

Portable Gas Conditioning Unit Series PSS[®]

PSS-5, PSS-5/3

Instruction Manual
Version 1.01.00



**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. 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.

© 04/2024 **M&C** Techgroup Germany GmbH. Reproduction of this document or its content is not allowed without permission from **M&C**.

PSS® is a registered trade mark.

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.

Version: 1.01.00

List of Contents

1	General information	4
2	Declaration of conformity	4
3	Safety instructions	5
3.1	Intended Use	5
4	Warranty	6
5	Used terms and signal indications	6
6	Introduction	8
7	Function of the M&C Jet-Stream heat exchanger	8
8	Application	9
9	Technical data	10
10	Description	11
11	Receipt of goods and storage	13
12	Installation instructions	13
13	Supply connections	14
13.1	Tube connections.....	14
13.1.1	Connecting the heated sample line with special adapter (option)	16
13.2	Electrical connections	16
14	Preparations for Commissioning	18
15	Commissioning	18
16	Closing down	19
17	Maintenance	20
18	Trouble shooting	21
19	Proper Disposal of the Device	22
20	Spare parts list	22
21	Risk Assessment	24
22	Appendix	27

List of Figures

Figure 1	Diagram of the heat exchanger function.....	8
Figure 2	PSS-5 and PSS-5/3 gas flow diagram	9
Figure 3	Design of the conditioning units PSS-5 and PSS-5/3.....	11
Figure 4	Sample gas connection.....	14
Figure 5	Heated sample line connection with special adapter.....	16
Figure 6	Electrical connection and main switch.....	17
Figure 7	Overview risk assessment.....	25
Figure 8	Circuit diagram PSS-5 and PSS-5/3, 115 V and 230 V.....	28

HEAD OFFICE

M&C TechGroup 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 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



CE - Certification

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

EMC-Instruction

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

Low Voltage Directive

The requirement of the EU directive 2014/35/EU "Low Voltage Directive" are met.

The compliance with this EU directive has been examined according to DIN EN 61010.

RoHS Directive

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

Declaration of conformity

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

3 SAFETY INSTRUCTIONS

Follow these 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 sun, direct rain or moisture.

The gas conditioning systems PSS-5 and PSS-5/3 must not be used in hazardous areas.

Installation, maintenance, inspections and any repairs of the devices must be carried out only by qualified skilled personnel in compliance with the current regulations.

3.1 INTENDED USE

The **PSS-5** and **PSS-5/3** must not be used for sampling flammable gas/air or gas/oxygen mixtures, for sampling flammable gas which can form a flammable mixture in combination with air or oxygen, or in explosive atmospheres or in hazardous areas.

They can only be operated in compliance with the information in chapter 9 Technical data. 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

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.



Note

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

Qualified Personnel

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



High voltages!

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



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.



Hot surface!
Contact may cause burn! Do not touch!



Caution, risk of being crushed due to rotating parts.
Do not open the device. Use personal protective equipment (PPE).



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

The portable gas conditioning systems **PSS-5** and **PSS-5/3** have been specially designed, so that precise gas analysis can be carried out in any place and at any time.

The entire gas conditioning system is housed in a compact and robust aluminium framed protective case which ensures that the components can be removed easily, and gas analysis carried out quickly, safely and with a minimum amount of maintenance.

The **PSS-5** and **PSS-5/3** must not be used for sampling flammable gas/air or gas/oxygen mixtures, for sampling flammable gas which can form a flammable mixture in combination with air or oxygen, or in explosive atmospheres or in hazardous areas.

7 FUNCTION OF THE M&C JET-STREAM HEAT EXCHANGER

The **ECP1000** and **ECP3000** gas coolers, specially developed for analysis technology, are designed for maximum flow rates of up to 350 NI/h. They are also installed as system assemblies in the PSS-5 and PSS-5/3.

Jet-Stream heat exchangers are available in Duran glass, stainless steel (316Ti) and PVDF (polyvinylidene fluoride). The selection of the appropriate heat exchanger material is customer specific. The heat exchangers are easily accessible and easily replaceable in a heat-insulated cooling block.

Figure 1 shows a schematic diagram of the heat exchanger function.

