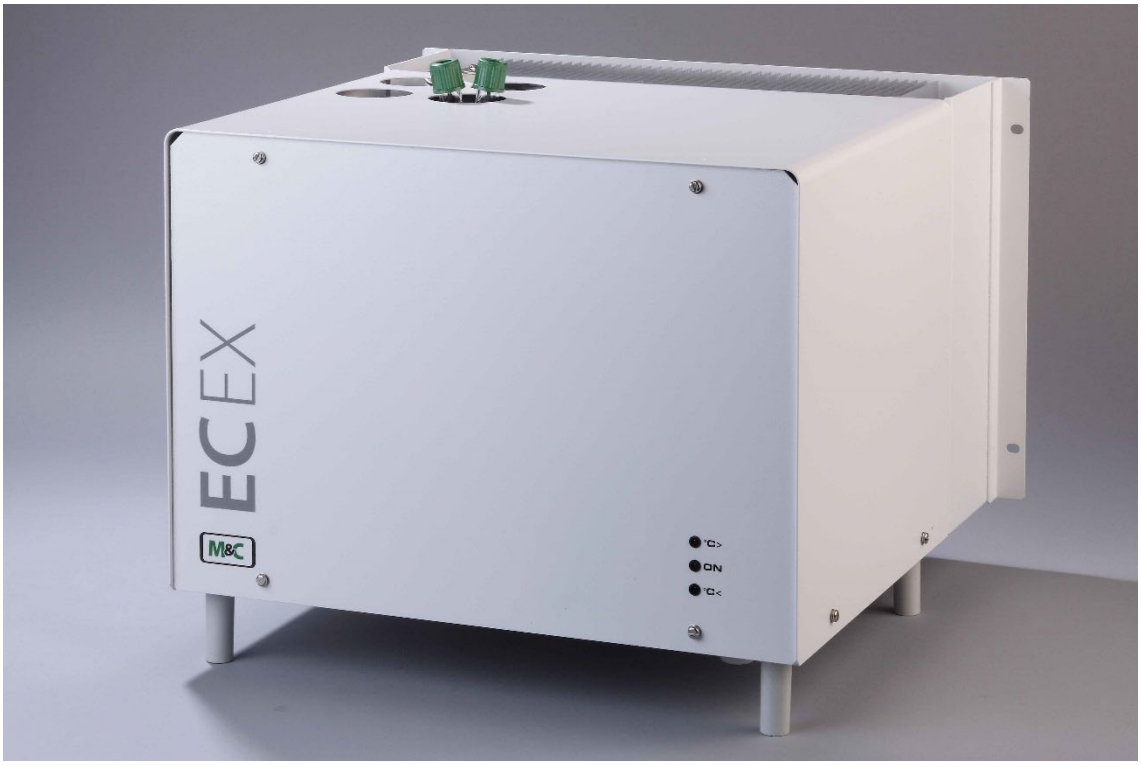
Embracing Challenge

Electric Gas Cooler Series EC®

EC-EX
(starting from serial no.1904XXXX)

Instruction Manual
Version 1.03.01



Dear customer,

Thank you for buying our product. In this instruction manual you will find all necessary information about this M&C product. The information in the instruction 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 manual.

For additional information about our products and our company, please go to M&C's website www.mc-techgroup.com. There you will find the data sheets and manuals of all our products in German and English.

Version: 1.03.01

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Head Office

M&C Tech**Group** Germany GmbH ◆ Rehhecke 79 ◆ 40885 Ratingen ◆ Germany
Telephone: 02102 / 935 - 0
E - mail: info@mc-techgroup.com
www.mc-techgroup.com

1 General information

The product described in this 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 manual need to be followed. This manual includes all information regarding proper transportation, storage, installation, operation and maintenance of this product by qualified personnel.
Follow all instructions and warnings closely.
Read this manual carefully before commissioning and operating the device. If you have any questions regarding the product or the application, please don't hesitate to contact M&C or your M&C authorized distributor.

2 Declaration of conformity

CE - Certification

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

ATEX-Directive

The product described in this manual is produced in accordance with the EU directive for devices and protection systems for appropriate use in hazardous areas 2014/34/EU appendix II.

RoHS Directive

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

EMC-Instruction

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

Low Voltage Directive

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

Declaration of conformity

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

3 Electrical standards

The electrical equipment standard complies with the safety requirements of the following standards and norms:

EN 60079-0:2012 + A11:2013	IEC 60079-0:2011, Ed. 6
EN 60079-1:2014	IEC 60079-1: 2014, Ed. 7
EN 60079-2:2014	IEC 60079-2: 2014, Ed. 6
EN 60079-5:2015	IEC 60079-5: 2015 Ed. 4
EN 60079-7:2015	IEC 60079-7: 2015 Ed. 5
EN 60079-11:2012	IEC 60079-11:2011, Ed. 6

for use of the device in potentially explosive atmospheres of equipment **Group II Category 2G**.

4 Safety instructions

Note the following basic safety procedures when using this equipment:

- Read these operating instructions carefully before start-up and use of the equipment! The information and warnings given in these operating instructions must be heeded.
- Attention must be paid to the requirements of the certificate of conformity (see appendix): 17 ATEX E 080.
- Work on electrical equipment may only be carried out by qualified personnel in accordance with the currently valid regulations.
- Attention must be paid to the requirements of **VDE 0100** when setting high-power electrical units with nominal voltages of up to 1000 V, together with the associated standards and stipulations.
- For use in hazardous area observe the relevant national and international instructions and regulations.
- Check the details on the type plate to ensure that the equipment is connected up to the correct mains voltage.
- Protection against touching dangerously high electrical voltages. Before opening the equipment, it must be switched and hold no voltages. This also applies to any external control circuits that are connected.
- Use the device only in permitted temperature and pressure ranges.
- Opening the enclosure is only permitted in an Ex-free environment.
- Ensure that the device is installed in a weatherproof location. It should not be subjected to either direct sun, rain or moisture.
- Installation, maintenance, inspection and any repairs must only be carried out by authorised and qualified personnel in compliance with the relevant regulations.

4.1 Intended Use

The EC-EX gas cooler is intended for use in hazardous environments. It may only be operated in compliance with the information in chapter "5 Information and safety instructions for using the cooler in hazardous areas" and "10 Technical data". Only use the device within the permitted temperature and pressure ranges.
Do not use this product for any other purpose. Improper use and handling can create hazards and cause damage. For more information, please refer to the safety information in this instruction manual.

5 Information and safety instructions for using the cooler in hazardous areas

The compressor cooler **EC-EX** is suitable for use in explosive atmospheres of category 2G.
The explosion proof protection is:

230 V / 115 V: Ⓔx II 2G Ex pxb eb db q [ib] IIC T4 Gb (registration number: 17 ATEX E 080)

The cooler is certified by Dekra Exam GmbH. Detailed information and a copy of the Ex certificate are attached to the appendix of this instruction manual.

Installation and operation of the cooler must be carried out in accordance to the conditions and installation instructions specified in the Ex certificate (see appendix). Reliable operation of the cooler in hazardous areas can only be ensured by following the conditions and installation instructions specified in the Ex certificate.

Any change in the standard configuration with unspecified or not M&C approved parts, as well as repair and service with unspecified parts will result in the loss of Ex certification.

In case of doubt, please contact **M&C** or your **M&C** distributor directly.

6 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.

Return deliveries must be made in appropriate and proper protective packaging. Please do not send glass heat exchanger with the unit.

7 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, commissioning, maintenance and operation of these types of products. The following knowledge is at least required for the work:

- Instructed person in EX-protection
- Trained person in the electrotechnical field
- Detailed knowledge of the manual and the applicable safety regulations

'Ex' indicates important information about the product or about the corresponding parts in the instruction manual, relating to usage in potentially explosive atmospheres.

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.

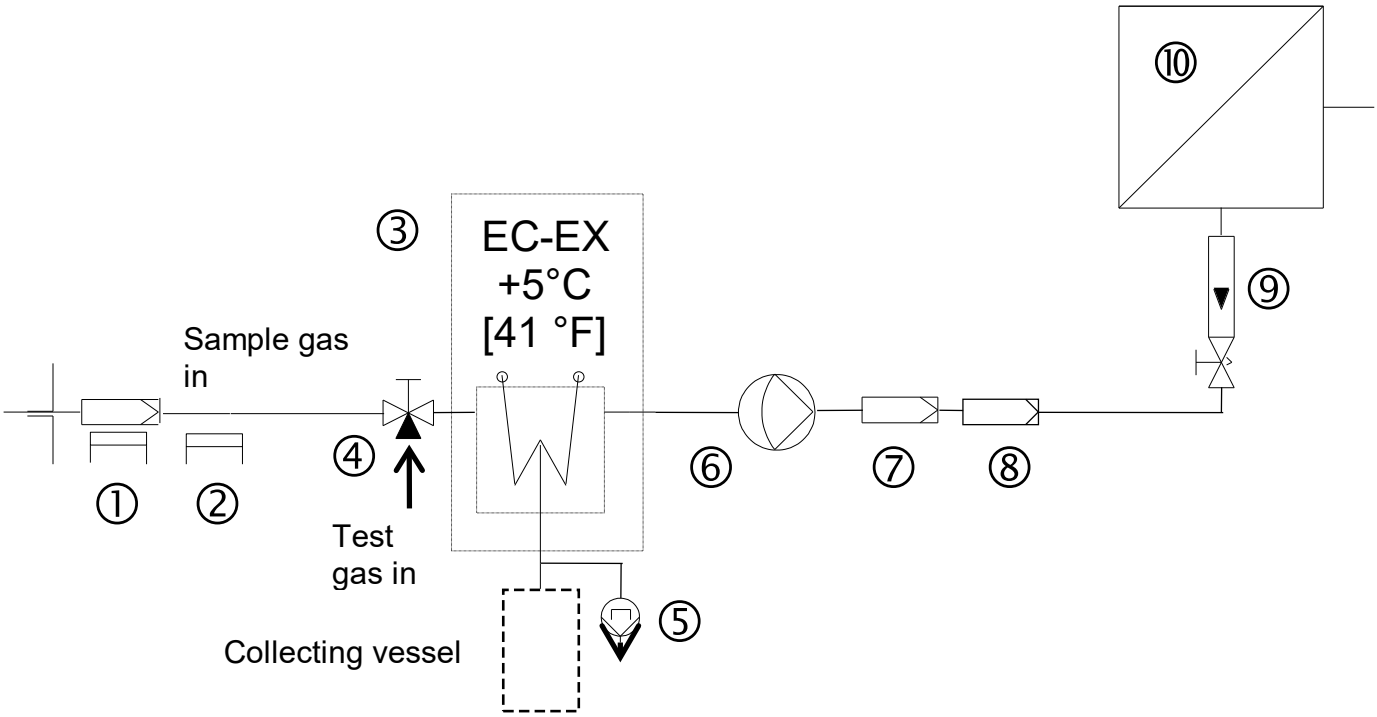
8 Introduction

The **M&C EC-EX** cooler is used whenever an interfering moisture load in the sample gas is expected, and the area of use is declared as potentially explosive.

Lowering the temperature to a very low and stable dew point prevents condensation in the analyzer.

9 Application

Figure 1 shows a typical application example for the use of the **EC-EX** gas cooler unit.



