# SCC-C Sample gas cooler

Standard model and
Category 3G explosion-proof version

## Operator's manual

42/23-55 EN Rev. 3


Power and productivity
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# Contents

# Preface

**Content of the operator's manual**

This operator's manual contains all the information you will need to safely and efficiently install, start-up, operate and maintain the SCC-C sample gas cooler.

This operator's manual contains information on all the functional units in the sample gas cooler. The delivered sample gas cooler may differ from the version described.

**Additional document**

Data sheet "System components and accessories for sample gas conditioning", document no. 10/23-5.20 EN

This publication can be ordered from your authorized ABB representative or from

ABB Automation GmbH, Analytical, Marketing communication,
Fax: +49-(0)69-79 30-45 66, e-mail: cga@de.abb.com

**Further information on the internet**

You can find further information on ABB Analytical products and services on the internet: "http://www.abb.com/analytical".

**Symbols and typefaces**

Identifies safety information to be heeded during unit operation in order to avoid risks to the operator.

Identifies specific information on operation of the unit as well as on the use of this manual.

***1***, ***2***, ***3***, ... Identifies reference numbers in the figures.

# Intended application, instrument designs

**Intended application**

The sample gas cooler SCC-C is intended for cooling the sample gas, separation of the condensate and condensate discharge.

**Use with flammable sample gases**

The sample gas cooler is suitable for use with flammable sample gases in the version with stainless steel heat exchangers.

**Standard model**

The standard model of the sample gas cooler is intended for installation in non-hazardous areas. It complies with EN 61010 Part 1 “Safety requirements for electrical equipment for measurement, control and laboratory use”.

**Version with CSA certification**

The version of the sample gas cooler with CSA certification is certified to
- Class 2258 02 Process control equipment – For hazardous locations und
- Class 2258 82 Process control equipment – For hazardous locations – Certified to U.S. standards

for use in hazardous areas Class 1, Division 2, Groups A, B, C and D, temperature code T4, ambient temperature max. +50 °C.

The approval includes the testing in accordance with the relevant Canadian CSA and US American guidelines.

Certificate no. 1105720.

**Explosion-proof version**

The Category 3G explosion-proof version of the sample gas cooler is suitable for use in hazardous areas (see also the information on page 8). It complies with the European standards
- EN 60079-0:2012 + A11:2013 “Explosive atmospheres – Part 0: Equipment – General requirements” and
- EN 60079-15:2010 “Explosive atmospheres – Part 15: Equipment protection by type of protection 'n'”.

**Details on the rating plate**

The details on the rating plate are applicable for the version of the sample gas cooler.

# General safety information

**Requirements for safe operation**

In order to operate in a safe and efficient manner the instrument should be properly handled and stored, correctly installed and started, properly operated and correctly maintained.

**Personnel qualifications**

Only persons familiar with the installation, set-up, operation and maintenance of comparable equipment and certified as being capable of such work should work on the instrument.

**Special information and precautions**

These include
- The content of this operator's manual.
- The safety information affixed to the instrument.
- The applicable safety precautions for installing and operating electrical devices
- Safety precautions for working with gases, acids, condensates, etc.

**National regulations**

The regulations, standards and guidelines cited in this operator's manual are applicable in the Federal Republic of Germany. The applicable national regulations should be followed when the instrument is used in other countries.

**Instrument safety and safe operation**

The instrument is designed and tested in accordance with EN 61010 Part 1, "Safety requirements for electrical equipment for measurement, control and laboratory use" and has been shipped ready for safe operation.

To maintain this condition and to assure safe operation, read and follow the safety information identified with the ⚠ symbol in this manual. Failure to do so can put persons at risk and can lead to instrument damage as well as damage to other systems and instruments.

The protection provided by the instrument may be impaired if the instrument is used in a manner not specified by the manufacturer.

**Additional information**

If the information in this operator's manual does not cover a particular situation, ABB Service is prepared to supply additional information as needed.

Please contact your local service representative. For emergencies, please contact

ABB Service, telephone: +49-(0)180-5-222580, telefax: +49-(0)621-38193129031, E-mail: automation.service@de.abb.com

# Safety tips for handling electronic measurement devices

**Protective lead connection**

The protective lead should be attached to the protective lead connector before any other connection is made.

**Risks of loss of protective lead continuity**

The instrument can be hazardous if the protective lead is interrupted inside or outside the instrument or if the protective lead is disconnected.

**Proper operating voltage**

The instrument voltage must be set to match the line voltage before the power supply is activated.