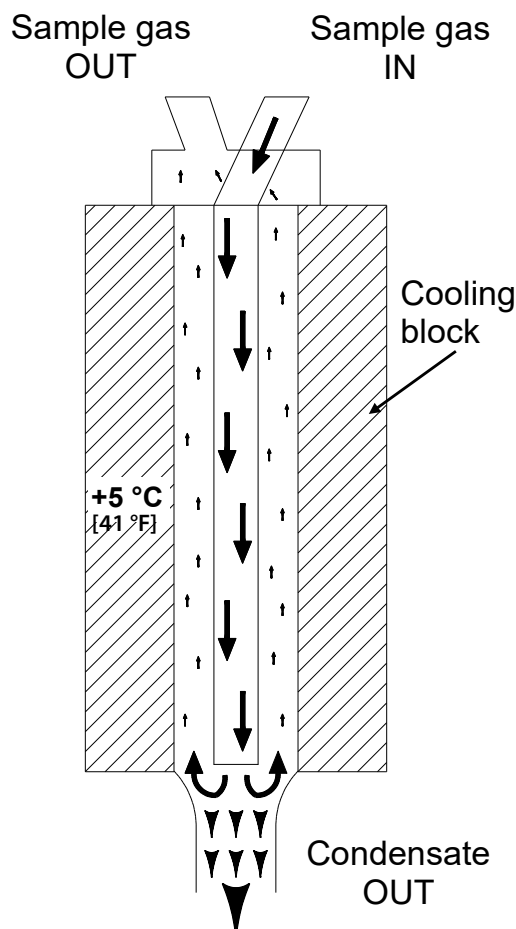
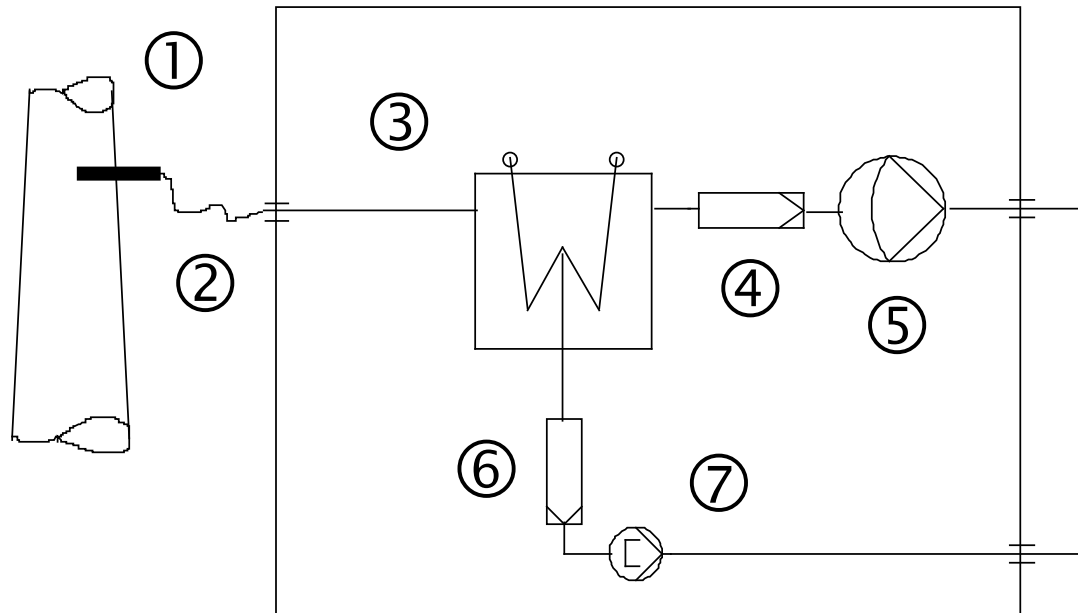


Figure 1 Diagram of the heat exchanger function

8 APPLICATION

The gas conditioning system is ideally suited for both intermittent and continuous operation.

The components of the **PSS-5** and **PSS-5/3** systems are intended for "standard use." We also provide a wide range of additional equipment and other components if special measurements are required.



- ① Gas sample probe, stainless steel 316, \varnothing 4/6 mm, length 0.5 m
- ② Gas sample line, PVC hose, \varnothing 4/6 mm, length 3 m
- ③ Gas cooler **ECP1000** or **ECP3000**
- ④ Fine filter **FP-2T**, filter element fineness 2 μ m
- ⑤ Sample gas diaphragm pump **N3KPE** or **N9KPE**
- ⑥ Pre-filter **PF2**
- ⑦ Peristaltic pump **SR25.2-W** for continuous removal of condensate

