

Electric gas cooler series EC[®]

EC/ECS (from model nos.: 95...)

Instruction Manual
Version 1.01.02



**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 instruction manual.

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

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

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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.

EC® is a registered trade mark.

Version: 1.01.02

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Head Office

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

1 GENERAL INFORMATION

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

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

Follow all instructions and warnings closely.

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

2 DECLARATION OF CONFORMITY



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 device must not be used in hazardous areas.

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

4 WARRANTY

In case of a device failure, please contact immediately M&C or your M&C authorized distributor.

We have a warranty period of 12 months from the delivery date. The warranty covers only appropriately used products and does not cover the consumable parts. Please find the complete warranty conditions in our terms and conditions.

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

5 USED TERMS AND SIGNAL INDICATIONS



DANGER!

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



WARNING!

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



CAUTION!

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

CAUTION!

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

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.

QUALIFIED PERSONNEL

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



High voltages!

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



Corrosive!

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



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.

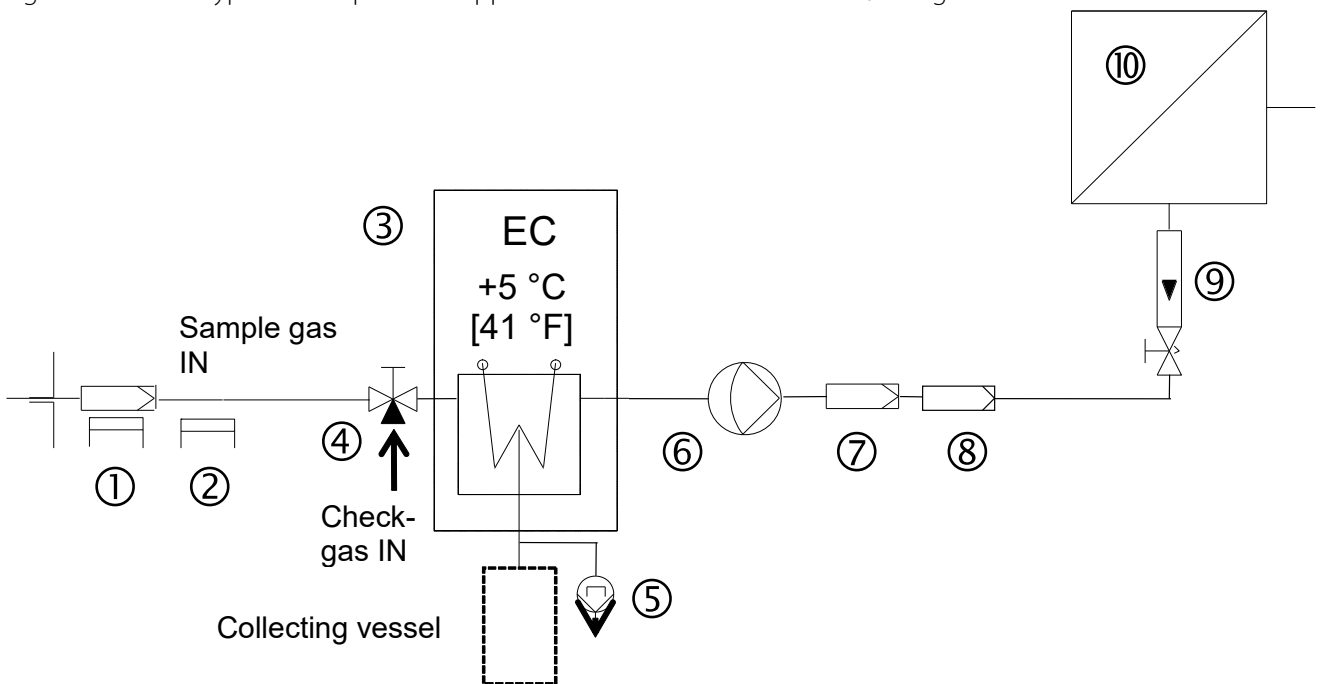
6 INTRODUCTION

The patented **M&C EC/ECS** gas cooler unit is always to be installed in situations where there is interference from moisture in the gas to be measured.

Reduction of the gas temperature inside the cooler to a stable and very low dew point effects a condensing-out of the sample gas.

7 APPLICATION

Figure 1 shows a typical example of an application for installation of an **EC/ECS** gas cooler unit.



- | | | |
|------------------------------------|--------------------|----------------------------------|
| ① Filter sample probe SP... | ④ 3-way ball valve | ⑦ Super-fine filter FP... |
| ② Heated sample line | ⑤ Peristaltic pump | ⑧ Aerosol filter CLF |
| ③ EC/ECS cooler | ⑥ Membrane pump | ⑨ Flow meter FM 10 |
| ⑩ Analyzer | | |

Figure 1 Example of application of EC/ECS

The gas to be measured is extracted with a gas sample pump ⑥ via a gas sample probe ① and a heated sample line ② and cooled down in the gas cooler **EC/ECS** ③ to a dew point of +5 °C (41 °F). The emerging condensate is removed by a peristaltic pump or a collecting vessel ⑤. The super-fine filter ⑦ located afterwards removes solid particles. For increased operating safety of the entire system we recommend installing a super-fine filter ⑦ with a liquid alarm sensor. If required an aerosol filter ⑧ can be installed in front of the flow meter ⑨. The gas thus treated can now be passed into the analyzer ⑩. For calibration of the analyzer a ball valve ④ is existing.

8 TECHNICAL DATA

Sample outlet dew point	Range of adjustment: +2 °C [35.6 °F]..... +7 °C [44.6 °F], factory setting: +5 °C [41 °F]						
Dew point stability	At constant conditions ±0.25 °C [±0.45 °F]						
Sample inlet temperature	**Max. + 180 °C [356 °F]						
Sample inlet dew point	**Max. +80 °C [176 °F]						
Gas flow rate per heat exchanger	**Max. 250 l/h						
Number of heat exchangers	1*, installation of max. 4 heat exchangers possible						
Material of heat exchangers	Duran glass or PVDF or stainless steel 316						
Ambient temperature	**+5 to +45 °C [41 to 113 °F] with option EC-F and EC-FD: +5 to +50 °C [41 to 122 °F]						
Storage temperature	-20 to +60 °C [-4 to 140 °F]						
Admissible gas pressure	With glass and PVDF: max. 3 bar With stainless steel : 10 bar* With option EC-FD : 1.2 bar						
Total cooling power	Max. 520 kJ/h at +25 °C [77 °F]						
Dead volume per heat exchanger	70 ml						
ΔP per heat exchanger at 300 l/h	1 mbar						
Sample gas connection	<table border="0"> <tr> <td>glass:</td> <td>For tube Ø 6 mm*, option: 8 mm, 10 mm or hose connector</td> </tr> <tr> <td>PVDF:</td> <td>G 1/4"i, option: hose connector</td> </tr> <tr> <td>stainless steel:</td> <td>G 1/4"i*, option: NPT or hose connector</td> </tr> </table>	glass:	For tube Ø 6 mm*, option: 8 mm, 10 mm or hose connector	PVDF:	G 1/4"i, option: hose connector	stainless steel:	G 1/4"i*, option: NPT or hose connector
glass:	For tube Ø 6 mm*, option: 8 mm, 10 mm or hose connector						
PVDF:	G 1/4"i, option: hose connector						
stainless steel:	G 1/4"i*, option: NPT or hose connector						
Condensate connection	<table border="0"> <tr> <td>glass:</td> <td>For tube Ø 12 mm*, option: 8 mm, 10 mm or hose connector</td> </tr> <tr> <td>PVDF:</td> <td>G 3/8"i, option: hose connector</td> </tr> <tr> <td>stainless steel:</td> <td>G 3/8"i*, option: NPT or hose connector</td> </tr> </table>	glass:	For tube Ø 12 mm*, option: 8 mm, 10 mm or hose connector	PVDF:	G 3/8"i, option: hose connector	stainless steel:	G 3/8"i*, option: NPT or hose connector
glass:	For tube Ø 12 mm*, option: 8 mm, 10 mm or hose connector						
PVDF:	G 3/8"i, option: hose connector						
stainless steel:	G 3/8"i*, option: NPT or hose connector						
Ready for operation	< 30 minutes						
Power consumption	280 VA, start up current at 230 V = 7.9 A						
Mains power supply	230 V 50 Hz +/-10 % *, or: 115 V 60 Hz +/-10 %						
Electrical connections	Terminal 2.5 mm ²						
Status alarm	2 changeover contacts, max. 250 V 2 A AC/DC 500 VA, 50 W						
Case protection	IP20 (EN 60529)						
Case color	RAL 9003						
Method of mounting	19" rack or wall mounting						
Case dimensions	EC : 19" x 7 U x 450 mm [≈ 17.72"], 32 kg [≈ (70.55 lbs)] ECS: 19" x 7 U x 360 mm [≈ 14.17"], 31 kg [≈ 68.34 lbs]						
Refrigerant	R134A 100 % CFC free						
Electrical equipment standard	EN 61010						

* standard

** Maximum values in technical datas 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].

9 DESCRIPTION

Figure 2 shows the **EC/ECS** cooler unit with the optional universal units **EC-F** and **EC-FD**.

