Embracing Challenge

Electric Gas Cooler Series ECP®

ECP 1000/2000/3000 (starting from serial no.: 95...)

Instruction Manual
Version 1.03.00

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. There you can find the data sheets and manuals of our products in German and English.

Version: 1.0300

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1 General Information

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

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

Follow all instructions and warnings closely.

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

2 Declaration of Conformity

CE - Certification

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

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

Follow these 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.

The installation and commissioning of the device must conform to the requirements of VDE 0100 (IEC 364) 'Regulations on the Installation of Power Circuits with Nominal Voltages below 1000 V' and must be in compliance with all relevant regulations and standards.

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, sun or moisture.

Do not use the device in hazardous areas.

Installation, maintenance, inspections and any repairs of the devices must be carried out only by qualified skilled personnel in compliance with the current regulations.

3.1 Intended Use

The ECP1000/2000/3000 gas cooler is intended for use in general purpose areas (non-hazardous environments). It may only be operated in compliance with the information in chapter 8. Only use the device within the permitted temperature and pressure ranges.

Do not use this product for any other purpose. Improper use and handling can create hazards and cause damage. For more information, please refer to the safety information in this instruction manual.

4 Warranty

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

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

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

5 Used terms and signal indications

Danger

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

Warning

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

Caution

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

Caution

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

Note

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

Qualified personnel

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

Electrical voltage!
Danger to life due to electric shock!
Keep a safe distance and avoid contact with the electrical system. It is MANDATORY to take suitable measures to reduce the risk and for personal protection.

Toxic!
Danger to life if swallowed, in contact with skin or inhaled!
Do not swallow toxic substances, avoid skin contact and do not inhale toxic vapors. It is MANDATORY to take appropriate measures to reduce the risk and for personal protection.

Corrosive!
Risk of severe skin burns and serious eye damage! Living tissue and many materials are destroyed on contact with this chemical.
Do not inhale vapors and avoid contact with skin, eyes and clothing!
It is MANDATORY to take appropriate measures to reduce the risk and for personal protection.

Container contains gas under pressure!
Risk of the container bursting! Risk of injury from flying objects!
Check the pressure of the container and adjust to atmospheric pressure. Only open containers carrying atmospheric pressure. Use personal protective equipment (PPE).

Hot surface!
Risk of burns from touching the surface!
Do not touch the surfaces which are marked with this warning sign. Allow the surfaces to cool down after operation. Use personal protective equipment (PPE).

Rotating parts in the device! Risk of being crushed!
Rotating parts cause crushing injuries to hands or other extremities.
Switch off the power supply and ensure that the part is no longer rotating.
Use personal protective equipment (PPE).

Use protective gloves!
Risk of injury from corrosive, hot or sharp objects!
Use adequate hand protection when working with chemicals, sharp objects or extreme temperatures.

Wear safety goggles!
Risk of injury to the eyes from splashes or flying particles!
Use suitable safety goggles.

Wear protective clothing!
Risk of injury from corrosive, hot or sharp objects!
Wear adequate protective clothing when working with chemicals, sharp objects or extreme temperatures.

Use safety shoes!
Risk of injury from falling objects, slippery floors or sharp objects on the floor!
Wear safety shoes with a suitable safety class.

Use head protection and full safety goggles!
Risk of injury from falling objects and splashes or flying particles from all directions.
Wear a helmet and full safety goggles when working with heavy equipment and where there is a risk to the eyes from splashes or flying particles from all directions.

6 Application

The Peltier gas sample cooler type **ECP1000/2000/3000** is used in analyser sample system design to reduce the dew point of wet gases to a level that is stable and low. Sample gas cooling prevents subsequent condensation in the analyser. The stability of the dew point is also extremely important at it helps to prevent water vapour cross sensitivity and volumetric error, especially in infrared analysers.

The sample gas passes through a sampling probe to the type **ECP .000** cooler where it is lowered to a dew point of +5 °C (41 °F). Solids will have been trapped in the filter of the sample probe, (If provided in the type used) or are trapped in a downstream fine filter. The conditioned gas can now be passed to the analyser.

If the downstream analyzer does not have gas quantity control/display, this must be done by an external device.

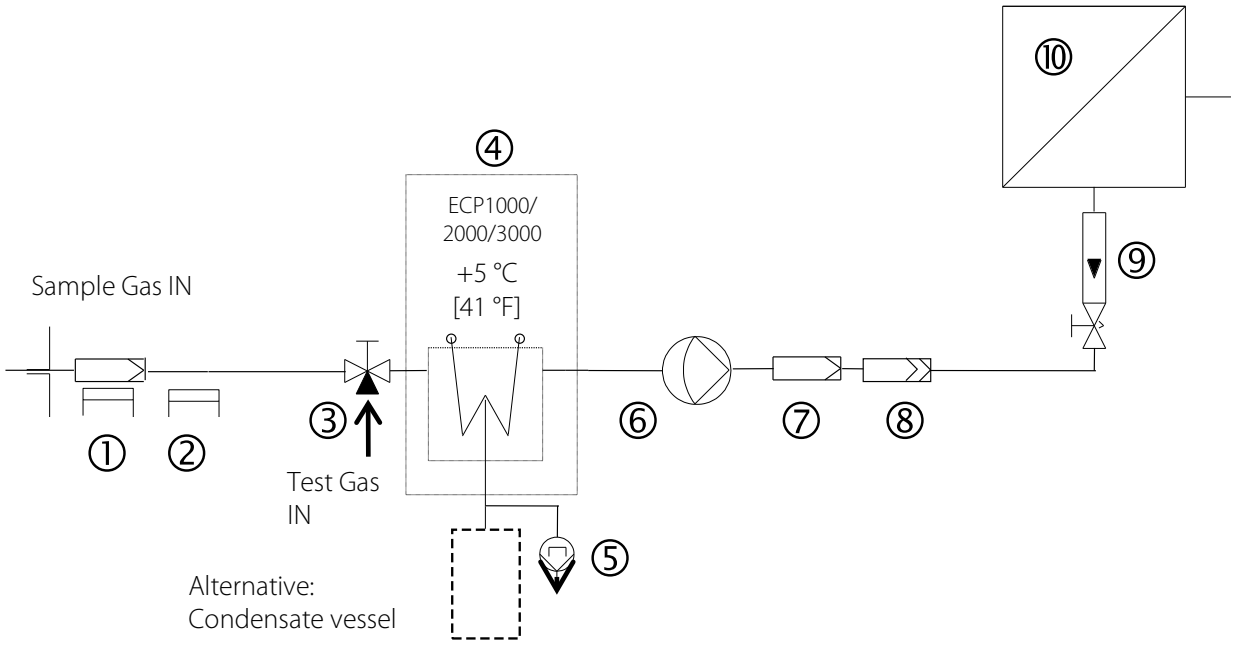
When feeding pressureless gases, an external gas pump must be installed.

The condensate is discharged externally. For operations under pressure, an automatic condensate drain or collection vessel is used. For operations in partial vacuum (suction), a condensate vessel with a manual drain or a peristaltic pump for automatic condensate removal is used.

Note

For protection against liquid breakthrough and to increase the dependability of the complete system we recommend the use of a fluid alarm sensor.

The following figure shows the flow diagram of a typical application of the electric gas cooler **ECP1000/2000/3000**.



① Gas sample probe SP…
② Heated sample line
③ 3-way ball valve
④ Gas cooler ECP .000
⑤ Peristaltic pump SR25.2 (option)
⑥ Sample gas pump MPF
⑦ Universal filter FP..
⑧ Liquid particles filter CLF..
⑨ Flowmeter FM..
⑩ Analyzer

Figure 1: Application example ECP1000/2000/3000

7 Function of the M&C Jet-stream heat exchanger

The coolers **ECP 1000/2000/3000** with special design for analysis technique are prepared for maximum flow rates of 350 l/h.

The Jet-Stream heat exchangers made of Duran glass, optional 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 easily. Figure 2 shows a schematic diagram of the functioning of the heat exchanger.