Figure 2 PSS-5 and PSS-5/3 gas flow diagram

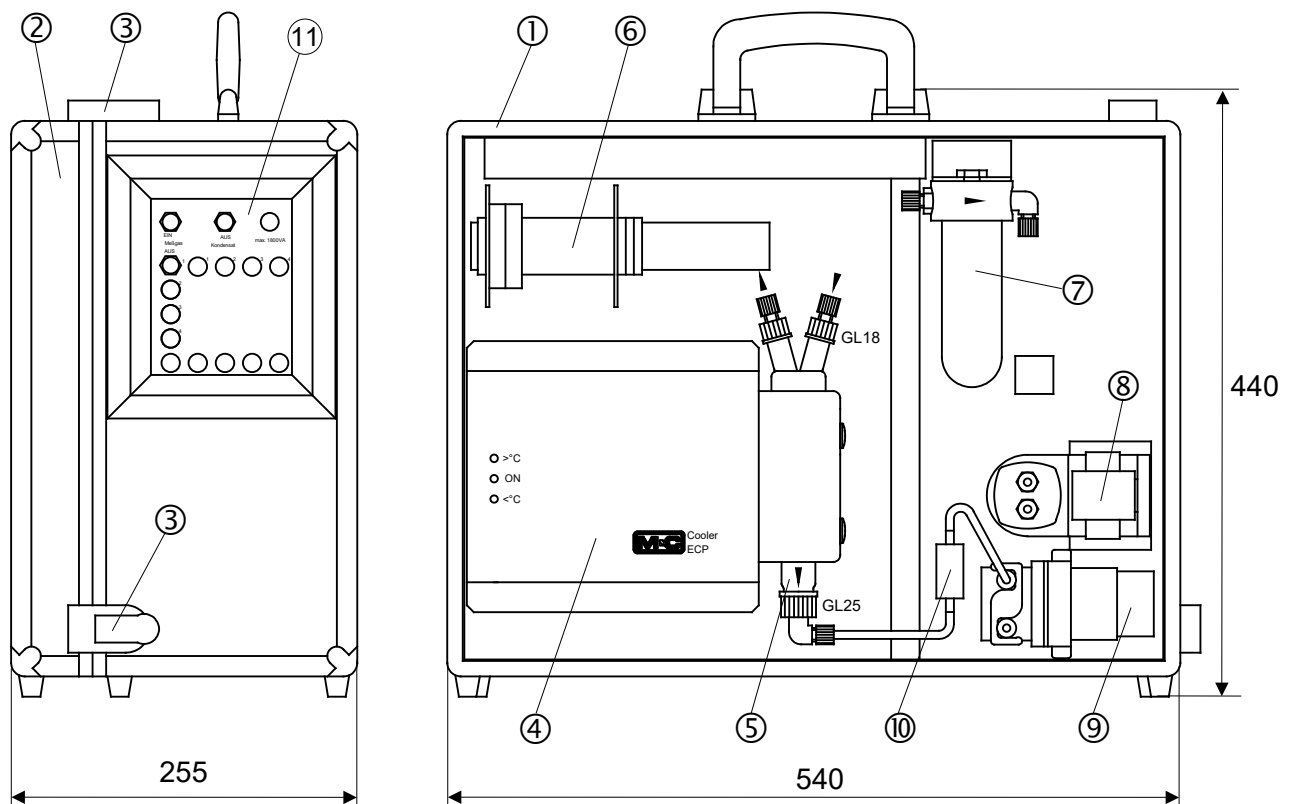
9 TECHNICAL DATA

Gas Conditioning Type	PSS-5	PSS-5/3
Part No.	01G1100(A)	01G1500(A)
Gas outlet dew point	Adjustment range: +2 to +15 °C [35.6 to 59 °F], factory setting: +5 °C [41 °F]	
Gas outlet dew point stability	At const. conditions: < ±0.1 °C [±0.18 °F]	
Gas inlet temperature	Max. 80 °C* [176 °F*], optional: max. 180 °C* [356 °F*] with stainless steel bulkhead union	
Gas inlet water vapor saturation	Max. +80 °C* [176 °F*]	
Gas flow rate	Max. 150 NI/h*	Max. 350 NI/h*
Ambient temperature	+5 to +40 °C* [41 to 104 °F*]	
Storage temperature	-25 °C to +65 °C [-4 to 149 °F]	
Pressure	0.7 to 1.4 bar abs.*	
Total cooling capacity	Max. 50 kJ/h	Max. 90 kJ/h
Number of gas inlets	1	
Number of gas outlets	1, optional: max. 4	
Medium connections	Tube connections DN 4/6	
Material of sample contacting parts	Stainless steel, glass, PPH, PVC, PVDF, PTFE, Novopren, optional: Viton® for gas sample line, Part No. 01G9025	
Ready for operation	Approx. 10 min.	
Mains power supply	230 V/50 Hz ±10 % or 115 V/60 Hz ±10 %	
Power consumption	Max. 240 VA Option temperature controller and heated sample line: 230 V max. 1620 VA 115 V max. 930 VA	
Fuse protection	4 A T (slow fuse), 5 x 20 mm With option temperature controller and heated sample line: 10 AT (slow fuse), 5 x 20 mm	
Electrical connection	Cold appliances plug with 2 m [≈ 6.6 ft] cable	
Case protection	IP20 (EN 60529)	
Case type	Portable aluminium framed protective case	
Case dimensions (H x W x D)	440 x 540 x 255 mm [approx. 17.3" x 21.3" x 10"]	
Weight without options	Approx. 17 kg [≈ 37.5 lbs]	Approx. 17.7 kg [≈ 39 lbs]
Options		
Temperature controller:	Range of control: 0 to 200 °C [32 to 392 °F] Input: Pt100	
Flow meter (optionally):	7 to 70 NI/h air, 15 to 150NI/h air, 25 to 250 NI/h air, 50 to 500 NI/h air Quantity: max. 4	
Electrical equipment standard	EN 61010	

PPH=Polypropylene, PTFE=Polytetrafluoroethylene (Teflon®), PVC=Polyvinyl chloride, PVDF=Polyvinylidene fluoride
 Viton®, Teflon® are registered Trademarks of DuPont Performance elastomer

* Maximum values in technical data must be rated in consideration of total cooling capacity at 25 °C [77 °F] ambient temperature and an outlet dew point of 5 °C [41 °F].

10 DESCRIPTION



- ① Case door
- ② Portable case
- ③ Tension locks
- ④ Gas cooler
- ⑤ Heat exchanger
- ⑥ Terminal mounting rail
- ⑦ Fine filter FP-2T
- ⑧ Sample gas pump
- ⑨ Peristaltic pump
- ⑩ Pre-filter PF2
- ⑪ Connections for the condensate and sample gas lines

Figure 3 Design of the conditioning units PSS-5 and PSS-5/3

All components of the gas conditioning system are built into a portable case ① and are freely accessible. The case door ② can be opened easily to the left by loosening the tension locks ③ mounted on the side and top of the case.

The installation of the gas cooler ④ and a corresponding diaphragm measuring gas pump ⑧ depends on the required maximum gas volume flow. The possible combinations are summarised in the following table:

PSS-5...	Type of cooler	Max. gas flow [NI/h]	Min. gas flow [NI/h]	Sample gas pump
PSS-5	ECP1000	150	60	N3KPE
PSS-5/3	ECP3000	350	200	N9KPE

The minimum amount of flow is determined by the sample gas pump (see chapter 9). If the required minimum total flow rate is not reached, excessive overpressure can lead to premature destruction of the pump diaphragm.

The gas cooler is equipped with a Duran® glass heat exchanger ⑤ as standard. Heat exchangers in PVDF or stainless steel are optionally available.

The FP-2T fine filter (2 µm filter porosity) ⑦ installed upstream of the sample gas pump ⑧ provides the necessary solids separation.

The overtemperature alarm contact (+8 °C [46.4 °F]) of the cooler automatically regulates the switching on and off of the sample gas pump.

The resulting condensate is continuously discharged by a peristaltic pump type SR25.2-W ⑨.

A pre-filter type PF2 ⑩ is installed in the condensate line between the heat exchanger and the peristaltic pump. This protects the pump from particle contamination in the condensate.

The 4/6 mm tube connections for the condensate and sample gas lines ⑪ are located on the right side of the case (see Figure 3 and Figure 4).

A stainless steel sample tube (length 0.5 m, Ø 6 mm) and 3 m PVC sample tubing (4/6 mm) are included as standard.

The ventilation grids in the lid and in the left side wall of the case provide sufficient convective forced ventilation.

Options:

The **PSS-5** and **PSS-5/3** sample gas conditioning unit can be equipped at the factory with a maximum of four sample gas outlets. Each sample gas outlet can be controlled according to the specified volume flow range (see table) by the optional installation of a flow meter type **FM40** with needle valve. Unused mounting holes for sample gas outputs or flow meters are closed by blind caps.

To protect the downstream analyzers against liquid ingress and to increase the operational reliability of the entire system, we recommend the installation of a liquid alarm sensor type **LA1S**. For this purpose, the **FP-2T** fine filter installed as standard is replaced at the factory by the **FP-2T-D** fine filter with built-in liquid alarm sensor. The **LA1.4** electronic controller is located on the terminal support rail ⑥ (Figure 3), in the upper part of the case. The LA electronics automatically shuts off the sample gas pump in the event of a liquid alarm. The alarm is indicated by a red LED. If there is no alarm, a green LED will be on.

