

Gas Conditioning Unit Series CSS[®]

CSS-V1 and CSS-V2

19" housing or wall mounting

Instruction Manual
Version 1.02.02



**Dear customer,**

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

If you have any question regarding the product or the application, please don't hesitate to contact M&C or your M&C authorized distributor. You will find 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 our products in German and English.

This Operating Manual does not claim to be complete 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.

Version: 1.02.02

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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:

EMC-Instruction

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

RoHS Directive

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

Follow these safety directions and instructions regarding installation, commissioning and operation of the device:

- Read this manual before commissioning and operating the product. Make sure to follow all safety instructions.
- Installation and commissioning of electrical devices must be carried out only by qualified skilled personnel in compliance with the current regulations.
- The installation and commissioning of the device must conform to the requirements of VDE 0100 'Regulations on the Installation of Power Circuits with Nominal Voltages below 1000 V' and must be in compliance with all relevant regulations and standards.
- Make sure to compare the supply voltage with the specified voltage on the product label before connecting the device.
- Protection against damage caused by high voltages:
Disconnect the power supply before opening the device for access. Make sure that all external power supplies are disconnected.
- Operate the device only in the permitted temperature and pressure ranges. For details please refer to the technical data sheet or manual.
- Install the device only in protected areas, sheltered from rain and moisture. The product should not be exposed to the elements.
- This device is NOT certified to be installed or operate in explosive 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 CSS-V1 and CSS-V2 are intended for use in general purpose areas (non-hazardous environments). They can only be operated in compliance with the information in chapter 8 "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

DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.



Warning

WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.



Caution

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

Attention

Attention is used to address practices not related to physical injury.



Note

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



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.



Contains gas under pressure. Do not open container!

Check pressure before opening container, and adjust pressure to atmospheric pressure.



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 gas conditioning units **CSS-V1** and **CSS-V2**, optionally for 19" or wall mounting, are complete pre-assembled compact continuously operating gas conditioning systems, which, depending on the version, can deliver a sample gas quantity of max. 2 x 150 NI/h or 1 x 250 NI/h. Due to a large number of additional options, the sample gas preparation can be adapted to the various requirements of continuous gas analysis technology.

The entire gas conditioning system is housed in a compact and robust sheet steel housing so that gas analyses can be carried out quickly, with low maintenance and reliably without any major assembly work.

The **CSS-V1** and **CSS-V2** gas conditioning units 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 APPLICATION

The **CSS-V1** and **CSS-V2** are completely pre-installed sample gas conditioning systems for continuous use, which can be excellently integrated into analytical systems due to their individual configurability. The compact design only requires a small amount of space. The preparations are ready for operation within a few minutes. The usual time-consuming procurement of individual components and small parts and their assembly is no longer necessary.

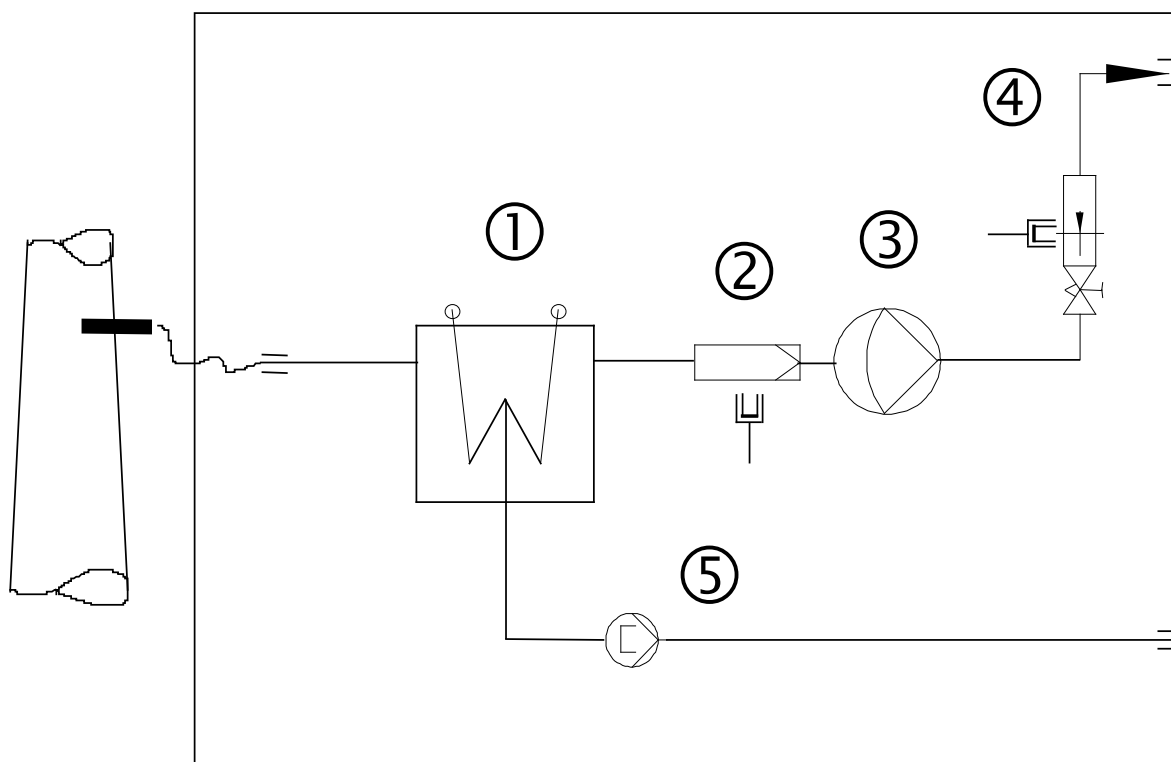


Figure 1 Gas flow diagram CSS-V1

- ① Gas cooler **ECM-1**
- ② Front panel filter **FPF-2-0,3GF**, 0.3 µm porosity with integrated liquid alarm sensor (optional)
- ③ Sample gas pump **N3/5/9 KPE** (optional)
- ④ Flowmeter **FM40** with option flow alarm **FM-20mo** (optional)
- ⑤ Peristaltic pump **SR25.2** for continuous automatic condensate removal (optional)

- Sample gas line, material: PTFE.
- Condensate line, material: Novoprene.
- At the heat exchanger the sample gas inlet and outlet are marked with arrows.

