screws and nuts attached to the packing.

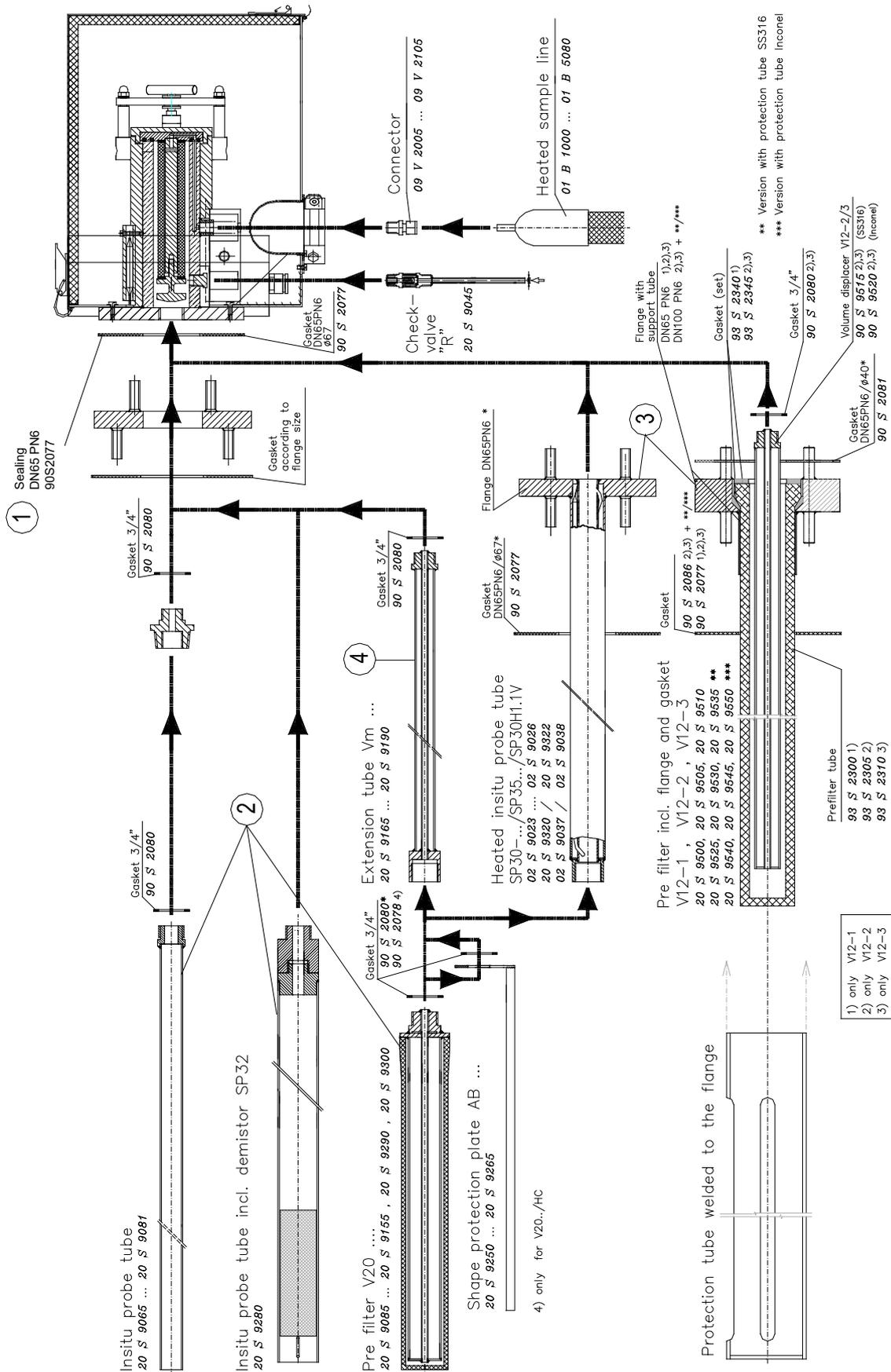


Figure 6 Mounting the sample tube or pre-filter

13 SUPPLY CONNECTIONS

13.1 MOUNTING THE SAMPLE LINE

- Open the fastening clip of the sample line.
- Unscrew the union nut ① of the connecting adapter GL18-DN4/6 and put it together with the clamping ring ② in the correct order and direction over the 6mm PTFE core of the heated line.
- Put the PTFE core on the connection piece ③ inside the connection adapter and fasten the union nut with clamping ring hand-tight.
- Shut the fastening clip of the sample line.

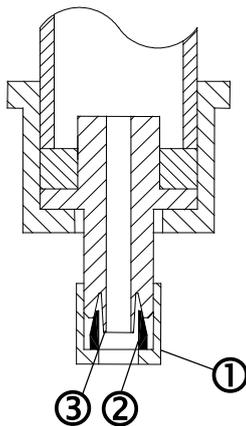


Figure 7 Connection tube on GL adapter



NOTE!

For probe type SP2000-H320/S.. it is important to use a heated line with exchangeable PTFE core only.

13.2 CONNECTION OF THE TEST GAS FEEDING LINE

When using the standard execution or execution with a 3-way ball valve option /3VA320 in the probe inlet for test gas feeding, an appropriate pipeline has to be connected to the 6mm pipe socket ① below the probe housing by means of the attached tube connector. During the measurement, this tube connector has to be closed with the attached blind cap.

Optionally, a check valve can be mounted in the test gas inlet for thermal decoupling. Also in this case, an appropriate pipeline has to be connected to the 6mm pipe socket below the probe housing and by means of the respective tube connector.

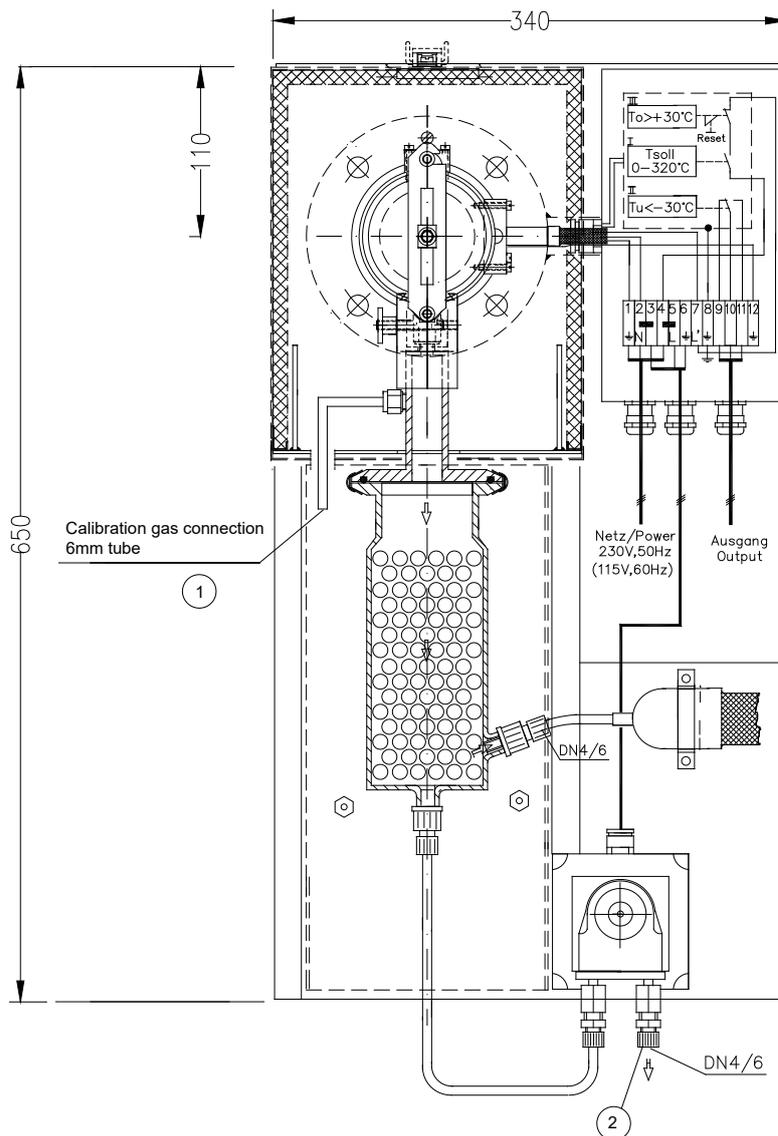


Figure 8 Connection of test gas line and condensate evacuation

13.3 CONNECTING THE CONDENSATE EVACUATION

On versions **SP2000-H320/S** and **SP2000-H320/S1** the condensate is evacuated via a peristaltic pump **SR25.1**.

