

# Electrically-Heated and Portable Gas Sample Probe

## PSP4000-H, PSP4000-H/C, PSP4000- H/C/T

Instruction Manual  
Version 1.02.00



**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 instruction manual does not claim completeness and may be subject to technical modifications.

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With the release of this version all older manual versions will no longer be valid. The German instruction manual is the original instruction manual. In case of arbitration only the German wording shall be valid and binding.

**SP**® is a registered trade mark.

Version: 1.02.00

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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

**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, sun 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.

#### 3.1 INTENDED USE

The **PSP400-H**, **PSP400-H/C** and **PSP400-H/C/T** are intended for use in general purpose areas (non-hazardous environments). The gas sample probes can only be operated in compliance with the specifications given in chapter 9. You must meet the requirements of the ambient temperature and pressure characteristics in particular.

Do not use this product for any other purpose. Improper use and handling can create hazards and cause damage. For more information, please refer to the safety information in this instruction manual.

### 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**

The 'Danger' warning sign indicates that death, serious injury and/or significant material damage will be the consequence, if the appropriate precautions should not be taken.



**Warning**

The 'Warning' warning sign indicates that death, serious injury or damage to property may occur if the relevant precautionary measures are not observed.



**Caution**

The 'Caution' warning sign indicates that slight personal injury can occur if the appropriate safety precautions are not observed.



**Toxic!**

Acute toxicity (oral, dermal, inhalation)! Toxic when in contact with skin, swallowed or inhaled.



**Corrosive!**

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

**Caution**

'Caution' indicates that damage to property can occur if the appropriate safety precautions are not observed.



**Note**

'Note' indicates important information relating to the product or highlights parts of the documentation for special attention.

**Qualified personnel**

'Qualified personnel' are experts who are familiar with the installation, mounting, commissioning and operation of these types of products.



**High voltages!**

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



**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.



Use foot protection



Use safety helmet and full protective goggles



## 6 INTRODUCTION

**M&C** gas sample probes provide direct in-situ ultra-fine filtration during continuous gas sampling for analytic measurements. In this way, part of the necessary maintenance work for a system is concentrated on a single point. This filter technology has the major advantage that dust mixtures consisting of ultra-fine and coarse dusts can be optimally retained with the least possible maintenance work.

Optimal adaptation of the sample probe to processing conditions and to measurement work is a necessary condition for a measurement system to work smoothly. Basically, the gas sample should be kept to a necessary minimum. This is made possible thanks to optimised downstream gas processing using **M&C** components. Only in this way is it possible to reduce maintenance to a minimum while ensuring maximum availability.

## 7 SERIAL NUMBERS

The nameplates bearing the serial number are located on the side of the electrical connection box. Always quote the device's serial number when making enquiries and ordering replacement parts.

## 8 POWER SUPPLY

Depending on the version, the probe is operated with 115 or 230 V AC. Precise details can be found on the device's nameplate.



## 9 TECHNICAL DATA

Probe series SP® portable version PSP4000	PSP4000-H	PSP4000-H/C	PSP4000-H/C/T
Part No. 230 V	40S1000	40S1005	40S1015
Part No. 115 V	40S1000a	40S1005a	40S1015a
Sample temperature	Max. 600 °C *standard		
Sample pressure	Max. 1 bar		
Ambient temperature	-20 °C to +60 °C		
Filtration chamber volume	40 cm <sup>3</sup>		
Filter element	S-2K ceramic, 2 µm		
Probe temperature	Adjustable between 100-180 °C, pre-set at works to 180 °C		
Ready for operation	After approximately 30 minutes		
Gas inlet	Basic connection G 3/8" i, probe tube or adapters optional		
Gas outlet	1/8" NPT + tube connector ø 6 mm (optional ø 8 mm) and pipe clamp for attachment of heated sample line		
Power supply	220-240 V 50/60 Hz, 200 W or 115 V 60 Hz		
Electrical connection	Plug and socket connector 7 pin with 4 meter connection cable		
Electrical equipment standard	EN 61010, EN 60519-1		
System of protection	IP40, EN 60529 (starting from Part No. 1907XXX IP42, EN 60529)		
Material	Stainless steel 316Ti, ceramic, FKM		
Weight	3 kg		
Calibration gas connection for SS-tube/Plastic hose ø 6 mm	No	Yes	Yes
Temperature measurement with Thermocouple sensor FeCuNi, length 600 mm with 4 m connection cable and standard plug.	No	No	Yes

## 9.1 OPTIONS

Part No.	Option
	<b>Miscellaneous</b>
40S9130	Extra charge for PSP4000-H with $\varnothing$ 8 mm tube connector in the sample gas outlet
40S9100	Extra charge for PSP4000-H/FW with stainless steel filter wool receptacle including glass wool filling, filter S-2K not included, connection M 12, material: SS 316Ti
40S9090	Aluminium-framed case for portable gas sample probe PSP4000H and max. 5 m [ $\approx$ 16.4 ft] heated sample line PSP4M4/6 or max. 8 m [ $\approx$ 26.2 ft] PSP4M4/6-W, dimensions: (H x W x D): 530 x 420 x 300 mm [ $\approx$ 20.9" x 16.5" x 11.8"]
	<b>Sample adapter with variable sample tube length</b>
40S9005	Adapter fitting 3/8" with gasket and 8 mm PTFE sealing ring
40S9000	Adapter with cone transition for openings of $\varnothing$ 10 to 20 mm and $\varnothing$ 8 mm sample tube out of SS 316Ti, extensible from 80 to 200 mm. [ $\approx$ 3.1" to 7.9"]
40S9010	Sample tube $\varnothing$ 8 mm with position mark, for extensible probe length from 190 to 300 mm [ $\approx$ 7.5" to 11.8"]
	<b>Fixed sample tubes with male connector G 3/8", length 1 m [<math>\approx</math> 3.3 ft]</b>
40S9020	Material: stainless steel SS 316Ti, $\varnothing$ 6 mm OD, max. 600 °C [1112 °F]
40S9030	Material: stainless steel SS 316Ti, $\varnothing$ 8 mm OD, max. 600 °C [1112 F]
40S9040	Material: stainless steel SS 316Ti, $\varnothing$ 10 mm OD, max. 600 °C [1112 F]
40S9050	Material: stainless steel SS 316Ti, $\varnothing$ 12 mm OD, max. 600 °C [1112 F]
40S9108	Material: Titanium, $\varnothing$ 6 mm OD, max. 400 °C [752 °F]
40S9109	Material: Hastelloy®, $\varnothing$ 6/8 mm OD, max. 900 °C [1652 °F]
40S9112	Material: Inconel® 625, $\varnothing$ 12 mm OD, max. 1200 °C [2192 °F]
40S9106	Material: Kanthal®, $\varnothing$ 15 mm OD, max. 1300 °C [2372 °F]
40S9113	Material: Silicon nitride-ceramic, $\varnothing$ 12.5 mm OD, max. 1400 °C [2552 °F]
40S9110	Material: Ceramic, aluminium oxid <sup>1)</sup> , $\varnothing$ DN 12/8, max. 1800 °C [3272 °F], for mounting tube adapter PSP4000H/AO, Part No. 40S9111 is necessary
40S9111	Support tube adapter PSP4000H/AO, with 3 o-rings and 1 gasket, material: stainless steel SS 316Ti
	<b>Heated sample tubes SP34-H</b>
40S9115	Heated sample tube SP34-H with integrated thermostat
40S9120	Heated sample tube SP34-H1.1 with thermocouple sensor FeCuNi
40S9125	Heated sample tube SP34-H2 with PT100 sensor
	<b>Pre-filter SP1</b>
04S5000	Pre-filter SP1/SS3, OD: 30 mm, length: 150 mm [ $\approx$ 5.9"], filter porosity: 3 $\mu$ m, material: SS 316/316Ti, connection 1/4" NPT o
04S5010	Pre-filter SP1/SS20, OD: 30 mm, length: 150 mm [ $\approx$ 5.9"], filter porosity: 20 $\mu$ m, material: SS 316/316Ti, connection 1/4" NPT o
40S9054	Screw-on connector with female thread for sample tube 12 mm for mounting SP1, material: SS 316Ti, max. 600 °C [1112 °F]
	<b>Accessories made of SS 316Ti for stationary probe installation:</b>
40S9060	Intermediate connection adapter G 3/4" o - G 3/8" i, $\varnothing$ 8 mm, for further adaption possibilities, with gasket 3/4"
40S9070	Thread nipple R2" with G 3/4" i und G 3/8" i for mounting the probe in R2" thread adapter, material: SS 316Ti
40S9080	Flange DN 65 PN 6 B with thread connection G 3/4" for mounting the probe to the flange nozzle (other flange sizes on request)
90S2075	Flange gasket set for DN 65 PN 6 B, consisting of gasket (67) and screw set M 12 x 60