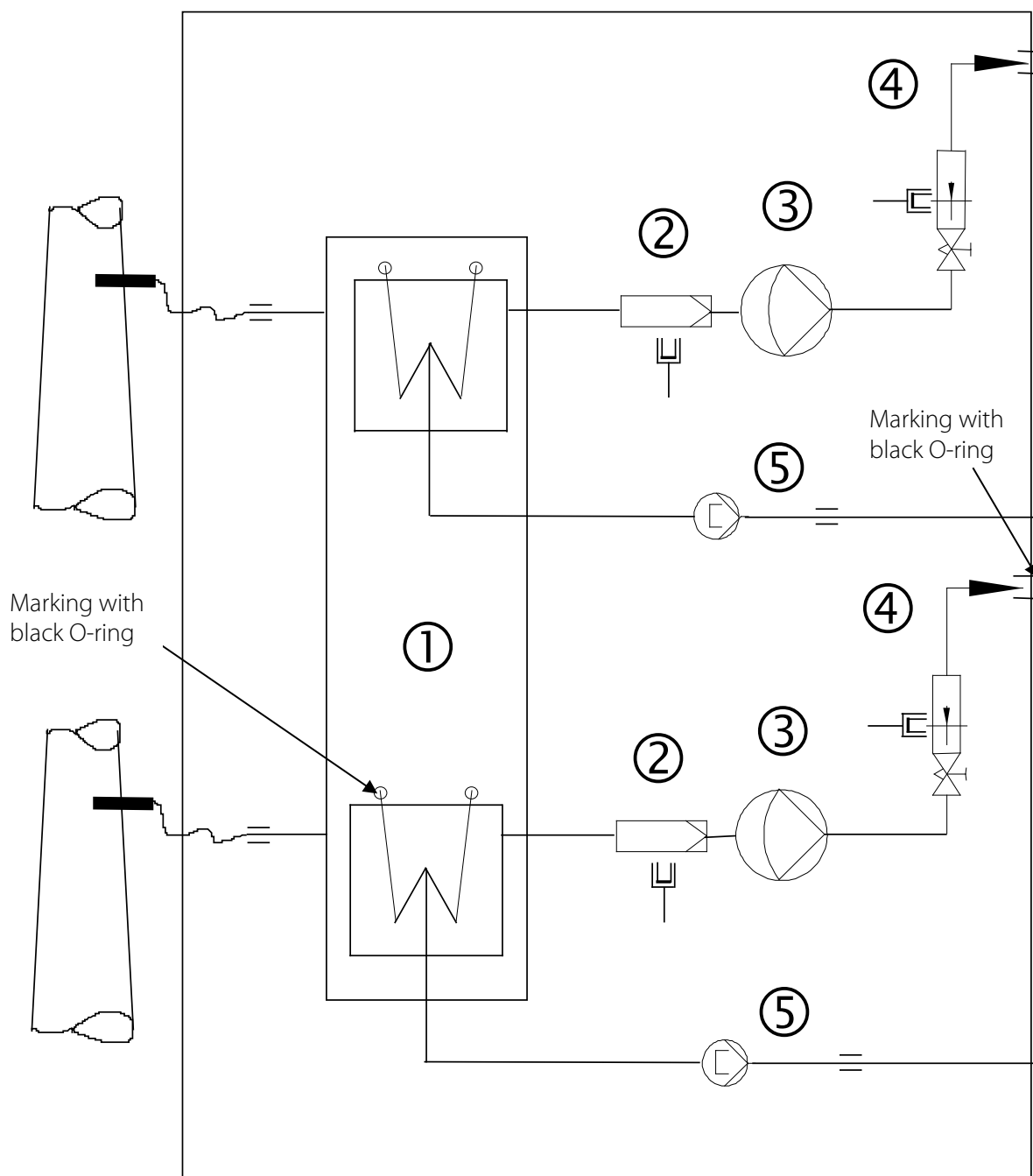


Figure 2 Gas flow diagram CSS-V2

- ① Gas cooler **ECM-2**
- ② 2 x Front panel filter **FPF-2-0,3GF**, 0.3 μm porosity with integrated liquid alarm sensor (optional)
- ③ 2 x Sample gas pump **N3/5/9 KPE** (optional)
- ④ 2 x Flowmeter **FM40** with 2 x flow alarm **FM-20mo** (optional)
- ⑤ 2 x Peristaltic pump **SR25.2** for continuous automatic condensate removal (optional)

- Sample gas line, material: PTFE.
- Condensate line, material: Novoprene.
- To distinguish the sample gas lines, sample gas line 2 is marked with a black O-ring at the sample gas inlet and outlet of the heat exchanger 2.
- At the heat exchanger, sample gas inlet and outlet are marked with arrows.

8 TECHNICAL DATA

Gas Conditioning Unit Type	CSS-V1	CSS-V2
Part No. 230 V/50 Hz	01G6010	01G6020
Part No. 115 V/50 to 60 Hz	01G6010a	01G6020a
Sample outlet dew point	Adjustment range 2 to 7 °C [35.6 to 44.6 °F], factory setting +5 °C [41 °F]	
Dew point stability	At constant conditions < ±0.1 °C [±0.18 °F]	
Sample inlet temperature	Max. 180 °C** [356 °F**]	
Gas inlet water vapor saturation	Max. +80 °C** [176 °F**]	
Gas flow rate	**Max. 250 NI/h	**Max. 2 x 150 NI/h
Ambient temperature	+10 to +40 °C** [50 to 104 °F**]	
Storage temperature	-25 to +65 °C [approx. -13 to 149 °F]	
Pressure	0.7 bar to 1.4 bar abs.*	
Total cooling capacity	Max. 144 kJ/h	
Number of gas inlets	1	2
Number of gas outlets	1	2
Number of condensate outlets	1	2
Sample gas connections	Tube connection 4/6 mm	
Material of sample contacting parts	PVDF, PVC, Novoprene, FKM, PPH, PTFE	
Ready for operation	Approx. 10 min.	
Mains power supply	230 V 50 to 60 Hz ±10 % or 115 V 50 to 60 Hz ±10 % (115 V/50 Hz not with option sample pump)	
Power consumption	Max. 220 VA + max: 300 VA for the sample gas pumps	
Fuse protection	6.3 A, time-lag, 5 x 20 mm	
Electrical mains supply	Cold appliance plug with 2 m [≈ 6.56 ft] cable	
Case protection	IP20 EN 60529	
Housing version	Sheet steel case for 19"- or wall mounting, lacquered RAL 7035	
Case dimensions (W x H x D)	483 x 267.5 x 301.5 mm [≈ 19" x 10.5" x 11.9"]	
Weight	Approx. 22 kg [≈ 48.5 lbs]	

PVDF = Polyvinylidene fluoride

PVC = Polyvinyl chloride

FPM = Fluor caoutchouc

PPH = Polypropylene hard

PTFE = Polytetrafluorethylene

* Standard

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

Please note: NI/h and NI/min refer to the German standard DIN 1343 and are based on these standard conditions: 0 °C [32 °F], 1013 mbar.

8.1 OPTIONS

Part No.	Description
93K0140	Extra charge for heat exchanger ECM- 1, material: glass
93K0160	Extra charge for heat exchanger ECM- 1 material: stainless steel SS 316Ti
93K0170	Extra charge for heat exchanger ECM- 1 material: PVDF
97K0100	Extra charge for heat exchanger ECM- 2 material: glass
97K0110	Extra charge for heat exchanger ECM- 2 material: PVDF
97K0115	Extra charge for heat exchanger ECM- 2 material: stainless steel SS 316Ti
01G6125	Extra charge for mounting a sample gas pump N3 KPE (additionally electronic controller 01G6150 necessary)
01G6130	Extra charge for mounting a sample gas pump N5 KPE (additionally electronic controller 01G6150 necessary)
01G6135	Extra charge for mounting a sample gas pump N9 KPE (additionally electronic controller 01G6150 necessary)
01G6120	Extra charge for mounting a sample gas filter FPF-2-0,3GF with integrated liquid alarm sensor
09F4000	Extra charge for mounting a flow meter FM40 7 to 70 NI/h
09F4005	Extra charge for mounting a flow meter FM40 15 to 150 NI/h
09F4010	Extra charge for mounting a flow meter FM40 25 to 250 NI/h
02E3500	Extra charge for mounting a flow alarm sensor FA-20mo
01G6150	Extra charge for mounting a control electronic for max. 2 liquid alarm sensors and max. 2 flow alarm sensors
01G6140	Extra charge for mounting a peristaltic pump SR25.2 for condensate removal, with complete tubing

9 DESCRIPTION

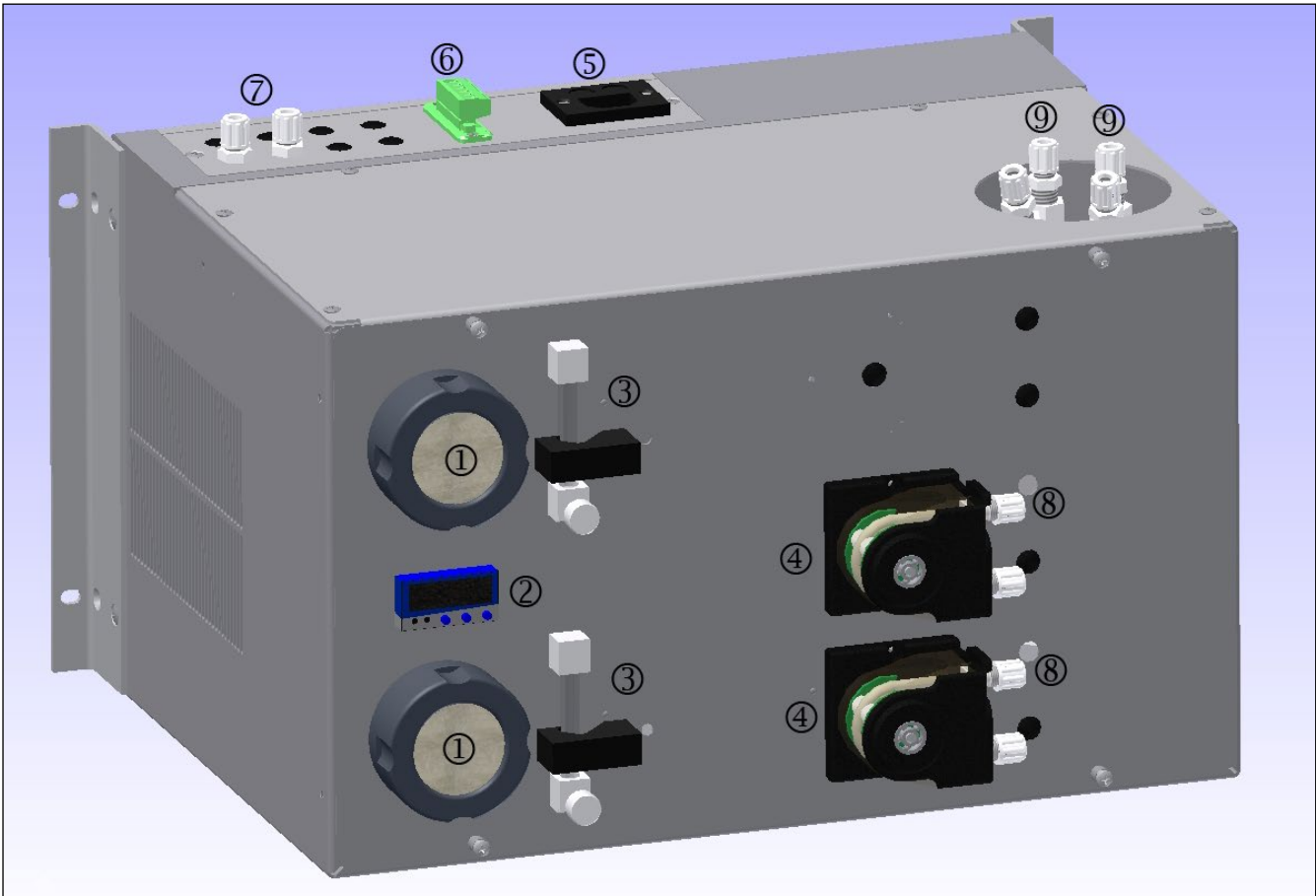


Figure 3 Design CSS-V2

- ① Fine filter **FPF-2-0,3GF**
- ② Electronic controller
- ③ Flow meter **FM40** with flow alarm sensor **FA-20mo**
- ④ Peristaltic pump **SR25.2** with condensate outlet
- ⑤ Cold appliance socket
- ⑥ Connection for collective alarm
- ⑦ Sample gas outlets
- ⑧ Condensate outlet directly at the peristaltic pump
- ⑨ Sample gas inlet directly at the heat exchanger