In order to carry away the condensate, a tube with 6 mm outside diameter has to be connected to the condensate outlet DN4/6 ②.

On version **SP2000-H320/S2** no peristaltic pump is integrated because no condensate is arising.



WARNING!

Aggressive condensate possible.



Wear safety glasses and Appropriate protective clothes!

13.4 ELECTRICAL CONNECTION



WARNING!

Wrong supply voltage can destroy the equipment. when connecting the device, please ensure that the supply voltage is identical with the information provided on the type plate!



WARNING!

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 1000V, together with the associated standards and stipulations!

A main switch 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.



13.4.1 VERSION SP2000-H320/S WITH INTERNAL CAPILLARY TUBE THERMOSTAT

- Remove the lid of the connection box. Inside the lid, you can see the terminal connecting plan.
- Insert the mains cable (min. 3 x 1.5 mm², terminal range 6-12 mm) through the left cable gland and connect it to the appropriate terminals.
- Insert the signal cable (terminal range 6-12 mm) through the right cable gland and connect it to the appropriate terminals.
- Screw lid on again.

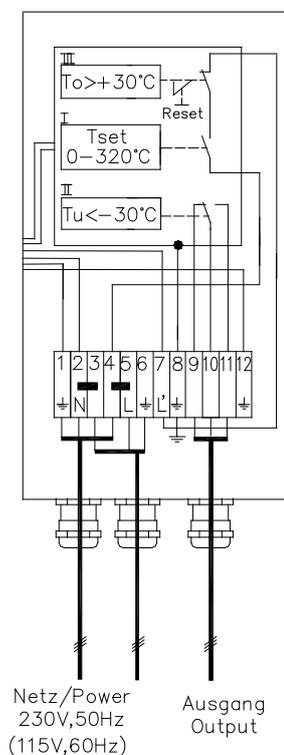


Figure 9 Electrical connection SP2000-H320/S with thermostat

13.4.2 VERSION SP2000-H320/S1 WITH ELECTRONIC TEMPERATURE CONTROLLER

The gas sample probe is supplied either as unit with a fixed and electrically connected temperature controller, or the temperature controller is attached as separate unit for external mounting. Then, the electrical connection is to be made as follows:

- Remove the lid of the connection box on the gas sample probe. Inside the lid, you will find the terminal connection plan.
- Insert the mains cable (min. 3 x 1.5 mm², terminal range 6 – 12 mm) through the medium cable gland of the gas sample probe and connect it to the appropriate terminals.
- Insert the temperature sensor cable into the right cable gland of the gas sample probe and connect it to the appropriate terminals.
- Screw the lid on again.

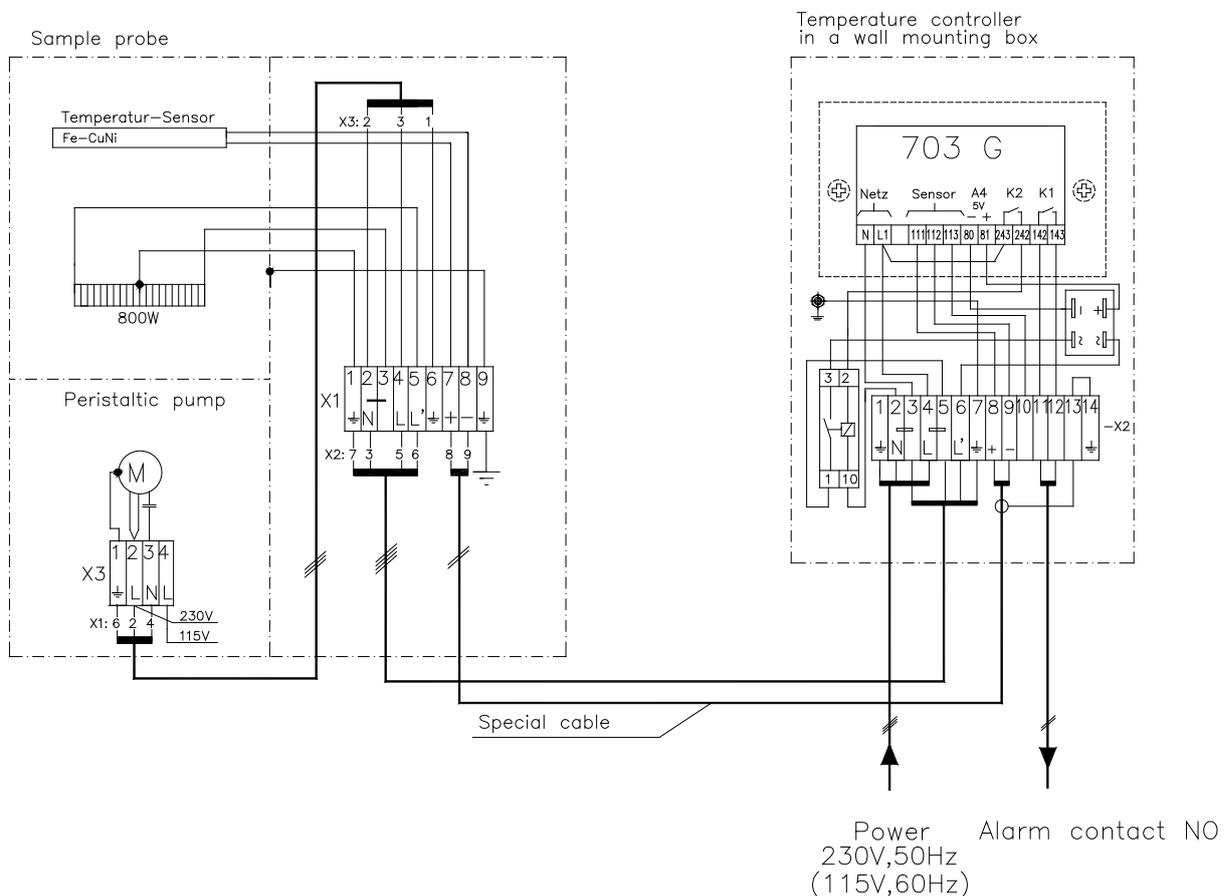


Figure 10 Electrical connection SP2000-H320/S1 with electronic controller eg. type 703G



As sensor line an equalization line has to be provided. The corresponding thermo equalization terminals are provided inside the connection box.



The electrical connection of the temperature controller **Type 703G** is to be made according to the terminal connecting plan as shown in figure 10 and described as follows:

- Unscrew the housing lid.
- Insert the mains cable (min. 3 x 1.5 mm², terminal range 6 – 12 mm) into the left cable gland of the controller and connect it to the appropriate terminals.
- Insert the cable for the alarm contact (terminal range 6 – 12 mm) into the right cable gland and connect it to the appropriate terminals.

In case the temperature controller **Type 703G** is delivered as separate unit, then the probe has additionally to be connected with the controller according to figure 13 and as described as follows:

- Insert the power supply cable for the gas sample probe (min. 3 x 1.5 mm², terminal range 6 – 12 mm) through the second cable gland of the controller and connect it to the appropriate terminals.
- Insert the temperature sensor cable (terminal range 6 – 12 mm) through the third cable gland of the controller and connect it to the appropriate terminals.
- Screw the housing lid on again.