① Filter sample probe **SP2000-H/Ex**
② Heated sample line **Ex-version**
③ **EC-EX** cooler
④ 3-way ball valve
⑤ Peristaltic pump **SR25.1/Ex**
⑥ Sample gas pump **MPF-05/Ex**
⑦ U-fine filter **FP...**
⑧ Aerosol filter **CLF**
⑨ Flow meter **FM 10**
⑩ Analyzer **PMA50 Ex**

Figure 1: Application example EC-EX

The sample gas is fed to the **EC-EX** cooler ③ via a gas sampling probe ①. In the cooler the sample gas is cooled down to a dew point of +5 °C [41 °F]. Solid particles are separated with a downstream ultra-fine filter ⑦. To increase the operational reliability of the entire system, we recommend equipping the ultra-fine filter ⑦ with a liquid alarm sensor (e. g. **LA1** with evaluation electronics **ER 142 Exi**). If necessary, an aerosol filter ⑧ can be installed upstream of the flow meter ⑨. The conditioned gas can then be fed to the analyzer ⑩.

10 Technical data

Sample outlet dew point	Range of adjustment: +2 °C to +7 °C [35.6 °F to 44.6 °F], factory setting: +5 °C [41 °F]
Dew point stability	At constant conditions ±0.25 °C [±0.45 °F]
When mounting the cooler in an Ex zone with temperature class T3	
Sample inlet temperature	**Max. +180 °C [356 °F]
When mounting the cooler in an Ex zone with temperature class T4	
Sample inlet temperature	**Max. +120 °C [248 °F]
Sample inlet dew point	**Max. +80 °C [176 °F]
Gas flow rate per heat exchanger	**Max. 250 l/h
Number of heat exchangers	1*, installation of max. 4 heat exchangers possible
Material of heat exchangers	Borosilicate glass or PVDF or stainless steel 316Ti
Ambient temperature	**+0 to +45 °C [32 °F to 113 °F]
Gas pressure	With glass and PVDF: max. 3 bar With stainless steel: 10 bar*
Total cooling power	Max. 520 kJ/h at +25 °C [77 °F]
Dead volume per heat exchanger	70 ml
ΔP/heat exchanger at 300 l/h	1 mbar
Gas connection Borosilicate glass: PVDF: rostfr. Stahl :	 For tube ∅ 6 mm*****, option: 8 mm, 10 mm or tube connection screw fitting G 1/4" i, option: tube connection screw fitting G 1/4" i*****, option: NPT or tube connection screw fitting
Condensate connection borosilicate glass: PVDF: stainless steel:	 For tube ∅ 12 mm*, option: 8 mm, 10 mm or tube connection screw fitting G 3/8"i, option: tube connection screw fitting G 3/8"i*, option: NPT or tube connection screw fitting
Ready for operation	< 30 min
Power consumption	280 VA, start up current at 230 V = 8.1 A; at 115 V= 17 A
Mains power supply	230 V 50-60 Hz ±10 %***** or 115 V 50-60 Hz ±10 %
Electrical connections	Terminal 2.5 mm^2
Status alarm	1 changeover contact, max. 230 V 2 A AC/DC 100 VA, 50 W
ATEX marking/certificate number	**II 2G** Ex pxb eb db q [ib] IIC T4 Gb Certificate No: BVS 17 ATEX E 080
Enclosure colour	RAL 9003
Method of mounting	19" rack or panel mounting
Enclosure dimensions, weight	84 TE x 7 HE x 450 mm [17.72"], 40 kg [88.18 lbs]
Refrigerant	R134A
Type of housing protection	IP20; EN 60529

* standard

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

10.1 Dimensions

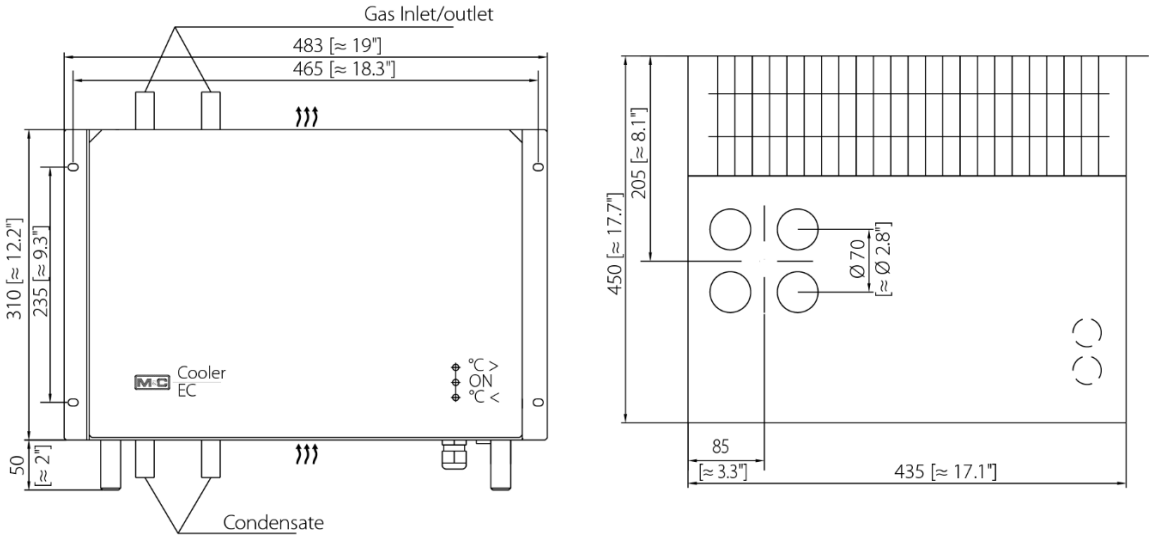


Figure 2: Dimensions and air flow

11 Description

Figure 3 shows the design of the **EC-EX** cooler unit .

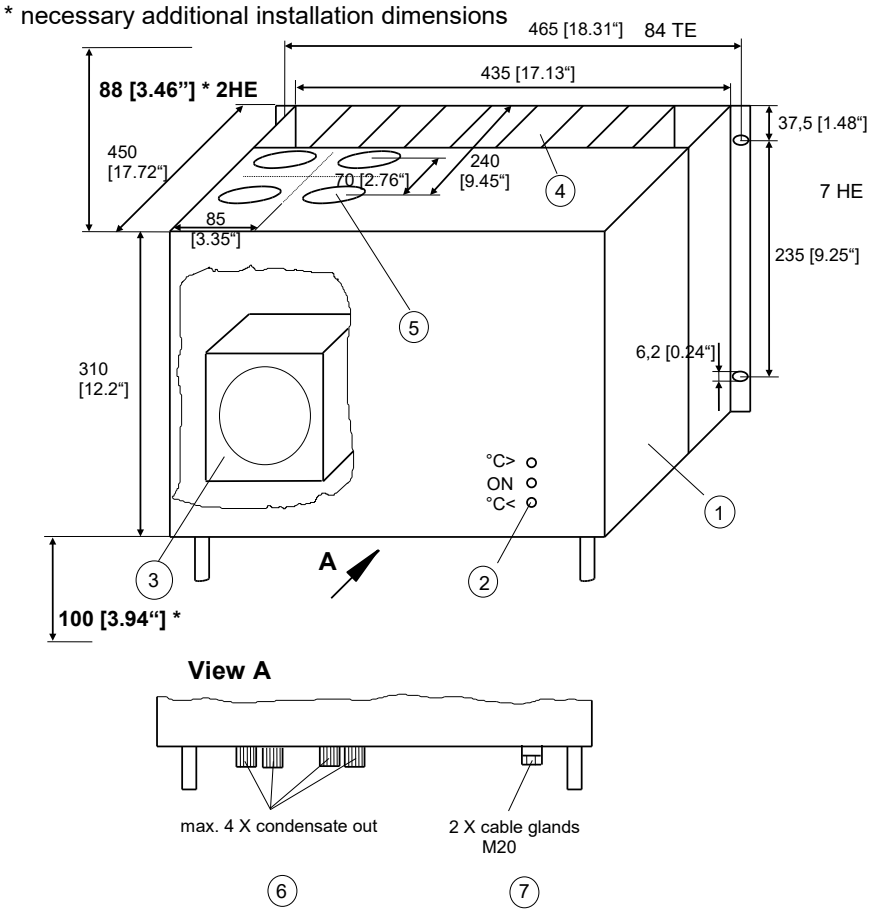


Figure 3: EC-EX design
The **EC-EX** ① is equally suitable for wall installation and 19“ rack mounting.

The type of mounting determines the position of the LED status display ②. While for wall installation the LED status display ② can be fitted into the corresponding cut-outs in the **EC-EX** front panel, for 19" rack mounting this is done using the cut-outs in the back panel of the enclosure. The LED status display will be positioned at the factory according to the type of installation stated in the order. Retrofitting can be easily carried out by the customer. The mounting position of the LED status display ② is marked accordingly.

The enclosure of the **EC-EX** cooler is 450 mm [17.72"] deep. Additional installations inside the cooler enclosure are not possible.

The electrical parts of the **EC-EX** cooler are explosion protected. The electronic control and alarm unit including the compressor-motor-protective circuit-breaker ③ are pressure-proof encapsulated, **Ex-d**.

The cooling compressor is equipped with a special electrical connection. On the compressor capsule a temperature monitor with manual reset function button has been installed for monitoring purposes
and on the suction side of the compressor, two pressure switches are installed in the coolant circuit. These monitors are integrated into the **Ex-i** control circuit. They interrupt the power supply to the compressor in the event of the following malfunctions:

- the surface temperature of the compressor capsule is too high,
- there are leaks,
- the pressure in the refrigeration circuit is too low.

The **EC-EX** cooler in the 230 V version has two **Ex-q** compressors start capacitors. The **EC-EX** cooler in the 115 V version is equipped with three **Ex-q** compressors start capacitors.
The electrical connections provided by the customer for power ON and status alarm OFF are located in an **Ex-e** terminal box.

On top of the cooler enclosure are the cut-outs ⑤ for a maximum of four Jet-Stream heat exchangers. The sample gas inlet and outlet connections are on the top of the heat exchangers.

The condenser ④ for dissipation of compressor waste heat is at the rear of the enclosure.

The following standard connections are on the bottom of the enclosure (View A, Figure 3):

⑥ standard heat exchanger condensate outlets;
⑦ cable glands M20.

Condensate disposal is carried out externally in “overpressure operation” with automatic liquid drainer e. g. type **AD-...,** and for “negative pressure operation” (pump behind cooler) with peristaltic pumps type **SR25.1/Ex** or by using collecting vessels.

12 Function

The M&C gas cooler **EC-EX** has been specially developed for the analysis technology. The **EC-EX** operates according to the compressor cooling principle, and is equipped with a status alarm for safe continuous operation.

Up to 4 Jet-stream heat exchangers made of borosilicate glass, PVDF or stainless steel are located in a heat-insulated cooling block. All heat exchangers are easily accessible and easily interchangeable.

Figure 4 shows a schematic diagram of the heat exchanger function.

