

Electric Gas Cooler Series ECP®

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

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

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

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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 operating manual complies with the following EU directives:

EMV-Instruction

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

Low Voltage Directive

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

Declaration of conformity

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

3 SAFETY INSTRUCTIONS

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

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

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

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 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.

4 WARRANTY

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

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

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

5 USED TERMS AND SIGNAL INDICATIONS



DANGER!

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



WARNING!

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



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.



High voltages!

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



Corrosive!

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



Wear protective gloves!

Working with chemicals, sharpe objects or extremly high temperatures requires wearing protective gloves.



Wear safety glasses!

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



Wear protective clothes!

Working with chemicals, sharpe objects or extremely high temperatures requires wearing protective clothes.

6 APPLICATION

The Peltier gas sample cooler type **ECP .000** 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 as 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 analyser 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.

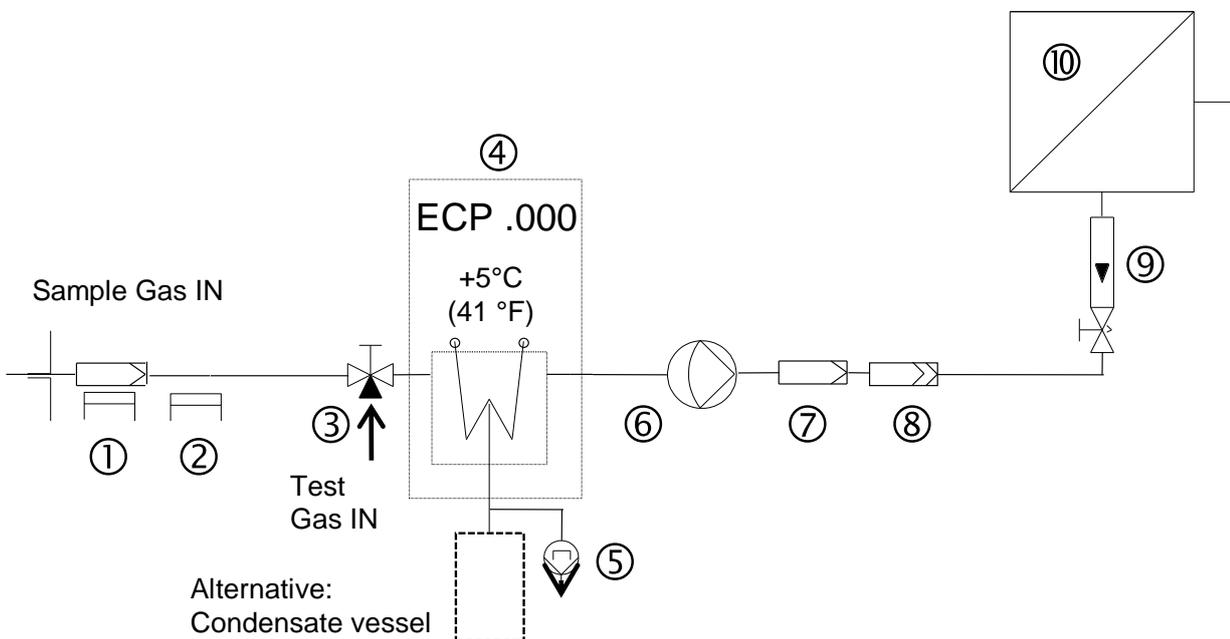
The condensate is discharged externally. For operations under pressure, an automatic condensate drain or collection vessel is used. For operations in partial vacuum (suction), a condensate vessel with a manual drain or a peristaltic pump for automatic condensate removal is used.



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 **ECP .000**.



- | | |
|-----------------------------|---------------------------------|
| ① Gas sample probe SP... | ⑥ Diaphragm pump |
| ② heated sample line | ⑦ Universal filter FP.. |
| ③ 3-way ball valve | ⑧ Liquid particles filter CLF.. |
| ④ Gas cooler ECP .000 | ⑨ Flowmeter FM.. |
| ⑤ Peristaltic pump (option) | ⑩ Analyser |

Figure 1 Application example ECP .000

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.

