

Electric Gas Cooler Series ECP®

ECPX4 and ECP5X

Instruction Manual
Version 1.00.00
Software Version 1.0



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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With the release of this version all older manual versions will no longer be valid. The German instruction manual is the original instruction manual. In case of arbitration only the German wording shall be valid and binding.

ECP® is a registered trade mark.

Version: 1.00.00

Software version: 1.0

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1 General Information

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

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

Follow all instructions and warnings closely.

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

2 Declaration of Conformity



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

RoHS2 Directive

The requirements of the RoHS2 ('Restriction of Hazardous Substances 2') directive 2011/65/EU and its annexes are met.

EMC Directive

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 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.

4 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.

5 Intended Use

Observe the following basic safety precautions when installing, commissioning and operating the device:

- Read the instruction manual before commissioning and operating the device. The instructions and warnings in the instruction manual must be followed.
- Installation and commissioning of electrical devices must be carried out only by qualified skilled personnel in compliance with the current regulations.
- 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.
- Protection against damage caused by contact with parts carrying high voltages:
Disconnect the power supply before opening the device for access. Make sure that all external power supplies are disconnected.
- Operate the device only in the permitted temperature and pressure ranges. For details please refer to the technical data sheet or the technical data in the manual.
- 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 and skilled personnel in compliance with the current regulations.

The **ECP4X** and the **ECP5X** may only be operated under the conditions described in chapter "9 Technical Data". Only use the devices within the permitted temperature and pressure ranges.
Refrain from any use other than for this purpose.
Improper use can lead to serious injuries, see the safety instructions in the appropriate section.

6 Reasonably Foreseeable Misuse

Ensure that you only install and operate the gas cooler for the purpose described in this instruction manual.

Improper installation and operation of the housing may invalidate the warranty.

The housing must not be damaged.

The materials of the gas cooler that come into contact with the process gas must be suitable for the application.

It's important to set up the gas cooler securely before putting it into operation.

Do not install, maintain or dismantle the device with the power cord connected.

Always wear personal protective equipment (PPE) in accordance with the risk assessment.

During operation, the ambient temperature must not exceed the values stated in the technical data.

Do not use the gas cooler in potentially explosive areas without Ex labelling.

If the gas cooler is used to cool toxic or oxygen-displacing gases, the gas paths must be purged with inert gas or air before opening the gas-carrying parts.
Furthermore, the operator's occupational safety regulations must be observed.



7 Application

The Peltier gas cooler type **ECP4X** or **ECP5X** is used in analyzer systems to reduce the dew point of humid gases to a stable and low level. Sample gas cooling prevents subsequent condensation in the analyzer. The stability of the dew point is of great importance as it helps to minimize measurement errors due to cross-sensitivity of water vapor and volumetric errors, especially with infrared analyzers.

The sample gas is fed to the electric gas cooler type **ECP4X** or **ECP5X** via a gas sample probe and cooled to a stable, adjustable dew point. The factory setting is +5 °C. An ultra-fine filter with optional liquid alarm sensor type LA1 or LA1S (the evaluation of the liquid alarm sensor is integrated in the **ECP4X** and **ECP5X**), which is connected downstream of the gas cooler, separates particles from the sample gas. The sample gas conditioned in this way can be fed to the analyzer.

When conveying unpressurised gases, an external sample gas pump must be installed.

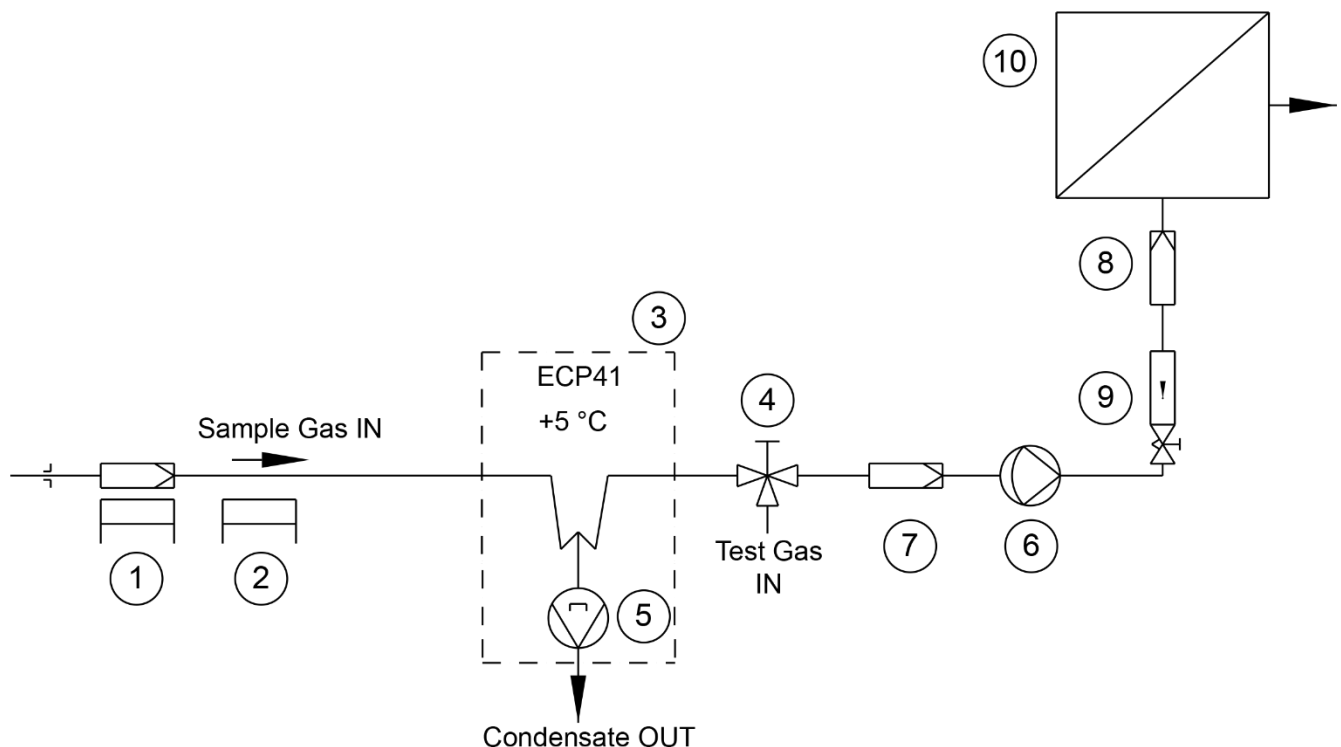
The accumulated condensate can be collected using the optionally integrated peristaltic pump(s) SR25.2.



Note

To protect against liquid breakthroughs and to increase the operational safety of the entire system, we recommend installing an M&C liquid alarm sensor type LA1 or LA1S. The evaluation of the sensor is integrated into the ECP4X and ECP5X.

Figure 1 shows the flow diagram of the ECP41 electric gas cooler (1-channel gas cooler) for a typical application.



- ① Gas sample probe SP180-H or SP2000-H
- ② Heated sample line 4M4/6
- ③ 3-way ball valve 3L/PV-1
- ④ Gas cooler ECP41
- ⑤ Peristaltic pump SP25.2 (optionally)

- ⑥ Analysis pump, e. g., MP-F10
- ⑦ Ultra-fine filter FP-2T-D with liquid alarm sensor LA1
- ⑧ Aerosol filter CLF-5/W depending on application
- ⑨ Flow meter FM10 or FM40, 25-250 NI/h
- ⑩ Analyzer, e. g., GenTwo PMA1000

Figure 1: Application example ECP41 with SR25.2

8 Function of the M&C Jet Stream Heat Exchanger

The gas coolers **ECP4X** and **ECP5X** were specially developed for analysis technology. The heat exchangers of the **ECP4X** are prepared for maximum flow rates of up to 150 NI/h and the heat exchangers of the **ECP5X** are prepared for maximum flow rates of up to 250 NI/h.

The jet stream heat exchangers are available in Duran® glass, stainless steel (SS 316Ti) and PVDF (polyvinylidene fluoride). The heat exchanger material can be selected by the customer. The heat exchangers are easily accessible and easy to replace, and are each housed in a thermally insulated cooling block. Figure 2 shows a schematic diagram of how the heat exchanger inside the ECP4X works.

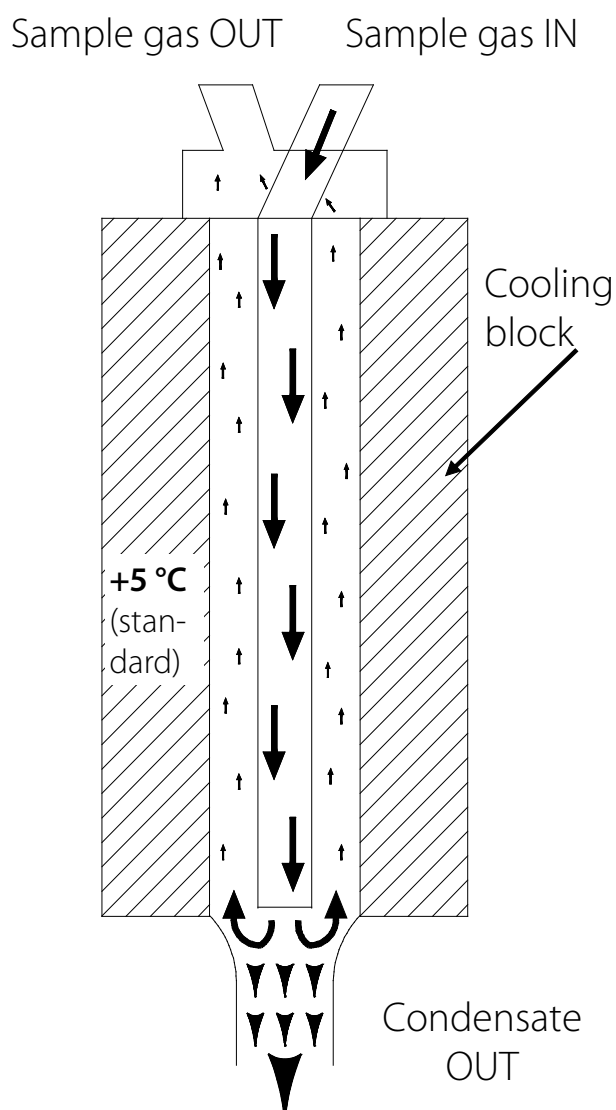


Figure 2: Function of the M&C jet stream heat exchanger inside the ECP4X

9 Technical Data

Gas cooler type	ECP4X	ECP5X
Part number base unit	01K4100	01K4200
Possible number of cooling modules	4	
Max. gas flow rate heat exchanger	150 NI/h	250 NI/h
Ambient temperature	+5 to +50 °C [+41 to +122 °F]	
Max. relative humidity	80 % at temperatures up to +50 °C [122 °F], non-condensing	
Storage temperature	-20 to +60 °C [-4 to +140 °F]	
Gas outlet dew point	Setting range: +2 °C to +45 °C [+35.6 to +113 °F], factory setting: +5 °C [+41 °F]	
Gas outlet dew point stability	Under constant conditions ± 0.1 °C [± 0.18 °F]	
Gas inlet temperature*	Max. 180 °C [356 °F]	Max. 180 °C [356 °F]
Gas inlet water vapor saturation*	Max. 86 °C [186.8 °F]	Max. 94 °C [201.2 °F]
Max. total cooling capacity (@ +25 °C [+77 °F] ambient temperature, 50 NI/h flow rate)	4 x 160 kJ/h (4 cooling channels) 2 x 320 kJ/h (2 cooling channels with 2 cooling modules in series)	4 x 450 kJ/h (4 cooling channels)
Power consumption	120 VA per cooling module (max. 480 VA)	240 per cooling module (max. 960 VA)
Main power connection	230 V AC ± 10 %, 50-60 Hz or 115 V AC ± 10 %, 50-60 Hz	
Cable Entry	5 x M 12, 4 x M 20	
Ready for operation	< 3 min (@ 25 °C environment and without applied load)	
Electrical Connections	Power supply: pluggable via PCB connectors Alarm relays: pluggable via PCB connectors Analog outputs: pluggable via PCB connectors LA: pluggable via PCB connectors CAN bus: pluggable via PCB connectors	
Status alarm	5 x NO contacts, potential-free (4 x cooling module alarms plus 1 x collective alarm) Standard setting: ± 3 °C	
Relay specifications	250 V AC/24 V DC, 2 A, load 500 Ω , minimum switching capacity: 1.2 W (@ min. 12 V and min. 100 mA)	
Analog output	mA output: 0-20 or 4-20 mA, adjustable, maximum load 500 Ω or V output: 0-1 or 0-10 V	
Electrical device standard	EN 61010	
Installation site	The gas cooler is intended for indoor use. The maximum altitude is 2,000 meters above sea level.	
Enclosure protection type	IP20 EN 60529	
EMC standard	EN 61326	
Overvoltage category	OVC II	
Pollution Degree	2	
Mounting type	Wall-mounting, 19" -rack or tabletop	
Housing color	RAL 9003 (white)	
Dimensions without HE(s) and without peristaltic pump(s) with device feet (W x H x D)	482 x 248 x 360 mm [$\approx 19" \times 9.8" \times 14.2"$]	482 x 381 x 360 mm [$\approx 19" \times 15" \times 14.2"$]

Gas cooler type	ECP4X	ECP5X
Device weight without HE(s) and without peristaltic pump(s) with 1 cooling module	9.7 kg [≈ 21.4 lbs]	13.9 kg [≈ 30.6 lbs]
2 cooling modules	12.6 kg [≈ 27.8 lbs]	19.2 kg [≈ 42.3 lbs]
3 cooling modules	15.4 kg [≈ 34.0 lbs]	24.3 kg [≈ 53.6 lbs]
4 cooling modules	18.7 kg [≈ 41.2 lbs]	30.6 kg [≈ 67.5 lbs]

* Technical data with max. specifications must be evaluated taking into account the total cooling capacity at 25 °C and an output dew point of +5 °C.

