Embracing Challenge

Gas Conditioning Unit Series PSS®

SS-M05 for Marine Application

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 all the addresses in the appendix of this manual.

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

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.

PSS® is a registered trade mark.

Version: 1.02.02

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1 General Information

The product described in this instruction manual has been built and tested in our production facility.

All M&C products are packed to be shipped safely. To ensure the safe operation and to maintain the safe condition, all instructions and regulations stated in this instruction manual need to be followed. This instruction manual includes all information regarding proper transportation, storage, installation, operation and maintenance of this product by qualified personnel.

Follow all instructions and warnings closely.

Read this manual carefully before commissioning and operating the device. If you have any questions regarding the product or the application, please don't hesitate to contact M&C or your M&C authorized distributor.

2 Declaration of Conformity

CE - Certification

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

RoHS Directive

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

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.

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 equipment:

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 1000V' and must be in compliance with all relevant regulations and standards.

When connecting the device, make sure that the mains voltage is correct as specified on the nameplate.

Protection against damages caused by high voltages:
Disconnect the power supply before opening the device for access. Make sure that all extern power supplies are disconnected.

Operate the device only in the permitted temperature and pressure ranges. The location classes according to DNV can be found in the technical data of this instruction manual.

Check that the location is weather-protected. It should not be subject to direct rain or liquids.

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

This product is intended for use as a gas conditioning device for gas treatment on ships. The location classes according to DNV can be found in the technical data of this instruction manual.
Do not use the unit for any other purpose than for this purpose.
Improper use can lead to serious injuries, see the safety instructions at the appropriate place in this manual.

3.2 Qualified Personnel

The gas treatment device must be operated only by qualified personnel.

Use of the system by unqualified persons or failure to observe the warning instructions in this instruction manual or on the device/cabinet itself may result in serious physical injuries and/or material damage. The instruction manuals for the individual components must also be observed. Only qualified personnel are allowed to use and maintain this device.

Qualified personnel in the sense of the safety instructions in this instruction manual or on the product itself are persons who

- as project personnel are familiar with the safety concepts of the gas treatment device, or
- as operating personnel are trained in the use of gas treatment devices and are familiar with the contents of this manual relating to its operation, or
- as maintenance and/or service personnel have been trained in the repair of such devices of automation technology and who are authorised to operate, to earth and to designate circuits and devices/systems in accordance with the standards of safety technology.

3.3 Electrical Voltage

All work, including in particular work on live components, must be carried out in accordance with current applicable safety guidelines. The gas treatment device must in this case be switched off externally!

Danger of electric shock! Disconnect the device from the mains power supply before starting work. Secure the system against being switched on again unintentionally.

This also applies to all devices and equipment connected to this device.

4 Warranty

In case of a device failure, please contact immediately M&C or your M&C authorized distributor.
We have a warranty period of 12 months from the delivery date. The warranty covers only appropriately used products and does not cover the consumable parts. Please find the complete warranty conditions in our terms and conditions.

The warranty includes a free-of-charge repair in our production facility or the free replacement of the device. If you return a device to M&C, please be sure that it is properly packaged and shipped with protective packaging. The repaired or replaced device will be shipped free of delivery charges to the point of use.

5 Used Terms and Signal Indications

Danger

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

Warning

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

Caution

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

Caution

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

Attention

'Attention' indicates that an unintended result or situation can occur if the corresponding information is not considered.

Note

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

Qualified personnel

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

High voltages!
Protect yourself and others against 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.

Container under pressure! Do not open the container!
Check pressure before opening the container and adjust 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 unit is used for gas treatment during continuous measurement of emissions in marine applications. The system consists of a stainless steel housing which accommodates the peristaltic pump, the flow meter with sensor and components for automatic calibration of the analyzer. The cooler and the bellows pump with needle valve are attached to the stainless steel housing.

6.1 Serial Numbers

The serial number plate is located on the right side of the stainless steel housing.

Note

Please refer to this serial number if you have any questions about the device or if you need to order spare parts or consumables.

6.2 Power Supply

The valid supply voltage connections can be found on the type plate.

7 Application

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

The components of the system **SS-M05** are intended for "standard use". We also provide a wide range of additional equipment and other components if special measurements are required.

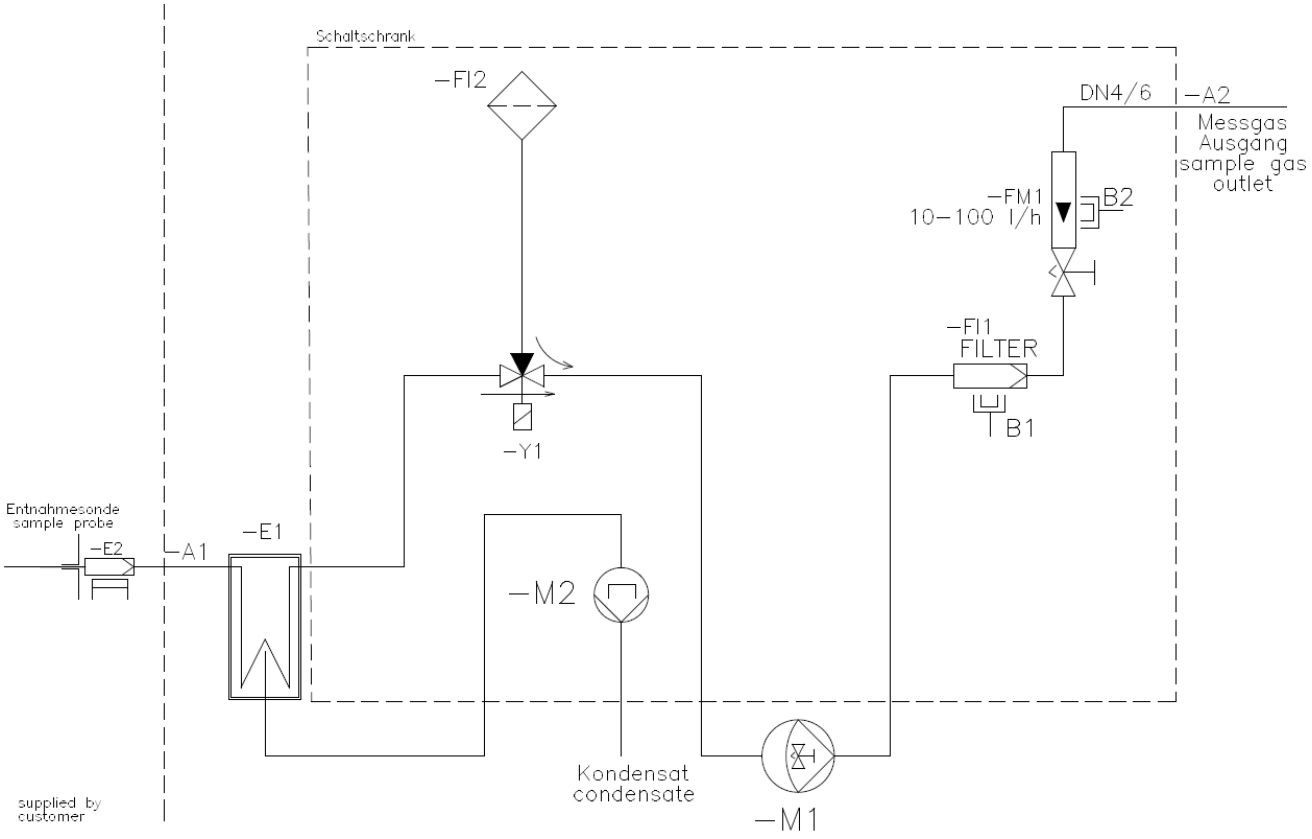


Figure 1 Gas flow diagram

The sample gas is fed to the gas treatment device via a heated sample gas probe –E2 (supplied by customer, SP180-H/MA) to the input of the gas cooler –E1. The gas treatment device supplies the current for the self-regulating heated sample gas line between the sample gas probe and the cooler -E1.

The bellow valve pump –M1 has a needle valve to adjust the flow through the cooler –E1. The sample gas enters the gas conditioning device through the cooler. The bellow pump -M1 pumps the gas through the solenoid valve –Y1, the filter -FI1 and the flowmeter -FM1.
The 3/2 way solenoid valve –Y1 is used for the auto calibration function of the analyzer. The solenoid valve –Y1 is controlled by the analyzer. To auto calibrate the analyzer air is fed through the filter -FI2.
The bellows pump -M1 pumps the sample gas further through filter –FI1 including condensate detection B1 and flowmeter -FM1 including flow detection B2, to the output "A2" of the gas treatment device.

At the output A2 output an unheated Teflon® tube can be connected to the analyzer.
The flow detection B2 triggers an alarm contact, if the gas flow is too low.
The condensate forming in the gas cooler is transported to the condensate outlet by the peristaltic pump –M2.

In case of liquid alarm at B1, pump -M1 is automatically switched off to protect the downstream analyzer. The error messages can be routed to the signalling terminal block.

