

Pre-Cooling Unit Series VC

VC-1, VC-1-SL, VC-2-L, VC-2-SL

Instruction Manual
Version 1.00.02





Dear customer,

we have made up this operating manual in such a way that all necessary information about the product can be found and understood quickly and easily.

Should you still have any question, please do not hesitate to contact **M&C** directly or go through your appointed dealer. Respective contact addresses are to be found in the annexe to this operating manual. Please also contact our homepage www.mc-techgroup.com for further information about our products. There, you can read or download the data sheets and operating manuals of all **M&C** products as well as further information in German, English and French.

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

© 04/2016 **M&C TechGroup** Germany GmbH. Reproduction of this document or its content is not allowed without permission from **M&C**.

Version: 1.00.02

Content

1	General information	4
2	Declaration of conformity	4
3	Safety instructions	5
4	Warranty	5
5	Used terms and signal indications	6
6	Introduction	7
7	Application	7
8	Technical Data	7
9	Description	8
10	Function	10
11	Reception and storage	11
12	Installation instructions	12
13	Supply connections	12
13.1	Hose connections	12
13.2	Electrical connections	13
14	Start-up	14
15	Closing down	14
16	Maintenance	14
16.1	Cleaning the cooling fins	14
16.2	Maintenance of the peristaltic pump(s), type SR25.1 and SR25.2.....	15
16.2.1	Change of the pump tube.....	15
16.2.2	Change of contact pulleys and springs.....	16
16.2.3	Cleaning the pump head	16
17	Spare parts list	17
18	Appendix	18

List of illustrations

Figure 1	Dimensions VC-1	8
Figure 2	Dimensions VC-1-SL	9
Figure 3	Dimensions VC-2-L.....	9
Figure 4	Dimensions VC-2-SL	10
Figure 5	Schematic diagram of the heat exchanger function.....	11
Figure 6	Electrical connection VC-1-SL	13
Figure 7	Electrical connection VC-2-SL	13
Figure 8	Change of the pump tube	15

Head Office

M&C TechGroup Germany GmbH ♦ Rehhecke 79 ♦ 40885 Ratingen ♦ Germany
Telephone: 02102 / 935 - 0
Fax: 02102 / 935 - 111
E - mail: info@mc-techgroup.com
www.mc-techgroup.com

1 GENERAL INFORMATION

The product described in this operating manual has been examined before delivery and left our works in perfect condition related to safety regulations. In order to keep this condition and to guarantee a safe operation, it is important to heed the notes and prescriptions made in this operating manual. Furthermore, attention must be paid to appropriate transportation, correct storage, as well as professional installation and maintenance work.

All necessary information a skilled staff will need for appropriate use of this product are given in this operating manual.

2 DECLARATION OF CONFORMITY



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

EMV-Instruction

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

Low Voltage Directive

The requirement of the EU directive 2014/35/EU “Low Voltage Directive“ are met.
The compliance with this EU directive has been examined according to DIN EN 61010.

Declaration of conformity

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

3 SAFETY INSTRUCTIONS

Please take care of the following basic safety procedures when mounting, starting up or operating this equipment:

Read this operating manual before starting up and use of the equipment. The information and warnings given in this operating manual must be heeded.

Any work on electrical equipment is only to be carried out by trained specialists as per the regulations currently in force.

Attention must be paid to the requirements of VDE 0100 (IEC 364) when setting high-power electrical units with nominal voltages of up to 1000 V, together with the associated standards and stipulations.

Check the details on the type plate to ensure that the equipment is connected to the correct mains voltage.

Protection against touching dangerously high electrical voltages:

Before opening the equipment, it must be switched off and hold no voltages. This also applies to any external control circuits that are connected.

The device is only to be used within the permitted range of temperatures and pressures.

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

The devices must not be used in hazardous areas.

Installation, maintenance, monitoring and any repairs may only be done by authorized personnel with respect to the relevant stipulations.

