

# Electric Gas Cooler Series EC<sup>®</sup>

## ECL

Instruction Manual  
Version 1.02.00



**Dear customer,**

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

If you have any question regarding the product or the application, please don't hesitate to contact M&C or your M&C authorized distributor. You will find all the addresses in the appendix of this instruction manual.

For additional information about our products, please go to M&C's website [www.mc-techgroup.com](http://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.

Version: 1.02.00

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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



The product described in this instruction 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 basic safety procedures when mounting, starting up or operating this equipment:**

Read this instruction manual before starting up and use of the equipment. The information and warnings given in this instruction 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 gas cooler ECL 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



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



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



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.



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

### Qualified personnel

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



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



Toxic!  
Acute toxicity (oral, dermal, inhalation)! Toxic when in contact with skin, swallowed or inhaled.



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



Contains gas under pressure. Do not open container!  
Check pressure before opening container and adjust pressure to atmospheric pressure.



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



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



Wear protective gloves!  
Working with chemicals, sharp objects or extremely high temperatures requires wearing protective gloves.



Wear safety glasses!  
Protect your eyes while working with chemicals or sharp objects. Wear safety glasses to avoid getting something in your eyes.



Wear protective clothes!  
Working with chemicals, sharp objects or extremely high temperatures requires wearing protective clothes.



Use foot protection



Use safety helmet and full protective goggles



## 6 INTRODUCTION

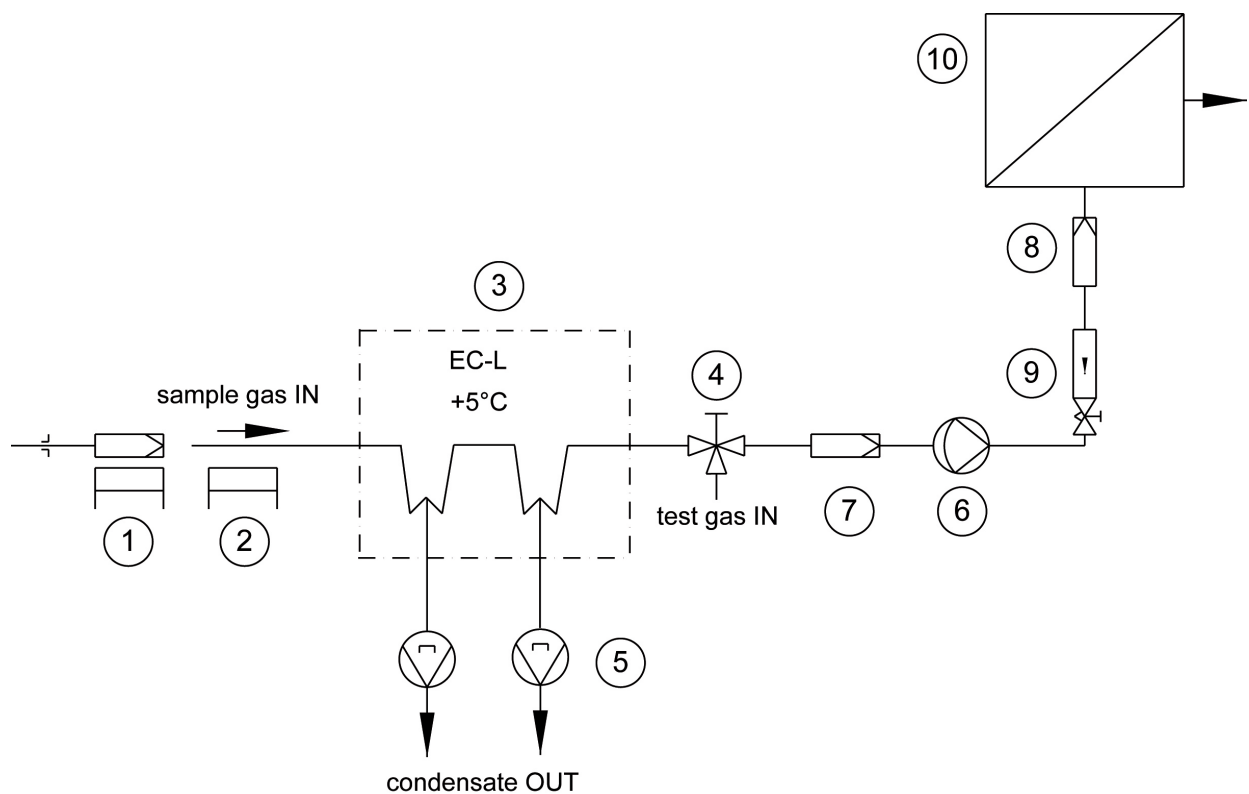
The **M&C** cooler **ECL** is used whenever disturbing moisture loading in the sample gas is to be expected. By lowering the temperature to a very low stable dew point, condensation in the analyzer is prevented and fluctuating measured values due to water vapor cross sensitivities or volumetric errors are avoided.

### 6.1 SERIAL NUMBER

The type plate with the serial number is located at the side panel of the cooler housing. Whenever you call **M&C** regarding questions or orders for spare parts please give us the serial number of your **ECL**.

## 7 APPLICATION

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



- 1 : Filter sample probe SP ...
- 2 : Heated sample line
- 3 : **ECL** cooler
- 4 : 3-way ball valve
- 5 : Peristaltic pump (option)
- 6 : Membrane pump
- 7 : Super fine filter FP ...
- 8 : Aerosol filter CLF-5
- 9 : Flow meter FM10
- 10 : Analyzer

**Figure 1** Application example of the ECL

Through a gas sample probe ① and a heated sample line ②, the sample gas is fed to the **ECL** cooler ③ and cooled down to a dew point of approx. +5 °C [41 °F]. Solid particles are separated with a downstream ultra-fine filter ⑦. To increase the operational reliability of the entire system, we recommend equipping the ultra-fine filter ⑦ with a liquid alarm sensor. If necessary, an aerosol filter ⑧ can be installed upstream of the flow meter ⑨. The processed gas can then be fed to the analyzer ⑩.