Note

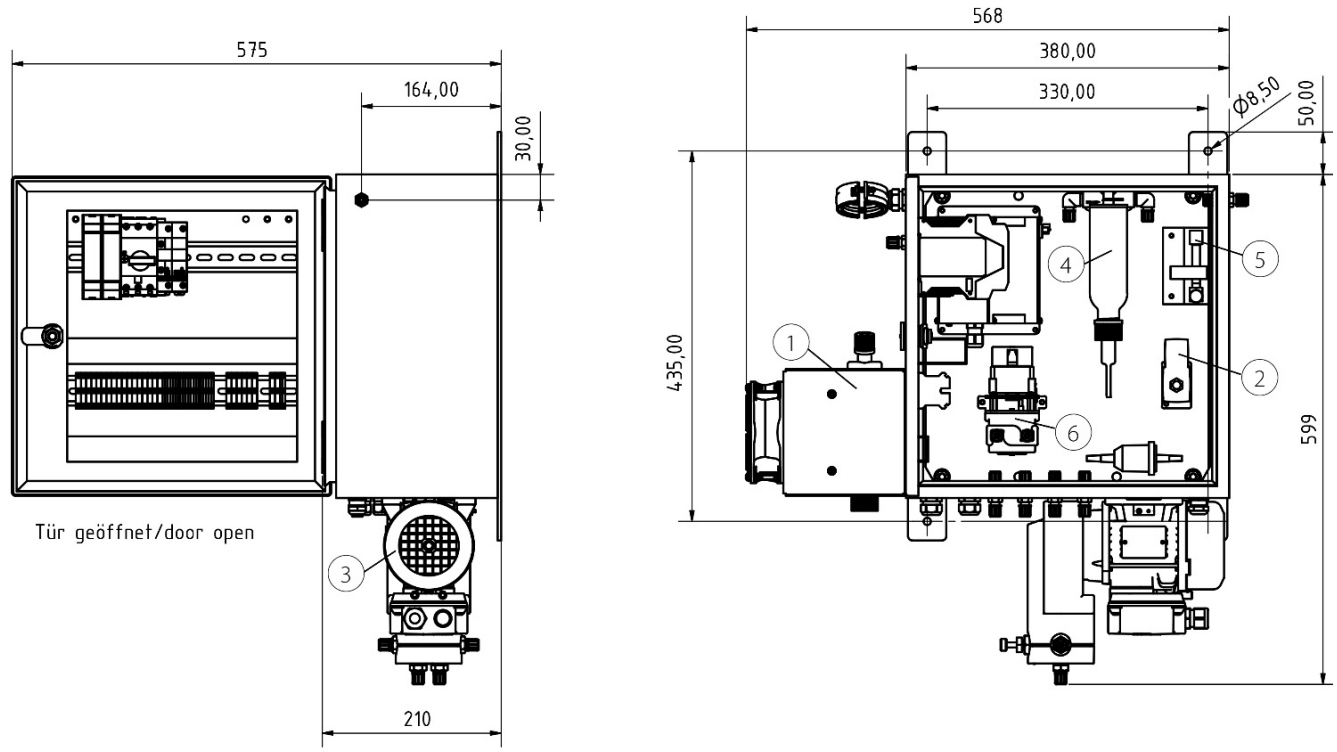
Detailed technical information on the built-in analysis device, as the sample gas cooler, the pumps etc. can be found in the attached operating instructions.
The supplied technical documentation with the included instructions must be observed.

8 Technical Data

Gas Conditioning Type	SS-M05 Marine
Part-No	03G6000
DNV Type Approval Certificate	TAA000018R
Location classes	Temperature A Moisture B Vibration A EMC A Housing B
Sample outlet dew point	Range of adjustment: +2 to +15 °C [35.6 to 59 °F], factory setting: +5 °C [41 °F]
Sample outlet dew point stability	At const. conditions: < ±0.1 °C [±0.18 °F]
Sample inlet temperature	Max. 70 °C [158 °F]*, saturated
Sample inlet water vapor saturation	Max. +70 °C [158 °F]*
Gas flow rate/heat exchanger	Max. 100 l/h*
Number of heat exchangers	1
Heat exchanger material	SS 316Ti
Ambient temperature	+5° to +50 °C [41 to 122 °F]*
Storage temperature	-25 to +65 °C [-13 to 149 °F]
Pressure	Max. 1 bar above atmospheric pressure
Total cooling power at 25 °C [77 °F] ambient temperature	Max. 80 kJ/h
Sample gas connection inlet	Ø 6 mm tube as standard, others on request
Sample gas connection outlet	Tubing connection DN 4/6
Condensate connection	Tubing connection DN 4/6
Condensate removal	Peristaltic pump SR25.2
Sample gas pump	MP-F05
Ready for operation	Approx. 10 min.
Power consumption	250 VA (up to max. 1600 VA with heated sample gas line)
Mains power supply	230 V ±10 % 50 or 115 V ±10 % 60 Hz
Electrical connection	Terminals: 2.5 mm^2, cable glands 2 x M20
Status alarm: gas flow rate	1 change-over contact
Switching power: status alarm	250 V, 2 A, 500 VA, 50 W
Case protection	IP54, EN 60529
Electrical equipment standard	EN 61010
Housing color	RAL 9005, stainless steel RAL 9005/RAL 9003
Installation type	Wall mount
Over all dimension (W x H x D)	600 x 780 x 600 mm [≈ 23.6" x 30.7" x 23.6"] with opened door
Weight	Approx. 30.0 kg [≈ 66.1 lbs]

* 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].

8.1 Dimensions



Dimensions in mm

① Gas cooler
② Solenoid valve for test gas feeding
③ Sample gas pump MP-F 05 with needle valve
④ Filter FP-2T-D Filter porosity 2 µm with integrated liquid alarm sensor LA
⑤ Flow meter FM40 with flow monitoring FA1bi
⑥ Peristaltic pump SR25.2 for continuous automatic condensate drainage

Figure 2 Dimensions and design SS-M05

9 Description

All components of the gas conditioning system are either inside the compact stainless steel housing or attached to it.

The sample gas line is connected directly to the heat exchanger inlet of the sample gas cooler. The sample gas cooler cools the sample gas down to 5 °C [41 °F]. The heat exchanger is placed inside a heat-insulated cooling block. An electronically controlled (analog technology) Peltier element cools the cooling block to a constant temperature of +5 °C [41 °F]. A PT100 sensor is used to measure the temperature. The thermal energy generated by the cooling system is dissipated via a fan-cooled heat sink.
The cooler is equipped with a temperature alarm contact that switches off the sample gas pump in case of a temperature deviation of ±3 °C [±5.4 °F] from the factory set point (+5 °C [41 °F]).

The peristaltic pump removes the accumulated condensate.

Downstream the cooler, there is a micro-filter with a 2 µm filter element and integrated liquid alarm sensor LA. In case of leaking, the liquid alarm sensor switches off the sample gas pump automatically.

A PTFE bellows pump is attached to the outside of the housing. This pump draws the sample gas from the sampling point via the sample probe SP180H/MA (sold separately) through the heated sample gas line (optional) into the cooler and further through the micro-filter. In the outlet of the sample gas pump a flow meter FM40 with flow monitor FA1bi is integrated. The flow rate monitor FA1bi signals the failure of the sample gas flow.

The now filtered and dried sample gas is passed on to the analyzer.

To calibrate the system, there is a switchover for test gas feeding through a solenoid valve. The switchover is implemented in the gas treatment device.

9.1 Outlet dew point as a function of ambient temperature

The following diagrams show the output dew point of the device as a function of the ambient temperature for a flow rate of 100 Nl/h and 60 Nl/h respectively. The individual curves show the different input dew points.