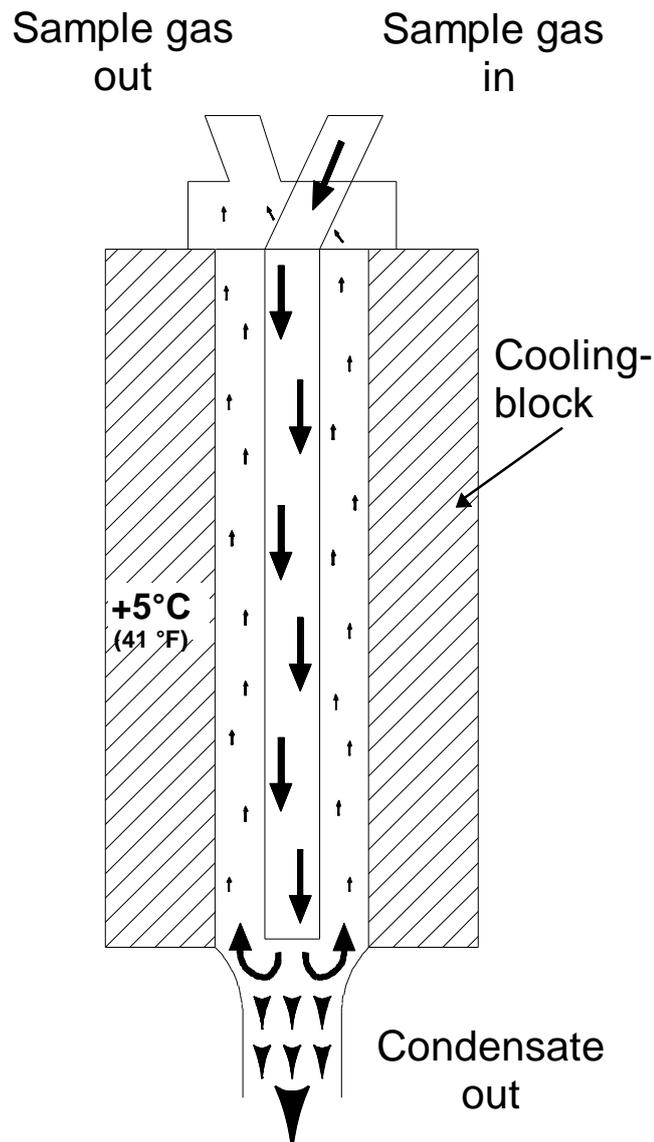


Figure 2 Functioning diagram of the heat exchanger

8 TECHNICAL DATA

Electro Gas Cooler Version	ECP 1000	ECP 2000	ECP 3000
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: $\pm 0.1\text{ °C}$ ($\pm 0.18\text{ °F}$)		
Sample inlet temperature***	max. 180 °C (356 °F)		
Sample inlet dew point***	max. 80 °C (176 °F)		
Gas flow rate***	150 NI/h	2 x 150 NI/h	350 NI/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 NI/h	1 mbar at 150 l/h	5 mbar at 350 l/h
Sample gas connection	for Tube 6 mm \varnothing^* 8 or 10 mm \varnothing^{**}	G1/4"i	G1/4"i* NPT**
Condensate connection	for Tube 12 mm \varnothing^* 8 or 10 mm \varnothing^{**}	G3/8"i	G3/8"i* NPT**
Ready for operation	10 min.		
Power consumption	115 VA	115 VA	
Mains power supply	230 V or 115 V $\pm 10\%$, 50...60 Hz		
Electrical connections	Clamps 2.5 mm ² , cable gland 2 x M16		
Alarm contact	2 change-over contacts, alarm point: $\Delta T \pm 3\text{ °C}$ ($\pm 5.4\text{ °F}$) 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 (10.83" x 8.66" x 5.35")	305 x 220 x 136 mm (12.01" x 8.66" x 5.35")	
Weight	5.5 kg (12.13 lbs)	7 kg (15.43 lbs)	
Electrical equipment standard	EN 61010		

* Standard

** Option

*** Maximum values in technical datas must be rated in consideration of total cooling capacity at 25 °C (77 °F) ambient temperature and an outlet dew point of 5 °C (41 °F).

9 DESCRIPTION

Figure 3 shows the **ECP .000** cooler unit.

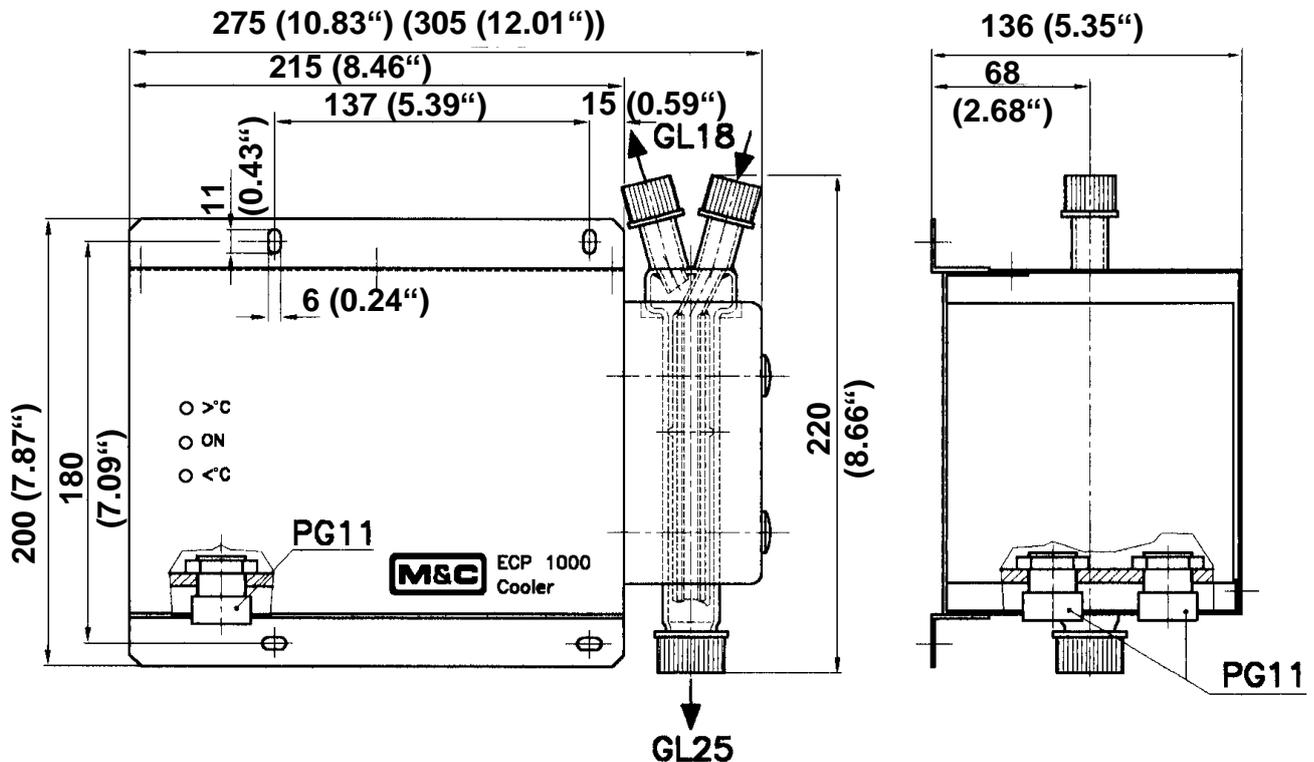


Figure 3 Electric gas cooler ECP .000

The gas coolers ECP 1000/2000/3000 have been specially developed for the analysis technology. All ECP.. 000 gas coolers are available with Duran glass, PVDF or stainless steel 316Ti jet stream heat exchangers.

The ECP 1000 cools a gas path with a maximum gas flow of 150 l/h. The ECP 2000 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 ECP 3000 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 ECP. 000 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 ($T > +8\text{ °C}$ (46.4 °F))
- Central green LED "ON", is on or blinking = Cooling function is activated
- Lower red LED "°C <" = Temperature alarm ($T < +2\text{ °C}$ (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 ECP. 000 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 (p. 10).

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

- Peristaltic pump **SR25.1** 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 **ECP .000** 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 SUPPLY CONNECTIONS

12.1 HOSE CONNECTIONS

The gas inlet and outlet is 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 (page 10).

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 tubings, 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 **SR25.1**;
- 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 FF 11000 (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.

12.2 ELECTRICAL CONNECTIONS



WARNING!

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



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 **ECP .000** 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 **ECP .000** control board:

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

The two M16 cable glands are located on the underside of the cooler enclosure. For further details refer to the electrical circuits and terminal drawing and cover plate.

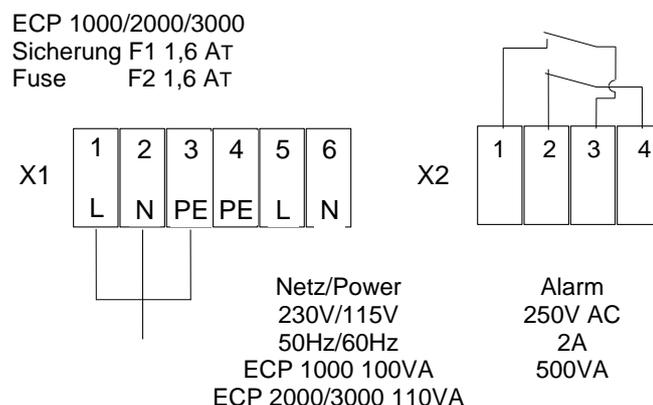


Figure 4 Terminals for mains supply and temperature alarm

13 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 $>8\text{ }^{\circ}\text{C}$ ($46.4\text{ }^{\circ}\text{F}$).