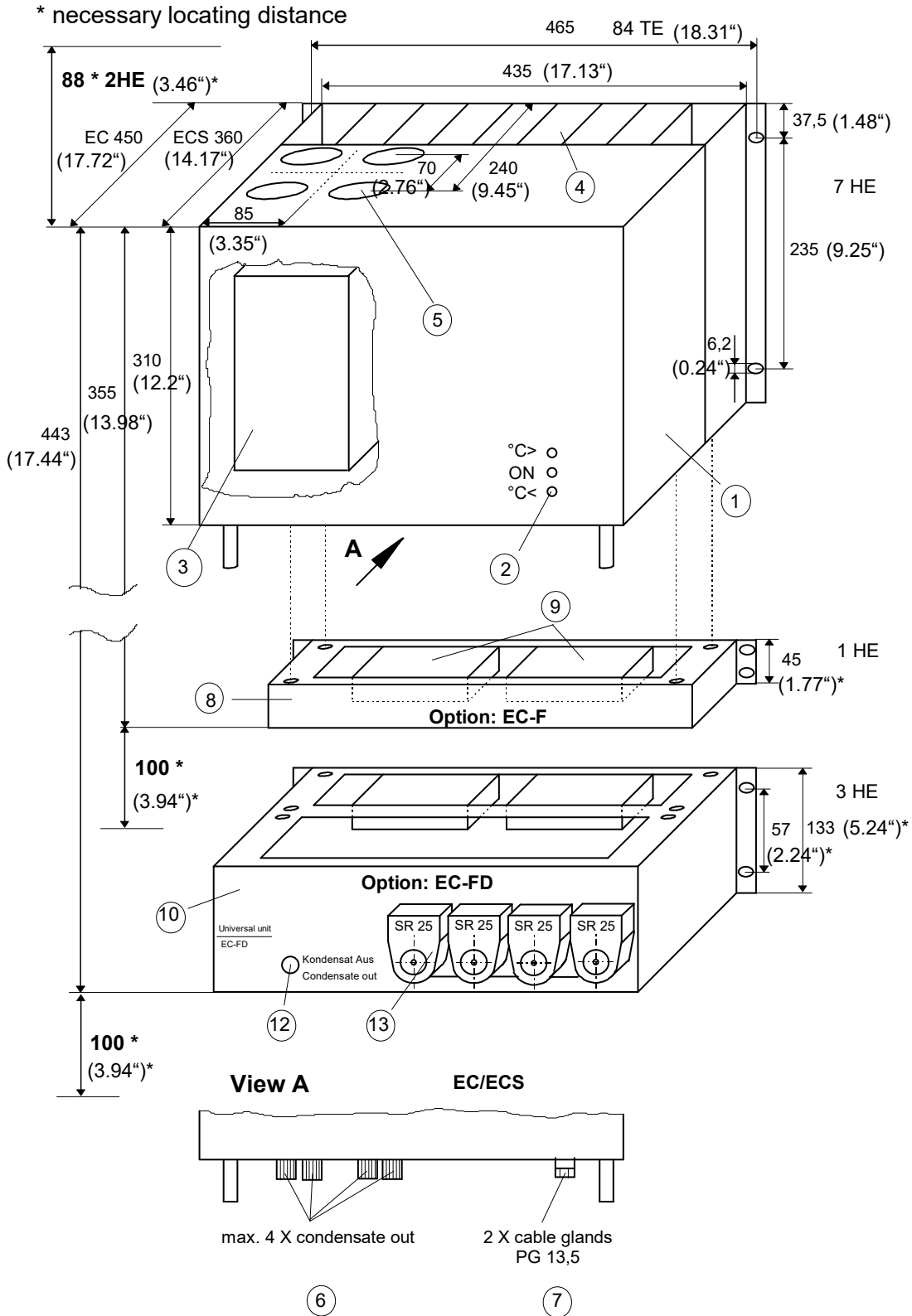


Figure 2 EC/ECS with options EC-F and EC-FD

The **EC/ECS** ① is equally suitable for wall installation or mounting in a 19"-rack.

The versions differ in the positioning of the LED function display ②. While for wall installation the LED function display ② can be fitted into the corresponding cut-outs in the **EC/ECS** front panel, for 19" rack mounting this is done using the cut-outs in the back panel of the housing. This positioning can be done at the factory when stating the type of installation of the **EC/ECS** gas cooler. It is relatively simple to subsequently reconfigure it on site at the user location. The location for installation of the LED function display ② will be marked correspondingly.

The housing depth of the **EC-..** cooler is 450 mm [$\approx 17.72"$]. The **ECS** cooler unit differs in its less housing depth of 360 mm [$\approx 14.17"$] and thereby is appropriate for mounting in a gas analysis cabinet with swing frame.

On the upper side of the cooler housing you will see the cut-outs ⑤ for maximum 4 heat exchangers. Sample gas enters and leaves the heat exchangers by the correspondingly connections on the upper part of the heat exchangers.

At the rear part of the housing the condenser ④ to remove heat given off in the compressor can be seen.

The **EC** automatic control board is located in the plastic housing ③ behind the removable front panel of the **EC/ECS** housing.

On the underside of the housing the following connections are provided as standard:

- ⑥ Standard condensate outlets from the heat exchangers respectively,
- ⑦ Cable glands PG 13,5;

As standard, the condensate is removed externally with collecting vessels, peristaltic pumps **SR25.1** or **SR25.2**, or by "over-pressure operation", with automatic drawing-off of condensate, as e.g. **type AD-...**

The heat energy from the cooling system is drawn off by a forced-ventilation ④. The required fans ⑧ and large air suction filter elements are provided as standard in This is arranged below the **EC/ECS** housing and is absolutely essential for operation of the cooler unit.

Optionally, the automatic condensate removal unit **EC-FD** (10) with maximum 4 peristaltic pumps **SR25.1** (13) can be mounted by factory below the housing of the **EC/ECS** cooler. The fans ⑧ and large air suction filter elements guarantee the above-mentioned condenser forced ventilation and make operation at higher ambient temperatures up to +50 °C [122 °F] possible. The connection for the common condensate outlet (12) is located in the front panel of the **EC-FD** unit.

If no forced ventilation for the condenser is required, peristaltic pumps type **SR25.2** can be build into the front plate of the cooler (Part No. 01P9140).



Figure 3 Peristaltic pump **SR25.2** mounted into the front panel

Instead of the unit **EC-FD** the universal unit **EC-F** ⑩ optionally can be used for operation at higher ambient temperatures up to +50 °C [122 °F] without automatic condensate removal. The unit is mounted by factory below the housing of the **EC/ECS** cooler and contains as well the above mentioned fans ⑧ with large air suction filter elements.

10 FUNCTION

The **M&C EC/ECS** gas cooler is a compressor cooler with status alarm capability. This ensures a reliable continuous operation of the cooler.

Up to 4 Jet-stream heat exchangers made of Duran glass, PVDF or stainless steel are located in a heat-insulated cooling block. All the heat exchangers are easily accessible and are arranged in such a way that they can be removed very simply.

Figure 4 shows a schematic diagram of the functioning of the heat exchanger..

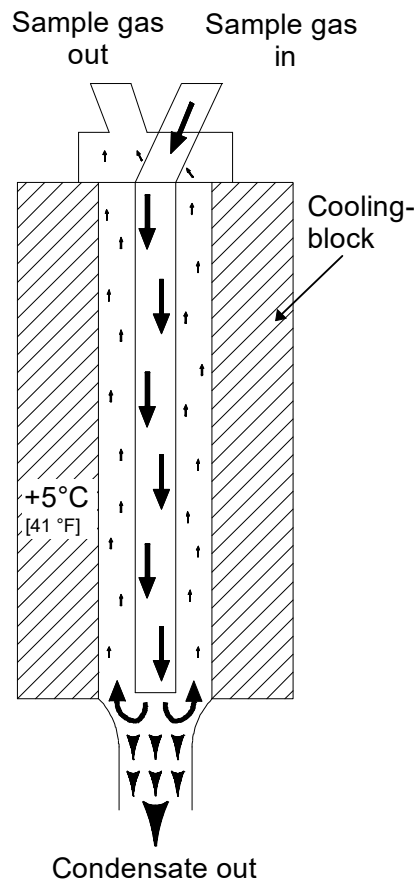


Figure 4 Schematic diagram of functioning of heat exchanger

The compressor cooler system has a heat-insulated cooling block at a constant temperature of +5 °C [41 °F]. Control of the compressor for models as from **serial numbers 95...** is done contactless by the **EC** automatic control electronics and is therefore not subject to wear.

The novel construction of the heat exchanger guarantees a very good pre-separation of condensate and for that reason an optimal drying of sample gas.

Alarm warnings for excess- and low-temperature are given as a collective status alarm via a relay output with two potential-free changeover contacts. Alarm will be released if the current temperature is out of a range of ± 3 °C [± 5.4 °F] referring to the set temperature (+5 °C [41 °F]).

11 RECEPTION AND STORAGE

The **EC/ECS** gas cooler is a complete pre-installed unit.

- Carefully inspect the EC/ECS 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!



NOTE!

During transport and when in storage, the cooler must always be stood up with the transport feet positioned underneath so that the oil in the closed compressor circuit cannot run out of this compressor case. If the cooler is transported on its back by mistake, it must stand in the operating position for approx. 24 hours before it is switched on!

12 INSTALLATION INSTRUCTIONS

The **EC/ECS** cooler is equally suitable for wall mounting or for installation in a 19" rack.



NOTE!

Please state the desired type of mounting when ordering so that the LED function display can be positioned to match at the factory!



NOTE!

The operating position for this cooler is exclusively vertical. This is the only way to ensure proper separation and removal of condensate in the heat exchangers. During transport and installation, the cooler must always be stood up with the transport feet positioned underneath so that the oil in the closed compressor circuit cannot run out of the compressor case.

The cooler should be kept away from sources of heat and well ventilated when installed, so that condensation from warmth will not occur and interfere with operation.

The minimum installation dimensions (fig. 2) must be followed without fail. If the unit is installed in the open, the cooler must be installed in a housing that is frost-free in winter and adequately ventilated in summer. Avoid locating the unit in direct sunlight.

Unheated gas sample lines must be provided with slope up to the cooler. In that case pre-separation of the condensate is not required.

Connect the heated sample line with sufficient thermal decoupling to the cooler!

13 SUPPLY CONNECTIONS

13.1 HOSE CONNECTIONS



WARNING!

Aggressive condensate is possible.



Wear protective glasses and proper protective clothing!



The gas inlet and outlet connections are at the upper part of the heat exchanger. For possible connectors see technical data (see chapter 8).

Corresponding tube or hose connectors are available optional at M&C.



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:

Duran glass heat exchangers with connections GL 18-6 respectively GL 25-12

- 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.

PVDF respectively stainless steel heat exchangers with G 1/4"i respectively G 3/8"i

- The corresponding tube respectively hose couplings with threaded connections have to be screwed in with PTFE thread sealing tape.
- To grant a functional and unproblematic mounting we recommend to use union pieces with taper pipe thread type R according to DIN 2999/1 in connection with suitable sealing tape.