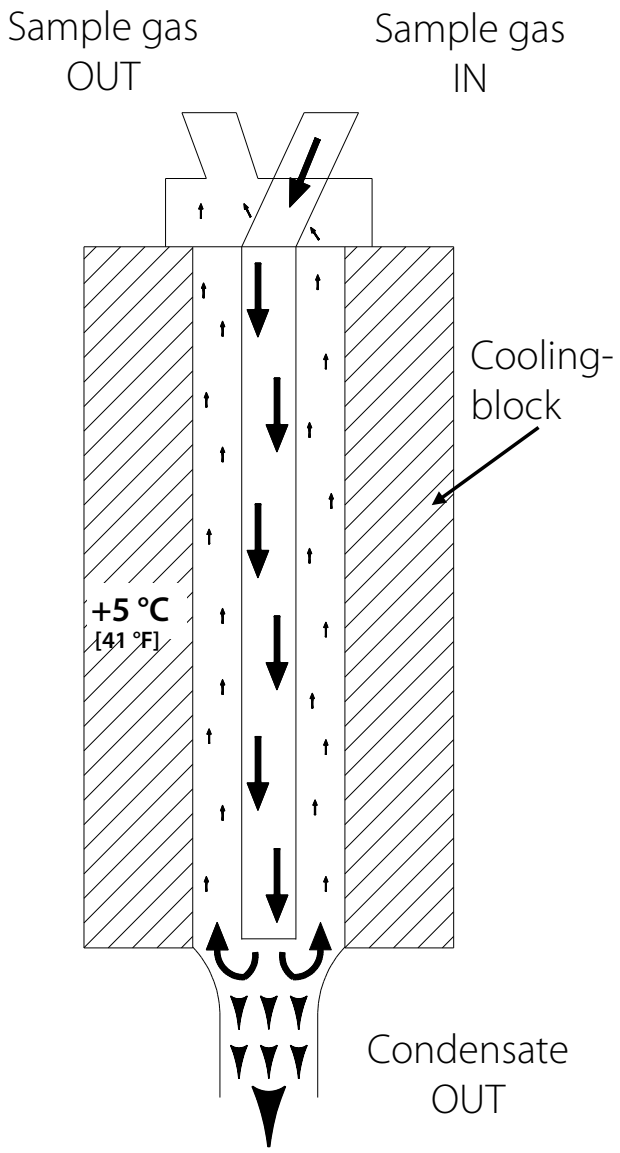


Figure 2: Functioning diagram of the heat exchanger

8 Technical data

Electro Gas Cooler Version	ECP1000	ECP2000	ECP3000
Sample outlet dew point	Range of adjustment: +2 °C to +15 °C [35.6 °F to 59 °F], factory setting: +5 °C [41 °F]		
Dew point stability	At const. conditions: < ±0.1 °C [±0.18 °F]		
Sample inlet temperature***	Max. 180 °C [356 °F]		
Sample inlet dew point***	Max. 80 °C [176 °F]		
Gas flow rate***	150 Nl/h	2 x 150 Nl/h	350 Nl/h
Number of heat exchangers	1	2	1
Material of heat exchangers	Duran® glass, PVDF or stainless steel 316Ti		
Ambient temperature***	+5 °C to +45°C* [41 °F to 113 °F]* +5 °C to +50 °C** [41 °F to 122 °F]**	+5 °C to +50 °C [41 °F to 122 °F]	
Storage temperature	-20 to +60 °C [-4 °F to 140 °F]		
Pressure	Duran glass : max. 3 bar PVDF : max. 3 bar Stainless steel: max. 10 bar (other versions on request)		
Total cooling power at +25°C [77 °F] ambient	50 kJ/h	90 kJ/h	
Dead volume heat exchanger	50 ml	2 x 50 ml	100 ml
ΔP per heat exchanger	1 mbar at 150 Nl/h	1 mbar at 150 l/h	5 mbar at 350 l/h
Sample gas connection	For tube 6 mm Ø* 8 or 10 mm Ø**	G 1/4" i	G 1/4" i* NPT**
Condensate connection	For tube12 mm Ø* 8 or 10 mm Ø**	G 3/8" i	G 3/8" i* NPT**
Ready for operation	10 min.		
Power consumption	115 VA	115 VA	
Mains power supply	230 V or 115 V ±10 %, 50...60 Hz		
Electrical connections	Clamps 2.5 mm^2, cable glands 2 x M 16		
Alarm contact	2 change-over contacts, alarm point: ΔT ±3 °C [±5.4 °F] to temperature setpoint		
Contact rating	250 V AC, 2 A, 500 VA, 50 W		
Service-measuring point	0.1 V/°C		
Electrical protection	Fuse 2 x 1.6 A_T (slow-blow fuse)		
Case protection	IP20 (EN 60529)		
Housing colour	RAL 9005 (black)		
Method of mounting	Wall mounting		
Dimensions (W x H x D)	275 x 220 x 136 mm [≈ 10.8" x 8.7" x 5.4"]	305 x 220 x 136 mm [≈ 12.0" x 8.7" x 5.4"]	
Weight	5.5 kg [≈ 12.1 lbs]	7 kg [≈ 15.4 lbs]	
Electrical equipment standard	EN 61010		

* Standard
** Option
*** Maximum values in technical data must be rated in consideration of total cooling capacity at 25 °C [77 °F] ambient temperature and an outlet dew point of 5 °C [41 °F].

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

8.1 Air flow direction and minimum distance for installation

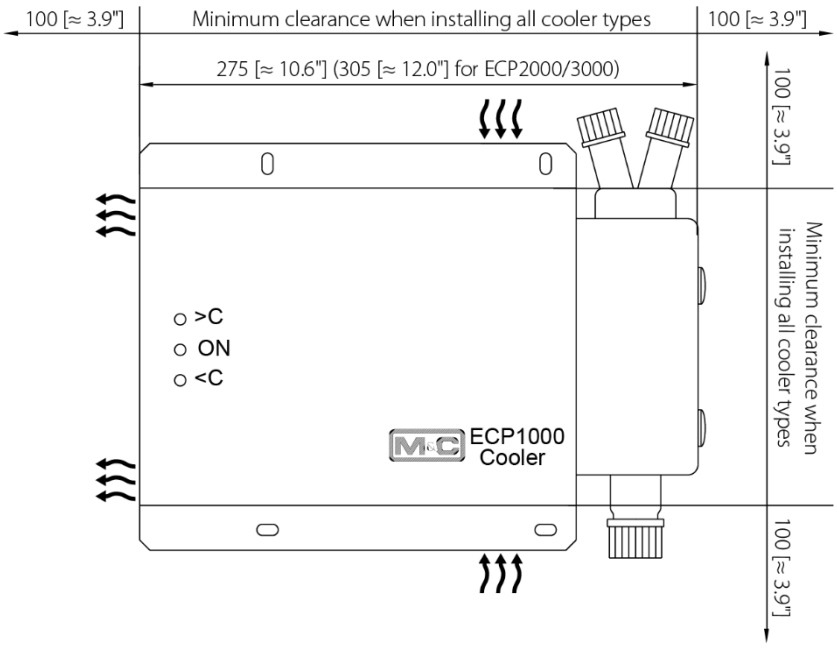


Figure 3: Air flow direction and minimum distance for installation

9 Description

Figure 4 shows the **ECP .000** cooler unit.

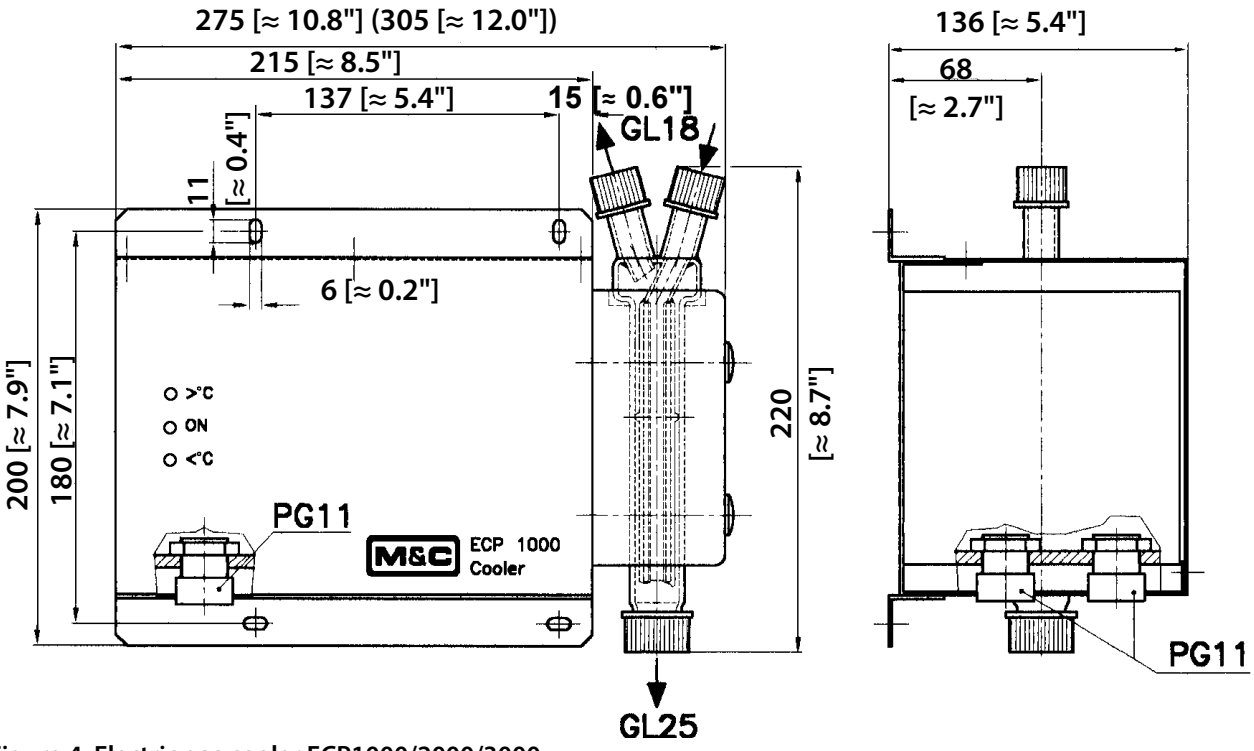


Figure 4: Electric gas cooler ECP1000/2000/3000

The gas coolers ECP1000/2000/3000 have been specially developed for the analysis technology. All ECP1000/2000/3000 gas coolers are available with Duran® glass, PVDF or stainless steel 316Ti jet stream heat exchangers.