CAUTION! In case you should not use all cable glands when connecting the temperature controller, it is important to shut the cable glands in order to provide the tightness of the housing.

13.4.3 VERSION SP2000-H320/S2 WITH 2 ELECTRONIC TEMPERATURE CONTROLLERS

The gas sample probe is supplied either as unit with a fixed and electrically connected temperature controller, or the temperature controller is attached as separate unit for external mounting. Then, the electrical connection is to be made as follows:

- Remove the lid of the connection box on the gas sample probe. Inside the lid, you will find the terminal connection plan.
- Insert the mains cable (min. 3 x 1.5 mm², terminal range 6 – 12 mm) through the medium cable gland of the gas sample probe and connect it to the appropriate terminals.
- Insert the temperature sensor cable into the right cable gland of the gas sample probe and connect it to the appropriate terminals.
- Screw the lid on again.

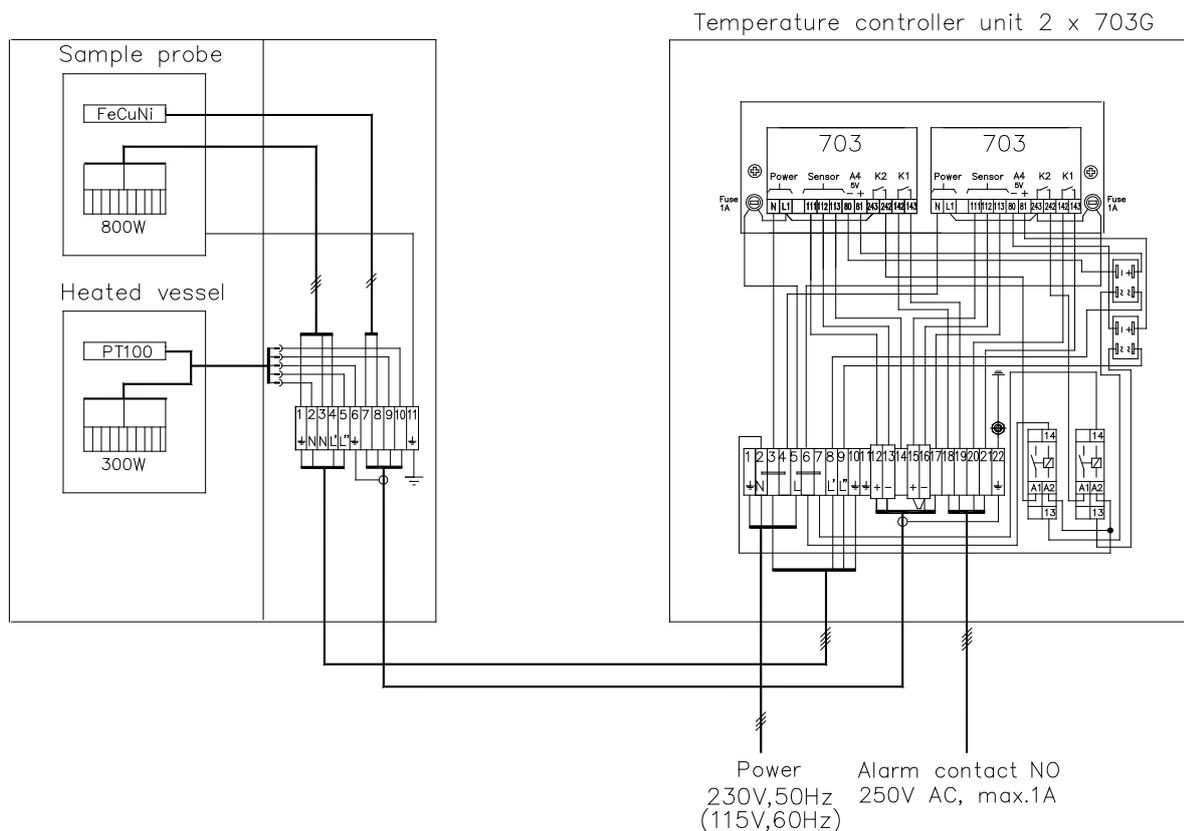


Figure 11 Electrical connection SP2000-H320/S2 with electronic double controller 703G



NOTE!

An equalization line has to be provided to be used as a sensor line. The appropriate thermo equalization terminals are available inside the connection box.

The electrical connection of the temperature controller **Type 703G** is to be made according the terminal connection plan as shown in figure 11 and being described as follows:

- Screw off the housing lid.
- Insert the mains cable (min. 3 x 1.5 mm², terminal range 6 – 12 mm) through the left cable gland and connect it to the appropriate terminals.
- Insert the cable for the alarm contact (terminal range 6 – 12 mm) through the fifth cable gland and connect it to the appropriate terminals.

In case the temperature controller **Type 703G** is delivered as separate unit, the probe is to be connected according to figure 11 and as described as follows:

- Insert the mains cable for the gas sample probe (min. 3 x 1.5 mm², terminal range 6 – 12 mm) through the second cable gland of the controller and connect it to the appropriate terminals.
- Insert the temperature sensor cable (terminal range 6 – 12 mm) through the third cable gland of the controller and connect it to the appropriate terminals.
- Screw the housing lid on again.

CAUTION!

In case you should not have used all cable glands when connecting the temperature controller, it is important to shut the cable glands in order to provide the tightness of the housing.

14 STARTING UP

- Before starting up, check whether the supply voltage corresponds to the indication on the type plate.
- Control whether the eventually integrated ball valve is connected. The turning handle of the hand operated ball valve must be in position on the right limit stop.
- Switch on the power supply.
- Control the set value on the integrated thermostat or on the external regulator. (see 14.1).
- The total heating time is approx. 2 h. After approx. 1 h the probe is heated up so far that the temperature has exceeded the below temperature alarm (30°C below set value).
- If there is a ball valve present, turn it with the turning handle until the left limit stop in case of a 2/2-way ball valve or until the medium position in case of a 3/2-way ball valve.
- Now, the probe is ready for work.

**NOTE!**

When the set value on the thermostat is lowered in one step for more than 28 °C during operation, the over temperature thermostat will switch off! Press the reset button to switch the temperature thermostat on again.

**WARNING!**

For works during operation:

High surface temperatures!

Any contact may cause burnings.

Wear protective gloves and protect the probe against unauthorized access!

14.1 ADJUSTMENT OF THE SET VALUE TEMPERATURE

If the sample probes are delivered together with the temperature controllers **703** or **double 703**, then the temperature controllers are parameterized for the sample probe. The adjusted set value of the temperature is 320°C for the sample probe and 180°C for the heated separator.

In case there must be changed another parameter than the set value temperature, you can read how to proceed in the separate operating manual of the temperature controller 703.

CAUTION! The maximum temperature of the device to be controlled must be heeded because otherwise the equipment may be damaged or destroyed.

14.1.1 VERSION SP2000-H320/S

- Open the lid of the connection box.
- The adjustment of the set value is made via the control knob of the thermostat to be found inside the connection box. The value can be adjusted between 50 °C and max. 320 °C.
- The thermostat has got an excess temperature limiter that switches off automatically and permanently the heating in case the set value temperature is exceeded by 30 °C. For switching the heating on again, the RESET-button has to be actuated which is situated below the opening in the mounting plate of the thermostat.



Figure 12 Set value adjustment on Version SP2000-H320/S

14.1.2 VERSION SP2000-H320/S1

The following steps must be carried out on the controllers **703**:

- Push the PGM-key for a short time. On the display you can read “SP1”.
- Adjust the desired set value by using the arrow keys \uparrow \downarrow in the above display.
- Wait until the set value is flashing for a short time, then it is fixed.
- Push the PGM-key twice for return to the normal reading.