NOTE!

When fixing the connectors in the PVDF heat exchanger hold up with a wrench at the pane of the bolt head!

Option: stainless steel heat exchanger with NPT

- The heat exchangers with NPT threaded connectors are marked with circulated notches.
- To ensure the tightness of the connections, the NPT connection threads are inserted or glued in place with sealing paste.

In the standard configuration, the tubes for removal of condensate are connected directly to the heat exchangers. These protrude with the GL 25-12 tube connectors* (Duran glass heat exchanger) respectively with G 3/8"* thread joint (PVDF or stainless steel heat exchanger) above the base plate of the cooler housing (Fig.2).

Condensate removal is done by customer according to the type of operation with:

- Automatic float-type condensate traps **AD-...** only for over-pressure operation;



NOTE!

Stainless steel heat exchangers with G 3/8" thread joint can be directly fitted up with the float-type condensate trap AD-SS by means of a thread adapter part number FF 11000 (1/2" NPT to G 3/8"i). By this wall mounting of the AD-SS unit isn't necessary!

- Condensate collector container that is emptied manually;
- peristaltic pump.

Option: automatic condensate removal with peristaltic pump SR25.1 resp. SR25.2

In case of peristaltic pumps type **SR25.2**, build in the front plate, the condensate outlet 4/6 mm hose is provided directly at the corresponding pump.

The Universal unit **EC-FD** with peristaltic pumps **SR25.1** is equipped with a condensate outlet for 4/6mm hose connection on the front panel (see fig. 2).

13.2 ELECTRICAL CONNECTIONS



WARNING!

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



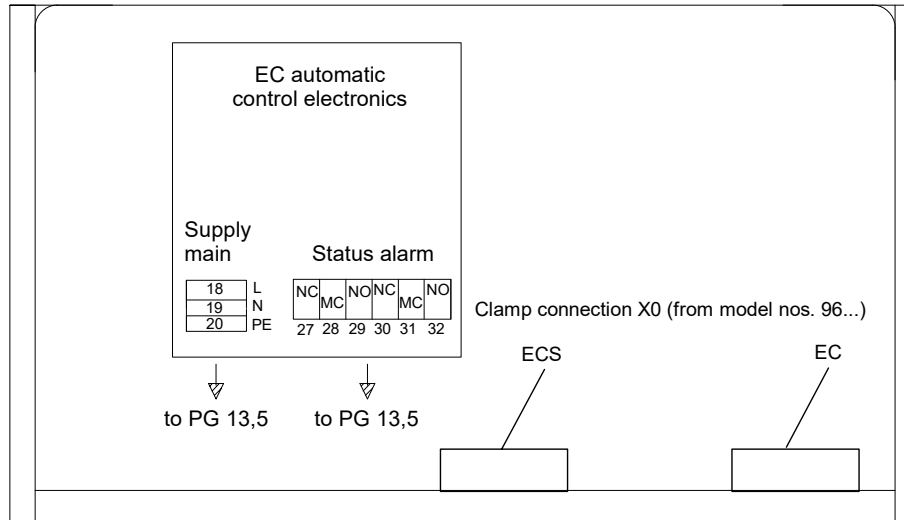
NOTE!

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 1000 V, together with the associated standards and stipulations.

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

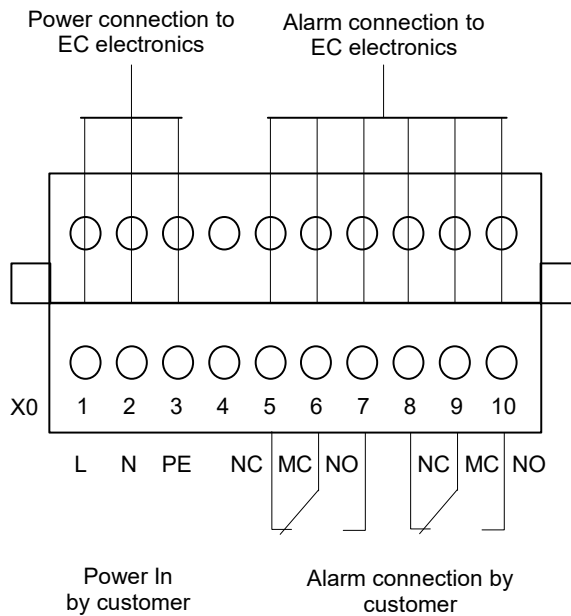
The main circuit must be equipped with a fuse of 10 A_T (over current protection); for electrical details see technical data.

Figure 5 shows the electrical connections at the plastic housing behind the front panel of the **EC/ECS** housing.



Power supply : 230V/50Hz or 115V/60Hz (see type plate)
 Status alarm : two potential free changeover contacts
 Contact rating : 250V AC, 2A, 500VA or
 250V DC, 2A, 50W

Figure 5 Electrical sockets



For location of clamp **X0** see Fig.6 .

Figure 6 Pin configuration from model nos. 96...

Two PG 13.5 cable glands are provided for the cable bushings through the base plate of the cooler housing.

Before model nos. 96... the pin configuration for power and alarm connection was as follows:

The power connector is on the front panel of the **EC** automatic control board. This is within the plastic housing, behind the removable front panel of the cooler unit. The pin arrangement of the power connector is as shown below:

Terminal	18	19	20
EC automatic control board			
Connection	L	N	PE

The potential-free contacts of the status collector alarm are located as well on the **EC** automatic control board (Fig. 5), pins 27 to 32. Further details are given in the pin configuration in Figure 7.

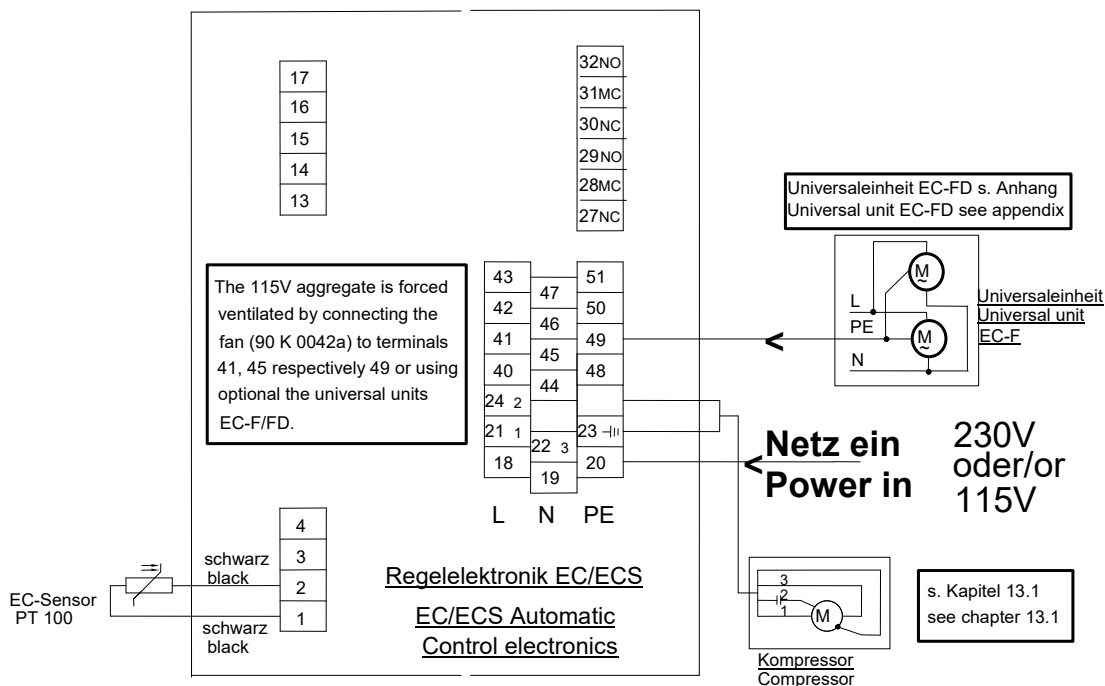


Figure 7 Pin configuration for EC/ECS up to model nos. 95...

14 START-UP

The automatic control electronics of the **EC/ECS** permit automatic start-up of the cooler. The error diagnostics guarantee full monitoring and reporting of possible sources of error.

The following description is valid for start-up of the gas cooler for an ambient temperature $> 8\text{ °C}$ [46.4 °F].



Before starting up the gas cooler, it must be placed in its operating position for at least two hours. The liquid inside the system may have been redistributed, and this could cause problems in operating!

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

- Connect the cooler unit to the mains power supply; Check that the equipment is connected to the correct mains voltage, 115 V or 230 V, as shown on the type plate!
- Lead the status contacts for reporting of under- and over-temperature to the measuring station;



NOTE!

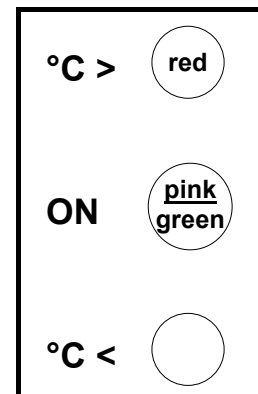
The status contacts must be connected to the external sample gas pump or to a valve in the sample gas line to protect the entire analysis system by immediately cutting off the gas supply in the event of error messages from the cooler!

14.1 FUNCTION SEQUENCE AND LED FUNCTION DISPLAY

Three function display LEDs are provided to give a visualization of the function sequence during start-up of the cooler. According to the type of installation, they are located either on the front panel or the back panel of the cooler (Fig. 2). The top LED (red) indicates that the temperature set by the **EC** automatic control electronics has been exceeded or has not been reached. The two-colour (pink/green) LED in the middle shows that the cooler compressor is operating. The bottom red function display LED gives an alarm if the temperature falls too low.

Switching the cooler on

As soon as there is a mains voltage, the top red LED lights up. This indicates that the temperature of the cooler is above +8 °C [46.4 °F]. The two-coloured LED in the middle lights up as pink once the cooler compressor is in operation.

