Embracing Challenge

Electric Gas Cooler Series EC®

ECM

Instruction Manual
Version 1.00.01

Dear customer,

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

Version: 1.00.01

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List of illustrations

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1 GENERAL INFORMATION

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

2 DECLARATION OF CONFORMITY

CE - Certification

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**.

CSA - Certification

The product described in this operating manual complies with the following CSA directive:
CAN/CSA-C22.2 No.61010.1-04 UL Std.61010-1 (2 Edition).

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 gas cooler ECM must not be used in hazardous areas.

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

4 WARRANTY

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

5 USED TERMS AND SIGNAL INDICATIONS

DANGER!

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

WARNING!

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

CARE!

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

CARE!

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

ATTENTION!

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

NOTE!

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

SKILLED STAFF

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

6 INTRODUCTION

The patented **M&C ECM** 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.

6.1 SERIAL NUMBER

The type plate with the serial number is located at the side panel of the cooler housing (wall mounting version). Whenever you call **M&C** regarding questions or orders for the spares please give us the serial number of your **ECM.**

7 APPLICATION

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

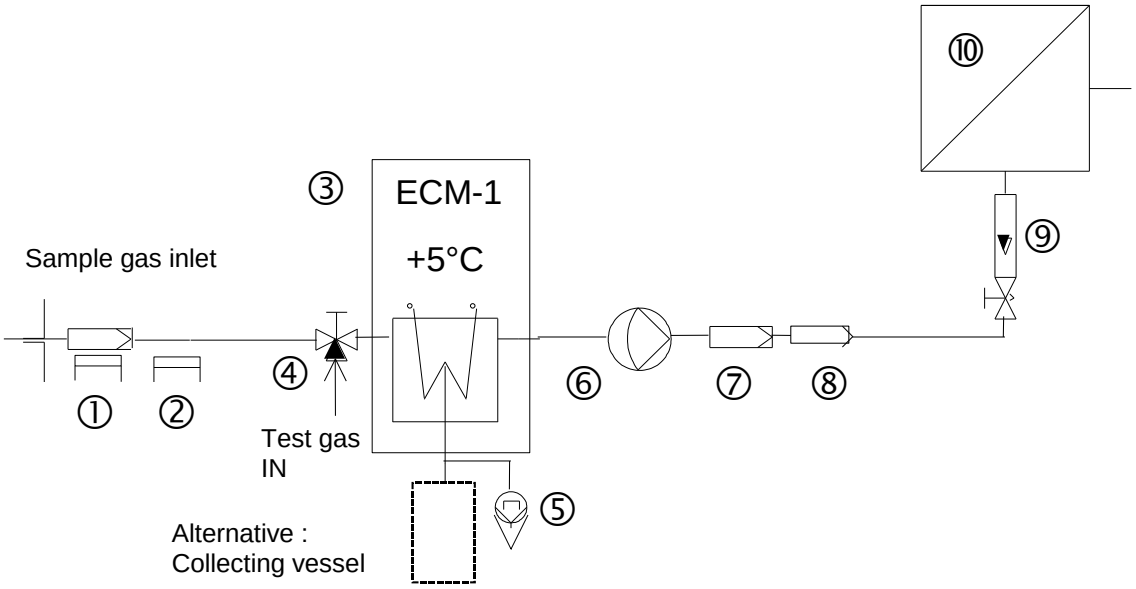


Figure 1 Application example of the ECM

1 : Filter sample probe SP ...
2 : Heating sample line
3 : **ECM** 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 : Analyser

The gas to be measured is taken from the **ECM** gas cooler ③ by a gas sample probe ① via a heated sample line ② and cooled down to a dew point of +5°C. 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 analyser ⑩.