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!

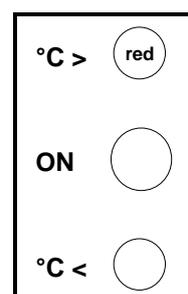
The status contacts must be connected to the external sample gas pump or to a valve in the sample gas line to protect the entire analysis system by immediately cutting off the gas supply in the event of error messages from the cooler!

13.1 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 $+8\text{ }^{\circ}\text{C}$ ($46.4\text{ }^{\circ}\text{F}$).

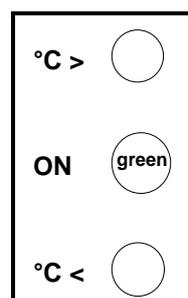


Normal operation

After around 20 minutes the cooler has been cooled down to a temperature below $+8\text{ }^{\circ}\text{C}$ ($46.4\text{ }^{\circ}\text{F}$). 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.



14 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!

15 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 **ECP ..000** Gas Cooler requires 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.

15.1 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;



WARNUNG!

Aggressive condensate is possible.



Wear protective glasses and proper protective clothing!

- Pull the heat exchanger upwards from the cooling block by turning it slightly;

The installation is as follows:

- Dry and clean the opening in the aluminium cooling block with a cloth;
- Apply a thin coat of heat sink compound (item no. 90 K 0115) to the insertion opening, covering the entire surface;
- Apply a thin, even coat of heat sink compound to the entire surface of the heat exchanger to ensure a good cold transition. To prevent the heat sink compound from penetrating into the heat exchanger during installation, it is advisable to seal the condensate drain with an adhesive tape beforehand;
- Insert the heat exchanger into the insert opening of the cooling block by turning it slightly and push it up to the top stop;
- Remove adhesive tape and pressed out heat sink compound;
- Connect the tubing.



NOTE!

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

When installing heat exchangers of type **ECP 1000/2000/3000** made of duran glass, note the following points:

- 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 tightness cannot be guaranteed.
- Hand tighten the red GL union nuts by turning them clockwise;

16 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
<p>ECP .000 is not cooling</p> <p>°C > <input type="radio"/></p> <p>ON <input type="radio"/></p> <p>°C < <input type="radio"/></p> <p>°C > <input checked="" type="radio"/> red</p> <p>ON <input type="radio"/></p> <p>°C < <input type="radio"/></p>	<p>No mains supply</p> <p>Ambient temperature $+2\text{ °C (35.6 °F)} \leq T \leq +5\text{ °C (41 °F)}$</p> <p>Temperature sensor faulty</p> <p>Set point at Pot 3 out of adjustment</p>	<p>Check for mains supply voltage at terminals L&N, X1/ 1+2 against nameplate. If OK, check fuses F1, F2.</p> <p>Check ambient temperature.</p> <p>Disconnect white wires from terminals X5/ 3+4 and measure sensor resistance: $107,79 \pm 0.4$ Ohm at $+20\text{ °C (68 °F)}$ ambient; if there is great deviation change the sensor.</p> <p>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).</p>
<p>ECP .000 cools continuously</p> <p>°C > <input type="radio"/></p> <p>ON <input type="radio"/></p> <p>°C < <input checked="" type="radio"/> red</p>	<p>Transistor BUZ11 faulty</p>	<p>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.</p>

17 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.

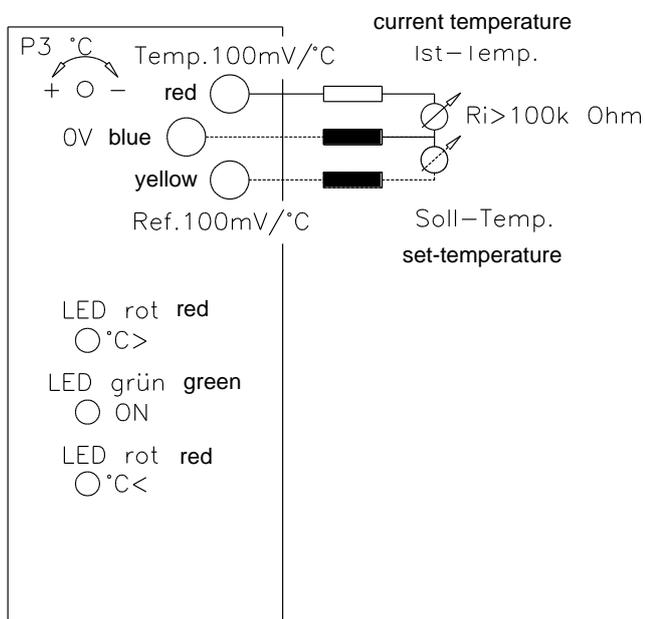


Figure 5 Temperature adjustment

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).

18 CHECKING THE TEMPERATURE SENSOR

The **ECP .000** 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.

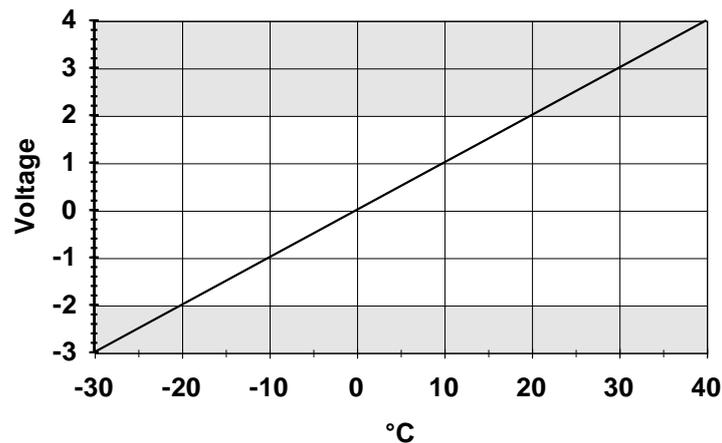


Figure 6 Voltage in relation to the temperature of the cooler

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.