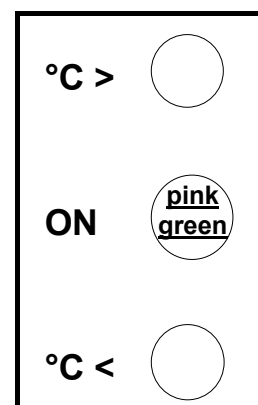


Normal operation

After around 30 minutes the cooler has been cooled down to a temperature below +8 °C [46.4 °F]. The top red LED goes out.

The status collector alarm contacts are deactivated and control the automatic external release for gas measurement.

The cooler compressor is switched off as soon as the cooler stage reaches the controlled temperature of +5 °C [41 °F]. The middle LED lights up as green.



The cooler compressor will be alternately switched on and off by the **EC** automatic control electronics in a load-dependent cycle. The middle LED will alternately light up as pink and green (normal operating functions).

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



WARNING!

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!



WARNING!

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



The **EC/ECS** cooler unit does not require any special maintenance intervals.

Depending on the degree of contamination of the ambient air, the cooling fins need to be cleaned periodically with compressed air.

16.1 CHANGE OF FILTER ELEMENT AT OPTION EC-F OR EC-FD

The air suction filter units in the **EC- F/EC-FD** universal unit are to be cleaned or replaced according to the contamination level of the ambient air. They are located in a plug-in box underneath the cooler unit. The filter elements are removed as follows:

- Unclamp the plug-in box by turning the quick-lock screw plug 90° to the left;

- Pull out the box;
- Remove the crossbars holding the filter element by pulling with moderate force in the direction of the filter element axis;
- Remove and replace the filter elements.

Reassembly is done in the reverse order.

When using automatic condensate removal by means of peristaltic pumps, the hoses of the peristaltic pumps must be checked every three or six months, depending on the operating conditions, and replaced if necessary. The procedure for changing the hoses is given in the corresponding operating instruction **SR25**.

16.2 ADDING AND 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:

- Release the upper gas connections and lower condensate connections;
- Pull the heat exchangers upwards with rotation out of the cooling block;

Replace the heat exchangers as follows:

- Dry and clean the push-in opening in the aluminium cooling block with a cloth;
- Apply a thin and equal layer of thermal conductivity paste (part no. 90K0115) to the opening of the cooling block to ensure good heat conduction.
- 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;
- Lightly push the heat exchangers with rotation back into the push-in opening of the cooling block and press to the upper block;
- Remove the adhesive tape and any surplus thermal conductivity paste;
- Reconnect the hoses.



NOTE!

Do not mix up the hose connections; gas outlet and gas inlet are marked with arrows!

Mounting the Duran glass heat exchangers please notice:

- Check the PTFE/Silicon locking rings for damage. In assembly, the locking rings must have the PTFE side facing the medium, otherwise the required degree of sealing cannot be guaranteed!
- Tighten the GL coupling rings hand-tight by turning them to the right.

16.3 MAINTENANCE OF THE OPTIONAL MOUNTED PERISTALTIC PUMP(S), TYPE SR25

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



DANGER

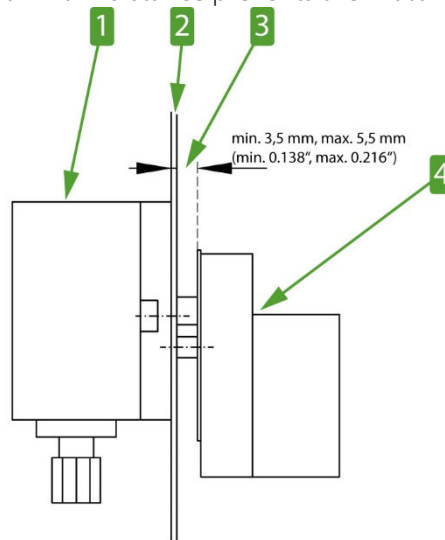
Dangerous voltage!

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.

16.3.1 MOUNTING INSTRUCTIONS FOR SR25.2 PERISTALTIC PUMP (OPTIONAL)

Make sure to mount the pump to the front of the cooler with a minimum distance of 3.5 mm (0.138") and a maximum distance of 5.5 mm (0.216") between the pump motor and the front panel. The minimum distance avoids damages to the pump motor and the maximum distance prevents the motor shaft from getting loose.



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

Figure 8 SR25.2: Mounting distance between front panel and pump motor



NOTE!

For mounting instructions, see the SR25.2 instruction manual. The manual is available on our website www.mc-techgroup.com.

16.3.2 CHANGE OF THE PUMP TUBE



CAUTION!

Aggressive condensate is possible.



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



NOTE!

If you send the peristaltic pump to M&C Customer Service for repair, please provide details of the medium pumped. For this purpose, use the form on our homepage at <https://www.mc-techgroup.com/en/service-support/return-of-products>.

The pump must be cleaned of hazardous or highly aggressive contaminants before being returned.

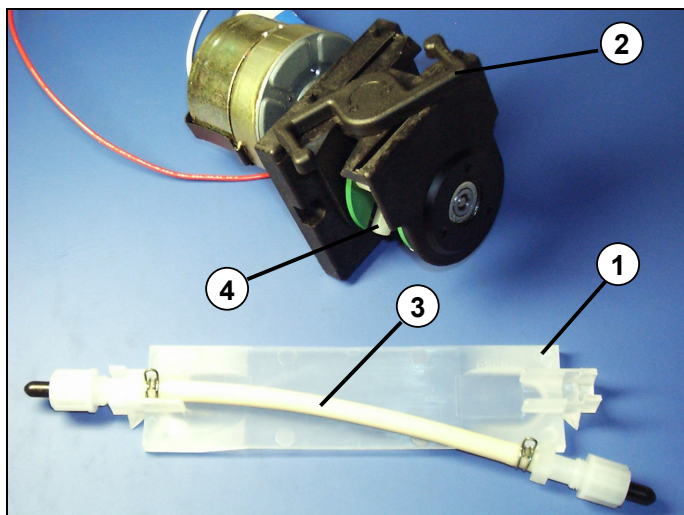


Figure 9 Change of the pump tube

- 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 (s. 16.3.3);
- 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 ⌚ anticlockwise until it snaps into place;
- Switch on pump.

16.3.3 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 the 'rotational axis' and 'driver'.
Use genuine spare parts only!**

16.3.4 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.
- 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.



CAUTION!

Aggressive condensate is possible.












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






17 TROUBLE SHOOTING

Troubleshooting is made much easier by the LED function display.

The following table shows possible reasons for error and how to correct them (not applicable for the running-up phase of the cooler).

LED display	Function error and status alarm	Probable cause	Checking / Correction
°C >  ON  °C < 	Equipment does not cool;	No mains power;	Check the mains voltage 230 V (115 V) at pins 18 and 19 of the EC automatic control electronics; If mains voltage OK: replace defective EC automatic control board.
°C >  ON  °C < 	Equipment does not cool or the cooling is insufficient;	Cooling compressor is not running;	Check that the plugs are firmly seated in the sockets for power connection to the compressor; If OK: Measure the voltage 230 V/115 V for the compressor at the EC automatic control board at pins 21 and 22. If not OK: Replace the defective EC automatic control board; If OK: Does the red LED D3 on the EC automatic control board lights up for more than one second? (A blocked unit will be switched off by the motor breaker switch); If yes: Replace the starting condenser; If compressor does not run: Send cooler in for repair.
°C >  ON  °C < 	See above	Cooling compressor runs; over-loading of the cooler unit;	Check: - Is the maximum of 250 l/h of gas flowing? - Is the ambient temperature max. +45 °C [113 °F]? - Are the air suction filters dirty? - Are the fans working? - Are the condenser fins contaminated? If OK: Temperature at the EC automatic control board (chapter 18.2); If the temperature is < 8 °C [46.4 °F] (< 0.8 V) for a nominal set temperature of 5 °C [41 °F]: Replace EC automatic control board; If temperature > 8 °C [46.4 °F] (> 0.8 V): Check PT100 temperature sensor (chapter 19.); If not OK: Replace sensor; If sensor and electronics OK: Send cooler in for repair.

LED display	Function error and status alarm	Probable cause	Checking / Correction
$^{\circ}\text{C} >$  ON  $^{\circ}\text{C} <$ 	<p>Equipment does not cool;</p> <p>Cooler has been over-cooled (temp. $< 2^{\circ}\text{C}$ [35.6 $^{\circ}\text{F}$];</p>	<p>Ambient temperature $< 2^{\circ}\text{C}$ [35.6 $^{\circ}\text{F}$]</p> <p>Cooling compressor stopped;</p> <p>Cooling compressor runs continuously;</p>	<p>Ambient temperature must be $\geq 8^{\circ}\text{C}$ [46.4 $^{\circ}\text{F}$!]</p> <p>Check temperature at EC automatic control board (chapter 18.2); <i>If temperature $< 2^{\circ}\text{C}$ [35.6 $^{\circ}\text{F}$] ($< 0.2\text{ V}$):</i> Check PT100 temperature sensor (chapter 19); <i>If not OK:</i> Replace sensor. Solid-state relay defective; Replace EC automatic control board;</p>

18 EC AUTOMATIC CONTROL BOARD

Figure 10 shows the arrangement of the **EC** automatic control board (wiring scheme in Appendix).