14.1.3 VERSION SP2000-H320/S2

The following steps must be carried out on the controllers **703**:

Adjustment of the set value on the sample probe:

- Push the PGM-key for a short time. You can read "SP1" on the below display.
- Adjust the desired set value by using the arrow keys \uparrow \downarrow in the above display.
- Wait until the set value is flashing for a short time, then it is fixed.
- Push the PGM-key twice to return to the normal reading.

Adjustment of the set value of the heated separator:

The actual set value SP1 can be changed directly on the standard reading via the arrow keys \uparrow \downarrow . After the changing, the new value is flashing for short time and is fixed then.

14.2 TEST GAS FEEDING

- During the test gas (calibration gas) feeding, the analyse system remains connected.
- The test gas quantity should be at least 25 % higher than the sucked sample gas quantity in order to avoid a mixing with the sample gas.
- If you have processes with excess pressure or low pressure, we recommend an integrated ball valve in the probe inlet. In this case, a small quantity of test gas is sufficient because the probe is separated from the process by actuating the ball valve. For shutting the hand actuated ball valve, turn the turning handle to the right until the limit stop.

14.2.1 OPTION TEST GAS FEEDING RETURN VALVE

When feeding test gas via the return valve (check valve) of the probe, a mixing with the sample gas must be avoided. The flow rate of the test gas should be at least 25 % higher than the sample gas quantity.



NOTE!

Pay attention – in case of low pressure operation – that it may occur that secondary air is sucked via the non-shut return valve if there is less than 300 mbar abs.

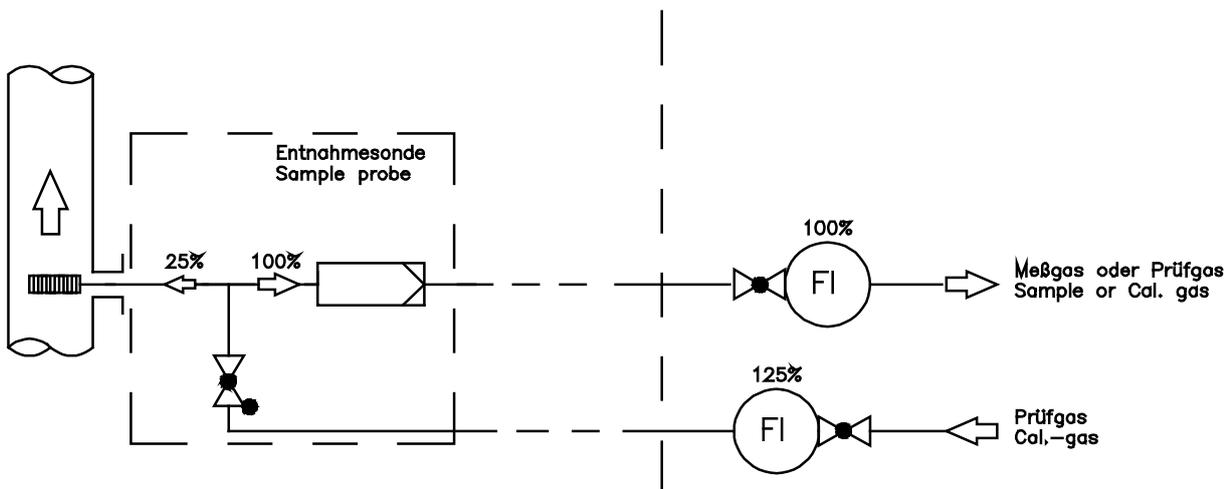


Figure 13 Schema of test gas (calibration gas) feeding via return valve

14.2.2 OPTION 3/2-WAY BALL VALVE /3VA320

When feeding the test gas, the probe is automatically separated from the process and, therefore, only a small quantity of test gas is necessary as no mixing with the sample gas may occur.

- For the measurement operation, set the ball valve into the central position.
- For the test gas feeding, turn the ball valve to the right until the limit stop.
- For the measurement operation, set the ball valve into the central position again.

15 CLOSING DOWN

Before closing down, i.e. switching off the heating, the probe should be purged with inert gas or air to avoid condensation and an eventual acidification.

16 MAINTENANCE AND REPAIR

Prior to any maintenance work, the safety instructions specific to the plant and the process have to be observed!

It is difficult to give any recommendation as to a particular maintenance cycle. Depending on your process conditions, a meaningful maintenance cycle has to be found for your specific application.

An indication that a probe maintenance may be necessary can be shown by a constant decrease of the sample gas quantity in your analyse system.

Probe maintenance is essentially to be concentrated on the replacement of the filter elements and control of the seals.

**WARNING!****Aggressive condensate possible.****Wear protective glasses and protective clothes!****WARNING!****For works during operation:
High surface temperatures!****Any contact may lead to burnings.****Wear protective gloves and protect the probe against unauthorized access!**

16.1 REPLACEMENT OF THE STANDARD FILTER ELEMENT AND CONTROL OF THE SEALS

- Shut the ball valve (if present). **Purge the probe if toxic gases have been used!**
- Remove the protective cover.
- Take out the filter receiving part as described in chapter 12.1.
- Unscrew the filter knurled screw **I** and replace the filter element **J**.
- Control the filter element seals **K** and replace them if necessary.
- Control the flat seal of graphite inside the lid and replace it if necessary.
- Clean the filter space.
- Push eventually through the sample tube to remove any deposits.
Caution! Risk of fracture when using sample tubes of aluminium oxide.
- Then insert the filter receiving part again. Set the handle **C** in position **E** and tighten the lid again by using the locking handle **A**.
- Put on the protective cover.
- Open the ball valve.