Part No.	Heated sample line PSP3/4-M Sil 4/6 with silicone outer jacket and fittings
01B4040	Electrically heated silicone sample line type PSP3-M Sil 4/6 with non-replaceable PTFE hose DN 4/6, 230 V/50 Hz for mobile use, stainless steel tube connection adapted on probe side, max. temperature: 200 °C, price per meter.
01B4045	Front/end fittings type I/K for heated samle line type PSP3-M Sil 4/6, probe-side tube stub 25 mm, connection cable 0.3 m axial to the rear with 7-pole socket, case-side tube stub 25 mm, connection cable 0.5 m axial to rear with 7-pole socket.
01B4050	Electrically heated silicone sample line type PSP4-M Sil 4/6, PTFE tube DN 4/6 replaceable, for mobile use, 230 V/50 Hz, with power line for probe, stainless steel tube stub adapted to the probe, max. temperature: 200 °C, price per meter.
01B4055	Front/end fitting type I/K for heated sample line type PSP4M/Sil4/6, tube stub on the probe side: 0.25 m connection cable axial to the rear, 0.3 mm with 7-pole socket, tube stub on the case side: 0.25 m connection cable axial to the rear, 0.5 mm with 7-pole socket.
01B4070	Option: Quicklock adapter for electrically heated silicone sample line type PSP4M-Sil4/6 with replaceable PTFE hose DN 4/6, 230 V/50 Hz for mobile use, max. temperature: 200 °C, price per piece
	<b>Heated sample line PSP4M4/6, corrugated or nylon braided outer jacket, and fittings</b>
01B4036	Electrically heated sample line PSP4M4/6 with replaceable PTFE tube DN 4/6, 230 V/50 Hz, SS tube stub on the probe side, outer jacket: nylon braided, max. temperature: 200 °C [392°F], price per meter
01B4034	Connection fitting type I for heated sample line PSP4M4/6 with 1.5 m [≈ 4.9 ft] connection cable and 7-pole plug with integrated power supply for PSP4000
01B4037	End fitting type K for heated sample line PSP4M4/6 with tube stub on the probe side and 0.5 m [≈ 1.6 ft] connection cable axial to the rear, with 7 pole-plug
01B4036W	Electrically heated sample line PSP4M4/6-W with replaceable PTFE tube DN 4/6, 230 V/50 Hz, tube stub out of stainless steel on the probe side, outer jacket: corrugated hose, max. temperature: 200 °C [392°F], price per meter
01B4034W	Connection fitting type I for sample line PSP4M4/6-W with corrugated hose for replaceable PTFE tube DN 4/6, power: 230 V/50 Hz, 110 W/m, and 1.5 m [≈ 4.9 ft] connection cable with 7-pole plug, integrated power supply for PSP4000
01B4037W	End fitting type K for sample line PSP4M4/6-W with corrugated hose for replaceable PTFE tube DN 4/6, tube stub on the probe side, 0.5 m [≈ 1.6 ft] connection cable axial to the rear, with 7-pole plug

1) Please pay attention to the characteristic feature of ceramic in case of high and changing temperatures!

Temperature controller: see data sheets "Electronic Temperature Controller plug-in system, Version TRD-H1, Version TRD-H3", "Electronic Temperature Controller 701" and " Microprocessor-Controlled Temperature Controller Type 70304"; portable gas conditioning system: see data sheets „Portable Gas Conditioning Unit Series PSS“ for PSS5, PSS5/3, PSS5C, PSS5C/2, PSS5C/3 und PSS-10/1; portable oxygen analyzer: see data sheets "Oxygen Analyzer Series PMA" for PMA10 and PMA10S.

Hastelloy® is a registered trademark for a nickel-chromium-molybdenum alloy by Haynes International, USA.

Inconel® is a registered trademark for a nickel-based alloy by Special Metals Corporation, USA:

Kanthal® is a registered trademark for an iron-chromium-aluminium alloy by the Sandvik Group, Sweden.

## 10 APPLICATIONS

The **PSP4000-H...** gas sample probes are used for extraction of gases from dust loaded, high-temperature or humid processes.

Due to its compact design and low weight, the device is envisaged particularly for mobile uses. The basic probe including the compact sample adapter with variable probe tube lengths enable rapid and centric gas sampling from, for example, exhaust gas pipes with diameters of between 150 mm [ $\approx 5.9$ "] and 600 mm [ $\approx 23.6$ ".]

A probe tube with a fixed length of 1 meter extends the range of potential applications.

With version **PSP4000-H/C/T**, parallel to gas sampling it is also possible to measure the process temperature at the end of the probe tube using an integrated thermo-couple sensor.

To avoid cooling and condensation of sample gas in the extraction area, a heated sample probe tube **SP34-H** is available.

Appropriate accessories are available for mounting the probes directly at the flange or threaded sleeve-mounting brackets.

The specially designed, electrically-heated sample lines PSP4M4/6 or PSP4M4/6-W with reduced outer diameter can be connected to the PSP4000-H for transporting gas to the gas sample conditioning system.



### Note

The max. length of heated sample lines for PSS-5 gas conditioning systems with integrated temperature controller is 12 m [ $\approx 39.4$  ft] for 230V/50 Hz resp. 6 m [ $\approx 19.4$  ft] for 115/60 Hz.

If unheated sample lines are used, this should be conducted on a descending gradient to the gas sample conditioning system.

## 11 DESCRIPTION

The standard version is as follows:

The stainless steel filter chamber (SS 316Ti) with an integrated 2  $\mu$ m ceramic depth filter element is inserted completely into an electrically heated aluminium heating jacket with a heat-insulated protective housing. For use with diesel exhaust gas measurements, the ceramic depth filter element can optionally be replaced with a filter wool holder made of stainless steel (part no. 94S0005).

The temperature is adjusted to + 180 °C [356 °F] via an integrated and adjustable capillary tube thermostat. The green control lamp glows during the heat-up phase and is extinguished when the heating element temperature is reached. It then comes on and off as the heating element is switched on and off.

By changing the internal wiring, the sample probe can be operated at 230 V 50 Hz or 115 V 60 Hz. The standard wiring is for 230 V.

Electrical connection is effected at the connection socket on the probe via the power cable provided with a 7-pin adapter jack or via an additional cable conducted within the heated sample line PSP4M4/6 resp. PSP4M4/6-W, also with a 7-pin adapter jack.

The adapter jack's pins are wired as follows:

- Pin 3: **L** - Mains power line conductor.
- Pin 4: **N** - Mains power neutral conductor.
- Pin 7: **PE** - Protective earthing conductor.