All components of the gas conditioning unit are mounted inside a compact sheet steel case. Filter and peristaltic pump are mounted to the front panel to ensure easy maintenance.

The minimum flow is determined by the gas sample pump (see also chapter 15 Commissioning) Premature damage can be caused to the pump membrane if less than the minimal total amount of flow is extracted as a result of excess pressure.

The gas cooler is equipped with a heat exchanger made of Duran glass, stainless steel SS 316Ti or PVDF.

The **FPF-2-0.3GF** fine filter (0.3 µm filter porosity) installed upstream of the **N3/5/9 KPE** sample gas pump ensures the necessary solids separation.

The device has a temperature alarm contact which switches off the sample gas pump(s), if present, when an alarm is triggered. An alarm is triggered with factory configuration (gas outlet dew point: 5 °C [41 °F], alarm window: 3 °C [5.4 °F], alarm hysteresis: 1 °C [1.8 °F]) within the limits < +1.5 °C [34.7 °F] (under temperature) and > +8.5 °C [47.3 °F] (over temperature). See also chapter 18, Figure 14.

The temperature alarm contact of the cooler automatically switches the existing sample gas pump(s) on and off.

The condensate occurred is removed continuously via the peristaltic pump type **SR25.2**.

The DN4/6 mm hose connections for the sample gas outlet as well as the electrical connections in the top of the gas conditioning unit can, in dependence on the installation conditions, also be mounted in the back of the unit very easily.

The ventilation grids in the sidewalls ensure that the equipment is sufficiently ventilated.

A liquid alarm sensor is integrated in the filter **FPF-2-0,3GF** to protect the downward analyzers against liquid ingress and to increase the operating safety of the whole system. In case of liquid inrush, the sample gas pump, if existing, is switched off automatically.

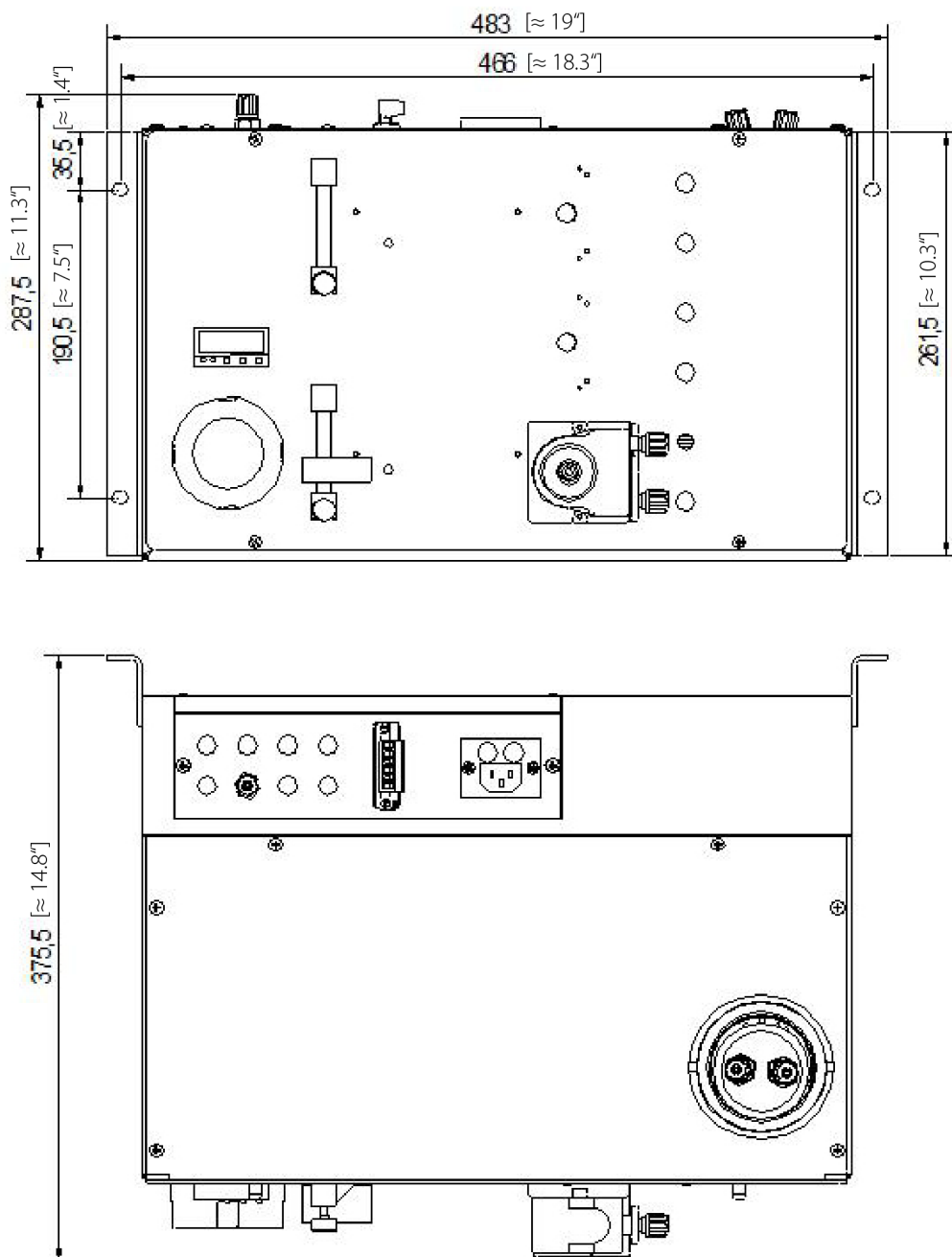


Figure 4 Dimensions CSS-V1 and CSS-V2

10 RECEIVING AND STORING

The gas sampling systems **CSS-V1** and **CSS-V2** are completely pre-installed unit. The scope of delivery includes furthermore:

- 25 x Filter elements (1 package)
- 1 x Connection cable
- 1 x 6-pole connection box
- 1 x Instruction Manual

Please remove the **CSS-V1** or **CSS-V2** carefully from the packaging. Check the scope of the delivery specified on the delivery note. Please make sure that you have received all items stated on the delivery note.

Please check the unit for any transport damage after receipt and report any complaints to the transport company immediately.



Note

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

11 INSTALLATION INSTRUCTIONS



Note

In order to ensure that the case is safe and stable when being used, it should be placed on a horizontal surface free from vibrations. Only then, the perfect functioning of the separation and drainage procedures of the condensate inside the heat exchanger of the cooler will only be guaranteed.

The gas conditioning system should be kept away from heat sources and be freely ventilated in order to prevent an accumulation of heat.

When the equipment is being used outside, ample protection against the effects of direct sunlight and dampness must be provided. In winter, the equipment must only be used in frost-free areas; pay attention to the type of the equipment protection.

Please avoid temperature variations, strong airflow as well as aggressive atmospheres at the place of installation.

In order to guarantee the operational safety of the gas conditioning system and the downstream analyzers, and to avoid false alarms, the gas conditioning unit should not be used at temperatures other than those specified. Furthermore, it must be protected against dust deposits and penetrating dust.

It is of great importance that the analyzers connected downstream are used at temperatures well above the specified gas outlet dew point of +5 °C [41 °F]. This prevents the gas in the connector lines to the analyzers from subsequent condensing.

Unheated gas sample lines must be installed with slope up to the cooler.

11.1 RETROFITTING OF THE WALL MOUNT HOUSING TO A 19"-HOUSING

The gas conditioning units **CSS-V1** and **CSS-V2** are delivered with a wall mounting housing. If a 19"-housing is needed, the gas conditioning unit can be retrofitted very easy by installing the mounting brackets from the back to the front:

1. Remove two fixing screws per bracket,
2. Align the angle with the 19" mounting holes facing the front,
3. Fix the mounting bracket flush with the front panel at the housing by using the two fixing screws.