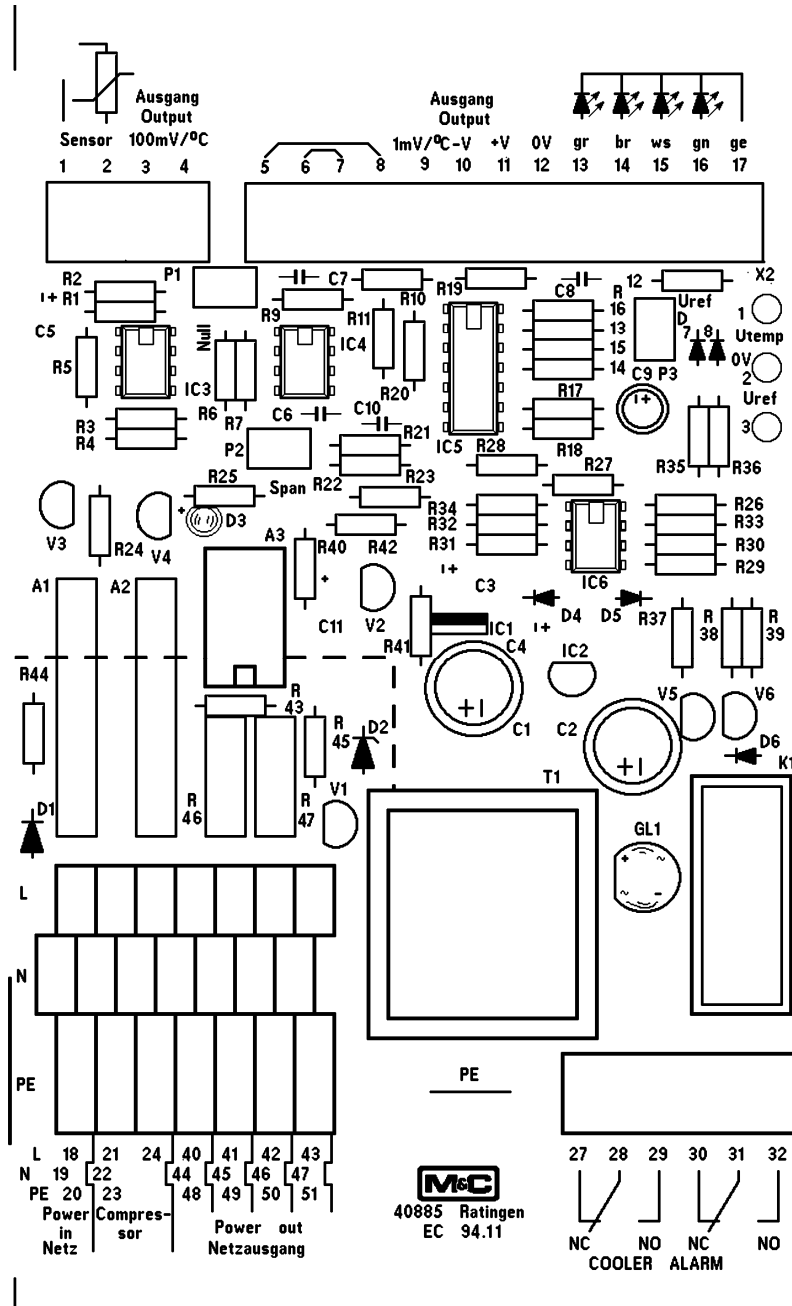
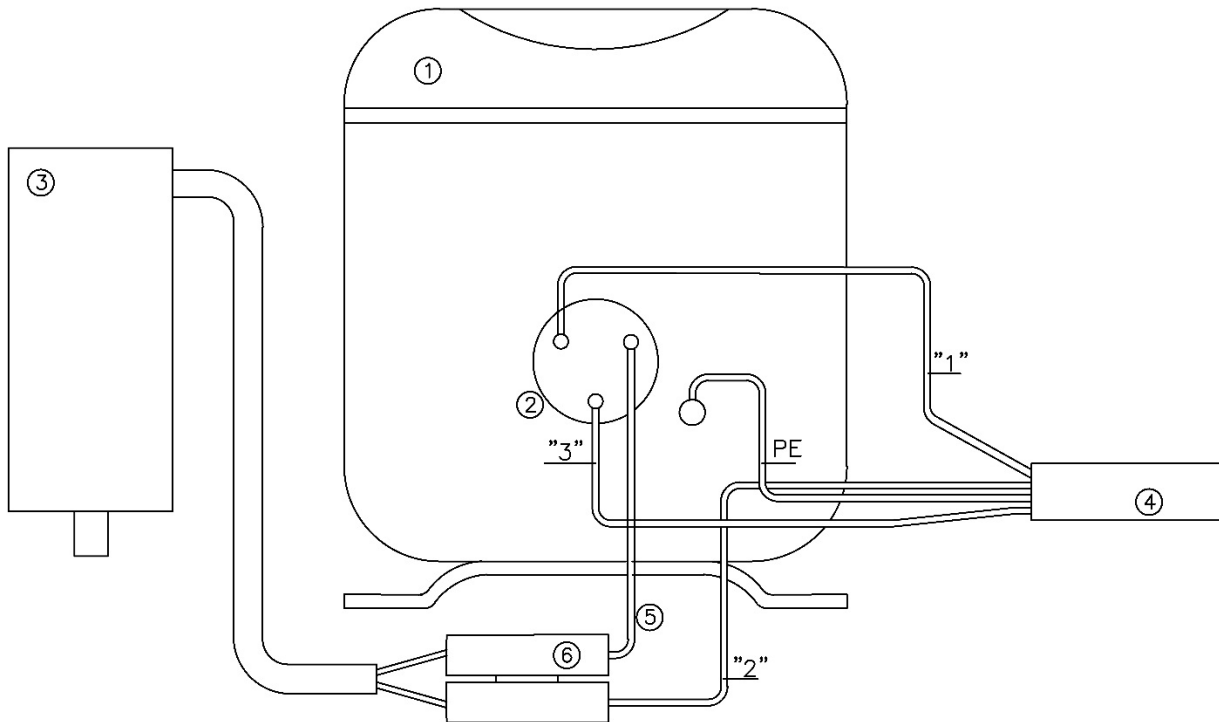


Figure 10 EC automatic control board

18.1 CONNECTING THE COOLING COMPRESSOR

The cooling compressor is connected to the **EC** automatic control board (Fig. 10). Figure 11 shows the connection diagram for the compressor.



- ① Compressor
- ② Terminal area inside the compressor terminal box
- ③ Starting capacitor of the compressor
- ④ Controller cable from the main electronics
- ⑤ Connection wires
- ⑥ Flat connector

Cable no. compressor	1	2	3	PE green/yellow
EC automatic control board	21	24	22	23

Figure 11 Connection diagram for compressor

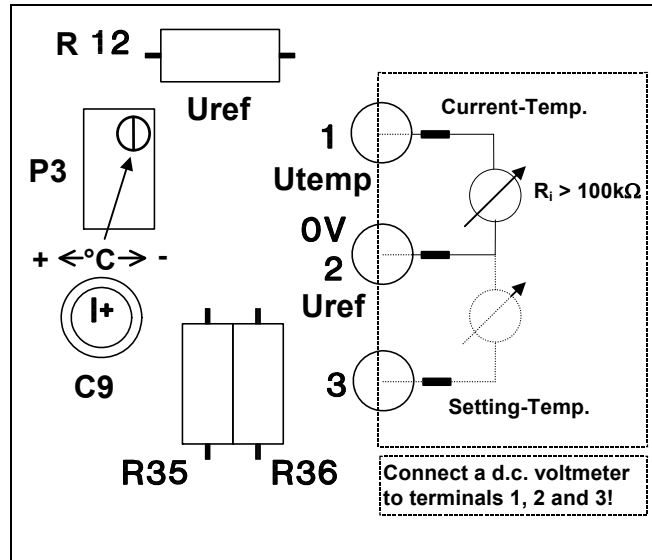
18.2 TEMPERATURE SETTING FOR THE EC/ECS COOLER

The **EC/ECS** gas cooler is set at the factory to a regulated temperature of +5°C [41 °F].

Setting of the regulated temperature is done by trimming potentiometer **P3**, on the **EC** automatic control board of the cooler. The setting range covers from 0 °C to 20 °C [32 °F to 68 °F]. Turning it to the right sets a lower temperature, and turning it to the left sets a higher temperature.

Connecting an external voltmeter to plugs 2 and 3 allows the nominal set temperature to be read off and controlled. A voltage value of 0.1 V corresponds to a temperature of 1 °C [33.8 °F].

It is possible to measure and control the current temperature at measuring sockets 1 and 2.



NOTE!

Freezing-up in the cooling stage will endanger the operation of the cooler unit. For this reason the cooler temperature must never fall below 2 °C [35.6 °F]!

18.3 CONNECTION OF AN EXTERNAL TEMPERATURE READING WITH OPTION SECOND PT100 SENSOR (PART-NO.: 02K9500)

The second PT100 sensor is connected to the clamps 5 and 6 on the clamp block X2 (see fig. 8).

The external temperature reading is connected to the clamps 7 and 8. The connection cable is led through one of the cable glands PG13,5 at the bottom plate of the cooler housing.

19 CHECKING THE TEMPERATURE SENSOR

The **EC/ECS** cooler temperature sensor is a PT100 element as from **serial numbers 95...** . There are two methods for checking the PT100 element, as follows:

1. Voltage method

In order to check the sensor for the cooler currently in operation, the actual voltage at the measuring sockets 1 and 2 of the **EC** automatic control board must be measured as per section 18.2 above. Figure 12 shows the voltage characteristics in relation to temperature. If the measured voltage is inside the shaded area, the sensor is defective and must be replaced.

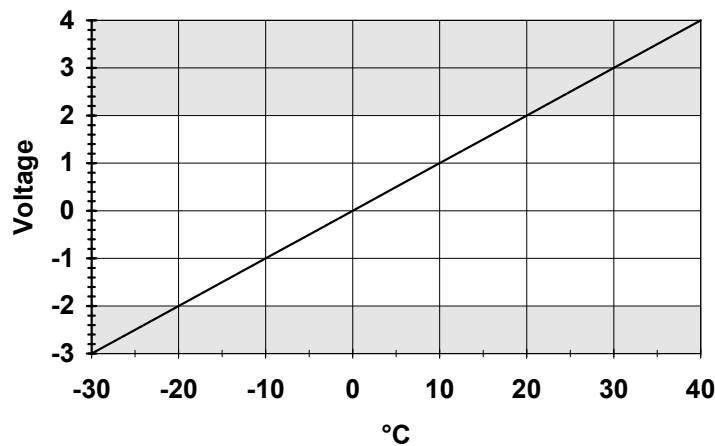


Figure 12 Voltage in relation to the temperature of the cooling stage

2. Resistance method

In this case the sensor must be disconnected from pins 1 and 2 at the **EC** automatic control board (Fig. 10) and removed from the cooling block. When measuring the resistance of the PT100 element, this must be proportional to the ambient temperature. The resistance-temperature characteristics are shown in Figure 13 below.