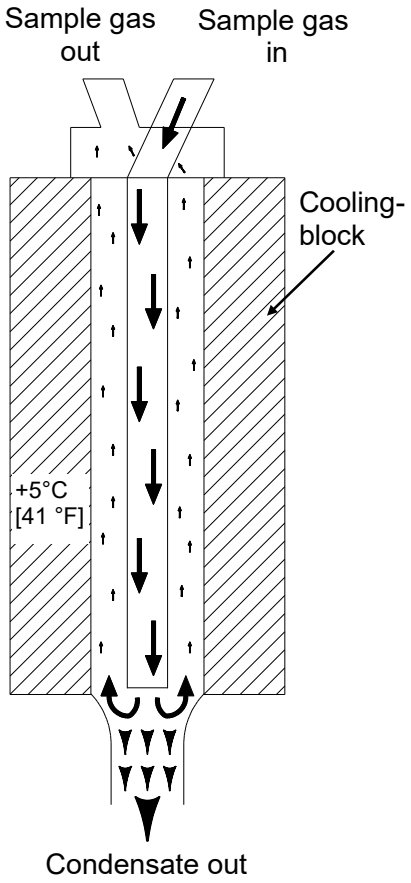


Figure 4: Schematic diagram of the heat exchanger function

The compressor cooler system keeps the heat-insulated cooling block at a constant temperature of +5 °C [41 °F].

The innovative design of the Jet-Stream heat exchangers ensures excellent condensate pre-separation and optimum drying of the sample gas.

Alarm warnings for over- and under-temperature are given as a collective status alarm via a relay output with a potential-free switch-over contact to the outside. An alarm will be released, when the current temperature is ±3 °C [±5.4 °F] higher or lower than the EC set-temperature of +5 °C [41 °F]).

13 Reception and storage

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

- Remove the cooler and any special accessories immediately after arrival carefully from the shipping packaging, and check the scope of delivery according to the delivery note;
- Check the goods for possible transport damage and, if necessary, inform your transport insurance company immediately about any damage!

Note

The cooler must be stored in a weatherproof frost-free area!

Note

During transport and storage, the cooler should always be positioned with the transport feet facing down so that the oil in the closed compressor circuit cannot flow out of the compressor capsule (vertical position). If the cooler was accidentally transported in a horizontal position, for example, it must be in the operating position for approx. 24 hours before switching it on!

14 Installation instructions

The **EC-EX** cooler is equally suitable for wall mounting and for installation in a 19" rack.

The compressor cooler EC-Ex is suitable for use in hazardous areas of Group II Category 2G. Attention must be paid to the certificate of conformity (see appendix).

Note

Please state the mounting type on your order. The LED status display will be positioned according to the specifications on your order.

Note

The operating position for this cooler is exclusively vertical. This is the only way to ensure proper separation and removal of condensate in the heat exchangers.
During transport and installation, the cooler must always be positioned with the transport feet facing down, so that the oil in the closed compressor circuit cannot run out of the compressor case.
The cooler should be installed away from heat sources and freely ventilated, so that no disturbing heat accumulation occurs.
Minimum installation dimensions (Figure 3) must be strictly observed. When installed outdoors, the cooler must be installed in a protective housing, frost-free in winter and sufficiently ventilated in summer. Avoid direct sunlight.
Unheated gas sampling lines must be installed with a slope down to the cooler. In this case, condensate pre-separation is not necessary. Connect heated lines with sufficient thermal decoupling to the cooling unit!

15 Pneumatic Connections

The connection for the gas inlet and outlet are at the top of the heat exchanger. Please refer to the technical data (chapter 10) for additional connection options.
M&C can optionally supply corresponding tube connection screw fittings.

Note

Do not mix up the tube connections for sample gas inlet and outlet; connections are marked by arrows on the heat exchangers.
After connecting all lines, check the tightness of the connections.
To ensure free removal of the condensate, do not reduce the specified discharge cross sections.

Follow these instructions to ensure the necessary tightness of the connections:

Borosilicate glass heat exchanger with GL connections

- Before mounting the GL union nuts, check if 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" i or G 3/8" i

- The correspondingly dimensioned tube fitting with connecting thread must be screwed in with PTFE sealing tape.
- For a functional and trouble-free installation, only use connections acc. to EN 10226-1 with tapered R-thread in conjunction with a 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 marked by notches around the connection pieces.
- To ensure the tightness of the connections, the NPT connection threads are inserted or glued in place with sealing paste.

In the standard version, the line for condensate removal is connected directly to the connection piece on the lower part of the heat exchanger. This connection piece protrudes with the corresponding condensate connector 12 mm out of the base plate of the cooler enclosure (Figure 3). The corresponding condensate connectors are:

- Borosilicate glass: compression ring fitting (standard version)
- PVDF and stainless steel: G 3/8" i connection (standard version)

The condensate discharge is carried out by the customer depending on the operating mode:

- Automatic liquid drainer **AD-...** only for over-pressure operation;

Note

If the stainless steel heat exchanger with G 3/8" condensate connection is used, the automatic liquid drainer AD-SS can be mounted directly using a threaded adapter, part no. FF11000 (1/2" NPT to G 3/8" i). This eliminates the otherwise necessary wall mounting!

- Condensate collecting vessels with manual condensate discharge;
- External peristaltic pump **SR25.1/Ex**.

16 Electrical connections

The operator must ensure that all work on the EC-EX is carried out only by authorized and qualified personnel. Observe the plant- and process-specific regulations and the regulations which are applicable to Ex zones.
Any work must only be carried out after the EX-free measurement has been completed. Immediately after finishing the work, all safety and protective devices must be reattached or put into operation and tested.

Warning

Wrong power supply can destroy the device. When connecting the equipment, make sure that the supply voltage is identical with the information provided on the model type plate.

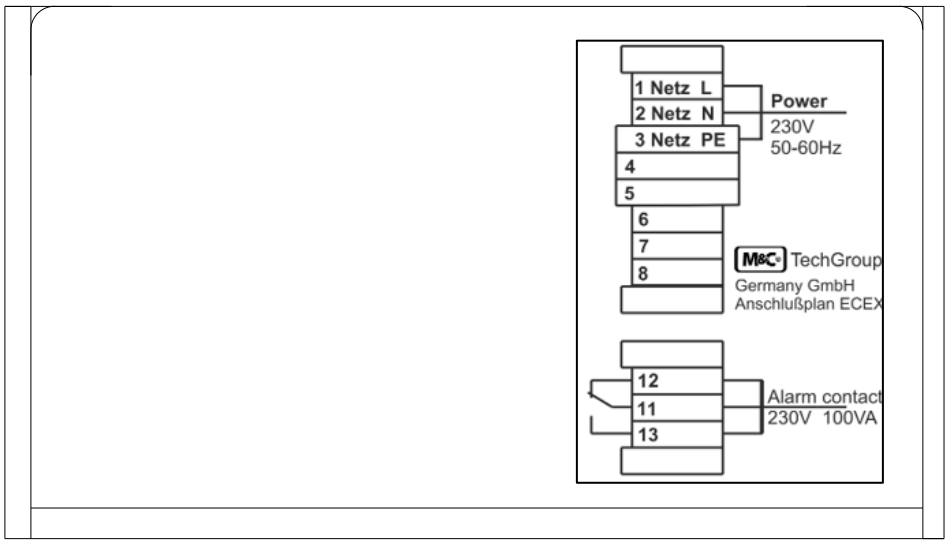
Note

When installing high voltage systems with nominal voltages up to 1000V, the requirements of VDE 0100 as well as your relevant standards and regulations must be observed!

A main switch must be provided externally.

The supply circuit of the device must be equipped with a 10 A_T fuse at 230 V and a 16 A_T fuse at 115 V (cable protection); the electrical data can be found in the technical data.

Figure 5 shows the electrical connections inside the plastic housing on the right-hand side behind the front panel of the EC-EX enclosure.



Power supply : 230 V / 50 Hz oder 115 V / 50-60 Hz (see type plate)
Status alarm : one changeover contact
Contact rating : 230 V AC, 2 A, 100 VA or
230 V DC, 2 A, 50 W

Figure 5: Electrical connections

The power supply terminals are located in the terminal box inside the cooler enclosure. The terminal box can be reached by loosening the 4 fixing screws of the cooler enclosure front panel.

Terminal	1	2	3
EC-EX Terminal box			
Connection	L	N	PE

The potential-free contact of the status collector alarm is also located in the terminal box inside the **EC-EX** cooler enclosure.

Terminal	12	11	13
EC-EX Terminal box			
Connection	NC	COM	NO

Two M20 cable glands are available to pass the cables through the base plate of the cooler enclosure.

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

Qualified personnel

The work described in this chapter can be carried out by qualified personnel. The following knowledge is at least required for the work:

- Instructed person in EX-protection
- Trained person in the electrotechnical field
- Detailed knowledge of the manual and the applicable safety regulations

The operator must ensure that all work on the EC-EX is carried out only by authorized and qualified personnel. Observe the plant- and process-specific regulations and the regulations which are applicable to Ex zones.
Any work must only be carried out after the EX-free measurement has been completed. Immediately after finishing the work, all safety and protective devices must be reattached or put into operation and tested.

The **EC-EX** control electronic allows automatic commissioning of the cooler. The error diagnostics (LED status display) guarantees reliable signalling of possible sources of errors.

The following description is valid for commissioning of the gas cooler at ambient temperatures > +8 °C.

Note

The gas cooler must be in operating position for at least two hours before commissioning. During transport or assembly, the coolant may be dispersed in the system, which can lead to malfunctions.

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

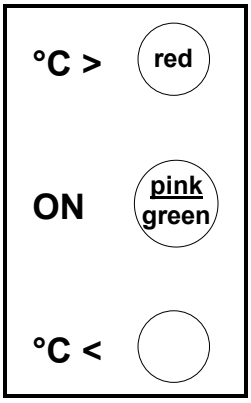
- Connect the cooler to the power supply. Make sure that the power supply voltage is 230 V or 115 V, as specified on the type plate.
- Lead the contact output of the over- and under temperature signal to the control room.

Note

The status contact output should be connected to the external sample gas pump or to a valve in the sample gas line. This protects the entire analysis system by immediately interrupting the gas supply in the event of error messages from the cooler!

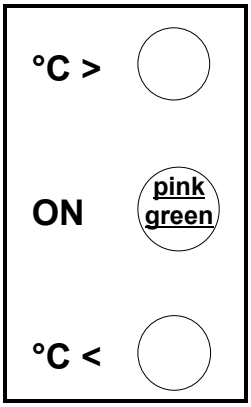
18.1 Operating sequence and LED status display

Three LED's are available to indicate the operating sequences during commissioning of the cooler. Depending on the type of installation, they are located on the front or rear panel of the cooler (Figure 3). The upper LED (red) indicates that the control temperature has been exceeded or is not reached. The dual-color (pink/green) middle LED indicates the operation of the cooling compressor. The lower LED (red) alerts the user when the temperature falls below the control temperature.



Switching the cooler on

As soon as the power supply voltage is applied, the upper red LED lights up. This indicates that the cooler temperature is above +8 °C [46.4 °F]. The cooling compressor is in operation, so the two-colour middle LED lights up pink.



Normal operation

After around 30 minutes the cooler has cooled down to a temperature below +8° C [46.4 °F]. The upper red LED goes out.

The status collective alarm contacts are deactivated and control the automatic external sample gas release, if the sample gas pump or a solenoid valve in the sample gas line is controlled via the alarm contact.

As soon as the cooler has reached the control temperature of +5 °C [41 °F], the cooling compressor is switched off. The middle LED lights green.