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

9.1 Heat Exchanger for ECP4X

Gas cooler	ECP4X				
Heat exchanger type	ECM-2/ ECP(1/2)000C/E CC-1 G, WT	ECM-2/ ECP(1/2)000C/ ECC-1 PV, WT	ECM-2/ ECP(1/2)000C/E CC-1 SS, WT	ECM-2/ ECP(1/2)000C/E CC-1 SS/NPT, WT	ECM-2/ ECP(1/2)000C/E CC-1 G/GL14, WT
Part No.	97K0100	97K0110	97K0115	97K0115NN	97K0101
Heat exchanger material	Borosilicate glass	PVDF	Stainless steel 316Ti	Stainless steel 316Ti	Borosilicate glass
Flow Rate	150 NI/h				
Sample gas pressure	Max. 3 bar abs. ¹⁾ (2 bar abs. ²⁾)	Max. 3 bar abs. (2 bar abs. ²⁾)	Max. 10 bar abs. (2 bar abs. ²⁾)	Max. 10 bar abs. (2 bar abs. ²⁾)	Max. 3 bar abs. ¹⁾ (2 bar abs. ²⁾)
ΔP per heat exchanger	1 mbar at 150 NI/h				
Dead volume heat exchanger	50 ml				
Sample gas connection	GL 18 for Ø 6 mm OD tube	Tube Ø 6 mm	Tube Ø 6 mm	1/4" Tube	GL 18 for Ø 6 mm OD tube; GL14 for sensor
Condensate connection	GL 25 for Ø 12 mm tube, Ø 8 mm* or Ø 10 mm*	G 3/8" female	G 3/8" female	3/8" NPT	GL 25 for Ø 12 mm tube, Ø 8 mm* or Ø 10 mm*

* Optional

1) With GL connection adapter

2) With SR25.2

9.2 Heat Exchanger for ECP5X

Gas cooler	ECP5X			
Wärmetauschartyp	EC-G, WT	EC-PV, WT	EC-SS, WT	EC-SS/NPT, WT
Part No.	02K9100	02K9300	02K9200	02K9250
Heat exchanger material	Borosilicate glass	PVDF	Stainless steel 316Ti	Stainless steel 316Ti
Flow Rate	250 NI/h			
Sample gas pressure	Max. 3 bar abs. ¹⁾ (2 bar abs. ²⁾)	Max. 3 bar abs. (2 bar abs. ²⁾)	Max. 10 bar abs. (2 bar abs. ²⁾)	Max. 10 bar abs. (2 bar abs. ²⁾)
ΔP per heat exchanger	1 mbar at 250 NI/h			
Dead volume heat exchanger	70 ml			
Sample gas connection	GL18 for Ø 6 mm OD tube	G 1/4" female	G 1/4" female	1/4" NPT
Condensate connection	GL 25 for Ø 12 mm tube, Ø 8 mm* or Ø 10 mm*	G 3/8" female	G 3/8" female	3/8" NPT

* Optional

1) With GL connection adapter

2) With SR25.2

9.3 Additional Options

	Options	Part No.
ECP4X cooling module	ECP4X cooling module, 150 NI/h, without heat exchanger, for ECP4X base unit with integrated power supply and a gas outlet dew point adjustable from +2 to +45 °C (factory default: +5 °C), max. cooling capacity 160 kJ/h	01K4150
ECP5X cooling module	ECP5X cooling module, 250 NI/h, without heat exchanger, for ECP5X base unit with integrated power supply, independently adjustable pre-cooling zone and adjustable gas outlet dew point from +2 to +45 °C (factory default: +5 °C), max. cooling capacity 450 kJ/h	01K4250
Analog output	1 x mA output respectively 1 x V output module (per cooling module)	01K4300
Thermocouple	1 x thermocouple inclusive thermocouple module and installation (per cooling module)	
LA1S	Typ LA1S: LA sensor with cable break detection <i>Note: the evaluation is performed inside the Peltier gas cooler by default, LA1S for M&C universal filter with "D" connection</i>	01K9260
LA1	Type LA1: LA sensor without cable break detection <i>Note: the evaluation is performed inside the Peltier gas cooler by default, LA1 for M&C universal filter with "D" connection</i>	01K9270
SR25.2	Option: peristaltic pump type SR25.2, installed in the front of the cooler ECM, peristaltic pump head accessible from outside, completely tubed and electrically wired, material: PV, Novoprene, condensate outlet: DN 4/6	01P9125

9.4 Dimensions

Figure 3 shows the dimensions of the ECP4X and Figure 4 shows the hole pattern for mounting the gas cooler. The dimensions are given in mm and the three small arrows indicate the direction of the air flow per cooling module.

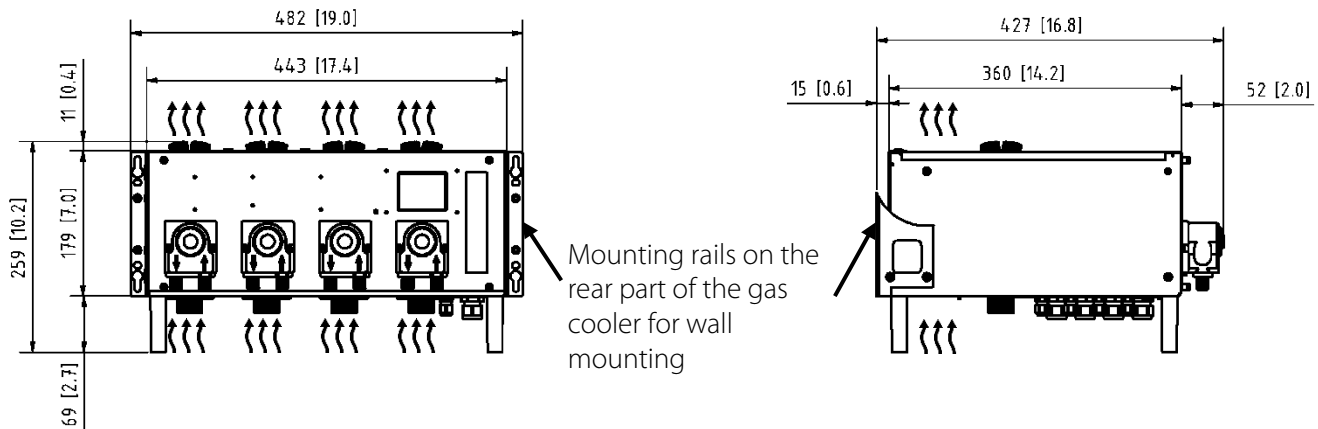


Figure 3: Dimensions ECP4X

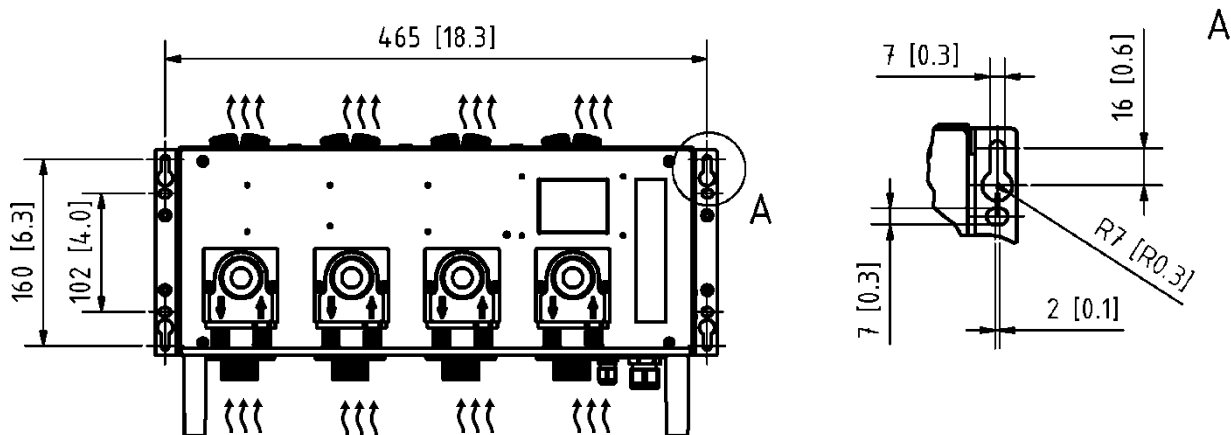


Figure 4: Drilling pattern ECP4X with mounting rails

Figure 5 shows the dimensions of the ECP5X and Figure 6 shows the hole pattern for mounting the gas cooler. The dimensions are given in mm and the three small arrows indicate the direction of the air flow per cooling module.

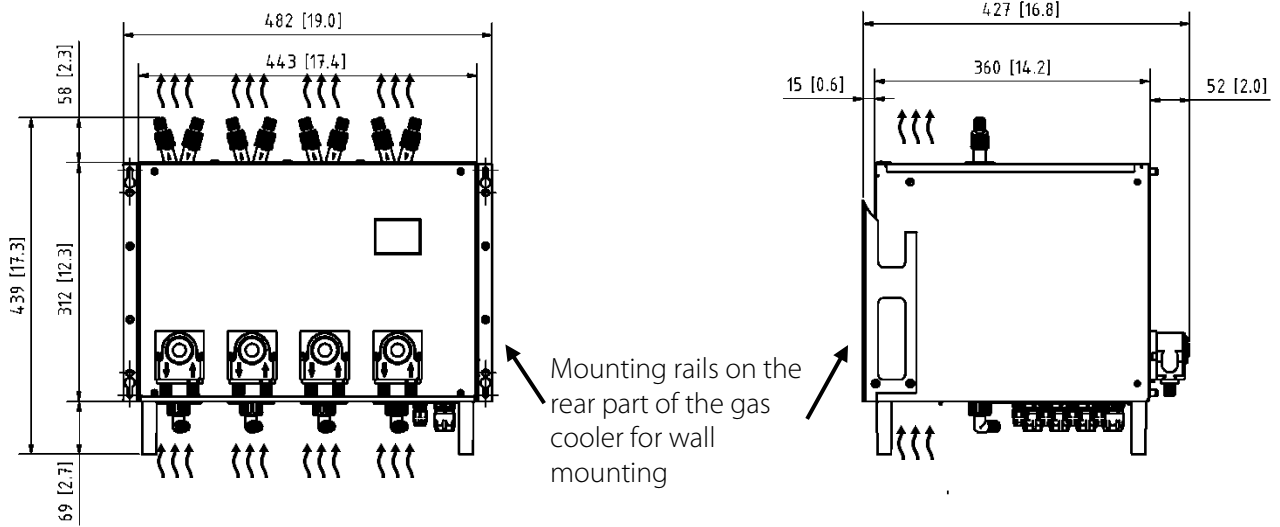


Figure 5: Dimensions ECP5X

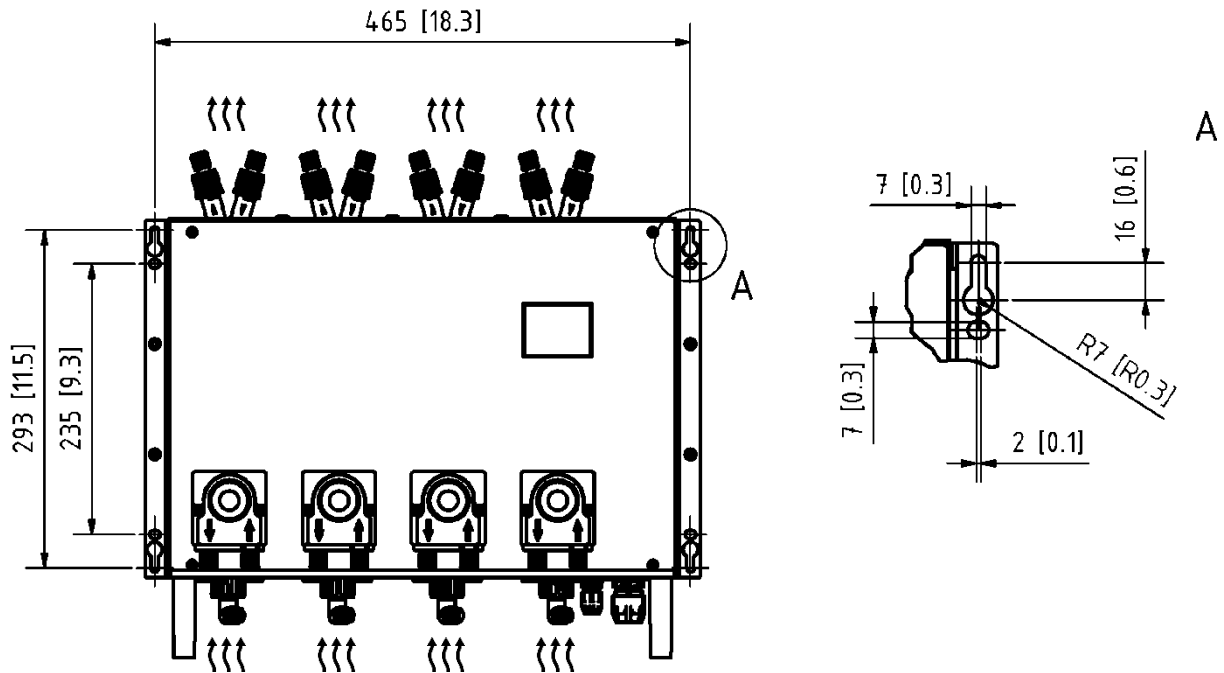


Figure 6: Drilling pattern ECP5X with mounting rails

10 Description

The Peltier gas coolers ECP4X and ECP5X are used in gas analysis to lower the dew point of humid gas to prevent condensation in the analyzer. By setting an extremely stable gas outlet dew point, the effects of water vapor cross-sensitivity and volumetric errors are minimized.

The high cooling capacity of the ECP4X and ECP5X devices are particularly well-suited for use in process and emissions analysis, even in locations where compressor coolers were previously the only option due to high ambient temperatures.

Modular, retrofittable, user-friendly, low-maintenance, and self-monitoring are some features of the M&C gas coolers. The smart design solutions ensure optimum cooling of the measured gas with minimal washout effects and guarantee reliable separation of the condensate.

Since the individual cooling modules operate independently of one another and the HMI (Human Machine Interface) is used only for display and configuration rather than for control, the cooler's basic function remains intact even if the HMI is out of order.

The Peltier gas coolers ECP4X and ECP5X can be equipped with up to four cooling modules. The modular design enables easy and cost-effective retrofitting of the devices in the field.

The modular cooler architecture allows for the installation of heat exchangers made of glass, PVDF or stainless steel, depending on the application. The required heat exchangers are available separately (see table of heat exchanger options).

The accumulated condensate can be collected using the optionally integrated peristaltic pump(s) SR25.2.

The HMI's graphical user interface not only displays all relevant values but also allows for intuitive configuration of the Peltier gas cooler.

Optionally, four configurable analog outputs (mA or V outputs) can be installed and up to four liquid alarm sensors can be connected per device.

The cooling modules can be optionally retrofitted with a thermocouple module for a reference only temperature measurement in the heat exchanger.

For each cooling module, the setpoints and the temperature control type (absolute or ΔT) can be configured individually.

The standard, built-in, and configurable CAN Bus with CANopen protocol enables easy integration into the existing analysis system.