The probe's sample gas outlet connection has a 1/8" NPT inner thread. A temperature resistant 6 mm tube connector is fitted gas-tight into this to connect the sample line. Once the electrically-heated sample line PSP4M4/6 resp. PSP4M4/6-W has been mounted, the connection is enclosed in special heat-conducting jaws in order to avoid temperatures falling below the required level in the critical connection areas.

The heated sample line is rapidly and safely mechanically coupled with a tightening bracket including integrated quick-coupling.

To ensure simple filter changes, the complete filter unit including the connected sample line can be drawn out of the heat-insulated protective housing.

In the **PSP400H/C** special version, calibration-gas into the probe is possible without disassembling the probe via a special threaded connecting joint.

The special version **PSP400H/C/T** allows the process temperature to be measured by way of a thermo-element which is introduced into this threaded connecting joint. Its length can be adjusted up to the end of the sampling tube. The standard length of this thermocouple sensor is 600 mm [≈ 23.6"].

Optionally available is the **PSP** transport case for transporting the PSP4000-H... gas-sample probe including a maximum 5 m [≈ 16.4 ft] heated sample line PSP4M4/6 resp. max. 8 m [≈ 26.2 ft] for type PSP4M4/6-W.

## 12 RECEIPT OF GOODS

The gas sample probe **PSP4000-H...** is normally delivered in two packaging units:

1. Basic gas-sample probe with optional mounting accessories.
2. Optional sample tubes.

The gas sample probe 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.

## 13 PREPARATION AND INSTALLATION

Select the optimal sampling point in accordance with the generally applicable guidelines or consult the competent persons.

The sampling point should be easily accessible.

Locate the probe connections in such a way that the connections' temperature is always above the acid dew point in order to avoid corrosion and blockage problems.

If the ambient temperature in the area of the connections is > 80 °C [176 °F] as a result of radiated heat, then a radiated-heat deflector must be mounted to protect the probe.

The probe can also be mounted with an optional mounting flange or R2" threaded mounting fitting.

Before mounting, the probe must be adjusted to the existing operating conditions.

The existing operational parameters are to be checked accordingly prior to commencing mounting work.

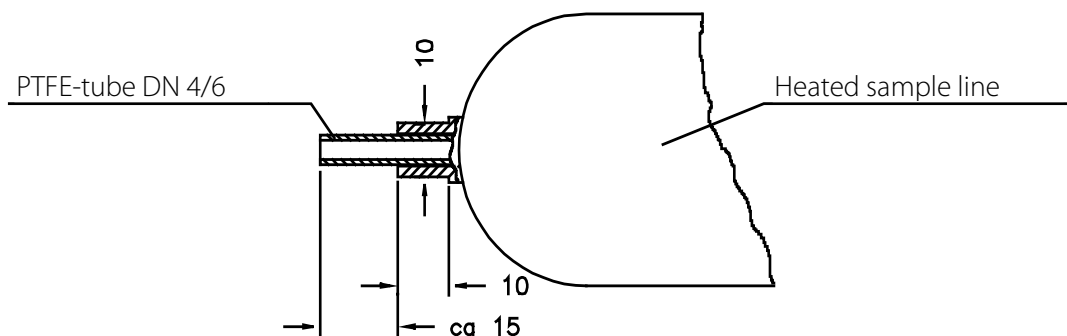
Under / over pressure situation	<b>mbar</b>	<b>bar</b>	
Process temperature	Min. °C,	Max. °C,	
Dust loading	<b>g/m<sup>3</sup></b>		
Dust composition - grain size	<b>µm</b>		
Gas composition	<b>corrosive</b>	<b>toxic</b>	<b>explosive</b>
Which parameters should be measured, e.g. O <sub>2</sub> , CO, SO <sub>2</sub> , NO <sub>x</sub> , .....	<b>vol%</b>	<b>mg/Nm<sup>3</sup></b>	<b>ppm</b>
Required amount of gas	Min. l/h,	Max. l/h,	
Necessary T <sub>90</sub> time	<b>sec.</b>		

## 14 SUPPLY CONNECTIONS

### 14.1 CONNECTING THE HEATED SAMPLE LINE

- Remove the aluminium heat-conducting jaws at the probe's filter head by loosening the 4 screws from the gas outlet's threaded connection. The outlet's threaded connection is provided for the connection of a tube with an external diameter of 6 mm (optionally 8 mm)
- Before connecting a sample line not specified by M&C, the tube connection should be prepared according to the following sketch.

M&C's heated sample lines type **PSP4M4/6** and **PSP4M4/6-W** are manufactured to fit the mechanical and electrical connections to the PSP4000-H... gas sample probe and already contain an internal line for the probe's power supply.



**Figure 1 Connection of the heated sample line**

1. Push the insert into the PTFE tube in order to avoid the tube being compressed and slide the red silicon protective ring up to the end of the heated sampling tube.
2. Introduce the PTFE tube into the threaded connection joint with the double-cutting ring system to ensure sealing.
3. After tightening the connecting nuts by hand, tighten them a further 1 ¼-turns using a flat spanner.

4. Push the end of the heated sample line as far as the end of the threaded connection joint and clamp with the aluminium heat-conducting jaws.
5. Mount the aluminium heat-conducting jaws in the longitudinal axis of the filter chamber in such a way that they fit into the aperture in the heat-insulated protective housing.
6. Remove the front part of the tension clip for holding the heated sampling tube to the probe and push the filter chamber including the heated sampling probe into the heat-insulated protective housing.
7. Screw on the front part of the tension clip again.
8. In the case of the **PSP4000-H** screw down the black knob on the rear side of the protective housing and tighten by hand.

In the case of the **PSP4000-H/C**, **PSP4000-H/C/T**, the flat nut and the dummy bolt of the threaded connecting joint on the rear side are to be screwed on again and after tightening the dummy bolt by hand, this is then to be tightened further by turning precisely 1 ¼-turns with a flat spanner.

## 14.2 ELECTRICAL CONNECTION

- Plug in the 7-pin plug (power supply) and switch on the power. During the heating up phase, the green control lamp glows. When the operating temperature is reached (180 °C [356 °F]), the green control light is extinguished and then lights up when the heating element is switched on to adjust the temperature.
- For safety reasons, we recommend switching the gas pump on only after another fifteen minutes has elapsed in order to ensure that the sampling probe heats up completely.

When using the **SP34-H...** heated sample tube, the electrical connection should be made separately using the built-in connection socket. The **SP34-H** sample tube has a built-in capillary tube thermostat which adjusts the temperature in a range between 100 °C [212 °F] and 180 °C [356 °F], factory setting 180 °C [356 °F].

When using the heated sample tube **SP34-H1.1** and **SP34-H2**, an external temperature controller is to be used for adjusting the temperature.

## 14.3 CALIBRATION-GAS DISCHARGE

In the case of the probe version **PSP400-H/C** with integrated calibration-gas connection, test gas can be conducted directly into the probe during the entire sampling procedure for the calibration of connected gas-analysis devices.

1. Remove the threaded connection's dummy bolt on the rear side of the probe.
2. Connect the 6 mm stainless steel tube provided or a temperature resistant tube DN 4/6 (PTFE, Viton®, silicon) using the nut provided and the double clamping ring. When connecting the tube, prior to assembly the 4 mm stainless steel insert must be pushed into the tube.
3. Introduce the tube or the hose into the threaded connection until it clicks in.
4. Tighten the threaded connection's nuts by hand and then exactly 1 ¼-turn using a flat spanner.

## 14.4 TEMPERATURE MEASUREMENT

1. In the case of the probe version **PSP4000-H/C/T**, after removing the dummy bolt, the thermo-element is pushed into the threaded connection on the rear side of the probe and fixed and sealed using the connecting nut and the PTFE conical ring seal.
2. The thermo-element can be adjusted to the length of the sampling tube by sliding it backwards and forwards accordingly.
3. Tighten the nut by hand and then carefully tighten further using an open-end wrench until the thermo-element sits firmly.
4. The external measuring amplifier or an extension compensation lead is to be connected to the compensating lead's standard plug.