In a load-dependent cycle, the cooling compressor is alternately switched on and off by the **EC-EX** control electronics. The middle LED lights up alternately pink or green (normal operating function).

19 Decommisioning

Note

The site where the cooler is installed, must also remain frost-free even when the unit is switched off.

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

If the cooler is to be taken out of service for a longer period, we recommend flushing it with inert gas or air. Residual condensate should be completely removed from the cooler.

Aggressive condensate is possible.

May cause chemical burns due to aggressive media!

Wear protective gloves and protective glasses!

Wear proper protective clothing!

20 Maintenance

Qualified personnel

The inspections and maintenance work described in this chapter can be carried out by qualified personnel. The following knowledge is at least required for the work:

- Instructed person in EX-protection
- Trained person in the electrotechnical field
- Detailed knowledge of the manual and the applicable safety regulations

The operator must ensure that all work on the EC-EX is carried out only by authorized and qualified personnel. Observe the plant- and process-specific regulations and the regulations which are applicable to Ex zones.
Any work must only be carried out after the EX-free measurement has been completed. Immediately after finishing the work, all safety and protective devices must be reattached or put into operation and tested.

Warning

High Voltage.
Before opening the enclosure, disconnect the cooler from the power supply!

Do not open in hazardous areas.
When opening the electronics housing (pressure-resistant enclosure), make sure that the transmission paths of an internal ignition (blank surfaces and threads on the enclosure base and cover) are absolutely clean and undamaged. If the surface or thread is damaged, the enclosure must be replaced.

The **EC-EX** cooler does not require any special maintenance intervals.

Depending on the degree of contamination of the ambient air, the cooling fin block must be cleaned from time to time with compressed air.

When using an automatic condensate disposal system with peristaltic pumps, depending on the operating conditions, the pump tubing must be checked quarterly or semi-annually and replaced if necessary. Refer to the corresponding **SR25.1/Ex** instruction manual for instructions on how to replace the tubing.

20.1 Removing a Heat Exchanger

Warning

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

Wear protective gloves!

Wear safety goggles and appropriate protective clothing!

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

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

20.2 Cleaning a Heat Exchanger

Warning

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

Wear protective gloves!

Wear safety goggles and appropriate protective clothing!

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

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

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

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

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

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

20.3 Installing a Heat Exchanger

The installation is as follows:

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

Note

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

20.3.1 Notes on Installing Glass Heat Exchangers

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

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

To ensure a safe connection of the sample gas respectively condensate tubes to the Borosilicate glass heat exchanger(s) we recommend the use of GL-couplings.
Please feel free to contact us, if you need any help choosing the right connectors or couplings.

21 Trouble Shooting

Qualified personnel

The inspections and maintenance work described in this chapter can be carried out by qualified personnel. The following knowledge is at least required for the work:

- Instructed person in EX-protection
- Trained person in the electrotechnical field
- Detailed knowledge of the manual and the applicable safety regulations

The operator must ensure that all work on the EC-EX is carried out only by authorised and qualified personnel. Observe the plant- and process-specific regulations and the regulations which are applicable to Ex zones.
Any work must only be carried out after the EX-free measurement has been completed. Immediately after finishing the work, all safety and protective devices must be reattached or put into operation and tested.

Troubleshooting is made much easier thanks to the LED status indication.

The following table shows possible sources of error and how to correct them (does not apply to the cooler start-up phase).

LED display	Function error and status alarm	Probable cause	Checking / Correction
°C > ○ ON ○ °C < ○	Equipment does not cool;	No mains power; Fuse F1 defective;	Check power supply voltage 230 V (115 V) at terminals X1.1 (L1) and X1.2 (N) inside the terminal box; *If power supply is O.K.:* Check voltage at fuse F1 on the circuit board in Ex-d enclosure, replace fuse if necessary; Replace defective EC-EX control electronics. Replacement only by qualified personnel* or M&C Service.
°C > red ON pink °C < ○ (red LED V18 on control board is out)	Equipment does not cool or cooling is insufficient;	Cooling compressor is not running; motor-protective circuit-breaker M1.1 Pressure switch alarms S2 and S3 Temperature monitor alarm S1	Check that the plug contacts are firmly seated in the Ex-d housing (compressor electrical connection); *if O.K.:* Test inside the Ex-d enclosure on terminal X2.7 (L) and X2.6 (N) 230V (115V) for compressor: *When 0 volts are applied to X2.7 and X2.6:* Either the motor-protective circuit-breaker M1.1 has been triggered and will be automatically switched on again after approx. 3 minutes; in the event of a continuous fault, possible causes are, for example, too high ambient temperature or excessive cooling capacity; or the internal alarm relay K1 has switched off by temperature or vacuum alarm: 1. Check pressure switch alarms S2 and S3. Jumper over terminal X3.3 and X3.4. When compressor is running now, the possible causes are: very low ambient temperature when starting up the cooler or clogged or empty cooling unit. 2. Check temperature monitor alarm S1. Jumper over terminal X3.5 and X3.6. When compressor is running, remove jumper. After approx. 10 min. press reset button S1. Otherwise replace defective EC-EX control electronics. Replacement only by qualified personnel* or M&C Service.
°C > red ON pink °C < ○ (red LED V18 on control board is on)	Cooler does not cool or cooling is insufficient;	Cooling compressor is not running;	1. Check operating windings; If voltage is applied at terminal points X2.9 and X2.6, the solid-state relay is not activated; the EC-EX control electronics are defective and must be replaced. Replacement only by qualified personnel* or M&C Service. There is no voltage at terminals X2.9 and X2.6; the operating winding is activated: 2. Check the starting windings; LED V18 must light up red. Check voltage at terminal points X2.12 and X2.6. If voltage is applied, the solid-state relay is not activated. Control electronics or starting capacitors defective. Replacement only by qualified personnel* or M&C Service.

LED display	Function error and status alarm	Probable cause	Checking / Correction
			Note: If the compressor is blocked, this state (red LED V18 on) can alternate with the above-mentioned state (red LED V18 off), because the motor circuit breaker will release and automatically switch on again after 3 min.
	see above	Cooling compressor is running; Overload of the cooling unit	*Check:* -Is gas flow max. 4 x 250 l/h? -Is ambient temp. max. +45 °C [113 °F]? -Cooling fins are dirty? Disconnect **EC-EX** temperature sensor R51 at terminals X3.1+ X3.2 and measure resistance. It should be > 1.7 kΩ at 20 °C [68 °F] ambient temp. *If O.K.:* Replace **EC-EX** compressor unit R134A completely.
°C > red ON green °C < or °C > ON green °C < red	Cooler does not cool;	Cooling compressor does not work;	Disconnect **EC-EX** temperature sensor R51 at terminals X3.1 and X3.2 and measure the resistance. It should be >1.7 kΩ at 20 °C [68 °F] ambient temp. *If defective:* fit new **EC-EX** temperature sensor with thermal paste in the cooling block. *If o.k.:* Replace defective **EC-EX** control board. Replacement only by qualified personnel* or M&C Service.
°C > ON pink °C < red	Cooler cools continuously (temp. < 2 °C [35.6 °F]);	Cooling compressor runs to long or continuously;	Disconnect **EC-EX** temperature sensor R51 at terminals X3.1 and X3.2 and measure the resistance. It should be >1.7 kΩ at 20 °C [68 °F] ambient temp. *If defective:* fit new **EC-EX** temperature sensor with thermal paste in the cooling block. *If o.k.:* Replace defective **EC-EX** control board. Replacement only by qualified personnel* or M&C Service.

* The inspections and maintenance work described in this chapter can be carried out by qualified personnel. The following knowledge is at least required for the work:
  - Instructed person in EX-protection
  - Trained person in the electrotechnical field
  - Detailed knowledge of the manual and the applicable safety regulations

22 EC control electronics

Figure 6 shows the circuit board design of the **EC-EX** control electronics (wiring schematic in appendix).

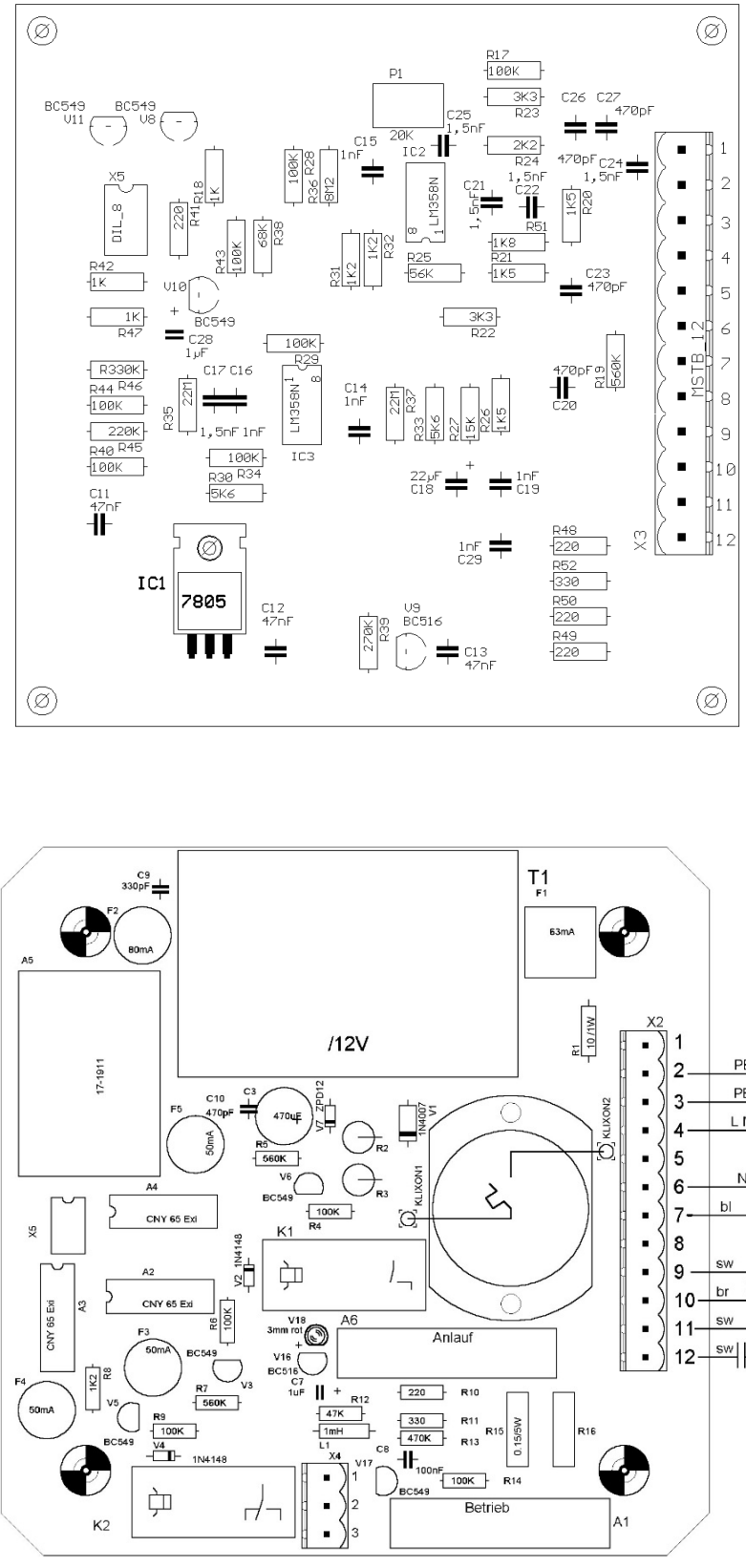


Figure 6: EC-EX control electronics board design

22.1 Temperature Setting of the Cooler

The cooler and the Ex-d enclosure can only be opened in an Ex-free environment.