8 TECHNICAL DATA

8.1 FOR BASIC COOLER ECM WITHOUT HEAT EXCHANGER

Gas cooler series EC®	**version ECM-1**	**version ECM-2**
Part No.	02K7500 (a)**	02K7510 (a)**
Number of heat exchanger possibility	prepared for 1 stream	prepared for 2 streams
Sample outlet dew point	range of adjustment: +2 °C ..... +7 °C, factory setting: +5 °C	
Dew point stability	at const. conditions: < ±0,1°C	
Sample inlet temperature	***max. +180°C	
Sample inlet dew point	***max. +80°C	
Gas flow rate	***max. 250l/h	***max. 2x150l/h
Ambient temperature	+10°C to +50°C	
Storage temperature	-20 to +60°C	
Total cooling capacity	40W at 10°C - 50°C ambient temperature	
Ready for working	< 15 min	
Power consumption	max. 200VA (start up current at 230V=2,5A; at 120V=4,5A)	
Main power connection	240V/120V, 50Hz/60Hz (a):-15%/+10%	
Electrical connections	terminals: 6-12mm , cable gland: 2xM20x1,5	
Status alarm	1 free configurable status alarm with 2 potential free change-over contacts, alarm point: < 2°C and > 8°C contact rating 250VAC, 2A; 500 VA; 50W	
Electrical safety	**EN**	EN 61010
	CSA C US	CAN/CSA-C22.2 No.61010.1-04 UL Std. No. 61010-1(2 Edition)
System of protection	IP20 (EN 60529)	
Case colour	RAL 9003	
Method of mounting	wall mounting	
Dimensions Weight	270 x 270 x 316mm (WxHxD) 12kg/13,5kg (version: 230V/115V)	

8.2 OPTIONS FOR BASIC COOLER ECM

Heat exchanger type	**ECM-1G**	**ECM-1PV**	**ECM-1SS**	**ECM-2G**	**ECM-2PV**	**ECM-2SS**
Part No	93K0140	93K0170	93K0160	97K0100	97K0110	97K0115
Material of heat exchanger	Borosilicate glass	PVDF	st. steel 316Ti	Borosilicate glass	PVDF	st. steel 316Ti
Max. gas flow rate	250Nl/h	250Nl/h	250Nl/h	150Nl/h	150Nl/h	150Nl/h
Sample gas pressure abs.	max. 2bar (3bar)[1]	max. 3bar	max. 10bar	max. 2bar (3bar)[1]	max. 3bar	max. 10bar
Sample gas connection	GL18 for Ø6mm a.d. tube*	G1/4“i	G1/4“i or 1/4“ NPT**	GL18 for Ø6mm a.d. tube*	Tube Ø6mm*	Tube Ø6mm*
Condensate connection	GL25 for Ø12mm tube* Ø8mm or Ø10mm**	G3/8“i	G3/8“i o. 3/8“NPT**	GL25 for Ø12mm tube* Ø8mm or Ø10mm**	G3/8“i	G3/8“i o. 3/8“NPT**
ΔP at max. flow	1mbar	1mbar	1mbar	1mbar	1mbar	1mbar
Stagnant space approx.	100ml	100ml	100ml	40ml	25ml	30ml

Peristaltic pump SR25.2	1 pc. incorporated in the cooler, compl. installed, part no.: 01P9125; cooler weight plus 0,6kg per pump ⚠ the sample gas pressure is limited to 2bar absolute

* Standard, other version on request [1] with GL connecting adapter

** Option

*** Maximum values in technical data must be rated in consideration of total cooling capacity at 25 °C ambient temperature and an outlet dew point of 5 °C.

9 DESCRIPTION

Figure 2 shows the **ECM-2G** cooler unit.