## 15 PREPARATIONS FOR COMMISSIONING

Before initial startup, all plant- and process-specific safety measures must be observed. It is mandatory for the operator to complete the enclosed risk assessment of the product.

The gas exposure risk must be assessed by the operator with regard to the hazards posed by process and calibration gas and the setup at the installation site (e.g. tubing, system cabinet/container/plant). If the risk assessment reveals increased exposure hazards, further measures are required.

A visible label must be attached to the installation site in accordance with the risk assessment provided by the operator.

## 16 STARTING



Incorrect mains voltage can destroy the device.

When connecting, make sure that the mains voltage is correct as indicated on the nameplate!

If a transport case is in use, remove the probe along with the heated sample line connected. Connect the sample line to the gas sample conditioning system.

1. Connection of the PTFE tube connection
2. Connection of the 7-pin plug.



### Caution hot surface

The surface temperature of the protective housing is approx. 50 °C. Risk of burns due to contact with hot surface.

- Use protective gloves.
- Use personal protective equipment



When using the device for the first time and when connecting the heated sample line, proceed as follows:

- In the case of the **PSP4000-H**, draw the probe's filter chamber forwards out of heat-insulated protective housing by loosening and removing the black knob (rear side).



- In the case of the **PSP4000-H/C, PSP4000-H/C/T**, the dummy bolt and the flat nut located on the rear side of the threaded connection must be loosened and removed to do this.

Then mount the desired probe option at the filter chamber's G 3/8" inlet:

- In case of option "probe with adjustable tube length", screw the connecting adapter including its integrated PTFE conical ring seal (40S9005) with washer into the probe's G 3/8" inlet thread. Push the heat-insulated adapter with its cone connector (40S9000) over the connection adapter's pressure nut and fix it to the nut with the clamping screw.
- Push the 8 mm sample tube through the conical connection into the filter chamber.
- By turning the adapter to the right, the PTFE conical ring seal is pressed together and thus seals the sampling tube.



**Note**

Push the sample tube into the connecting adapter up to the marking as otherwise the conical seal ring will not have a sealing effect.

When using a **SP34-H** heated sample tube, this should be screwed into the probe's G 3/8" inlet threaded connection. Additional unheated sample tubes or pre-filters can be screwed into the G 3/8" threaded connection at the other end as the need arises.

When mounting the probe in conjunction with the threaded fitting (40S9070), and flange (40S9080), the connecting adapter with the PTFE conical ring seal 40S9005 and the intermediate adapter G 3/4" – 8 mm (40S9060) are to be used.

## 17 MAINTENANCE

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

Probe maintenance is restricted essentially to replacing filter elements and checking seals.



### Caution hot surface

The gas sampling probe is hot. Risk of burns due to contact with hot surface.

- Use protective gloves when changing the filter element.
- Use personal protective equipment

## 17.1 CHANGING THE FILTER ELEMENT

As far as possible, the filter element should be changed when the probe is cold.



### Caution hot surface

The gas sampling probe is hot. Risk of burns due to contact with hot surface.

- Use protective gloves when changing the filter element.
- Use personal protective equipment



1. To do this in the case of the **PSP4000-H**, screw off the black knob on the rear side.  
In the case of the **PSP400-H/C** with sample-gas connection and **PSP4000-H/C/T** with temperature measurement the dummy bolt on the rear side is first to be removed and the thermo-element drawn out.
2. Then loosen and remove the threaded connection's hexagon nut.
3. Now loosen the rapid coupling for the heated sample line holder by pressing down on the outside coupling ring and draw the complete filter unit out of the heat-insulated protective housing.
4. Screw the screw-on sleeve off the filter head.
5. Screw off the filter element holder and replace the filter element.
6. Check the filter element seals and the O-ring at the filter head and replace if necessary.
7. Clean filter chamber.
8. Clean or rod through the sampling tube in order to remove any deposits.
9. Then re-assemble in reverse order.

## 18 SWITCHING OFF

Before switching off, i.e. switching off the heating, the probe should be flushed with inert gas or air in order to avoid condensation of aggressive components from the process gas.



**Warning**



### Aggressive Condensate

Living tissue as well as many materials are destroyed by contact with this chemical.

- Do not inhale vapors and avoid contact with skin, eyes and clothing!
- Wear safety glasses and appropriate protective clothing.

## 19 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.

## 20 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.

<b>Portable gas sample probe PSP4000-H..</b>					
<b>(C) Consumables parts</b>					
<b>(R) Recommended spare parts</b>					
<b>(S) Spare parts</b>					
					<b>Recommended quantity being in operation [years]</b>
<b>Part No.</b>	<b>Description</b>	<b>C/R/S</b>	<b>1</b>	<b>2</b>	<b>3</b>
90S0015	Filter element <b>S-2K</b> , ceramic 2 µm [4]	C	6	12	24
94S0005	Spun glass receptacle <b>FW</b> for PSP4000	S	-	1	1
93S2083	Filter spun glass, pure, temp. resistant up to 690 °C [1274 °F], <b>1000 g [≈ 2.2 lbs]</b> ,	C	1	2	3
93S0045	Viton® gasket [3] for PSP4000	R	4	8	12
90F0040	Viton® O-ring 26 [2]	R	2	4	8
94S0045	Novapress® gasket 3/8" (blue), max. 600 °C [1112 °F]	R	3	6	9
90S2078	Ceramic fiber gasket 3/4", max. 1250 °C [2282 °F]	R	1	1	1
90S2080	Novapress® gasket 3/4" (blue), max. 600 °C [1112 °F]	R	1	1	1
90S2077	Flange gasket <b>DN65 PN6 B</b> , Novapress® (67 mm i.d.)	S	-	-	-
94S0040	PTFE fix ring, for 3/8" fitting Part No. 40S9005	R	2	4	5
94S0050	Thermostat 100 to 180 °C [212 to 356 °F] with 6 mm sensor tube	R	-	1	1
93S0018	Temperature resistant heat sink compound, max. 200 °C [392 °F], <b>100 g [≈ 0.2 lb] tube</b>	R	1	1	1
94S0010	Cartridge heater <b>230 V 160 W</b> , PSP4000 up to <b>Serial No. 118</b>	R	1	1	2
94S0015	Cartridge heater <b>115 V/230 V 100 W</b>	R	2	2	4
94S0025	Tube connection 6 mm for PSP4000-H/C	S	-	-	-
94S0020	Blind cap complete for PSP4000-H/C	S	-	-	-
94S0030	Viton® O-ring 3 for PSP4000-H/C blind cap	R	2	4	6
94S0035	PTFE fix ring for PSP4000-H/C/T thermolement connection	R	2	4	6

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Novapress® is a registered trademark of Frenzelit GmbH.