Gas sample probe SP2000-H320/0,1GF with 0,1µ fibre glass filter element

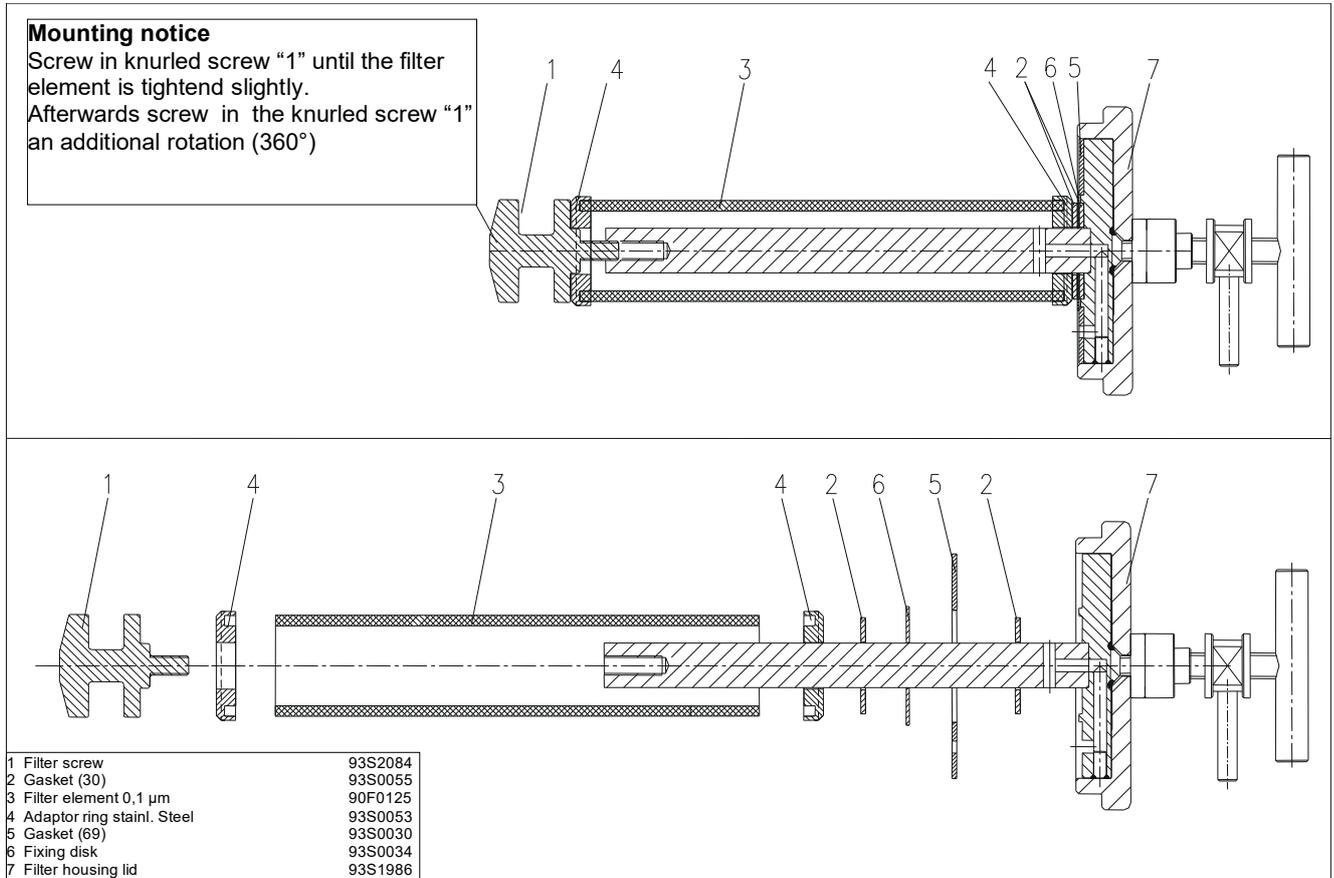


Figure 14 Mounting notice for probes with fibre glass filter element F-0,1GF 150



NOTE!

For replacement of the pre-filters, remove the complete probe unit out of the process. The pre-filters can be cleaned mechanically or in the ultrasonic bath according to the degree of contamination and be used again.

16.2 REPLACEMENT OF THE HEATING CARTRIDGE AND THE THERMOSTAT



WARNING!

Prior to works on any electrical parts, the power supply has to be switched off on all poles! this is also valid for all eventually connected alarm or control circuits.



- Switch the probe free from voltage (Switch off the power supply) and let the probe cool down.
- Remove the weather protection cover.

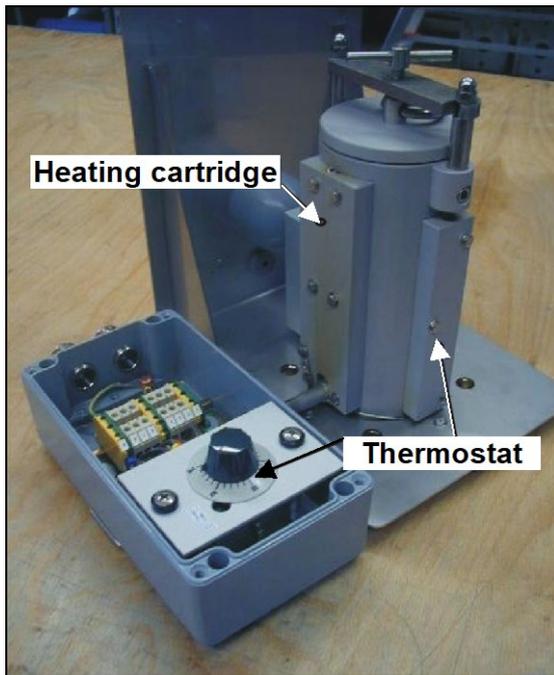


Figure 15 Positioning of the thermostat and heating cartridge

- Remove the lid of the electrical connection box after having loosened the 4 screws.
- Unscrew both screws "A" on the bottom of the connection box (figure 16) which are serving to mount the connection box on to the holding clip.
- Unscrew the hexagon head cap screws "B" (figure 16) which are serving to fix the heating cartridge receiving plate and the thermostat sensor receiving plate.

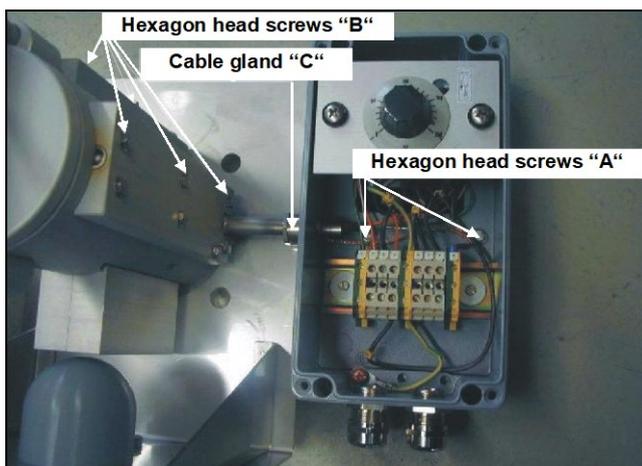


Figure 16 Positioning of the fixing screws and cable gland

- Remove the connection box including heating cartridge and thermostat sensor (figure 17)
- Loosen the leading-in cable gland "C" for the heating cartridge and the capillaries of the thermostat.



Figure 17 Connection box with heating cartridge and thermostat sensor

- Disconnect on the terminal strip the electrical connection lines of the heating cartridge and of the thermostat.
- Tear off the turning knob on the thermostat. Remove both fixing screws being under there (see figure 18). Remove also the 2 fixing screws of the thermostat receiving plate.
- Tear out the heating cartridge through the cable gland "C".
- Tear out the thermostat sensor of the aluminium block and through the cable gland in the opposed direction.
- Mount the new thermostat and lead the thermostat sensor through the cable gland.
- Also lead in the new heating cartridge through the cable gland.
- Connect the electrical lines according to terminal connecting plan.
- Mount the complete unit on to the probe again.

The thermostat has got a mechanical stop that is limiting the maximum adjustable temperature to be set by using the turning knob.

When mounting the thermostat, this mechanical stop must be adjusted in such a way that the arrow on the metal ring shows the desired maximum temperature (standard adjustment 190 °C).



Figure 18 Mechanical stop of the thermostat

If you use gas sample probes with temperature sensor (PT100 or thermo element) instead of the thermostat, you must lead the sensor connection line together with the heating cartridge through the cable gland. For this purpose, put the connection line into the bead of the sealing ring the two metal rings.

17 SPARE PARTS LIST

Gas sample probe SP2000...**(V) Consumable parts and (E) recommended spare parts**

Part No.	Description	V/E	Recommended quantity being in operation for [years]		
			1	2	3
90S0020	Filter element Type S-2K150. Length 150 mm, Material ceramic, Filter porosity: 2 µm	V	5	10	15
90F0125	Filter element Type F-0,1GF150. Length 150 mm, Material glass fibre, Filter porosity: 0,1 µm	V	5	10	15
93S2096	Filter glass wool for probe SP2..00../FW analytical clean and heat resistant up to 690 °C, Packing of 1 kg	V	2	4	6
93S0053	Spare receiving adaptor stainl.steel/sealing ring (30) for filter element F-0,1GF150	E	2	4	6
93S0055	Spare gasket (30) for filter element SP2000H 320/S-2K150	E	10	20	30
93S0030	Spare gasket of graphite (69) for filter housing lid SP2000/H320	E	2	4	6
93S0011	Thermostat 0 to 320°C, with excess temperature limiter and low temperature alarm 30 °C to T set value, Sensor diameter 8 mm	E	1	1	1
93S0015	Heating cartridge for SP2000-H, L=160 mm, 230VAC/800W	E	1	1	1
93S0017	Heating cartridge for SP2000-H, L=160 mm, 115 V AC/800 W	E	1	1	1
93F0130	Spare glass for electrically heated separator Type SDH flange execution exit laterally on the bottom	E	1	1	1
01P1000	Peristaltic pump SR25.1, 115/230 V	E			1
90P1007	Spare flexible tube set for peristaltic pump SR25 with PVDF connector unions DN 4/6 mm	V	2	4	6