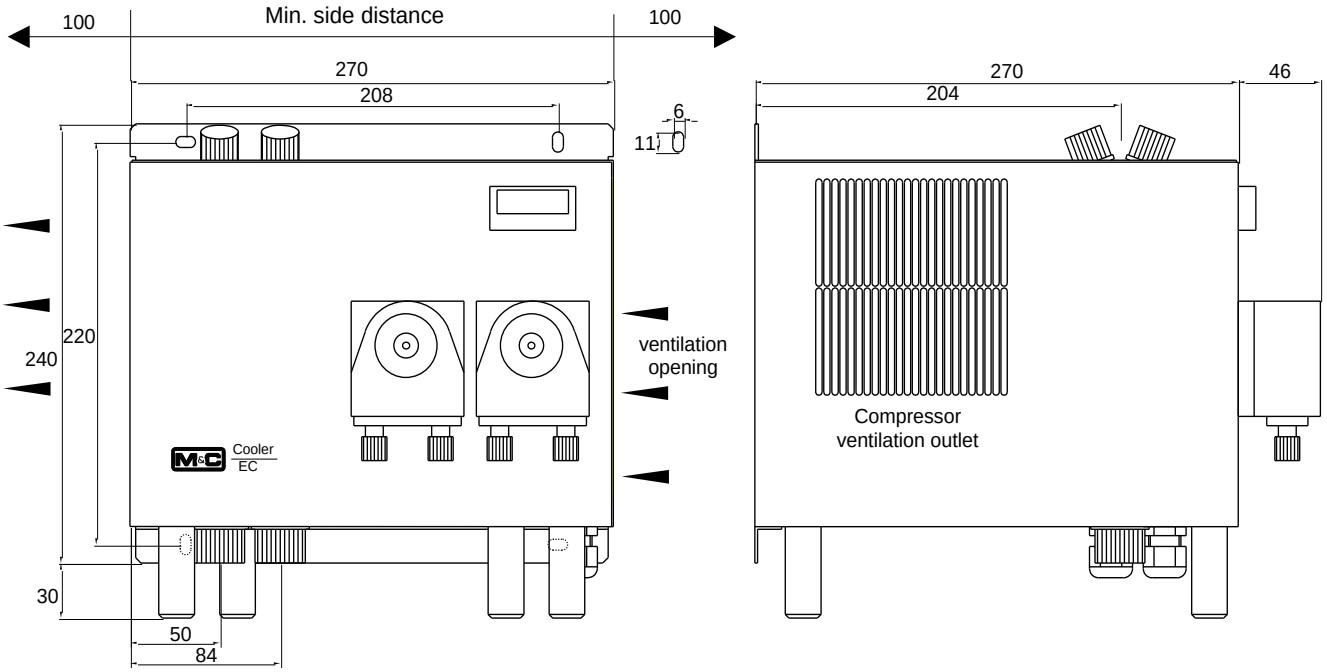


Figure 2 ECM-2G

The cooler **ECM** is equally suitable for wall installation. The depth of the housing of the cooler is 270mm (316mm with optional mounted peristaltic pumps).

On the upper side of the cooler casing you will see the cutouts for 1 or 2 heat exchangers. Sample gas enters and leaves the heat exchangers by the correspondingly connections on the upper part of the heat exchangers (see 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 removable front panel of the **ECM** 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 6-12mm;

With under- respectively ambient pressure the condensate removal happens via the peristaltic pumps **SR25.2** optionally implemented in the cooler housing or externally with collecting vessels type **TG.../TK...** . With over-pressure an automatic liquid drainer type **AD-...** is suitable.

10 FUNCTION

The **M&C** gas cooler type **ECM** is a compressor cooler with status alarm capability. This ensures 100% availability of the cooler.

Up to 2 Jet-stream heat exchangers made of Borosilicate 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 3 shows a schematic diagram of the functioning of the heat exchanger: The compressor cooler system has a heat-insulated cooling block at a constant temperature of +5°C. 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.

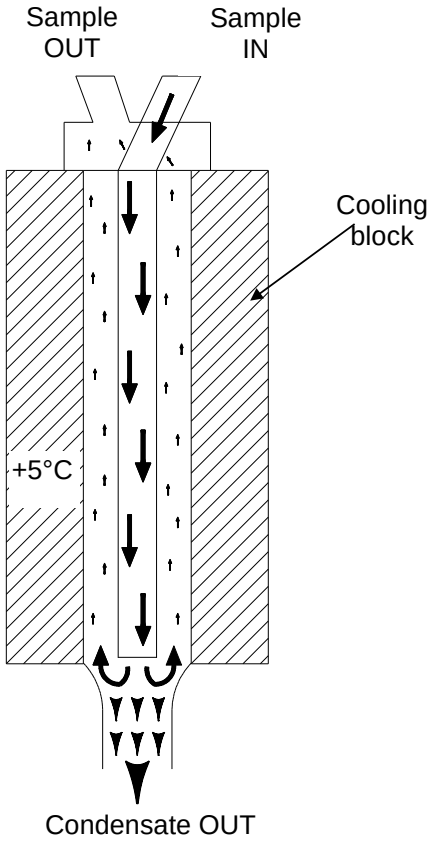


Figure 3 Schematic diagram of the heat exchanger function

11 RECEPTION AND STORAGE

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

- Carefully inspect the **ECM** 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!
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 stood in the operating position for approx. 24 hours before it is switched on!