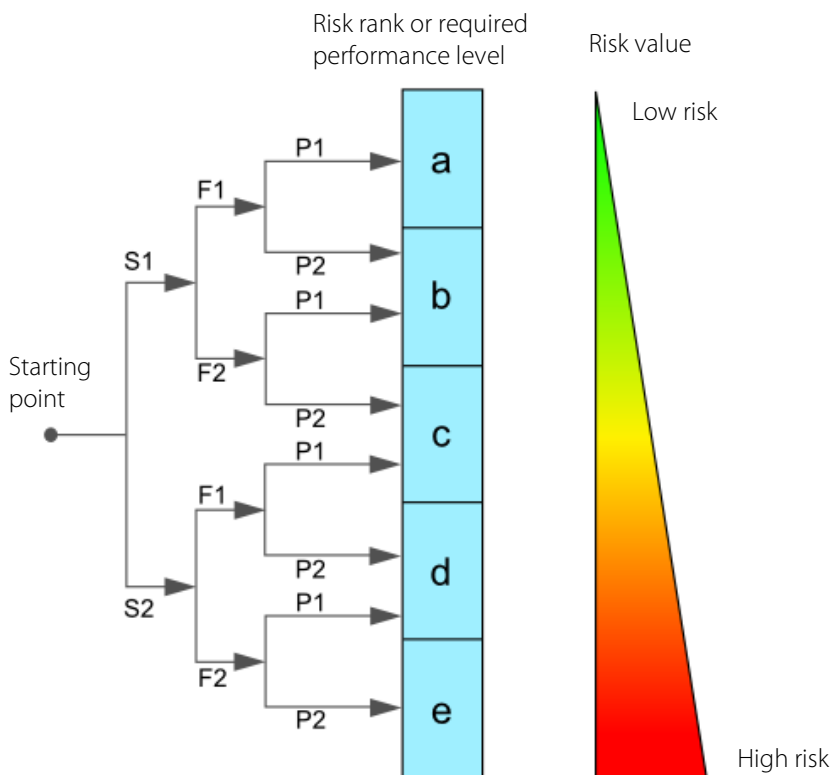
## 21 RISK ASSESSMENT

The risk assessment provided in this chapter is intended for all work activities on the product. The hazards can occur in the work steps of assembly, commissioning, maintenance, disassembly and in the event of a product fault. During normal operation, the product is protected by a system cabinet or appropriate covers.

Only qualified personnel is permitted to perform the work. The following minimum knowledge is required for the work:

- Employee instruction provided in process engineering
- Employee instruction provided in electrical engineering
- Detailed knowledge of the instruction manual and the applicable safety regulations

The product complies with the current regulations according to state-of-the-art science and technology. Nevertheless, not all sources of danger can be eliminated while observing technical protective measures. Therefore, the following risk assessment and the description of exposure hazards refer to the work steps mentioned above.



### Severity of injury:

S1 = 1 = minor (reversible injury)

S2 = 2 = serious (irreversible injury, death)

### Frequency and duration:

F1 = 1 = infrequent or short exposure to hazard

F2 = 2 = frequent (more than once per hour/shift)

### Possibility of preventing or limiting the damage

P1 = 1 = possible

P2 = 2 = hardly possible

**Figure 2 Overview risk assessment**



### Aggressive condensate possible

#### Risk rank group A

Chemical burns due to aggressive media possible!

This applies to all liquids in vessels and in the product.

In general, for electrical and mechanical work on the product, wear personal protective equipment (PPE) in accordance with the risk assessment.



### Caution hot surfaces

#### Risk rank group A

The temperature inside the product can be higher than  $> 180\text{ }^{\circ}\text{C}$ .

The hot parts are shielded by mechanical devices. Before opening the products, they must be disconnected from the power supply and a cooling time of more than  $> 180$  minutes must be observed. In general, for electrical and mechanical work on the product, wear personal protective equipment (PPE) in accordance with the risk assessment.



### Caution electric shock

#### Risk rank group C

When installing high-power systems with nominal voltages of up to 1000 V, the requirements of VDE 0100 and their relevant standards and regulations must be observed!

This also applies to any connected alarm and control circuits. Before opening the products, they must always be disconnected from the power supply.



### Gas hazard

#### Risk rank group A-B-C

The hazard potential mainly depends on the gas to be extracted.

If toxic gases, oxygen displacing or explosive gases are conveyed with the product, an additional risk assessment by the operator is mandatory.

In principle, the gas paths must be purged with inert gas or air before opening the gas-carrying parts.

The escape of potentially harmful gas from the open process connections must be prevented.

The relevant safety regulations must be observed for the media to be conveyed. If necessary, flush the gas-carrying parts with a suitable inert gas. In the event of a gas leakage, the product may only be opened with suitable PPE or with a monitoring system.

Furthermore, the work safety regulations of the operator must be observed.



### Caution crushing hazard

#### Risk rank group A

The work must be performed by trained personnel only.

This applies to products weighing less than  $< 40 \text{ kg}$  [ $\approx 88.2 \text{ lbs}$ ]:

The product can be transported by 1 to 2 person(s). The instructions for appropriate personal protective equipment (PPE) must be observed.

The weight specifications are contained in the technical data of this product.

Furthermore, the work safety regulations of the operator must be observed.

## 22 APPENDIX

- Sample facilities, PSP4000-H/C and PSP4000-H/C/T
- Wiring plan
- Basic version
- Carrying case to transport sample probe
- Filter unit and connection of the heated sample line
- High temperature sample tube aluminium oxyde
- Electrically heated sample tube SP34-H



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

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

- Data sheet – portable heated sample probe **PSP4000-H**
- Data sheet - electrically heated sample probe tube **SP34-H**

Portable Gas Sample Probe PSP 4000-H...