**Risks involved in opening the covers**

Current-bearing components can be exposed when the covers or parts are removed, even if this can be done without tools. Current can be present at some connection points.

**Risks involved in working with an open instrument**

The instrument must be disconnected from all power sources before any maintenance work is performed. Work on an instrument that is open and connected to power should only be performed by trained personnel who are familiar with the risks involved.

**Charged capacitors**

The instrument capacitors can retain their charge even when the instrument is disconnected from all power sources.

**Use of proper fuses**

Only fuses of the specified type and rated current should be used as replacements.

Rating of fuse F1:
T 3.15A H 250 V for input voltage AC 115 V,
T 2A H 250 V for input voltage AC 230 V.

Never use patched fuses. Do not short-circuit the fuse holder contacts.

**When safe operation can no longer be assured**

If it is apparent that safe operation is no longer possible, the instrument should be taken out of operation and secured against unauthorized use.

The possibility of safe operation is excluded:
- If the instrument is visibly damaged
- If the instrument is no longer operational
- After prolonged storage under adverse conditions
- After severe transport stresses

# Information on the Category 3G explosion-proof version

**Category 3G explosion-proof version**

The Category 3G explosion-proof version of the SCC-C sample gas cooler complies with the European standards

- EN 60079-0:2012 + A11:2013 “Explosive atmospheres – Part 0: Equipment – General requirements” and
- EN 60079-15:2010 “Explosive atmospheres – Part 15: Equipment protection by type of protection 'n'”.

**Marking**

 II 3G Ex nA nC IIC T4 Gc

**Type examination certificate**

BVS 16 ATEX E 056 X

**Installation site**

The Category 3G explosion-proof version of the sample gas cooler may only be used in areas, which guarantee suitable protection against the ingress of foreign matter or liquids. It must be installed in a housing or cabinet with type of protection IP54 or higher to IEC 60079-0.

**Sample gas inlet temperature**

Max. 130 °C

**Work on live parts**

Work on live parts may not be carried out until the environment has been cleared as “safe”.

The fuses may not be changed until the sample gas cooler has been switched off-circuit or the environment has been cleared as “safe”.

**Work on the controller**

The controller flap cover may not be opened until the environment has been cleared as “safe” (free of explosive atmosphere).

# Chapter 1 Preparing the installation

## Requirements for the installation site

**Short gas paths**

The sample gas cooler should be installed as close as possible to the gas analyzer.

**Adequate air circulation**

Ensure adequate natural air circulation around the sample gas cooler. Avoid heat accumulation.

**Protection against adverse environmental conditions**

The sample gas cooler may only be installed indoor or in a cabinet.

The sample gas cooler should be protected from
- cold,
- radiated heat, e.g. from the sun, kilns or boilers,
- temperature fluctuations,
- strong air movement,
- moisture,
- dust deposits and dust penetration,
- corrosive atmosphere,
- vibration.

**Housing type of protection IP20**

The housing of the sample gas cooler has the type of protection IP20. Therefore the sample gas cooler – particularly in the Category 3G explosion-proof version (see type examination certificate, page 32) – may only be operated in clean and dry areas. Solid foreign matter or liquids must be prevented from entering through the cooling openings in the housing.

**Climatic conditions**

| | |
|---|---|
| Ambient temperature | During operation: +5 to +45 °C<br>Storage and transport: –25 to +60 °C |
| Relative humidity | ≤ 75 % year-round average, ≤ 95 % on 30 days per year, occasional light condensation permissible |

# Power supply

**Power supply**

| | |
|---|---|
| Input voltage | 230 VAC, –15 to +15 %, 50/60 Hz or<br>115 VAC, –15 to +15 %, 50/60 Hz |
| Power consumption | max. 200 VA |
| Starting current | 2.5 A at 230 VAC |

# Sample gas inlet conditions

**Sample gas inlet conditions**

Sample gas pressure

| Heat exchanger material | Sample gas pressure $p_{abs}$ without Peristaltic pump | with |
|---|---|---|
| Glass | 50 to 200 kPa (0.5 to 2.0 bar) | 50 to 150 kPa (0.5 to 1.5 bar) |
| PVDF | 50 to 250 kPa (0.5 to 2.5 bar) | 50 to 150 kPa (0.5 to 1.5 bar) |
| Stainless steel | 0.05 to 1 MPa (0.5 to 10 bar) | |

| | |
|---|---|
| Sample gas flow | 1 x 250 l/h or 1 x 125 l/h or 2 x 125 l/h, assuming sample gas pressure $p_{abs}$ = 100 kPa (1 bar) and 25 °C |
| Sample gas inlet temperature | 140 °C, max. 130 °C for the Category 3G explosion-proof version |
| Sample gas inlet dew point | max. 70 °C, max. 60 °C for heat exchanger HE250 where sample gas flow > 200 l/h |