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

The control temperature can be adjusted on the trimming potentiometer **P1** (Figure 7), which is located on the EC-EX control electronics board. The theoretical adjustment range is from 0 °C to 20 °C [32 °F to 68 °F]. Turning to the left will lower the temperature and turning to the right will increase it.

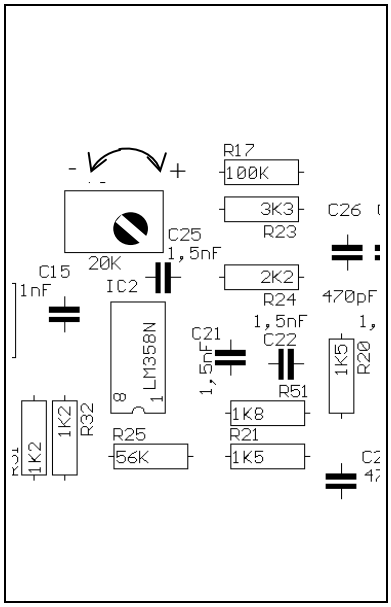


Figure 7: Temperature setting

Note

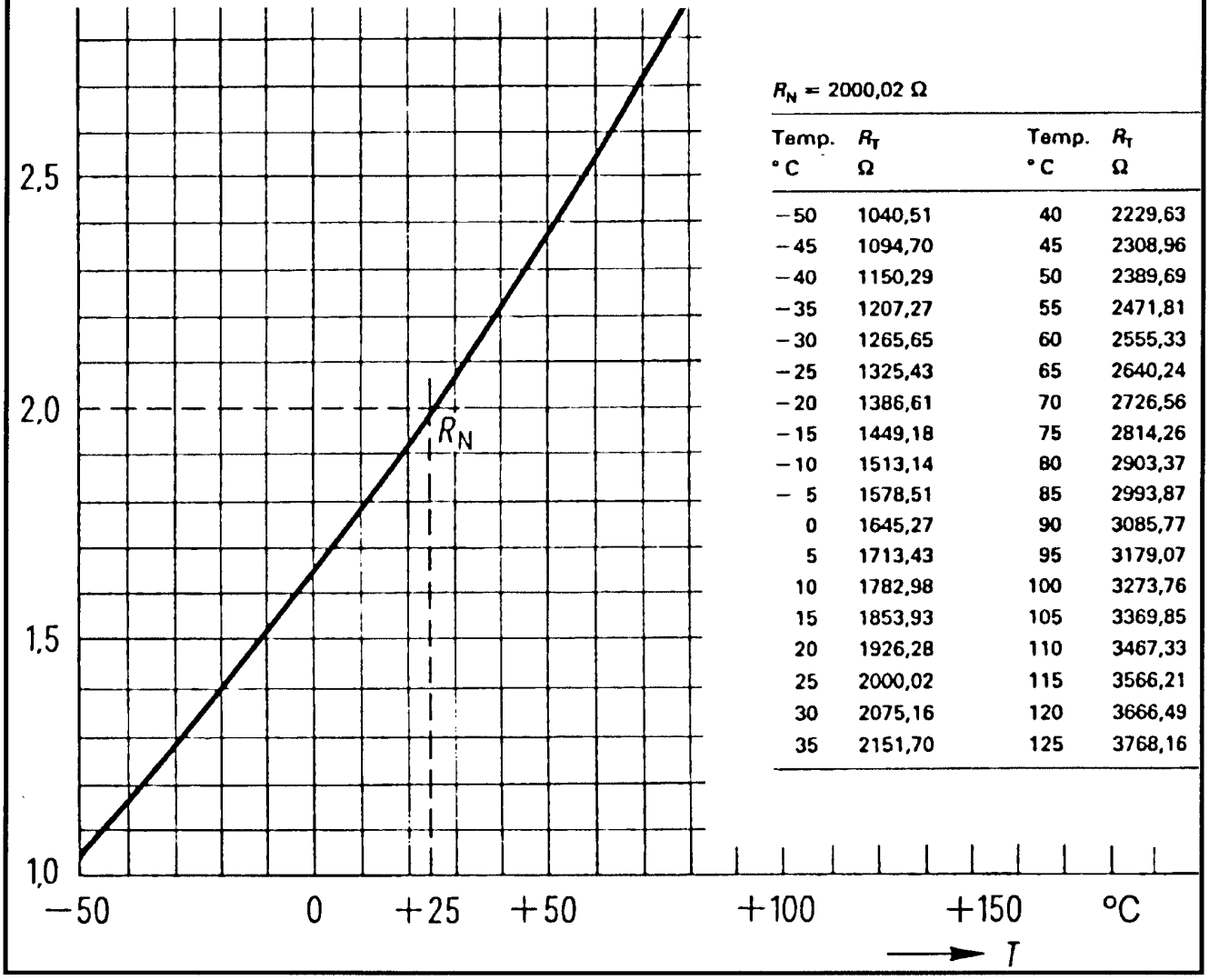
For proper operation, the temperature must not be set below +2 °C [35.6 °F] and above +7 °C [44.6 °F]!
Below +2 °C [35.6 °F] there is a risk that the heat exchanger will freeze. Above +7 °C [44.6 °F] the cooling unit will no longer work reliably.

By connecting an external temperature measuring device to the inside of the aluminium cooling block, the current actual temperature can be measured and controlled.

23 Checking the temperature sensor

The temperature sensor of the **EC-EX** cooler is a KTY-semiconductor.

Temperatursensor-Widerstand in Abhängigkeit von der Temperatur.
Temperature sensor resistance dependent on temperature.



R_N = 2000,02 Ω

Temp. °C	R_T Ω	Temp. °C	R_T Ω
−50	1040,51	40	2229,63
−45	1094,70	45	2308,96
−40	1150,29	50	2389,69
−35	1207,27	55	2471,81
−30	1265,65	60	2555,33
−25	1325,43	65	2640,24
−20	1386,61	70	2726,56
−15	1449,18	75	2814,26
−10	1513,14	80	2903,37
− 5	1578,51	85	2993,87
0	1645,27	90	3085,77
5	1713,43	95	3179,07
10	1782,98	100	3273,76
15	1853,93	105	3369,85
20	1926,28	110	3467,33
25	2000,02	115	3566,21
30	2075,16	120	3666,49
35	2151,70	125	3768,16

Figure 8: Temperature sensor resistance

24 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.

25 Spare Parts List

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

Electric gas cooler EC-EX
(C) consumable parts and (R) recommended spare parts

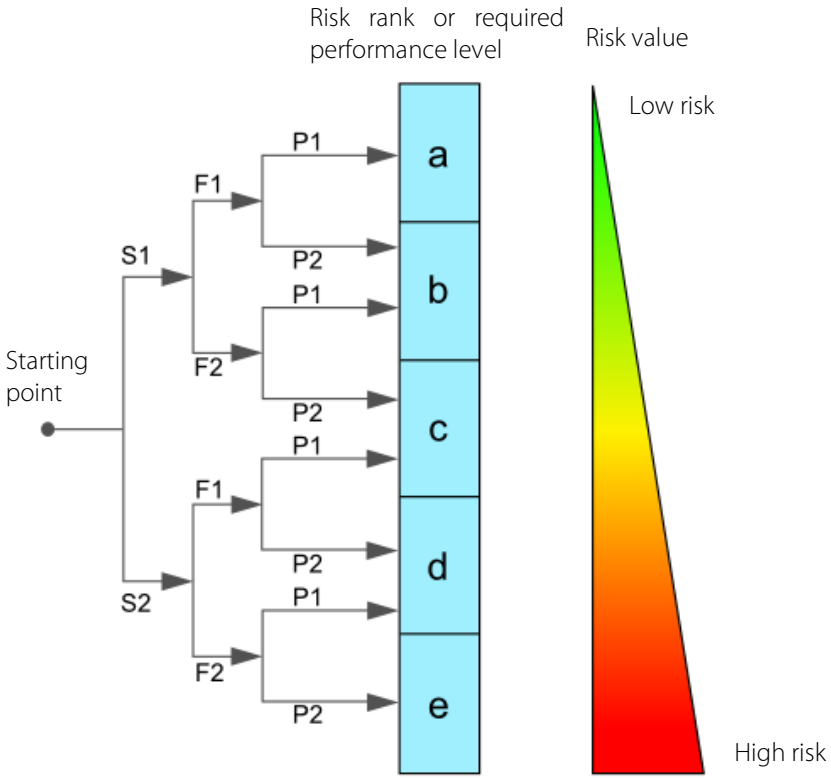
			recommended quantity **EC-EX** being in operation [years]		
Part number	Description	C/R	1	2	3
02K9105	**EC-G** jet stream heat exchanger material: Borosilicate glass	R	1	1	1
02K9150	**EC-G-90°** jet stream heat exchanger material: Borosilicate glass	R	1	1	1
02K9200	**EC-SS** jet stream heat exchanger material: stainless steel	R	1	1	1
02K9250	**EC-SS/NPT** jet stream heat exchanger material: stainless steel Connections: sample gas in and out 1/4" i NPT condensate out 3/8" i NPT	R	1	1	1
02K9300	**EC-PV** jet stream heat exchanger material: PVDF	R	1	1	1
90K0115	**EC** thermal conductivity paste 50 g (-40 °C to 140 °C [-40 to 284 °F])	R	1	1	2
90K5010	**EC-EX** temperature sensor R51	R	-	-	1
90K5015	**EC-EX** Temperature contact S1	R	-	-	1
90K1010	**EC-EX** LED-display unit with connecting cable	R	-	-	1
90K5035	**EC-EX** cooling unit complete with compressor vaporizer and condenser. Supply 230 V, 50 Hz	R	-	-	-
90K5040	**EC-EX** cooling unit complete with compressor vaporizer and condenser. Supply 115 V, 50-60 Hz	R	-	-	-
90K5021	**EC-EX** control board complete with Ex-d enclosure, 230 V / 50 Hz	R	-	-	-

26 Risk assessment

The risk assessment provided in this chapter is intended for all work activities on the product. The hazards can occur in the work steps of assembly, commissioning, maintenance, disassembly and in the event of a product fault. During normal operation, the product is protected by a system cabinet or appropriate covers.
Only qualified personnel is permitted to perform the work. The following minimum knowledge is required for the work:

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

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



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

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

Possibility of preventing or limiting the damage
P1 = 1 = possible
P2 = 2 = hardly possible

Figure 9: Overview risk assessment

Aggressive condensate possible

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

Caution risk of being crushed by rotating parts

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

Caution glass

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

Caution hot surfaces

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

Caution electric shock

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

Gas hazard

Risk rank group A-B-C

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

Caution crushing hazard

Risk rank group A

The work must be performed by trained personnel only.
This applies to products weighing more than > 40 kg [≈ 88.2 lbs]:
The product can be transported by 2 persons. 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.