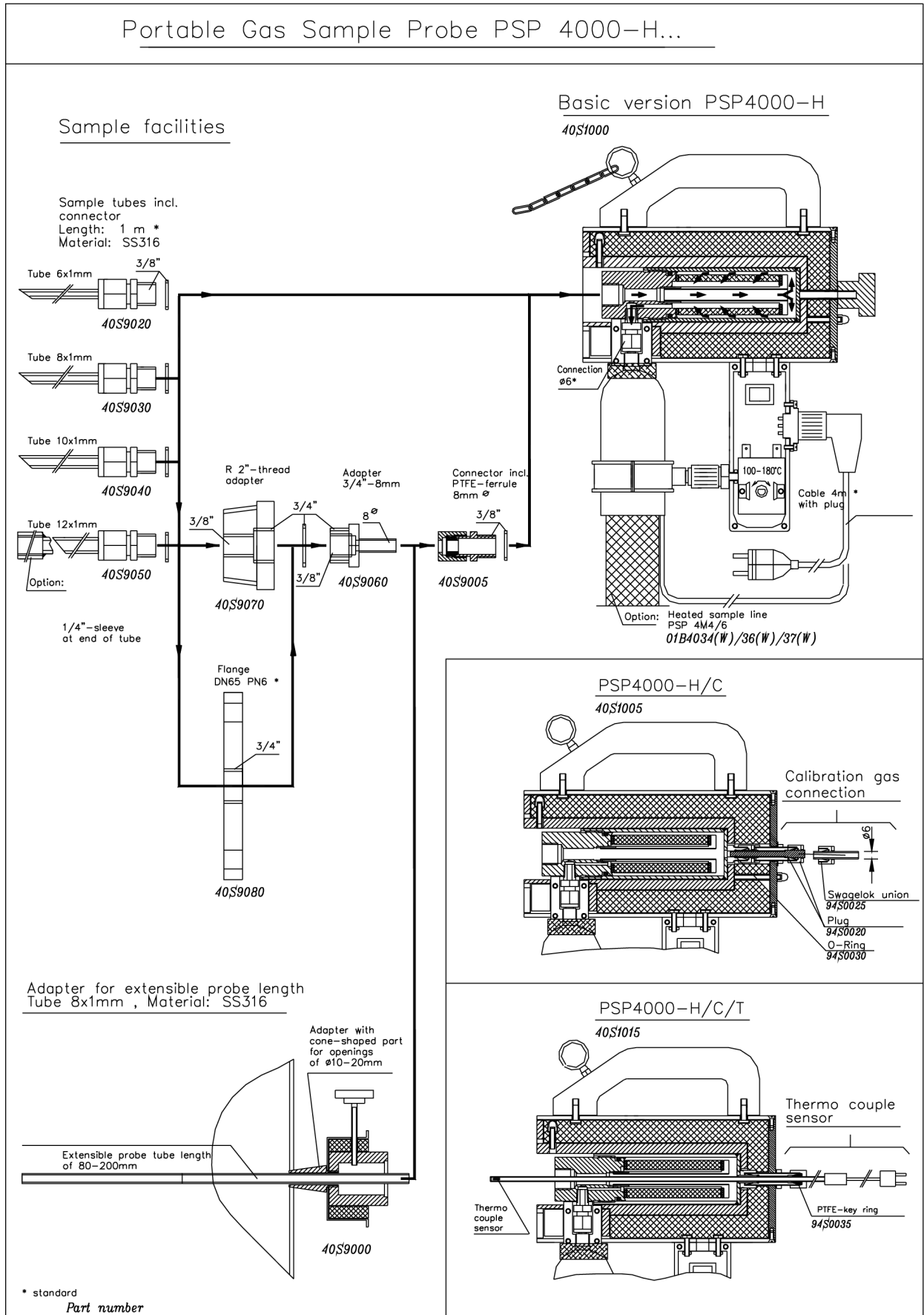


Figure 3 Available sampling options

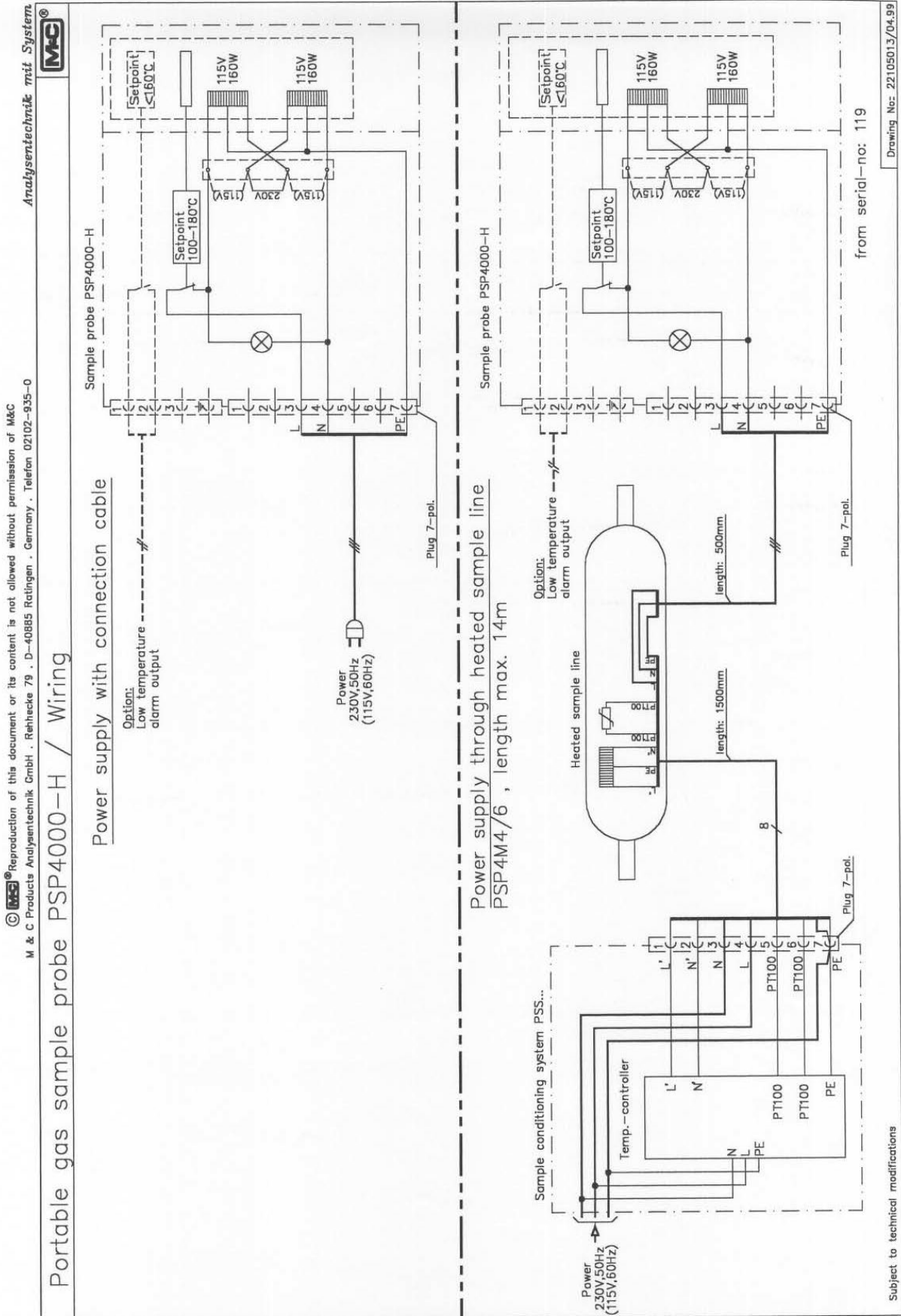


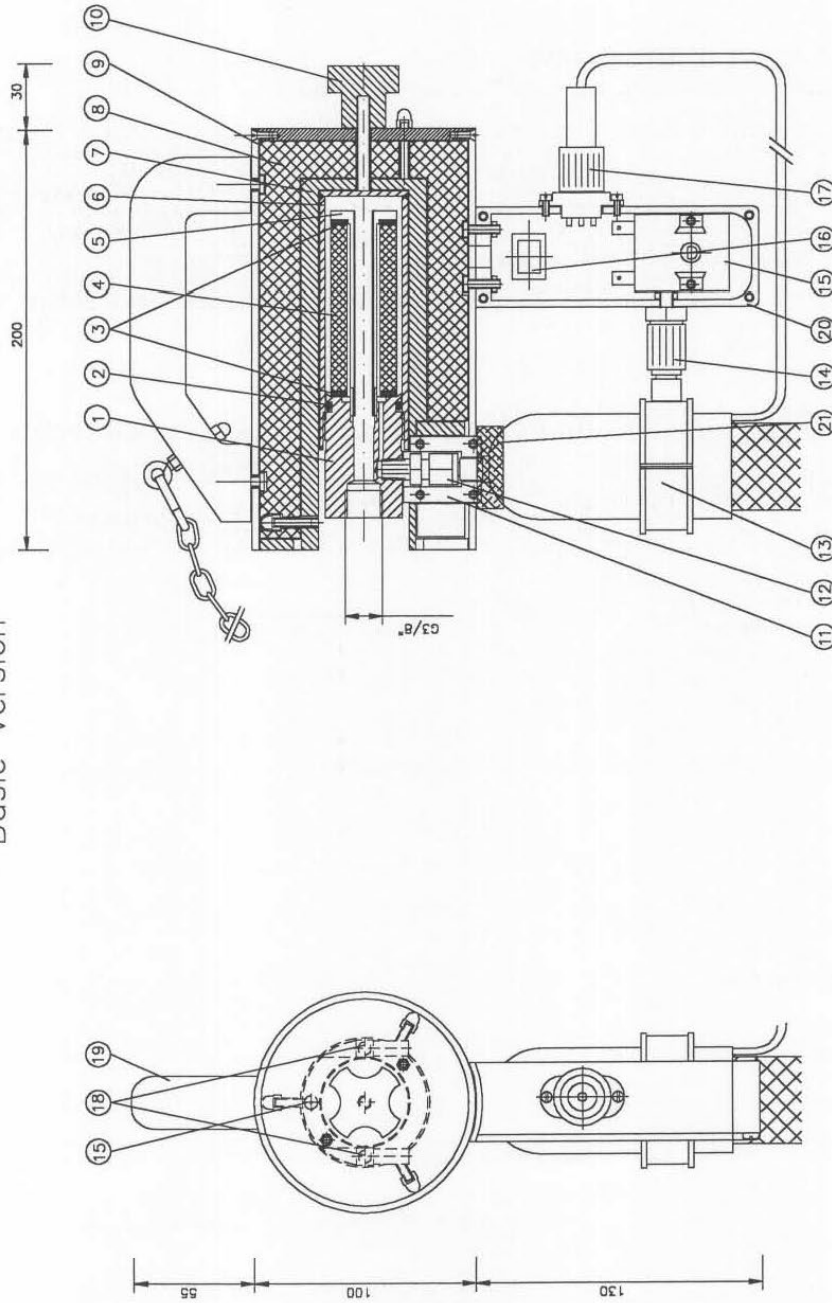
Figure 4 Wiring plan



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 Analysetechnik mit System

Portable sample probe PSP4000-H

Basic Version



Part number  
40S1000

Item	Description	Type	Part-No	Material	Item	Description	Type	Part-No	Material
1	Filter head	SS316			15	Thermostat 100-180°C		94S0050	
2	O-Ring 26	Viton	90F0040		16	green lamp 230V,50Hz			
3	Gasket 30	Viton	85S0045		17	Connector 7-pin			
4	Filter element	Ceramic*	90S0015		18	Cartridge heater 2 x 113V,150W		94S0075	Plastic, Steel