12 HOSE CONNECTIONS

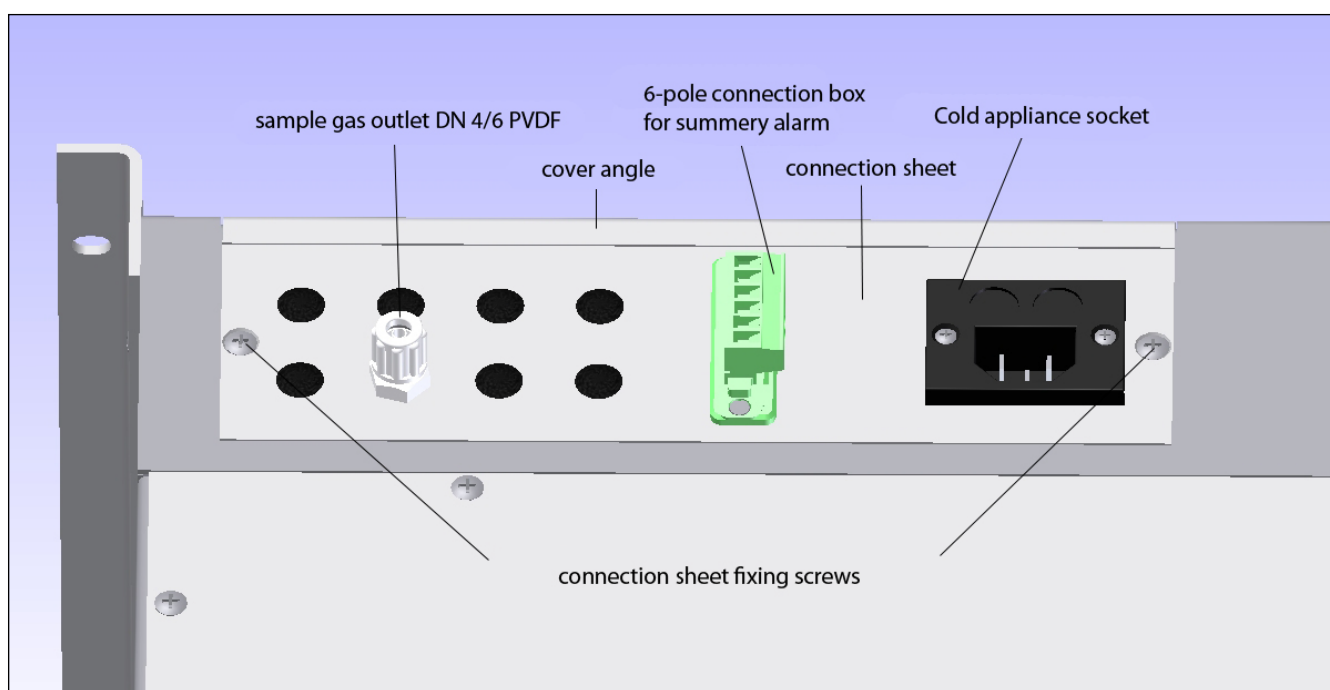


Figure 5 Hose connections **CSS-V1**



Note

Do not mix up the hose connections.

Check the seals after connecting all lines.

Contrary to Figure 5, version **CSS-V2** has two sample gas outlets. The condensate connections are carried out directly at the peristaltic pump.

All tube connections are DN 4/6 mm sealing ring threaded hose couplings out of PVDF as standard. They are suitable for gas inlet temperatures of maximum 80 °C [176 °F] (see chapter 8).

Follow these steps to mount the sample gas and condensate tubes:

1. Remove the union nut from the sealing ring couplings by turning it anti-clockwise. Be sure to remove the union nut carefully from the fitting. There is a loose clamp ring inside the union nut.
2. Place the union nut over the connecting tube.
3. Push the sealing ring over the connecting tube with the thicker bulge facing the nut.
4. Place the tube over the nipple on the thread.

**Note**

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

5. Hand-tighten the nut.
6. The tube is now slip-proof and pressure-tight mounted to the hose connection fitting.
7. The tubes are to be removed in the reverse order.

**Warning**

Aggressive condensate is possible.



Chemical burns caused by aggressive media possible!



Wear protective gloves and protective glasses!

Wear proper protective clothing!

12.1 RELOCATE THE CONNECTIONS TO THE BACK OF THE HOUSING

If the installation conditions require to relocate the connections to the back of the housing, follow these steps:

1. Remove connection sheet fixing screws (see Figure 5)
2. Remove cover angle fixing screws at the back of the unit
3. Attach connection sheet with 2 fixing screws at the back of the unit
4. Attach cover angle with 2 fixing screws at the top of the housing

13 ELECTRICAL CONNECTIONS



Warning

Wrong 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 assembly 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 (chapter 8).

The gas conditioning units **CSS-V1** and **CSS-V2** are available with either 230 V/50 Hz or 115 V/50 to 60 Hz (for circuit diagram see appendix). 6.3 A time-lag fuses are used on all models as fuse protection. The fuses are located inside of the cold appliance socket.

The electrical connection is made via the 2 m [\approx 6.6 ft] mains cable with cold appliance plug optionally at the back side or the top of the housing.

13.1 CONNECTING SIGNAL LINES

The electrical connection of the collective alarm (cooler, liquid and flow) is a 6-pole male connector, which is located at the back or top of the housing.

The matching 6-pole female connector is part of the scope of delivery.

The male connector is connected as follows:

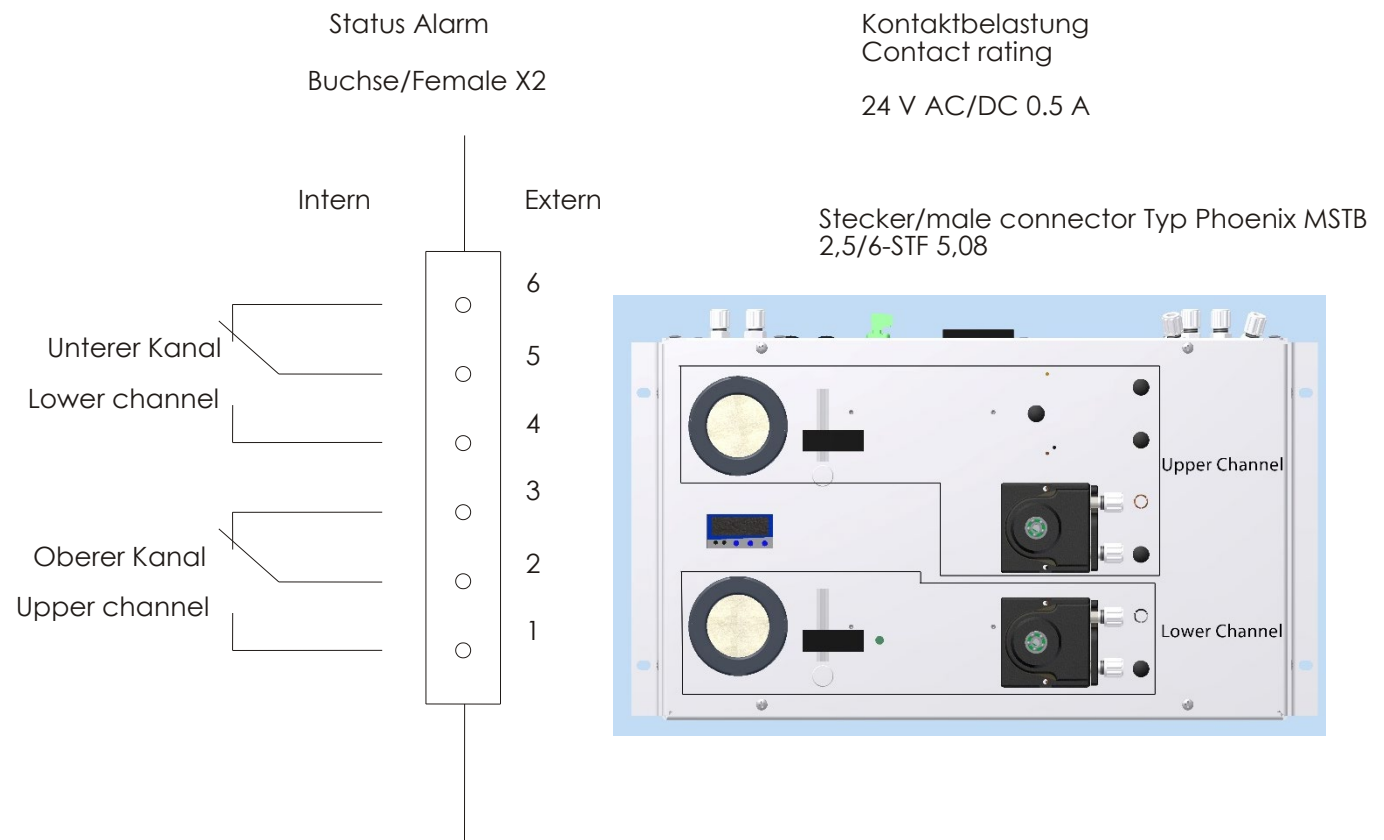


Figure 6 Connecting the collective alarm

For **CSS-V1** the collective alarm of the lower channel is connected (4, 5, 6).