27 Appendix

- Sample outlet dew point (ambient temperature 20 °C [68 °F]) depending on gas flow rate
- Basic drawing of the EC-EX cooler including installation position of sensors
- Schematic **EC-EX** control board 230 V,
  drawing number : **2392-…;**
- Schematic **EC-EX** control board 115 V,
  drawing number : **2392-…;**

- EU-Type Examination Certificate (Registration No.: 17 ATEX E 080): German original and English translation
- IECEx Certificate of Conformity (Certificate No.: IECEx BVS 18.0021)

More product documentation is available on our Internet catalogue:
www.mc-techgroup.com.

- Instruction manual for peristaltic pump **SR25.1/Ex**
- Data sheet for Ccondensate vessel **TG**, **TK**
- Data sheet for fittings for **GL** connections,
  clamp ring, connection adapter and adjusting screw fitting
- Data sheet for automatic liquid drain **AD-SS**
- Data sheet for automatic liquid drain **AD-P**

Sample outlet dew point (ambient temperature 20 °C) depending on gas flow rate

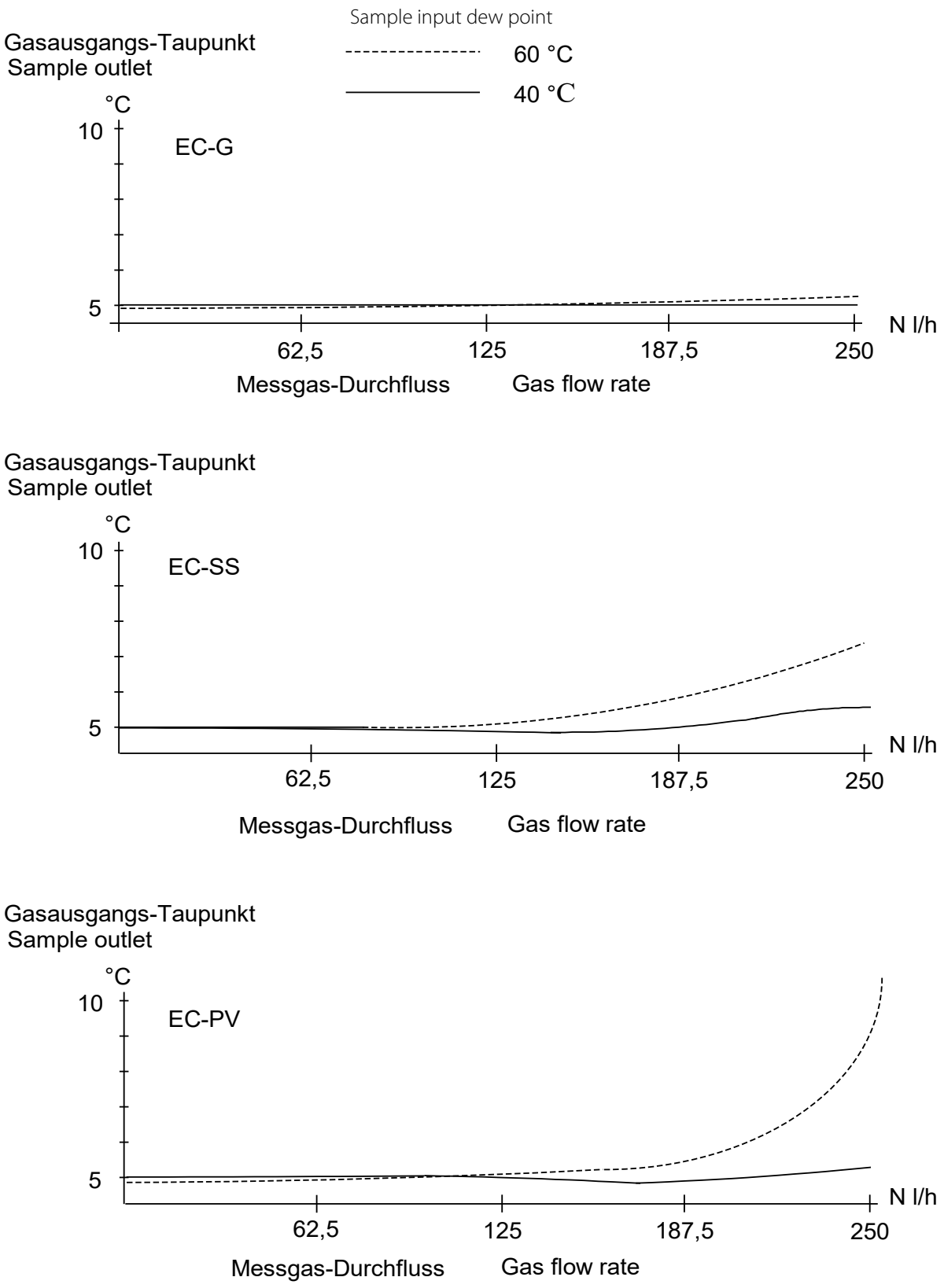


Figure 10: Sample outlet dew point

Basic drawing of the EC-EX cooler including installation position of sensors

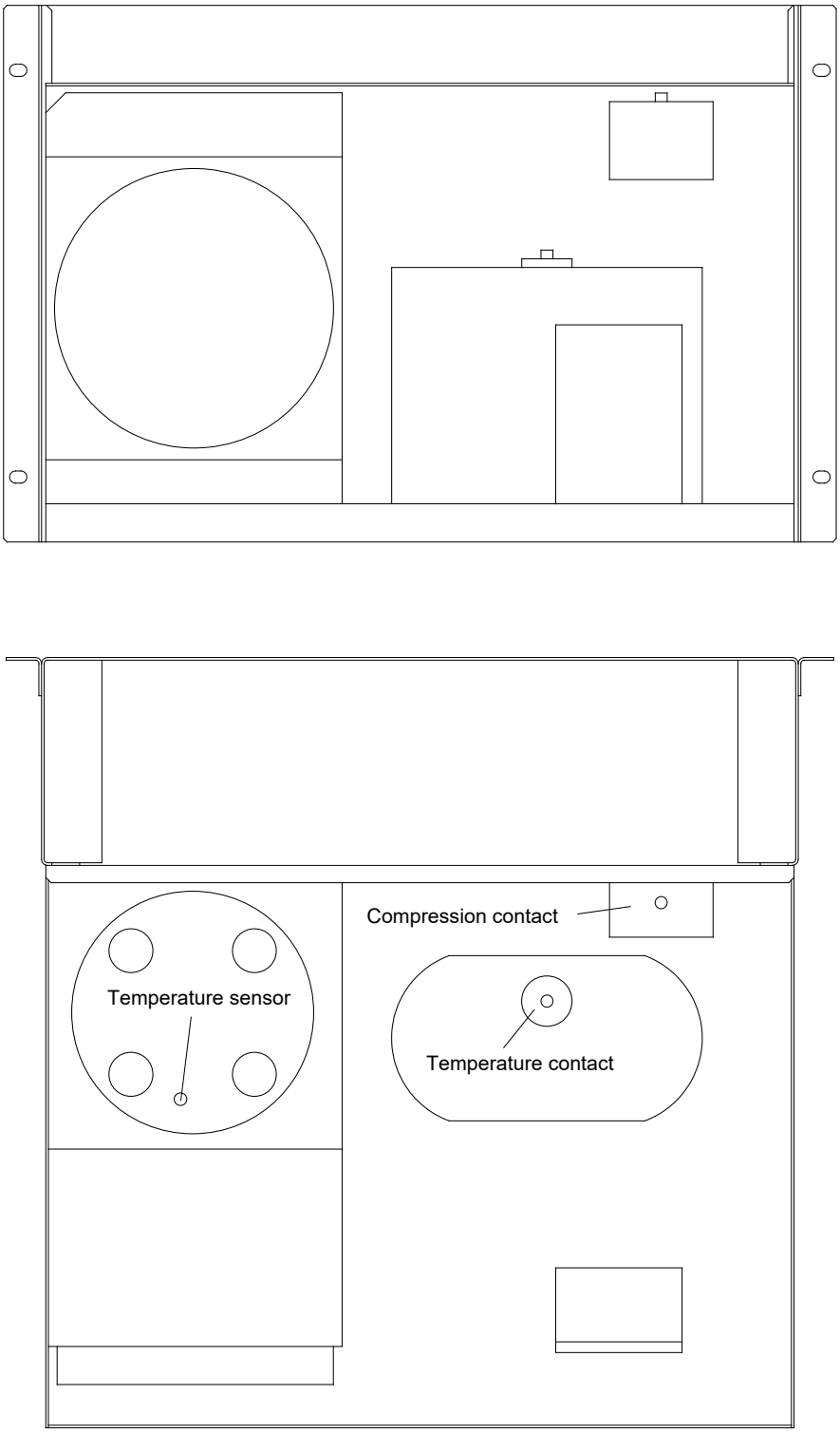


Figure 11: Basic EC-EX cooler drawing

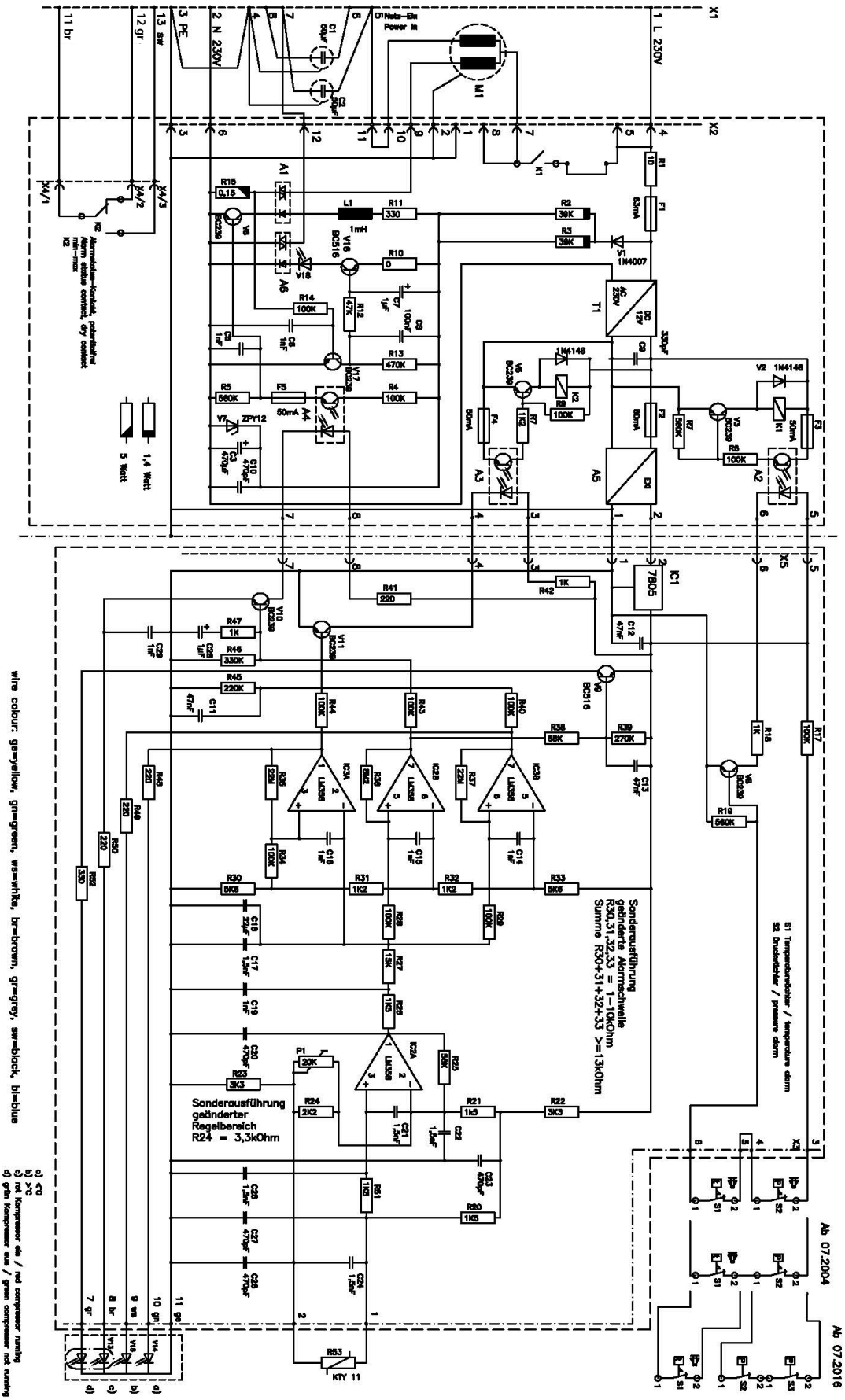


Figure 12: Schematic EC-EX 230 V 50 Hz (drawing no.: 2392-…)