## 8 TECHNICAL DATA

### 8.1 FOR BASIC COOLER ECL WITHOUT HEAT EXCHANGER

Gas cooler series EC®	Version ECL
Part No. for basis cooler without heat exchanger, 230 V 50 Hz	02K4000X
Part No. for basis cooler without heat exchanger, 115 V 50 to 60 Hz	02K4000Xa
Number of heat exchangers	2
Ambient temperature	+10 to +45 °C [50 to 113 °F]
Sample outlet dew point	Range of adjustment: +2 to +7 °C [35.6 to 44.6 °F], factory setting: +5 °C [41 °F]
Dew point stability	At constant conditions < ±0.1 °C [±0.18 °F]
Sample inlet temperature	Max. 180 °C*** [356 °F***]
Gas inlet water vapor saturation	Max. 80 °C*** [176 °F***]
Total cooling capacity	144 kJ/h at +10 to +45 °C [50 to 113 °F] ambient
Ready for operation	< 15 min
Main power connection/Power consumption	230 V AC* or 115 V AC**(a) -15 %/+10 %, 50/60 Hz, max. 200 VA start up current: 230 V 50 Hz = 2.5 A/115 V 60 Hz = 4.5 A
Electrical connection	Terminals 2.5 mm <sup>2</sup> , 2 x M20
Status alarm	1 free configurable status alarm with 2 potential free change-over contacts, contact rating 250 VAC, 2 A; 500 VA; 50 W, see chapter 18, Figure 11 for under and over temperature settings
Case protection/Electrical standard	IP20 EN 60529/EN 61010
Method of mounting/Case color	Wall mounting/case color gray, RAL 9003
Dimensions (W x H x D)	210 x 380 x 350 mm [≈ 8.3" x 15" x 13.8"] (Height including cooler feet and depth including peristaltic pump)
Weight	17.6 kg [≈ 38.8 lbs] (with 2 x SR25.2 and 2 x glass heat exchangers)

\* Standard, other versions on request.

\*\* Option

\*\*\* Maximum values in technical data's must be rated in consideration of total cooling capacity at 25 °C [77 °F] ambient temperature.

## 8.2 OPTIONS FOR BASIC COOLER ECL

Options for basic cooler	ECL		
Heat exchanger type	ECL-G	ECL-PV	ECL-SS
Part No	97K0605	97K0610	97K0600
Material of heat exchanger	Duran® glass	PVDF	SS 316Ti
Max. gas flow rate per heat exchanger	250 NI/h***	250 NI/h***	250 NI/h***
Gas press. max. bar abs. <sup>3)</sup>	2 / 3 <sup>2)</sup>	3	10*
Sample gas connection	GL18 for Ø 6 mm OD tube*	Tube ø 6 mm*	Tube ø 6 mm
Condensate connection	GL25 for Ø 12 mm tube* Ø 8 mm or Ø 10 mm**	G3/8"i	G3/8"i or 3/8 NPT**
ΔP at max. flow rate	1 mbar	1 mbar	1 mbar
Stagnant space approx.	50 ml	50 ml	50 ml
Peristaltic pump SR25.2	1 pc. incorporated in the cooler, completely installed, Part No. 01P9125 cooler weight plus 0.6 kg [1.3 lb] per pump		

\* Standard, other version on request.

\*\* Option

\*\*\* Maximum values in technical data's must be rated in consideration of total cooling capacity at 25 °C [77 °F] ambient temperature.

2) With GL-Connecting adapter.

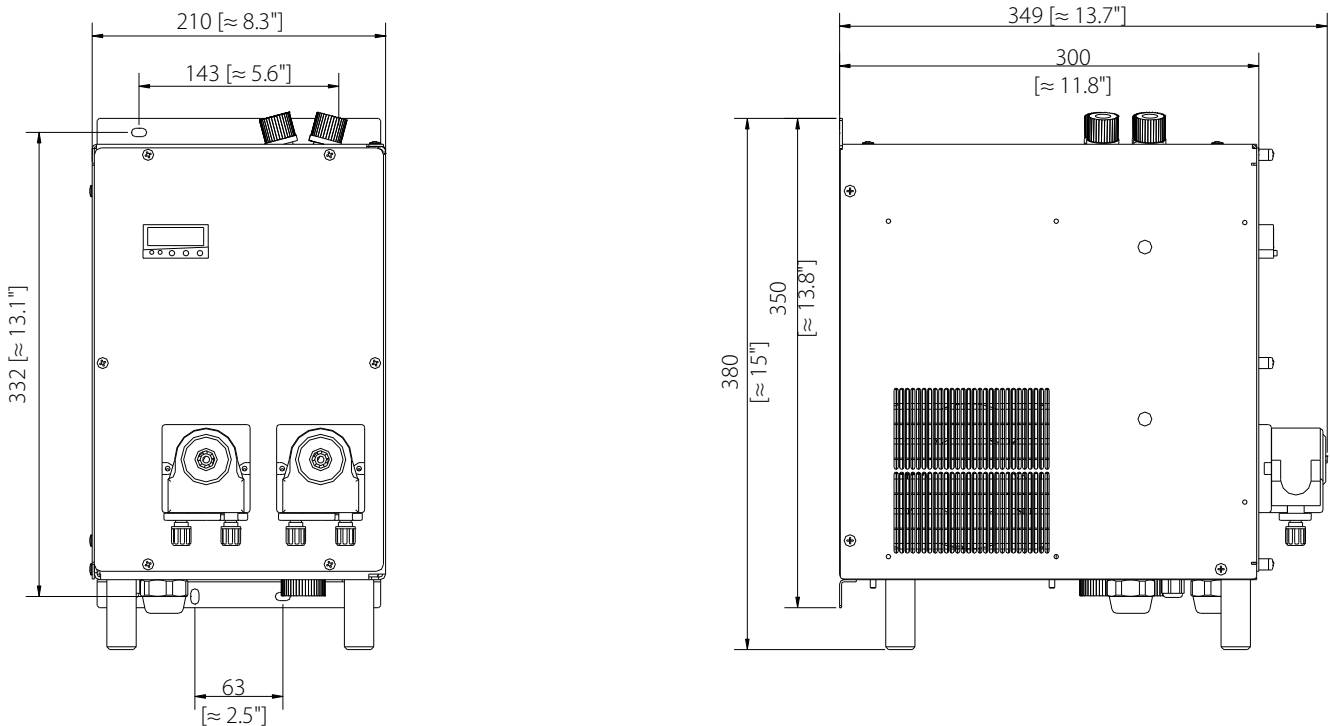
3) With SR25.2 max. 2 bar abs.

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

Duran® is a registered trademark for borosilicate glass by DWK Life Sciences GmbH, Germany.

## 9 DESCRIPTION

Figure 2 shows the **ECL** cooler unit.



**Figure 2 Dimensions ECL**

The cooler **ECL** is suitable for wall installation. The depth of the housing of the cooler is 300 mm [ $\approx 11.8$ "] (349 mm [ $\approx 13.7$ "] with optional mounted peristaltic pumps).