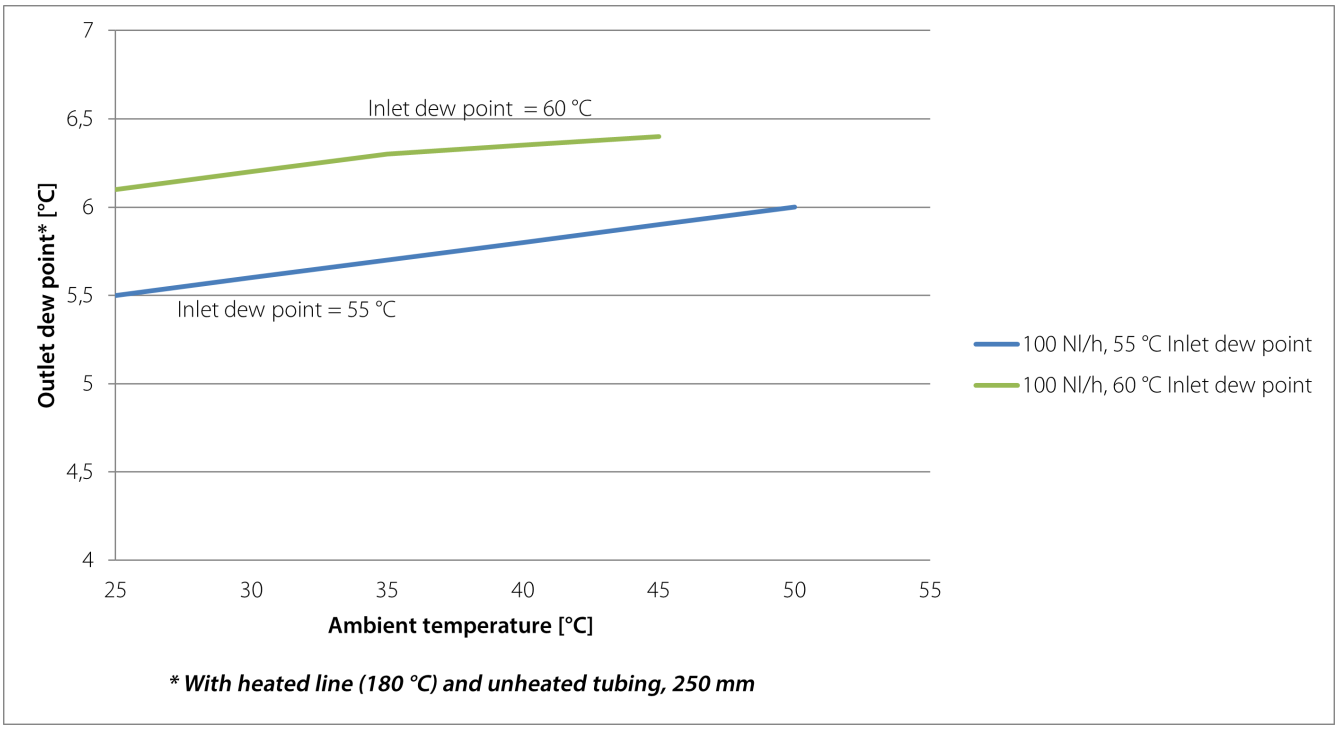


Figure 3 Outlet dew point at 100 Nl/h

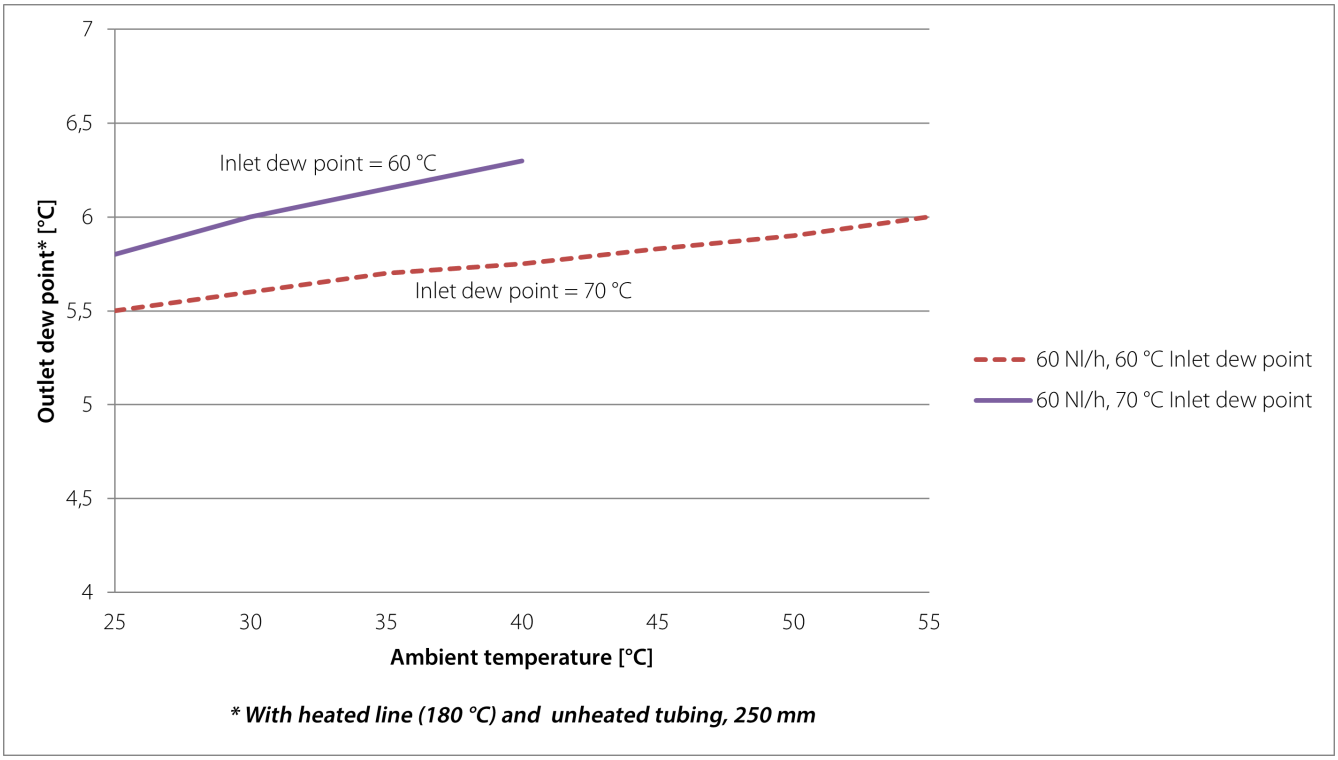


Figure 4 Outlet dew point at 100 Nl/h

10 Receipt of Goods and Storage

Warning

Heavy device!
Risk of injury when handling heavy equipment.
Do not lift, move or carry the device without help. A second person is required to lift, move or carry the device.

The gas conditioning device **SS-M05** is a completely pre-installed unit.

- Please remove the gas conditioning device 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 damages after receipt and report any complaints to the transport company immediately.

Note

The SS-M05 Marine system must be stored in a weather protected frost free area.

11 Installation

Warning

Heavy device!
Risk of injury when handling heavy equipment.
Do not lift, move or carry the device without help. A second person is required to lift, move or carry the device.

Before installation and commissioning of the gas conditioning device, the operating instructions of the components used must be read and followed.

Note

The fan must have a minimum distance of 200 mm to adjacent devices or boundaries.

- Install the gas conditioning device with a minimum distance of 200 mm between the fan and adjacent equipment or boundaries.
- The gas conditioning device is intended for wall mounting

Note

The equipment is to be used in a vertical position only. The perfect functioning of the separation and drainage procedures will only be guaranteed if the equipment is used in a vertical position.

Installation according to location classes, see chapter "8 Technical data".

For outdoor installation, adequate protection against direct sunlight and moisture must be provided. In winter, the installation site must be frost-free; observe the degree of protection of the gas conditioning device.
Do not use the gas conditioning device at temperatures other than those specified. This avoids false alarms and ensures the operational safety of the gas conditioning system and the additionally connected analyzer.

Downstream analysers and the unheated Teflon tubing must always be operated at temperatures well above the specified gas output dew point of +5 °C [41 °F].

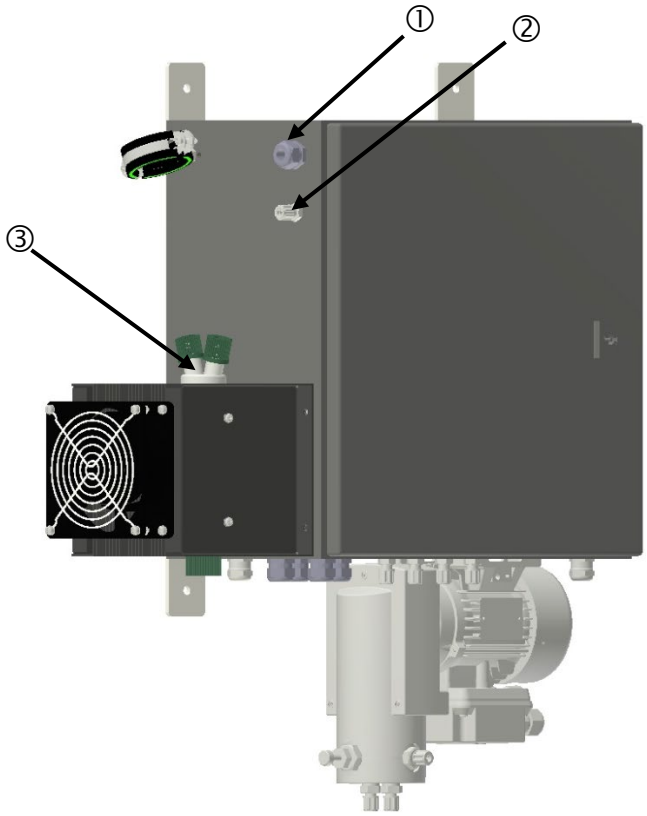
Unheated gas sample lines must be installed with a slope down to the cooler. Condensate pre-separation is then not necessary.

11.1 Connecting the Sample Gas Line

Note

Do not mix up connections. The upper heat exchanger connection is the inlet, the side heat exchanger connection is the outlet and the lower heat exchanger connection is the condensate outlet.

The sample gas line is connected to the inlet of the external heat exchanger. The heated part of the sample gas line should end approx. 30 cm in front of the heat exchanger.
The electrical connection of the sample gas line is made via the cable gland K1 at the upper left corner of the SS-M05 system cabinet. The outlet of the heat exchanger must be connected to media connection 1.



① Cable gland K1 ② Media connection 1 ③ Heat exchanger inlet (A1) and outlet

Figure 5 Sample gas line connection

Connect the heated sample gas line as follows:

1. Connect heated sample line “E2” to the inlet of the heat exchanger “A1”. At least 60 mm unheated tube should be at the end of the heated line.
2. Check tightness!
3. Connect sample gas outlet “A2”.

12 Connecting the Tubing

Note

Do not confuse tubing connections; connections are marked accordingly.

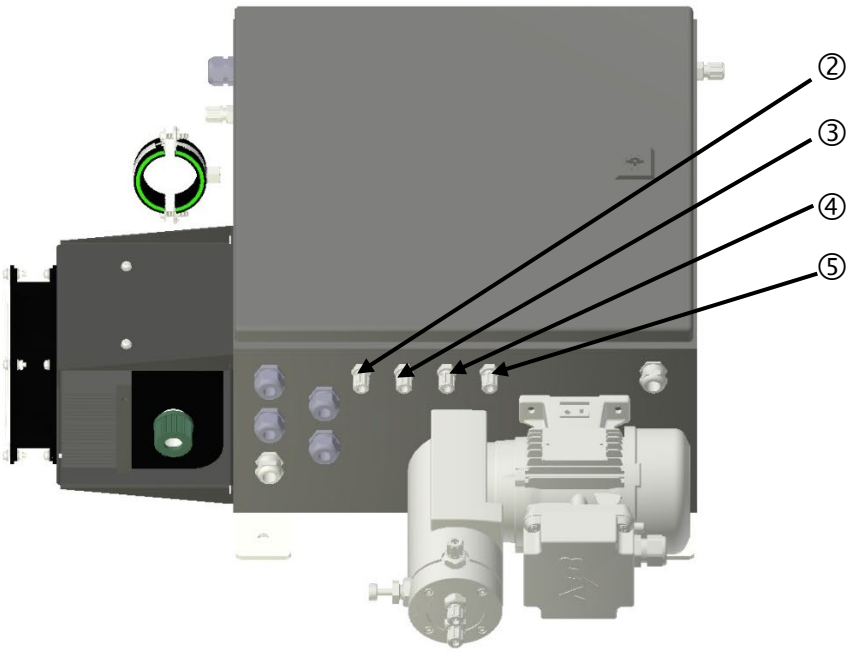
After connecting all tubing, check for leaks.

12.1 Media Connections

The condensate outlet of the heat exchanger is connected to the media connection 2.

Media connection 3 is the condensate outlet of the peristaltic pump. The media connection 3 must be lead to a condensate collecting container supplied by the customer.