10.1 Cooling Capacity and Max. Inlet Dew Point ECP4X

The following tables show the cooling capacity and the max. inlet dew point of the ECP4X with one cooling module or two cooling modules with different setpoint in series. The cooling capacity and maximum inlet dew point were measured under the following conditions:

- Heat exchanger material: glass
- Gas inlet: connection of a heated sample line (heated to 180 °C) which ends 20 cm in front of the heat exchanger for thermal decoupling
- Gas outlet dew point TP_{OUT} : +8 °C

Ambient temperature [°C]	Flow rate [NI/h]	Cooling capacity [kJ/h]	Inlet dew point max. TP_{IN} [°C]
25	50	160	86
25	150	100	62
50	50	20	50
50	150	20	30

Table 1: ECP4X per cooling module (up to 4 cooling channels are possible)

Ambient temperature [°C]	Flow rate [NI/h]	Cooling capacity [kJ/h]	Inlet dew point max. TP_{IN} [°C]
25	50	320	92
25	150	320	82
50	50	160	86
50	150	160	70

Table 2: ECP4X with 2 cooling modules in series (up to 2 cooling channels are possible)

10.2 Cooling Capacity and Max. Inlet Dew Point ECP5X

The following table shows the cooling capacity and the max. inlet dew point of the ECP5X with one cooling module. The cooling capacity and maximum inlet dew point were measured under the following conditions:

- Heat exchanger material: glass
- Gas inlet: connection of a heated sample line (heated to 180 °C) which ends 20 cm in front of the heat exchanger for thermal decoupling
- Gas outlet dew point TP_{OUT}: +8 °C

Ambient temperature [°C]	Flow rate [NI/h]	Cooling capacity [kJ/h]	Inlet dew point max.TP _{IN} [°C]
25	50	450	94
25	250	140	58
50	50	160	86
50	250	70	40

Table 3: ECP5X per cooling module (up to 4 cooling channels are possible)

11 Operation and Settings of the Peltier Gas Cooler

The resistive color touchscreen on the front panel of the gas cooler is operated by tapping buttons, switches, and lists.

After powering on, the device automatically switches to the start screen. If no modules are connected or expected, "No active modules" appears.

The start screen displays the current temperatures of the main cooling zones, the temperatures of the pre-cooling zones "Pre" (ECP5X only), and the current Peltier load of the available cooling modules as a percentage. In addition, the temperature of the thermocouple, if present, is displayed as "TC". The temperature readings on the start screen can be displayed in °C or °F.

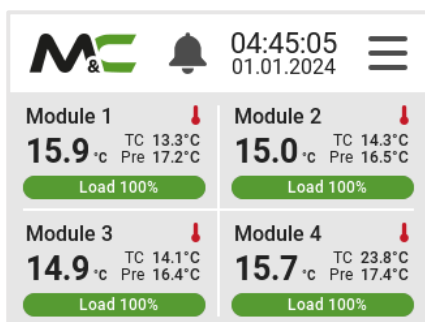


Figure 7: Start screen of an ECP5X with 4 cooling modules

Symbols on the start screen		Shows
	Red thermometer	Temperature alarm (high/low) of the cooling zone
	Yellow thermometer	Temperature or thermocouple warning
	Red triangle	Device or module error
	Yellow triangle	Device or module warning

Table 4: Warning and alarm symbols

Tap on one of the displayed modules to open the detailed view.

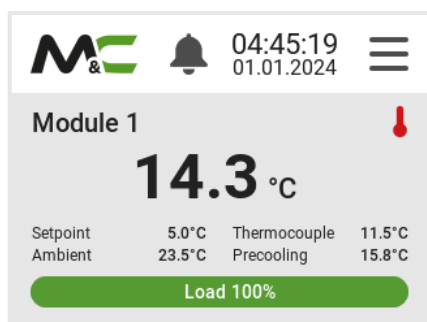


Figure 8: Detailed view of module 1 with thermocouple

The navigation menu can be accessed via the three horizontal lines at the top right of the screen.



Note

Click on the M&C logo to jump back to the start screens.

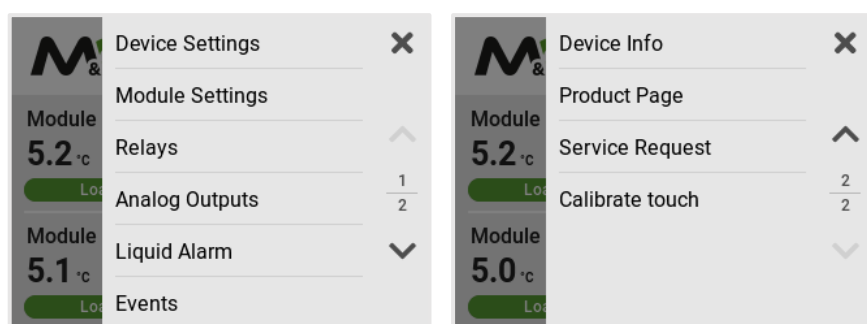


Figure 9: Navigation menu

Use the arrow keys on the right side to navigate to the other pages in the navigation menu. Then tap the selected menu item to open the page for that menu item.

11.1 Device Settings

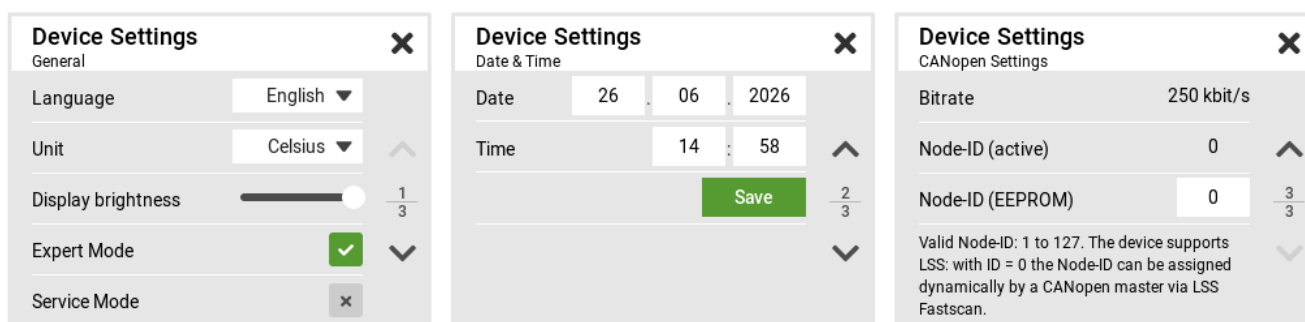


Figure 10: Device settings

In the "General" device settings, you can change the language, the temperature unit (°C or °F), and the brightness of the touchscreen.

Permissions are required to access the Service and Expert sections.

The **Service Mode** can only be entered by an M&C service technician.

The **Expert Mode** can only be reached by using **PIN: 1234**. The PIN is intended to prevent unintentional user errors. Additional advanced settings can be configured in this section. Expert mode unlocks the following pages/settings:

- Module settings
 - Page “Fan” unlocked
 - Page “Setpoint”: lower limit of the setpoint adjustable to –20 °C (without expert mode: +2 °C)
- Relay settings
 - Relay RE0 configurable (without expert mode: no settings possible)
- Device info
 - Page “Factory Settings” unlocked with “Automatic updates” switch

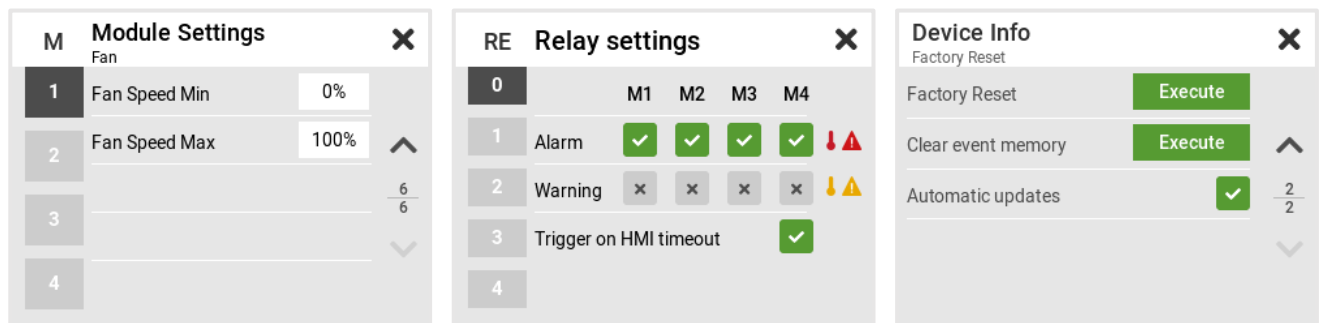


Figure 11: Expert Mode: unlocked pages



Note

Expert mode must be manually turned off.
The device remains in expert mode even after a restart.

The date and time can be set on the “Date & Time” page.

The cooler can be connected to a CANopen network via a CAN bus based on the CANopen protocol. The node ID uniquely identifies the device on the CAN network.

If the value “0” is entered in the “Node ID (EEPROM)” edit field, the device is identified via the LSS (Layer Setting Services) functionality in accordance with the CANopen specification (CiA 305). The LSS master can select the device using FastScan. The LSS master then configures the Node-ID. The configuration is saved in the device only if it is actively transferred to non-volatile memory.

If a value between 1 and 127 is entered in the “Node ID (EEPROM)” edit field, this Node ID is used as a fixed CANopen address. It becomes active immediately after the device starts up and enables direct addressing of the cooler via the CANopen network.

11.2 Module Settings

Here you can configure all parameters for a cooling module: setpoints, control types, alarm and warning thresholds, and – depending on your access level – fans, PID controllers, and capacity limits.

11.2.1 Setpoint and Control Type

M Module Settings		
Setpoint		
1	Cooling temperature	5.0°C
2	Precooling temperature	5.0°C
3	Cooling mode	Absolute
4	Precooling mode	Absolute

Figure 12: Module settings for ECP5X, setpoint and control type

In the module settings, you can enter the setpoint temperature for the gas outlet dew point and the control type (absolute or ΔT) of the cooling zone (ECP4X and ECP5X) and the pre-cooling zone (ECP5X only). On the ECP5X, the setpoint temperatures for the cooling zone and the pre-cooling zone can be set independently of each other. The factory setting for the setpoint and pre-cooling temperature is +5 °C.

With the “Absolute” control type, the setpoint temperature can be set as an absolute value, and with the “Delta” control type, it can be set as a temperature difference relative to the ambient temperature. The setpoint temperature is entered via the following keypad.

Min 2 °C
Max 45 °C
+/- 0.5 °C
Target temperature for cooling control of the selected module.

Cooling temperature

5.0 °C

X

1 2 3

4 5 6

7 8 9

- 0 .

Cancel

Save

Figure 13: Keypad to enter the setpoint temperature

11.2.2 Warning and Alarm Thresholds

The temperature limit values for warnings and alarms are set in this menu item. In addition, the thresholds for warning and alarm hysteresis are also set here.

Use the temperature alarm limits to define when the alarm is triggered. “Temp. alarm high” and “Temp. alarm low” can be set independently of each other between +2 and +45 °C. In the following figure, the upper and the lower temperature alarm limit is set to “3”. The hysteresis is set to “1”.

M Module Settings ✕

Warning

1

Warning active ☒

2

Temp. warning high 2.0 ⬆

3

Temp. warning low 2.0 3/5

4

Warning hysteresis 1.0 ⬇

5

Deviation from the setpoint

M Module Settings ✕

Alarm

1

Temp. alarm high 3.0

2

Temp. alarm low 3.0 ⬆

3

Alarm hysteresis 1.0 2/5

4

Temperature alarm as a deviation from the setpoint. If the temperature leaves the allowed range, an alarm is triggered. The alarm function is always active.

Figure 14: Warning and alarm thresholds

The diagram below shows the alarm thresholds and the alarm hysteresis from Figure 14.

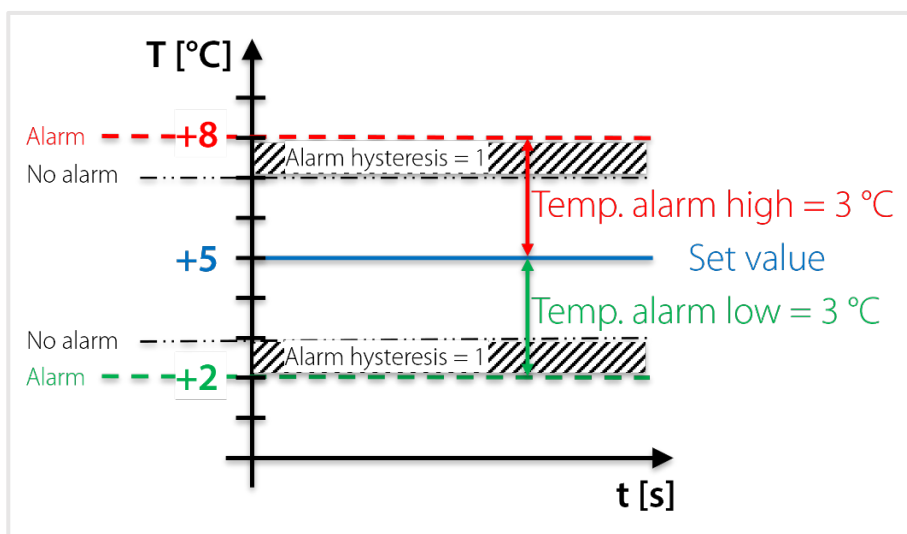


Figure 15: For example: temperature alarm limits and alarm hysteresis



Note

Alarm hysteresis can be reduced automatically.

If the upper or lower temperature alarm is reduced to "2" while a hysteresis greater than "1" is set, the hysteresis is automatically reduced to "1."

11.2.3 Thermocouple Warning Settings (With Installed Thermocouple Only)

Here, you can enter the specific configurations of the installed cooling modules. For example, if a cooling module includes a thermocouple module for monitoring the temperature in the heat exchanger, this can be entered here. If the thermocouple is missing or a fault occurs, a warning or an alarm will be triggered, depending on the settings.

M Module Settings ✕

TC Warning

1

Warning active ☒

2

TC warning high 2.0 ⬆

3

TC warning low 2.0 4/5

4

TC hysteresis 1.0 ⬇

5

Deviation from the setpoint

Figure 16: Thermocouple (TC) warning settings

11.2.4 Removing Cooling Modules

An installed cooling module is automatically detected by the device. If a cooling module is offline or isn't working properly, it will be shown on the start screen as "Cooling module missing". Go to the "Module Settings" to remove this cooling module.

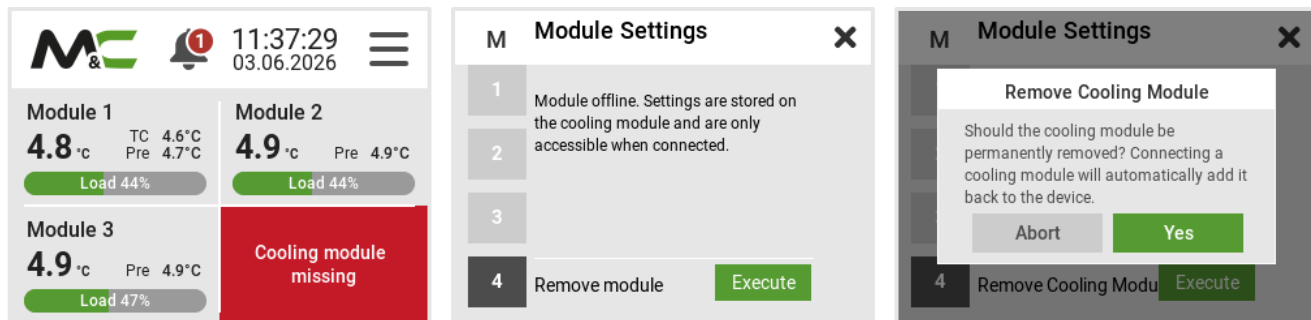


Figure 17: Removing a cooling module

11.3 Relays

The Peltier gas coolers are equipped with 5 potential-free NO contacts. The collective alarm is listed as "RE 0". As shown on the left-hand screen of Figure 18, for this collective alarm all cooling modules are activated. Changes to "RE 0" are possible in Expert Mode only.