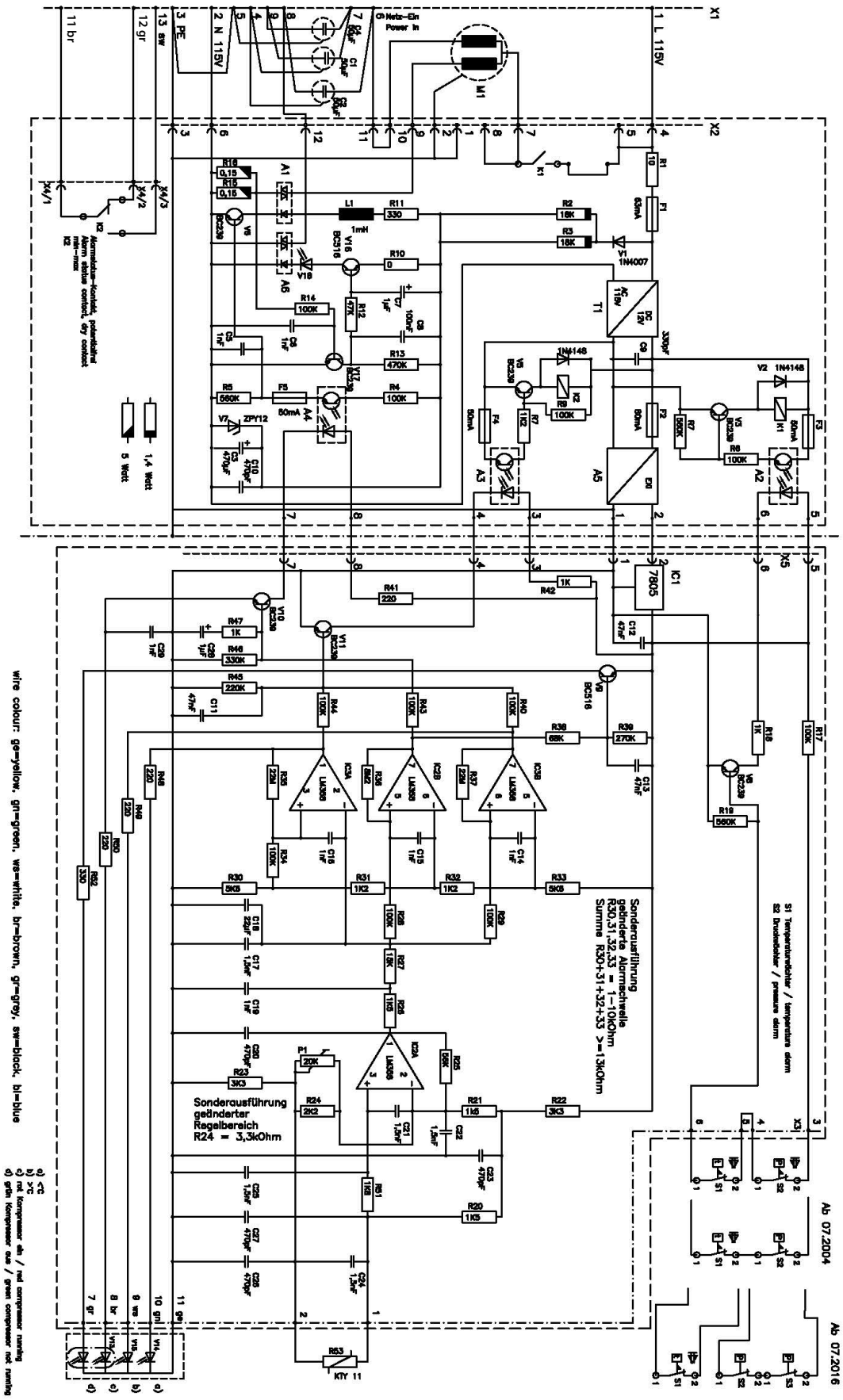


Figure 13: Schematic EC-EX 115 V 60 Hz (drawing no.: 2392-…)

1 # EU-Baumusterprüfbescheinigung

2 **Geräte zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen Richtlinie 2014/34/EU**

3 Nr. der EU-Baumusterprüfbescheinigung: **BVS 17 ATEX E 080**

4 Produkt: **Elektrogaskühler Typ EC-EX**

5 Hersteller: **M&C TechGroup Germany GmbH**

6 Anschrift: **Rehhecke 79, 40885 Ratingen, Deutschland**

7 Die Bauart dieses Produktes sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Baumusterprüfbescheinigung festgelegt.

8 Die Zertifizierungsstelle der DEKRA EXAM GmbH, benannte Stelle Nr. 0158 gemäß Artikel 17 der Richtlinie 2014/34/EU des Europäischen Parlaments und des Rates vom 26. Februar 2014, bescheinigt, dass das Produkt die wesentlichen Gesundheits- und Sicherheitsanforderungen für die Konzeption und den Bau von Produkten zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie erfüllt.
Die Ergebnisse der Prüfung sind in dem vertraulichen Prüfprotokoll BVS PP 17.2143 EU niedergelegt.

9 Die wesentlichen Gesundheits- und Sicherheitsanforderungen werden erfüllt durch Übereinstimmung mit den Normen:

EN 60079-0:2012+A11:2013	**Allgemeine Anforderungen**
EN 60079-1:2014	**Druckfeste Kapselung „d“**
EN 60079-2:2014	**Überdruckkapselung „p“**
EN 60079-5:2015	**Sandkapselung „q“**
EN 60079-7:2015	**Erhöhte Sicherheit „e“**
EN 60079-11:2012	**Eigensicherheit „i“**

10 Falls das Zeichen „X“ hinter der Bescheinigungsnummer steht, wird in der Anlage zu dieser Bescheinigung auf besondere Bedingungen für die sichere Anwendung des Produktes hingewiesen.

11 Diese EU-Baumusterprüfbescheinigung bezieht sich nur auf den Entwurf und Bau der beschriebenen Produkte.
Für den Herstellungsprozess und die Abgabe der Produkte sind weitere Anforderungen der Richtlinie zu erfüllen, die nicht durch diese Bescheinigung abgedeckt sind.

12 Die Kennzeichnung des Produktes muss die folgenden Angaben enthalten:

Ⓔx **II 2G Ex pxb db eb q [ib] IIC T* Gb** * siehe Thermische Kenngrößen

DEKRA EXAM GmbH
Bochum, den 12.09.2017

Zertifizierer

Fachzertifizierer

DEKRA EXAM GmbH, Dinnendahlstraße 9, 44809 Bochum, Deutschland
Telefon +49.234.3696-105, Telefax +49.234.3696-110, zs-exam@dekra.com

13 **Anlage zur**

14 **EU-Baumusterprüfbescheinigung**
BVS 17 ATEX E 080

15 **Beschreibung des Produktes**

15.1 **Gegenstand und Typ**

Elektrogaskühler Typ EC-EX

15.2 **Beschreibung**

Der Elektrogaskühler Typ EC-EX besteht aus einem hermetisch geschlossenen Kältemittelverdichter in der Zündschutzart Überdruckkapselung mit einem elektrischen Anschluss in der Zündschutzart Erhöhte Sicherheit.
Die Steuerung befindet sich in einem Gehäuse in der Zündschutzart Druckfeste Kapselung „d" Typ GUB01 (CESI 01 ATEX 034U).
Die Anlaufkondensatoren sind in der Zündschutzart Sandkapselung Ex q Typ 24 *** *** (SEV 10 ATEX 0154X) ausgeführt.
Der Netzanschluss erfolgt über ein Gehäuse in der Zündschutzart Erhöhte Sicherheit „e" Typ 07-5105 (PTB 08 ATEX 1064) über gesondert bescheinigte Klemmen (Sira 02 ATEX 3001U).
Die Verbindung zwischen Anschlussgehäuse, Steuerungsgehäuse und den Anlaufkondensatoren erfolgt über zu diesem Zweck gesondert bescheinigte Kabel- und Leitungseinführungen.
Die Druck- und Temperaturschalter des Messgaskühlers, werden in Stromkreisen in der Zündschutzart Eigensicherheit betrieben.
Der elektrische Anschluss des Messgaskühlers ist durch eine dauerhaft angeschlossene Leitung ausgeführt.

Auflistung aller verwendeten Komponenten mit älterem Normenstand

Gegenstand und Typ	Zertifikat	Normenstand
Abzweig und Verbindungskasten Typ 07-5105	PTB 08 ATEX 1064	EN 60079-0:2012 EN 60079-7:2007 EN 60079-11:2007
Ex-Motorkondensator Typ 24 *** ***	SEV 10 ATEX 0154X	EN 60079-0:2009 EN 60079-5:2007
Terminal Type AKZ and AKE	Sira 02 ATEX 3001U	EN 60079-0:2004 EN 60079-7:2003

15.3 **Kenngrößen**

15.3.1 Elektrische Daten

Bemessungsspannung		115/230 VAC, 50-60	Hz
Maximale Eingangsspannung	U_m	253	V
Bemessungsstromstärke (230 V)		8,1	A
Bemessungsstromstärke (115 V)		17	A
Bemessungsleistung		280	W

15.3.2 Thermische Daten

Umgebungstemperaturbereich	Maximale Messgaseintrittstemperatur	Temperaturklasse
0 °C bis +45 °C	120 °C	T4
0 °C bis +45 °C	180 °C	T3

15.3.3 Weitere Daten

Maximaler Betriebsdruck Kältemittel	10 bar
Kältemittel	R134a

DAkkS Deutsche Akkreditierungsstelle D-PL-18053-01-00

DEKRA EXAM GmbH, Dinnendahlstraße 9, 44809 Bochum, Deutschland
Telefon +49.234.3696-105, Telefax +49.234.3696-110, zs-exam@dekra.com

16 **Prüfprotokoll**

BVS PP 17.2143 EU, Stand 12.09.2017

17 **Besondere Bedingungen für die Verwendung**

Keine

18 **Wesentliche Gesundheits- und Sicherheitsanforderungen**

Die wesentlichen Gesundheits- und Sicherheitsanforderungen sind durch die unter Abschnitt 9 gelisteten Normen abgedeckt.