18 CONNECTION AND MOUNTING DATA

Gas sample probe Type	SP2000-H320/S	SP2000-H320/S1	SP2000-H320/S2
Dimensions (B x H x T)	340 x 650 x 345 mm		
Material filter housing	Stainl. Steel 1.4571*		
Sealing material	Graphite		
Material probe flange seal	Novapress		
Low temperature alarm contact	Capacity: 250 V, 3 A~, 0.25 A=, Switching point: ΔT 30 °C	See 703	See 703
Connection gas outlet	DN4/6		
Connection test gas	Pipe \varnothing 6 mm		
Voltage supply /Capacity /Fuses	230 V 50/60 Hz, 800 W, /115 V** = 115 V 60 Hz, 800 W Fuse 10 A		
Electrical connection	Terminals max. 4 mm ² , 2 x M20 x 1,5 cable gland		
Mounting flange	DN 65 PN 6, Form B, 1.4571*, > DN or ANSI possible**		

Controller Type	703G	703 2-fach
Dimensions (B x H x T)	150 x 250 x 145 mm	260 x 280 x 140 mm
Status signal output	Low temperature alarm: 1 contact NO, potential free. Capacity max. 250 V AC 3 A	Low temperature alarm: 2 con- tacts NO, potential free. Capacity max. 250 V AC 3 A
Electrical connection	Terminals max. 4 mm ² , 4 x M20 x 1,5 cable gland	
Additional energy	115 V 50/60 Hz 1725VA, 230 V 50/60 Hz 3450 VA	

* = Standard ** = Option

19 ANNEX

- SP2000-H/Filter elements drawing No.: 22551050
- High temperature sample tube max. 1800 °C drawing No.: 22551040
- Electrically heated sample tube SP30-H1.1/-H2 drawing No.: 22091024
- SP2000-H320/S, drawing No.: 22551137
- SP2000-H320/S1, drawing No.: 225511301
- SP2000-H320/S2, drawing No.: 225511303



Further product documentation is available on our internet catalogue:
www.mc-techgroup.com