On the upper side of the cooler housing there is a cutout for 2 Jet Stream heat exchangers. Sample gas enters and leaves the heat exchangers by the correspondingly connections on the upper part of the heat exchangers (see chapter 8 Technical Data).

The main power connector and the contact output for the status alarm can be connected at terminals X1 respectively X3 located behind the hinged front panel of the **ECL** housing.

At the bottom of the housing the following connections are provided as standard:

- standard condensate outlets from the heat exchangers,
- cable bushings 2 x M20 x 1.5 clamp range 6 to 12 mm;
- cable bushing 1 x M12 x 1.5 clamp range 4 to 8 mm

The condensate is discharged in "negative pressure operation" (pump behind cooler) with peristaltic pumps of type **SR25.2** optionally installed in the cooler or alternatively externally via collecting vessels type **TG** or **TK** or in "positive pressure operation" with automatic float condensate drains, e.g. type **AD**. The peristaltic pumps are electrically connected to terminal strip X5, under the removable cover of the **ECL** housing.

The cooler has an integrated electronic for the liquid alarm sensor **LA1S** and a relay contact for pump control. In case of liquid alarm the pump will be switched off via the relay. Both connections are on the electronic board behind the front plate. The necessary plugs for electrical connection are in the range of delivery.

## 10 FUNCTION

The **M&C ECL** gas cooler, specially developed for analysis technique, operates according to the compressor cooling principle, and is equipped with a status alarm for safe continuous operation.

Two Jet-Stream heat exchangers, optionally made of borosilicate glass, stainless steel or PVDF, are easily accessible in a heat-insulated cooling block and can be easily exchanged.

Figure 3 shows the functional diagram of the heat exchanger. The compressor cooling system maintains the thermally insulated cooling block at a constant temperature of +5 °C [41 °F]. The regulated, forced air-cooled compressor cooling system and the special design of the Jet Stream heat exchangers ensure very good condensate pre-separation and optimum drying of the sample gas.

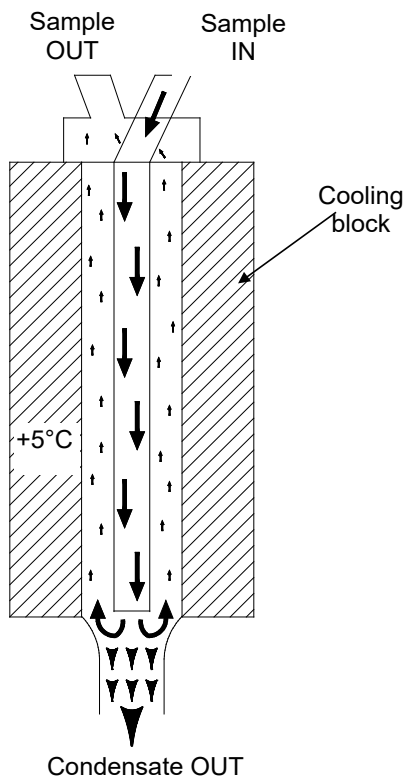


Figure 3 Schematic diagram of the heat exchanger function

## 11 RECEPTION AND STORAGE

The **ECL** gas cooler is a complete pre-installed unit.

- Carefully inspect the **ECL** 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!

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 **ECL** cooler is suitable for wall mounting.

The operating position of the cooler is exclusively vertical. Only then is the proper separation and discharge of the condensate in the heat exchanger guaranteed. During transport and installation, the cooler should always be positioned with the transport feet pointing downwards so that the oil present in the closed compressor circuit cannot flow out of the compressor capsule.



### Note

The cooler must be installed away from heat sources and freely ventilated with a minimum side distance of 100 mm [ $\approx 3.9$ "] to other components so that no disturbing heat accumulation occurs.

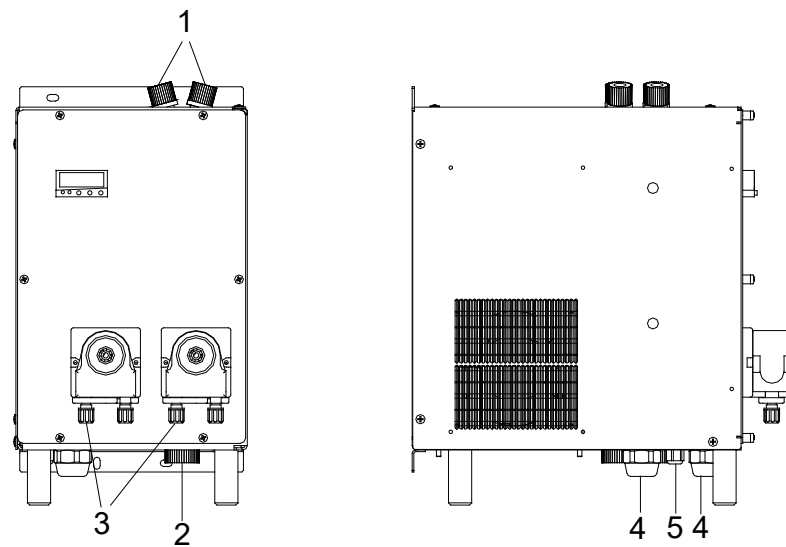
For outdoor installation, the cooler must be installed in a protective housing that is frost-free in winter and sufficiently ventilated in summer. Direct sunlight should be avoided.

Unheated gas extraction lines must be installed with a gradient down to the cooler. Condensate pre-separation is then not necessary. Connect heated extraction lines with sufficient thermal decoupling of at least 20 cm [ $\approx 7.9$ "] to the cooling unit.

## 13 SUPPLY CONNECTIONS

### 13.1 TUBE CONNECTIONS

The connections for sample gas inlet and outlet are located on the upper part of the heat exchangers. For possible connectors see technical data (chapter 8).



- 1 Gas in- and outlet
- 2 Condensate outlet
- 3 Condensate outlet with incorporated peristaltic pumps
- 4 Cable glands M20 x 1,5
- 5 Cable gland M12 x 1,5

**Figure 4** Position of the gas and condensate connections and cable glands

Correspondingly tube and hose connectors are optional available by **M&C**.



**Note**

Do not mix up the tube 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:

#### **Borosilicate glass heat exchangers with connections GL18-6 or GL25-12 (standard)**

- 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- resp. stainless steel heat exchangers with 6 mm tube resp. G 3/8" female**

- For sample gas in- and outlet use a corresponding tube/hose connector (e.g. D 6-DN 4/6, Part No. 05V3115).
- The correspondingly dimensioned tube respectively hose couplings for condensate outlet with threaded connections G 3/8" 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 screwing the connection fitting into the PVDF heat exchanger, make sure to hold a wrench against the key surfaces milled on the corresponding sleeves!