The ECP1000 cools a gas path with a maximum gas flow of 150 l/h. The ECP2000 is equipped with two heat exchangers. This makes it possible to cool two gas paths with a maximum volume flow of 2 x 150 l/h. The ECP3000 is used for cooling a gas path with a gas flow rate of up to 350 l/h max.

The heat exchangers are located in a heat-insulated cooling block and are easily replaceable.

The cooling block is cooled to a constant temperature of +5 °C [41 °F] by an electronically controlled Peltier element. A PT100 sensor measures the temperature. The target and actual temperature of the cooler can be obtained and checked by connecting a DC voltage meter (0.1 V / °C) to appropriate test sockets accessible from outside.

The excess thermal energy of the cooling system is dissipated via a large cooling fin block which is forced ventilated by a fan.

A selector switch on the electronic control board of the ECP1000/2000/3000 gas cooler allows switching from 230 V / 50 Hz to 115 V / 60 Hz.

Control electronics with status indication and cooler power supply are located in a compact aluminium protective housing on the left side of the cooler.
The operating status indicator with three LEDs, also located on the left side of the cooler, indicates the following operating states:

- Upper red LED "**°C >**" = Temperature alarm (T > +8 °C [46.4 °F])
- Central green LED "**ON**", is on or blinking = Cooling function is activated
- Lower red LED "**°C <**" = Temperature alarm (T < +2 °C [35.6 °F])

If only the green LED is on. the specifications regarding dew point temperature and dew point stability are guaranteed.

The red LEDs light up if the temperature deviation from the setpoint is more than 3 °C [5.4 °F].

If the upper red LED "°C >" lights up, an overload is detected because a higher cooling capacity is required compared to the existing one.

The alarming of the over- and under-temperatures is routed as a collective status alarm via a relay output with a potential-free switch-over contact to the outside. The alarm is triggered in a window of 3 °C [5.4 °F] to the control temperature.

The electric gas coolers ECP10002000/3000 are designed to protect against overload. The gas outlet dew point increases according to the overload.

Gas inlet and outlet are located on top of the ECP Jet-Stream heat exchanger and are marked by arrows.
The condensate drain is located at the bottom of the Jet-Stream heat exchanger.

For the possible dimensions of the gas and condensate connections, please refer to the technical data (chapter 8).

The operating mode determines the choice of externally operated condensate removal devices:

- Peristaltic pump **SR25.2** for automatic condensate removal in vacuum and overpressure operation up to max. 2200 mbar abs.

- Automatic liquid drain Type **AD-...** Exclusively for "overpressure operation".
- Condensate collection vessel **TG... /TK...** for manual disposal.

10 Receipt of goods and storage

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

- Please take the ECP gas cooler and possible special accessories carefully out of the packaging material immediately after arrival, and compare the goods with the items listed on the delivery note.

- Check the goods for any damage caused during delivery and, if necessary, notify your transport insurance company without delay of any damage discovered.

Note

The equipment should be stored in a protected, frost-free room!

11 Installation instructions

The **ECP1000/2000/3000** Peltier Gas Cooler is designed for wall or panel mounting.

Note

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

When in use, the ECP cooler should be placed in an area well away from any heat emitting sources in order to prevent damage caused by an accumulation of heat the air vents must be free at all times!

When the equipment is being used outside, ample protection against the effects of direct sunlight and dampness must be provided. In winter, the equipment must only be used in frost-free areas!

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!

12 Pneumatic connections

The gas inlet and outlet are located on the top of the cooler and is indicated by arrows on the **ECP** Jet-Stream heat exchangers. For possible connectors see technical data (chapter 8).

Corresponding tube or flexible tubing connection fittings are optionally available through M&C.


Note

Do not mix up the tubing connections; the inlet and outlet connections of the heat exchangers are marked with arrows;
After connecting all tube and flexible tubing, the tightness must be checked.
To ensure free condensate discharge, the specified discharge cross-sections should not be 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 correspondingly dimensioned tube respectively flexible tubing 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.
- The NPT thread must be screwed in with sealant or fixed with adhesive.

In the standard configuration, the tubes for condensate removal are connected directly to the heat exchangers, with the standard GL 25-12 tube connectors (Duran glass heat exchanger) respectively with the standard G 3/8" thread joint (PVDF or stainless steel heat exchanger).

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

- External peristaltic pump **SR25.2**;
- Automatic liquid drain **AD-...** only for over-pressure operation;
- Condensate collector container that is emptied manually;


Note

Stainless steel heat exchangers with G 3/8" thread joint can be directly fitted up with the automatic liquid drain AD-SS by means of a thread adapter part number FF11000 (1/2" NPT to G 3/8" i). By this wall mounting of the AD-SS unit isn't necessary!

The gas sampling tubes or condensate tube must be installed as follows:


Note

The tightness of the connection can only be guaranteed if the connecting tube has a straight end edge (use a hose cutter)!

- Loosen the union nut of the clamping ring fitting by turning it counterclockwise; make sure that the nut is carefully removed from the fitting body so that the clamping ring which is loose in the nut is not lost;

- Push the union nut over the connecting tube;
- Push the clamping ring with the thicker bead facing the nut onto the connecting tube;
- Attach the tubing to the support nipple of the fitting body;
- Tighten the union nut by hand.

The tubing is now mounted non-slip and pressure-resistant.

13 Electrical Connections

Warning

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

Warning

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.

A main switch must be provided externally.

Before start-up, compare the setting of the voltage selector S1 with the mains voltage.

The supply circuit of the device is provided with a fuse corresponding to the rated current (overcurrent protection); the electrical data can be found in the technical data.

The main power supply terminals are located in the aluminium enclosure on the **ECP1000/2000/3000** electronic board:

- Power On, Terminal X1: 1, 2, 3 / L, N, PE

Coolers from serial no.: 95.. also have a mains selector (S1) on the basic board for either 230 V 50 Hz or 115 V 60 Hz operation on the basic circuit board (see circuit diagram in appendix).

Before start-up, use a screwdriver to turn the selector to the correct position 230/115 depending on your main power input supply.

The status alarm contact for indicating and isolating the gas supply must be incorporated into the equipment control system.

The volt free contact outputs of the status group alarm is located on the **ECP1000/2000/3000** control board:

- Temp. Alarm Terminal X2: 1 and 3 normal opened (NO), 2 and 4 normal closed (NC).

The two M 16 cable glands are located on the bottom of the cooler enclosure. For further details refer to the electrical circuits and terminal drawing and cover plate.

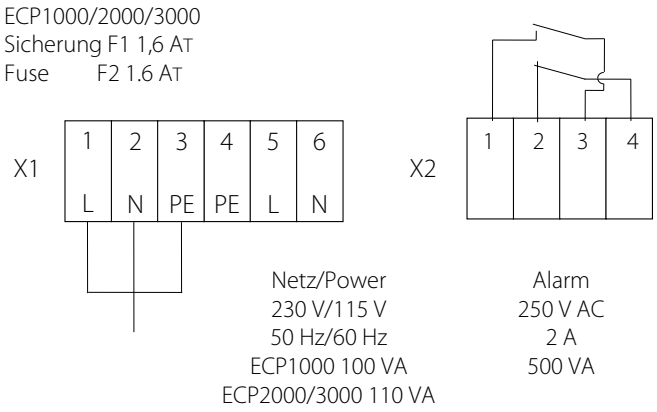


Figure 5: Terminals for mains supply and temperature alarm

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

Before using the equipment for the first time, check that the safety measures specific to the installation and process are complied with!

The automatic control electronics of the **ECP 1000/2000/3000** 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 °C [46.4 °F].

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

- Connect the cooler to the power supply; before putting it into operation, compare the mains voltage with the information on the rating plate;
- Lead the status contacts for reporting of under- and over-temperature to the measuring station;

Note

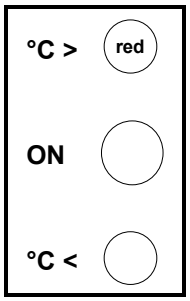
The status contacts must be connected to the external sample gas pump or to a valve in the sample gas line to protect the entire analysis system by immediately cutting off the gas supply in the event of error messages from the cooler!

15.1 Function sequence and LED function display

Three function display LED's are provided to give a visualisation of the function sequence during start-up of the cooler. The top LED (red) indicates that the temperature set by the **ECP** automatic control electronics has been exceeded or has not been reached. The central green LED shows that the cooler is operating. The bottom red LED (display of function messages) 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].

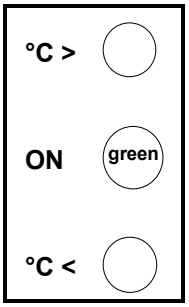


Normal operation

After around 20 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 central green LED is alternately switched on and off by the **ECP** automatic control electronics in a load-dependent cycle. The cooler is ready to use.



16 Closing down

Note

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

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. Condensate has to be removed completely from the cooler.

Warning

Aggressive condensate is possible.

Wear protective glasses and proper protective clothing!

17 Maintanance

Before starting any maintenance work, follow all safety notes and descriptions stated in this manual. Before the maintenance work is carried out, it is necessary to follow the specific safety procedures in regards to the system and operational process!

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 **ECP1000/2000/3000** gas coolers require no particular routine maintenance. Depending on the quality of the ambient air the cooling fin block should be blown out with compressed air from time to time.

17.1 Removing a Heat Exchanger

Warning

Aggressive sample gas or condensate residues possible.
Chemical burns due to aggressive media possible!