12 INSTALLATION INSTRUCTIONS

The **ECM** cooler is suitable for wall mounting.

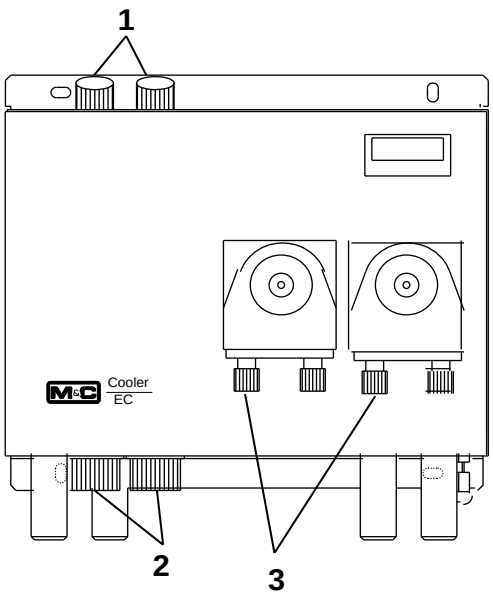
NOTE!

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 of min. 20cm to the cooler!

13 SUPPLY CONNECTIONS

13.1 HOSE CONNECTIONS

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



1 Gas inlet and outlet

2 Condensate outlet

3 Condensate outlet with optional mounted peristaltic pump

Figure 4 Gas and condensate connections

Correspondingly tube and hose connectors are optional available by **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:

Borosilicate glass heat exchangers with connections GL18-6 respectively 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 G1/4“I resp. G3/8“I

- The correspondingly dimensioned 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 respectively stainless steel 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.
- 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 G3/8” (standard) thread joint PVDF or stainless steel heat exchanger above the base plate of the cooler casing (fig.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 over-pressure operation).

NOTE!

Stainless steel heat exchangers with G3/8” 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 G3/8”i). By this wall mounting and tubing of the AD-SS unit isn’t necessary!

13.2 ELECTRICAL CONNECTIONS

CARE!

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 1000V, together with the associated standards and stipulations.
An external main switch must be provided.
The main circuit must be equipped with a fuse of 10AT (over current protection); for electrical details see technical data (8.).

WARNING!

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

Figure 5 shows the electrical connections at the plastic housing behind the front panel of the **ECM** housing (fig. 2).
Alarm warnings for over- and under-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 referring to the set-temperature (+5°C).

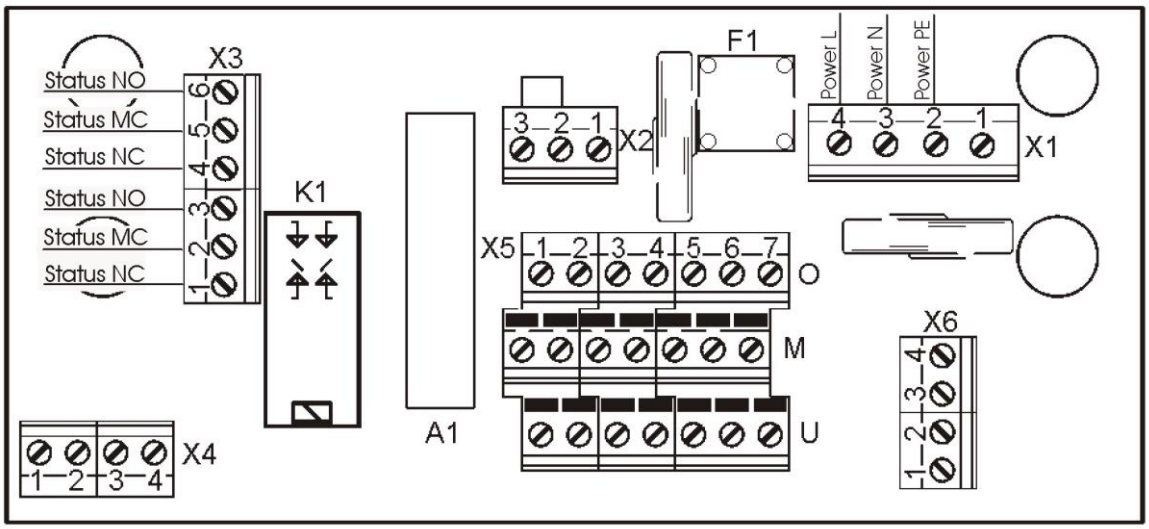


Figure 5 Electrical sockets alarm contact

The connection of the mains respectively status alarm signals happens as follows:

- release the screws (7 pcs.) from the cooler top and remove it;
- put the cables (6-12mm) through one of the cable glands and connect them according to a.m. wiring plan;
- the re-installation of the cooler top happens in the opposite way.