The individual cooling module alarms (RE1-4) or warnings are assigned to the respective modules by default. In the right-hand screen of Figure 18, "RE 1" is assigned as an alarm to cooling module "M1". The assignment of relays to cooling modules can be changed in the relay settings.

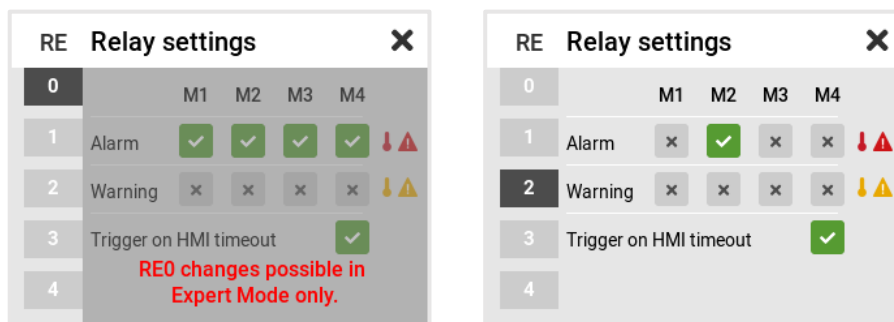


Figure 18: Relay settings (collective and single cooling module warnings and alarms)

The relays are configured as normally open (NO) — in the event of an alarm or failure, they de-energize. During normal operation (no alarm, HMI connected), they are energized.



Note

A cable break in a liquid alarm sensor cannot be distinguished from a cooling module alarm—both cause the relay to drop out (de-energized).

11.3.1 HMI monitoring (can be set per relay)

Use the "Trigger on HMI Timeout" switch to specify individually for each relay whether it should de-energize if the HMI has not communicated for more than 5 seconds.

If the “Trigger on HMI Timeout” switch is enabled (factory setting: switch is enabled for all relays RE0–RE4), the relay will de-energize in the event of an HMI failure—regardless of all other conditions. De-energizing the relay means that an alarm is triggered when the HMI fails.

If the “Trigger on HMI Timeout” switch is grayed out/disabled, the relay operates only according to its active alarm and warning settings. In this case, the HMI failure is not reported as an alarm.

11.4 Analog Outputs (mA or V), Optionally

Up to four individually configurable analog outputs (mA or V output) can be installed per device. The current range can be set between 0-20 or 4-20 mA with a maximum load of 500 Ω , or the voltage range can be set between 0-1 or 0-10 V.

The built-in analog outputs are factory calibrated. Retrofitted analog outputs are also calibrated before shipment. If necessary, the calibration can easily be repeated using your own measuring equipment.

In the test mode, when the test switch is “green,” the analog output delivers exactly the set current or voltage values—regardless of the temperature.

Caution

The test modus overrides the normal operation. Enter only test values that the downstream analysis system can process.

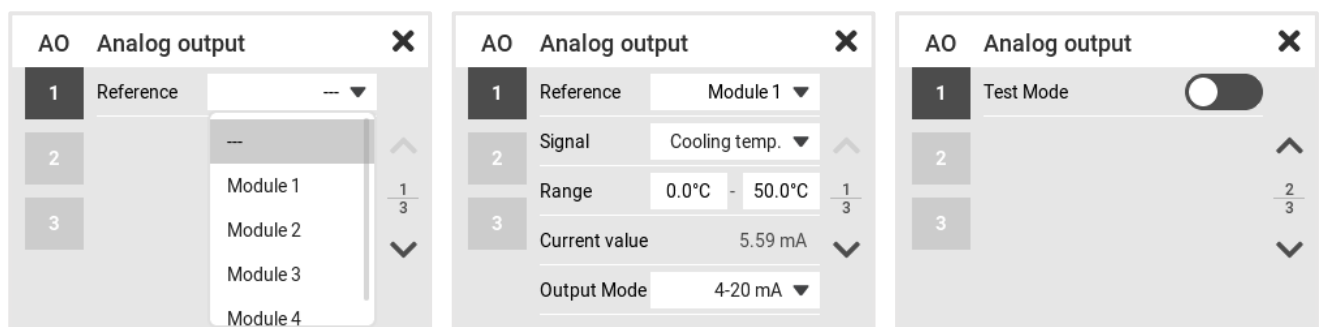


Figure 19: Choosing a module, setting the analog outputs, test mode switch

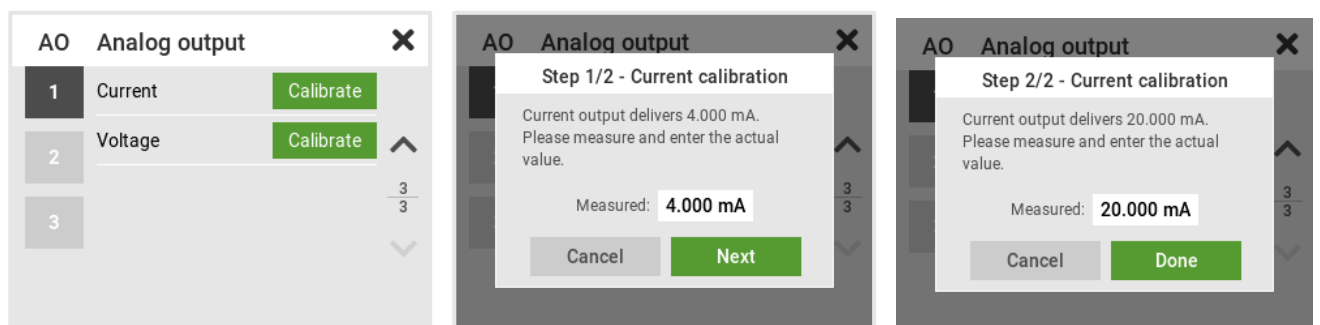


Figure 20: Calibrating an analog output

11.5 Liquid Alarm Sensor LA1 or LA1S, Optionally

Liquid alarm sensors are used in gas conditioning systems to monitor gas cooling and condensate drainage systems in order to protect downstream analysis devices.

Up to four liquid alarm sensors can be electrically connected to the Peltier gas cooler and each of them needs to be assigned to one cooling module. The evaluation of the liquid alarm sensors is performed by default in the Peltier gas cooler. The liquid alarm sensors can be mounted into M&C universal filters with GL connection.



Note

The M&C liquid alarm sensors type LA1 and LA1S work according to the principle of electrical conductivity from a conductivity value of 50 $\mu\text{S}/\text{cm}$.

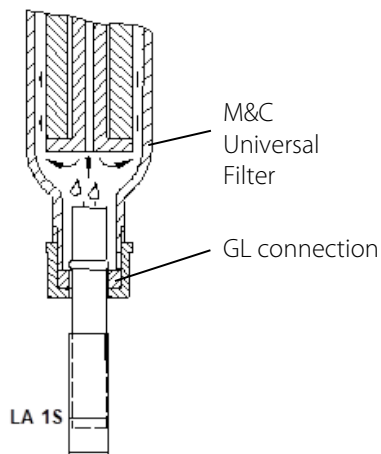


Figure 21: LA1S inside M&C universal filter with GL connection

Two sensor types are available for connection. The LA The liquid alarm sensors are 1 liquid alarm sensor (part No. 01K9270) without cable break detection and the LA1S (part No. 01K9260) with cable break detection.

If a liquid alarm sensor triggers an alarm, it is logged in the event list and displayed on the start screen. At the same time, a connected alarm relay can be activated. The alarm relay can be used to interrupt the gas supply by shutting down the affected sample gas pump or activating a shut-off solenoid valve.



Note

The LA evaluation does not have a hold function. This means that the gas cooler resets the alarm as soon as the LA sensor has dried and the value falls below the alarm reset threshold again.

Type LA1S (with cable break detection, part No. 01K9260) is offered as an option for the Peltier gas cooler as standard.

If no liquid alarm sensor is purchased with the device, the evaluation is deactivated. This can be subsequently activated by the customer if required.

The LA connection is located inside the device on the electronics part. When connecting type LA1 or LA1S, the connecting cable must not exceed 3 meters.

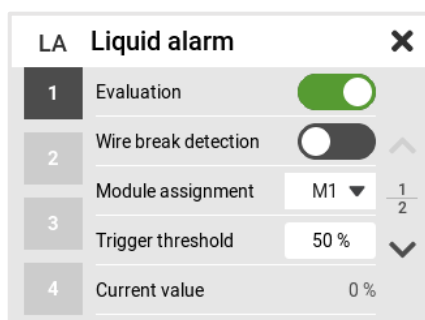


Figure 22: LA without cable break detection is activated

11.5.1 LA Activation

The liquid alarm sensors installed by M&C (type LA1 or LA1S) are calibrated and activated for tap water at the factory. Later purchased liquid alarm sensors must be activated and calibrated.

Do the following to activate the alarm sensor:

1. Activate the liquid alarm sensor by setting the "Evaluation" switch to green.
2. Calibrate the subsequently purchased liquid alarm sensor (see chapter 11.5.3).

11.5.2 Set the Sensitivity of the LA Sensor

To change the sensitivity of the LA sensor, proceed as follows:

Sensor status "2" is set as standard. It can be changed from "1" to "7". The sensor status corresponds to the switching threshold for the alarm. See the table below for more details.

Sensor status	Sensitivity	Conductivity value
Dry	0 %	
7	30 %	~50 $\mu\text{S}/\text{cm}$
6	40 %	
5	50 %	
4	60 %	
3	70 %	
2	80 % (standard)	~300 $\mu\text{S}/\text{cm}$
1	90 %	
Wet	100 %	

The cancellation limit is always 15 % below the sensitivity limit. If the sensor status of "2" is not changed, the alarm is triggered at 80 % and is automatically cancelled again as soon as it falls below 65 %.

The following diagram illustrates the relationships:

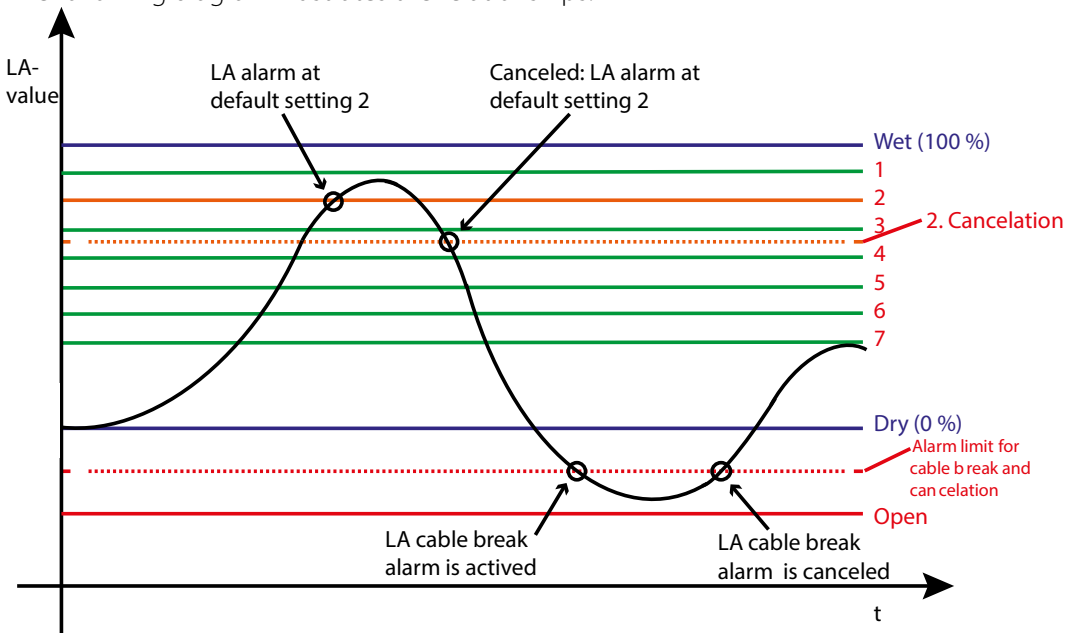


Figure 23: LA alarm limits

11.5.3 LA Calibration

The type LA1 or LA1S liquid alarm sensors installed by M&C are activated and calibrated at the factory. If necessary, the basic accuracy of the liquid alarm sensors can be optimized by recalibration. Later installed liquid alarm sensors must be activated and calibrated.

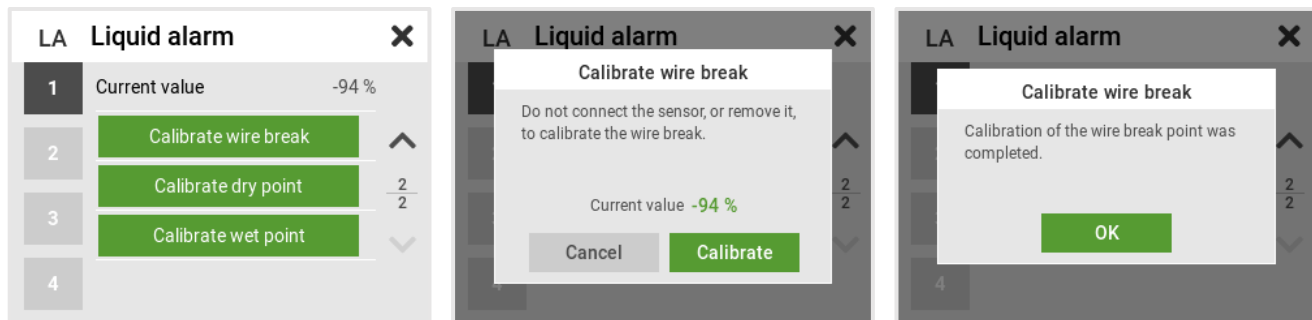


Figure 24: LA1S with wire break calibration

11.6 Events

The events for all cooling modules in use can be viewed in the event list. The severity of each message is indicated by color: a red message is an alarm, a yellow message is a warning, a green message indicates that the status is back to normal, and a blue message is for information only, such as changes to the setpoint temperature or limit values.



Figure 25: List of events

Figure 26 shows the “Cooling module missing” alarm. Tap the bell at the top of the screen or directly on the red area labeled “Cooling module missing” to view detailed information about this active alarm. You can also access this information by tapping the three horizontal lines in the upper-right corner of the screen under the “Events” menu item.

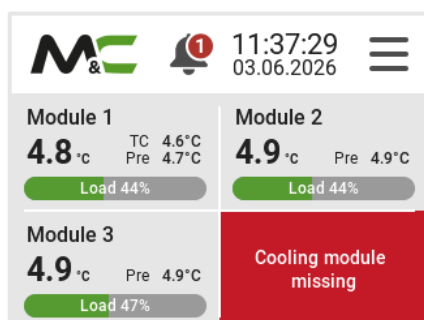


Figure 26: Active alarm, module 4 was not recognized

11.6.1 Events and Messages

This list shows the most important messages that may appear in the event list.