#### **Option: stainless steel heat exchanger with NPT female thread at the condensate outlet**

- The heat exchangers with NPT threaded connectors are marked with circulated notches at the condensate outlet.
- The NPT thread must be screwed in with sealant or fixed with adhesive.

In the standard configuration, the tubes for removal of condensate are connected directly to the heat exchangers. These protrude with the GL25-12 tube connectors (standard, Borosilicate glass heat exchanger) respectively with G 3/8" (standard) thread joint PVDF or stainless steel heat exchanger above the base plate of the cooler casing (Figure 2).

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

- peristaltic pump(s) type **SR25.2** implemented optionally in the cooler housing,
- external mounted condensate vessel(s) with manually emptying respectively,
- automatic float-type condensate traps type **AD** (only for excess pressure operation).



**Note**

If the stainless steel heat exchanger with G 3/8" condensate connection is used, the AD-SS automatic liquid drain can be mounted directly with a threaded adapter, Part No. FF11000 (1/2" NPT on G 3/8" female). This eliminates the need for wall mounting, piping or tubing of the automatic liquid drain.



### 13.2 ELECTRICAL CONNECTIONS



When connecting the equipment, make sure 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 1000 V, together with the associated standards and stipulations.

An external main switch must be provided.

The main circuit must be equipped with a fuse of 10 AT (over current protection); for electrical details see technical data (chapter 8).

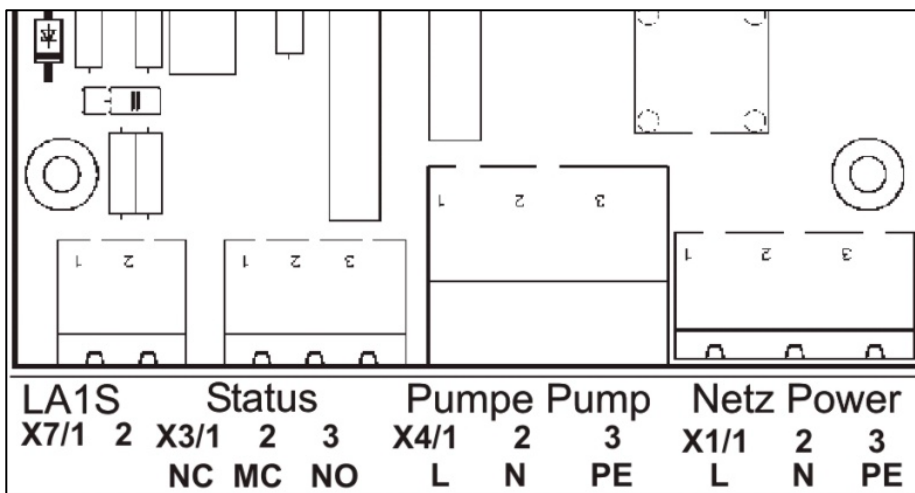


Cooler versions with 115 V resp. 120 V have a built-in transformer to generate an internal current of 230 V. That means, device internal live parts have a current of 230 V not 115 V/120 V.

Figure 5 shows the electrical connections behind the front panel of the **ECL** housing.

Alarm warnings for over- and under-temperature and liquid alarm (if connected) are given as a collective status alarm via a relay output with two potential-free changeover contacts. An alarm is triggered at:

- factory configuration (gas outlet dew point: 5 °C [41 °F], alarm window: 3 °C [5.4 °F], alarm hysteresis: 1 °C [1.8 °F]) within the limits < +1.5 °C [34.7 °F] (under temperature) and > +8.5 °C [47.3 °F] (over temperature). See also chapter 18, Figure 11. A sample pump connected to terminal X4 will be switched off via an internal relay in case of temperature alarm. The temperature alarm contact of the cooler automatically switches the connected sample gas pump on and off.
- liquid breakthrough. A sample pump connected to terminal X4 will be switched off via an internal relay in case of liquid alarm.



**Figure 5 Electrical connections**

Terminals 8 (L and N/PE) and 9 (L and N/PE) on terminal strip X5 are provided for retrofitting two peristaltic pumps (not shown in the figure).

The procedure for connecting the power lines or liquid alarm sensor, pump, and status alarm output is as follows:

1. Release the captive screws (6 pieces) at the cooler front and then swing open the front plate;
2. put the cables (6 to 12 mm) through the cable glands M20 and connect them with the provided plugs according to above mentioned wiring plan;
3. if a liquid alarm should be connected put the cable of the liquid alarm sensor through the cable gland M12 and connect it with the provided plug according to above mentioned wiring plan;
4. tighten the front panel again.

## 14 PREPARATIONS FOR COMMISSIONING

Before initial startup, all plant- and process-specific safety measures must be observed. It is mandatory for the operator to complete the enclosed risk assessment of the product.

The gas exposure risk must be assessed by the operator with regard to the hazards posed by process and calibration gas and the setup at the installation site (e.g. tubing, system cabinet/container/plant). If the risk assessment reveals increased exposure hazards, further measures are required.

A visible label must be attached to the installation site in accordance with the risk assessment provided by the operator.

## 15 START-UP

The ECL's controlled cooling system enables the automatic commissioning of the cooler.

The following description is valid for commissioning the gas cooler at ambient temperatures  $> +8\text{ }^{\circ}\text{C}$  [46.4 °F].



**Note**

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 operation.

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

1. 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.
2. Lead the status contact for status alarm 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!

## 16 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 put out of action for a short time no particular measures need to be taken.

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



**Caution**

Aggressive condensate is possible.



Wear protective glasses and proper protective clothing!

## 17 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 **ECL** cooler does not require any special maintenance intervals. The cooler is to be cleaned with compressed air according to the contamination level of the ambient air (see chapter 17.2).

### 17.1 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:

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

**Note**

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

When installing borosilicate glass heat exchangers, the following must be observed:

1. 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!
2. Remount the GL coupling rings hand-tight by turning them to the right;

To ensure a safe connection of the sample gas respectively condensate tubes to the Borosilicate glass heat exchanger(s) we recommend the use of GL-couplings.

If you have any questions, we will be happy to assist you.

## 17.2 CLEANING THE FINS OF THE CONDENSER

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

1. Shut off the gas flow;
2. Take the cooler off the mains;
3. Release the captive screws (6 pcs.) at the cooler front and then swing open the front plate;
4. Clean the fins through the ventilation slots on the left side carefully with compressed air;
5. Re-install the front plate;
6. Connect the tubing for gas in- and outlet.