For **CSS-V2** both channels are connected with the cooler alarm and with one liquid and one flow alarm each.



Note

Please install the signal lines separated from the power supply lines.

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.

Before switching on the power supply, check again that the operating voltage (see type plate) and the mains voltage match!

Follow these steps before starting up the device for the first time:

1. Place the cold appliance plug, which is delivered with the mains supply cable, into the cold appliance plug socket;
2. Connect the mains plug to the mains;
3. Switch on power.

After the starting time (LED K1 on the controller is on), the gas conditioning system is ready for use, and the sample gas pump is switched on. Only now the sample gas can be fed.



Note

The following minimum gas flow rates result from the requirement not to limit the sample gas pump to less than 20 % of its maximum capacity:

N3 KPE min. 30 NI/h air

N5 KPE min. 60 NI/h air

N9 KPE min. 110 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.

15.1 COOLER CONTROL

	Indication	LED K1	LED K2
After starting up	> 8 °C [> 46.4 °F] (Ambient temperature)	Off (Status alarm and pump off)	Yellow light is permanently on (cooling)
After approx. 10 min.	≤ 7.5 °C [≤ 45.5 °F]	Yellow light is on If there is no condensate alarm, the pump is switched on. Sample gas is pumped.	Yellow light is permanently on (cooling)
Normal operation	5 °C [41 °F]	Yellow light is on	Yellow light is blinking (cooler control)

16 CLOSING DOWN



Note

The location for the gas conditioning unit must remain frost-free, even if the unit has been switched off.

There are no special regulations to be observed if the gas conditioning unit **CSS-V1** or **CSS-V2** is to be closed down for a short period of time.

In the event of prolonged shutdown, it is recommended to purge the gas conditioning system with ambient 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.



Chemical burns caused by aggressive media possible!



When disassembling, repairing or cleaning, wear safety 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 any maintenance work is carried out on the gas conditioning system, disconnect the unit from the mains!

The frequency of the maintenance work depends on the operational process and can therefore only be determined in each individual case.

All parts which require maintenance work are easily accessible and are installed on the front side of the gas conditioning unit **CSS-V1** or **CSS-V2**. The housing must only be opened for maintenance of the sample gas pump:

- Replace the filter element of the fine filter **FPF-2-0,3 GF** in case the flow rate is too low or after visible inspection (see chapter 17.1).

**Note**

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

- The diaphragm of the sample gas pump **N3/5/9 KPE** should be checked every six months and, if necessary, replaced (see chapter 17.2).
- The hose of the condensate pump **SR25.2** should be checked every six months and, if necessary, replaced (see chapter 17.3.2);
- Remove dust periodical from the cooling fins with pressure air (see chapter 17.4)

17.1 REPLACEMENT OF THE FILTER ELEMENT AND THE O-RING

**Note**

In any case you open the filter, the filter element has to be changed.

For changing the filter element and the O-ring:

1. Disconnect the mains voltage
2. Unscrew the filter housing cover
3. Exchange the filter element and/or O-ring. Pay attention to the correct insertion of the filter element and the O-ring (the textured surface of the filter element points to the front)!
4. Screw on the filter housing cover again.

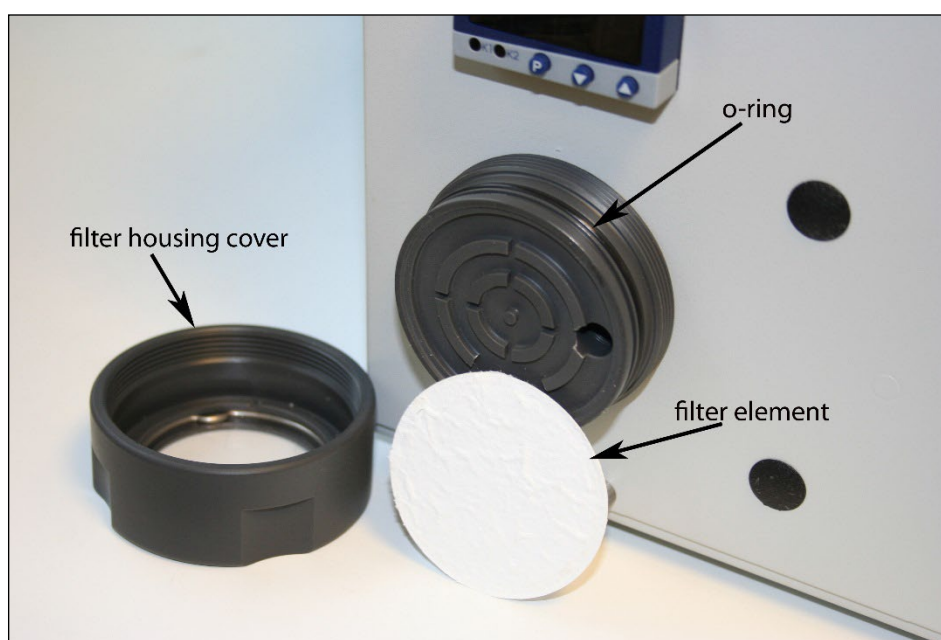


Figure 7 Replacing the filter element and the O-ring

17.2 DISMOUNTING THE SAMPLE GAS PUMP FOR EXAMINATION OR MAINTENANCE

For dismounting the sample gas pump **N3/5/9 KPE**:



Warning



Dangerous voltage. Before any maintenance work is carried out on the gas conditioning system, disconnect the unit from the mains!

1. Disconnect the gas conditioning system from the mains voltage.
2. Loosen the 4 screws on the front panel and slightly open it to the front without removing the tubing and wiring and pull it upwards out of the housing holder.
3. Loosen the 4 fastening screws of the mounting angle on which the pump is mounted (Figure 8).
4. Remove tubing from the pump head.
5. Pull out the pump with mounting angle.
6. Inspection and maintenance according to operating instructions **N3/5/9 KPE** (is part of the supplied manual or can be downloaded from our homepage: www.mc-techgroup.com).
7. After inspection or maintenance, retighten the mounting bracket and mount the front panel.

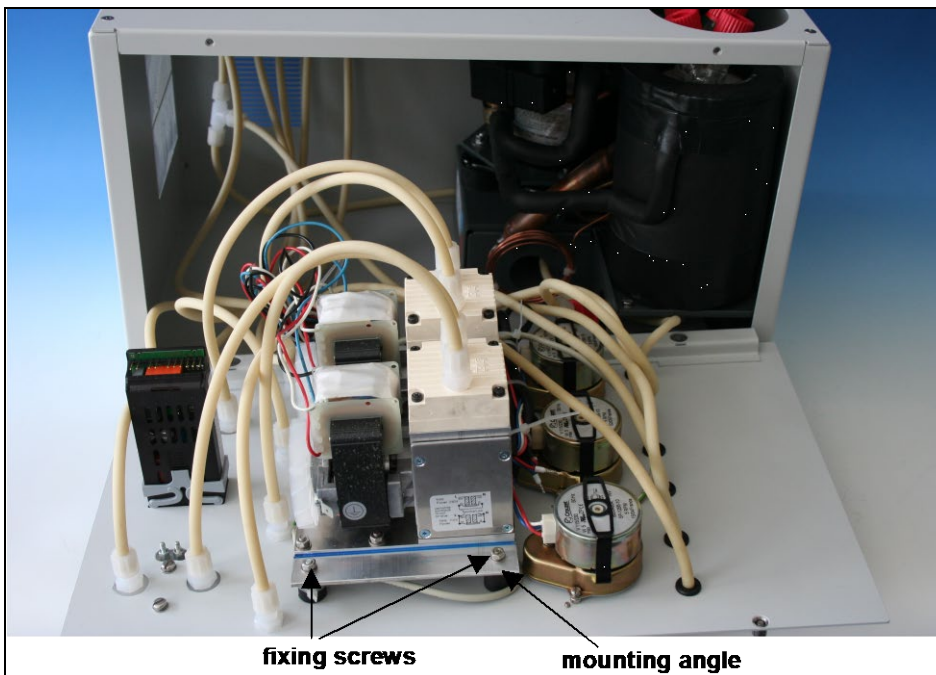


Figure 8 Dismounting the sample gas pump

17.3 MAINTENANCE OF THE INTEGRATED PERISTALTIC PUMP TYPE SR25.2

Before starting any maintenance work, make sure that any work done on the device is in compliance with all relevant regulations and standards.



Inhalation hazard possible, if using toxic or asphyxiant gases!