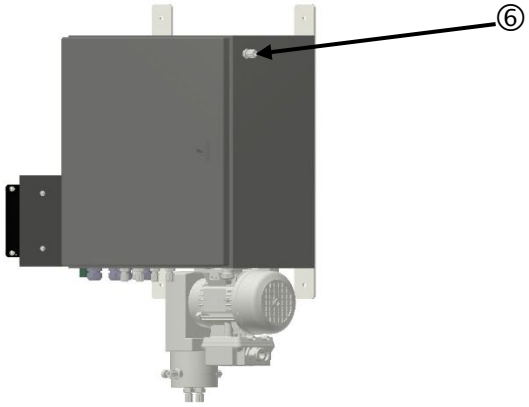
Bulkhead fittings 4 and 5 are connected to the inlet and outlet of the pump.



②	Media connection 2
③	Media connection 3
④/⑤	Bulkhead fittings connected to the pump in-, outlet

Figure 6 Media connections 2 to 5

The output of the SS-M05 is connected to the downstream analyzer: Media connection 6.



⑥ Media connection for downstream analyzer

Figure 7 Media connection for downstream analyzer

The sample gas inlet is a Ø 6 mm tube.

All tubing connections are equipped with 4/6 mm sealing ring threaded hose couplings made of PVDF, for gas input temperatures of up to a maximum of 80 °C [176 °F].
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 necessary.

Connection tubing with 4/6 mm diameter are used for all models.

The sample gas and condensation tubing 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 to ensure that the loose sealing ring in the nut is not lost.
2. Place the union nut over the connecting tubing.
3. Place the sealing ring over the connecting tubing with the thicker bead towards the nut.
4. Place the tubing 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. Tighten the union nut by hand.

The tubing is now securely positioned, and pressure-proof mounted.

Disassemble the tubing in reverse order.

Aggressive condensate possible!
Media residues in tubing!

Chemical burns caused by aggressive media possible!

Wear protective gloves and protective glasses!

Wear proper protective clothing!

12.2 Electrical Connections

Warning

Wrong supply voltage can damage the equipment. When connecting the equipment, make sure 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 1000V, the requirements of VDE 0100 and relevant standards and specifications must be observed!

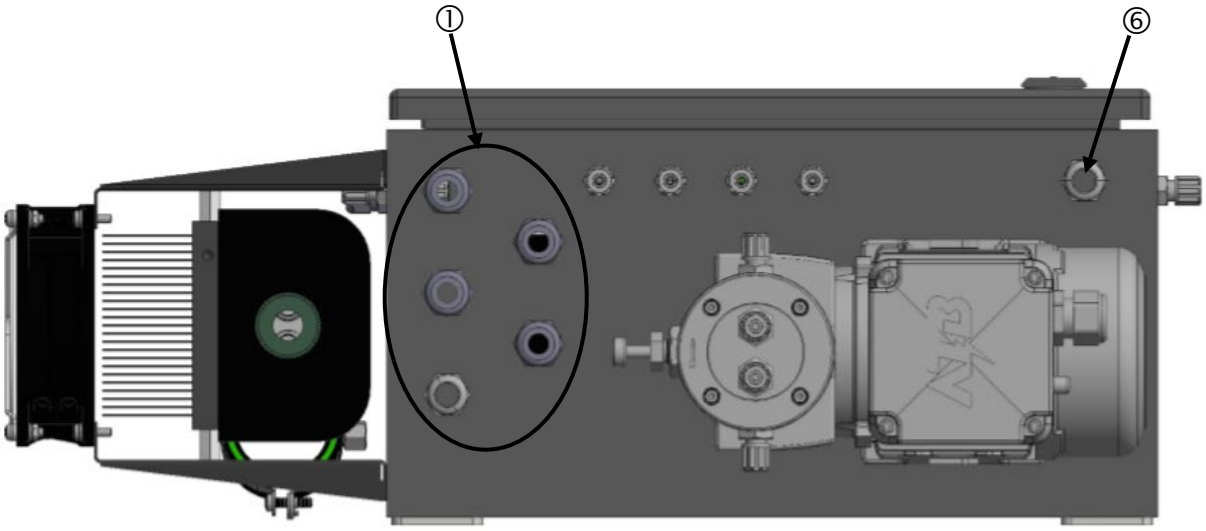
The main circuit is equipped with a fuse corresponding to the nominal current (over current protection); for electrical details see technical data.

The **SS-M05...** gas conditioning system is available with either 230 V/50 Hz or with 115 V/60 Hz (for circuit diagram see Appendix). Fuse protection is provided by a 16 A circuit breaker as standard. Fuse protection is provided by a 16 A circuit breaker as standard. This is located on the terminal support rail of the housing (see Figure 9).

For the electrical connection select the appropriate cable. Cable glands at the bottom of the SS-M0-5 are provided for the cables. The cable glands must be tightened after the cables have been inserted.

Note

Unused cable entries must be fitted with blind plugs to ensure IP protection of the enclosure.



① Cable glands
⑥ Cable gland for sample gas pump

Figure 8 Cable glands

12.3 Electrical Installation

Carry out the electrical installation (electrical fuses of the gas conditioning device must be switched off):

1. Connect the mains power supply (see –X1 in circuit diagram).
   a. Terminal X1:

Position	Wire
1	L
11	N
18	PE

2. Use shielded cables to connect the following alarms: Liquid alarm and Flow alarm, see –X2 in circuit diagram).
   a. Liquid alarm, terminal X2:

Position	Wire
1	MC
2	NO
3	NC

   b. Flow alarm, terminal X2:

Position	Leiter
4	MC
5	NO
6	NC

3. Connect the solenoid valve –Y1 (see –X3 in circuit diagram).
   a. Solenoid valve, 24 V auto cal, terminal X3:

Position	Leiter
1	+24 V
2	0 V
3	PE

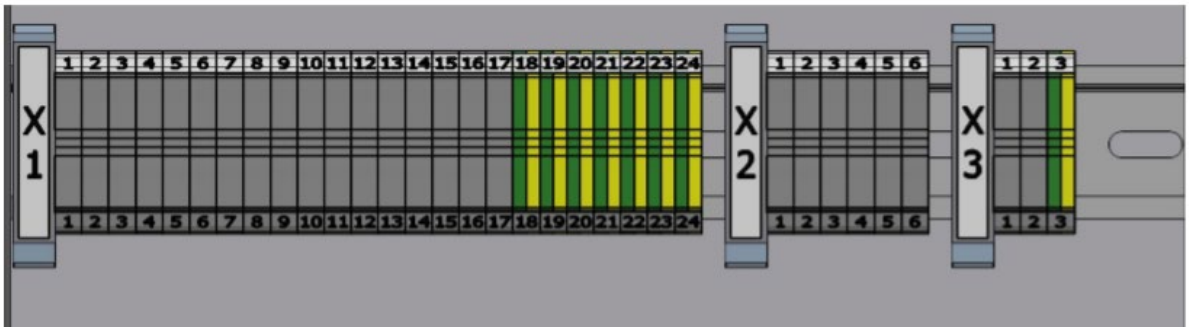


Figure 9 Terminals X1, X2, X3

13 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.

14 Starting

Observe the plant-specific and process-specific safety measures before commissioning.

Note

Before connecting the mains voltage, the circuit breakers must be set to OFF.

The following steps must be carried out before initial commissioning:

1. Wiring the system cable before commissioning according to the circuit diagram
2. Connect heated line (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 power to the system cables
4. Switch circuit breaker 1 to position ON.
5. Switch circuit breaker 2 to position ON with optional sample gas line.

Carry out the following steps for commissioning:

1. Switch on the fuses/circuit-breakers of the gas treatment device
   a. F2 heated sample tube. (self regulating)
   b. F1 gas cooler, sample gas pump, bellow valve pump, etc.

2. the gas conditioning unit is ready for operation after 45 minutes

3. Switch on "Q1" sample gas pump.

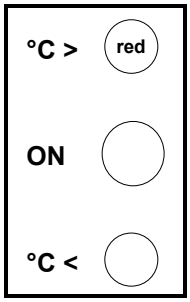
4. Set the sample gas flow at the regulating valve on the head of the sample gas pump to approx. 70 Nl/h.

14.1 Function Sequence and LED Function Display

Note

Detailed technical information about the sample gas cooler can be found in the ECP1150M operating manual.

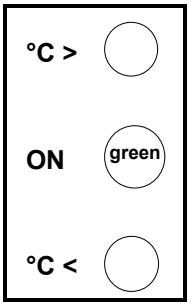
The three indicator LED's display the actual operating status during the commissioning of the gas cooler. The upper red LED indicates that the temperature set by the ECP 1150M electronic control unit has been exceeded or has not been reached. The green LED in the middle shows the operating status of the gas cooler. The lower red LED indicates that the temperature is lower than the temperature set by the ECP 1150M electronic control unit.



Switching-on the gas cooler

The upper red LED turns on as soon as the gas cooler is connected to the power outlet. The temperature of the gas cooler is higher than +8 °C [46.4 °F].

Normal operating mode



After about 10 minutes the temperature of the gas cooler drops to under +8 °C [46.4 °F]. The upper red LED turns off.
The collective status alarm is deactivated. If an external gas pump or a corresponding magnetic valve is in the sample gas line, the collective status alarm automatically opens the sample gas line.
Depending on the load, the gas cooler will be switch-on or off in a cycle controlled by the electronic control unit. The green LED in the middle is blinking or turns off completely (normal operating mode). The gas cooler is ready-to-use.

15 Closing Down

Note

The area in which the equipment is situated when not in use must be kept free of frost at all times.

There are no special regulations to be observed if the gas conditioning system is to be closed down for a short period of time.

In the case of a long-term closing down, for example after a series of measurements has been completed, it is recommended to backflush the gas conditioning system with ambient air or inert gas. Under normal conditions, the equipment only needs to be backflushed for 3 to 5 minutes. Condensate residue should also be removed from the system.

Aggressive condensate possible!