### 17.3 MAINTENANCE OF OPTIONAL MOUNTED PERISTALTIC PUMPS TYPE SR25.2

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



**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**



Dangerous voltage!

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



Aggressive condensate possible!

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



Wear protective gloves and protective glasses!



Wear proper protective clothing!



Peristaltic pump is under pressure! Do not open housing!

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

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



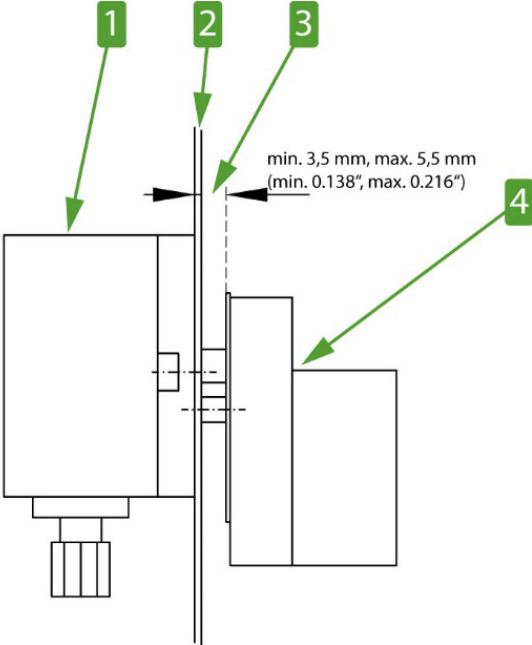
**Note**

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



### 17.3.1 MOUNTING INSTRUCTIONS FOR 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 [≈ 0.14"] and a maximum distance of 5.5 mm [≈ 0.22"] 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 6 SR25.2: Mounting distance between front panel and pump motor**

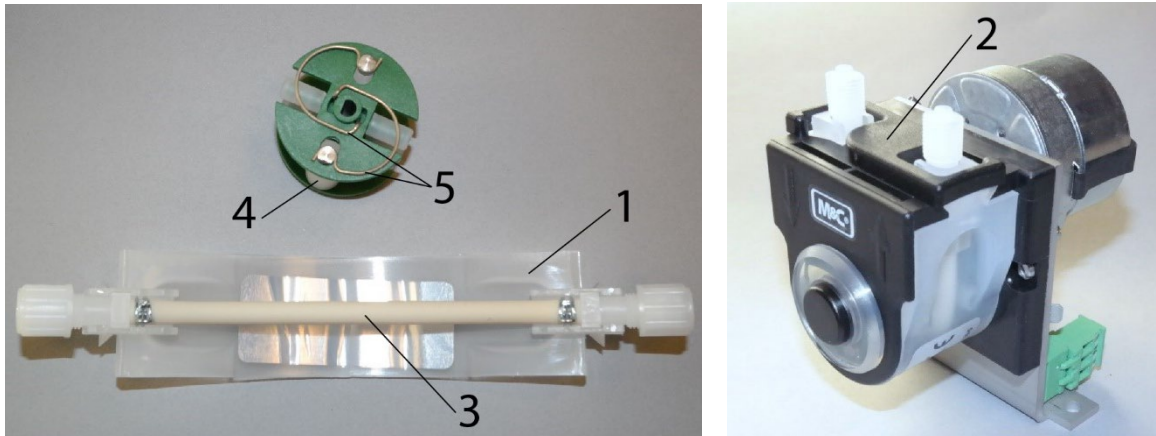


**Note**

For mounting instructions, see the SR25.2 instruction manual. The manual is available on our website [www.mc-techgroup.com](http://www.mc-techgroup.com).

Information on the electrical connection of the peristaltic pumps can be found in chapter 13.2 Electrical connections.

### 17.3.2 CHANGING THE PUMP TUBING



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

**Figure 7 Changing the pump tubing**

For changing the pump tubing please proceed as follows:

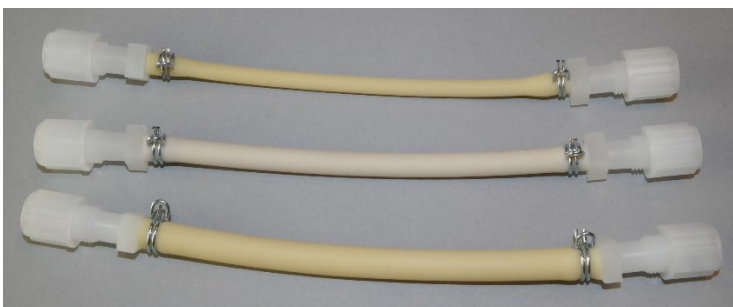
1. Unplug the pump from the mains voltage. The device needs to be voltage free.
2. Open tube connections at the pump;
3. Press conveying belt ① at the recessed grips and turn S-bolt ② clockwise up to limit stop;
4. Take away conveying belt ① and remove the old tubing set ③ from the guides by pulling 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 16.3.3);
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 8 Different pump tube sizes**



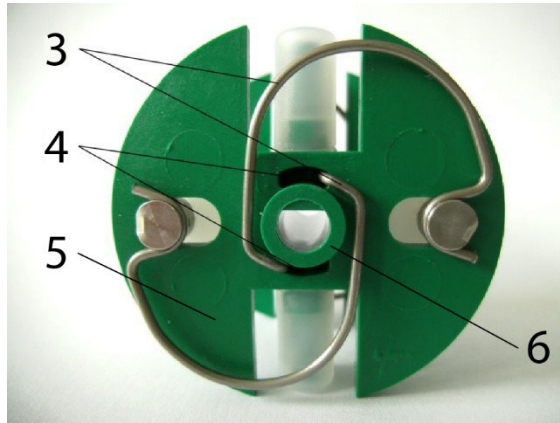
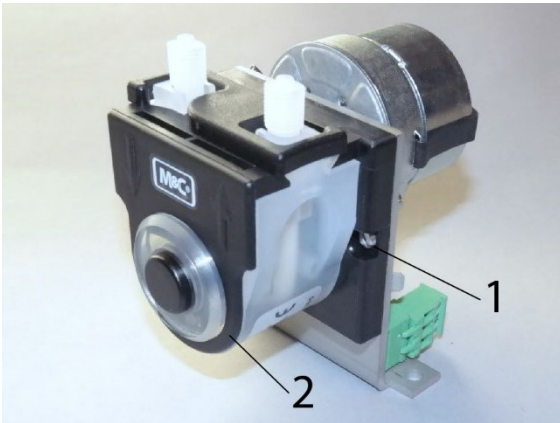
### 17.3.3 CHANGING CONTACT PULLEYS AND SPRINGS