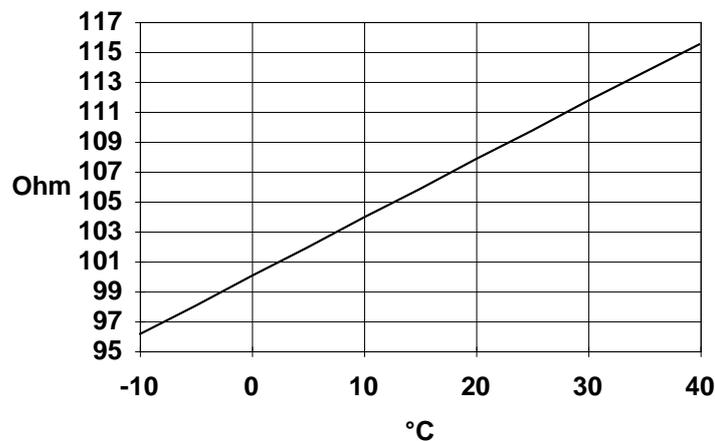


Figure 7 Resistance temperature characteristics of the PT100 temperature sensor

19 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

		C/R/S	recommended quantity ECP... being in operation [years]		
			1	2	3
93 K 0100	ECP-1000 G Jet-Stream Heat Exchanger Material: Duran Glass Connections: Gas GL18-6/6 mm Condensate : GL25-12 mm	R	1	1	1
93 K 0130	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
93 K 0110	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
93 K 0120	ECP-1000 PV Jet-Stream Heat Exchanger Material: PVDF Connections: Gas G 1/4" i Condensate: G 3/8" i	R	1	1	1
93 K 0140	ECP-3000 G Jet-Stream Heat Exchanger Material: Duran Glass Connections: Gas GL18-6/6 mm Condensate : GL25-12 mm	R	1	1	1
93 K 0150	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
93 K 0160	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
93 K 0170	ECP-3000 PV Jet-Stream Heat Exchanger Material: PVDF Connections: Gas G 1/4" i Condensate: G 3/8" i	R	1	1	1
90 K 0115	Heat sink compound 50g , -40 to +140 °C	R	1	1	2
93 K 0540	1.6 A fine-wire fuse 5 x 20 mm (F1/2)	R	2	4	4

Electric Gas Cooler ECP1000/2000/3000

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

		C/R/S	recommended quantity ECP... being in operation [years]		
			1	2	3
93 K 0010	ECP 1000 Fan DC for ECP 1000/2000/3000	C	-	2	2
93 K 0020	ECP Electronic Board complete from serial no.: 95...	R	-	-	1
93 K 0530	ECP Mains Board complete from serial no.: 95...	R	-	-	1
90 K 2010	Rectifier for ECP2000/3000 and ECP1000 as from s.no.:95xx	R	-	-	1
93 K 0040	PT100 sensor incl. screw and spring ECP 1000 for ECP1000/2000/3000	R	-	1	1
90 K 2020	ECP Power Transistor BUZ11	R	-	1	1
93 K 0047	ECP 1000 Peltier element 4/4 for ECP1000 as from s.no.:95xx	R	-	-	1
93 K 0048	ECP 1000 Peltier element for ambient tempera- ture at 50°C for ECP1000 as from s.no.:95xx	R	-	-	1
93 K 0520	ECP 2000/3000 Peltier element 6/6 for ECP2000/3000	R	-	-	1
90 K 0145	ECP Alarm Relay DSP1 for ECP1000/2000/3000	R	-	-	1

20 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 .000**, up to 2006 and from 2007 on
Drawing number : 2413-5.01.1 and 2413-5.03.0

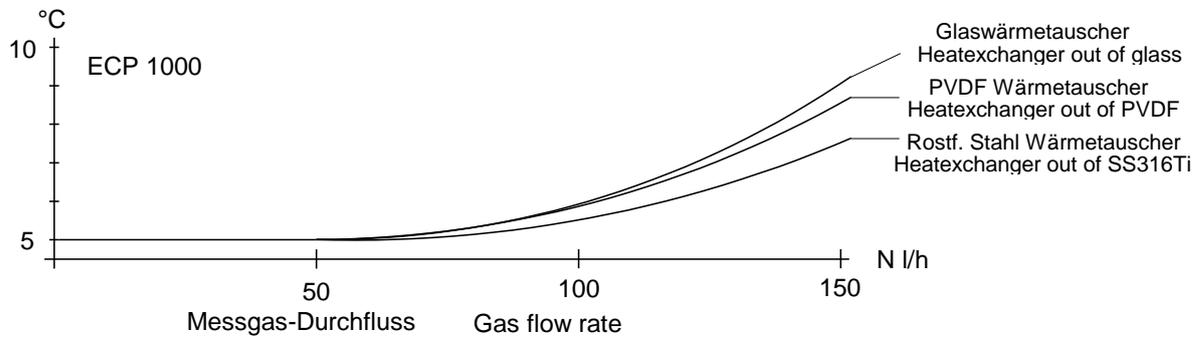


For additional manuals and data sheets please look on our home page
www.mc-techgroup.com

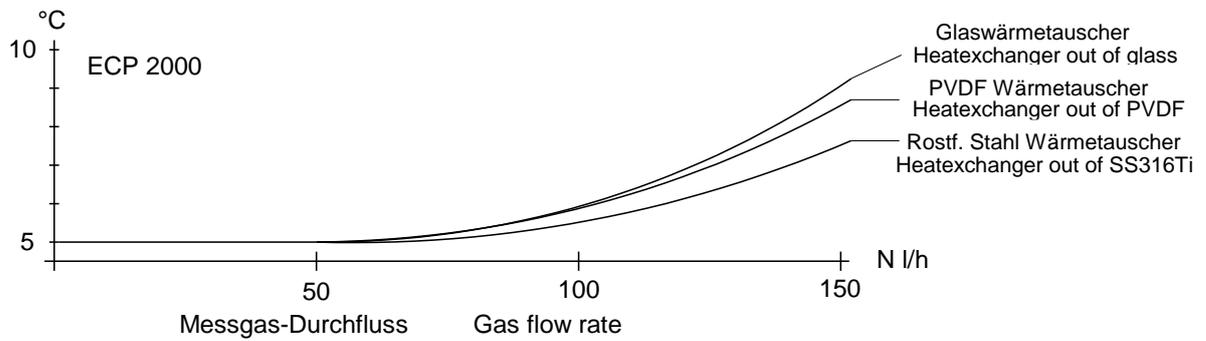
- Instruction manual peristaltic pump **SR 25.1**,
- Condensate vessel **TG, TK**
Data sheet : **6.14**
- **GL**-connectors
Data sheet : **11.5**
- Automatic liquid drain **AD-SS**
Data sheet : **6.13M**
- Automatic liquid drain **AD-P**
Data sheet : **6.12**

Sample inlet dew point 50 °C (122 °F)