# Scope of delivery

**Scope of delivery**

| Quantity | Description |
|---|---|
| 1 | SCC-C sample gas cooler |
| 2 | Operator's manuals (in English and in German language) |
| | for the model with glass heat exchanger:<br>GL coupling nuts with inset 6 x 4 x 1 threads for a hose or pipe<br>(2 per heat exchanger) |

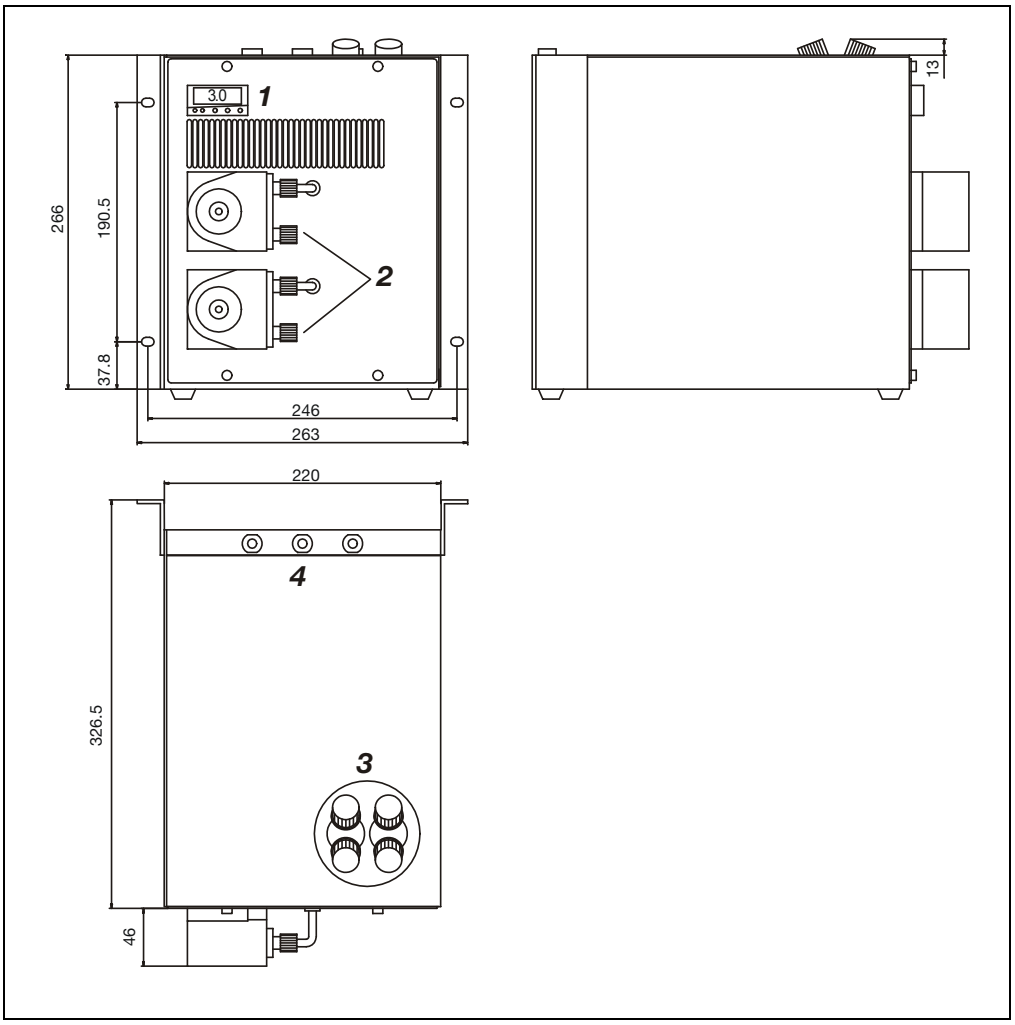
The fixing brackets are fitted by the factory.