Wear protective gloves!

Wear safety goggles and appropriate protective clothing!

Removal of the heat exchangers may be necessary to carry out maintenance or repair work. The cooler does not need to be disconnected from the power supply to replace the heat exchanger.
The following step-by-step procedure is recommended when removing a heat exchanger:

1. Interrupt the sample gas supply.
2. Release the upper gas connections and lower condensate connections.
3. Pull the heat exchanger upwards from the cooling block by turning it slightly;

17.2 Cleaning a Heat Exchanger

Aggressive condensate residues and cleaning agents possible.
Chemical burns due to aggressive media possible!

Wear protective gloves!

Wear safety goggles and appropriate protective clothing!

You will need the following tools to clean the heat exchanger:

- A suitable cloth to remove the heat-conducting paste
- Suitable cloth for drying the heat exchanger
- Distilled water
- Collecting container
- If necessary, cleaning agent suitable for the heat exchanger material or an ultrasonic bath
- Disposal options for the contaminated liquids

The following step-by-step procedure is recommended for cleaning the heat exchanger:

1. The heat exchanger is coated on the outside with heat-conducting paste to improve thermal conductivity. Remove the heat-conducting paste with a suitable cloth.
2. Use distilled water to clean the heat exchanger. Rinse the heat exchanger with distilled water and collect the dirty water in a collecting container. Dispose of it in accordance with the applicable regulations. Dry the heat exchanger with a suitable cloth.

For persistent dirt, either a **suitable cleaning agent** or an **ultrasonic bath** can be used. Proceed as follows:

1. **Use cleaning agent:** The cleaning agent must be suitable for the respective material. Heat exchanger materials are Duran® glass, stainless steel and PVDF. Collect the contaminated cleaning agent in a collection container after cleaning and then dispose it according to the applicable regulations.
   Use an ultrasonic bath: When using an ultrasonic bath, follow the manufacturer's operating instructions.
2. After cleaning with a cleaning agent or inside an ultrasonic bath: Rinse the heat exchanger with distilled water and collect the contaminated water in a container. Dispose it according to the applicable regulations. Dry the heat exchanger with a suitable cloth.

17.3 Installing a Heat Exchanger

The installation is as follows:

1. Dry and clean the opening in the aluminium cooling block with a cloth.
2. Apply a thin and equal layer of thermal conductivity paste (part no. 90K0115) onto the opening.
3. Close the condensate removal connections of the heat exchanger with adhesive tape to prevent any thermal conductivity paste getting into the heat exchanger.
4. Apply a thin and equal layer of thermal conductivity paste over the whole surface of the heat exchangers (part no. 90K0115) to ensure good conduction of heat.
5. Lightly push and slightly rotate the heat exchanger back into the opening of the cooling block and press it to the upper block.
6. Remove the adhesive tape and any surplus thermal conductivity paste.
7. Reconnect the tubing.
8. Switch on the sample gas supply.

Note

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

17.4 Notes on Installing Glass Heat Exchangers

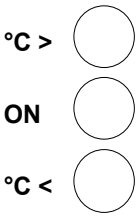
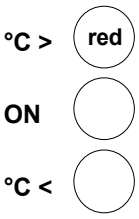
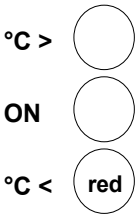
When installing heat exchangers made of Duran® glass, note the following:

1. Check PTFE/silicone clamping rings for damage. The clamping rings must be mounted with the PTFE surface pointing to the medium side, otherwise the necessary gas tightness cannot be guaranteed.
2. Hand tighten the GL union nuts by turning them clockwise;

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.
Please feel free to contact us, if you need any help choosing the right connectors or couplings.

18 Trouble shooting

Troubleshooting is made much easier thanks to the LED status indication.
The following table shows possible sources of error and how to correct them (does not apply to the cooler start-up phase).

Problem/Indication	Possible cause	Action/Check
ECP .000 is not cooling 	No mains supply	Check for mains supply voltage at terminals L&N, X1/ 1+2 against nameplate. If OK, check fuses F1, F2.
	Ambient temperature +2 °C [35.6 °F] ≤ T ≤ +5°C [41 °F]	Check ambient temperature.
	Temperature sensor faulty	Disconnect white wires from terminals X5/ 3+4 and measure sensor resistance: 107,79 +0.4 Ohm at +20 °C [68 °F] ambient; if there is great deviation change the sensor.
	Set point at Pot 3 out of adjustment	Adjust the desired temperature with the trimmer Potentiometer P3 (0.1 V / °C) and control the current temperature at terminals (X7/ 3) with an extern voltmeter (see Temperature Setting and Control).
ECP .000 cools continuously 	Transistor BUZ11 faulty	Check voltage of the Peltier elements at terminal X5/ 1 + 2 (see circuit diagram): Voltage > 12 V DC = transistor faulty; Fit the new transistor V1 on the basic circuit board.

19 Temperature setting and control the ECP cooler

The ECP gas cooler is factory set to a control temperature of +5 °C [41 °F].

The control temperature is set by adjusting the trimming potentiometer P3, which, like the measuring terminals, is located inside the cooler housing.

The adjustment range is from 0 °C to 20 °C [32 °F to 68 °F]. Turning it clockwise causes a higher temperature and turning it counterclockwise causes a lower temperature.

By connecting an external DC voltage measuring device, the set target temperature can be read off and checked at the yellow (X7/ 2) and blue (X7/ 3) measuring terminal. A voltage value of 0.1 V corresponds to a temperature of 1 °C.

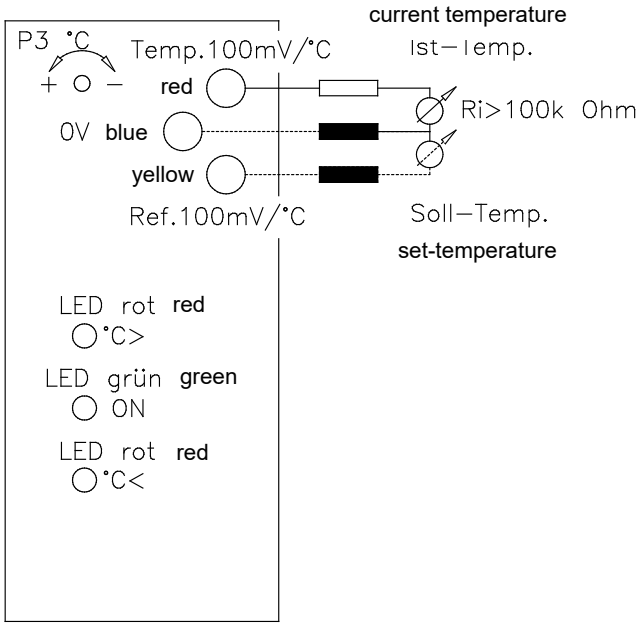


Figure 6: Temperature adjustment

The current temperature can be measured at the red (X7/ 1) and blue terminal (X7/ 3).

Note

To prevent the heat exchangers from freezing up, the temperature should never be set below +2 °C [35.6 °F].

20 Checking the temperature sensor

The **ECP1000/2000/3000** 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 corresponding measuring terminals must be measured (see chapter 17). The following figure 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.

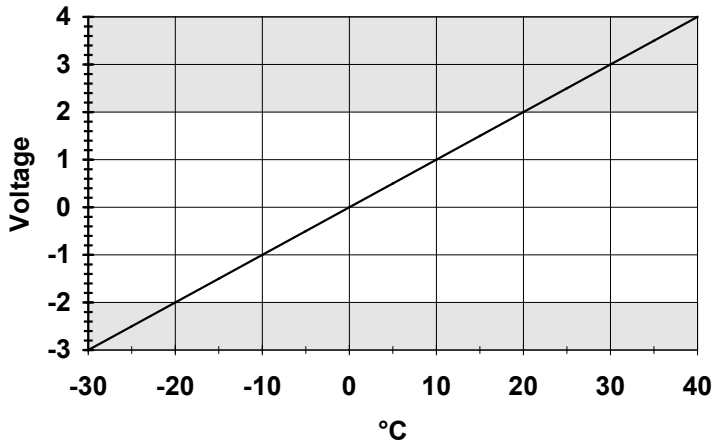


Figure 7: Voltage in relation to the temperature of the cooler

2. Resistance method

In this case the sensor must be disconnected from pins X5/ 3 + 4 at the **ECP** automatic control board 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 the figure below.

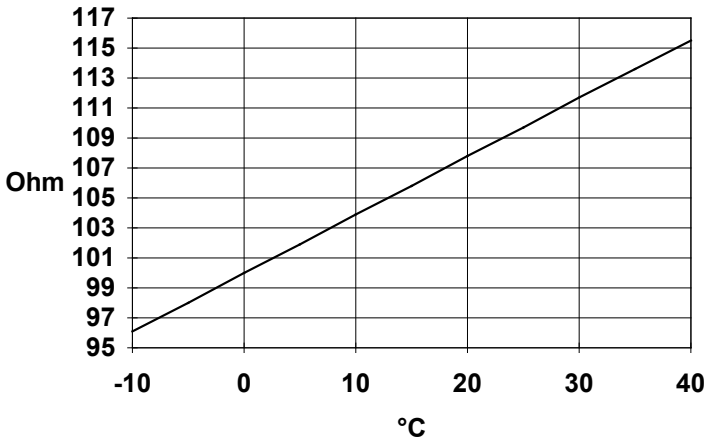


Figure 8: Resistance temperature characteristics of the Pt100 temperature sensor

21 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.