14 START-UP

The thermo-hydraulic controlled cooling system of the **ECM** permit automatic start-up of the cooler.
The following description is valid for start-up of the gas cooler for an ambient temperature > 8°C.

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 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, 115V or 230V, as shown on the type plate.
- 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!

15 CLOSING DOWN

NOTE!

The location for the cooler must remain frost-free, even when the unit has been switched off!
If the cooler unit is putting out of action for a short time no particular measures need to be taken.
We recommend sweeping the cooler with inert gas or ambient air while the unit is putting out of action for a longer time.

CARE!

Aggressive condensate is possible.
Wear protective glasses and proper protective clothing!

16 MAINTENANCE

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

DANGER!

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

The **ECM** 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.

16.1 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:

- 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;
- Smear the push-in opening with a thin and equal layer of thermal conductivity paste (part no. 90K0115);
- 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 Borosilicate 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!
- Do up the red 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.
We like to advise you.

16.2 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:

- Shut off the gas flow;
- Dismantle the tubing for gas in- and outlet;
- Unscrew the cooler hood and remove it carefully;
- Clean the fins carefully with compressed air;
- Re-install the cooler hood;
- Connect the tubing for gas in- and outlet.

NOTE!

Do not mix up the hose connections; the inlet and outlet connections of the heat exchangers are marked with arrows.

16.3 MAINTENANCE OF THE OPTIONAL MOUNTED PERISTALTIC PUMP(S), TYPE SR25.2

Before the maintenance work is carried out, it is necessary hat 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 CHANGE OF THE PUMP TUBE

CARE!

Aggressive condensate is possible !
Wear protective glasses and proper protective clothing !

NOTE!

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

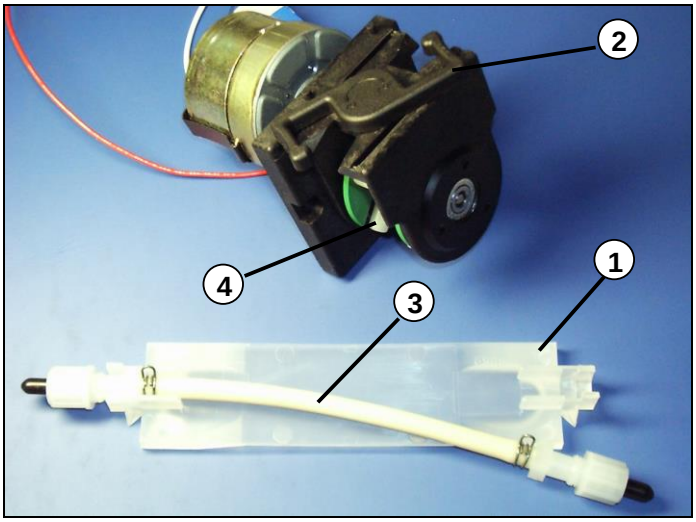


Figure 6 Change of the pump tube

- 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;
- Put the new hose set ③ with the hose connectors into the guides of the conveying belt ① ;

NOTE!

Only the usage of the original hose set guarantees a perfect function.
Never lubricate the hose.
Before mounting the pump check all parts for impurity and clean if necessary.

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

16.3.2 CHANGE OF CONTACT PULLEYS AND SPRINGS

- Take off the cooler of the mains;
- Unscrew the nut of the pump head (span of the jaw 5,5);
- Draw the pump head out of the motor shaft;

Now the driver can 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 dismounted and the contact pullets are ready for change.
- Remounting happens in the opposite way.

NOTE!

While mounting pay attention to the fit of ‘rotational axisdriver’.
Use genuine spare parts only!