5	Filter element clamp	SS316			19	Handle with ring end chain			Coated Al
6	Filter body	SS316			20	Terminal box			Silicone
7	Heater body	Anodized Al			21	Silicone isolation ring 10x30mm			

Dimensions in mm  
\* Standard

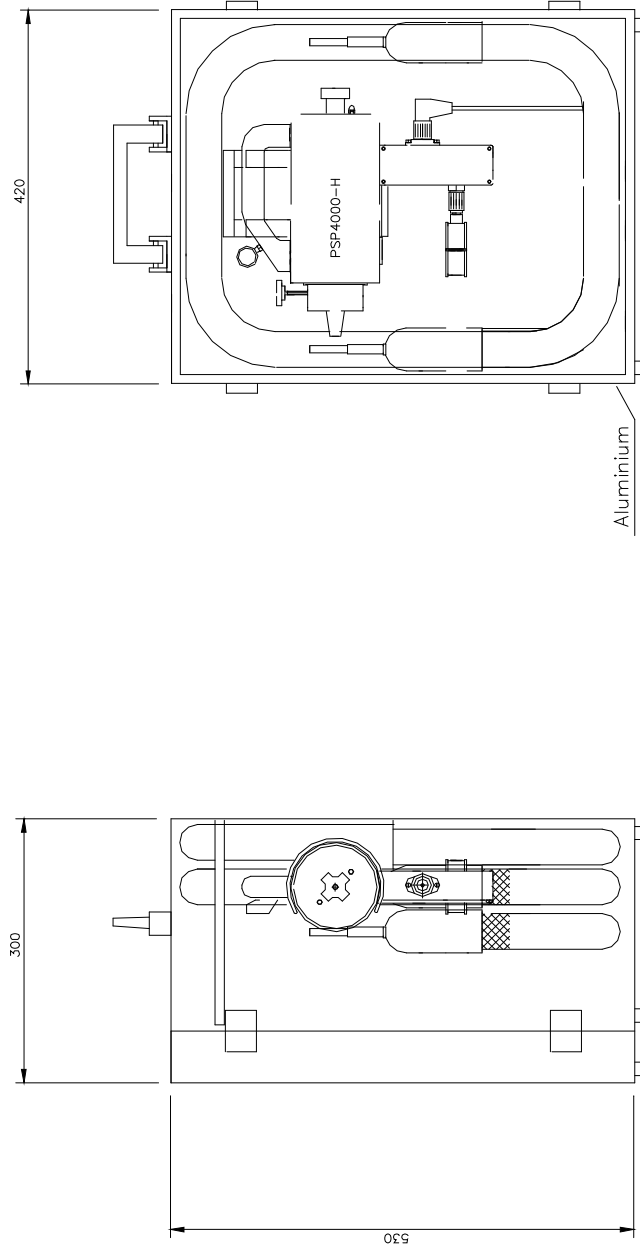
Subject to technical modifications

Drawing No: 22101022/04.99

Figure 5 Basic version



Carrying case to transport sample probe PSP4000-H incl. connected heated line



Part number  
40S9090

Dimensions in mm  
Subject to technical modifications

Drawing No: 22101031/04.99

Figure 6 Carrying case to transport sample probe

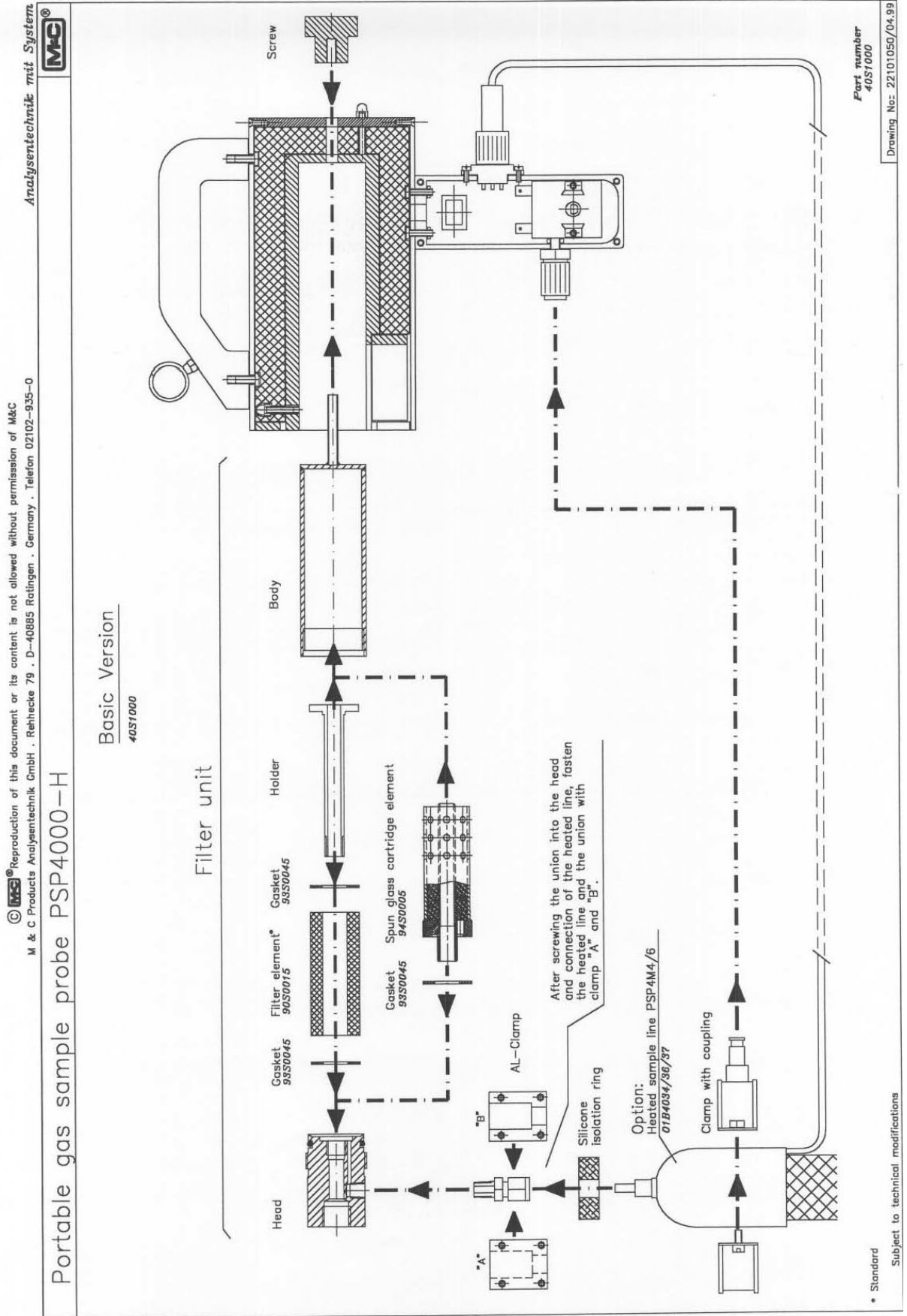
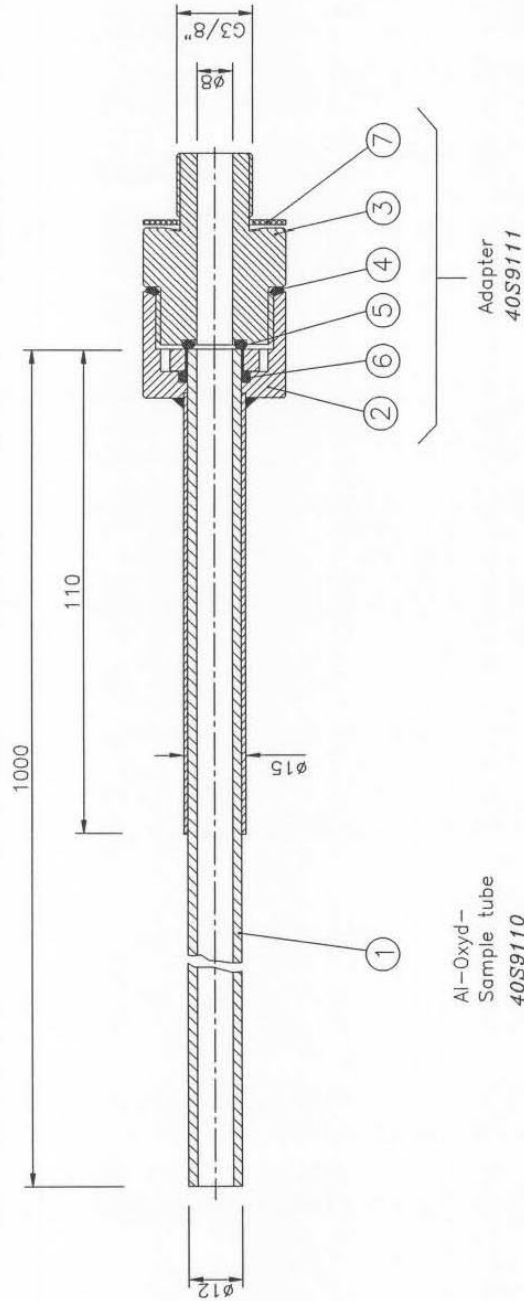