4 WARRANTY

If the equipment fails, please contact **M&C** directly or else go through your **M&C** authorised dealer. We offer a one year warranty as of the day of delivery as per our normal terms and conditions of sale, and assuming technically correct operation of the unit. Consumables are hereby excluded. The terms of the warranty cover repair at the factory at no cost or the replacement at no cost of the equipment free ex user location. Reshipments must be send in a sufficient and proper protective packaging.

5 USED TERMS AND SIGNAL INDICATIONS



DANGER!

This means that death, severe physical injuries and/or important material damages **will occur** in case the respective safety measures are not fulfilled.



WARNING!

This means that death, severe physical injuries and/or important material damages **may occur** in case the respective safety measures are not fulfilled.



CARE!

This means that minor physical injuries **may occur** in case the respective safety measures are not fulfilled.

CARE!

Without the warning triangle means that a material damage may occur in case the respective safety measures are not met.

ATTENTION!

This means that an unintentional situation or an unintentional status may occur in case the respective note is not respected.



NOTE!

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

SKILLED STAFF

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

6 INTRODUCTION

The **VC-...** pre-cooling units produced by **M&C** incorporates the “Jet-Stream” design of heat exchanger. This design induces condensate formation and guarantees optimum dew point reduction to ambient temperature.

7 APPLICATION

The **M&C** pre-cooling units **VC-...** are used in gas analysis to lower the dew point of humid gas, for example:

- to relieve downstream main cooling system
- if process-bound water or steam irruption can become forward,
- if non-heated sample lines without adequate slope are mounted,
- for gas analysis system with electrochemical sensors.

8 TECHNICAL DATA

Pre-cooling unit version VC-..	VC-1	VC-1-SL	VC-2-L	VC-2-SL
Part No. 230V 50-60Hz	03K1000	03K3000	03K4000	03K5000
Part No. 115V 50-60Hz	03K1000	03K3000a	03K4000a	03K5000a
Jet-Stream heat exchanger out of Duran glass EC-G	1x	1x	2x	2x
Forced ventilation	no	yes	yes	yes
Autom. condensate removal with SR25..		1x		2x
Sample gas connection	2x GL18-6	2x GL18-6	4x GL18-6	4x GL18-6
Condensate connection	1x GL25-12	1x DN4/6	2x GL25-12	2x DN4/6
Power consumption		25VA	20VA	30VA
Gas flow rate recommended, (other flow rates possible)	1x 250 NI/h	1x 250 NI/h	2x 250 NI/h	2x 250 NI/h
Weight approximately	ca. 3,5 kg	ca. 7,5 kg	ca. 9 kg	ca. 11 kg
Sample gas pressure	max. 3 bar g			
ΔP per heat exchanger	4 mbar at 300 NI/hr			
Stagnant space per heat exchanger	70 ml			
Sample inlet temperature	max. 180 °C			
Ambient temperature	+2 °C to +45 °C			
Storage temperature	0 °C to +55 °C			
Electrical connection	Terminals max. 2,5 mm ² , PG11 cable gland			
Electrical standard / Case protection	EN 61010 / IP22-EN60529			
Method of mounting / Ready for working	mounting / immediately			
Material of sample contacting parts	Duran glass®, PTFE	Duran glass®, PTFE, PVDF, Novoprene	Duran glass®, PTFE	Duran glass®, PTFE, PVDF, Novoprene

9 DESCRIPTION

The condensate formed should be removed with a small peristaltic pump, sample trap or collection vessel. The **VC-...-SL** pre-cooling unit has as a standard peristaltic pumps **SR25.1** for automatic condensate removal. The **VC-...-L** pre-cooling unit has got a fan to force the ventilation of the cooling fins for performance rise. In this case, a deflector is integrated for an optimal air conduction. The **VC-1-..** pre-cooling unit is equipped with one EC-Jet-Stream heat exchanger. The **VC-2-..** pre-cooling unit is equipped with two EC-Jet-Stream heat exchangers to connect two independent sample streams or parallel or series function to connect one sample stream with a corresponding high flow rate. The compact lightweight design of this device makes it ideal for use in portable and continuous sample conditioning systems. The pre-cooling units are self-controlling with low maintenance.