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

Wear protective gloves and protective glasses!

Wear proper protective clothing!

16 Maintenance

Maintenance work			Maintenance intervals in months				
	BMK	**Option**	**1**	**3**	**6**	**12**	**36**
Check, clean or replace of the filter	-FI1		C				
Check and replace of the filter	-FI2			C			
Check for condensate in the lines after the gas cooler				C			
Check the temperature of the Peltier sample gas cooler	-E1				C		
Replace hoses of the peristaltic pump	-M2				C		
Replace valve plate and O-rings of the bellow valve pump	-M1					M	
Replace bellows of the below valve pump	-M1						M

M : M&C personnel or other trained personnel **C** : Customer

1. Maintenance work must be carried out only by suitably trained specialist personnel.
2. The recommended maintenance intervals are based on M&C's experience.
3. The maintenance intervals can be further optimised if indicated by experience and local conditions.
4. Depending on the composition of the measuring gas, it could be possible that maintenance intervals have to be shortened. For costs resulting of this M&C will not take any responsibility.

Observe the plant- and process-specific safety measures prior to carrying out maintenance work!

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 !

Note

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

16.1 Maintenance Cooler

Note

Detailed technical information about the sample gas cooler can be found in the ECP1150M operating manual.

Observe the plant- and process-specific safety measures before carrying out maintenance work!

Warning

Dangerous voltage. Disconnect the mains plug before opening the cooler housing!

The ECP 1150M coolers do not require special maintenance intervals.

Depending on the degree of contamination of the ambient air, the cooling fin block must be cleaned from time to time with compressed air.

16.1.1 Replacing the Heat Exchangers

Removal of the heat exchangers may be necessary to carry out maintenance or repair work.
We recommend the following procedures and in this order for replacement of the heat exchangers:

1. Release the upper gas connections and lower condensate connections;

Warning

Aggressive condensate.
Wear safety glasses and appropriate protective clothing!

2. Pull the heat exchangers upwards with rotation out of the cooling block;

Replace the heat exchangers as follows:

1. Dry and clean the push-in opening in the aluminium cooling block with a cloth;
2. Smear the push-in opening with a thin and equal layer of thermal conductivity paste (Part No. 90K0115);
3. Smear the heat exchangers with a thin and equal layer over the whole surface with thermal conductivity paste (Part No. 90K0115) to ensure good conduction of heat. It is best to close off the condensate removal of the heat exchangers tube with adhesive tape to prevent any of the thermal conductivity paste from getting into the heat exchanger;

4. Lightly push the heat exchangers with rotation back into the push-in opening of the cooling block and press to the upper block;
5. Remove the adhesive tape and any surplus thermal conductivity paste;
6. Reconnect the tubing.

Note

Do not confuse tubing. The upper heat exchanger connection is the inlet, the side heat exchanger connection is the outlet and the lower heat exchanger connection is the condensate outlet.

16.2 Maintenance Peristaltic Pump

Note

Detailed technical information about the peristaltic pump can be found in the SR25.2 instruction manual.

The instruction manual can be found at www.mc-techgroup.com

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

Warning

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.

Warning

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.

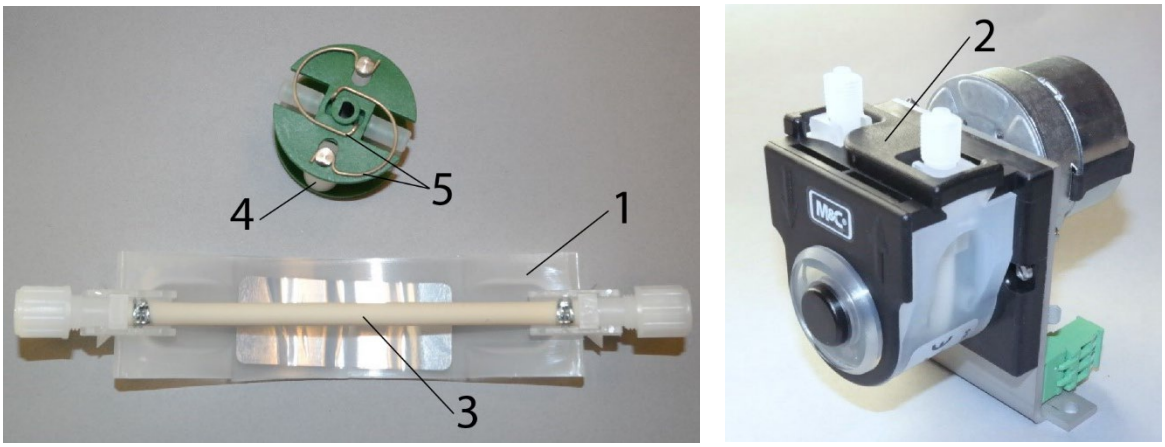
Flexible tube, conveying belt, contact pulleys and contact springs are the only parts of the peristaltic pump subject to wear. They are simple to change.

Note

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.
For this purpose, use the form on our homepage at https://www.mc-techgroup.com/en/service-support/return-of-products

Before sending the pump back clean all parts from dangerous or highly aggressive contaminants.

16.2.1 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 16.2.2);
6. Put the new tubing set ③ with the tube connectors into the guides of the conveying belt ① ;

Note

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.

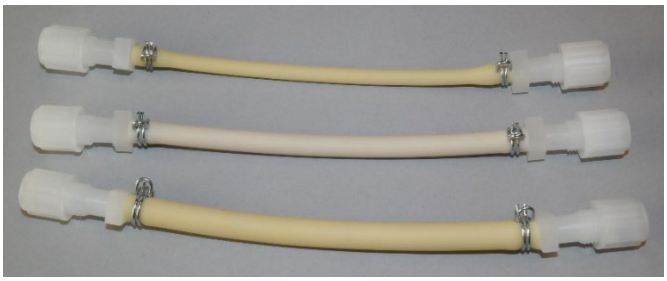


Figure 11 Different pump tube sizes

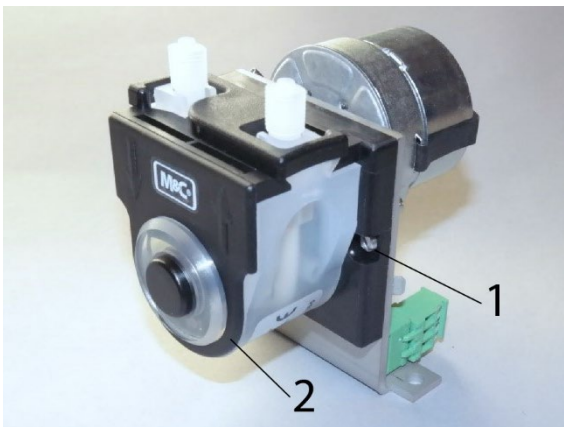
16.2.2 Changing Contact Pulleys and Springs

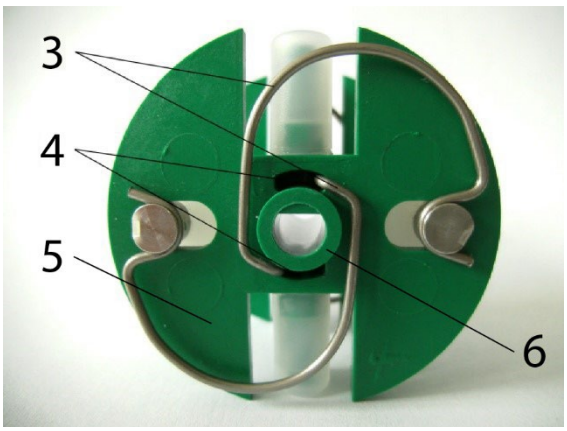
Note

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* **3** *Springs*
4 *Groove* **5** *Driver (roll carrier)* **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).

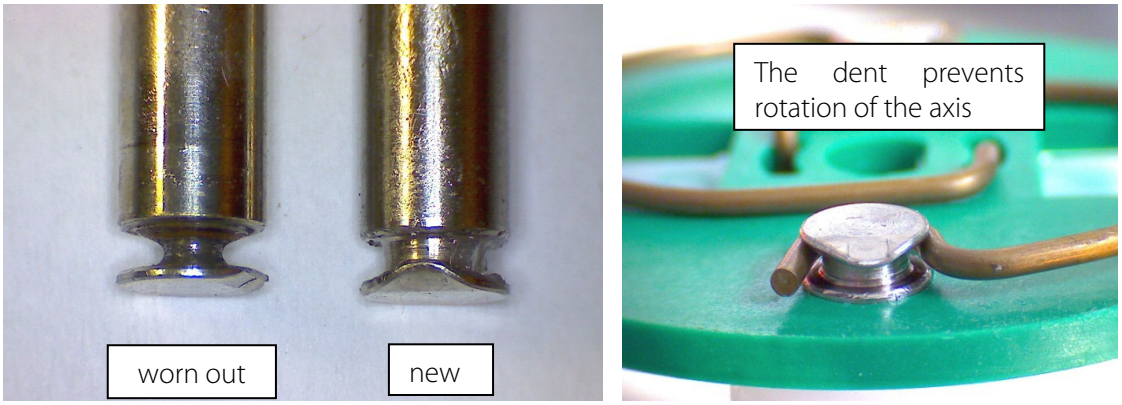


Figure 13 Check of axes and rolls

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 Novopren pump tubing' (Part No. 90P1010) has a diameter of 1.1 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.

7. 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.

16.2.3 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!

16.2.4 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 to clean 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!

16.2.5 Repair Information

Note

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.
For this purpose, use the form on our homepage at https://www.mc-techgroup.com/en/service-support/return-of-products

Before sending the pump back clean all parts from dangerous or highly aggressive contaminants.

16.3 Maintenance Sample Gas Pump

Note

Detailed technical information on the sample gas pump can be found in the MP-F05 instruction manual.
The instruction manual can be found at www.mc-techgroup.com

It is necessary to schedule maintenance work at least twice a year.