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

Follow these instructions to change the contact pulley and springs:

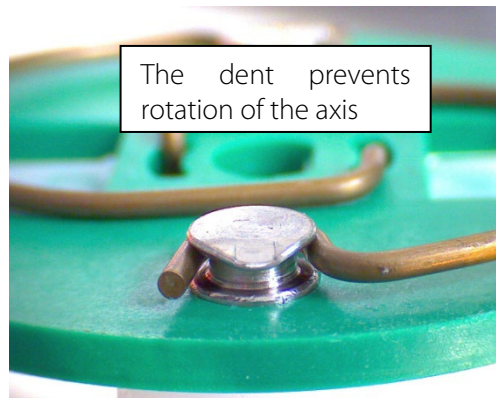
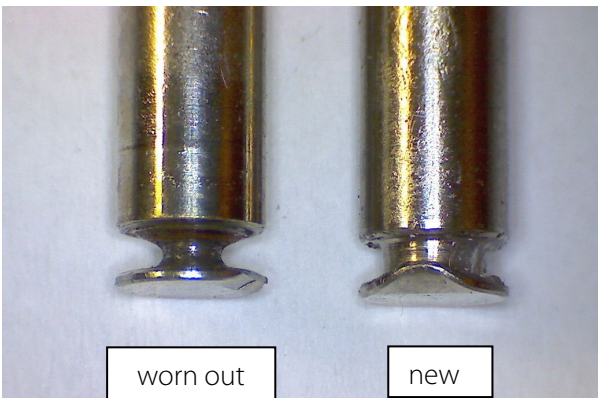
1. Disconnect the peristaltic pump from power supply;
2. Unscrew nuts of the pump head (wrench size 5.5) ①;



1 Pump head nuts                      2 Pump head  
4 Groove                                  5 Driver (roll carrier)  
3 Springs                                  6 Collar of the shaft bore

**Figure 9 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 10).



**Figure 10 Check of axes and rolls**



**Note**

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

**Note**

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

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 10. Please pay attention to the alignment of the dent.

#### 17.3.4 REASSEMBLY OF THE DRIVER

Reassemble the driver in reverse order:

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

**Note**

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

Make sure that the collar of the shaft bore (see Figure 10) faces towards the front of the pump head while mounting the roll carrier.

Use genuine spare parts only!

### 17.3.5 CLEANING THE PUMP HEAD

- When changing flexible tube or other parts, inspect all parts for dirt before assembling the pump head and clean them if necessary.
- We recommend cleaning the parts with a dry cloth. Solvent should not be used, because it can damage the plastics and synthetic rubber parts. Use oil-free compressed air to clean the parts if available.



Aggressive condensate possible!

Media residues in tubing!

Chemical burns caused by aggressive media possible!



Wear protective gloves and protective glasses!



Wear proper protective clothing!

### 17.3.6 REPAIR INFORMATION FOR INTEGRATED PERISTALTIC PUMP TYPE SR25.2 (OPTIONAL)



**Note**

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

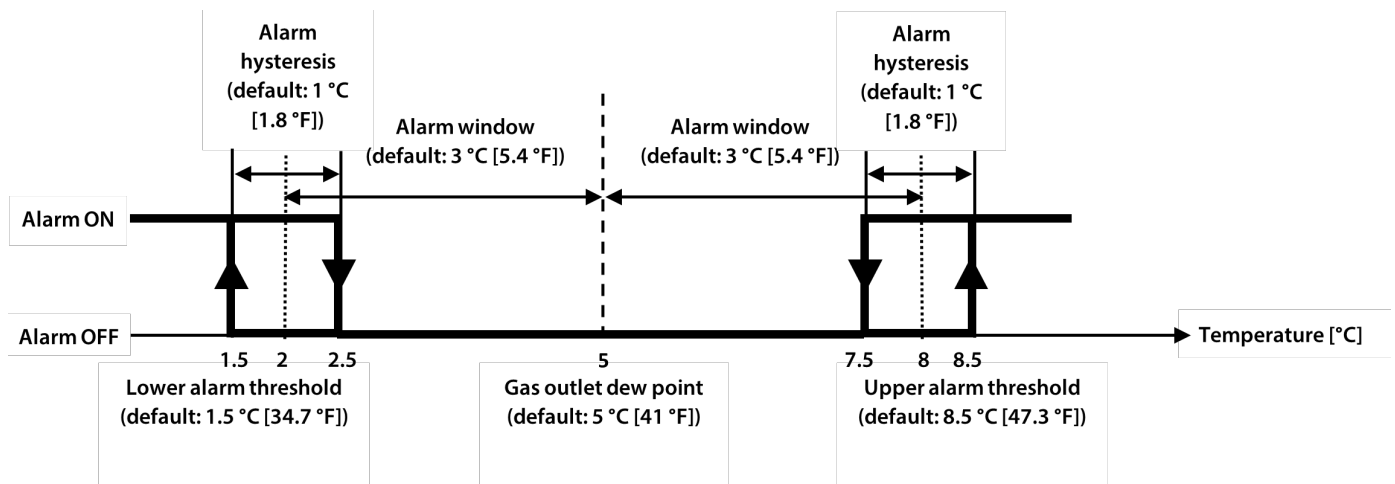
## 18 OPERATING OF THE BUILT-IN ELECTRONIC TEMPERATURE CONTROLLER

New electronic temperature controllers were installed in the housing of the ECL cooler effective April 2022 and February 2024.

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

Figure 11 shows the hysteresis behavior of the status alarm at factory settings. The status alarm of the temperature controller is activated (Alarm ON) and deactivated (Alarm OFF) depending on the temperature, following the hysteresis.

When the cooler is switched on, the temperature is cooled down starting from the ambient temperature, which means that the status alarm is activated: Alarm ON. Figure 11 shows that the alarm remains active until the temperature of 7.5 °C [45.5 °F] is reached. The status alarm follows the hysteresis and is set to Alarm OFF at 7.5 °C [45.5 °F]. If the temperature remains within the range of 1.5 to 8.5 °C [34.7 to 47.3 °F], the status alarm will stay at Alarm OFF. If the temperature changes beyond these limits, the temperature controller follows the hysteresis and sets the status alarm back to Alarm ON at a temperature below 1.5 °C [34.7 °F] or above 8.5 °C [47.3 °F].