Gasausgangs-Taupunkt
Sample outlet



Gasausgangs-Taupunkt
Sample outlet



Gasausgangs-Taupunkt
Sample outlet

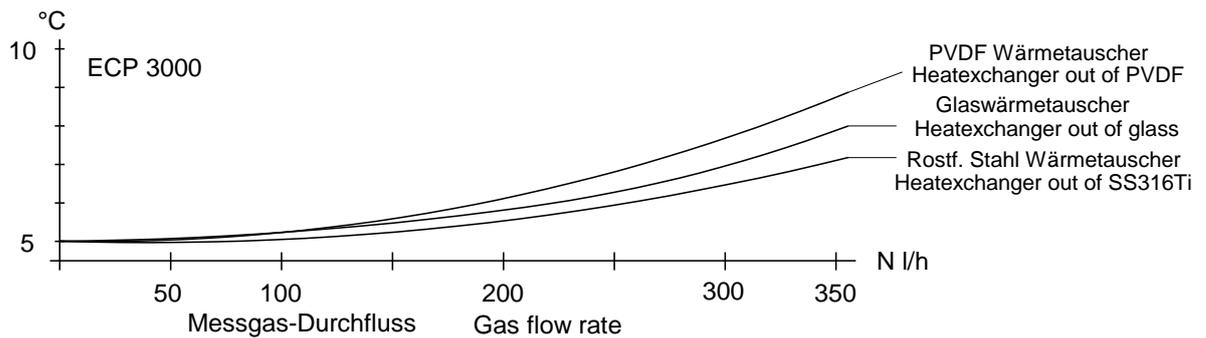


Figure 8 Sample output dew point (ambient temperature 20 °C) depending on gas flow rate