The intervals between servicing are dependent on the process and system conditions in your facility. The facility QA/QC plan should address the frequency for maintenance and should be updated based on your operations.

Follow all safety notes and descriptions stated in this manual.

Danger

There may be harmful sample gases in the pump. Prevent potentially harmful gases from escaping the open sample gas lines during maintenance. Purge the pump with inert gas or air before servicing.

Warning

High voltage!

Working without disconnecting the power supply may cause an electrical shock. Disconnect power supply before any assembly, maintenance or disassembly.

Secure the pump against accidental restart.

Aggressive condensate possible.

Chemical burns possible due to aggressive media!

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

The four hexagon socket screws, see Figure 14 part G, need to be re-tightened to a value of 4 Nm [≈ 2.95 ft/lbs] by using a torque wrench. Start to re-tighten one screw. Tighten the opposite screw to the same amount, then select the adjacent pair. Repeat in the same sequence to reach the value of 4 Nm [≈ 2.95 ft/lbs].

The bellows, valve plates and O-rings are the only consumable parts of the sample gas pump. Valve plates must be replaced when they have reached a total thickness of < 1.6 mm [≈ 0.063"] including spacers. It is recommended to replace the O-rings to ensure the tightness of the pump.

Please refer to the spare parts list for our recommended spare parts.

Inspect the following pump components	Action
Pump	Check pump for external damages and any leakage in regular intervals, at least two times per year.
Capacitor	Check the conditions of the adhesive covers of the vents in regular intervals. Replace capacitor with damaged adhesive cover.
Bellows, valve plates and O-rings	Replace at least when performance of the pump decreases. Valve plates must be replaced when they have reached a total thickness of < 1.6 mm [≈ 0.063"] including spacers. It is recommended to replace the O-rings to ensure the tightness of the pump.
Connecting rod bearings	Need to be replaced after 20 000 operating hours or 24 month of operation, whichever occurs first.
Motor bearings	Need to be replaced after 20 000 operating hours or 24 month of operation, whichever occurs first.
Fittings, connections, inlets	Check in suitable intervals. Replace when damaged with original parts in perfect condition.
Equipotential bonding	Check equipotential bonding between pump enclosure and motor. The equipotential bonding needs to be lower than 0.3 Ohm. Use lock washers for the screws.
Additional components, accessories	During maintenance, any upstream filters, separators or coolers must be checked for proper functioning.

Note

If there are any damages to the connection rod, e.g. a loose threaded pin M8 or loose ball bearings, the complete unit with connection rod and bearings need to be replaced (see spare parts list for more details)

The eccentric is glued to the motor shaft by using Loctite 270. This connection is additionally secured by a set screw.

16.3.1 Replacing the Valve Plates

Note

If you replace the valve plates, we also recommend to replace the O-rings C at the same time. New O-rings ensure the tightness of the pump.

For replacing the valve plates, the sample gas fittings don't need to be dismounted.

To replace the valve plates, proceed as follows:

1. Unscrew the crankcase cover. To do this, loosen the 3 hexagon socket screws F (3 mm spanner).
2. Loosen the four hex socket screws G (3 mm spanner).
3. Remove pressure ring H.
4. Remove upper pump head A.

Caution

Turn the pump head A to the right only. This prevents the bellows from detaching from the connecting rod. Then pull the pump head A out upwards.

O-rings C and valve plates B are freely accessible now.

5. The valve plates and O-rings can now be cleaned or replaced.
6. Clean valve seats and pump head with an adequate solvent (e.g. alcohol) and use oil-free compressed air to remove dust particles from the parts.

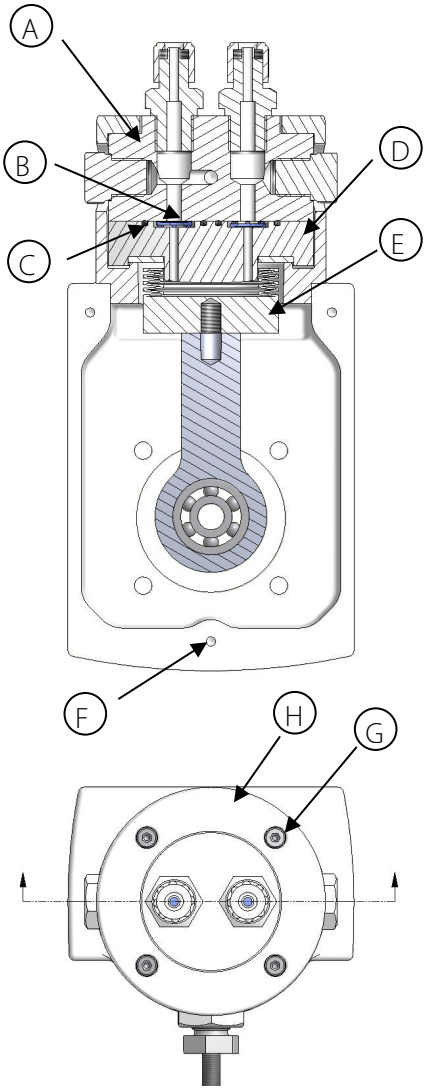


Figure 14 Sectional drawing MP-F..

After replacing or cleaning the valve plates and O-rings, follow these steps to re-assemble the pump:

1. Insert O-rings C into the grooves, and place valve plates B back into the cleaned valve seats. Make sure that the valve plates are in the correct position.

Note

On the pressure side, the smooth side of Valve B is facing downwards, and on the suction side the smooth side of Valve B is facing upwards (operating direction is marked with an arrow on the pump head).

2. Install the upper pump head A and then the pressure ring H again. Align both so that the screws fit into the threads in the housing.
3. Check that the bellows are seated correctly. The bellows must be attached to the connecting rod.
4. Fasten the pressure ring H with the four hexagon socket screws G. First tighten the screws by hand. Start lightly to tighten one screw. Tighten the opposite screw to the same amount, then select the adjacent pair. Repeat in the same sequence, going for a hand-tight setting.

5. Then tighten the four hexagon socket screws alternately in the same sequence with a torque to a value of 4 Nm [≈ 2.95 ft/lbs].
6. Screw the crankcase cover back on again. Tighten the three hexagon socket screws F (wrench 3 mm) by hand.

16.3.2 Replacing the Bellows

Note

If you replace the bellows, we also recommend replacing the O-rings C at the same time. New O-rings ensure the tightness of the pump.

To replace the bellows, proceed as follows:

1. Unscrew the crankcase cover. To do this, loosen the 3 hexagon socket screws F (3 mm spanner).
2. Loosen the four hex socket screws G (3 mm spanner).
3. Remove pressure ring H.
4. Remove upper pump head A.

Caution

Turn the pump head A to the right only. This prevents the bellows from detaching from the connecting rod. Then pull the pump head A out upwards.

5. Remove lower pump head D. For easier removal of the lower pump head D, please close one of the boreholes in the valve seat with your fingers and blow pressured air into the other borehole. This will loosen the lower pump head D.
6. Unscrew the bellows E from the connection rod. Please make sure to leave any spacers which might be there, on the threaded pin.
7. Screw new bellows hand-tight onto the connection rod.

After replacing the bellows, please follow these steps to re-assemble the pump:

1. Put lower pump head D back into place.
2. Insert O-rings C into the grooves, and place valve plates B back into the cleaned valve seats. Make sure that the valve plates are in the correct position.

Note

On the pressure side, the smooth side of Valve B is facing downwards, and on the suction side, the smooth side of Valve B is facing upwards (operating direction is marked with an arrow on the pump head).

3. Install the upper pump head A and then the pressure ring H again. Align both so that the screws fit into the threads in the housing.
4. Check that the bellows are seated correctly. The bellows must be attached to the connecting rod.
5. Fasten the pressure ring H with the four hexagon socket screws G. First tighten the screws by hand. Start lightly to tighten one screw. Tighten the opposite screw to the same amount, then select the adjacent pair. Repeat in the same sequence, going for a hand-tight setting.
6. Then tighten the four hexagon socket screws alternately in the same sequence with a torque to a value of 4 Nm [≈ 2.95 ft/lbs].
7. Screw the crankcase cover back on again. Tighten the three hexagon socket screws F (wrench 3 mm) by hand.

16.3.3 Cleaning Instructions

- When changing valve plates and bellows, inspect all parts for contamination before assembling the pump head and clean them if necessary.

- Only use adequate solvents (e.g. alcohol) to prevent corrosion of the plastic parts (PTFE, PFA, FEP). If available, use oil-free compressed air to remove dust particles from the parts.

17 Trouble Shooting

Error messages:

- Condensate alarm – B1 terminal -X2: 1/2
- Flow monitoring alarm – B2 terminal -X2: 4/5

The error messages can be retrieved potential-free at the terminal rail -X2.
Maximum contact load 250 V AC/DC, AC = 500 VA, DC = 45 W, 2 A

Note

Note that the liquid alarm and the Peltier cooler alarm stops the bellow pump with needle valve!

The following table shows possible operational problems and offers solutions (not applicable during the starting procedure).

Indication	Problem	Possible Cause	Check/Solution
Upper LED on cooler is red;	Interruption of gas flow	No power	Check supply voltage with model type plate; OK? Check whether the supply voltage plug is inserted correctly and if the main switch is in position '1' OK? Check the fine fuse on connector block; OK?
		Cooler does not function. Cooler alarm registers 'excess temperature'. Cooler turns off sample gas pump automatically	Ambient temperature too high. OK? Cooler failure (check manual ECP1150M). OK?
Middle LED on cooler is green	Cooler works, but gas flow is interrupted	Sample gas pump doesn't work	Check voltage on clamps X1/14 and X1/9; ok?
		Sample gas pump is clogged	**DANGER! Toxic gas! Flush pump with inert gas or air!** Remove the tubing at the pump head and check; OK? Clean pump if necessary; OK?
		Sample gas probe/line is clogged or line is compressed	**DANGER! Toxic gas! Flush pump with inert gas or air!** Remove sample gas line at the gas inlet; Gas flow? Clean clogged line or replace; No gas flow?
		Sample gas line to analyzer is clogged or compressed	**DANGER! Toxic gas! Flush pump with inert gas or air!** Remove sample gas line on analyzer side and check on the line connector if sample gas flows; No gas flow? Clean clogged line or replace; Gas flows?
Alarm LED on the LA electronics is red		Optional liquid alarm sensor:	Cooler is overloaded momentarily due to excessive amount of condensate; OK?