The "Color" column corresponds to the colored bar on the left side of the event list (● Alarm, ● Warning, ● Information, ● Resolution/Acknowledgment). Messages marked as "Resolution" reappear in green as soon as the status returns to normal.

Message: temperature	Color	What it means
Temperature too high / too low	●	Measured temperature is above or below the alarm threshold. Text displayed when the event is resolved: "Temperature alarm OK."
Temperature high / low	●	Measured temperature is above or below the warning threshold. Text displayed when the event is resolved: "Temperature warning OK."
TC Temperature warning	●	Thermocouple temperature above the warning threshold. Text displayed when the event is resolved: "Thermocouple Temperature Warning OK."

Message: thermocouple & sensors	Color	What it means
Thermocouple error	●	Thermocouple is missing, even though it is expected (display shows -----). Text displayed when the event is resolved: "Thermocouple OK".
Thermocouple Short Circuit/Cable Break	●	Thermocouple is short-circuited or the cable is broken.
Temp.sensor error	●	The temperature sensor in the cooling or pre-cooling zone is defective. Text displayed when the event is resolved: "Temperature sensor OK."
Ambient temperature sensor error	●	The ambient sensor is defective or cannot be reached.

Message: liquid alarm sensors	Color	What it means
LA1 / LA2 / LA3 / LA4 (+ „Wet" / „Cable break")	●	Liquid breakthrough detected (wet) or sensor wire disconnected (cable break). Text displayed when the event is resolved: "LAX OK".

Message: cooling module & zones	Color	What it means
Power supply error	●	The module's supply voltage is outside the specified range.

Message: cooling module & zones	Color	What it means
Analog output error	●	An assigned analog output module is not responding.

Message: peristaltic pumps & mains voltage	Color	What it means
Mains voltage not detected – peristaltic pumps deactivated	●	The mains voltage cannot be determined: The measurement has never been calibrated, or there is currently no mains power. All relays, including the pump power supply, have been shut off as a safety precaution; if the device is uncalibrated, the calibration window appears. Text displayed when the event is resolved: “Mains voltage detected again – peristaltic pumps available.”
Mains voltage outside the specified range	●	The device is calibrated, but it measures a voltage between 140–170 V that cannot be attributed to either of the two pump power supplies (110 V/230 V)—for example, an actual 160-V mains supply. To be on the safe side, the pumps remain unpowered. Text displayed when the event is resolved: “Mains voltage back within the specified range.”
Internal peristaltic pumps disabled	●	The internal peristaltic pumps were intentionally turned off. This message also appears once each time the device starts up (without showing it on the bell counter) as long as they are deactivated—so their status is visible in the event list at all times. Text displayed when the event is resolved: “Internal peristaltic pumps activated.”

11.7 Device Information

The device information includes the device serial number, the serial numbers of the cooling modules, and the firmware version.

Device Info		Signal Distribution	
Versions			
HMI		FW 1.013	BL 1.002
FW 0.964	BL 1.002		
SN 260600000			
Module 1		Module 2	
FW 1.015	BL 1.002	FW 1.015	BL 1.002
SN 260699999		SN 260699998	
OPH 9 h		OPH 19 h	
Module 3		Module 4	
FW 1.015	BL 1.002	FW 1.015	BL 1.002
SN 260699997		SN 260699996	
OPH 19 h		OPH 18 h	

Figure 27: Device information

11.8 Product Page

On the product page, you can use the QR code shown to access the relevant product information. Scan the QR code with a smartphone. It will take you to the corresponding product page on the Internet, where you'll find the current user manual, data sheet, and firmware downloads.

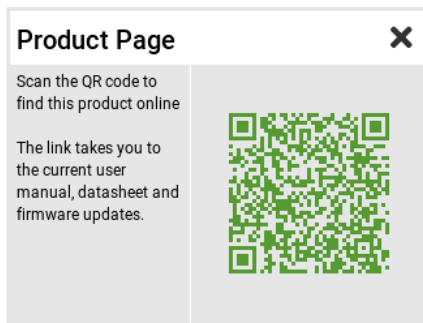


Figure 28: QR code for product information



Note

Tap the QR code to enlarge the image. Tap it again to close the enlarged view.

11.9 Service Request

If you experience any issues or have any questions, please take a photo of the QR code on your device and send it to MSA M&C Service.

The QR code contains all relevant diagnostic data for the device. M&C can use this to perform a complete remote diagnosis without having to be on-site.

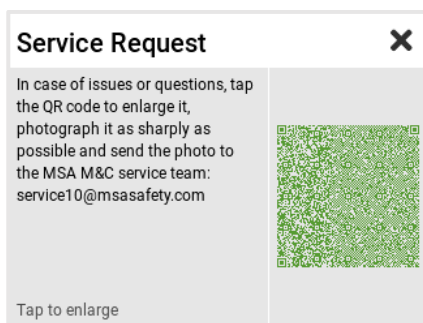


Figure 29: MSA M&C Service page with an example QR code



Note

Tap the QR code to enlarge the image. Tap it again to close the enlarged view.

11.10 Calibrate Touch Screen

If your touchscreen has become less accurate, you can calibrate it. Follow the instructions on this page to identify the exact touch points and reduce touch errors.



Figure 30: Touch screen calibration

12 Receipt of Goods and Storage



Caution

Heavy equipment!
Risk of injury from handling heavy equipment.
Do not move or carry the device alone.
Involve a second person to assist with handling the device.

The base unit, along with the ordered cooling modules, is a fully pre-installed unit. Glass heat exchangers are shipped separately due to the risk of glass breakage.

- Carefully remove the gas cooler and any special accessories from the shipping packaging immediately upon receipt and check the scope of delivery against the delivery note.
- Check the goods for any transport damage and, if necessary, inform your transport insurer immediately of any damage.



Note

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

12.1 Type Designation

The respective versions of the gas coolers can be found in the following table.

ECP	X	X	EX	Type designation
	4			Base unit with max. 150 NI/h per cooling module
	5			Base unit with max. 250 NI/h per cooling module
		1		1 cooling module
		2		2 cooling modules
		3		3 cooling modules
		4		4 cooling modules
			EX	EX approval

Table 5: Type designation

12.2 Type Plate and Serial Number

The type plate of the gas cooler is located on the housing. The following information can be found on the type plate:

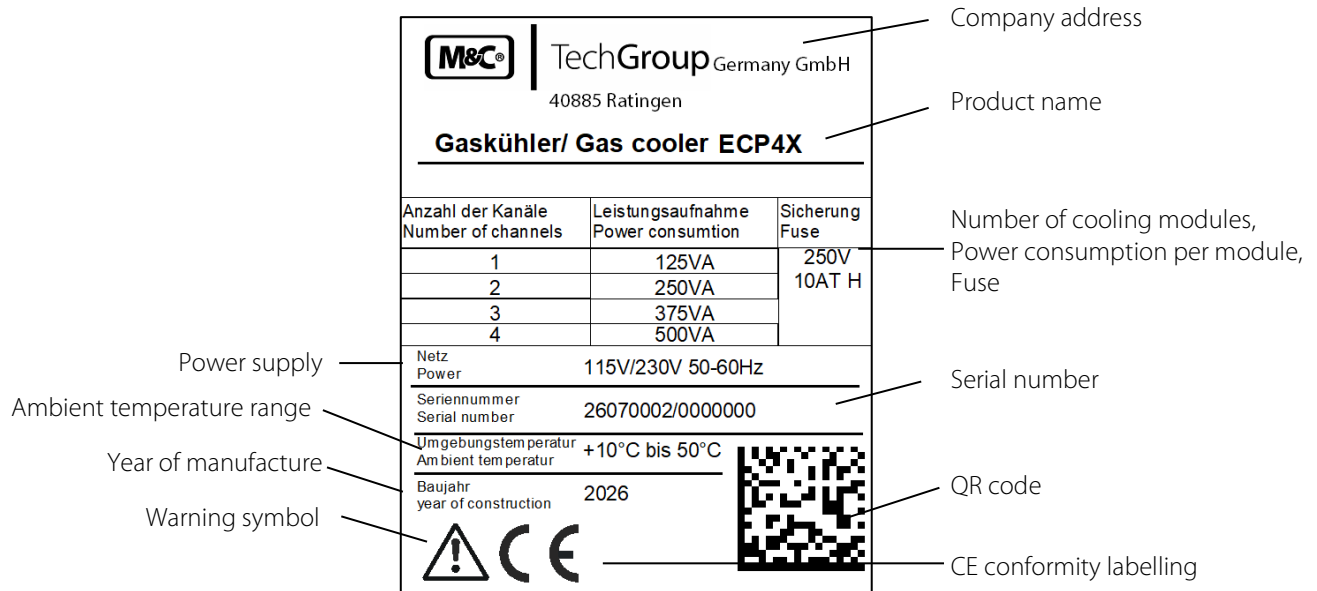


Figure 31: Type plate for ECP4X

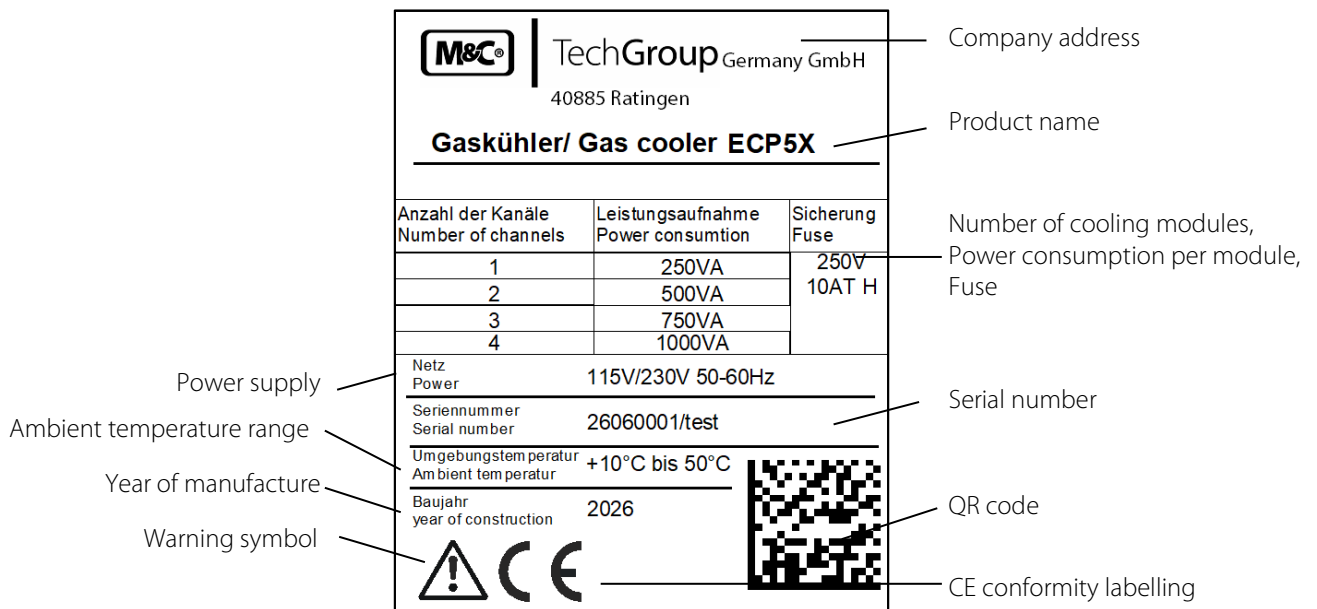


Figure 32: Type plate for ECP5X

13 Preparation for Installation

The following requirements must be met for the installation of the gas cooler:

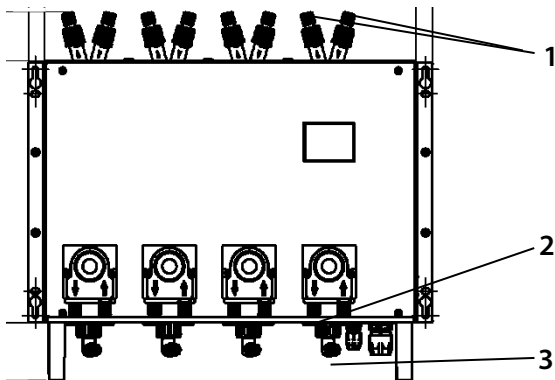
1. An easily accessible main switch, which is labelled for the device, must be provided externally in the building installation. In addition, the main switch must be tested in accordance with IEC 60947-3. The main switch must be close to where the device is installed. The device must be positioned so that the main switch is easy to operate.
2. The supply circuit of the device must be fitted with a fuse corresponding to the rated current (overcurrent protection).
3. The device must be earthed (potential equalization terminal). The leakage resistance must be everywhere $< 10^6 \Omega$.
4. The operating position of the gas cooler is exclusively vertical. This is the only way to ensure that the condensate is properly separated and drained in the heat exchanger.
5. Sufficient space for installing and removing the cooling modules and for connecting the heat exchangers.
6. The gas cooler should be installed away from heat sources and freely ventilated with a minimum side clearance of 100 mm to other components so that no disruptive heat build-up occurs.
7. Unheated gas sample lines must be laid with a downward gradient to the gas cooler. Due to the inclination, condensate pre-separation is not necessary.
8. Connect heated sample lines with sufficient thermal decoupling of at least 20 cm to the gas cooler! The heated sample line ends at least 20 cm before the gas cooler, i.e. the last 20 cm of the sample line are not insulated.
9. Use a gas warning device if toxic gas is being cooled in the gas cooler. Wear suitable personal protective equipment (PPE) in accordance with the risk assessment.

14 Installation

The gas coolers **ECP4X** and **ECP5X** are suitable for wall mounting, for installation in a 19" rack or as a desktop unit. Mounting rails are available for wall mounting and the 19" rack housing, which can be attached to the front or rear of the gas cooler depending on the installation location. See the drilling patterns in Figure 4 and Figure 6. The gas cooler is equipped with feet so that it can be used as a table-top device.

15 Tubing Connections

The connection for the gas inlet and gas outlet is at the top of the heat exchanger. Please refer to the technical data (chapter 9) for the possible connection variants.



1 Sample gas inlet and outlet (marked with arrows)

2 Condensate outlet (marked with an arrow) at the optionally built-in peristaltic pump

3 Condensate outlet at the heat exchanger

Figure 33: Sample gas and condensate connections

Corresponding tube or hose connection fittings are optionally available from M&C.



Note

Do not swap the hose connections for the sample gas inlet and sample gas outlet; connections are marked with arrows on the heat exchangers.

After connecting all lines, check for leaks.

In order not to jeopardize the condensate drainage, the specified drainage cross-sections should not be reduced.