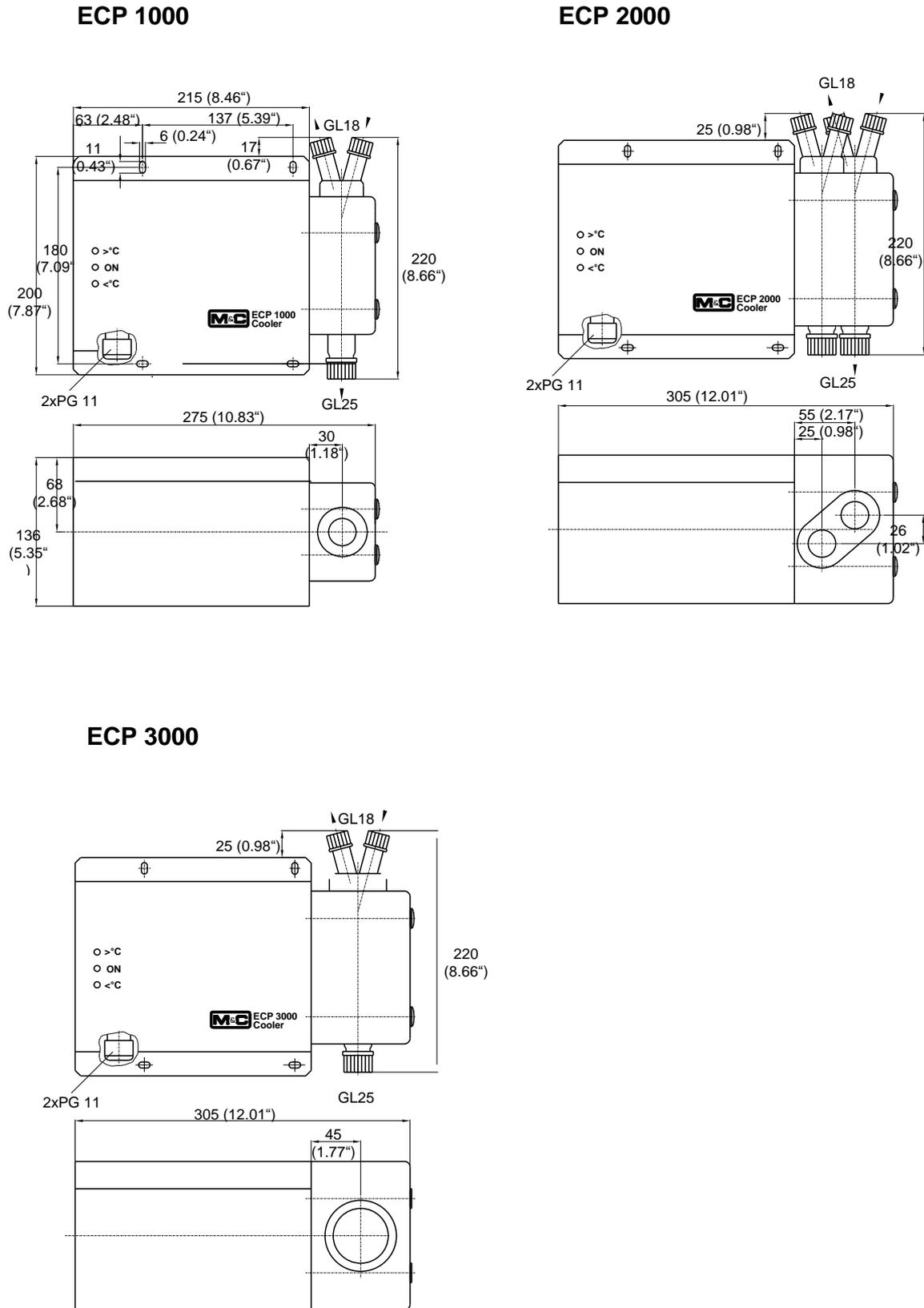


Figure 9 Dimensions of the cooler Type ECP 1000/2000/3000

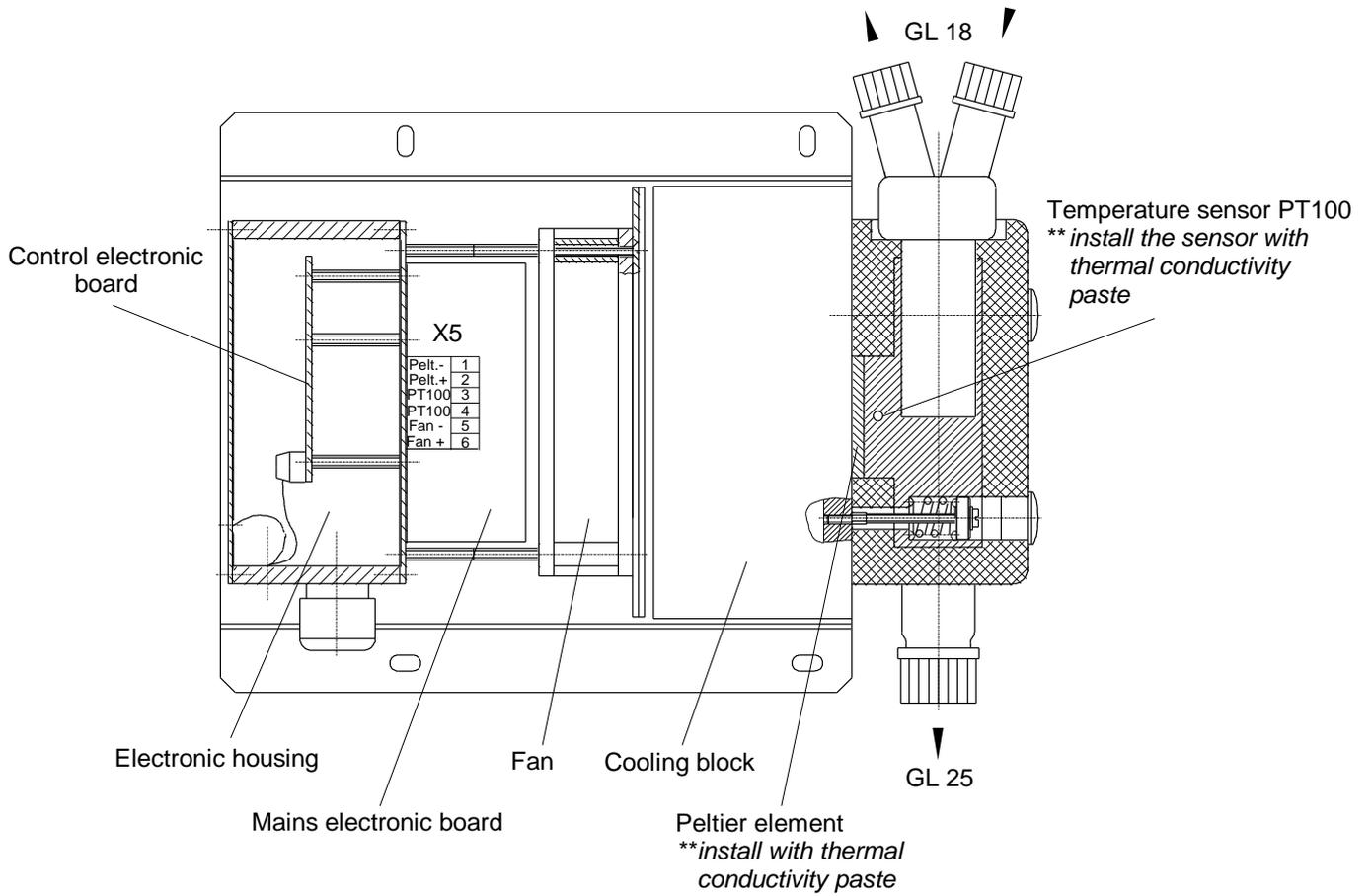
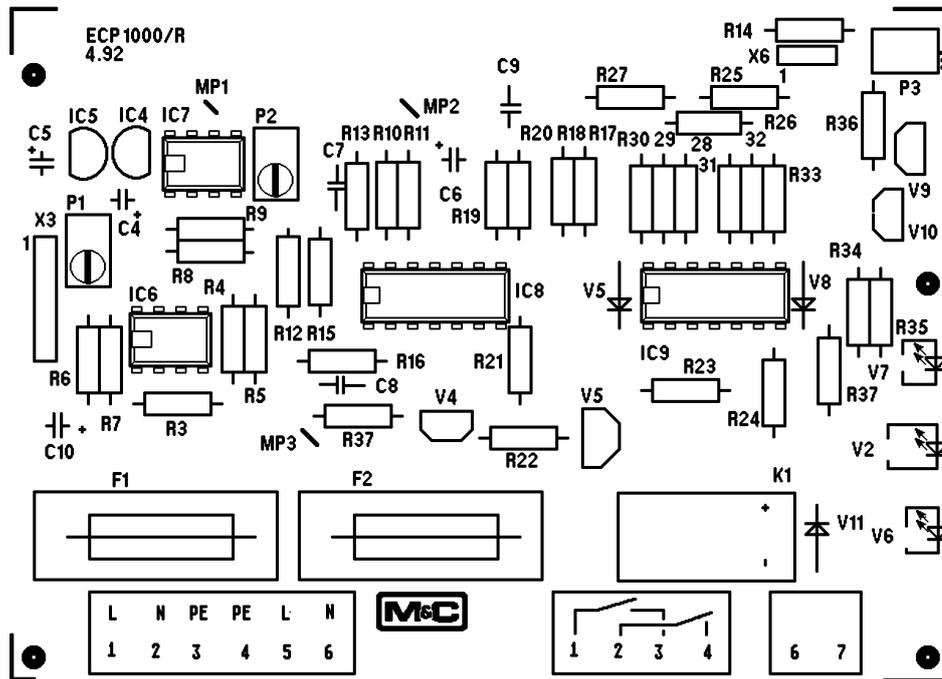