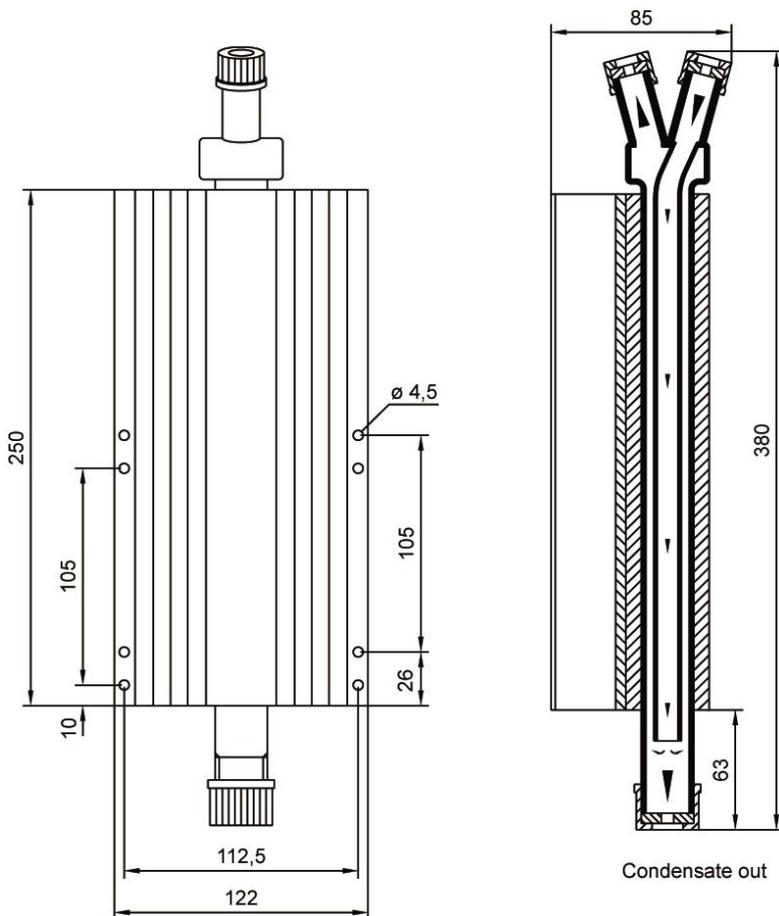


Figure 1 Dimensions VC-1

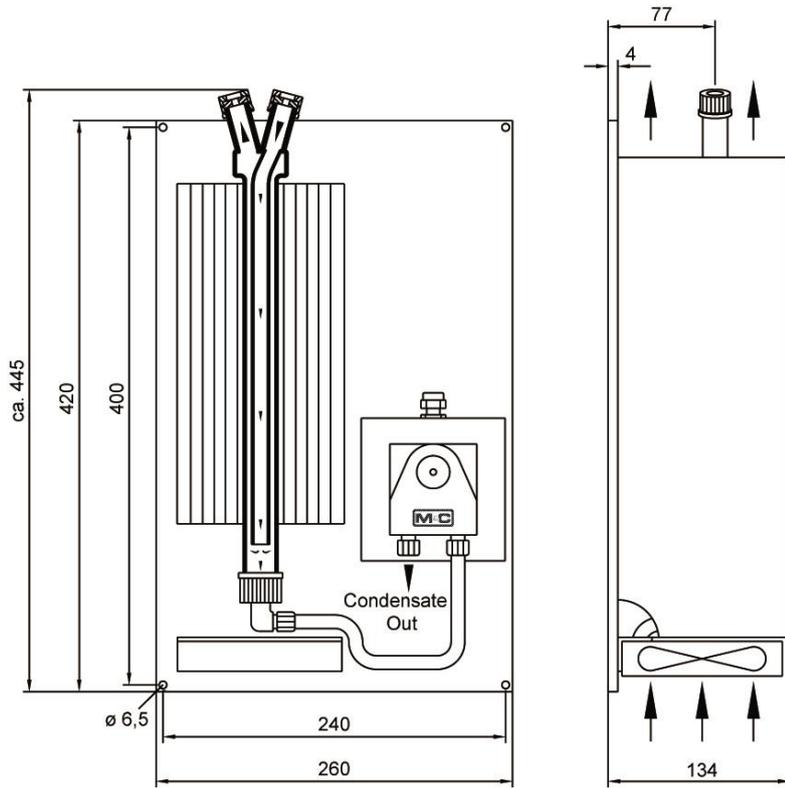


Figure 2 Dimensions VC-1-SL

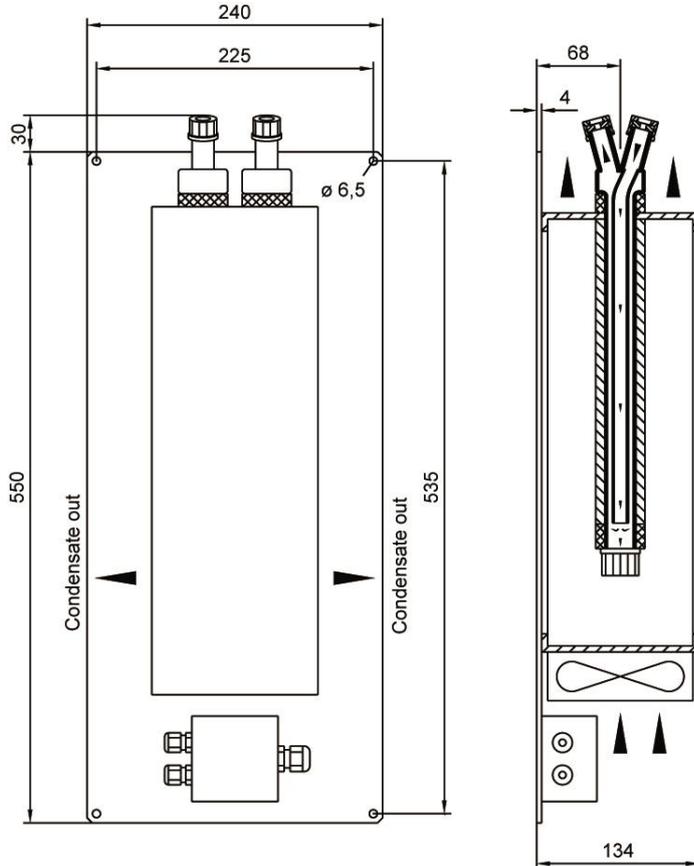


Figure 3 Dimensions VC-2-L

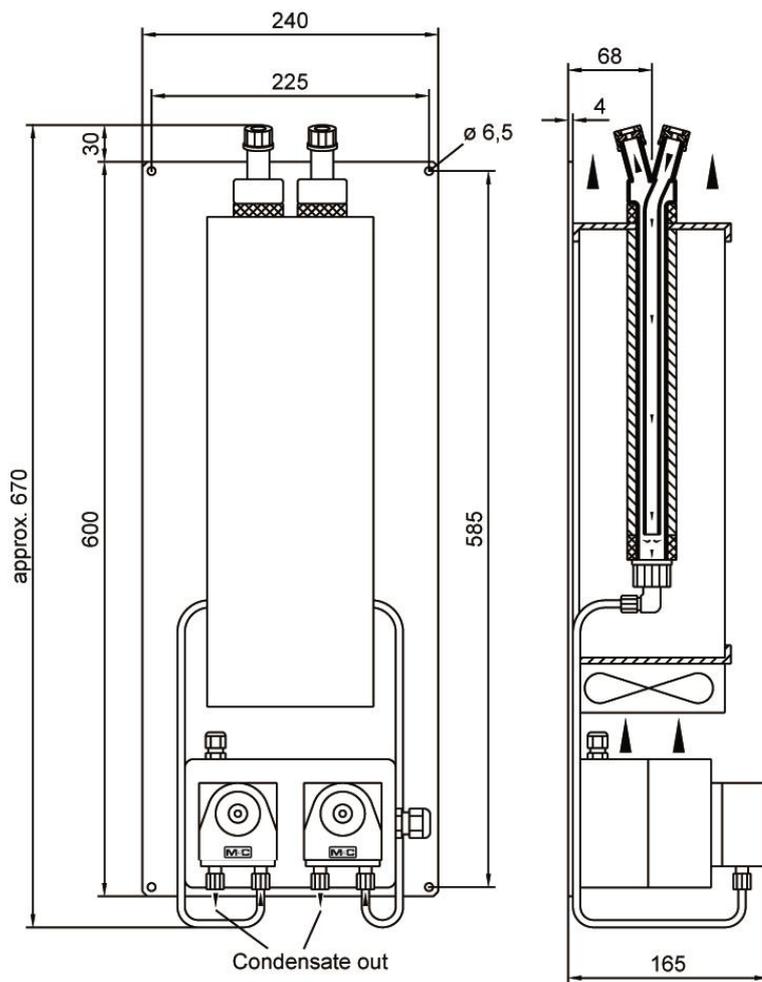


Figure 4 Dimensions VC-2-SL

10 FUNCTION

The especially for gas analysis designed **M&C** gas pre-cooler type **VC-..** cools sample gas down to ambient temperature. The novel construction of the jet-stream heat exchangers guarantees a very good pre-separation of condensate and for that reason an optimal drying of sample gas with a minimum of washing out effects. Figure 3 shows the functional diagram of the heat exchanger.

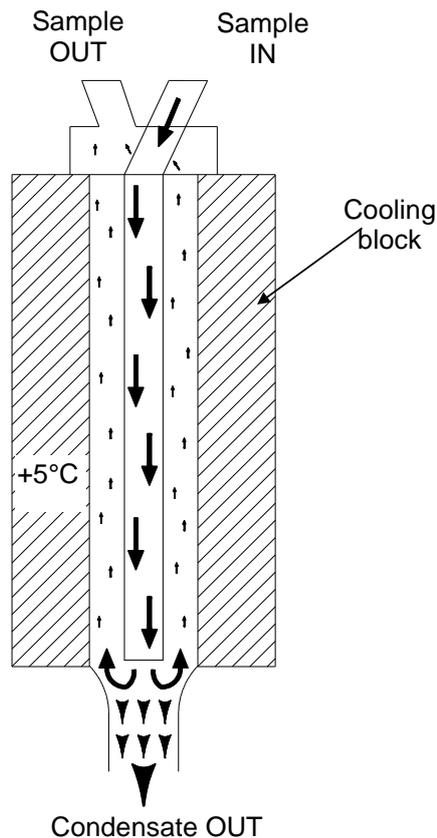


Figure 5 Schematic diagram of the heat exchanger function

11 RECEPTION AND STORAGE

The gas cooler **VC-**.. are complete pre-installed units.