Warning

Only use suitable rigid tube or flexible tubing connection fittings. The heat exchanger and the connection materials used must be checked for suitability/resistance/pressure with regard to the gas and liquid phases. Potential gas hazards/leaks must be assessed in accordance with chapter 27 Risk Assessment "Gas hazards".

Ensure that the connections are adequately sealed by observing the following points:

Duran® glass heat exchanger with GL connections GL 18-6 or GL 25-12

- Before fitting the GL union nuts, check that the PTFE/silicone clamping rings are undamaged;
- The clamping rings are mounted with the PTFE surface facing the medium side.

PVDF or stainless steel heat exchanger with G 1/4" female or G 3/8" female

- The appropriately dimensioned tube or hose fitting with connection thread must be screwed in using PTFE sealing tape.
- For functional and problem-free installation, only fittings in accordance with DIN 2999/1 with a tapered R-thread should be used in conjunction with suitable sealing tape/sealing fluid.



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 thread are characterized by circumferential notches on the connection pieces.
- To ensure that the connections are tight, the NPT connection threads are inserted or glued in with sealing paste.

The tubes for condensate drainage are connected directly to the heat exchanger bases, 12 mm OD compression fittings for Duran® glass or G 3/8" female for PVDF and stainless steel.

Depending on the operating mode, condensate is drained by the customer using:

- **SR25.2** peristaltic pump electrically connected inside the device or an externally connected peristaltic pump;
- Automatic liquid drain **AD-...** only for over-pressure operation;
- Condensate collector container which needs to be 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" female). This eliminates the need for wall mounting the AD-SS unit!

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

**Note**

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

1. 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;
2. Push the union nut over the connecting tube;
3. Push the clamping ring with the thicker bead facing the nut onto the connecting tube;
4. Attach the tubing to the support nipple of the fitting body;
5. Tighten the union nut by hand.

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

16 Electrical Connections

**Warning**

Work on live parts may only be carried out when the environment has been approved as "safe".

Incorrect mains voltage can destroy the device: When connecting, ensure the correct mains voltage as specified on the type plate!

The requirements of VDE 0100 and your relevant standards and regulations must be observed when installing power installations with rated voltages of up to 1000 V!

An easily accessible main switch with appropriate labelling must be provided externally. In addition, the main switch must be tested in accordance with IEC 60947-3. The main switch should be close to where the device is installed and easy to operate.

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

16.1 Power Supply Connection

The plug-in mains connection is located inside the gas cooler. Please refer to Figure 34 for the pin assignment.

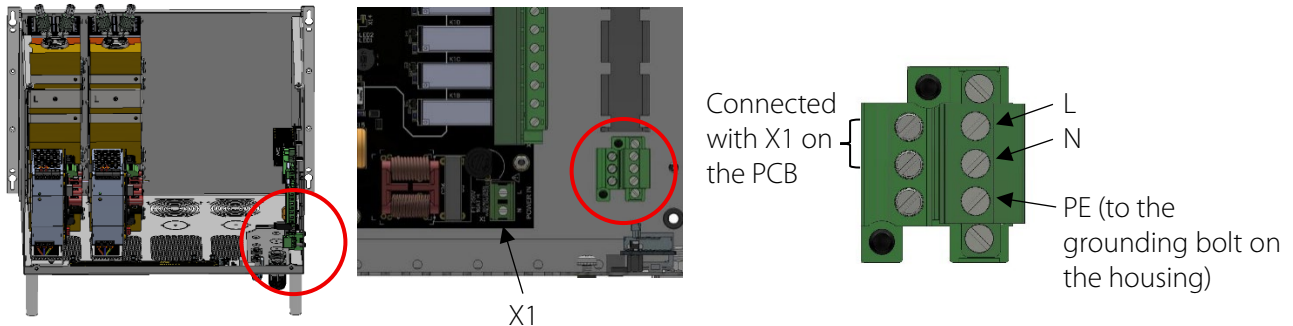


Figure 34: Pluggable mains connection

16.2 Mains Voltage Detection for Internal Peristaltic Pumps

There are two separate power connections for the internal peristaltic pumps—one for 110-V power supplies and one for 230-V power supplies. The device automatically connects to exactly one of them, depending on the line voltage it detects.



Note

If the internal peristaltic pumps are not running, in most cases the mains voltage detection system has detected a fault.

If the device detects that the supply voltage (e.g., an existing 160-V supply) is outside the two specified ranges (110 V/230 V), the supply voltage detection feature shuts down the peristaltic pumps.

After the peristaltic pumps are shut down, a one-time message appears on the screen, and the alarm “Mains voltage outside the specified range” is logged in the event list.

Check whether the actual mains voltage is indeed outside the device specifications (e.g., a 3-phase sub-network or an autotransformer with an unusual voltage); if necessary, use external peristaltic pumps or connect the system to a specified power supply (110 V or 230 V).



Note

If the “Calibrate Mains Voltage” window appears on the device, this means that the one-time calibration of the device to an existing mains voltage has not yet been performed. Follow the on-screen instructions to perform the calibration. After calibration, the mains voltage detection feature checks whether the mains voltage is within the specified range.

16.3 Signal Connections

The signal connections are located on the circuit board inside the gas cooler. In addition to the existing sockets on the circuit board, the plugs are included in the scope of delivery.

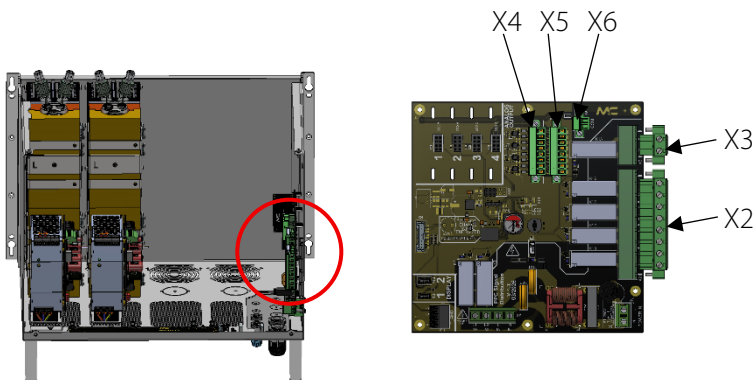


Figure 35: Pluggable signal connections

Connector plugs/sockets	Terminal assignment
X2	Relay 1 to 4
X3	Relay 0
X4	Liquid alarm sensor
X5	Analog output interface or temperature sensor connection
X6	CAN bus

Table 6: Signal pin assignment

The alarm relay connection is pluggable and is made via a type C solenoid valve connector. The switching capacity of the 2 changeover contacts is 250 V, 2 A, 500 VA, 50 W.



Note

Inductive DC loads (e.g. relays, solenoid valves) may only be connected via flyback diodes.

16.3.1 Relay Connections

The Peltier cooler has a total of five relays (RE0–RE4) that are used to report alarms and warnings to higher-level systems (e.g., a control system or signal lights).

The relays operate in fail-safe mode: During normal operation (no alarm, module present), the relay is energized. A specific condition causes the relay to de-energize.

Pin	Function
X2.1	Relay 1 COM
X2.2	Relay 1 NO
X2.3	Relay 2 COM
X2.4	Relay 2 NO
X2.5	Relay 3 COM
X2.6	Relay 3 NO
X2.7	Relay 4 COM
X2.8	Relay 4 NO

Pin	Function
X3.1	Relay 0 COM
X3.2	Relay 0 NO

Table 7: Pin assignments for the relay connections

16.3.2 Analog Output Connections for Cooling Block Temperature(s) (Optionally)

The analog outputs of the cooling block temperatures are potential-free and the max. load is 500 Ohm.

Pin	Function
X5.1	X13A.2 AnalogOut1+ / Thermocouple1 EL+
X5.2	X13A.1 AnalogOut1- / Thermocouple1 EL-
X5.3	X13B.2 AnalogOut2+ / Thermocouple2 EL+
X5.4	X13B.1 AnalogOut2- / Thermocouple2 EL-
X5.5	X13C.2 AnalogOut3+ / Thermocouple3 EL+
X5.6	X13C.1 AnalogOut3- / Thermocouple3 EL-
X5.7	X13D.2 AnalogOut4+ / Thermocouple4 EL+
X5.8	X13D.1 AnalogOut4- / Thermocouple4 EL-

Table 8: Pin assignments for the analog outputs

In chapter "28.1 Calculations for the mA Output" you will find the calculation of the temperature from the mA value, the calculation of the mA value from the temperature and the step size and resolution of the mA output.

16.3.3 LA Connections (Optionally, Type LA1 or LA1S)

The LA connections are located inside the device on the electronics part. When connecting type LA1 or LA1S, the connecting cable must not exceed a length of 3 meters.

Pin	Function
X4.1	Liquid Alarm 1 A
X4.2	Liquid Alarm 1 B
X4.3	Liquid Alarm 2 A
X4.4	Liquid Alarm 2 B
X4.5	Liquid Alarm 3 A
X4.6	Liquid Alarm 3 B
X4.7	Liquid Alarm 4 A
X4.8	Liquid Alarm 4 B

Table 9: Pin assignments for the liquid alarm sensor

16.3.4 Connection of the Informative Temperature Measurement in the HE (TC, Optionally)

If it is necessary to measure the outlet temperature in the gas for process reasons, the thermocouple option can be purchased. This option includes:

- A special glass heat exchanger (with an additional gas fitting for the thermocouple)
- One thermocouple type K class 1 shielded

- A TC module

The mA output for the thermocouple is not electrically isolated.
The maximum load is 180 Ω .

Pin	Function
X5.1	X13A.2 AnalogOut1+ / Thermocouple1 EL+
X5.2	X13A.1 AnalogOut1- / Thermocouple1 EL-
X5.3	X13B.2 AnalogOut2+ / Thermocouple2 EL+
X5.4	X13B.1 AnalogOut2- / Thermocouple2 EL-
X5.5	X13C.2 AnalogOut3+ / Thermocouple3 EL+
X5.6	X13C.1 AnalogOut3- / Thermocouple3 EL-
X5.7	X13D.2 AnalogOut4+ / Thermocouple4 EL+
X5.8	X13D.1 AnalogOut4- / Thermocouple4 EL-

Table 10: Pin assignments for the thermocouples

The measurement accuracy is determined as follows:

Measuring range	Typical temperature deviation*	Max. temperature deviation*	Max. temperature deviation under extreme (EMC) conditions
-40 to +180 °C	± 0.5 °C	± 1.5 °C	± 4 °C

* When using these values, the sensor's tolerance class must be taken into account.

Table 11: Measurement accuracy of the sensor for informative temp. measurement in the HE (TC)

In the thermocouple settings, you can specify an offset.

17 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.

18 Start-Up

If the gas cooler is switched on after a longer period of inactivity at the place of use, it displays the current heat sink temperature. The gas cooler immediately starts cooling to the absolute temperature of +5 °C set as standard.

Until the temperature falls below the preset alarm cancellation limit of +6 °C, the main window shows a red thermometer.

After about 3 minutes, the gas cooler falls below the alarm cancellation limit of +6 °C. The gas cooler now adjusts to +5 °C and the red thermometer disappears. The respective alarm relay is switched according to the alarm, the alarm is cancelled and the relay is energized. The 3 minutes assume that the gas cooler is still unloaded. If there is gas in the gas cooler, the time is extended depending on the energy content of the gas.

18.1 Delay Period After Power-On

After each power-on or restart, there is a grace period of approximately 5 minutes during which temperature alarms and warnings do not yet increment the bell counter. Background: Immediately after startup, the channels first cool down from ambient temperature to their setpoint. During this phase, the actual temperature is inevitably still above the alarm/warning threshold—these “ramp-up messages” are expected and should not appear as unread messages in the bell counter.



Figure 36: Bell counter in the header

Once you open the bell/event list, the grace period ends—from that point on, all active temperature alerts in the bell counter continue to count normally.

18.2 Parameter Setting During Commissioning

The preset parameters can be changed immediately after starting the device. The important basic settings are:

- **Control temperature:** +5 °C (adjustable between +2 and +45 °C)
- **Control type:** Absolute value control (absolute) or differential value control (ΔT)
 - **Absolute value control (Absolute):** The gas cooler cools to the set target temperature regardless of the ambient temperature.
 - **Differential value control (ΔT):** The gas cooler temperature generally corresponds to the current ambient temperature detected by the device minus the set control temperature. To protect the gas cooler from freezing, the gas cooler temperature is limited to +2 °C at low ambient temperatures, regardless of the setpoint.
- **Temperature alarm limits:** ± 3 °C from the control temperature (+2 to +45 °C adjustable). The upper and lower limits can be set independently of each other.
- **Hysteresis:** 2 (1 or 2 °C)
As soon as one or both temperature alarm limits are reduced to 2, the hysteresis is automatically reduced to 1.

In addition, when commissioning subsequently purchased mA outputs or LA sensors, it should be checked whether they are appropriately preconfigured for the planned process.

19 Decommissioning



Note

The installation site of the gas cooler must remain frost-free even when the device is switched off.

No special measures need to be taken if the gas cooler is taken out of service for a short time.

We recommend purging the gas cooler with inert gas or air if it is out of operation for a longer period of time.

Residual condensate should be completely removed from the gas cooler.



Warning



Aggressive condensate possible.



Wear safety goggles and appropriate protective clothing!

20 Maintenance

Follow all safety instructions and descriptions in this instruction manual before starting maintenance work. Before carrying out maintenance work, the specific safety precautions relating to the system and the operating sequence must be observed!



Warning



Dangerous voltage.

Disconnect the power plug before opening the cooler housing!

Danger of death from electric shock when opening the cooler housing!

In the event of a fault, the housing is energized!



Note

For information on maintaining the peristaltic pump, please refer to the SR25 instruction manual. The SR25 Instruction manual is available on our website at www.mc-techgroup.com.

The ECP4X and ECP5X gas coolers do not require any special maintenance intervals. Depending on the degree of contamination of the ambient air, the cooling fin block must be cleaned regularly with compressed air.

20.1 Removal of Heat Exchangers



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

Wear protective gloves!

Wear safety goggles and appropriate protective clothing!

It may be necessary to remove the heat exchanger for maintenance or repair work. The gas cooler does not need to be de-energized to replace the heat exchanger.

The following step-by-step procedure is recommended when removing the heat exchanger:

1. Disconnect the sample gas supply.
2. Disconnect the upper gas connections and the lower condensate connection;
3. Pull the heat exchanger upwards out of the cooling block by turning it slightly;

20.2 Cleaning of the Heat Exchanger



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

Wear protective gloves!

Wear safety goggles and appropriate protective clothing!

You will need the following auxiliary means to clean heat exchangers:

- suitable cloth for removing the thermal 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 exchangers:

1. The outside of the heat exchanger is coated 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 collection container. Dispose of it in accordance with the applicable regulations. Dry the heat exchanger with a suitable cloth.