16.3.3 CLEANING THE PUMP HEAD

- When changing flexible tube or other parts, inspect all parts for dirt before assembling the pump head and clean them if necessary.
- As far as possible clean the parts with a dry cloth. Solvents should not be used as they can attack the plastics and synthetic rubber parts. If a compressed air line is available, blow the parts out with it.

CARE!

Aggressive sample is possible!
Wear protective glasses and proper protective clothing during disassembly, repair or cleaning!

17 OPERATING OF THE BUILT-IN ELECTRONIC TEMPERATURE CONTROLLER

In normal operation the display of the temperature controller shows the actual cooling temperature. Figure 7 shows the front view of the temperature controller.

Figure 7 Front view of the temperature controller

17.1 CHANGING THE SET VALUE

To change the set value the P-key has to be pushed < 2 sec. The company fixed value of 5°C appears. With the two arrow keys the value can be changed. This value should not be adjusted lower than +1°C, because otherwise the heat exchanger will freeze up. Is the value adjusted higher than the ambient temperature the cooler will not work.

17.2 CHANGING THE TEMPERATURE ALARM WINDOW

The exact description of changing the temperature alarm window can be found in the manual of the temperature controller.

18 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 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 (10.); Change peristaltic pump; Change the tubing (18.3); Clean the fins of the condenser (18.2); 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; Keep the operational data (10.); 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; ⚠ **Pay attention to the relevant safety instructions!**
Compressor does not work	Compressor defective; Motor protection switch defective	Send the cooler for repair;

19 SPARE PARTS LIST

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

Electric gas cooler ECM					
(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**
93 K 0140	ECP-3000 G Jet-Stream heat exchanger material: Borosilicate glass connections gas: GL18-6mm condensate: GL 25-12mm	R	1	1	1
93 K 0160	ECP-3000 SS Jet-Stream heat exchanger material: SS 316 connections gas: G 1/4“i condensat:e: G 3/8“i	R	1	1	1
93 K 0170	ECP-3000 PV Jet-Stream heat exchanger material: PVDF (Polyvinylidenfluorid) connections gas: G 1/4“i condensate: G 3/8“i	R	1	1	1
97 K 0100	ECM-2G Jet-Stream heat exchanger material: Borosilicate glass connections gas: GL18-6mm condensate: GL 25-12mm	R	1	1	1
97 K 0110	ECM-2PV Jet-Stream heat exchanger material: PVDF (Polyvinylidenfluorid) connections gas: 6mm tube condensate: G 3/8“i	R	1	1	1
97 K 0115	ECM-2SS Jet-Stream heat exchanger material: SS 316 connections gas: 6mm tube condensate: G 3/8“i	R	1	1	1
90 K 0115	EC-thermal conductivity paste 50g (-40°C bis 140°C)	R	1	1	2
90 K 0035	Fan ECP 230V, 50Hz	C	-	-	1
93 K 0040X	PT-100 temperature sensor for ECM	C	-	-	1
90 K 7005	Cooling unit, complete with compressor, vaporiser and condensor for ECM cooling medium: R134A, power: 230V, 50Hz	R	-	-	-
97 K 0010	ECM transformer 115V/230V, ... 230VA	R	-	-	-
01 B 8360	Electronic PID-temperature controller with LED indication, in a front mounting housing, power 230/115V 50/60 Hz.	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**
90 P 1007	Hose set ③ SR25.1 with PVDF-tube connectors 4/6mm, standard	C	1	2	4
90 P 1020	Driver SR25, complete	S	-	1	1
90 P 1010	1 set (4 pcs) contact springs SR25 for driver	R	1	2	2
90 P 1045	Contact pulleys SR25 PVDF ④ for driver	S	2	4	4
90 P 1050	Conveying belt SR25.1 ①	S	-	1	2
90 P 1025	S-bolt ② SR25.1	S	-	-	1
01 P 1300	Peristaltic pump SR25.2, complete 230V/115V, 50/60Hz	R	-	-	1
90 P 1031	Heat peristaltic pump SR25, complete without tube set, motor and gears	S	-	-	1

20 APPENDIX

- Sample output dew point depending on gas flow rate at sample inlet dew points of 60°C
- Circuit diagram ECM
  Drawing No.: **2456-5.01.0**
- Certificate of compliance