22 Spare parts list

The replacement interval for spare parts and consumables depends on the specific operating condition of the device. The quantities recommended in the following table are based on experience. Your replacement intervals will be based on your operating conditions.

Electric Gas Cooler ECP1000/2000/3000
(C) consumable parts, (R) recommended spare parts, (S) spare parts

			recommended quantity **ECP...** being in operation [years]		
		C/R/S	1	2	3
93K0100	ECP-1000 G Jet-Stream Heat Exchanger Material: Duran Glass Connections: Gas GL18-6/6 mm Condensate : GL25-12 mm	R	1	1	1
93K0130	ECP-1000 G 90° Jet-Stream Heat Exchanger with 90° angled gas connections Material: Duran Glass Connections: Gas GL18-6/6 mm Condensate: GL25-12 mm	R	1	1	1
93K0110	ECP-1000 SS Jet-Stream Heat Exchanger Material: SS 316Ti Connections: Gas G 1/4" i Condensate: G 3/8" i	R	1	1	1
93K0120	ECP-1000 PV Jet-Stream Heat Exchanger Material: PVDF Connections: Gas G 1/4" i Condensate: G 3/8" i	R	1	1	1
93K0140	ECP-3000 G Jet-Stream Heat Exchanger Material: Duran Glass Connections: Gas GL18-6/6 mm Condensate : GL25-12 mm	R	1	1	1
93K0150	ECP-3000 G 90° Jet-Stream Heat Exchanger with 90° angled gas connections Material: Duran Glass Connections: Gas GL18-6/6 mm Condensate: GL18-8 mm	R	1	1	1
93K0160	ECP-3000 SS Jet-Stream Heat Exchanger Material: SS 316Ti Connections: Gas G 1/4" i Condensate: G 3/8" i	R	1	1	1
93K0170	ECP-3000 PV Jet-Stream Heat Exchanger	R	1	1	1

Electric Gas Cooler ECP1000/2000/3000

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

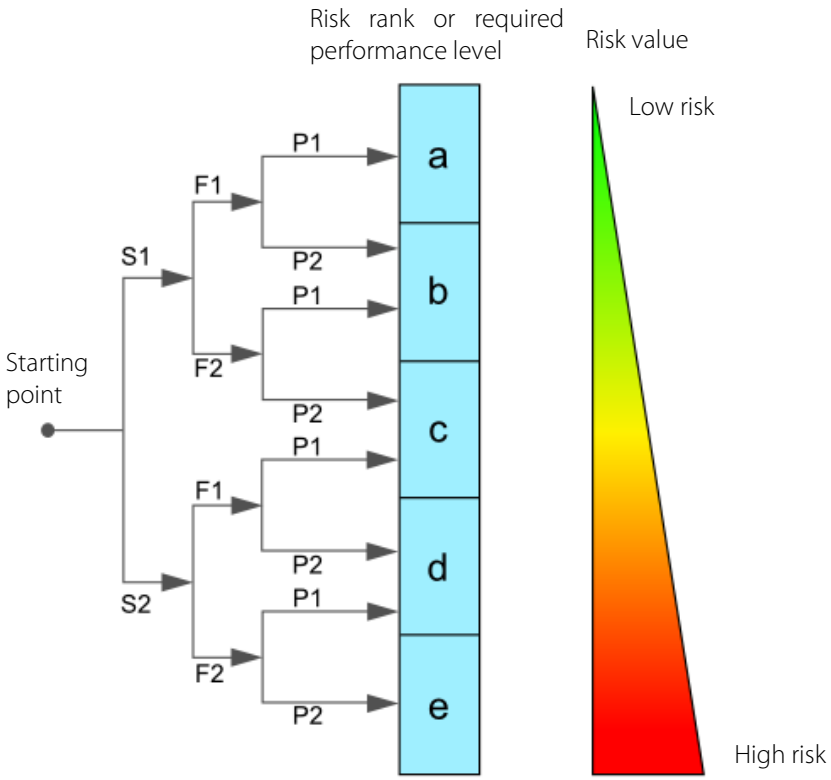
			recommended quantity **ECP...** being in operation [years]		
		C/R/S	1	2	3
	Material: PVDF Connections: Gas G 1/4" i Condensate: G 3/8" i				
90K0115	Heat sink compound 50g , -40 to +140 °C	R	1	1	2
93K0540	1.6 A fine-wire fuse 5 x 20 mm (F1/2)	R	2	4	4
93K0010	ECP 1000 Fan DC for ECP 1000/2000/3000	C	-	2	2
93K0020	ECP Electronic Board complete from serial no.: 95...	R	-	-	1
93K0530	ECP Mains Board complete from serial no.: 95...	R	-	-	1
90K2010	Rectifier for ECP2000/3000 and ECP1000 as from s.no.:95xx	R	-	-	1
93K0040	PT100 sensor incl. screw and spring ECP 1000 for ECP1000/2000/3000	R	-	1	1
90K2020	ECP Power Transistor BUZ11	R	-	1	1
93K0047	ECP 1000 Peltier element 4/4 for ECP1000 as from s.no.:95xx	R	-	-	1
93K0048	ECP 1000 Peltier element for ambient tempera-ture at 50°C for ECP1000 as from s.no.:95xx	R	-	-	1
93K0520	ECP 2000/3000 Peltier element 6/6 for ECP2000/3000	R	-	-	1
90K0145	ECP Alarm Relay DSP1for ECP1000/2000/3000	R	-	-	1

23 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 9: Overview risk assessment

Aggressive condensate possible

Risk rank group A
Chemical burns due to aggressive media possible!
This applies to all liquids in vessels and in the product.
In general, for electrical and mechanical work on the product, wear personal protective equipment (PPE) in accordance with the risk assessment.

Caution risk of being crushed by rotating parts

Risk rank - group A
The product contains rotating parts. Do not open covers until the device has been switched off.

Caution glass

Risk rank - group A

The product contains glass components. In general, for electrical and mechanical work on the product, wear personal protective equipment (PPE) in accordance with the risk assessment.

Caution hot surfaces

Risk rank group A

The temperature inside the product can be higher than 60 °C.
The hot parts are shielded by mechanical devices. Before opening the products, they must be disconnected from the power supply and a cooling time of more than 20 minutes must be observed. In general, for electrical and mechanical work on the product, wear personal protective equipment (PPE) in accordance with the risk assessment.

Caution electric shock

Risk rank group C

When installing high-power systems with nominal voltages of up to 1000 V, the requirements of VDE 0100 and their relevant standards and regulations must be observed!
This also applies to any connected alarm and control circuits. Before opening the products, they must always be disconnected from the power supply.

Gas hazard

Risk rank group A-B-C

The hazard potential mainly depends on the gas to be extracted.
If toxic gases, oxygen displacing or explosive gases are conveyed with the product, an additional risk assessment by the operator is mandatory.
In principle, the gas paths must be purged with inert gas or air before opening the gas-carrying parts.
The escape of potentially harmful gas from the open process connections must be prevented.
The relevant safety regulations must be observed for the media to be conveyed. If necessary, flush the gas-carrying parts with a suitable inert gas. In the event of a gas leakage, the product may only be opened with suitable PPE or with a monitoring system. Furthermore, the work safety regulations of the operator must be observed.

Caution crushing hazard

Risk rank group A
The work must be performed by trained personnel only.
This applies to products weighing less than 40 kg [≈ 88.2 lbs]:
The product can be transported by 1 to 2 person(s). The instructions for appropriate personal protective equipment (PPE) must be observed.
The weight specifications are contained in the technical data of this product.
Furthermore, the work safety regulations of the operator must be observed.

24 Appendix

- Sample output dew point (ambient temperature 20 °C [68 °F]) depending on gas flow rate
- Dimensions of the Cooler Type 1000/2000/3000
- Set-up diagram
- Components of main and electronic board up to 2006 and from 2007 on
- Circuit diagram **ECP 1000/2000/3000**, up to 2006 and from 2007 on
  Drawing number : 2413-5.01.1 and 2413-5.03.0

For additional manuals and data sheets please look on our home page
www.mc-techgroup.com

- Instruction manual peristaltic pump **SR 25.2**,
- Data sheet for Condensate vessel **TG**, **TK**
- Data sheet for **GL**-connectors
- Data sheet for Automatic liquid drain **AD-SS**
- Data sheet for Automatic liquid drain **AD-P**

Sample inlet dew point 50 °C [122 °F]