Purge peristaltic pump with inert gas or air before opening! If the pump is used for toxic gas or asphyxiant (oxygen-displacing) gas, it needs to be purged with inert gas or air before opening. Follow closely all relevant occupational safety regulations during operation.



Disconnect power supply before opening the device for access.
Make sure that all external power supplies are disconnected.



Aggressive condensate possible!

Media residues in tubing!
Chemical burns caused by aggressive media possible!



Wear protective gloves and protective glasses!



Wear proper protective clothing!



Peristaltic pump is under pressure! Do not open housing!

A peristaltic pump might be part of a system, which is under pressure. Check pressure before opening peristaltic pump and adjust pressure to atmospheric pressure.

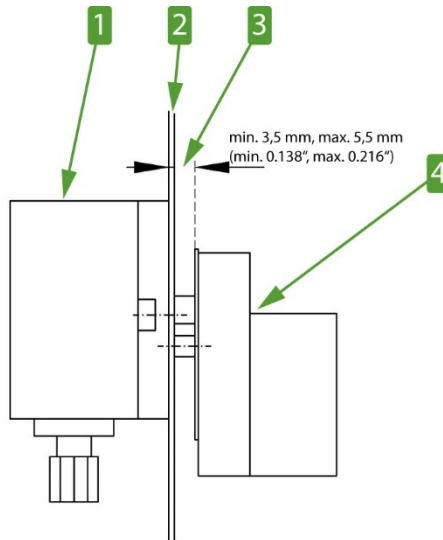
Flexible tube, conveying belt, contact pulleys and contact springs are the only parts of the pump subject to wear. They are simple to change.



If you send back the peristaltic pump to the M&C service for repair, please let us know what kind of condensate has been pumped.
Before sending the pump back clean all parts from dangerous or highly aggressive contaminants.

17.3.1 MOUNTING INSTRUCTIONS FOR PERISTALTIC PUMP

Make sure to mount the pump to the front of the cooler with a minimum distance of 3.5 mm [$\approx 0.138"$] and a maximum distance of 5.5 mm [$\approx 0.216"$] between the pump motor and the front panel. The minimum distance avoids damage to the pump motor and the maximum distance prevents the motor shaft from getting loose.



- 1 Pump head (outside the device housing)
- 2 Device front panel
- 3 Recommended mounting distance
- 4 Pump motor (inside the device housing)

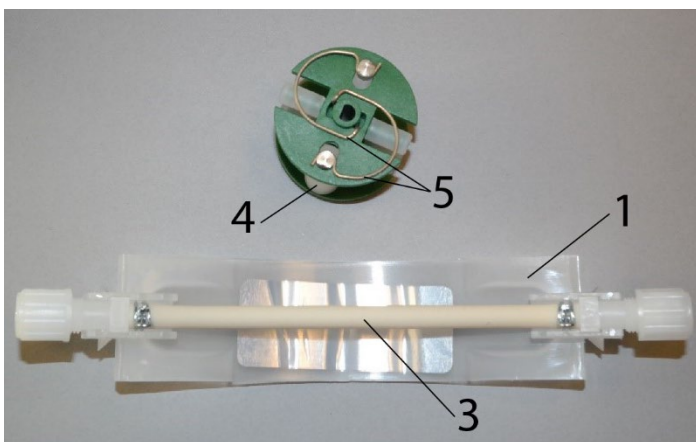
Figure 9 SR25.2: Mounting distance between front panel and pump motor



Note

For detailed mounting instructions, see the instruction manual for the peristaltic pump series SR[®]: The manual is available on our website www.mc-techgroup.com.

17.3.2 CHANGING THE PUMP TUBING



- 1 Conveying belt
- 2 S-bolt
- 3 Tubing set
- 4 contact pulley
- 5 springs

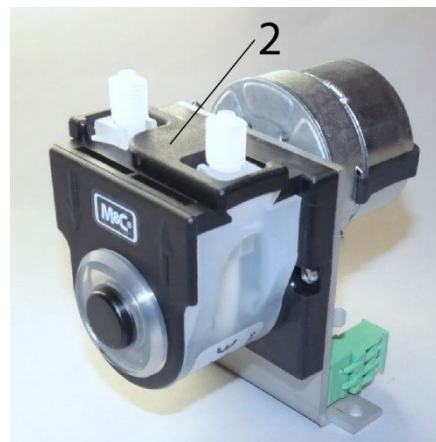


Figure 10 Changing the pump tubing

For changing the pump tubing please proceed as follows:

1. Unplug the pump from the mains voltage. The device needs to be voltage free.
2. Open tube connections at the pump;
3. Press conveying belt ① at the recessed grips and turn S-bolt ② clockwise up to limit stop;
4. Take away conveying belt ① and remove the old tubing set ③ from the guides by pulling on the tube connectors;
5. Press the two contact pulleys ④ and check whether the spring pressure is still sufficient, if not, the contact springs have to be changed (see chapter 17.3.3);
6. Put the new tubing set ③ with the tube connectors into the guides of the conveying belt ① ;



Warning

Only the usage of the original tubing set guarantees a proper functionality.
Never lubricate the tube.

Before mounting the pump check all parts for contaminations and clean if necessary.

7. Put the conveying belt ① with the new tubing ③ into the dovetail guide of the pump body;
8. Press conveying belt at the recessed grips and simultaneously turn the S-bolt ② anticlockwise until it snaps;
9. Switch on pump.

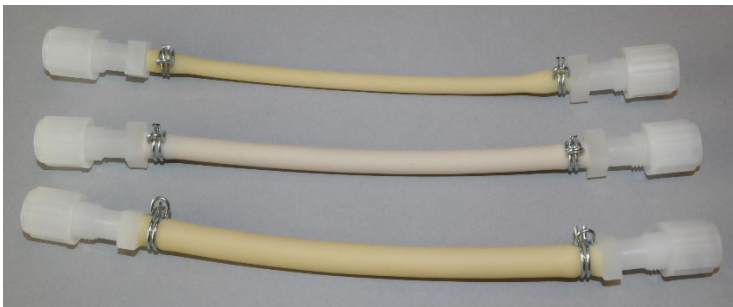


Figure 11 Different pump tube sizes

17.3.3 CHANGING CONTACT PULLEYS AND SPRINGS

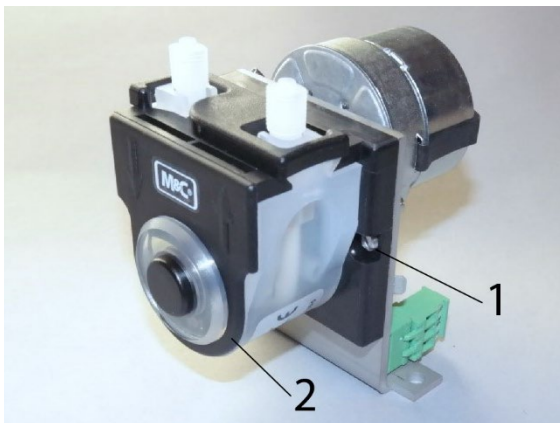


Note

While mounting, make sure that the center of rotation and the driver are aligned.
Use genuine spare parts only!

Follow these instructions to change the contact pulley and springs:

1. Disconnect the peristaltic pump from power supply
2. Unscrew nuts of the pump head (wrench size 5.5) ①

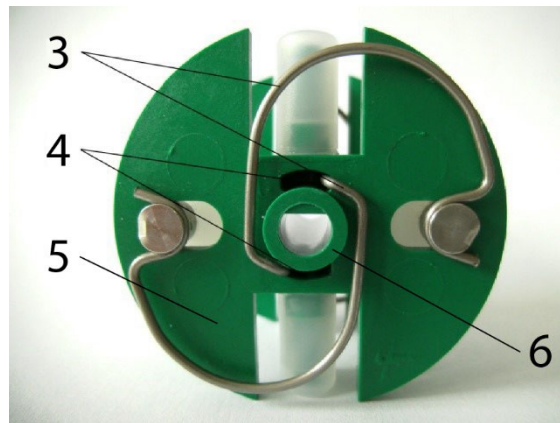


1 Pump head nuts

2 Pump head

4 Groove

5 Driver (roll carrier)



3 Springs

6 Collar of the shaft bore

Figure 12 Disassembly of pump head and driver

3. Remove the pump head ② from the motor shaft
4. Now the driver can be removed from the pump head and is ready for maintenance
5. The removal of the springs 4 pcs.) ③ away from the driver is easily possible without the aid of any tools. For this take spring out of the groove ④ near to the shaft bore
6. Dismount roller axes and change contact pulleys. Take care that axes are not worn out by the springs and have damaged the dent at the axes front end. In case of abrasion the axes have to be changed (see Figure 13).