# Dimensional drawing

**Fig. 1**

**Dimensional drawing**

(Dimensions in mm)




***1*** Temperature controller
***2*** Condensate outlet (in the model with peristaltic pumps)
***3*** Heat exchanger sample gas connections
***4*** Passages for the (Fixed) electrical connection cables

- You must take the additional space requirement into account
  - Adjacent to the instrument on the right-hand side for the cooling air inlet, and in front of the instrument for the cooling air outlet (approx. 10 cm in each case),
  - in front of and underneath the instrument for connecting the condensate pipes and
  - above the instrument for connecting the sample gas lines and the electrical leads.
- The fixing brackets are fitted in the factory, with about 2.5 cm projection to the rear wall.
- Slope max. 5°.

# Chapter 2 Sample gas cooler installation and start-up

**WARNING!**

**The sample gas cooler should always be transported and stored with the gas ports up. Otherwise the oil in the compressor circuit could leak from the compressor cap.**

**The sample gas cooler must stand in its operating position for about 24 hours prior to commissioning.**

- If there is shipping damage which points to improper handling file a damage claim with the shipper (railway, mail or freight carrier) within seven days.
- Make sure that none of the enclosed accessories are lost during unpacking (see the “Scope of delivery” section, page 10).
- Keep the shipping box and packaging material for future shipping needs.

## Sample gas cooler installation

**Sample gas cooler installation**

| Step | Action |
|---|---|
| Installation on the wall | |
| 1 | Fit the sample gas cooler to the wall using 4 M6 screws.<br>The fixing brackets required for this purpose are secured at the rear entry of the side walls in the factory.<br>To enable the cooling air to also pass unobstructed out of the sample gas cooler to the rear, the projection of the mounting brackets of around 2.5 cm to the rear wall, which is set up in the factory, must not be reduced. |
| Installation in a 19-Inch cabinet/Rack | |
| 1 | Unscrew the mounting brackets from the rear of the side covers and screw them securely at the front of the side covers, flush with the front cover, using the drill holes provided for this purpose. |
| 2 | Install the sample gas cooler in a 19-inch cabinet/rack using 4 M6 screws. |

**Compressor transportation restraints release**

Using a Ph2 cross-head screwdriver, turn the two screws counterclockwise through the holes in the base plate up to the point at which resistance can be felt.

**Installation of Sample gas cooler and sample gas feed unit side-by-side**

Installation of sample gas cooler and sample gas feed unit side-by-side is described in the SCC-F sample gas feed unit operator’s manual (publication no. 42/23-51 EN).

The SCC-F sample gas feed unit is not available in a Category 3G explosion-proof version.

# Sample gas and condensate pipe connection

**Sample gas and condensate connections**

| Heat exchanger material | Sample gas inlets and outlets | Condensate outlet Heat exchanger | Peristaltic pump |
|---|---|---|---|
| Glass | Hose/pipe thread GL18 | Pipe nipple GL25 | DN 4/6 mm |
| PVDF | Pipe 6 x 1 mm | G 3/8 inch | DN 4/6 mm |
| Stainless steel | G 1/4 inch | G 3/8 inch | DN 4/6 mm |

**Sample gas pipe connection**

Connect sample gas pipes to the sample gas inlets and outlets on the top side of the heat exchangers. The sample gas pipes should be made from material that is suited to the measuring task.

- The connections for sample gas inlet and outlet must be connected the right way round. The connections are identified by arrows on the heat exchangers.
- Glass heat exchangers: Before fitting the GL coupling nuts you should check that the PTFE/silicone compression fittings are not damaged. The compression fittings should be fitted with their white PTFE surface facing the glass.
- PVDF and stainless-steel heat exchangers: Screw suitably-sized pipe/hose connectors onto the pipe nipples.
- Make sure that the compression fittings and sealing rings are assembled in the right order
- When tightening the screw joints you should relieve the strain on the connection pieces, for example by using a spanner to counteract the rotation. Failure to protect the connection pieces in this way may result in them twisting and the seals consequently being impaired.
- It is important to observe the sample gas inlet conditions (see page 10).

**Condensate pipe connection**

Connect the condensate pipe to the condensate outlet on the heat exchanger or peristaltic pump.

- Glass heat exchangers: Before fitting the GL coupling nuts you should check that the PTFE/silicone compression fittings are not damaged. The compression fittings should be fitted with their white PTFE surface facing the glass.
- PVDF and stainless-steel heat exchangers: Screw in a suitably-sized pipe/hose screw connection. Only use screw connections conforming to DIN 2999/1 with a tapered R thread in conjunction with a suitable sealing tape/sealing fluid.
- Peristaltic pump: Connect the condensate pipe to the DN 4/6 mm pipe/hose screw connection.
- To avoid any restriction to the removal of condensate, the specified cross sections of removal pipes should not be reduced.