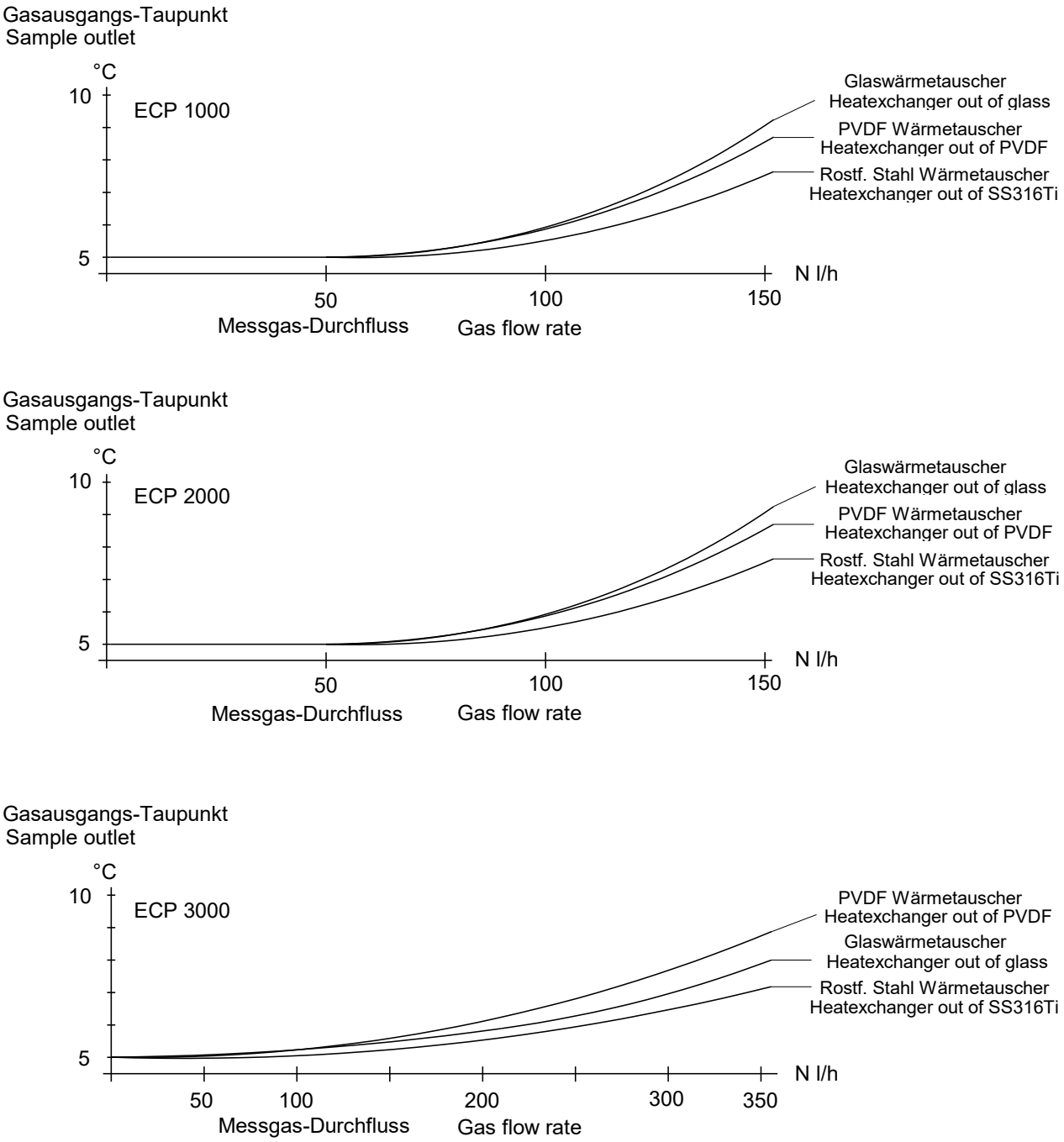
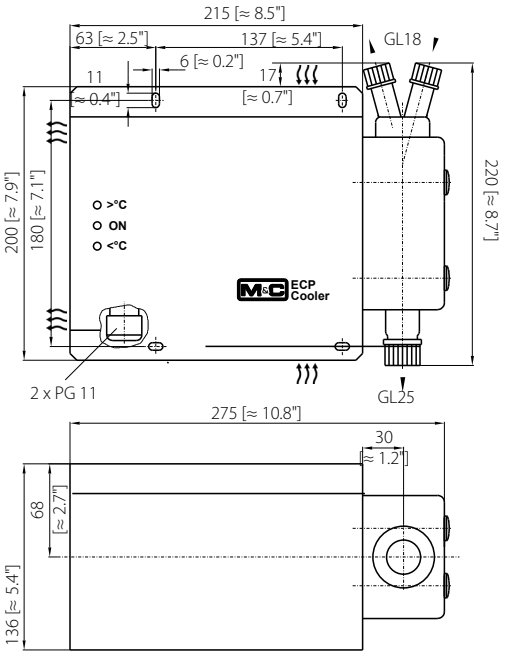
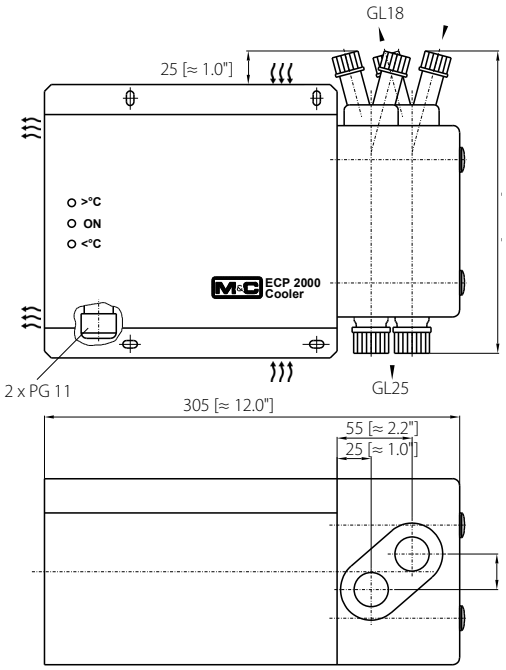


Figure 10: Sample output dew point (ambient temperature 20 °C) depending on gas flow rate