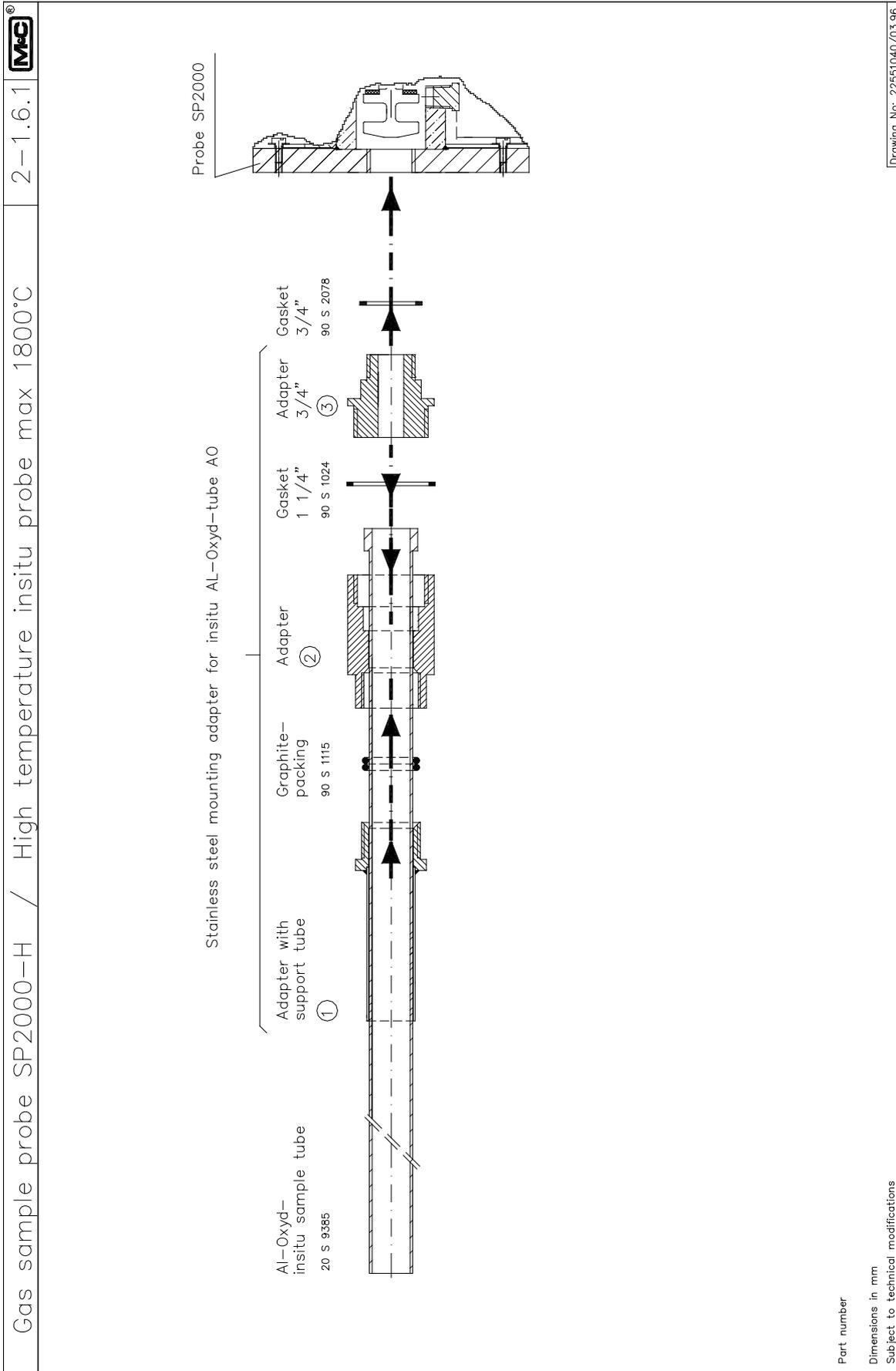


Figure 20 High temperature sample tube max. 1800 °C

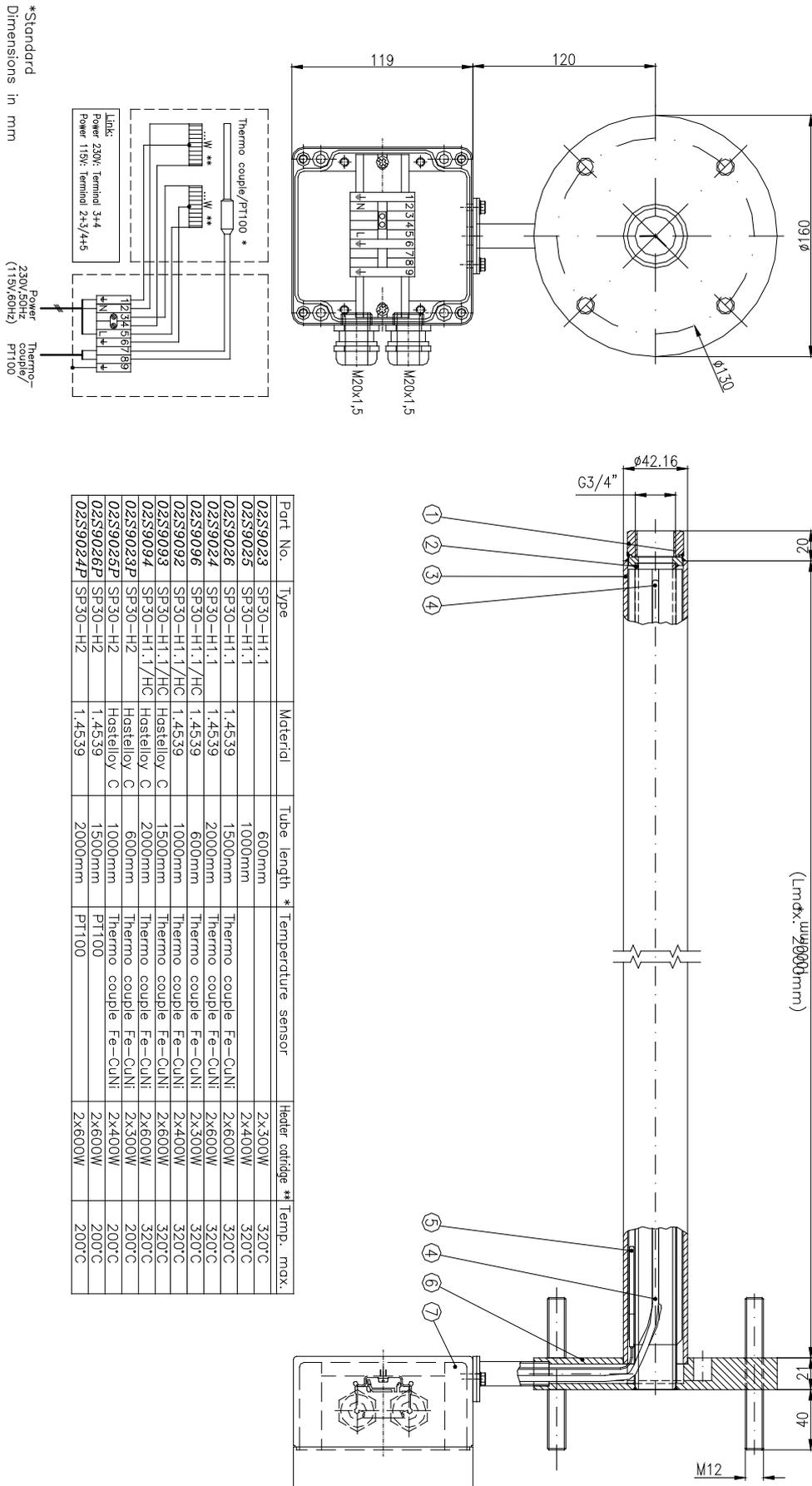


Figure 21 Electrically heated sample tube SP30-H1.1/-H2

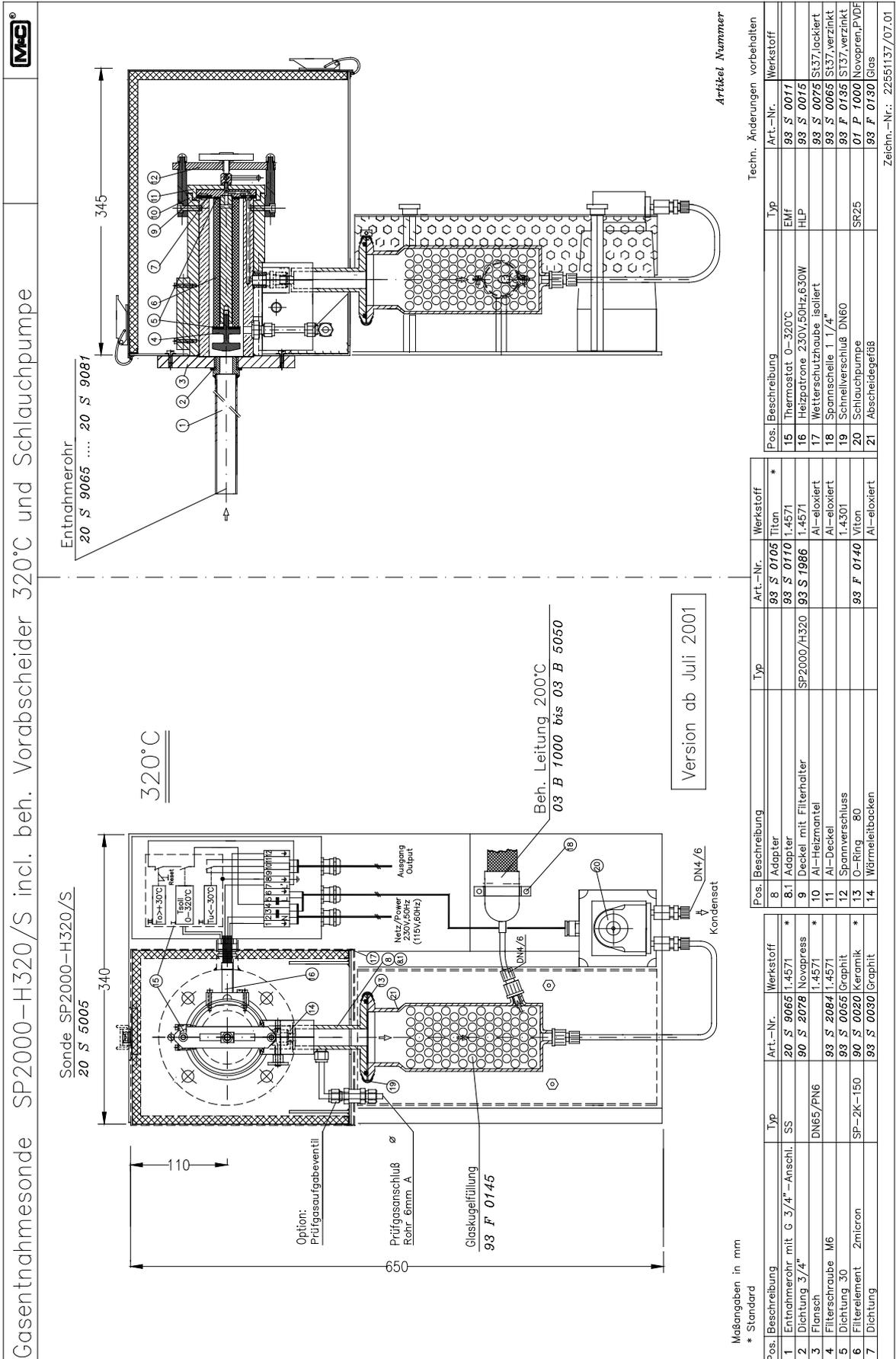
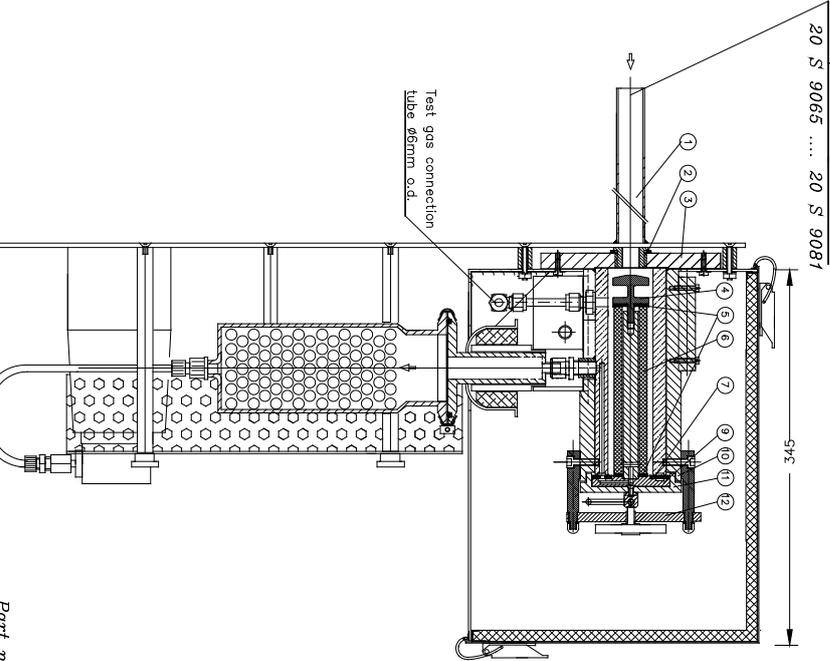
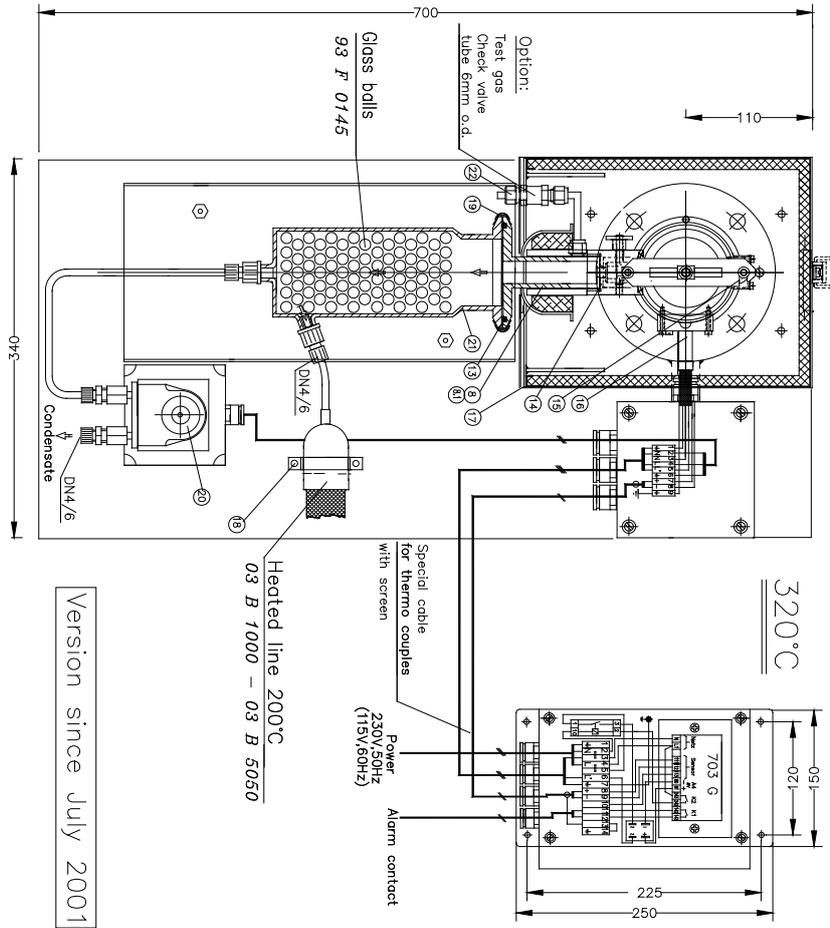