19 **Zeichnungen und Unterlagen**

Die Zeichnungen und Unterlagen sind in dem vertraulichen Prüfprotokoll gelistet.

DEKRA EXAM GmbH, Dinnendahlstraße 9, 44809 Bochum, Deutschland
Telefon +49.234.3696-105, Telefax +49.234.3696-110, zs-exam@dekra.com

Translation

1 # EU-Type Examination Certificate

2 **Equipment or Protective System intended for use in potentially explosive atmospheres Directive 2014/34/EU**

3 -Type Examination Certificate Number: **BVS 17 ATEX E 080**

4 Product: **Electric gas cooler type EC-EX**

5 Manufacturer: **M&C TechGroup Germany GmbH**

6 Address: **Rehhecke 79, 40885 Ratingen, Germany**

7 This product and any acceptable variations thereof are specified in the appendix to this certificate and the documents referred to therein.

8 The certification body of DEKRA EXAM GmbH, Notified Body number 0158, in accordance with Article 17 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to the Directive.
The examination and test results are recorded in the confidential Report No BVS PP 17.2143 EU.

9 Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 60079-0:2012+A11:2013	**General requirements**
EN 60079-1:2014	**Flameproof Enclosure 'd'**
EN 60079-2:2014	**Pressurised Enclosures 'p'**
EN 60079-5:2015	**Powder Filling 'q'**
EN 60079-7:2015	**Increased Safety 'e'**
EN 60079-11:2012	**Intrinsic Safety 'i'**

10 If the sign "X" is placed after the certificate number, it indicates that the product is subject to the Special Conditions for Use specified in the appendix to this certificate.

11 This EU-Type Examination Certificate relates only to the design and construction of the specified product.
Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.

12 The marking of the product shall include the following:

Ex II 2G Ex pxb db eb q [ib] IIC T* Gb * see Thermal parameters

DEKRA EXAM GmbH
Bochum, 2017-09-12

Signed: Jörg Koch
Certifier

Signed: Ralf Leiendecker
Approver

DEKRA EXAM GmbH, Dinnendahlstrasse 9, 44809 Bochum, Germany,
phone +49.234.3696-105, fax +49.234.3696-110, email: zs-exam@dekra.com

13 **Appendix**

14 **EU-Type Examination Certificate**

BVS 17 ATEX E 080

15 **Product description**

15.1 **Subject and type**

Electric gas cooler type EC-EX

15.2 **Description**

The electric gas cooler type EC-EX consists of a hermetically sealed cooling agent condenser of the type of protection Pressurised Enclosure 'p' which features an electric connector of the type of protection Increased Safety 'e'.
The control unit is accommodated in an enclosure of the type of protection Flameproof Enclosure 'd' type GUB01 (CESI 01 ATEX 034U).
The starting capacitors are designed for the type of protection Powder Filling Ex q, type 24 *** *** (SEV 10 ATEX 0154X).
The mains connection is provided via an enclosure of the type of protection Increased Safety 'e' type 07-5105 (PTB 08 ATEX 1064) using separately certified terminals (Sira 02 ATEX 3001U).
Connection between the terminal enclosure, the control enclosure and the starting capacitors is provided via cable glands which have been separately certified for this purpose.
The pressure and temperature switches of the measuring gas cooler are operated using circuits of the type of protection Intrinsic Safety.
The measuring gas cooler is electrically connected using a permanently installed cable.

List of all components used certified according to previous standard editions:

Subject and type	Certificate	Standards
Junction and terminal box type 07-5105	PTB 08 ATEX 1064	EN 60079-0:2012 EN 60079-7:2007 EN 60079-11:2007
Ex-motor capacitor type 24 *** ***	SEV 10 ATEX 0154X	EN 60079-0:2009 EN 60079-5:2007
Terminal types AKZ and AKE	Sira 02 ATEX 3001U	EN 60079-0:2004 EN 60079-7:2003

15.3 **Parameters**

15.3.1 Electrical data

Rated voltage		115/230 VAC, 50-60	Hz
Maximum input voltage	U_m	253	V
Rated current (at 230 V)		8.1	A
Rated current (at 115 V)		17	A
Rated power		280	W

15.3.2 Thermal data

Ambient temperature range	Maximum entry temperature of measuring gas	Temperature class
0 °C to +45 °C	120 °C	T4
0 °C to +45 °C	180 °C	T3

15.3.3 Other data

Maximum operating pressure cooling agent	10	bar
Cooling agent	R134a	

DEKRA EXAM GmbH, Dinnendahlstrasse 9, 44809 Bochum, Germany,
phone +49.234.3696-105, fax +49.234.3696-110, email: zs-exam@dekra.com

16 **Report Number**

BVS PP 17.2143 EU, as of 12.09.2017

17 **Special Conditions for Use**

None

18 **Essential Health and Safety Requirements**

The Essential Health and Safety Requirements are covered by the standards listed under item 9.

19 **Drawings and Documents**

Drawings and documents are listed in the confidential report.

We confirm the correctness of the translation from the German original.
In the case of arbitration only the German wording shall be valid and binding.

DEKRA EXAM GmbH
Bochum, dated 2017-10-04
BVS-Pe/Mu E7289/17

Certifier

Approver

DEKRA EXAM GmbH, Dinnendahlstrasse 9, 44809 Bochum, Germany,
phone +49.234.3696-105, fax +49.234.3696-110, email: zs-exam@dekra.com

IECEx Certificate of Conformity

INTERNATIONAL ELECTROTECHNICAL COMMISSION
IEC Certification Scheme for Explosive Atmospheres

for rules and details of the IECEx Scheme visit www.iecex.com

Certificate No.: IECEx BVS 18.0021 Issue No: 0 Certificate history: Issue No. 0 (2018-04-17)

Status: **Current**

Date of Issue: **2018-04-17**

Applicant: **M&C TechGroup Germany GmbH**
Rehhecke 79
40885 Ratingen
Germany

Equipment: **Electric gas cooler type EC-EX**

Optional accessory:

Type of Protection: **Equipment protection by flameproof enclosures "d", Equipment protection by intrinsic safety "i", Equipment protection by pressurized enclosure "p", Equipment protection by powder filling "q", Equipment protection by increased safety "e"**

Marking:
Ex pxb db eb q [ib] IIC T* Gb
* see thermal data

Approved for issue on behalf of the IECEx Certification Body: Jörg Koch

Position: Head of Certification Body

Signature:
(for printed version)

Date:

1. This certificate and schedule may only be reproduced in full.
2. This certificate is not transferable and remains the property of the issuing body.
3. The Status and authenticity of this certificate may be verified by visiting the Official IECEx Website.

Certificate issued by:

DEKRA EXAM GmbH
Dinnendahlstrasse 9
44809 Bochum
Germany

DEKRA
On the safe side.

IECEx Certificate of Conformity

Certificate No:	IECEx BVS 18.0021	Issue No: 0
Date of Issue:	**2018-04-17**	Page 2 of 3
Manufacturer:	**M&C TechGroup Germany GmbH** Rehhecke 79 40885 Ratingen **Germany**	

Additional Manufacturing location(s):

This certificate is issued as verification that a sample(s), representative of production, was assessed and tested and found to comply with the IEC Standard list below and that the manufacturer's quality system, relating to the Ex products covered by this certificate, was assessed and found to comply with the IECEx Quality system requirements. This certificate is granted subject to the conditions as set out in IECEx Scheme Rules, IECEx 02 and Operational Documents as amended.

STANDARDS:

The apparatus and any acceptable variations to it specified in the schedule of this certificate and the identified documents, was found to comply with the following standards:

IEC 60079-0 : 2011 Edition:6.0	Explosive atmospheres - Part 0: General requirements
IEC 60079-1 : 2014-06 Edition:7.0	Explosive atmospheres - Part 1: Equipment protection by flameproof enclosures "d"
IEC 60079-11 : 2011 Edition:6.0	Explosive atmospheres - Part 11: Equipment protection by intrinsic safety "i"
IEC 60079-2 : 2014-07 Edition:6	Explosive atmospheres - Part 2: Equipment protection by pressurized enclosure "p"
IEC 60079-5 : 2015 Edition:4.0	Explosive atmospheres –Part 5: Equipment protection by powder filling "q"
IEC 60079-7 : 2015 Edition:5.0	Explosive atmospheres – Part 7: Equipment protection by increased safety "e"

*This Certificate **does not** indicate compliance with electrical safety and performance requirements other than those expressly included in the Standards listed above.*

TEST & ASSESSMENT REPORTS:

A sample(s) of the equipment listed has successfully met the examination and test requirements as recorded in

Test Report:

DE/BVS/ExTR18.0023/00

Quality Assessment Report:

DE/BVS/QAR17.0009/00

IECEx Certificate of Conformity

Certificate No:	IECEx BVS 18.0021	Issue No: 0
Date of Issue:	2018-04-17	Page 3 of 3

Schedule

EQUIPMENT:

Equipment and systems covered by this certificate are as follows:

Subject and type

Electric gas cooler type EC-EX

Description

The electric gas cooler type EC-EX consists of a hermetically sealed cooling agent condenser of the type of protection Pressurised Enclosure "p" which features an electric connector of the type of protection Increased Safety "e".
The control unit is accommodated in an enclosure of the type of protection Flameproof Enclosure "d" type GUB01 (IECEx CES 14.0012U).
The starting capacitors are designed for the type of protection Powder Filling Ex "q", type 24 *** ***
(IECEx SEV 17.0021X).
The mains connection is provided via an enclosure of the type of protection Increased Safety "e" type 07-5105 (IECEx PTB 09.0009X) using separately certified terminals (IECEx SIR 05.0038U).
Connection between the terminal enclosure, the control enclosure and the starting capacitors is provided via cable glands which have been separately certified for this purpose.
The pressure and temperature switches of the measuring gas cooler are operated using circuits of the type of protection Intrinsic Safety.
The measuring gas cooler is electrically connected using a permanently installed cable.

Listing of all components

See Annex

Parameters

See Annex

SPECIFIC CONDITIONS OF USE: NO

Annex:

BVS_18_0021_M&C_Annex.pdf

IECEx Certificate of Conformity

DEKRA

Certificate No.: IECEx BVS 18.0021
Annex
Page 1 of 1

Listing of all components used referring to older standards

Subject and type	Certificate	Standards
Terminal types AKZ and AKE	IECEx SIR 05.0038U	IEC 60079-0:2004[1] IEC 60079-7:2001[1]

[1] No applicable technical differences

[2] Technical differences evaluated and found satisfactory

Parameters

Electrical data

Rated voltage		115/230 VAC, 50-60	Hz
Maximum input voltage	U_m	253	V
Rated current (at 230 V)		8.1	A
Rated current (at 115 V)		17	A
Rated power		280	W

Thermal data

Ambient temperature range	Maximum entry temperature of measuring gas	Temperature class
0 °C to +45 °C	120 °C	T4
0 °C to +45 °C	180 °C	T3

Other data

Maximum operating pressure cooling agent	10	bar
Cooling agent	R134a	