The **PSS-5** and **PSS-5/3** sample gas conditioning units can optionally be equipped with a sample gas inlet (see Figure 4, Part No. 01G9060) for connecting a heated sample line. The existing anti-kink protection must only be used for heated sample lines of connection type "C" (Part No. 03B1020). Assembly instructions can be found in the appendix.

It is also possible to connect the heated sample line Part No. 01B4036 in connection with the gas sample probe **PSP4000**.

The temperature controller (Part No. 01G9055) required to control the heated line is factory-installed on the terminal support rail ⑥ (Figure 3).

A 3-way ball valve (Part No. 01G9046) or a 5-way ball valve (Part No. 01G9045) can optionally be installed in the inlet of the gas conditioning unit for test gas feed or sample gas switching.

11 RECEIPT OF GOODS AND STORAGE

The gas conditioning and sampling systems **PSS-5** and **PSS-5/3** are completely pre-installed units.

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



Note

The gas conditioning unit should be stored in a protected frost-free area!

12 INSTALLATION INSTRUCTIONS



Note

The case should be placed on an even horizontal surface to ensure a secure and stable position.

The operating position is exclusively vertical. Only in this case is the proper condensate separation and discharge in the heat exchanger of the cooler guaranteed.

The gas conditioning case should be set up away from heat sources and freely ventilated so that no unwanted heat accumulation occurs.

For outdoor installation, adequate protection against direct sunlight and moisture must be provided. In winter, the installation site must be frost-free; observe the protection class of the case.

To ensure the operational safety of the portable gas conditioning unit and the downstream analyzers and to avoid false alarms, the sample gas conditioning unit must not be used outside the specified temperature range.

Downstream analyzers must always be operated at temperatures well above the specified gas output dew point of +5 °C. The temperature range of the downstream analyzers must not be exceeded. This avoids any condensation of the gas in the connecting lines to the analyzers.

Unheated gas sample lines must be installed with a gradient down to the cooler. Condensate pre-separation is then not necessary.

13 SUPPLY CONNECTIONS

13.1 TUBE CONNECTIONS



Note

Do not swap tube connections; connections are marked accordingly.
After connecting all lines, the tightness must be checked.

Figure 4 shows the possible medium connections. These are located recessed in a special mounting frame on the right side of the sample gas conditioning case.

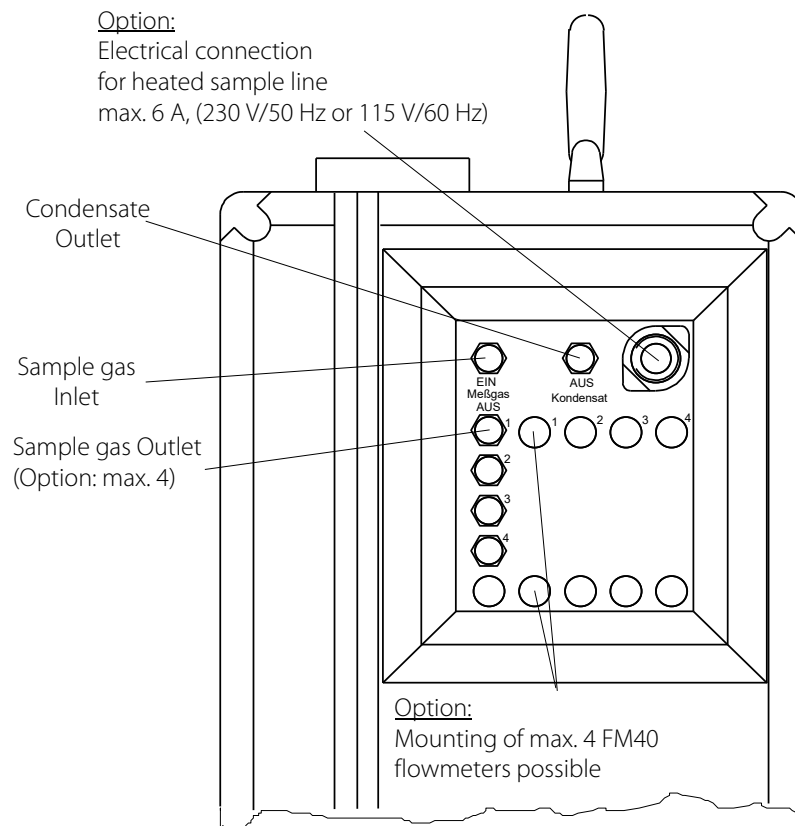


Figure 4 Sample gas connection

All tube connections are equipped with 4/6 mm sealing ring threaded hose couplings made of polypropylene (PP) for gas input temperatures of up to a maximum of 80 °C [176 °F] (see chapter 9). If heated sample lines are used, whereby the gas input temperatures are increased up to a maximum of 180 °C [356 °F], additional bulkhead unions made of stainless steel are recommended.

Dimension 4/6 mm connecting tubes are used as standard.

The sample gas tubes or condensation tubes, are to be assembled as follows:

1. Remove the union nut from the sealing ring couplings by turning it anti-clockwise. The nut should be removed from the thread with great care so as to ensure that the loose sealing ring in the nut is not lost.
2. Place the union nut over the connecting tube.
3. Place the sealing ring over the connecting hose with the thicker bead towards the nut.
4. Place the hose over the nipple on the thread.

**Note**

The tightness of the connections can only be guaranteed if the connecting tube has a straight rim (hose cutter).

5. The union nut is to be screwed tight by hand.

The tube will no longer be able to slip off and is now compression-proof.

The tubes are to be removed in the reverse order.

**Warning**

Aggressive condensate is possible.



Wear protective glasses and proper protective clothing!