ECP1000



ECP2000



ECP3000

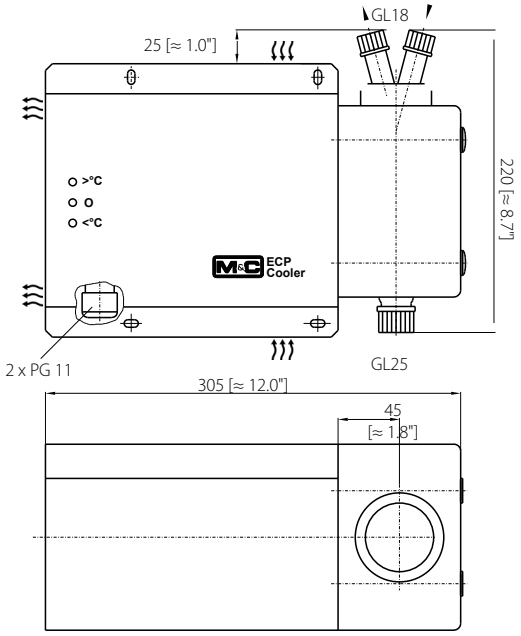


Figure 11: Dimensions of the cooler Type ECP 1000/2000/3000

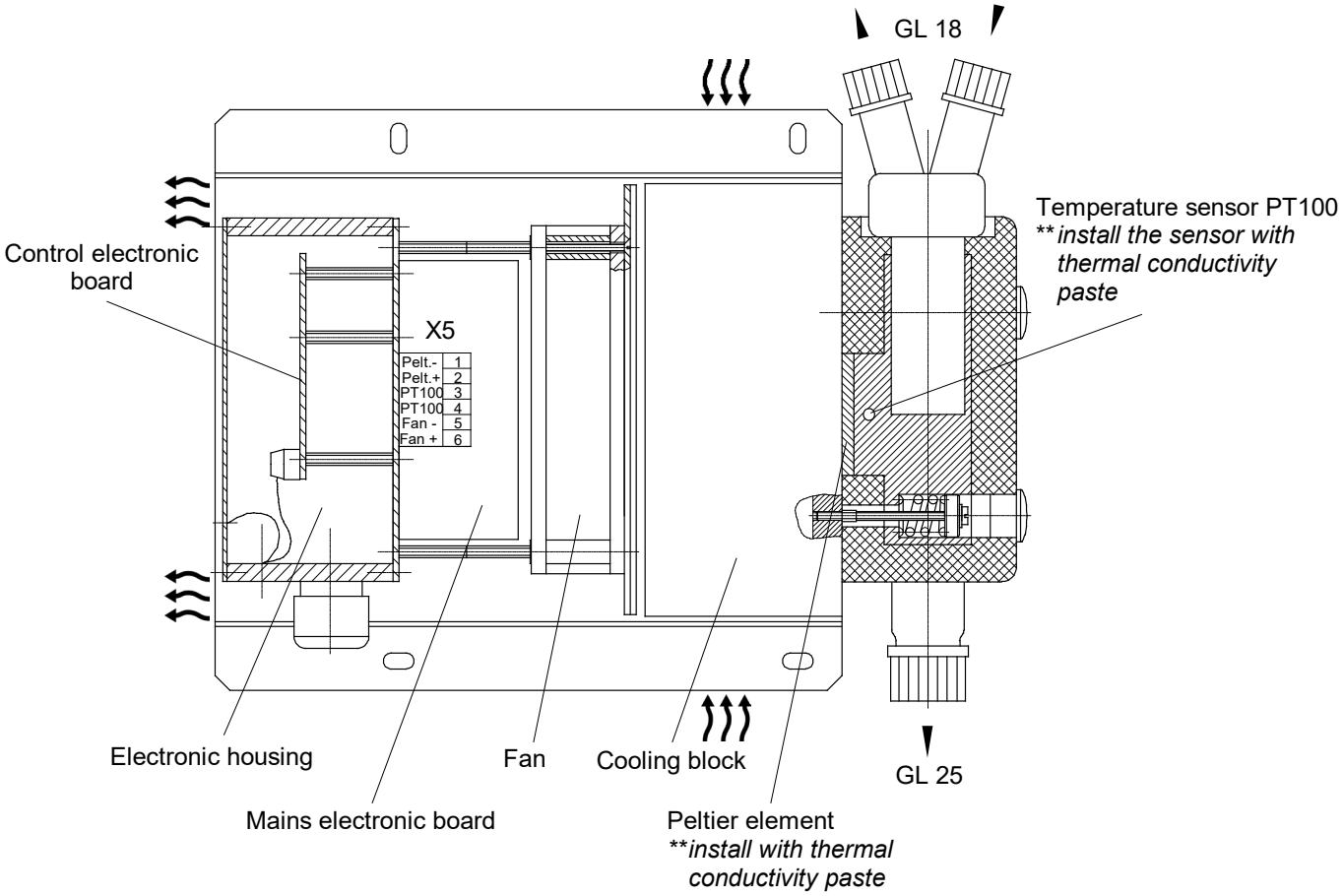
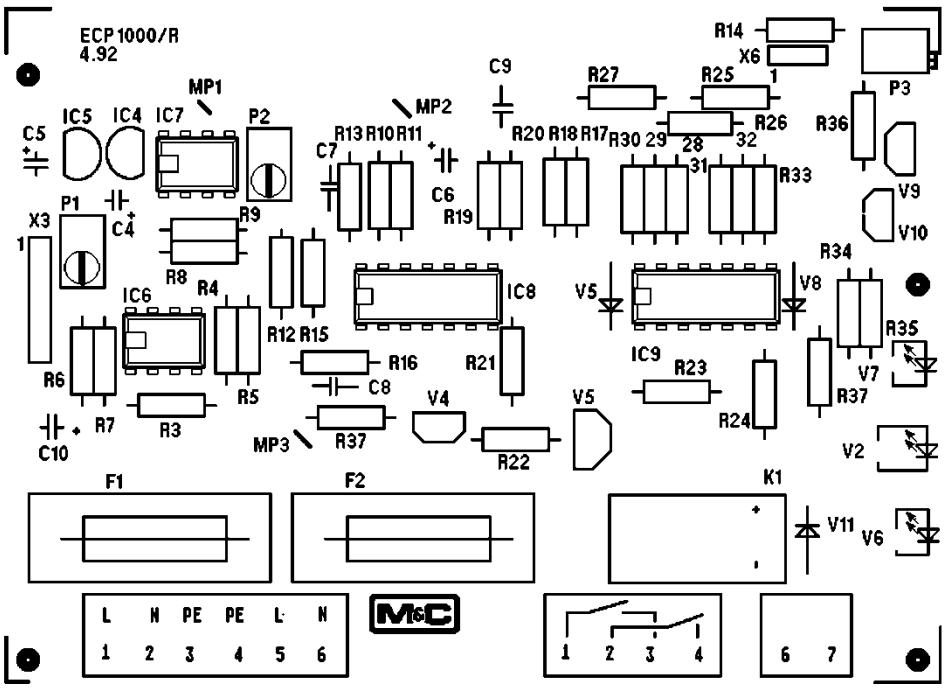


Figure 12: Set-up diagram with air direction

Electronic board up to 2006



Main board up to 2006

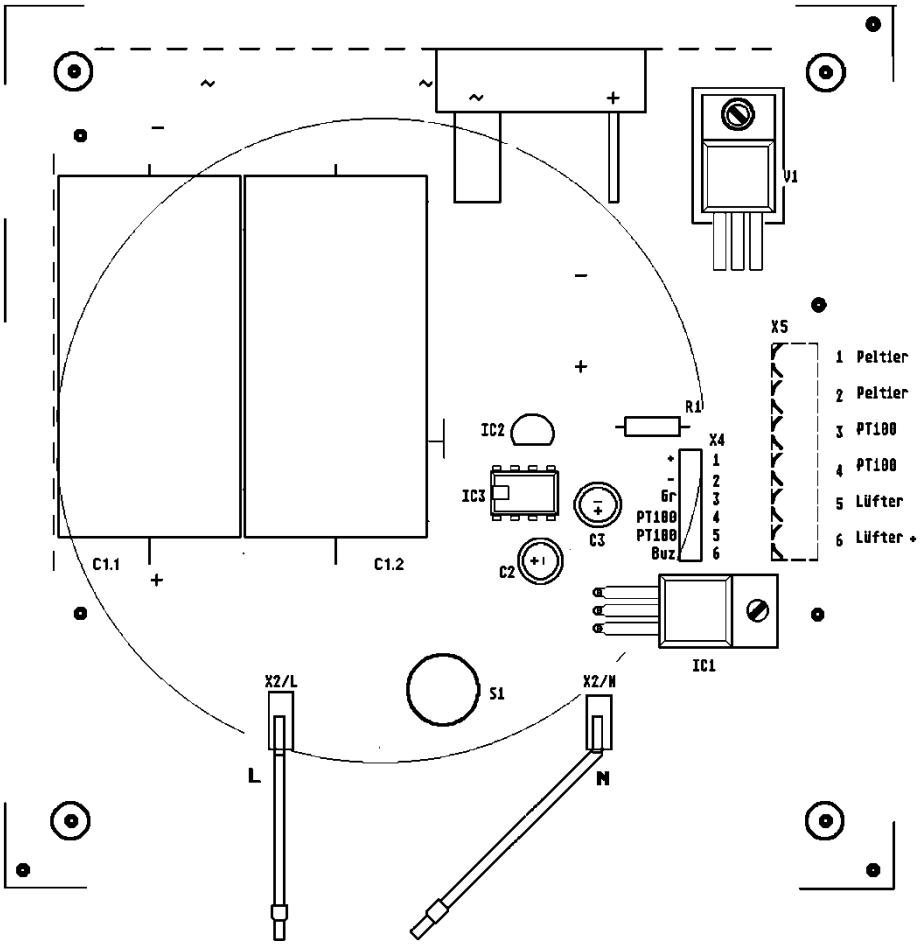
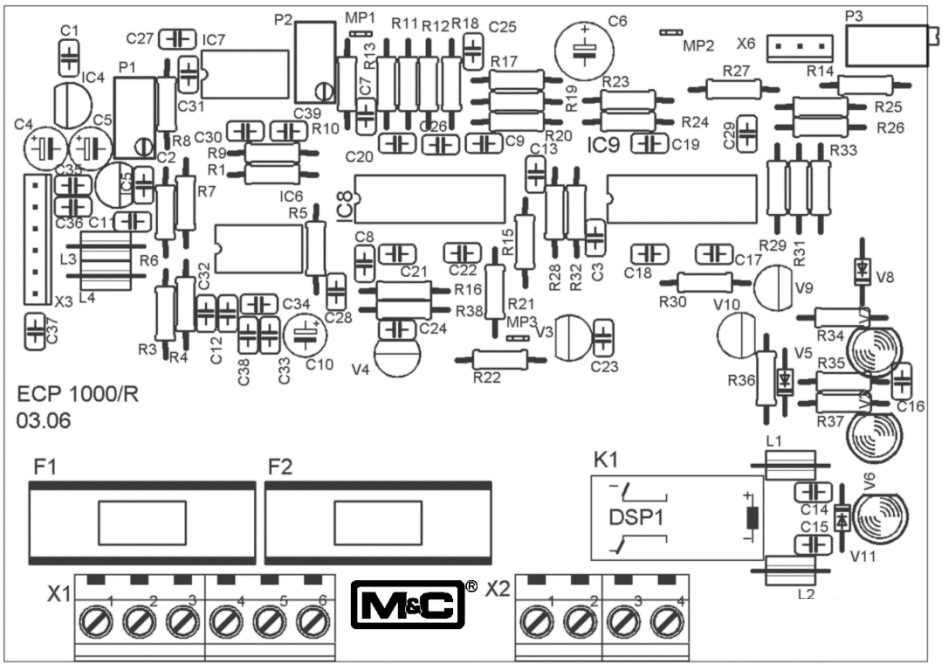