For stubborn dirt, either a suitable cleaning agent **or** an ultrasonic bath can be used. Do the following:

1. **Use cleaning agents:** Cleaning agents must be suitable for the respective material. Heat exchanger materials are Duran® glass, stainless steel and PVDF. After cleaning, collect the soiled cleaning agent in a collection container and dispose of it in accordance with the applicable regulations.
Use an ultrasonic bath: Follow the manufacturer's instruction manual when using an ultrasonic bath.
2. After cleaning with detergent or in an ultrasonic bath: Rinse the heat exchanger with distilled water and collect the dirty water in a collection container. Dispose of it in accordance with the applicable regulations. Dry the heat exchanger with a suitable cloth.

20.3 Installation of Heat Exchangers

Installation must be carried out as follows:

1. Dry and clean the slide-in opening in the aluminium cooling block with a cloth;
2. Apply a thin, even layer of thermal paste (part No. 90K0115) to the entire surface of the insertion opening using a brush;
3. To prevent the heat-conducting paste from penetrating the heat exchanger during installation, seal the condensate drain with adhesive tape;
4. Coat the heat exchanger evenly with a thin layer of heat-conducting paste over the entire surface to ensure good heat transfer.
5. Insert the heat exchanger into the insertion opening of the cooling block by turning it slightly and push it to the upper stop;
6. Remove the squeezed out thermal paste and the adhesive tape;
7. Connect the tubing.
8. Switch on the sample gas supply.



Note

Do not swap hoses. To avoid any mix-ups, the heat exchanger connections are labelled with arrows!

20.4 Notes on the Installation of Glass Heat Exchangers

Please note when installing heat exchangers made of borosilicate glass:

1. Check PTFE/silicone clamping rings for damage. The clamping rings must be installed with the PTFE surface facing the medium side, otherwise the necessary tightness cannot be ensured.
2. Hand-tighten the GL union nuts by turning them clockwise;

To connect the gas and condensate tubing securely, we recommend the use of GL hose fittings. We would be happy to assist you.

20.5 Information on Maintenance of the Peristaltic Pump SR25.2

The instruction manual for the peristaltic pump type SR25.2 contains all the information required by qualified personnel to maintain the peristaltic pump.

Read this instruction manual carefully before carrying out any maintenance work.

If you have any questions about the peristaltic pump or maintenance, please contact M&C or your authorized M&C dealer.



Note

Information for qualified personnel on maintaining the peristaltic pump can be found in the SR25 instruction manual (included in the scope of delivery of the peristaltic pump).

The SR25 instruction manual is also available on our website www.mc-techgroup.com.

20.6 Changing the Buffer Battery

The buffer battery used in the ECP4X or ECP5X for the real-time clock (RTC) is a type CR2032. The battery holder is located on the inside of the front panel of the device.

Follow these steps to replace the buffer battery:

1. Disconnect the Peltier gas cooler from the power supply.
2. Unscrew and open the front panel.
3. Remove the battery from the holder on the inside of the front panel and insert a new battery. Dispose of the old battery according to regulations.
4. Close the front panel and tighten the screws.
5. Turn on the device. The event list will display "The real-time clock has been reset."
6. Change the date and time in the device settings.



Note

If the Peltier gas cooler is started with a discharged buffer battery, the following message appears in the event list: "The real-time clock has been reset."
Now replace the buffer battery and reset the date and time.

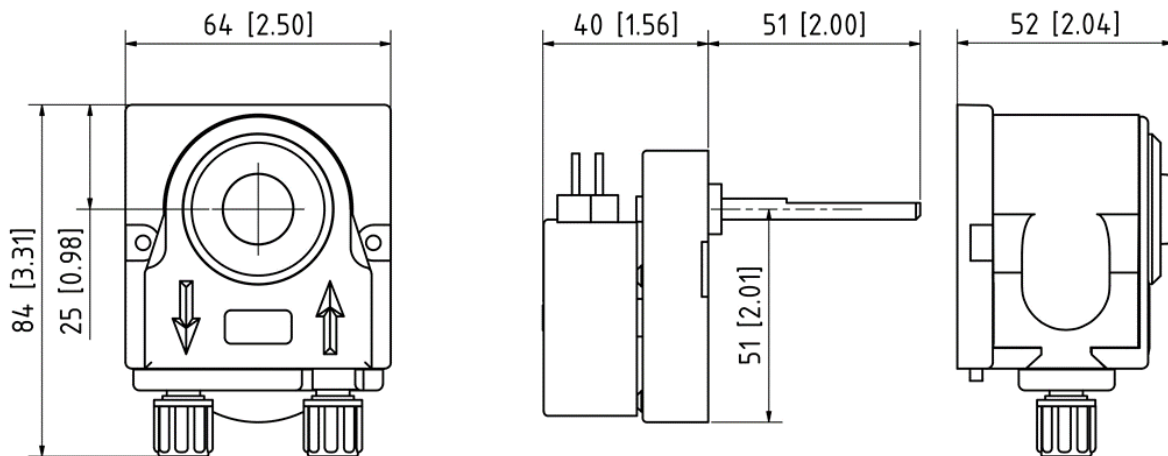
21 Retrofitting: SR25.2 Peristaltic Pump (Optionally)



Note

For mounting instructions and supply connections, please refer to the SR25 instruction manual (included in the scope of delivery of the peristaltic pump).

The SR25 instruction manual is also available on our website www.mc-techgroup.com.



Metric values are rounded. Inches are for reference only. In case of doubt, the values of the metric units apply.

Figure 37: Dimensions SR25.2

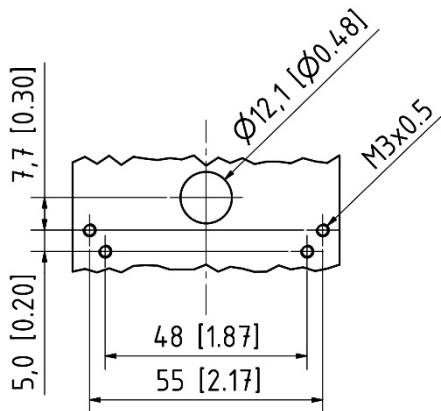


Figure 38: Drilling pattern for SR25.2

21.1 Electrical Connection of the Peristaltic Pump

The peristaltic pumps and the cooling modules are electrically connected to the PCB on the backside of the gas cooler front panel. The terminals X11, X21, X31 and X41 are for connecting the peristaltic pumps.

Terminals	Pin	Function
X11 to X41	L1	110 V
	L2	240 V
	N	Neutral conductor
	PE	Protective conductor

Terminals
for SR25.2

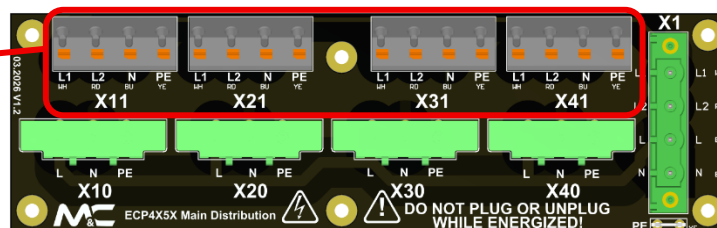


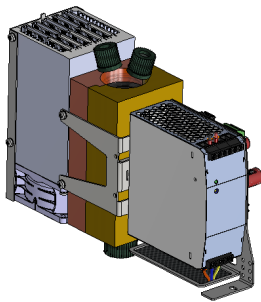
Figure 39: PCB to connect peristaltic pumps

Corresponding to the peristaltic pumps, the cooling modules are connected to the terminals X10, X20, X30 and X40.

22 Retrofitting a Cooling Module

Cooling modules can be retrofitted to the device by the customer. Each cooling module consists of a cooling fin block, a cooling block with heat exchanger and electronics. The cooling modules of the ECP4X and ECP5X are shown in the following illustration.

Cooling module for ECP4X



Cooling module for ECP5X

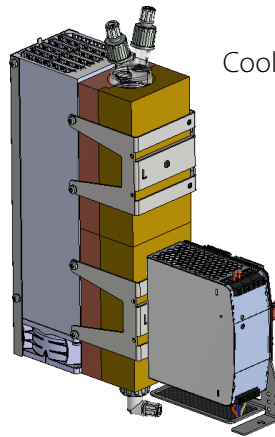


Figure 40: Cooling modules for both gas cooler sizes



Note

Glass heat exchangers are supplied separately due to the risk of glass breakage. Information on installation can be found in the chapters 20.3 and 20.4.

You will need the following tools to install a cooling unit:

- Tool for breaking out the pre-punched opening for the heat exchanger.
- Slotted screwdriver (size 0.4 x 2.5 mm) to fasten the cooling unit to the base plate of the gas cooler.

Do the following:

1. Disconnect the gas cooler from the mains supply.
2. Open the housing of the gas cooler. The front and cover plate of the gas cooler are secured with captive screws. The captive screws can be loosened without tools.
3. Use a suitable tool to break out the pre-punched opening for the heat exchanger. Remove the released housing parts from the gas cooler and dispose of them.
4. Insert the new cooling module into the gas cooler. The cooling unit is held in place by the Phillips head screw and the nose on the cooling fin block.

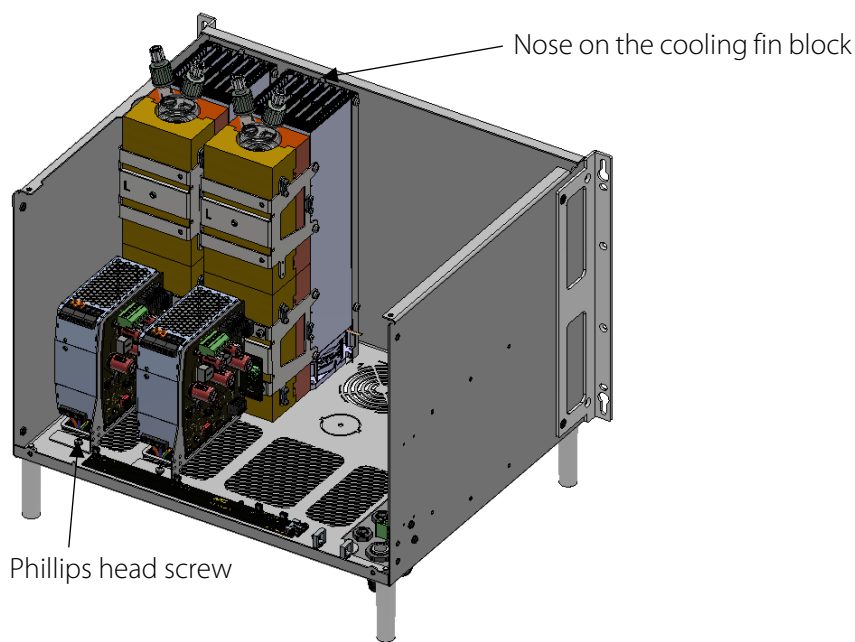


Figure 41: Installation of a cooling module into the ECP5X

5. Screw the cooling module to the base plate using the Phillips head screw.
6. Glass heat exchanger: for information on using the glass heat exchanger, see chapters 20.3 and 20.4.
7. Hose connections: for information on tubing, see chapter 15.
8. Electrical connections: for information on mains and signal connections, see chapter 16.
9. Close the gas cooler housing by fitting the front and cover plate and hand-tightening the captive screws.
10. Connect the device to the mains supply.
11. Commissioning: for information on commissioning the new cooling module, see chapter 18.

22.1 Power Connection for the Cooling Modules

The power cord is attached to the cooling module. The plug of the power cord needs to be connected to the power distribution board and secured with the screws which are inside the plug. The power distribution board is located on the inside of the housing front. Cooling modules and peristaltic pumps need to be connected to this board. The terminals X10, X20, X30 and X40 are for connecting the cooling modules.

Terminals	Pin	Function
X10 to X40	L	110-240 V
	N	Neutral conductor
	PE	Protective conductor

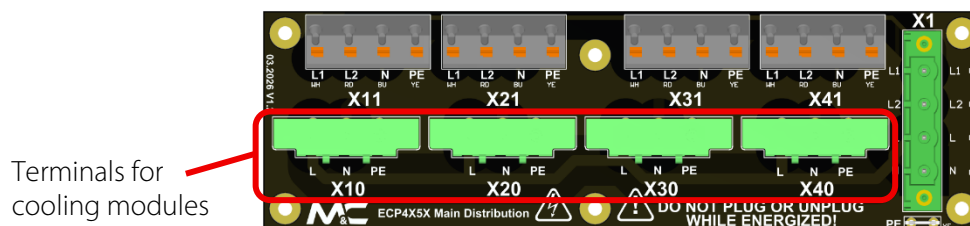


Figure 42: Power distribution board to connect cooling modules

22.2 Signal Connection for the Cooling Modules

The data cable of the cooling module is included in the scope of delivery and is supplied separately. The data cable has two identical plugs, which need to be connected to the cooling module and to the distribution board on the base plate of the housing.

The plug type used has a flap that snaps into place automatically when inserted into the socket. To remove the plug, press the flap while pulling the plug out of the socket.

There are four sockets on the distribution board. Each socket is assigned to one cooling module: the plug from cooling module X belongs to socket X.

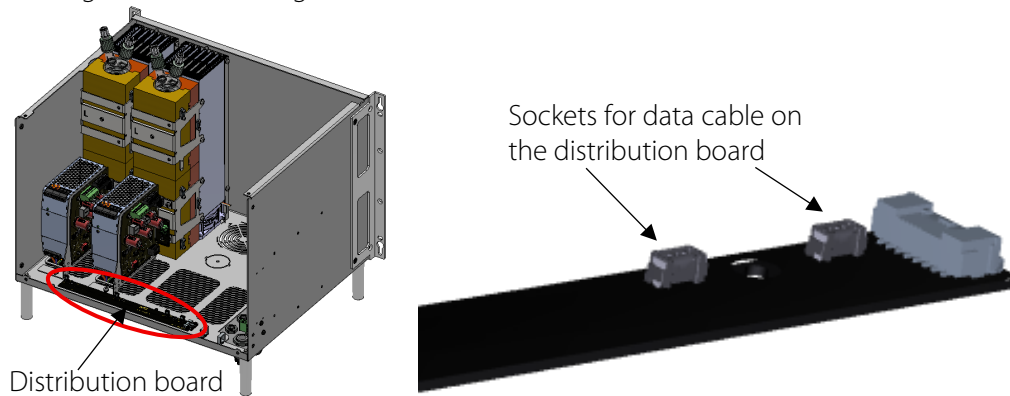
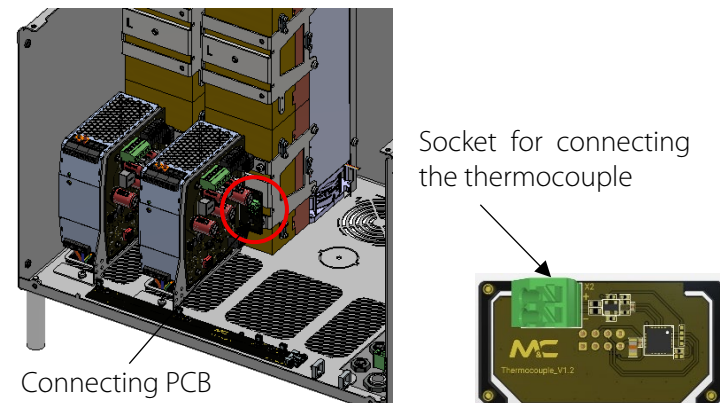


Figure 43: Distribution board to connect cooling modules

22.3 Connecting the Thermocouple to the Cooling Module

The thermocouple connection is located on a circuit board on the cooling module.