Figure 10 Set-up diagram

Electronic board up to 2006



Main board up to 2006

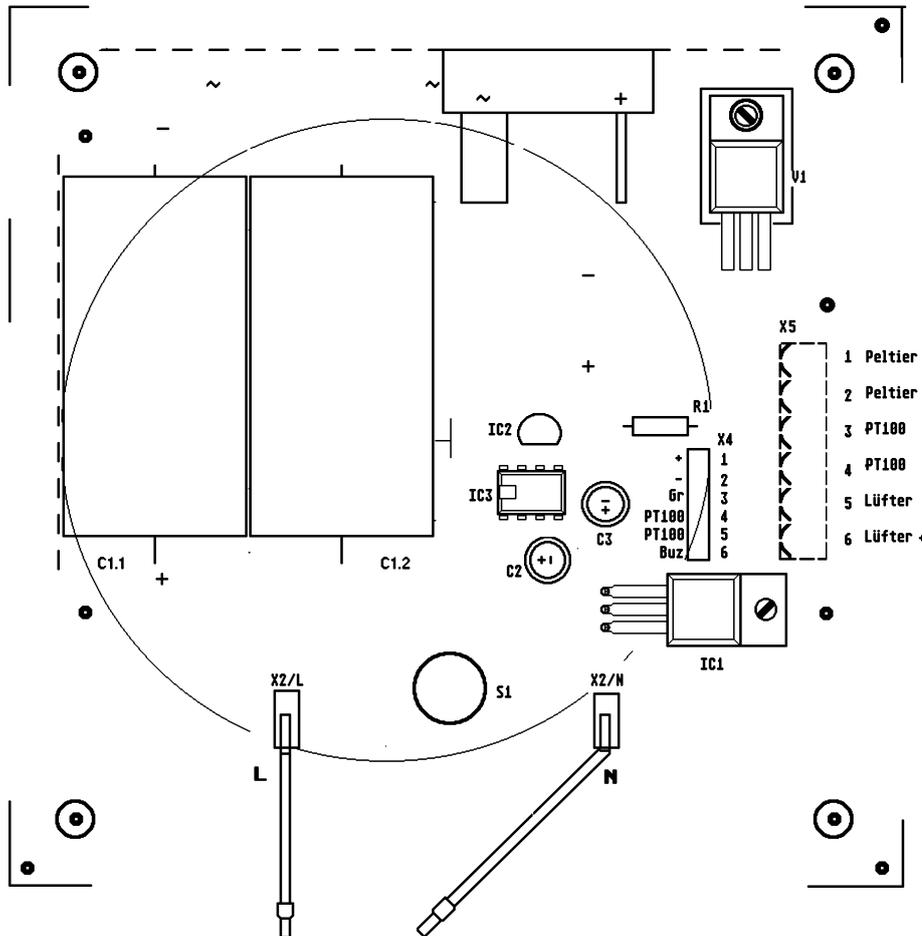
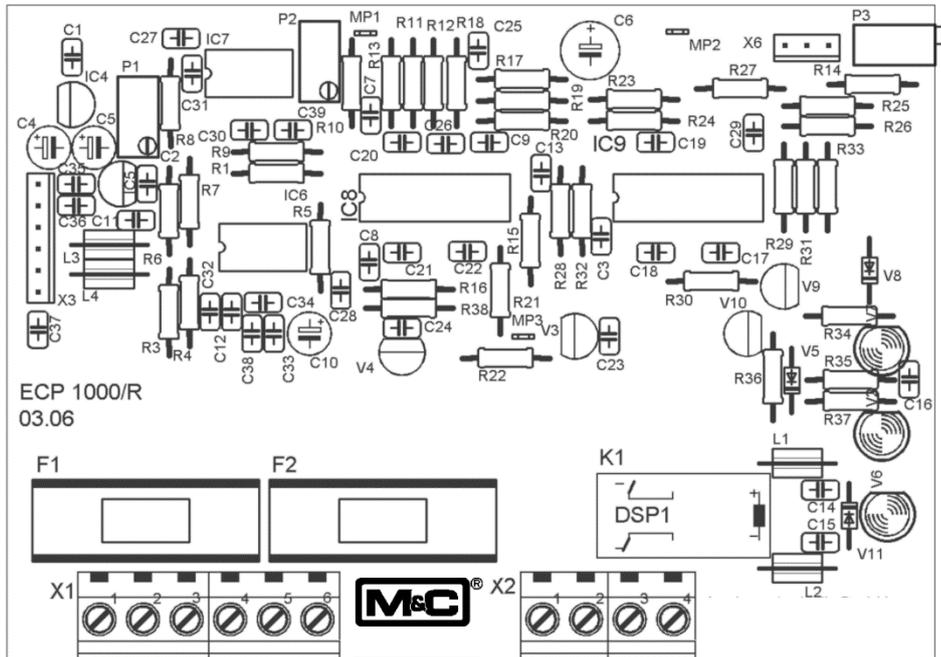