Indication	Problem	Possible Cause	Check/Solution
		Sensor turns off sample gas pump automatically	**WARNING! Aggressive condensate! Use personal protective equipment!** Check tubing for condensate removal; OK? Check peristaltic pump tubing (see instruction manual peristaltic pump SR25.2); OK? Check peristaltic pump SR25.2 (see manual peristaltic pump SR25.2); OK?
		Optional flowmeter: Needle valve closed	Check cooler according to instruction manual; Adjust needle valve to the desired flow
Middle LED on cooler is green	Cooler and sample gas pump are working; condensate in sample gas line	Peristaltic pump tubing defective	Peristaltic pump not working? **WARNING! Aggressive condensate! Use personal protective equipment!** Change pump tubing (see instruction manual peristaltic pump SR25.2); OK?
		Peristaltic pump SR25.2 defective	Check peristaltic pump (see instruction manual peristaltic pump SR25.2) OK?
		Sample gas is not sufficiently dry	Check cooler (see instruction manual ECP1150M);
LED of the LA electronics is green		Optional liquid alarm sensor: Sensor did not turn off pump.	Check the LA electronics and replace if necessary

18 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.

19 Spare Parts List

The replacement interval for spare parts and consumables depends on the specific operating condition of the probe.

The quantities recommended in the following table are based on experience. Your replacement intervals will be based on your operating conditions.

Portable Sampling System Versions SS-M05 **(C) consumable parts, (R) recommended spare parts, (S) spare parts**					
			recommended quantity **SS-M05** being in operation [years]		
		C/R/S	1	2	3
Spare parts and maintenance kits					
03G6005	Spare part kit for SS-M05 for use on ships consisting of: 1 x 93K1015 Fan ECP1150M 1 x 05P1010 MP-F 05 R 5 m 02B1000 PTFE tube, DN 4/6 1 x 90P1050 SR25, conveying belt 1 x 95P0010 Bellows, PTFE, MP-F 1 x 01K1255X Electric gas cooler ECP1150M, analyt. part 1 x 90P1020 SR25, driver, complete 1 x 90F0002 Filter element F-2T 1 x 01P1307 SR25.2.W, 0,3 Nl/h, 115/230 V 1 x 90F0012 Filter glass F-120G	R			
03G6010	Maintenance kit for SS-M05 for use on ships. We recommend 1 x kit for every 6 months at sea, consisting of: 4 x 95P0035 O-Ring, FEP, 18 x 2, MP-F 2 x 90P1007 SR25, tube set, connection DN 4/6 4 x 90P1110 MP47/MP-F, valve plate, PTFE	C	2	4	6
Fine filter FP-2T: ⑦ (see Fig. 2)					
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** (for deep filter element)	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
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* and gas pump MP-F05					
90P1007	Tubing set with Novoprene tubing and PVDF-tube connectors DN 4/6	C	2*	4*	8*
90P1110	Valve plate MP-F	C	2	4	6
95P0010	Bellows MP-F, PTFE	C	-	-	1
95P0035	O-ring FEP 18 x 2 MP-F	R	2	4	6
95P0030	Pump head MP-F lower part. material: PTFE	S	-	-	-

Portable Sampling System Versions SS-M05

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

			recommended quantity **SS-M05** being in operation [years]		
		C/R/S	1	2	3
95P0025	Pump head MP-F upper part. material: PTFE	S	-	-	-
95P0040	Connection rod with eccentric and ball bearing for MP-F05	S	-	-	-
95P0026	Pump head MP-F upper part with bore hole for needle valve, material: PTFE	S	-	-	-
90P6030	Needle valve for MP-F../R gasket made of PTFE and. needle made of PTFE	S	-	-	-
90P6015	Replacement needle made of PTFE for MP-F/R	S	-	-	-
90P6020	Gasket made of PTFE for needle valve for MP-F/R	S	-	-	-
90P6025	Adapter made of PTFE for needle valve for MP-F/R	S	-	-	-
Option flowmeter FM40:					
90A0015	Flowmeter glass for FM40 range **7-70 l/h** air	S	-	1	1
94F0010	Flowmeter glass for FM40 range **15-150 l/h** air	S	-	1	1
94F0015	Flowmeter glass for FM40 range **25-250 l/h** air	S	-	1	1
94F0020	Flowmeter glass for FM40 range **50-500 l/h** air	S	-	1	1
90A0018	Viton O-ring 9 for flowmeter glass FM40	R	2	4	6
Diverse:					
90K6030	Fine fuse 4A T, 5 mm x 20 mm for **PSS...**	R	5	5	5
90G0020	Fine fuse 10A T, 5 mm x 20 mm for **PSS... with option temp. controller and heated sample line**	R	5	5	5
Hose and hose fittings:					
05V3215	Bulkhead union SV-PVDF DN 4/6 **PSS-5 optional PVDF = Polyvinylidenfluoride**	R	2	2	2
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
01T2000	Hose Novoprene DN 3.2/6.4 (meters)	S	1	2	3
02B1000	Hose PTFE DN 4/6 (meters)	S	1	2	3
10T1000	Hose cutter	S	1	1	1

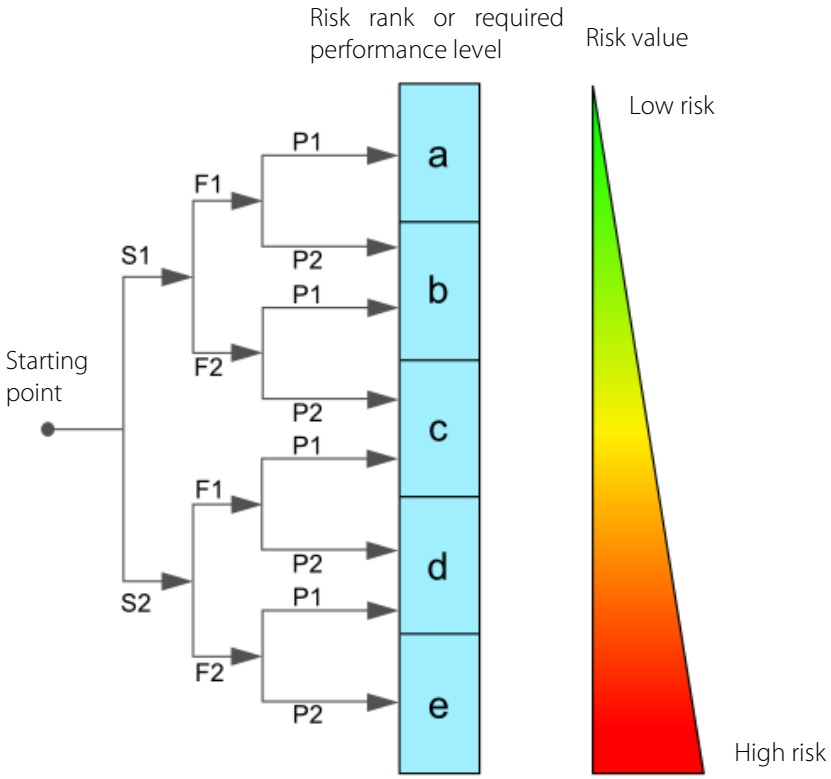
* The recommended number of tubing sets per year may vary depending on the process conditions and pumped medium.

20 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 15 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 °C [140 °F] .
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 [≈ 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.

21 Appendix

- Wiring diagram part 1
- Wiring diagram part 2
- DNV Type Approval Certificate

Further product information is available on our home page:
www.mc-techgroup.com

- Instruction manual electric gas cooler **ECP1150M**
- Data sheet for Universal-Filters **FP, FT, FPK, FS, FSS**
- Instruction manual bellows pump with needle valve **MP-F05**
- Instruction manual peristaltic pump **SR25.2**
- Data sheet for Liquid alarm sensor **LA1S** and electronic controllers type **LA1.4**
- Data sheet for Flow meter **FM40**
- Data sheet for Ball valves **L/PV-1**
- Data sheet for Temperature controller **701**