**Figure 11** Hysteresis behavior of the status alarm at factory settings

## 18.1 TEMPERATURE CONTROLLER VERSION UNTIL MARCH 2022

In normal operation the display of the temperature controller shows the actual cooling temperature. Figure 12 shows the front view of the temperature controller.



**Figure 12** Front view of the temperature controller version until 03.2022

### 18.1.1 CHANGING THE SET VALUE

To change the set value the P-button has to be pushed in for < 2 sec. The default value of 5 °C [41 °F] appears. With the two arrow buttons the value can be changed. This value should not be adjusted lower than +1 °C [33.8 °F], because otherwise the heat exchanger will freeze up. If the value is adjusted higher than the ambient temperature the cooler will not work.

### 18.1.2 CHANGING THE TEMPERATURE ALARM RANGE

The exact description of how to change the temperature alarm range, can be found in the temperature controller manual.

## 18.2 TEMPERATURE CONTROLLER VERSION STARTING APRIL 2022

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

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



Figure 13 Front view of the temperature controller version starting 04.2022

### 18.2.1 CHANGING THE SET VALUE

Pressing the  $\Delta$  or  $\nabla$  key once causes the set setpoint to start flashing in the bottom line.

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

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

### 18.2.2 CHANGING THE TEMPERATURE ALARM RANGE

The exact description of how to change the temperature alarm range, can be found in the temperature controller manual.

### 18.3 TEMPERATURE CONTROLLER VERSION STARTING FEBRUARY 2024

In normal operation, the display shows the measured temperature (temperature view). The ESC key and the arrow keys (UP and DOWN) are disabled in this view. Figure 14 shows the front view of the temperature controller.



**Figure 14 Front view of the temperature controller version starting 02.2024**

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

#### 18.3.1 CHANGING THE SETPOINT

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

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

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

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




**Note**

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

## 19 TROUBLE SHOOTING

The following table should give an overview of possible errors and an instruction to check and to repair them (is not valid for the starting-up period of cooler).

Error	Possible reason	Check/Repair
Condensate in the gas outlet	Ambient temperature < 5 °C [41 °F] Cooler overloaded Peristaltic pump doesn't work Tube of the peristaltic pump defective Cooling capacity too low (cooler is not overloaded)  Motor protection switch released	Heat up the components downstream; Keep the operational data (chapter 8); Change peristaltic pump; Change the tubing (chapter 17.3.2);  Clean the fins of the condenser (chapter 17.2); Check the vent; Check the safety distance to other heated components; Secure sufficient ventilation; Thermal load caused by the sample gas resp. ambient is too high; Clean the fins of the condenser (chapter 17.2); Keep the operational data (chapter 8); Let the cooler cool down before restarting it;
Gas flow blocks up reading	Contamination of the sample gas way	Optimize the dust pre-separation upstream the cooler; Clean the gas ways and the cooling system;
Wrong temperature	Temperature sensor defective Temperature controller defective Circuit of cooling agent leaky	Check the PT100-sensor; Check the temperature controller; Send the cooler for repair;
Cooler break-down	Power supply interrupted	Check the power supply and reconnect;  <b>Pay attention to the relevant safety instructions!</b>
Compressor does not work	Compressor defective; Motor protection switch defective	Send the cooler for repair;

## 20 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.

## 21 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.

<b>Electric gas cooler ECL</b>					
<b>(C) Consumable parts</b>					
<b>(R) Recommended spare parts</b>					
<b>(S) Spare parts</b>					
					<b>Recommended quantity being in operation [years]</b>
<b>Part No.</b>	<b>Indication</b>	<b>C/R/S</b>	<b>1</b>	<b>2</b>	<b>3</b>
97K0605	ECL-G Jet-Stream heat exchanger material: Borosilicate glass connections gas: GL18 to 6 mm condensate: GL 25 to 12 mm	R	1	1	1
97K0610	ECL-SS Jet-Stream heat exchanger material: SS 316 connections gas: 6 mm tube condensate: G 3/8" female	R	1	1	1
97K0600	ECL- PV Jet-Stream heat exchanger material: PVDF (Polyvinylidenfluorid) connections gas: 6 mm tube condensate: G 3/8" female	R	1	1	1
90K0115	EC-thermal conductivity paste 50 g [ $\approx$ 0.11 lb] (-40 to 140 °C [-40 to 284 °F])	R	1	1	2
90K0035	Fan ECL 230 V, 50 Hz	C	-	-	1
93K0042	PT100 temperature sensor for CSS/V	C	-	-	1
97K0010	ECM transformer 115 V/230 V, ... 230 VA	R	-	-	-
01B8360	Electron. PID-temperature controller for ECL version until 03.2022	T	-	-	1
01B8370	Electronic PID-temperature controller for ECL version starting 04.2022	T	-	-	1
04E1000	Electronic PID-temperature controller for ECL version starting 02.2024	T	-	-	1

Peristaltic pump 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
90P1007	Hose set ③ SR25 with PVDF-tube connectors DN 4/6 mm, standard	C	1	2	4
90P1020	Driver SR25, complete	S	-	1	1
90P1010	1 set (4 pcs) contact springs SR25 for driver	R	1	2	2
90P1045	Contact pulleys SR25 PVDF ④ for driver	S	2	4	4
90P1050	Conveying belt SR25 ①	S	-	1	2
90P1025	S-bolt ② SR25	S	-	-	1
01P1300	Peristaltic pump SR25.2, complete 230 V/115 V, 50/60 Hz	R	-	-	1
90P1030	Heat peristaltic pump SR25, complete without motor and gears	S	-	-	1