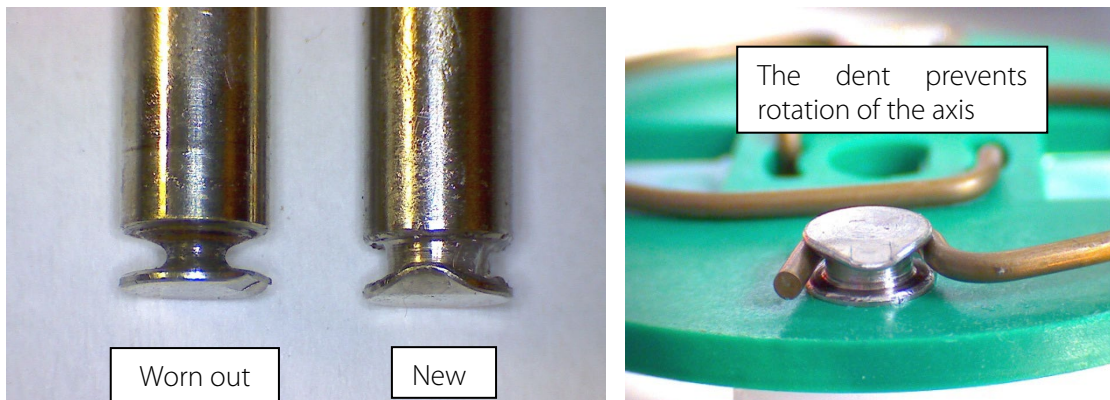


Figure 13 **Check of axes and rolls**



Note

The springs may come in different colorings. This is not a quality impairment. Make sure to use the right spring strength. This can be identified by the spring wire diameter. The 'standard version for Novoprene pump tubing' (Part No. 90P1010) has a diameter of 1.1 mm and the 'reinforced version for FKM-, Acidflex®- or Masterflex®-tubing' (Part No. 90P1015) has a diameter of 1.2 mm.



Note

Two different types of springs are mounted inside the driver (right and left springs) for the first delivery. When spare springs are ordered, for simplified storage, only one type will be delivered (right spring) which can be used for all four springs and will replace without any problems the initial springs. The replacement springs guarantee full functionality when all four springs are replaced.

- Make sure that contact pulleys move easily on the axis. After remounting the axis with contact pulley into the driver the spring has to be mounted as shown as in Figure 13. Please pay attention to the alignment of the dent.

17.3.4 REASSEMBLY OF THE DRIVER

Reassemble the driver in reverse order:

1. Insert the roll carrier back into the pump head
2. Push the pump head with the roll carrier onto the motor shaft ②
3. Tighten the nuts of the pump head fastening (SW 5.5) ①.



Note

While mounting, make sure that the center of rotation and the roll carrier (driver) are aligned.

Make sure that the collar of the shaft bore (see Figure 12) faces towards the front of the pump head while mounting the roll carrier.

Use genuine spare parts only!

17.3.5 CLEANING THE PUMP HEAD

When changing flexible tube or other parts, inspect all parts for dirt before assembling the pump head and clean them if necessary.

We recommend cleaning the parts with a dry cloth. Solvent should not be used, because it can damage the plastics and synthetic rubber parts. Use oil-free compressed air to clean the parts if available.



Aggressive condensate possible!

Media residues in tubing!

Chemical burns caused by aggressive media possible!



Wear protective gloves and protective glasses!



Wear proper protective clothing!

17.3.6 REPAIR INFORMATION FOR INTEGRATED PERISTALTIC PUMP TYPE SR25.2



Note

When sending the peristaltic pump to M&C customer service for repair, please indicate the type of medium pumped. Before shipping the pump, please remove hazardous or aggressive contaminations from all parts of the pump!

17.4 CLEANING THE COOLING FINS OF THE COMPRESSOR COOLER

To prevent a decrease of the cooling capacity the cooling fins have to be cleaned from dust periodical. For this purpose blow compressed air into the ventilation grid at the right side of the housing.



Note

With clean cooling fins a DIN A4 sheet of paper is sucked in and clings to the right side of the housing.

18 OPERATING OF THE BUILT-IN ELECTRONIC TEMPERATURE CONTROLLER

New electronic temperature controllers were installed in the housing of the conditioning unit CSS-V effective April 2022 and June 2023.

All built-in temperature controllers are factory set to the following values: Gas outlet dew point 5 °C [41 °F], alarm window: 3 °C [5.4 °F], alarm hysteresis: 1 °C [1.8 °F].

Figure 14 shows the hysteresis behavior of the temperature alarm at factory settings. The alarm of the temperature controller is activated (Alarm ON) and deactivated (Alarm OFF) depending on the temperature, following the hysteresis.

When the cooler is switched on, the temperature is cooled down starting from the ambient temperature, which means that the temperature alarm is activated: Alarm ON. Figure 14 shows that the alarm remains active until the temperature of 7.5 °C [45.5 °F] is reached. The alarm follows the hysteresis and is set to Alarm OFF at 7.5 °C [45.5 °F]. If the temperature remains within the range of 1.5 to 8.5 °C [34.7 to 47.3 °F], the alarm will stay at Alarm OFF. If the temperature changes beyond these limits, the temperature controller follows the hysteresis and sets the alarm back to Alarm ON at a temperature below 1.5 °C [34.7 °F] or above 8.5 °C [47.3 °F].

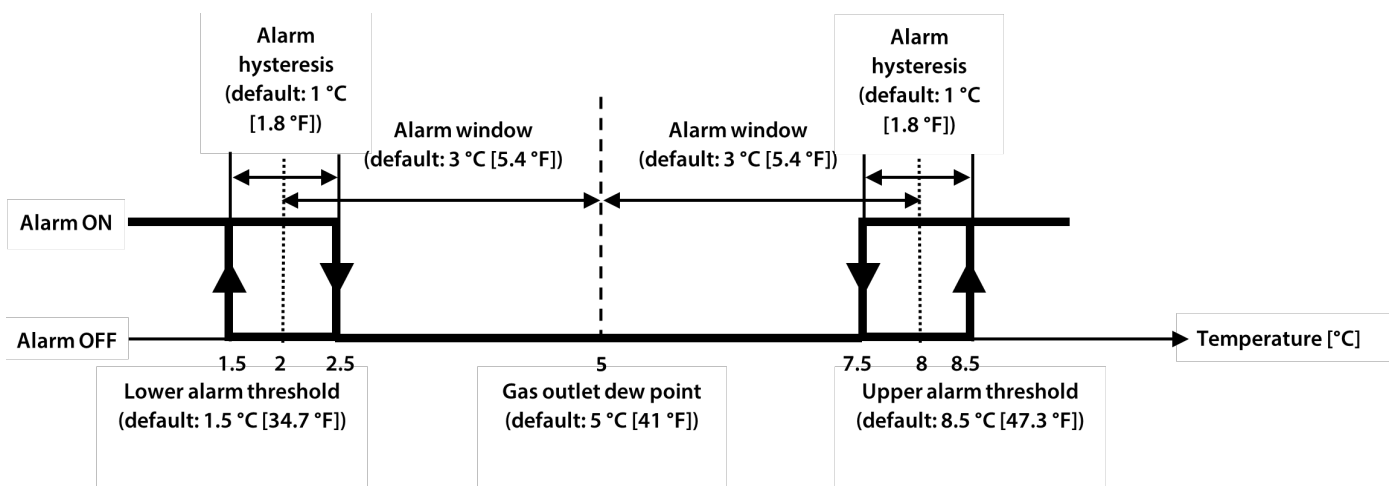


Figure 14 Hysteresis behavior of the temperature alarm at factory settings

18.1 TEMPERATURE CONTROLLER VERSION UNTIL MARCH 2022

During normal operation, the display of the temperature regulator shows the actual cooling temperature. Figure 15 shows the front view of the temperature controller.



Figure 15 Front view of the temperature controller version until 03.2022

18.1.1 CHANGING THE SET VALUE

For changing the set value, press the P-button < 2 s. The set value, adjusted at the factory to 5 °C [41 °F], is shown. With both arrow keys, the set value can be set upwards or downwards. However, this value should not be adjusted below +2 °C [35.6 °F], otherwise freezing up of the heat exchanger is possible. If the value is set above ambient temperature, the cooler will not work.

18.2 TEMPERATURE CONTROLLER VERSION STARTING APRIL 2022

In normal operation, the display of the temperature controller shows the current cooling temperature in the upper line.

In the bottom line, the adjusted set point is displayed.



Figure 16 Front view of the temperature controller version starting 04.2022

18.2.1 CHANGING THE SET VALUE

Pressing the Δ or ∇ key once causes the set setpoint to start flashing in the bottom line.

Now the setpoint can be increased or reduced using the Δ or ∇ keys. However, the value should not be set lower than +1 °C [33.8 °F], otherwise the heat exchanger is likely to freeze.

The change can be cancelled at any time with the \hookrightarrow key. The change is only accepted with the Menu/OK key.

18.3 TEMPERATURE CONTROLLER VERSION STARTING JUNE 2023

In normal operation, the display shows the measured temperature (temperature view). The ESC key and the arrow keys (UP and DOWN) are disabled in this view. Figure 17 shows the front view of the temperature controller.