13.1.1 CONNECTING THE HEATED SAMPLE LINE WITH SPECIAL ADAPTER (OPTION)

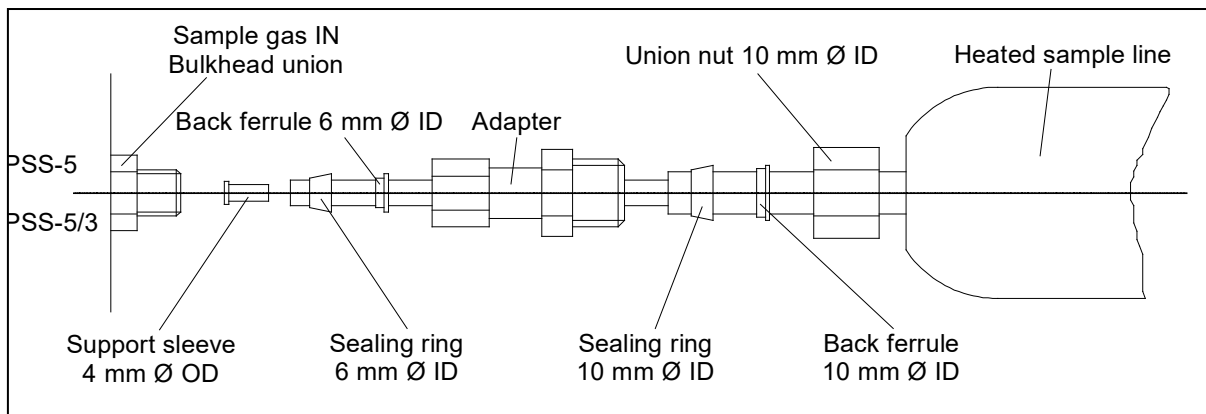


Figure 5 Heated sample line connection with special adapter

1. Place the special adapter on the PTFE tube according to the drawing seen above;
2. Place the support sleeve into the PTFE tube;
3. Insert the Teflon® tube as far as possible into the "Sample gas IN" bulkhead fitting and hand-tighten the adapter;
4. Tighten the adapter 1 1/4 turns with a wrench (SW 14), while holding the lock nut of the Schott screw connection with a wrench (SW 15);
5. Insert the 10 mm pipe of the heating cable into the adapter as far as possible and hand-tighten with the union nut;
6. Tighten the union nut 1 1/4 turns with the wrench (SW 19), holding the adapter in place with the wrench;

The screw connection is now cut gas-tight and can be loosened as often as required.

13.2 ELECTRICAL CONNECTIONS



Warning

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



Note

For the erection of power installations with rated voltages up to 1000 V, the requirements of VDE 0100 and relevant standards and specifications must be observed!

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

The **PSS-5** and **PSS-5/3** gas conditioning systems are available with either 230V/50 Hz or with 115V/60 Hz (for circuit diagram see Appendix). A 4 A fuse is used on all models as fuse protection. The fuse is located on the terminal mounting rail (see Figure 3). When optionally using a temperature controller with heated line, the overload protection increases to 10 A.

The electrical connection is made via a cold appliance plug with 2 m cable on the left side of the case. The power socket is equipped with a two-pole main switch.

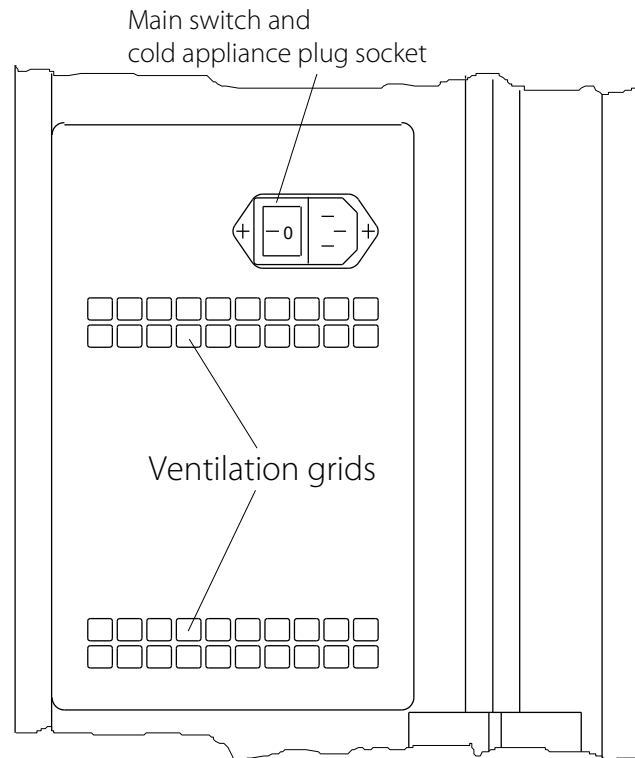


Figure 6 Electrical connection and main switch

Option “heated sample line”:

For the electrical supply of a heated sample line with Pt100 sensor and/or the connection of other heated components, e.g. heated sample gas probe or heated filter, a connection socket as shown in Figure 4 is available. The maximum connected load is 6 A, 1380 W for the 230 V sample gas conditioning or 6 A, 690 W for the 115 V version.

The maximum length of the usable heated sampling line is calculated as follows:

$$L(m) = \frac{\text{Max. connected load [W]} - \text{Power consumption of heated components (e.g. sample probe) [W]}}{\text{Power consumption heated line per meter [W/m]}}$$

14 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.

15 COMMISSIONING

Before commissioning, the plant-specific and process-specific safety measures must be observed.



Note

Before connecting the equipment to the supply voltage, the main switch must be in position "0".

The following steps must be carried out before initial commissioning:

1. Plug the power plug of the supplied power cable into the power socket;
2. Connect the heated cable (optional);



Warning

When operating the sample gas conditioning system with a heated sample gas line, the temperature must be checked at the temperature controller.