**WARNING!**

**The condensate that accumulates is often acidic. Appropriate precautions should be taken when removing the condensate, and relevant regulations on disposal should be complied with.**

# Reagent dosing connection

**Peristaltic hose pump for reagent dosing**

The peristaltic hose pump for reagent dosing is installed as an option
- either in the sample gas cooler (catalog no. 23070-0-xxxx3xxx0000)
- or in the sample gas feed unit (catalog no. 23212-0-xx1xxx000000).

When the peristaltic pump is installed in the sample gas feed unit it is turned off when a “condensate” failure occurs. When the pump is installed in the sample gas cooler this is not possible.

The pump’s feed performance is 15 ml/hour.

**Material needed**

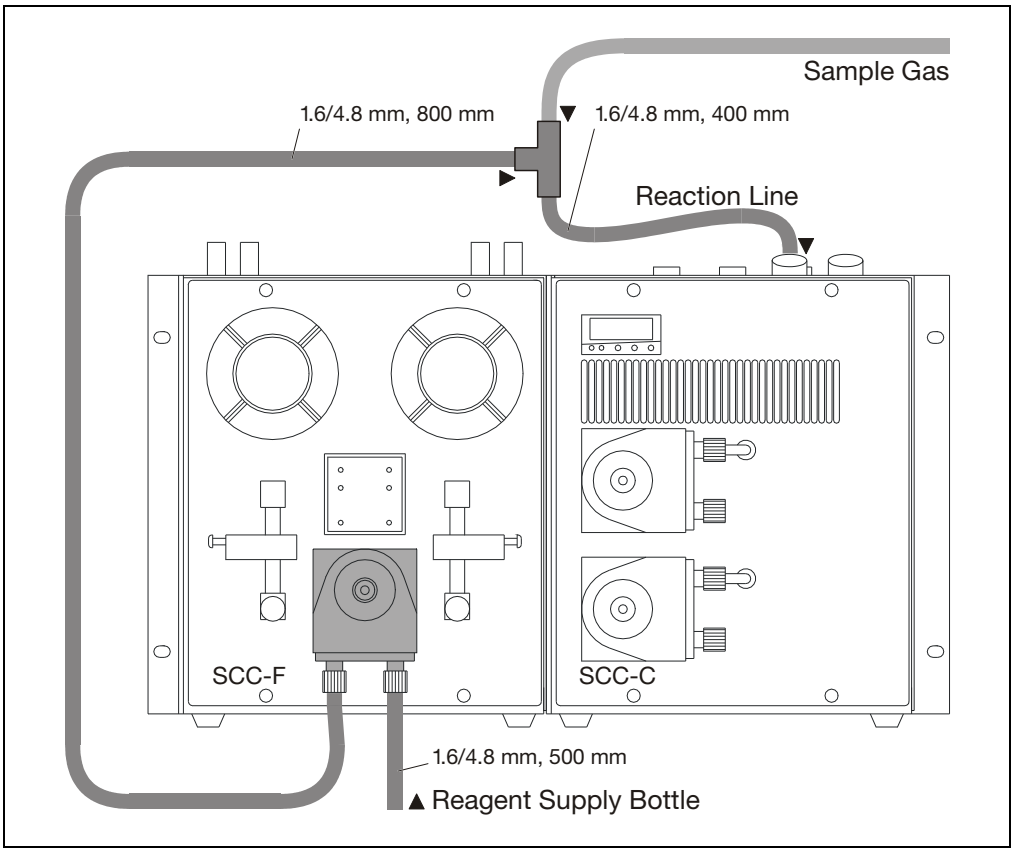
When the sample gas cooler has been ordered in the version “with dosing unit” (catalog no. 23070-0-x1xxxxxx0000) the following material is delivered with the instrument:

| Quantity | Description |
|---|---|
| 1 | T-piece |
| 1 | Hose, length 500 mm (reagent supply bottle – pump) |
| 1 | Hose, length 800 mm (pump – T-piece) |
| 1 | Hose, length 400 mm (T-piece – cooler sample gas inlet) |

**Fig. 2**

**Reagent dosing connection**

(Example: Peristaltic hose pump for reagent dosing installed in the sample gas feed unit)



# Electrical line connection

**WARNING!**

**Follow all applicable national safety regulations for the preparation and operation of electrical devices as well as the following safety precautions.**