Figure 7 Filter unit and connection of the heated sample line

Al oxyd sample tube for probe PSP4000

Operating temperature of Al oxyd tube: max. 1800°C



Al-Oxyd-  
 Sample tube  
 40S9110

Adapter  
 40S9111

Part number

Dimensions in mm  
 \* Standard

Item	Description	Type	Part-No	Material	Subject to technical modifications	
					Item	Description
1	Sample tube	Al Oxyd	40S9110		15	
2	Support tube adapter	SS316			16	
3	Nipple	SS316			17	
4	O-Ring (23)	Viton	94S0060		18	
5	O-Ring (10)	Viton			19	
6	O-Ring (12)	Viton			20	
7	Gasket 3/8"	Navapress	94S0045		21	

Drawing No: 22.10/01/02.99

Figure 8 High temperature sample tube, aluminium oxide

Elektrisch beheiztes Entnahmerohr SP34-H für tragbare Sonde PSP4000-H

2-2.2

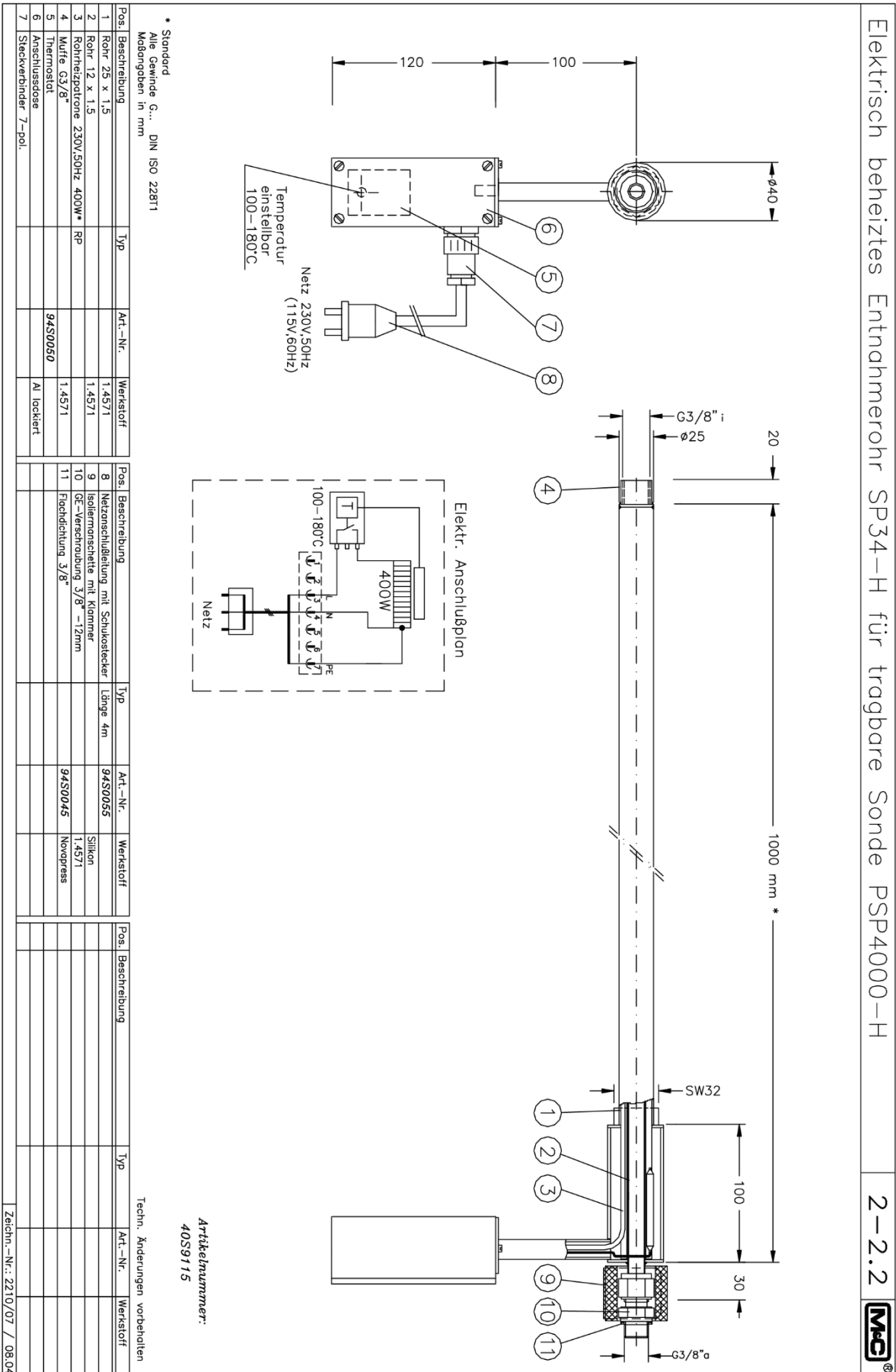


Figure 9 Electrically heated sample tube SP34-H