Figure 17 Front view of the temperature controller version starting 06.2023

While you tap on the OK key, the set setpoint value is displayed. The factory setting of the setpoint is "5.00". After releasing the key, the display immediately returns to the temperature view. The setpoint is only visible when the key is tapped.

18.3.1 CHANGING THE SET VALUE

The temperature controller needs to be unlocked, before changing the setpoint. To unlock the device, first press the OK key for about 3 seconds. The display changes to a flashing "000".

Then enter the PIN code "017" with the arrow keys and confirm the entry with OK. The display jumps back to the temperature view.

Now the temperature controller is unlocked. Again, press the OK key for about 3 seconds. The display changes to the setpoint view and the display is flashing.

While the display is flashing, the setpoint can be adjusted with the arrow keys. With OK the new setpoint is accepted. With ESC the current changes are discarded. In both cases, the display jumps back to the normal temperature display after pressing.



Note

If you hold the OK key too long, you will enter the configuration menu. This menu shows a "C", followed by two digits on the display. To return to the temperature view tap on the ESC key.

19 TROUBLE SHOOTING

The following table shows possible sources of errors and how to remove them (not applicable for the starting-up phase).

Display	Fault	Possible cause	Examination/Correction
None		No supply voltage;	Check the supply voltage according to the type plate; ok? Control whether the mains plug is put in correctly; ok? Examine the fine fuses F1, F2 in the cold appliance socket; ok?
LED K1 is beaming permanently and temp. > 8 °C [> 46.4 °F]		Cooler alarm „Excess temperature“; cooler switches off the sample gas pump automatically if existing; Ventilator does not function	Ambient temperature too high; ok? Free convection inside the gas conditioning unit upset ⇒ internal temperature too high; ok? Sample flow or dew point too high? Reduce flow. ok? Return the instrument for repair to M&C.
Temp. > 2 °C [> 35.5 °F] and < 7.5 °C [< 45.5 °F]	Cooler runs, sample flow is interrupted; Pump defective	Diaphragm pump does not work; <u>Liquid alarm sensor:</u> Sensor turns sample gas pump automatically off;	LED Liquid alarm is beaming red. Liquid in the filter (Dry filter and liquid alarm sensor and check peristaltic pump, see below.) ok? Check the tubing for condensate draining; ok? Check pump tubing (see chapter 17.3.2) ok? Check pump SR25.2 (see chapter 17.3); ok? Return instrument for repair to M&C.

Display	Fault	Possible cause	Examination/Correction
	Pump works, but sample gas flow is interrupted;	<u>Flow meter:</u> Needle valve is shut. Sample probe or sample hose clogged or line squeezed; Sample line to the analyzer clogged or squeezed; Pollution of the diaphragm pump;	Set the desired flow rate on the needle valve. Loosen the sample hose from the sample gas inlet of the gas conditioning unit (see chapter 12); Gas flow? Clean the clogged line or replace it; No gas flow? Loosen the outlet hose on the analyzer side and check on the threaded hose coupling whether sample gas flows; Sample gas does not flow? Clean the clogged line or replace it; Sample gas flows? ok? Loosen the piping on the pump head and examine it (see chapter 17.2); ok? If necessary, clean the pump; Ok?
Temp. < 2 °C [< 35.6 °F]		Cooler switches off the sample gas pump automatically; Cooler defective;	Ambient temperature too low; ok? Return the instrument for repair to M&C.

20 PROPER DISPOSAL OF THE DEVICE

At the end of the life cycle 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, please follow the rules and regulations of your country regarding recycling and waste management.

21 SPARE PART LIST

Wear, tear and replacement part requirements depend on specific operating conditions.
The recommended quantities are based on experience and are not binding.

Gas Conditioning Unit Version CSS-V

(C) Consumables, (R) Recommended Spare Parts and (S) Spare Parts

			Recommended quantity after operation of [years]		
Part No.	Description	C/R/S	1	2	3
Fine filter FPF-2-0,3GF					
90F0160	Filter element type F-2-0,3GF. Material: glass fiber, porosity: 0.3 µm 25 pcs./pack.	C	1	2	3
90F0167	O-ring FPF-2/54. Material: Viton®.	R	1	1	1
Peristaltic pump SR25.1:					
90P1007	SR25 pump hose with threaded hose coupling of PVDF, DN 4/6 mm	C	1	2	4
90P1010	1 set contact spring for driver of peristaltic pump R25.2, (set = 4 pcs.)	C	1	2	3
90P1020	Driver complete for peristaltic pump SR25.2	R			1
90P1045	Contact pulley (1 pc.) for peristaltic pump SR25.2, (2 pcs./pump required).	C		2	4
Diaphragm pump type N3/5/9 KPE					
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 per pump required)	C	2	4	6
90P2105	Intermediate plate type Z3, for N3/N5 KPE/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 piece, material: Viton®. (2 pieces per pump required)	C	2	4	6
90P2205	Intermediate plate type Z9, for N9 KPE/KP18, material: PVDF	S	-	-	1
90P2200	Square cap type D9, 1/8" female for N9 KPE/KP18, material: PVDF	S	-	-	1
Flow meter FM40:					
90A0015	Flow meter glass for FM40 Measuring range 7-70 NI/h air	S	-	1	1
94F0010	Flow meter glass for FM40 Measuring range 15-150 NI/h air	S	-	1	1

Gas Conditioning Unit Version CSS-V

(C) Consumables, (R) Recommended Spare Parts and (S) Spare Parts

Part No.	Description	C/R/S	Recommended quantity after operation of [years]		
			1	2	3
94F0015	Flow meter glass for FM40 Measuring range 25-250 NI/h air	S	-	1	1
90A0018	Viton® O-ring 9 for FM40 glass	R	2	4	6
Miscellaneous:					
90G0030	Fine fuse 6.3 A T (time delayed), 5 x 20 mm for CSS-V1 and CSS-V2	R	5	5	5
Tube and threaded tube couplings:					
05V3215	Bulkhead union SV-PVDF DN 4/6	R	2	2	2
05V6600	Ferrule 4/6 PVDF s.a.	R	5	10	10
05V6605	Union nut M10-4/6 PVDF s.a.	R	5	10	10
01T1000	Viton® tube NW 4/6 (m)	S	1	2	3
10T1000	Hose cutter	S	1	1	1

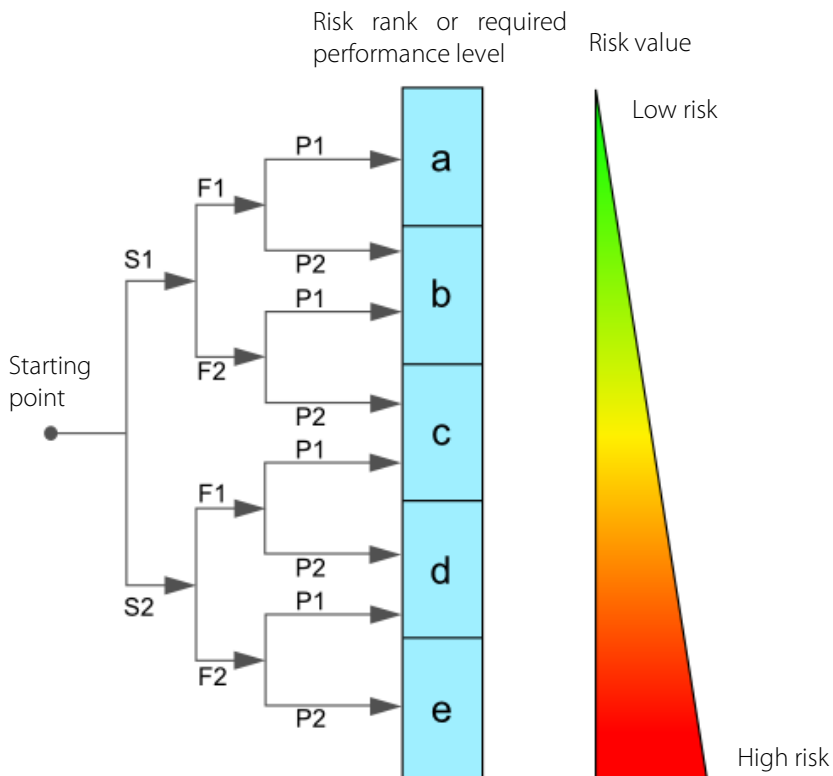
22 RISK ASSESSMENT

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 18 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 $< 40 \text{ kg}$ [$\approx 88.2 \text{ lbs}$]:

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.

23 APPENDIX

- Connecting conductors board **CSS-V**



For further product documentation, please see our internet catalogue:

www.mc-techgroup.com

- Instruction manual peristaltic pump **SR25.2**
- Instruction manual diaphragm pump **series N**
- Data sheet flowmeter **FM 40**,