- Carefully inspect the cooler and any special accessories included with it immediately on arrival by removing them from the packing and checking for missing articles against the packing list !
- Check the items for any damage in transit and, if required, inform the shipping insurance company immediately of the damage found!



NOTE!

The cooler must be stored in a weather protected frost-free area!

12 INSTALLATION INSTRUCTIONS

The cooler VC-.. is suitable for wall mounting. Mounting dimensions see figure 1-4.



NOTE!

Unheated gas sample lines must be provided with slope up to the cooler. Connect the heated sample line with sufficient thermal decoupling of min. 20cm to the cooler!

13 SUPPLY CONNECTIONS

13.1 HOSE CONNECTIONS

The connection for sample gas inlet and outlet happens at the GL-connectors on the upper part of the heat exchangers. In standard a hose with 6mm outer diameter is connected. **M&C** tube resp. hose connectors are available as option (see data sheet 3-5.1.1)



NOTE!

Do not mix up the hose connections; the inlet and outlet connections of the heat exchangers are marked with arrows; Ensure that the connections are sealed adequately; To ensure free removal of the condensate, ensure that the listed diameters for the condensate removal lines are not reduced!

Ensure that the connections are sealed adequately by noting the following:

- Before assembly, check the GL coupling rings to see if the PTFE/silicon locking rings have been damaged.
- The sealing rings should be installed with the PTFE side facing the medium.

The condensate connection for the **VC-1-SL** and **VC-2-SL** is done at the hose connectors DN4/6 of the peristaltic pumps.