Figure 13: Electronic board and main board up to 2006

Electronic board from 2007 on



Main board from 2007 on

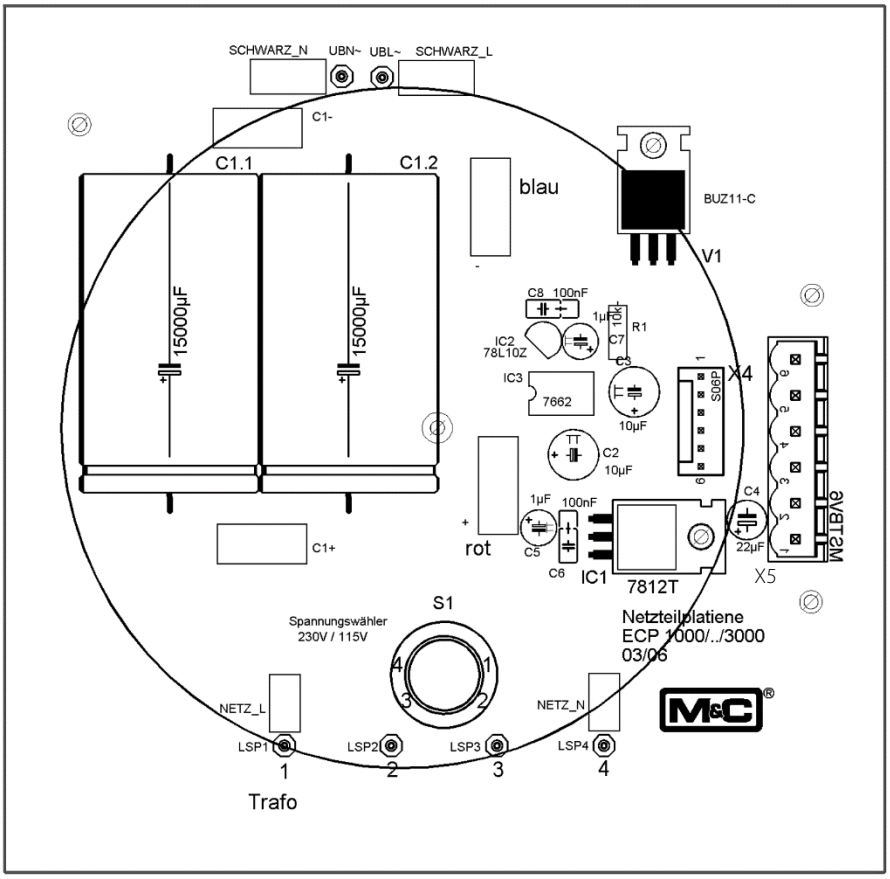


Figure 14: Electronic board and main board from 2007 on

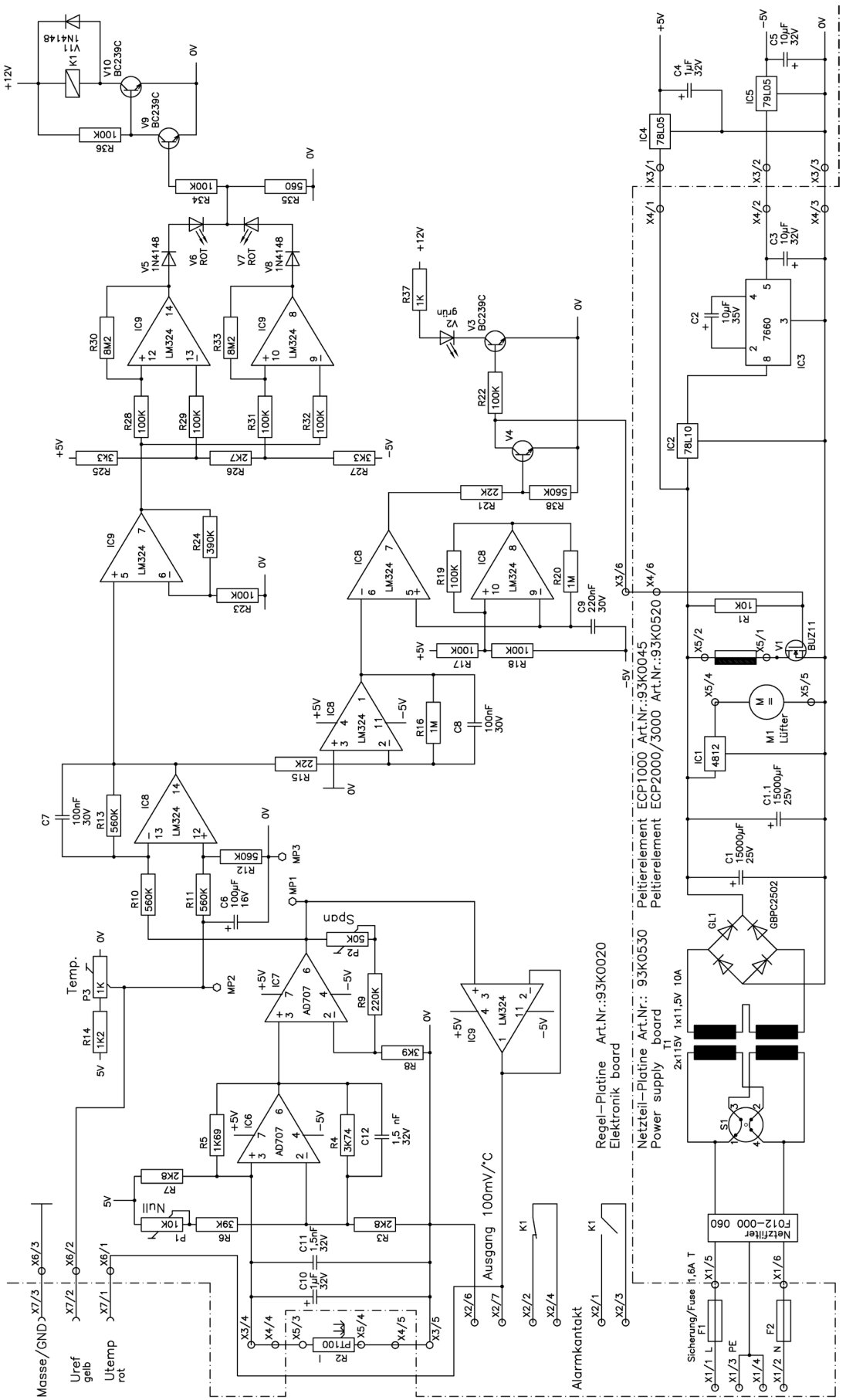


Figure 15: Circuit diagram up to 2006 (Drawing-No.: 2413-5.01.1)

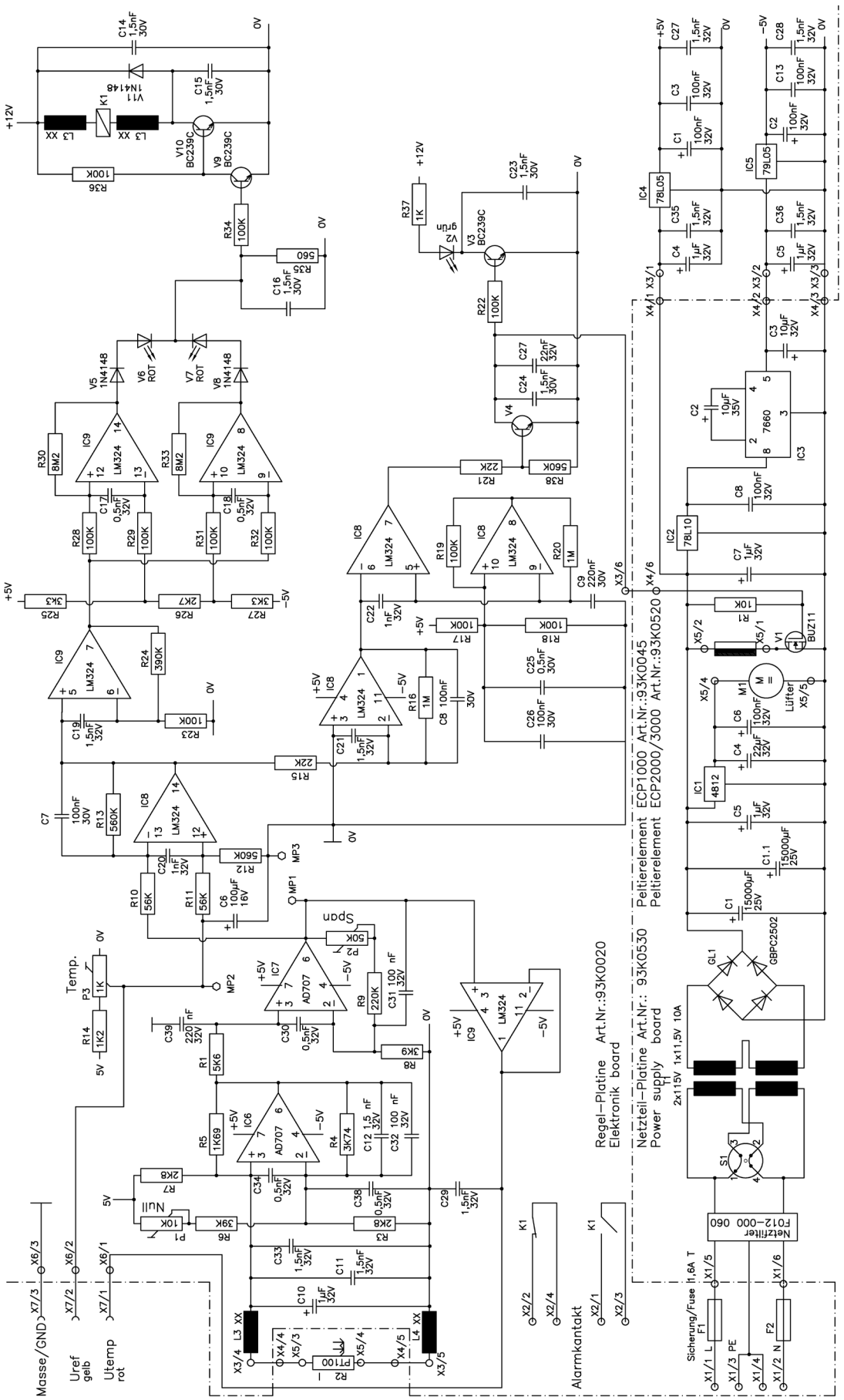


Figure 16: Circuit diagram from 2007 on (Drawing-No.: 2413-5.03.0)