Figure 11 Electronic board and main board up to 2006

Electronic board from 2007 on



Main board from 2007 on

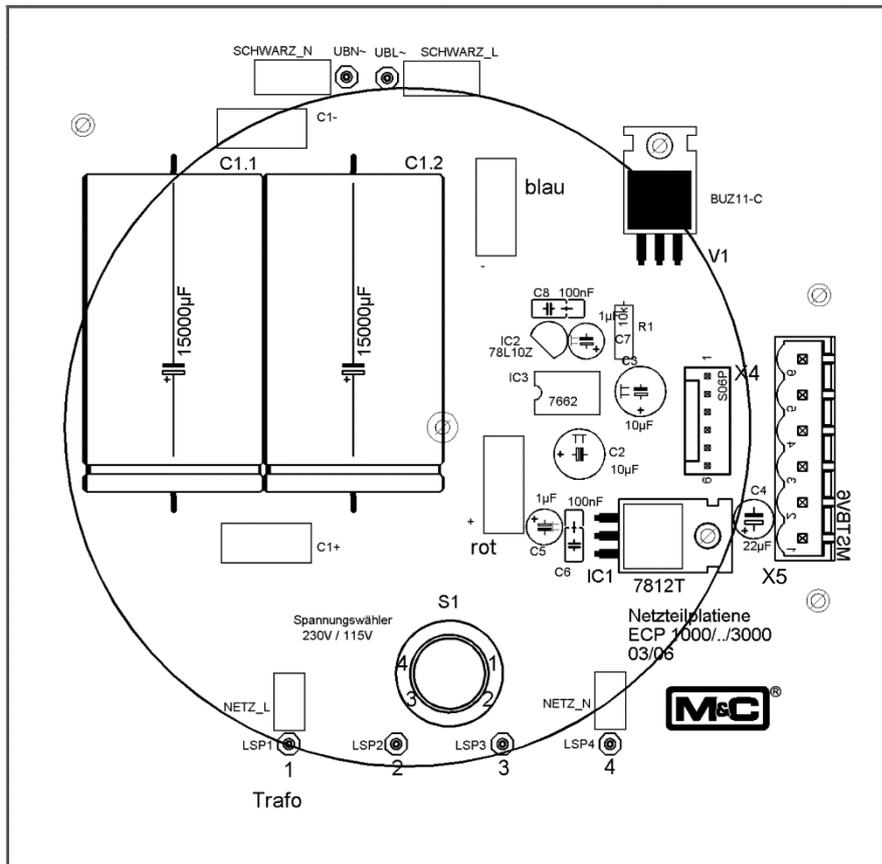


Figure 12 Electronic board and main board from 2007 on

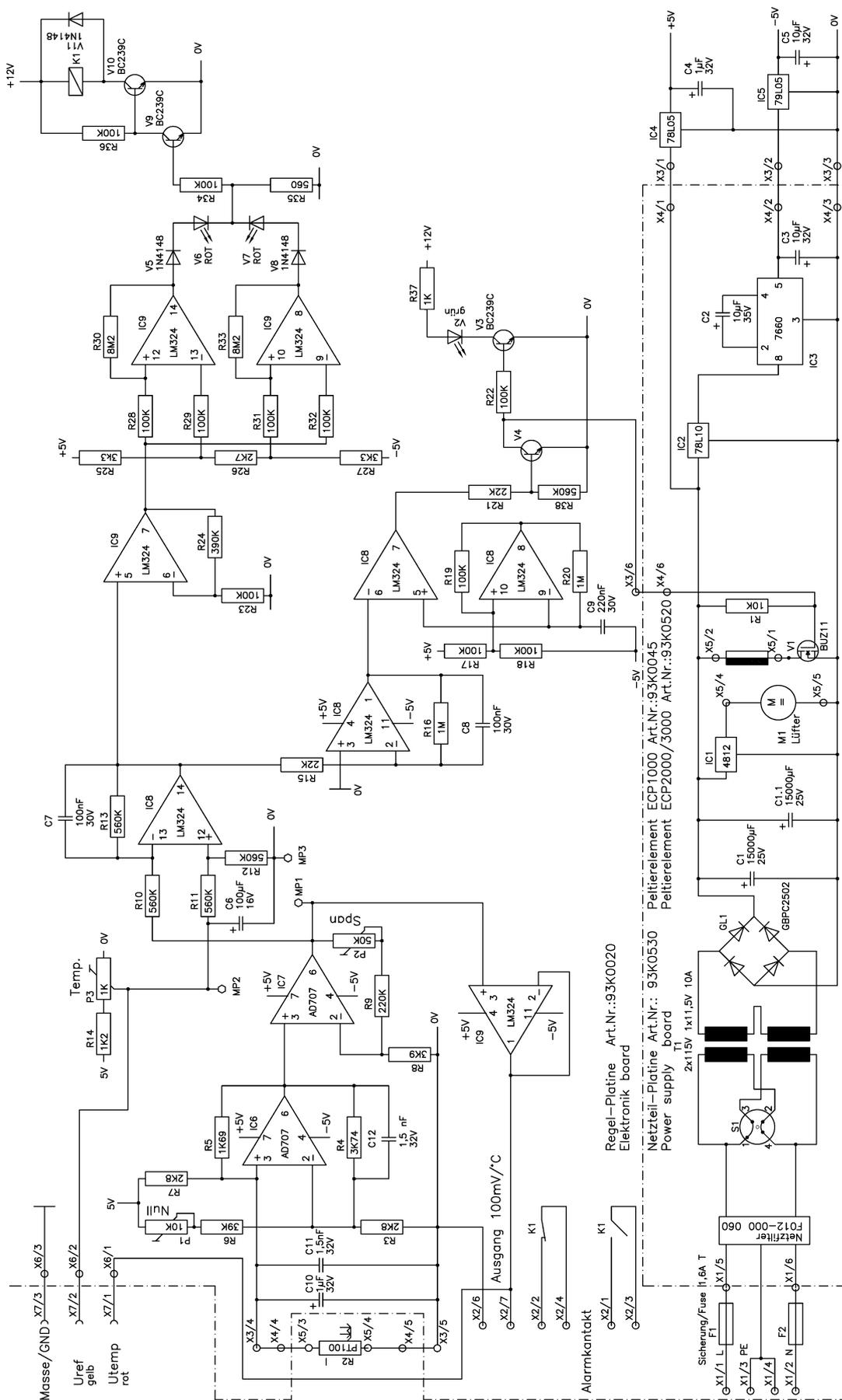


Figure 13 Circuit diagram up to 2006 (Drawing-No.: 2413-5.01.1)

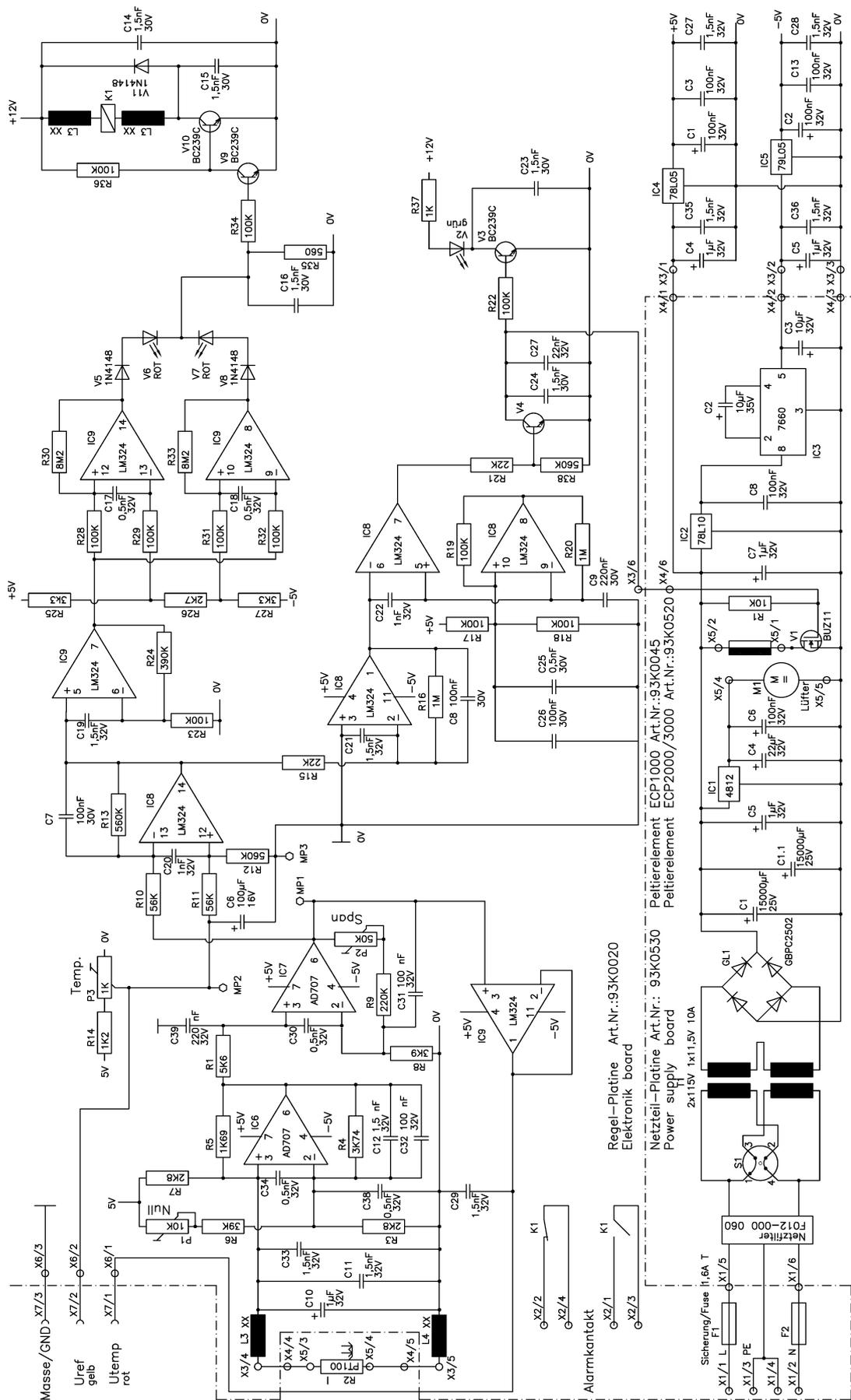


Figure 14 Circuit diagram from 2007 on (Drawing-No.: 2413-5.03.0)