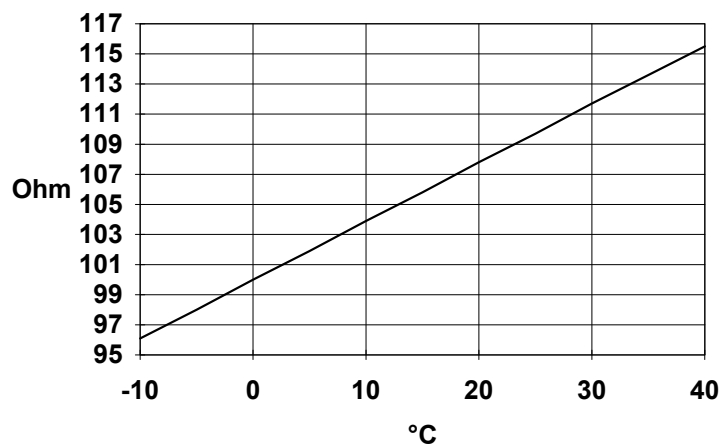


Figure 13 Resistance-temperature characteristics of the PT100 temperature sensor

20 CHANGING THE COOLER AGGREGATE



NOTE!

**Before removing the cooler aggregate disconnect the cooler from all power supplies;
Before mounting the new aggregate check, if voltage corresponds with the
specification on the type plate;**

changing the cooler aggregate may only be carried out by qualified personnel!

According to the cooler version, forced ventilated or not, cooler aggregates with differing quantity of refrigerant are available (spare parts list). As a spare part we deliver a complete replacement cooler aggregate (230 V- or 115 V), including the compressor, vaporizer, condenser, dryer and the capillary tube with the packaged refrigerant (R134A). You send us your defective, non damaged, complete cooler aggregate in a corresponding safe packing carton taking over the costs of shipping.

Figure 14 shows the positioning of the cooler aggregate within the cooler housing.

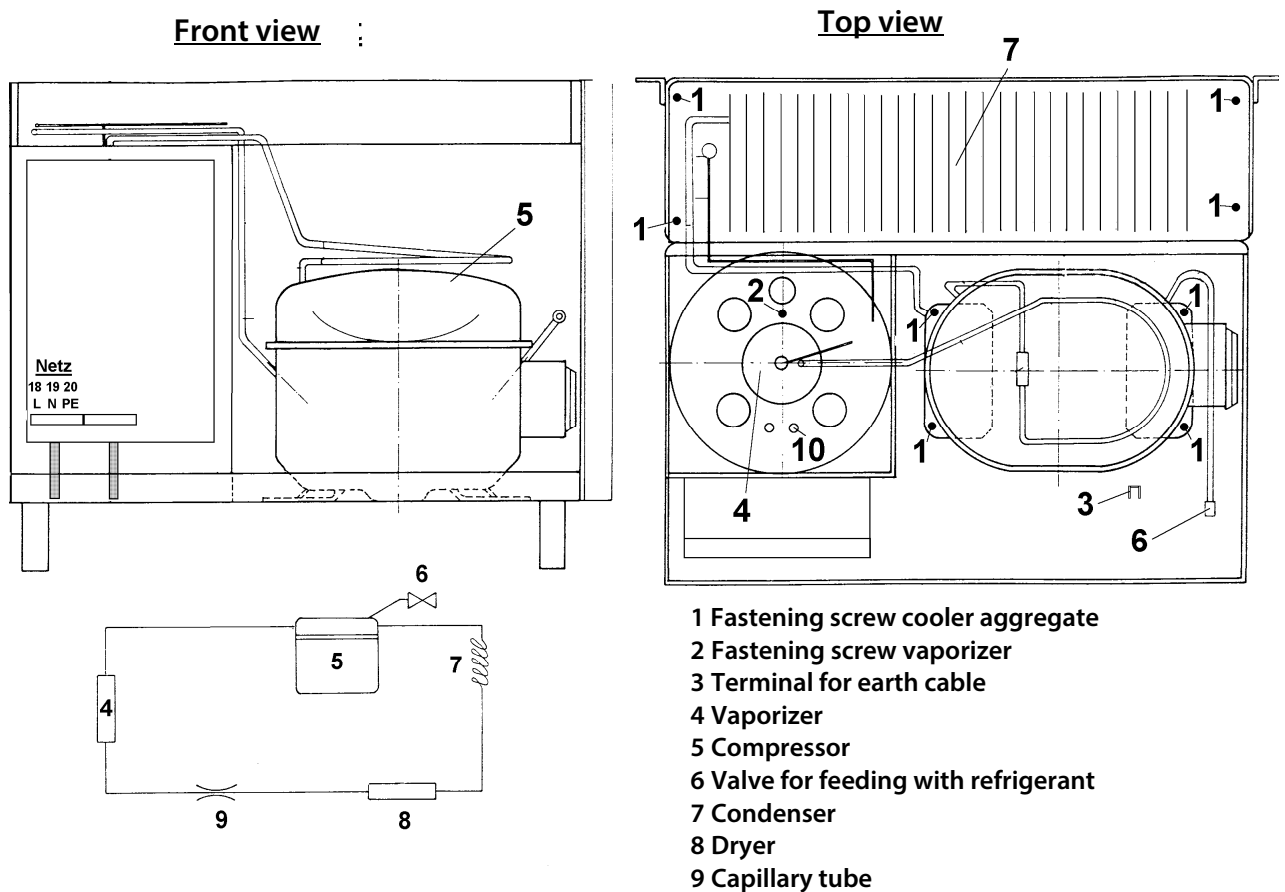


Figure 14 EC cooler aggregate

For changing the cooler aggregate please carry out the following steps:

- Remove the heat exchangers (16.2);
- Loosen the fastening screws from the front panel of the cooler housing (Fig. 2);
- Disconnect the earth wire of the front panel and remove the front panel;



NOTE!

If the LED function display is fitted in the front panel of the cooler housing (wall mounting) pay attention that the display will not be damaged by removing the front panel!

- If the LED function display is fitted in the back panel of the cooler housing (19" version) it must be pull out of the bracket before removing the cooler cover;



NOTE!

If replacing the LED function display please pay attention to the correct positioning (marked position respectively the connection cable points to the base plate of the housing)!

- Loosen the fastening screws of the cooler cover;
- Before removing the cooler cover disconnect the earth wire;
- Disconnect the cooler compressor from the **EC** automatic control electronics (18.1). For this remove the cap of the plastic housing (Fig. 2) and disconnect the cables from the corresponding terminals (Fig. 5) (replacement cooler aggregate does not include connecting cables).
- Disconnect the earth wire at terminal **3**;
- Loosen the fastening screws **1** of the cooler aggregate;
- Loosen screw **2** in the aluminium cooling block (it is covered under the isolation and is not visible from outside). For this push the isolation backwards;
- Loosen the vaporizer **4** by vibrations in the middle of the cooling block. If the vaporizer is bind it is possible to loosen it through a drilling in the base plate of the cooler by means of compressed air;
- Lift the complete cooler aggregate (**4, 5, 7**) out of the cooler housing;

The mounting of the replacement cooler aggregate happens in opposite order. For this smear the aluminium distributor block and the vaporizer sufficient with thermal conductivity paste (part number 90K0115).

After replacing the aggregate the cooler has to be start up according to the instructions given in chapter 9. The cooler temperature can be controlled after approx. 30 minutes by means of a thermometer in drilling **10**.

21 RETROFITTING A DIGITAL TEMPERATURE INDICATOR

21.1 TECHNICAL DATA: DIGITAL TEMPERATURE INDICATOR

Display	LCD 10 mm [≈ 0.39 "], unit °C
Display range	-30 to +30 °C [-22 °F to 86 °F]
Measuring period	2.5 per second
Ambient temperature range	0 to +50 °C [32 °F to 122 °F]
Main supply	4.5 V to 15 V, 2 mA
Housing	ABS plastics black
Protection	IP50 for the front IP00 for the back (DIN 40050)
Front cutout	30.5 mm x 57 mm [≈ 1.2 " x 2.24"] (H x W)
Installation depth	73 mm [≈ 2.87 "]

Data according to the technical description DPM 528, Schwille Elektronik.

21.2 INSTALLATION INSTRUCTIONS: DIGITAL TEMPERATURE INDICATOR



NOTE!

The safety instructions specific to the plant and process are to be consulted prior to installation, maintenance and inspection.

The cooler EC/ECS must be disconnected from all power supplies prior to installation, maintenance and inspection!

The digital temperature display is mounted in the front panel of the EC/ECS cooler. Figure 12 shows the positioning and the necessary locating distance.

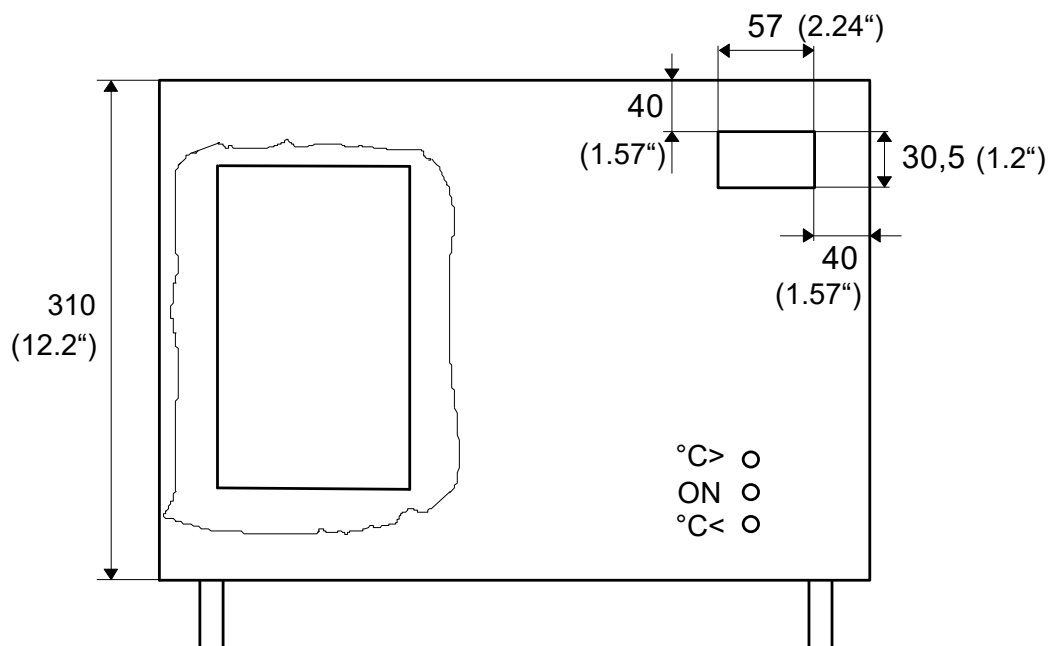


Figure 15 Mounting dimensions for digital temperature indication

For mounting the display and the temperature sensor please notice the following:

- Loosen up the fixing screws of the front panel and remove it (see operating manual EC/ECS);
- Remove the cooler cover (see operating manual EC/ECS);
- Make the cut-out for the temperature display into the front panel according to the locating distance shown in figure 13;
- For cable bushings through the plastic housing of the EC/ECS control board please use the available PG9 cable glands.