The figures in the table refer to Figure 7

## 22 RISK ASSESSMENT

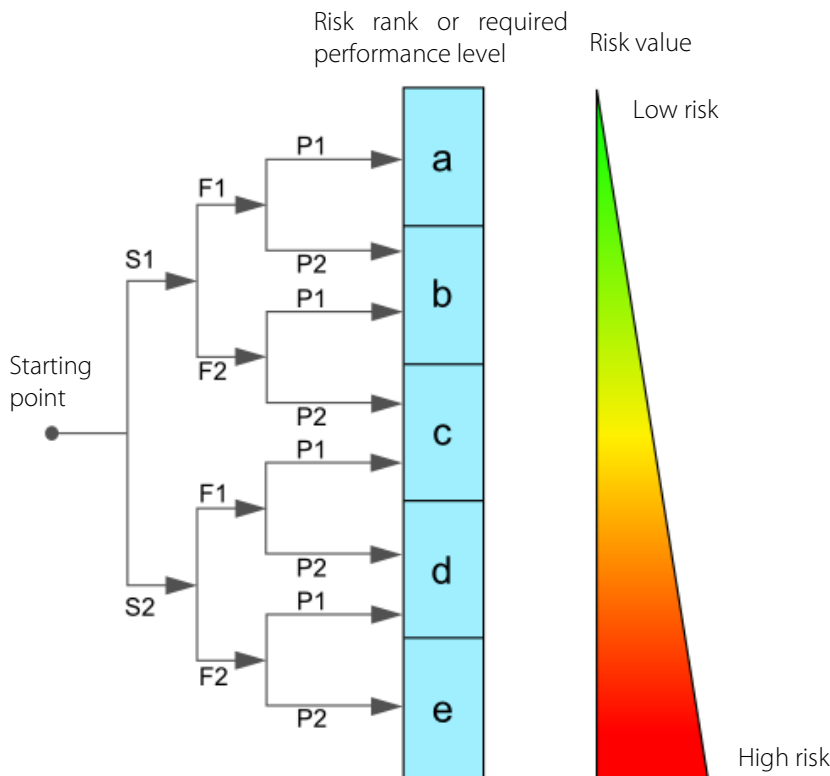
The risk assessment provided in this chapter is intended for all work activities on the product. The hazards can occur in the work steps of assembly, commissioning, maintenance, disassembly and in the event of a product fault. During normal operation, the product is protected by a system cabinet or appropriate covers.

Only qualified personnel is permitted to perform the work. The following minimum knowledge is required for the work:

- Employee instruction provided in process engineering
- Employee instruction provided in electrical engineering
- Detailed knowledge of the instruction manual and the applicable safety regulations

The product complies with the current regulations according to state-of-the-art science and technology. Nevertheless, not all sources of danger can be eliminated while observing technical protective measures. Therefore, the following risk assessment and the description of exposure hazards refer to the work steps mentioned above.





**Severity of injury:**

S1 = 1 = minor (reversible injury)  
 S2 = 2 = serious (irreversible injury, death)

**Frequency and duration:**

F1 = 1 = infrequent or short exposure to hazard  
 F2 = 2 = frequent (more than once per hour/shift)

**Possibility of preventing or limiting the damage**

P1 = 1 = possible  
 P2 = 2 = hardly possible

**Figure 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  $> 60\text{ }^{\circ}\text{C}$ .

The hot parts are shielded by mechanical devices. Before opening the products, they must be disconnected from the power supply and a cooling time of more than  $> 20$  minutes must be observed. In general, for electrical and mechanical work on the product, wear personal protective equipment (PPE) in accordance with the risk assessment.



### Caution electric shock

#### Risk rank group C

When installing high-power systems with nominal voltages of up to 1000 V, the requirements of VDE 0100 and their relevant standards and regulations must be observed!

This also applies to any connected alarm and control circuits. Before opening the products, they must always be disconnected from the power supply.



### Gas hazard

#### Risk rank group A-B-C

The hazard potential mainly depends on the gas to be extracted.

If toxic gases, oxygen displacing or explosive gases are conveyed with the product, an additional risk assessment by the operator is mandatory.

In principle, the gas paths must be purged with inert gas or air before opening the gas-carrying parts.

The escape of potentially harmful gas from the open process connections must be prevented.

The relevant safety regulations must be observed for the media to be conveyed. If necessary, flush the gas-carrying parts with a suitable inert gas. In the event of a gas leakage, the product may only be opened with suitable PPE or with a monitoring system. Furthermore, the work safety regulations of the operator must be observed.



### Caution crushing hazard

#### Risk rank group A

The work must be performed by trained personnel only.

This applies to products weighing less than  $< 40 \text{ kg}$  [ $\approx 88.2 \text{ lbs}$ ]:

The product can be transported by 1 to 2 person(s). The instructions for appropriate personal protective equipment (PPE) must be observed.

The weight specifications are contained in the technical data of this product.

Furthermore, the work safety regulations of the operator must be observed.

## 23 APPENDIX

- Gas outlet dew point dependency at a gas inlet dew point of  $80 \text{ }^\circ\text{C}$  [ $176 \text{ }^\circ\text{F}$ ]



Further product documentation can be seen and downloaded from our home page:  
[www.mc-techgroup.com](http://www.mc-techgroup.com)

- Data sheets:
  - Threaded couplings for 'GL' glass connections
  - Automatic condensate trap AD-SS
  - Automatic condensate trap AD-P
  - Condensate vessel TG, TK
- Instruction manual peristaltic pump SR25.2

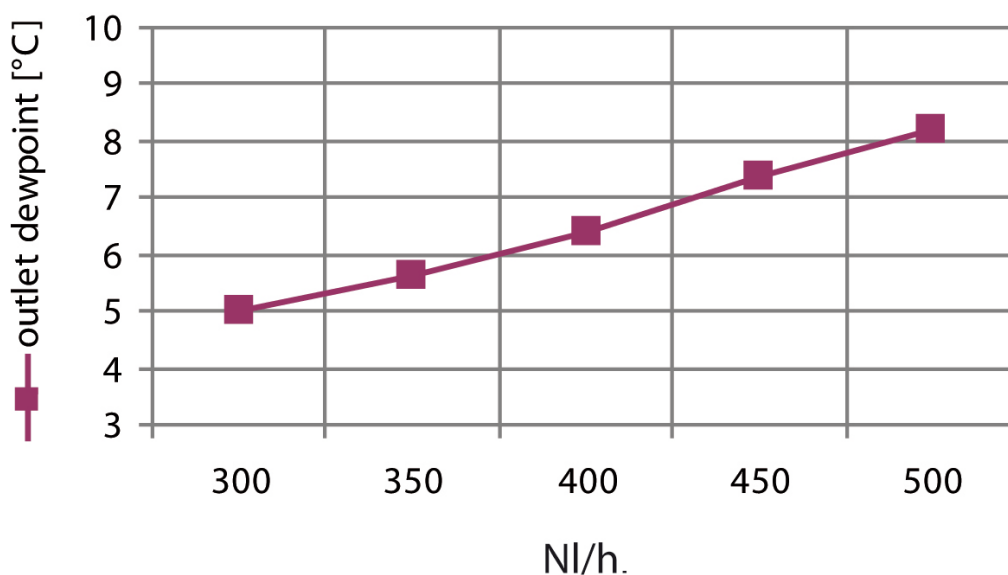


Figure 16 Gas outlet dew point dependency at a gas inlet dew point of  $80 \text{ }^\circ\text{C}$  [ $176 \text{ }^\circ\text{F}$ ]