3. Connect the mains plug to the mains;
4. Switch the main switch to position "I".
5. Set the desired temperature on the temperature controller:

Type 701

The digital display of the controller shows the actual value of the heated sample line after switching on the sample gas conditioning unit. The controller is set to 0 °C [32 °F] on delivery. Briefly press the *P* key to change the set point. *SP* appears in the display and then the display changes to the adjusted set point. Use the arrow keys to set the desired value. After 60 seconds, the display automatically changes to the actual value.

Type 701 (effective from: September 2020):

After switching on, the display of the controller shows the actual value and the setpoint of the heated line. On delivery, the set point is set to 0 °C [32 °F].

To change the set point, press one of the arrow keys to adjust the desired set point.



Note

The complete instruction manual of the temperature controller 701 is available at www.mc-techgroup.com.

The sample gas cooler is ready for operation after approx. 10 minutes. However, if a heated line is connected, the time in which the gas conditioning unit is ready for operation increases to approx. 1 hour. The overtemperature alarm contact of the cooler switches on the sample gas pump automatically when the cooler reaches the temperature of +8 °C [46.4 °F].



Note

The following minimum gas flow rates result from the requirement of the maximum pressure-side load of the sample gas pumps N3KPE and N9KPE of 1.4 bar abs.:

N3KPE approx. 60 NI/h air.

N9KPE approx. 200 NI/h air.

If the required minimum total flow rate is not reached, excessive overpressure can lead to premature destruction of the pump diaphragm.

For long-term measurements with a high dust content in the sample gas, a suitable gas sampling probe must be provided to protect the sampling line from blockages.

16 CLOSING DOWN



Note

The installation site of the gas conditioning unit must remain frost-free even when the unit is switched off.

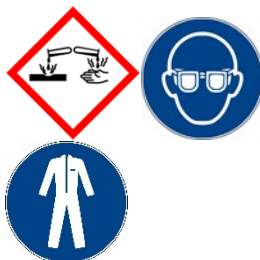
No special measures are to be taken in the event of short-term shutdowns of the gas conditioning system.

In the case of long-term shutdowns, for example after a completed series of measurements, it is recommended to purge the gas conditioning system with fresh air or inert gas. A flushing time of 3 to 5 minutes is sufficient under normal conditions. Condensate residues must also be removed from the system.



Warning

Aggressive condensate is possible.



Wear protective glasses and proper protective clothing!

17 MAINTENANCE

Before carrying out maintenance work, the plant-specific and process-specific safety measures must be observed!



Warning

Dangerous voltage.



Before carrying out any work on the gas conditioning unit, move the main switch to position "0" and pull out the mains plug!

The maintenance cycles depend on the process conditions and must therefore be determined for each specific application.

All parts to be serviced are easily accessible and installed in the sample gas conditioning case. These are (see Figure 3):

- The filter element of the preliminary filter **FP-2T** ⑦.



Note

In order to protect downstream analyzers, the wet filter element must always be replaced after a condensate ingress.

- Peristaltic pump pre-filter **PF2** ⑩; The pre-filter must be replaced at regular intervals if the condensate is loaded with particles. The "disposable filter" is inserted into the pump tube on the suction side (see Figure 3) and can be easily replaced;
- Check the tubing of the **SR25.2-W** ⑨ condensate pump every six months and replace it if necessary (see operating instructions in the appendix);



Note

The complete instruction manual of the SR25.2-W is available at www.mc-techgroup.com.

- Check the diaphragm of the gas feed pump **N3KPE** or **N9KPE** ⑧ every six months and replace if necessary.



Note

The complete instruction manual of the N3KPE, N5KPE, N9KPE is available at www.mc-techgroup.com.

18 TROUBLE SHOOTING

The following table aims to point out possible operational problems and offer solutions to such problems (not applicable during the starting procedure).

Problem	Display	Possible Causes	Check/Solution
Gas flow interruption	Upper LED on cooler does not turn on;	No voltage	Check supply voltage with model type plate; OK? Check if supply voltage plug is inserted correctly and if the main switch is turned in position "1" OK? Check fine fuse on the terminal mounting rail © (Figure 3); OK?
		Cooler does not work; Cooler alarm detects 'over temperature'. Cooler turns sample gas pump automatically off.	Ambient temperature too high. OK? Free convection in case impaired ⇒ case temperature too high; OK? Cooler error (see instruction manual ECP1000/ECP3000); OK?
Cooler works, but gas flow is interrupted	Middle LED on cooler is green;	Diaphragm pump does not work	Check voltage on terminals X1/8 and X1/11 ; OK?
		Contaminated diaphragm pump	Remove the tubes at the pump head and check; OK? Clean pump if necessary; OK?
		Gas sample probe/sample line clogged or sample line squashed	Remove sample line at gas inlet; Gas flow? Clean contaminated sample line or replace; No gas flow?
		Gas sample line to analyzer clogged or squashed	Disconnect the outlet tube on the analyzer side and check whether sample gas flows at the tube fitting; No gas flow? Clean contaminated lines or replace; Gas flow?
	Alarm LED on the LA electronics is red;	<u>Optional liquid alarm sensor</u> ; Sensor turns measuring pump off automatically;	Momentary overloading of the cooler due to excessive amount of condensate; OK? Check tubes for condensate removal; OK? Check tubes of the peristaltic pump (see manual peristaltic pump SR25.2-W); OK? Check peristaltic pump SR25.2-W (see manual peristaltic pump SR25.2-W); OK? Check ECP1000/ECP3000 cooler instruction manual;
	<u>Optional flowmeter(s)</u> ; Needle valve closed.	Adjust needle valve(s) to the desired flow	

Problem	Display	Possible Causes	Check/Solution
Cooler and sample gas pump are running; Condensate in the sample gas line	Middle LED on cooler is green;	Pre-filter PF2 clogged	Remove pre-filter PF2 from condensate line; Pump conveys? Change pre-filter; Pump does not convey?
		Pump tubing defect	Replace pump tubing (see manual peristaltic pump SR25.2-W); OK?
		Peristaltic pump SR25.2-W does not work	Check peristaltic pump (see manual peristaltic pump SR25.2-W); OK?
		Insufficient drying of sample gas	Check ECP1000/ECP3000 (see ECP1000/ECP3000 cooler instruction manual);
	LED of the LA electronics is green.	<u>Optional liquid alarm sensor:</u> Sensor has not turned off pump.	Check the LA sensor function and replace if necessary

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 are not binding.