21.3 ELECTRICAL CONNECTIONS: DIGITAL TEMPERATURE INDICATOR



NOTE!

Attention must be paid to the requirements of VDE 0100 when setting UP 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 cooler is connected up to the correct mains voltage!

The electrical connection of the digital temperature display happens on the EC/ECS control board (see operation manual EC/ECS).

The temperature display is already equipped with all necessary cables.

The following steps must be done:

- Loosen up the fixing screws of the cover of the plastic housing and remove the cover;

The cables of the digital temperature display have to be connected as follows:

digital temperature display cable [color]	Meaning	13-pole connector clamp No.
Power supply + yellow	+ 5 V	11
Power supply - brown	0 V	12
DC + white	1 mV/°C Measurement voltage	9
DC - green	0 V	12

22 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.

23 SPARE PARTS LIST

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

Electric gas cooler EC/ECS					
(C) consumable parts (R) recommended spare parts			Recommended quantity EC/ECS being in operation [years]		
Part number	Description	C/R	1	2	3
02K9100	EC-G jet stream heat exchanger material: Duran glass	R	1	1	1
02K9150	EC-G-90° jet stream heat exchanger material: Duran glass	R	1	1	1
02K9200	EC-SS jet stream heat exchanger material: stainless steel	R	1	1	1
02K9250	EC-SS/NPT jet stream heat exchanger material: stainless steel Connections: sample gas in and out 1/4"NPTi condensate out 3/8" NPTi	R	1	1	1
02K9300	EC-PV jet stream heat exchanger material: PVDF	R	1	1	1
90K0115	EC thermal conductivity paste 50 g (-40 to 140 °C [-40 to 284 °F])	R	1	1	2
90K1002	Temperature sensor PT100 for EC automatic control electronics from model nos.: 95.....	R			
90K1007	EC automatic control board complete for PT100 and contactless compressor control from model nos.: 95.....	R	-	1	1
90K0035	Fan (M1/2 – 230 V 50 Hz) with option EC-F/FD	C	-	2	2
90K0040	Fan (M1/2 – 115 V 60 Hz) with option EC-F/FD	C	-	2	2
90K0042a	Fan 90 mm x 90 mm (approx. 3.54" x 3.54") for EC 115 V 60 Hz	C	-	2	2
90K1035	Solid-state-Relais "RE2" ASP-204	R	-	1	1
90K1010	LED function display with connecting cable	R	-	-	1
90K1015	Cooler aggregate complete with compressor, vaporizer and condenser for EC/ECS ; refrigerant R134A, power: 230 V, 50 Hz standard	R	-	-	-
90K1014a	Cooler aggregate complete with compressor, vaporizer and condenser for EC/ECS ; refrigerant R134A, forced ventilated, power: 115 V, 60 Hz	R	-	-	-
90K1014	Cooler aggregate complete with compressor, vaporizer and condenser for EC/ECS ; special quantity of refrigerant R134A for forced ventilation, power: 230 V, 50 Hz with option EC-F/FD	R	-	-	-
90K0130	Filter cloth EC-F with option EC-F	C	2	4	6
or					
90K0135	Filter cloth EC-FD with option EC-FD	C	2	4	6
90K1046	Bimetal switch Klixon 230 V (for devices built until 2000 only)	R	-	1	1
90K1047	Bimetal switch Klixon 230 V (for devices built from 2000 until 2012 only)	R	-	1	1
90K1051	Bimetal switch Klixon 115 V (for devices built until 2000 only)	R	-	1	1
90K1052	Bimetal switch Klixon 230 V (for devices built from 2000 until 2012 only)	R	-	1	1



Electric gas cooler EC/ECS					
(C) consumable parts (R) recommended spare parts			Recommended quantity EC/ECS being in operation [years]		
Part number	Description	C/R	1	2	3
90K1055	Capacitor for compressor 80 μ F-230 V	R	-	1	1
90K1060	Capacitor for compressor 160 μ F-115 V	R	-	1	1

24 APPENDIX

- Sample output dew point (ambient temperature 20 °C (68 °F)) depending on gas flow rate
- Circuit diagram **EC** automatic control board,
drawing number : **2300 - 5.04.2**
- Wiring plan automatic condensate removal unit **EC-FD**,
drawing number : **2300-5.05.0**



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

- Instruction manual peristaltic pump **SR 25.1**,
- Data sheet: Condensate vessel **TG, TK**
- Data sheet: **GL**-connectors
- Data sheet: Universal unit **EC-D** and **EC-FD**
- Data sheet: Automatic liquid drain **AD-SS**
- Data sheet: Automatic liquid drain **AD-P**

Sample output dew point (ambient temperature 20 °C [68 °F]) depending on gas flow rate

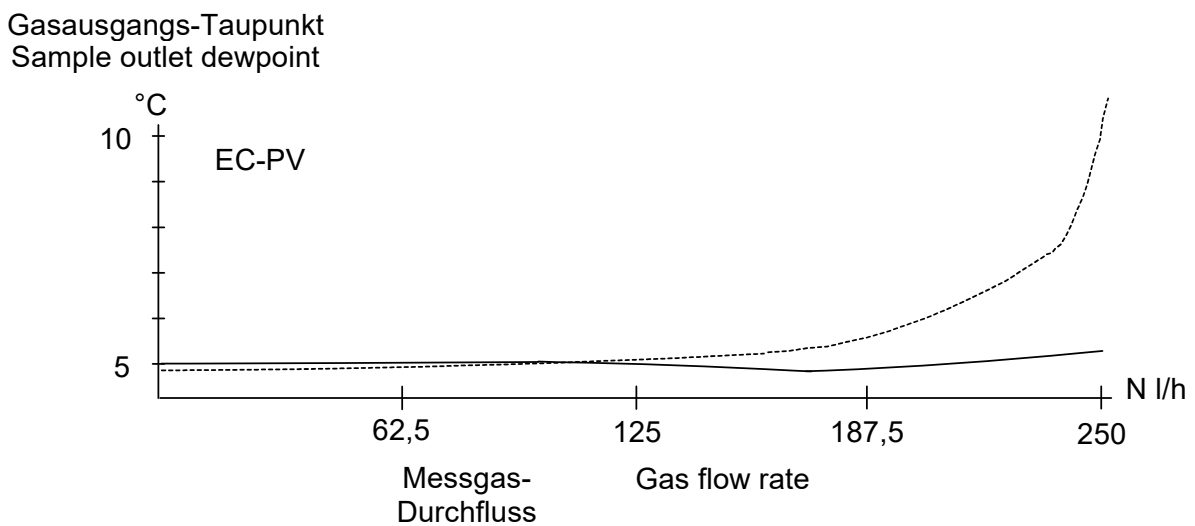
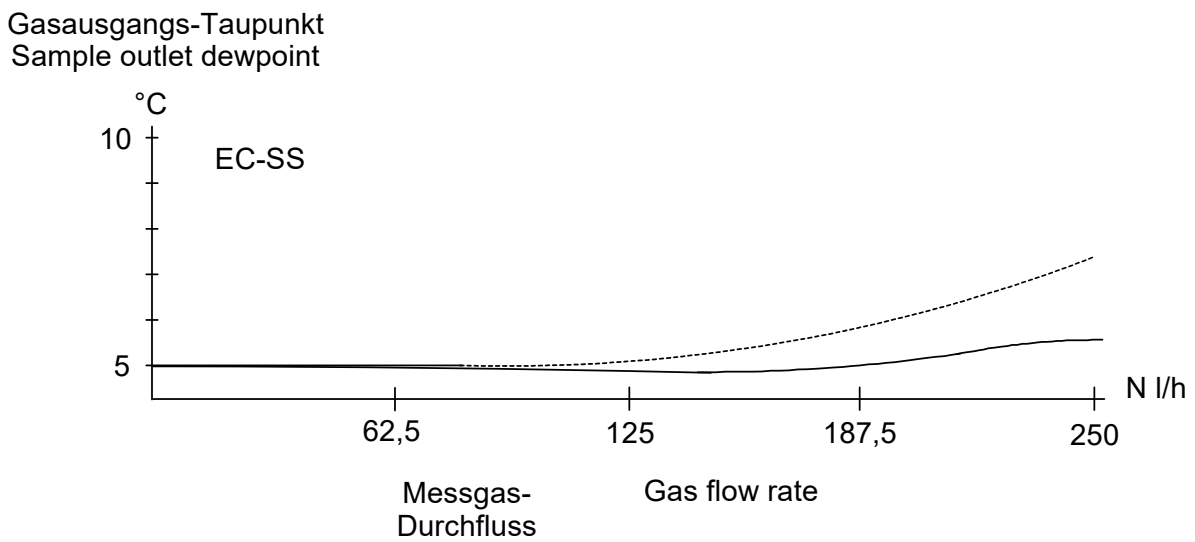
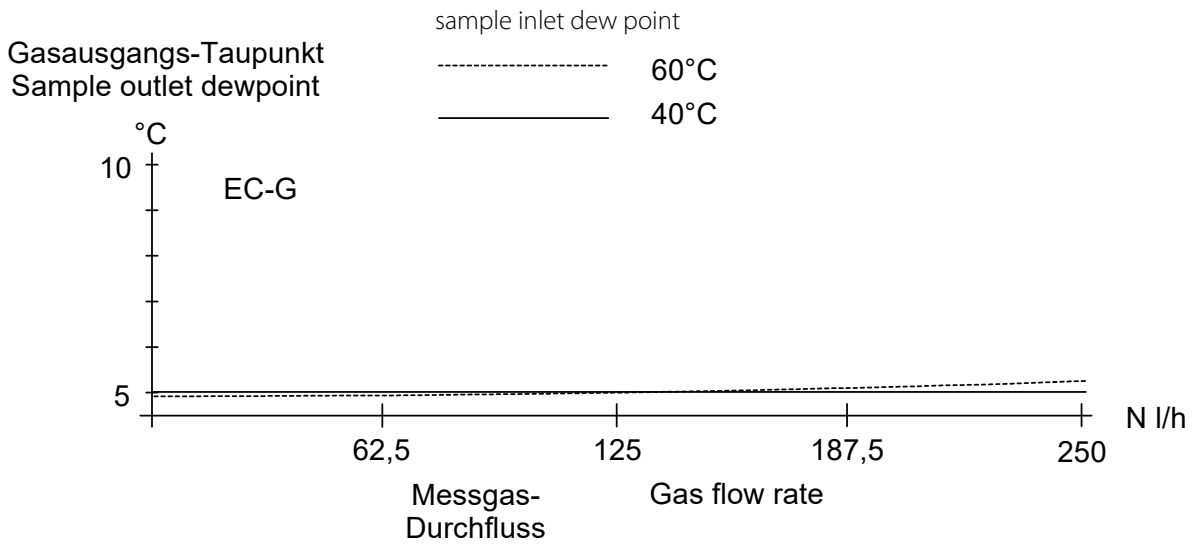