23 Troubleshooting

The ECP4X and ECP5X have several monitoring functions. If a value exceeds or falls below an alarm limit, or if an error occurs during operation, the corresponding messages are displayed on the screen via the bell counter in the header.

23.1 Display and Start-Up

Event	Possible Cause	Solution
"Loading..." screen freezes	No cooling module is responding (cabling, power supply)	Check the connections and power supply for the modules
Display too dark/ too bright	Brightness is misadjusted	Go to Device Settings → Adjust screen brightness
Touch response is not accurate	Touchscreen is out of calibration	Calibrate the touchscreen

23.2 Modules

Event	Possible Cause	Solution
"Cooling module missing" on the start screen	The module is marked as expected but is offline	Check the connection; or remove the module (see chapter 11.2.4)
Thermocouple shows 	Thermocouple is missing or defective	Check/connect the thermocouple; or reset the expectation in the module settings (remove TC)
Module does not reach the setpoint	Performance limit too low or setpoint outside the range	Load too high, cooling performance has deteriorated, module no longer has sufficient capacity; contact service
Red temperature alarm	Measured temperature outside the alarm limits	Actual temperature is above or below the alarm threshold. Resolution: "Temperature alarm OK."
Yellow temperature warning	Minor deviation (early warning)	Actual temperature is above or below the warning threshold. Resolution: "Temperature warning OK."
Shortly after powering on, a cooling module displays a temperature alarm or warning, but the bell counter is not counting	Normal cool-down period after startup (approx. 5 min). When cooling down from ambient temperature to the setpoint temperature, the temperature will inevitably still be outside the limits.	No error—wait until the cooling module reaches the target range. If the message persists after about 5 minutes, the bell counter will then start counting it; see chapter 18.1

23.3 Signal Distribution

Event	Possible Cause	Solution
A relay is not switching as expected	Incorrect assignment of cooling module to relay	Check the relay settings and, if necessary, review the event list

Event	Possible Cause	Solution
Internal peristaltic pumps are not running	The device is not calibrated to the mains voltage, or the mains voltage is outside the permitted range	Check the event list: "...not detected" → The device must be calibrated to the current mains voltage; "...outside the specified range" → Do not recalibrate; see chapter 16.2.
The "Calibrate Mains Voltage" window keeps appearing	The device has not been calibrated for the mains voltage	Calibrate the device using the actual mains voltage (nominal voltage of the connection); if the problem persists, the window will offer the option to "Deactivate" (internal pumps off, external pumps still usable) → Contact M&C Service
Analog output: "Module missing"	Analog output module is not present or cannot be detected	Check the connection of the analog output module
Liquid alarm triggers incorrectly or does not trigger	Sensor not calibrated or threshold is unsuitable	Perform calibration; adjust the trigger threshold (30–70 %)
All relays are de-energized, even though there is no module alarm	Mains voltage detection has detected an error (the device has not yet been calibrated to the mains voltage, or the mains voltage is outside the specified range)	If the "Calibrate Mains Voltage" window appears, follow the calibration instructions. Check the mains voltage; select "Deactivate" (internal pumps off, external pumps still usable); replace the internal peristaltic pumps with external ones if necessary.

23.4 Operation and Access

Event	Possible Cause	Solution
Desired setting is not visible	Access level is too low	Enable the appropriate access level
PIN is not accepted	Incorrect PIN	Expert = 1234

24 Return of Products

If you send your device to M&C Customer Service for repair, a fully completed Return Service Document is required. You can find the Return Service Document on our website www.mc-techgroup.com under Service & Support → Return of Products.

Among other things, you will enter here information about the pumped medium, especially about aggressive pumped media.



Note

Products whose conveyed media are classified as hazardous to health **must not** be sent in for repair without prior consultation with our technical service department.

25 Proper Disposal of the Device



Caution

Heavy device!

Risk of injury when handling heavy equipment.

Do not lift, move or carry the device without help. A second person is required to lift, move or carry the device.

At the end of the life cycle 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, please follow the rules and regulations of your country regarding recycling and waste management.

26 Spare Parts and Options List

The replacement intervals for consumables (C), recommended spare parts (R) and spare parts (S) depend on your operating conditions and the specific operating status of the device.

The following table contains recommendations on the stocking of wearing parts (parts with an expected service life) and recommended spare parts (to ensure high availability of the device).

The quantities stated for these parts in years of operation are based on experience.

For spare parts/options (S/O) and options (O), no recommended quantities can be specified for years of operation.

Part No	Denomination	C/R/S/O	Recommended number of units for operation in years		
			1	2	3
01K4150	ECP4X cooling module, 150 NI/h, without heat exchanger, for ECP4X base unit with integrated power supply and a gas outlet dew point adjustable from +2 to +45 °C (factory default: +5 °C), max. cooling capacity 160 kJ/h	S/O	-	-	-
01K4250	ECP5X cooling module, 250 NI/h, without heat exchanger, for ECP5X base unit with integrated power supply, independently adjustable pre-cooling zone and adjustable gas outlet dew point from +2 to +45 °C (factory default: +5 °C), max. cooling capacity 450 kJ/h	S/O	-	-	-
01K4300	1 x mA output respectively 1 x V output module (per cooling module)	O	-	-	-
	1 x thermocouple inclusive thermocouple module and installation (per cooling module)	O	-	-	-
01K9260	Type LA1S: LA sensor with cable break detection Note: the evaluation is performed inside the Peltier gas cooler by default, LA1S for M&C universal filter with "D" connection	O	-	-	-
01K9270	Type LA1: LA sensor without cable break detection Note: the evaluation is performed inside the Peltier gas cooler by default, LA1 for M&C universal filter with "D" connection	O	-	-	-
97K0100	Jet stream heat exchanger, type ECM-2G, ECP1000C, ECP2000C/PSS5C/PSS5C2, material: Duran® glass, connections: sample gas GL 18-6/6 mm, condensate GL 25-12 mm	R	1	1	1

Part No	Denomination	C/R/S/O	Recommended number of units for operation in years		
			1	2	3
97K0115	Jet stream heat exchanger, type ECM-2, ECP1000C, ECP2000C, material: stainless steel 1.4571, connections: sample gas 6 mm, condensate G 3/8" i	R	1	1	1
97K0110	Jet stream heat exchanger type ECM-2PV, ECP1000C, ECP2000C Material: PVDF, connections: Sample gas 6 mm, condensate G 3/8" i	R	1	1	1
93K0101	Jet stream heat exchanger, type ECM-2, ECP1000C, ECP2000C G/GL14 Material: Duran® glass, connections: sample gas GL 18-6/6 mm and GL 14, condensate GL 25-12 mm	R	1	1	1
97K0115N	Jet stream heat exchanger, type ECM-2, ECP1000C, ECP2000C SS/NPT, material: stainless steel 1.4571, connections: sample gas pipe 1/4" AD, condensate 3/8" i NP	R	1	1	1
02K9100	Jet-Stream heat exchanger type EC-G, material: Duran® glass, connections: Sample gas: 2 x GL 18-6 mm, condensate: 1 x GL 25-12 mm	R	1	1	1
02K9200	Jet-Stream heat exchanger type EC-SS, material: stainless steel 1.4571, connections: Sample gas: 2 x G 1/4" i, condensate: 1 x G 3/8" i	R	1	1	1
02K9300	Jet-Stream heat exchanger type EC-PV, material: PVDF, connections: Sample gas: 2 x G 1/4" i, condensate: 1 x G 3/8" i	R	1	1	1
02K9102	Jet-stream heat exchanger type EC-G/GL14, material: Duran® glass, connections: sample gas: 2 x GL18-6 mm, condensate: 1 x GL 25-12 mm with additional connection GL14 for temperature sensor	R	1	1	1
02K9250	Jet-stream heat exchanger type EC-SS/NPT, material: SS 316Ti, connections: sample gas: 2 x 1/4" NPT, condensate: 1 x 3/8" NPT	R	1	1	1
90K0115	Heat-conducting paste for HE (50 g)	C	1	1	1
01P9125	Option: peristaltic pump type SR25.2, installed in the front of the cooler ECM, peristaltic pump head accessible from outside, completely tubed and electrically wired, material: PV, Novoprene, condensate outlet: DN 4/6	O	-	-	-
90P1020	SR25.2: Roller carrier, complete	R	-	1	2
90P1050	Conveying belt for peristaltic pump SR25	R	-	1	2
90P1007	SR25 pump hose with PVDF hose connection fitting DN 4/6 mm	C	2	4	8

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

27 Risk Assessment

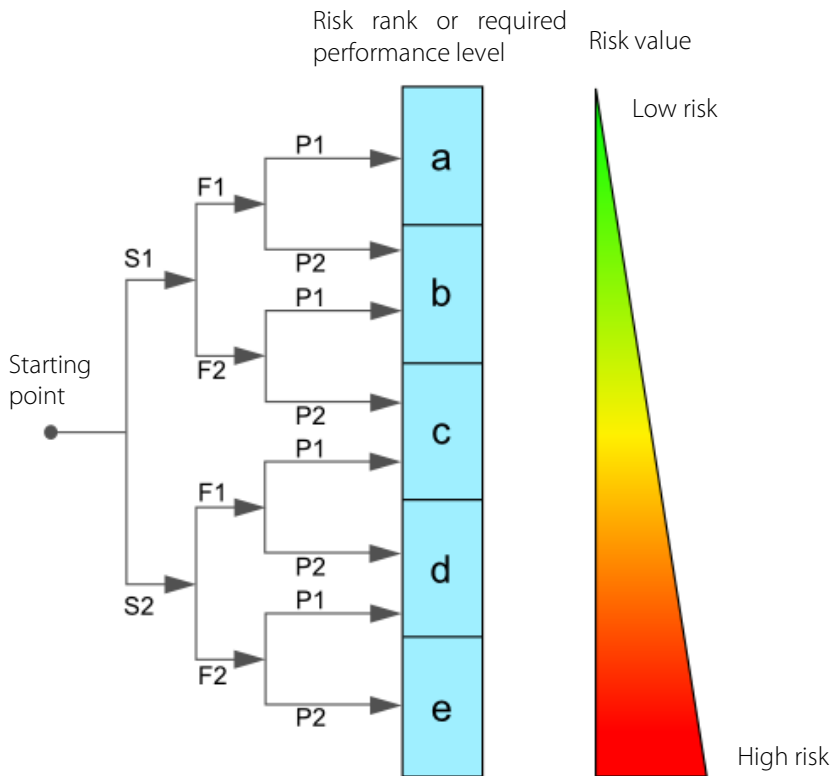
The risk assessment provided in this chapter is intended for all work activities on the product. The hazards can occur in the work steps of assembly, commissioning, maintenance, disassembly and in the event of a product fault. During normal operation, the product is protected by a system cabinet or appropriate 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 44: 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 $> 60^{\circ}\text{C}$.

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



Caution electric shock

Risk rank group C

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

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



Gas hazard

Risk rank group A-B-C

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

If toxic gases, biologically hazardous 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 suitability of the heat exchanger material and the rigid tube or flexible tubing connection fittings must be checked with regard to the gas to be extracted and its specifications.

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.

In the case of biologically hazardous gases, the user must attach the following "Biological hazard" warning label to the device near the heat exchangers.



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 [$\approx$ 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.

28 Appendix



Further product documentation can be found in the Internet catalog at:
www.mc-techgroup.com can be viewed and downloaded.

Instruction manual peristaltic pump **SR 25.2**

Data sheet for condensate collection vessels **TG, TK**

Data sheet for GL connection adapter

Data sheet for float arrester **AD-SS**

Data sheet for float arrester **AD-P**

28.1 Calculations for the mA Output

The mA output value always corresponds to the current gas cooler temperature.



Note

The calculations do not apply to the thermocouple option.
See chapter 16.3.4 "Connection of the Informative Temperature Measurement in the HE (TC, Optionally)".

28.1.1 Calculation of the mA Value from the Temperature

The value of the mA output signal can be calculated from the displayed gas cooler temperature become. The following equations are available for calculation:

$$I_{measured}[mA] = \left(\frac{(T_{Display}[^{\circ}C] + 10) * 4}{15} \right) + 4 \quad \text{In the event that 4 - 20 mA is set}$$

$$I_{measured}[mA] = \left(\frac{T_{Display}[^{\circ}C] + 10}{3} \right) \quad \text{In the event that 0 - 20 mA is set}$$

28.1.2 Calculation of the Temperature from the mA Value

The gas cooler temperature can be calculated from the measured mA output signal.
The following equations are available for calculation:

$$T[^{\circ}C] = \left(\frac{(I_{measured}[mA] - 4) * 15}{4} \right) - 10 \quad \text{In the event that 4 - 20 mA is set}$$

$$T[^{\circ}C] = I_{measured}[mA] * 3 - 10 \quad \text{In the event that 0 - 20 mA is set}$$

28.1.3 Step Size and Resolution of the mA Output

The mA outputs have a resolution of 0.1 °C.

- 4 - 20 mA: 0.1 °C corresponds to 0.027 mA
- 0 - 20 mA: 0.1 °C corresponds to 0.033 mA

28.2 PIN Assignment

Pin	Function
X1.1	L Power IN
X1.2	N Power IN

Pin	Function
X2.1	Relay 1 COM
X2.2	Relay 1 NO
X2.3	Relay 2 COM
X2.4	Relay 2 NO
X2.5	Relay 3 COM
X2.6	Relay 3 NO
X2.7	Relay 4 COM
X2.8	Relay 4 NO

Pin	Function
X3.1	Relay 0 COM
X3.2	Relay 0 NO

Pin	Function
X4.1	Liquid Alarm 1 A
X4.2	Liquid Alarm 1 B
X4.3	Liquid Alarm 2 A
X4.4	Liquid Alarm 2 B
X4.5	Liquid Alarm 3 A
X4.6	Liquid Alarm 3 B
X4.7	Liquid Alarm 4 A
X4.8	Liquid Alarm 4 B

Pin	Function
X5.1	X13A.2 AnalogOut1+ / Thermocouple1 EL+
X5.2	X13A.1 AnalogOut1- / Thermocouple1 EL-
X5.3	X13B.2 AnalogOut2+ / Thermocouple2 EL+
X5.4	X13B.1 AnalogOut2- / Thermocouple2 EL-
X5.5	X13C.2 AnalogOut3+ / Thermocouple3 EL+
X5.6	X13C.1 AnalogOut3- / Thermocouple3 EL-
X5.7	X13D.2 AnalogOut4+ / Thermocouple4 EL+
X5.8	X13D.1 AnalogOut4- / Thermocouple4 EL-

Pin	Function
X6.1	X12.1 COM P
X6.2	X12.2 COM N