For spare parts of components which are not presented in the following list please see the specific instruction manuals or leaflets added in the appendix.

Portable Sampling System Versions PSS-5, PSS-5/3

(C) consumable parts, (R) recommended spare parts, (S) spare parts

			recommended quantity PSS-5 and PSS-5/3 being in operation [years]		
		C/R/S	1	2	3
Fine filter FP-2T:					
90F0002	Filter element F-2T , PTFE, 2 µm	C	6	12	20
90F0040	Viton® O-ring, 26 for FP-	R	1	1	1
90F0056	PVDF filter element clamp F-P	S	-	-	1
90F0012	Filter body F-120G of glass	R	1	1	1
Fine filter FP-2T with Option LA1S:					
90F0015	Filter body F-120G-D of glass with GL25 condensate connection thread	R	1	1	1

Portable Sampling System Versions PSS-5, PSS-5/3

(C) consumable parts, (R) recommended spare parts, (S) spare parts

		C/R/S	recommended quantity PSS-5 and PSS-5/3 being in operation [years]		
			1	2	3
90F0020	Union nut GL 25	R	1	1	1
90F0025	PTFE sealing ring GL 25 – 12 mm Ø	R	1	1	1
Peristaltic pump SR25.2-W:					
90P1007	SR25 pump hose with PVDF tube connectors DN 4/6 mm	C	1	2	4
Diaphragm pump type N3KPE/KP18; N5KPE/KP18					
90P2100	Square cap type D3, 1/8" female for N3/N5 KPE/KP18 Material: PVDF	S	-	-	1
90P2120	Diaphragm type S3, for N3/N5 KPE/KP18, Material: Viton®, PTFE coated	C	1	2	3
90P2111	Valve reed type V3 with O-ring type O3, for N3-N5, 1 pc, material: Viton® (2 pieces required)	C	2	4	6
90P2105	Intermediate plate type Z3, for N3/N5 KPE/KP18 Material: PVDF	S	-	-	1
Diaphragm pump type N9 KPE/KP18					
90P2200	Square cap type D9, 1/8" female for N9KPE/KP18, Material: PVDF	S	-	-	1
90P2220	Diaphragm type S9, for N9 KPE/KP18, Material: Viton®, PTFE coated	C	1	2	3
90P2211	Valve plate with seal for N9 KPE, 1 pc., material: Viton®. (2 pcs./pump)	C	2	4	6
90P2205	Intermediate plate type Z9, for N9 KPE/KP18, Material: PVDF	S	-	-	1
Option flowmeter FM40:					
90A0015	Flowmeter glass for FM40 range 7-70 NI/h air	S	-	1	1
94F0010	Flowmeter glass for FM40 range 15-150 NI/h air	S	-	1	1
94F0015	Flowmeter glass for FM40 range 25-250 NI/h air	S	-	1	1
94F0020	Flowmeter glass for FM40 range 50-500 NI/h air	S	-	1	1
90A0018	Viton® O-ring (9) for flowmeter glass FM40	R	2	4	6
Diverse:					
90G0006	Pre-filter PF2 ® for condensate pump SR25.2-W	C	5	10	15
90K6030	Fine fuse 4 A T (slow fuse), 5 x 20 mm for PSS-5, PSS-5/3	R	5	5	5

Portable Sampling System Versions PSS-5, PSS-5/3

(C) consumable parts, (R) recommended spare parts, (S) spare parts

		C/R/S	recommended quantity PSS-5 and PSS-5/3 being in operation [years]		
			1	2	3
90G0020	Fine fuse 10 A T (slow fuse), 5 x 20 mm for PSS-5, PSS-5/3, with option temp. controller and heated sample line	R	5	5	5
Hose and hose fittings:					
05V3230	Bulkhead union SV-PP DN 4/6 PSS-5 standard PPH = Polypropylene	R	2	2	2
05V3215	Bulkhead union SV-PVDF DN 4/6 PSS-5 optional PVDF = Polyvinylidenfluoride	R	2	2	2
05V6500	Sealing ring 4/6 PP see above	R	5	10	10
05V6600	Sealing ring 4/6 PVDF see above	R	5	10	10
05V6505	Union nut M10-4/6 PP see above	R	5	10	10
05V6605	Union nut M10-4/6 PVDF see above	R	5	10	10
01T4000	Hose PVC DN 4/6 (meters)	S	3	6	9
01T1000	Hose Viton® DN 4/6 (meters)	S	1	2	3
01T2000	Hose Novopren DN 3,2/6,4 (per meter)	S	1	2	3
02B1000	Hose PTFE DN 4/6 (per meter)	S	1	2	3
10T1000	Hose cutter	S	1	1	1