Figure 16 Sample outlet dew point

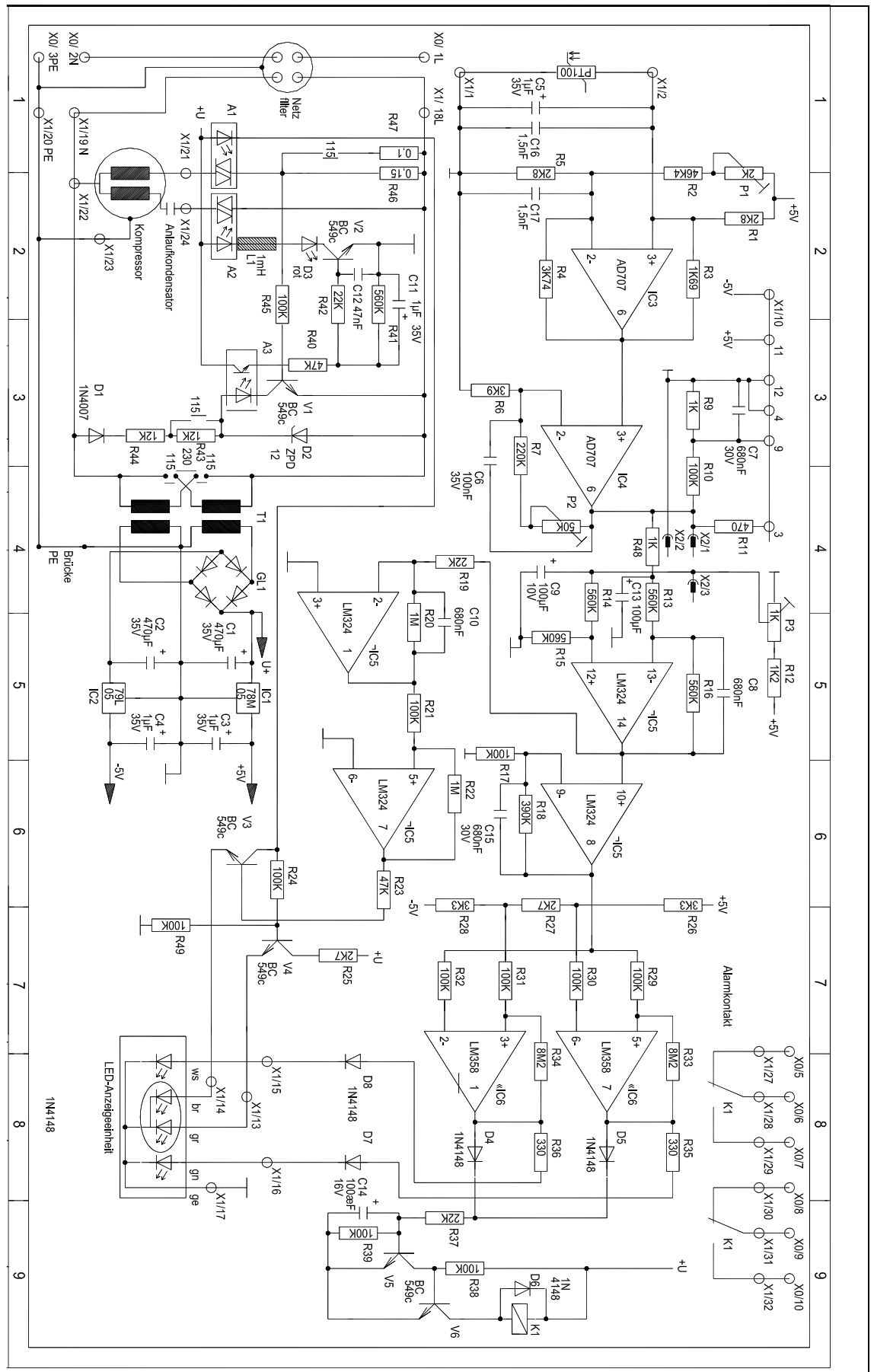


Figure 17 Circuit diagram EC automatic control board (drawing-No.: 2300-5.04.2)

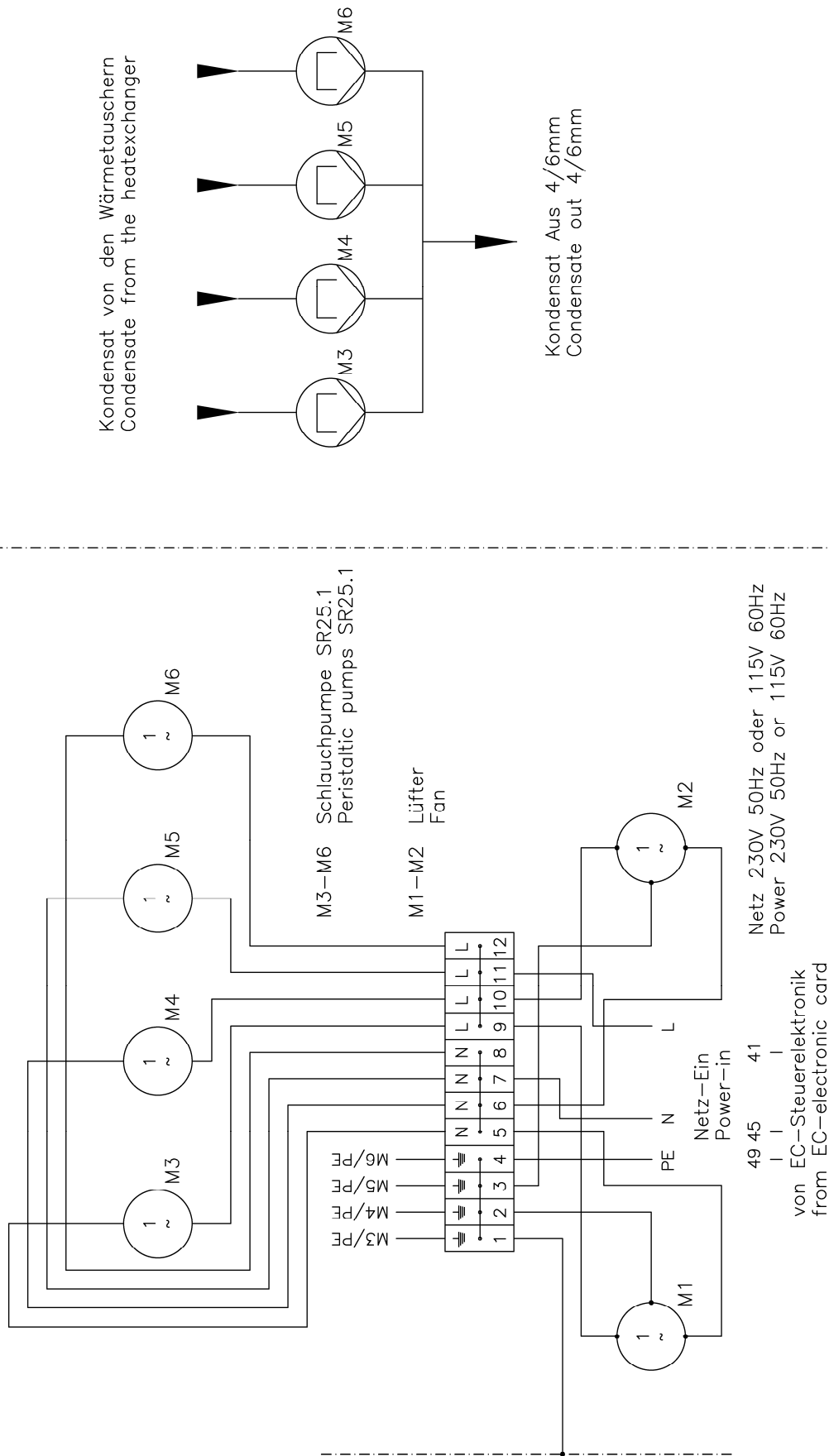


Figure 18 Wiring plan automatic condensate removal unit EC-FD (drawing-No.: 2300-5.05.0)