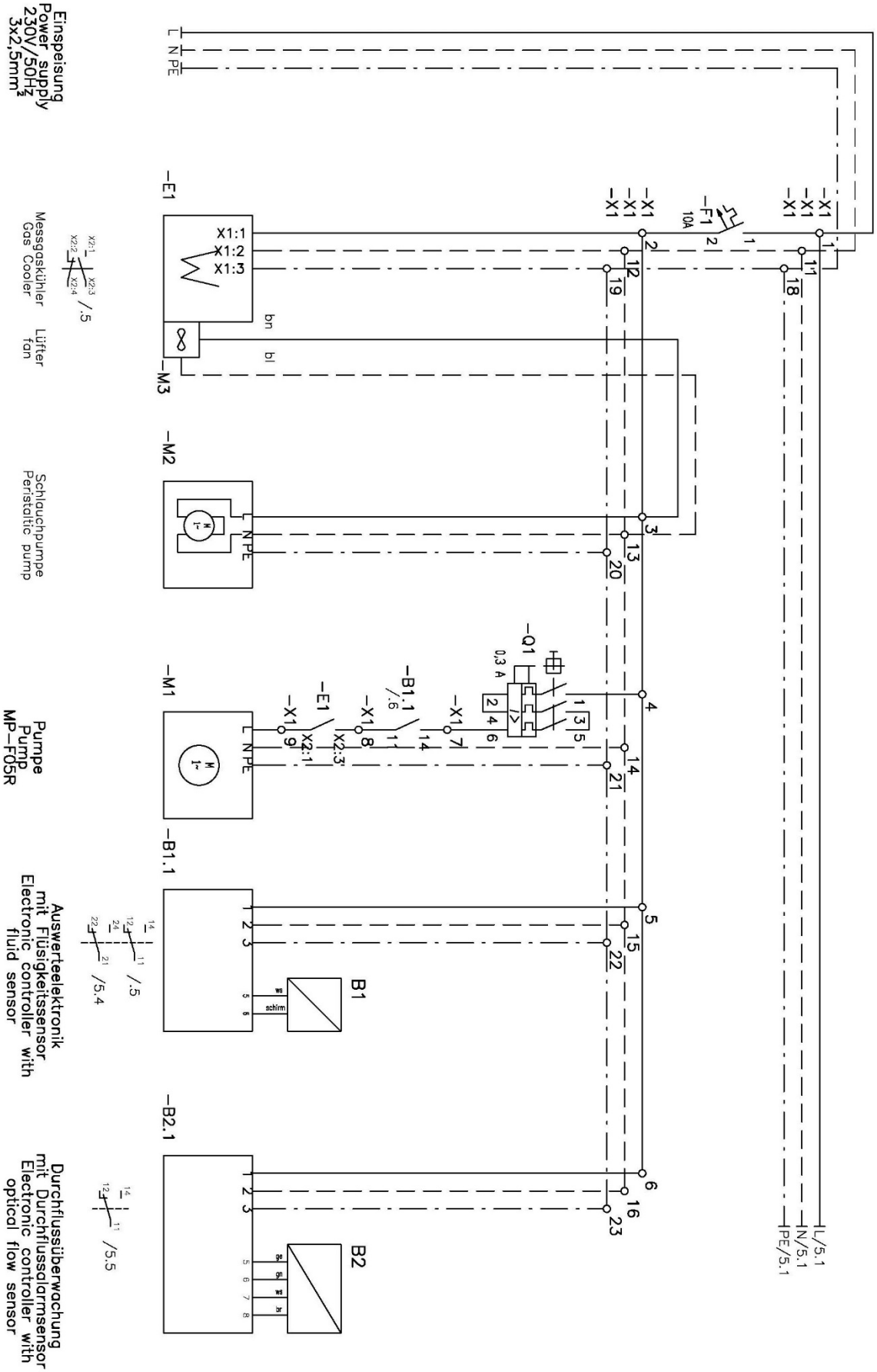


Figure 16 Wiring diagram part 1

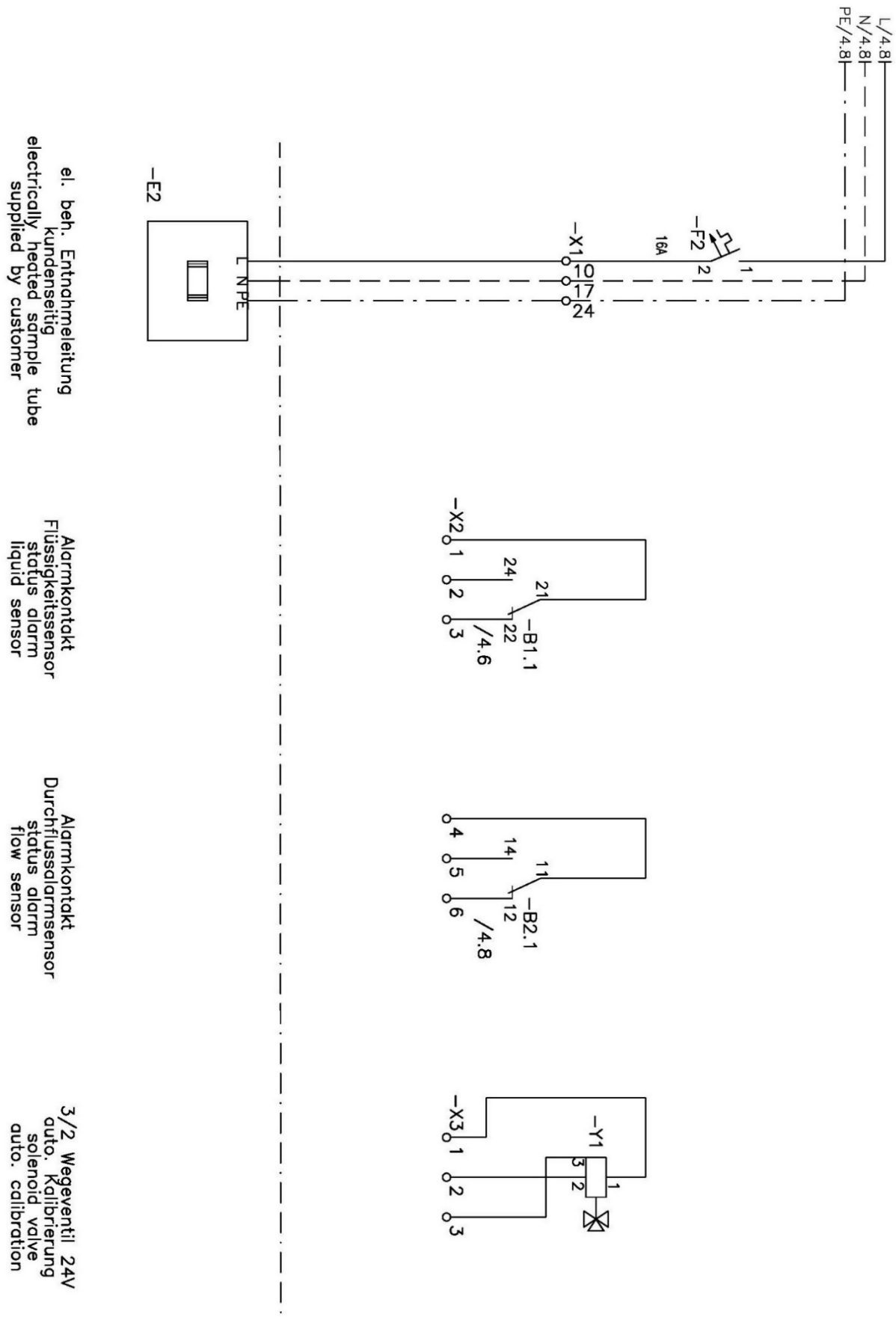


Figure 17 **Wiring diagram part 2**

DNV

TYPE APPROVAL CERTIFICATE

Certificate No:
TAA000018R
Revision No:
1

This is to certify:

That the Test and Calibration Equipment

with type designation(s)
Gas Conditioning System SS-M05

Issued to
M&C Techgroup Germany GmbH
Ratingen, Nordrhein-Westfalen, Germany

is found to comply with
DNV rules for classification – Ships, offshore units, and high speed and light craft

Application :

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV.

Location classes:

Temperature	**A**
Humidity	**B**
Vibration	**A**
EMC	**A**
Enclosure	**B**

Issued at **Hamburg** on **2022-12-20**

This Certificate is valid until **2027-12-19**.
DNV local station: **Essen**

Approval Engineer: **Heinz Scheffler**

for **DNV**
Digitally Signed By: Papanuskas, Joannis
Location: DNV GL SE Hamburg, Germany

Joannis Papanuskas
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

DNV

Job Id: **262.1-021044-3**
Certificate No: **TAA000018R**
Revision No: **1**

Product description

The gas treatment device is used for gas preparation of continuous measurement of emissions in Marine applications. The system consists of a stainless-steel housing which accommodates the main components such as cooler, peristaltic pump, bellow valve pump, flowmeter with sensor and components for auto cal of the Analyzer (external device).

Electrical performance data

Power supply	AC 230V, 50Hz
Power consumption	220VA up to max. 1600VA (depending on heated sample line length)

Physical setting data

Peltier coller	Setpoint +5°C
Flow rate sample gas	Approx..: 1.2 … 1.6Nl/min (72 … 100Nl/h)

Gas inlet conditions

Sample gas pressure Sample gas pump	Pressureless suction operation Adjustable via regulating valve in the pump head to 72 … 100Nl/h)
Sample gas temperature	Max. 70°C, saturated

Application/Limitation

The Type Approval covers hardware listed under Product description. When the hardware is used in applications to be classed by DNV, documentation for the actual application is to be submitted for approval by the manufacturer of the application system in each case. Reference is made to DNV Rules for Ships Pt.4 Ch.9 Control and Monitoring Systems.

Type Approval documentation

Test report: 216-16 (08.05.2017); 314-16 (08.12.2016); M&C 001-index 00 (07.02.2016); M&C no. 161003-002-index 00 (16.03.2017); Test plan M&C V00 (02.06.2016); 345-22 (05.10.2022); Function Test (14.12.2022)
Documents: System description of the Gas treatment Device for Marine Application no. 1610003 (07.07.2016); Technical specifications Version 8.22 - 1.00.06; Instruction Manual Version 1.01.02
Drawings:1348-5.00.0 (12.01.2017); 1348-1.00.0 (24.06.2016); 1348-4.03.0 (03.01.2017)

Tests carried out

Applicable tests according to Class Guideline DNVGL-CG-0339, Edition August 2021.

Marking of product

The products to be marked with:

- manufacturer name
- type
- serial number

Periodical assessment

The scope of the periodical assessment is to verify that the conditions stipulated for the type are complied with, and that no alterations are made to the product design or choice of systems, software versions, components and/or materials.

The main elements of the assessment are:

- Ensure that type approved documentation is available
- Inspection of factory samples, selected at random from the production line (where practicable)
- Review of production and inspection routines, including test records from product sample tests and control routines
- Ensuring that systems, software versions, components and/or materials used comply with type approved documents and/or referenced system, software, component and material specifications
- Review of possible changes in design of systems, software versions, components, materials and/or performance, and make sure that such changes do not affect the type approval given
- Ensuring traceability between manufacturer's product type marking and the type approval certificate

Periodical assessment is to be performed after 2 years and after 3.5 years. A renewal assessment will be performed at renewal of the certificate.

END OF CERTIFICATE