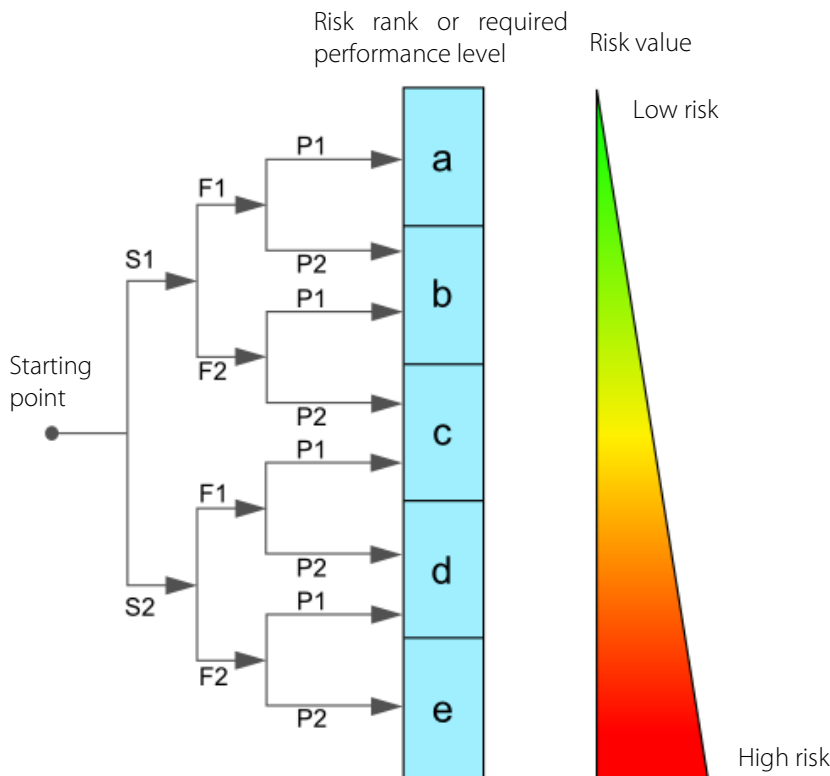
21 RISK ASSESSMENT

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 7 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 risk of being crushed by rotating parts

Risk rank - group A

The product contains rotating parts. Do not open covers until the device has been switched off.



Caution glass

Risk rank - group A

The product contains glass components. 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 $> 60\text{ }^{\circ}\text{C}$.

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 > 20 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 kg [\approx 88.2 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

- Circuit diagram **PSS-5** and **PSS-5/3**



More product documentation is available in our Internet catalogue:
www.mc-techgroup.com

- Instruction manual electric gas cooler **ECP 1000, ECP 3000**
- Data sheet: Universal-Filters **FP, FT, FS, FSS**
- Instruction manual diaphragm pump **Series N**
- Instruction manual peristaltic pump **SR25.2-W**
- Data sheet: Liquid alarm sensor **LA1S** and electronic controller type **LA1.4**
- Data sheet: Flow meter **FM40**
- Data sheet: Ball valves **L/PV-1**
- Data sheet: Temperature controller **701 (eTRON T100)**

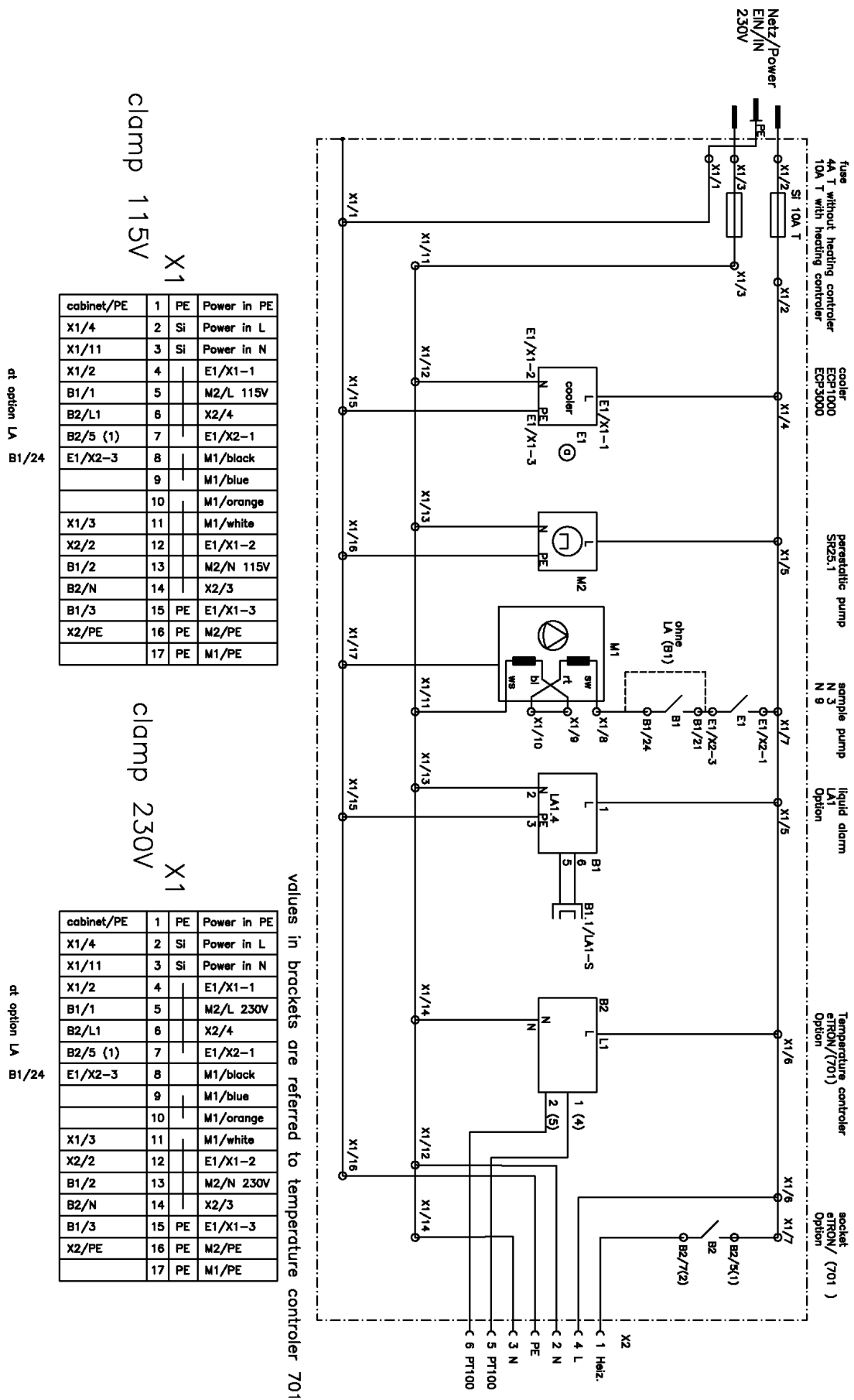


Figure 8 Circuit diagram PSS-5 and PSS-5/3, 115 V and 230 V