For **VC-1** and **VC-2L** the connection is done at the bottom of the heat exchanger with the following possibilities of condensate removal:

- peristaltic pump(s) type **SR25.1** or **SR25.2-G** (required connection adapter part no. 09F9520 for VC-1 resp. 05V6035 for VC-2L),
- external mounted condensate vessel(s) with manually emptying (required connection adapter part no. 09F9525 DN6/8 or 09F9530 DN10/12),
- automatic float-type condensate traps type **AD-...** (only for excess pressure operation). (required connection adapter part no. 09F9525 DN6/8 or 09F9530 DN10/12).

13.2 ELECTRICAL CONNECTIONS



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



Attention must be paid to the requirements of IEC 364 (DIN VDE 0100) when setting high-power electrical units with nominal voltages of up to 1000V, together with the associated standards and stipulations.

An external main switch must be provided.

The main circuit must be equipped with a fuse (over current protection); for electrical details see technical data (chapter 8).

The electrical connection of the **VC-1-SL** is done in the housing of the peristaltic pump **SR25.2-G**:

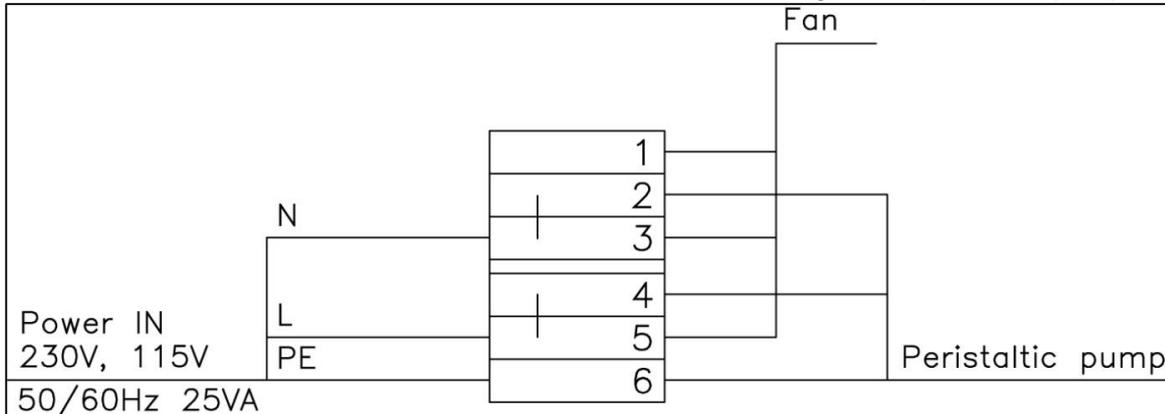


Figure 6 Electrical connection VC-1-SL

The electrical connection of the **VC-2-L** is done in the connection box at terminals:
L = 3, N = 2 and PE = 1

The electrical connection of the **VC-2-SL** is done in the housing of the 2 peristaltic pumps **SR25.1**:

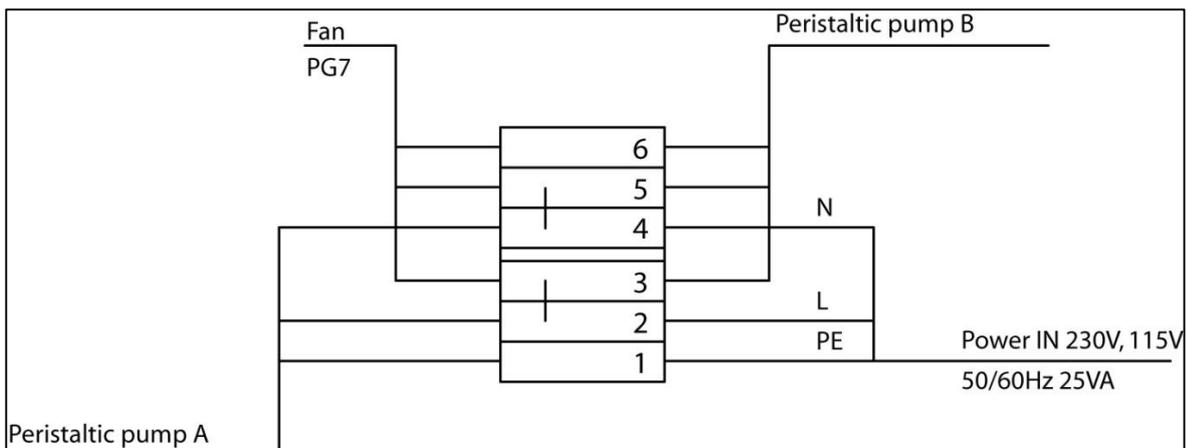


Figure 7 Electrical connection VC-2-SL

14 START-UP

The following steps should be carried out before initial start-up:

- Connect the cooler unit to the mains power supply (except **VC-1**); Check that the equipment is connected to the correct mains voltage, 115V or 230V, as shown on the type plate.

15 CLOSING DOWN



NOTE!

The location for the cooler must remain frost-free, even when the unit has been switched off!

If the cooler unit is putting out of action for a short time no particular measures need to be taken.

We recommend sweeping the cooler with inert gas or ambient air while the unit is putting out of action for a longer time.



CARE!

Aggressive condensate is possible.

Wear protective glasses and proper protective clothing!



16 MAINTENANCE

The safety instructions specific to the plant and process are to be consulted prior to any maintenance work!



DANGER!

Dangerous voltage!

It is necessary to take the gas cooler off the mains before any assembly, maintenance and repair work is carried out!



The cooler **VC-..** does not require any special maintenance intervals.

16.1 CLEANING THE COOLING FINS

Dust on the cooling fins reduces the cooling capacity. Therefore it is necessary to clean the fins from time to time. The following steps are recommended:

- Disconnect the cooler from the mains (except **VC-1**);
- Unscrew the cooler hood and remove it carefully (except **VC-1**);
- Clean the fins carefully with compressed air;
- Re-install the cooler hood;

16.2 MAINTENANCE OF THE PERISTALTIC PUMP(S), TYPE SR25.1 AND SR25.2

Before the maintenance work is carried out, it is necessary that the specific safety procedures pertaining to the system and operational process are observed !



Dangerous voltage !

It is necessary to take the pump off the mains before any assembly, maintenance and repair work is carried out !



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

16.2.1 CHANGE OF THE PUMP TUBE



Aggressive condensate is possible !

Wear protective glasses and proper protective clothing !



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

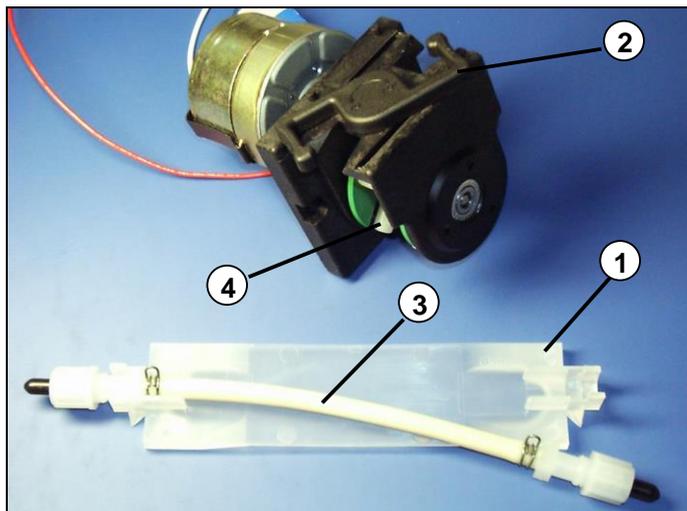


Figure 8 Change of the pump tube

- Take off the cooler of the mains;
- Open hose connectors at the pump;
- Press conveying belt ① at the recessed grips and turn S-bolt ② clockwise up to limit stop;

- Take away conveying belt ① and remove the old hose set ③ from the guides by the hose connectors;
- 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 16.2.2);
- Put the new hose set ③ with the hose connectors into the guides of the conveying belt ① ;

**NOTE!**

**Only the usage of the original hose set guarantees a perfect function.
Never lubricate the hose.**

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

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

16.2.2 CHANGE OF CONTACT PULLEYS AND SPRINGS

- Take off the cooler of the mains;
- Unscrew the nut of the pump head (span of the jaw 5,5);
- Draw the pump head out of the motor shaft; Now the driver can be picked out of the pump head and is ready for maintenance.
- The removal of the springs (4 pcs.) away from the driver is possible without the aid of any tools. Therefore press together the spring and take it out of the groove in the driver respectively out of the boring in the axle. Now the roller bearing axle can be dismantled and the contact pulleys are ready for change.
- Remounting happens in the opposite way.