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

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

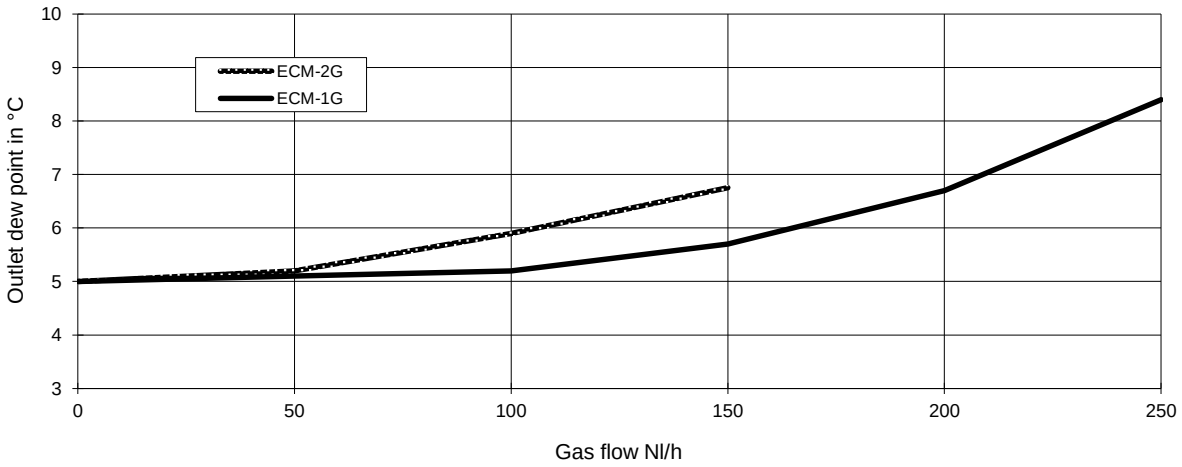


Figure 8 Sample outlet dew point depending on gas flow rate and sample inlet dew points of 60°C