Figure 22 SP2000-H320/S

Gas sample probe SP2000-H320/S.1, 320°C heated pre separator, peristaltic pump and temperature controller 703G 2-1.1.4



Probe SP2000-H320/S.1
20 S 5000
Temperature controller
in a wall mounting box
01 B 8450
(01 B 8450a)



Item	Description	Type	Part-No	Material
1	Instru probe tube with 3/4" thread	SS	20 S 9065	SS316
2	Gasket 3/4"		90 S 2080	Novopress
3	Flange	DN65 PN6		SS316
4	Filter screw M6		93 S 2084	SS316
5	Gasket 30		93 S 0055	Graphite
6	Filter element Zmicron	SP-2K-150	90 S 0020	Ceramic
7	Gasket		93 S 0030	Graphite
8	Adapter		93 S 0107	Hastelloy C *
9	Cover plate with filter holder	V	93 S 1986	Anodized Al
10	Al-Heater body			Anodized Al
11	Al-cover plate			SS304
12	Clamp unit		93 F 0140	Viton
13	O-Ring 80			Anodized Al
14	Thermal conductivity jaw			
15	Temperature sensor	Fe-CuNi	93 S 0060	
16	Heater cartridge 230V/50Hz/800W	HLP	93 S 0075	
17	Weather protection shield		93 S 0075	pointed steel
18	Clamp 1 1/4"		93 S 0065	galvsn. steel
19	Quick clamp DN60		93 F 0135	SS304
20	Peristaltic pump	SR25-1G	01 P 1100	Novopren,PVDF
21	Separation vessel		93 F 0130	Glass
22	Check valve, 0,7bar			SS316, Viton

Subject to technical modification

Part number

Drawing No: 225511301/08.03

Figure 23 SP2000-H320/S1

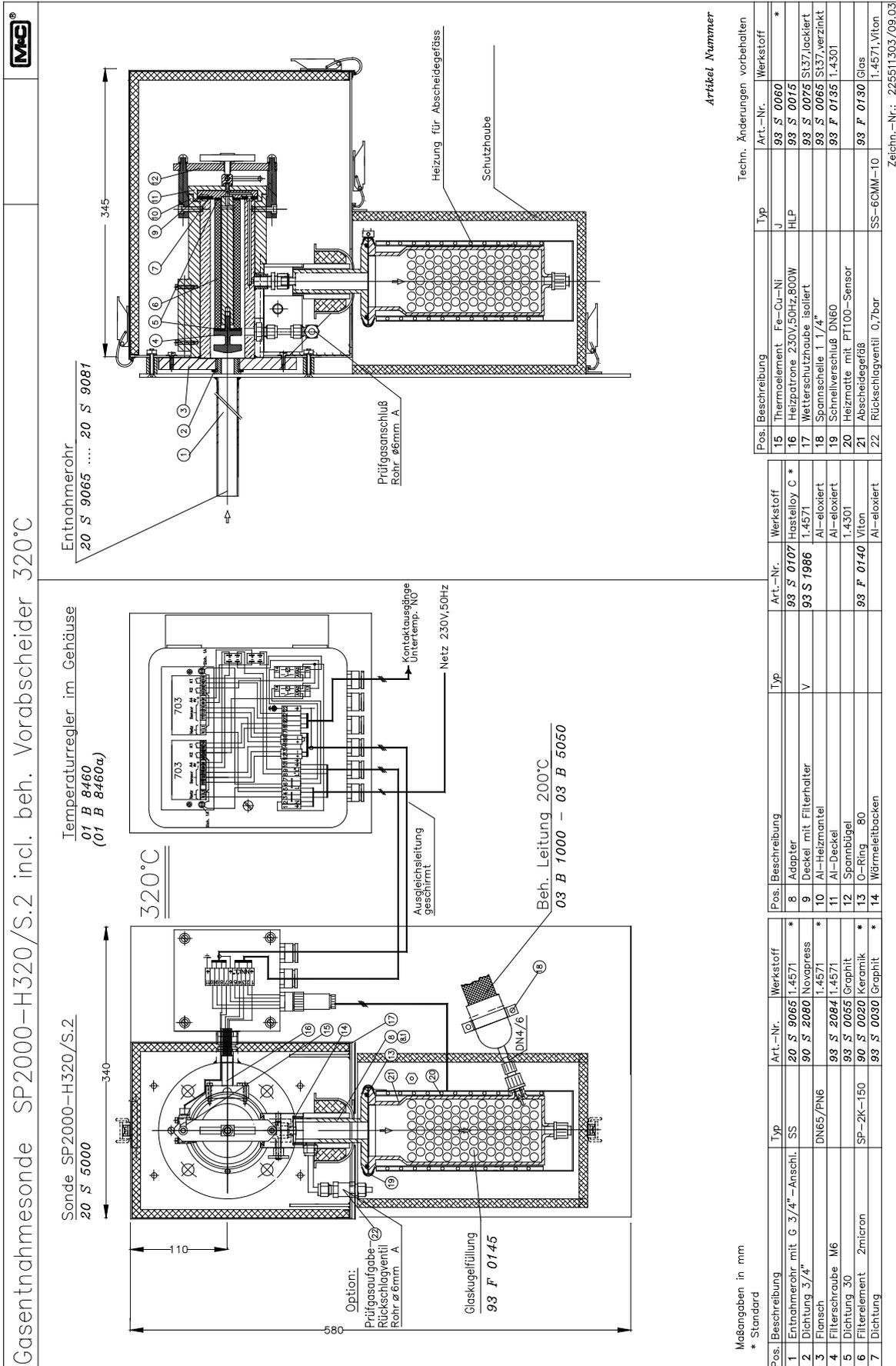


Figure 24 SP2000-H320/S2