**NOTE!**

**While mounting pay attention to the fit of 'rotational axis driver'.
Use genuine M&C spare parts only!**

16.2.3 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.
- As far as possible clean the parts with a dry cloth. Solvents should not be used as they can attack the plastics and synthetic rubber parts. If a compressed air line is available, blow the parts out with it.

**CARE!**

Aggressive sample is possible!

**Wear protective glasses and proper protective clothing
during disassembly, repair or cleaning!**



17 SPARE PARTS LIST

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

Electric gas cooler VC-..					
(C) Consumable parts (R) Recommended spare parts (S) Spare parts					
		Recommended quantity being in operation [years]			
Part No.	Indication	C/R/S	1	2	3
02 K 9100	Jet-stream heat exchanger type EC-G. Material: Duran-glass. Connections: Sample gas: 2x GL18-6mm, Condensate: 1x GL25-12mm	R	1	1	1
90 K 0115	Thermal conductivity paste, -20 to +140°C, silicon free, 50gr.	R	1	1	2
90 K 0035	ECP, EC-FD fan 230V 50Hz.	C	-	-	1
91 F 1010	Sealing ring GL18-6mm, material: PTFE.	R	2	4	6
91 F 1015	Sealing ring GL18-8mm, material: PTFE.	R	2	4	6
90 F 0025	Sealing ring GL25-12mm, material: PTFE.	R	2	4	6
91 F 1005	Spare union nut GL18	R	1	1	1
91 F 1007	Spare union nut GL18/14	R	1	1	1
90 F 0020	Spare union nut GL 25	R	1	1	1
90 F 0022	Spare union nut GL 25/18	R	1	1	1
09 F 9500	Connector/adaptor GL18 DN4/6 PV	S	-	-	-
09 F 9520	Connector/adaptor GL25 DN4/6 PV.	S	-	-	-
09 F 9525	Connector/adaptor GL 25 DN6/8 PV	S	-	-	-
09 F 9530	Connector/adaptor GL 25 DN10/12 PV	S	-	-	-

Peristaltic pump SR25.1 and SR25.2					
(C) Consumable parts (R) Recommended spare parts (S) Spare parts					
		Recommended quantity being in operation [years]			
Part No.	Indication	C/R/S	1	2	3
90 P 1007	Hose set ③ SR25.1 with PVDF-tube connectors 4/6mm, standard	C	1	2	4
90 P 1020	Driver SR25, complete	S	-	1	1
90 P 1010	1 set (4 pcs) contact springs SR25 for driver	R	1	2	2
90 P 1045	Contact pulleys SR25 PVDF ④ for driver	S	2	4	4
90 P 1050	Conveying belt SR25.1 ①	S	-	1	2
90 P 1025	S-bolt ② SR25.1	S	-	-	1
01 P 1000	Peristaltic pump SR25.1, complete 230V/115V, 50/60Hz	R	-	-	1
01 P 1300	Peristaltic pump SR25.2, complete 230V/115V, 50/60Hz	R	-	-	1
90 P 1030	Heat peristaltic pump SR25, complete without motor and gears	S	-	-	1

18 APPENDIX



Further product documentation can be seen and downloaded from our home page:
www.mc-techgroup.com

- Threaded couplings for "GL" glass connections
Document: **3-5.1.1**
- Instruction manual peristaltic pump SR25.1
Document: **3-7.1ME**
- Automatic liquid drain AD-SS
Document: **3-6.2.3**
- Automatic liquid drain AD-P
Document: **3-6.2.1**
- Condensate vessel TG, TK
Document: **3-6.3.1**