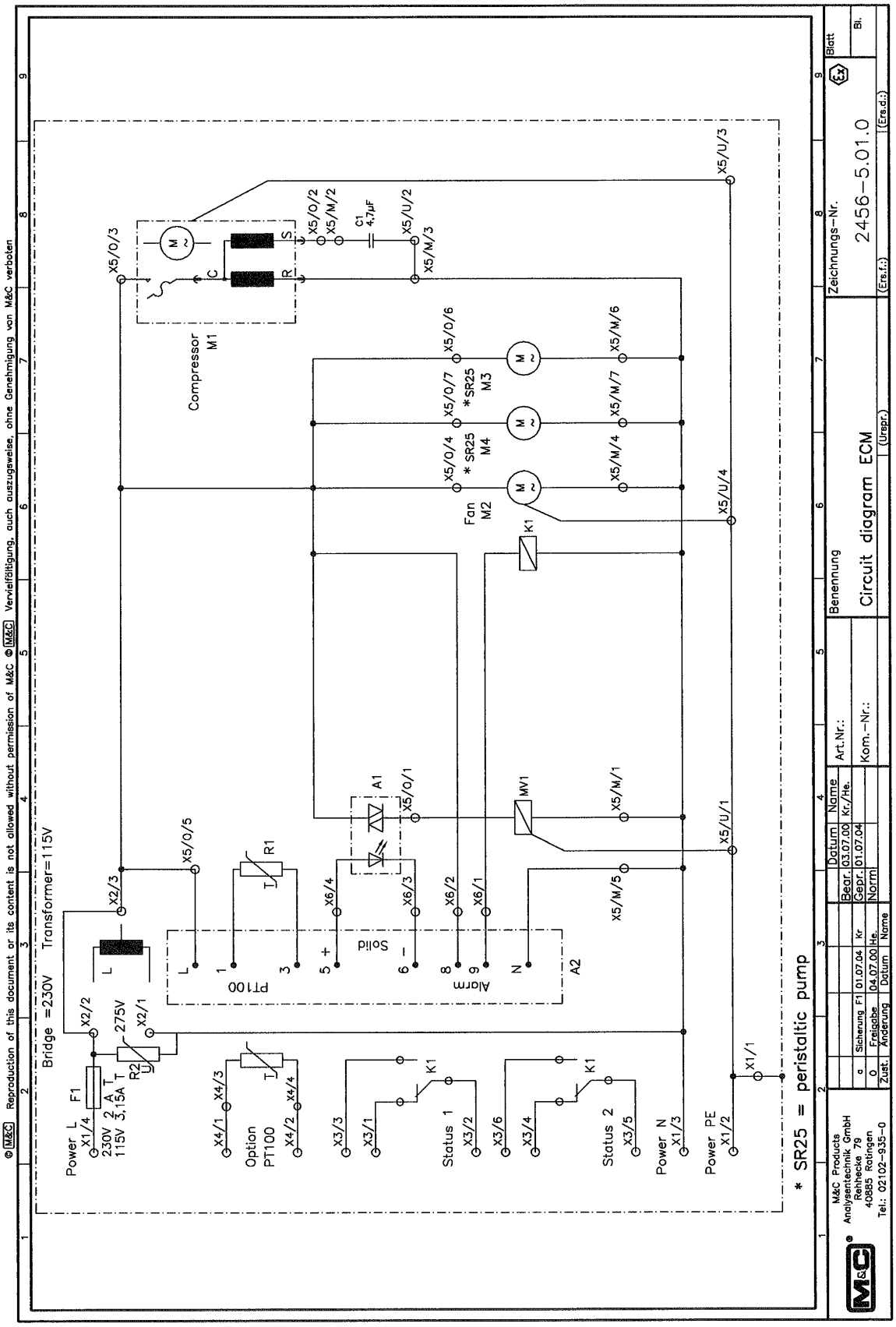


Figure 9 Circuit diagram ECM

CSA INTERNATIONAL

Certificate of Compliance

Certificate: 1830702 **Master Contract:** 222408

Project: 1830702 **Date Issued:** September 8, 2006

Issued to: **M & C Products Analysentechnik GmbH**
Rehhecke 79
40885 Ratingen
GERMANY

The products listed below are eligible to bear the CSA Mark shown with adjacent indicators 'C' and 'US'

Issued by: O. Ewanchyna, P. Eng.

Authorized by: M.H.J. Hoendervangers

C US

PRODUCTS

CLASS 8721 05 - LABORATORY ELECTRICAL EQUIPMENT
CLASS 8721 85 - ELECTRICAL EQUIPMENT FOR LABORATORY USE (Certified to U.S. Standards)

Electric gas cooler, Model ECM, ECM-ExII, Permanently connected, rated 120 V, 60 Hz or 240 V, 50 Hz, 200 VA.

NOTE: The above model is Equipment Class I, Pollution Degree 2, Installation Category II.

APPLICABLE REQUIREMENTS

CAN/CSA-C22.2 No. 61010.1-04 - Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use, Part 1: General Requirements"

UL Std. No. 61010-1 (2nd Edition) - Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 1: General Requirements

The 'C' and 'US' indicators adjacent to the CSA Mark signify that the product has been evaluated to the applicable CSA and ANSI/UL Standards, for use in Canada and the U.S., respectively. This 'US' indicator includes products eligible to bear the 'NRTL' indicator. NRTL, i.e. National Recognized Testing Laboratory, is a designation granted by the U.S. Occupational Safety and Health Administration (OSHA) to laboratories which have been recognized to perform certification to U.S. Standards183070September 8, 200222401830702

DQD 507 Rev. 2004-06-30

CSA INTERNATIONAL

Certificate: 1830702 **Master Contract:** 222408

Project: 1830702 **Date:** September 8, 2006

CONDITIONS OF ACCEPTABILITY

The ECM gas cooler cools down the sample gas to a dew point of +5 °C, after which the gas can be filtered and analyzed.

The ECM and ECM-ExII are electrical the same.

The 120 V unit has an additional non isolation transformer.

The Electric Gas Coolers were tested for an ambient Temperature of 50°C.

DQD 507 Rev. 2004-06-30

CSA INTERNATIONAL

Supplement to Certificate of Compliance

Certificate: 1830702 **Master Contract:** 222408

The products listed, including the latest revision described below, are eligible to be marked in accordance with the referenced Certificate.

Product Certification History

Project	Date	Description
1830702	September 8, 2006	cCSAus Original Certification of Electric Gas Cooler models ECM, ECM-ExII

DQD 507 Rev. 2004-06-30