**The sample gas cooler operating voltage must be set to match the line voltage before the power supply is connected.**

**The protective lead should be attached to the protective lead connector before any other connection is made.**

**The sample gas cooler can be hazardous if the protective lead is interrupted inside or outside the sample gas cooler or if the protective lead is disconnected.**

**Work on live parts may not be carried out until the environment has been cleared as “safe”.**

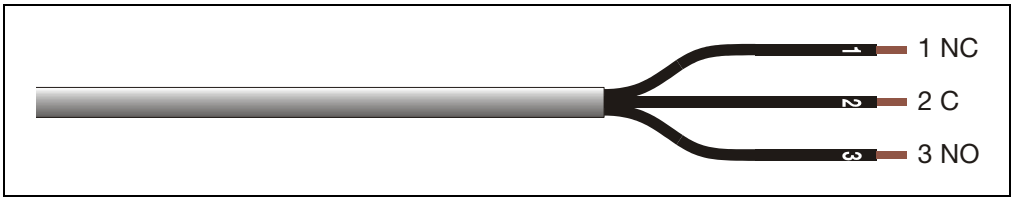
You should route the signal lines separately from the power supply lines.

**Connecting signal lines**

The signal lines (temperature monitoring status signal) should be connected in accordance with the numbering of the wires (see Fig. 3).

**Fig. 3**

**Signal lines**




**Connecting the sample gas cooler to the sample gas feed unit**

In case the SCC-C sample gas cooler is used in conjunction with the SCC-F sample gas feed unit (e.g. in an analysis system), it is possible to connect the power supply and the temperature monitoring status signal (temperature alarm) of the sample gas cooler to the sample gas feed unit.

If a temperature alarm occurs in the sample gas cooler the diaphragm pumps in the sample gas feed unit are turned off.

Electrical connection of the sample gas cooler to the sample gas feed unit is described in the SCC-F sample gas feed unit operator’s manual (publication no. 42/23-51 EN).

*Continued on next page*

**Connecting the power supply**

| Step | Action |
|---|---|
| 1 |  Make sure the voltage shown on the rating plate matches the line voltage.<br>  The operating voltage cannot be switched over. |
| 2 | Make sure the power supply leads have an adequately dimensioned protective device (breaker). |
| 3 | Install a switched outlet or a breaker in the power supply wiring near the sample gas cooler. This should allow the sample gas cooler and all switches to be completely disconnected from the power supply if necessary. The disconnection device should be identified in such a way that its relationship to the equipment that it is designed to disconnect can be clearly seen. |
| 4 | Connect the power supply wiring to the power supply.<br>  The sample gas cooler may start when the power supply is connected. |

# Power supply activation, lead time

**WARNING!**

**Before activating the power supply check once again that the operating voltage setting matches the line voltage (see rating plate)**

**The sample gas flow should only be started after the lead time period.**

**Power supply activation**

Activate the power supply using the externally installed breaker or the switched outlet.

The peristaltic pumps start to run (counterclockwise).

**Lead time**

The lead time is approx. 15 minutes. This allows the sample gas outlet temperature of +3 °C, which is set in the factory, to be reached.

**Status signal**

During the lead time the monitor will output the temperature alarm signal.

**Readiness**

At the end of the lead time period the sample gas cooler is ready for operation.

**Sample gas supply**

The sample gas must not be switched on until the sample gas outlet temperature lies within the limit values set in the factory, i.e. when it has fallen below +6 °C.

# Chapter 3 Maintenance

**WARNING!**

**The operations described in this chapter require specialized knowledge, and sometimes involve the necessity of working on the sample gas cooler with its cover open and live. They must therefore only be carried out by qualified and specially trained persons.**

**Special information on the Category 3G explosion-proof version: Work on live parts may not be carried out until the environment has been cleared as "safe". The fuses may not be changed until the sample gas cooler has been switched off-circuit or the environment has been cleared as "safe". The controller flap cover may not be opened until the environment has been cleared as "safe" (free of explosive atmosphere).**

## Removing and installing heat exchangers

**Cleaning the heat exchanger**

The heat exchanger must be removed and re-installed when it is dirty and requires cleaning.

**WARNING!**

**Residual condensate may be present in the heat exchanger. The condensate is often acidic. Appropriate precautions should be taken, and relevant regulations on disposal should be complied with.**

**Removing and installing the heat exchanger**

(see Fig. 4)

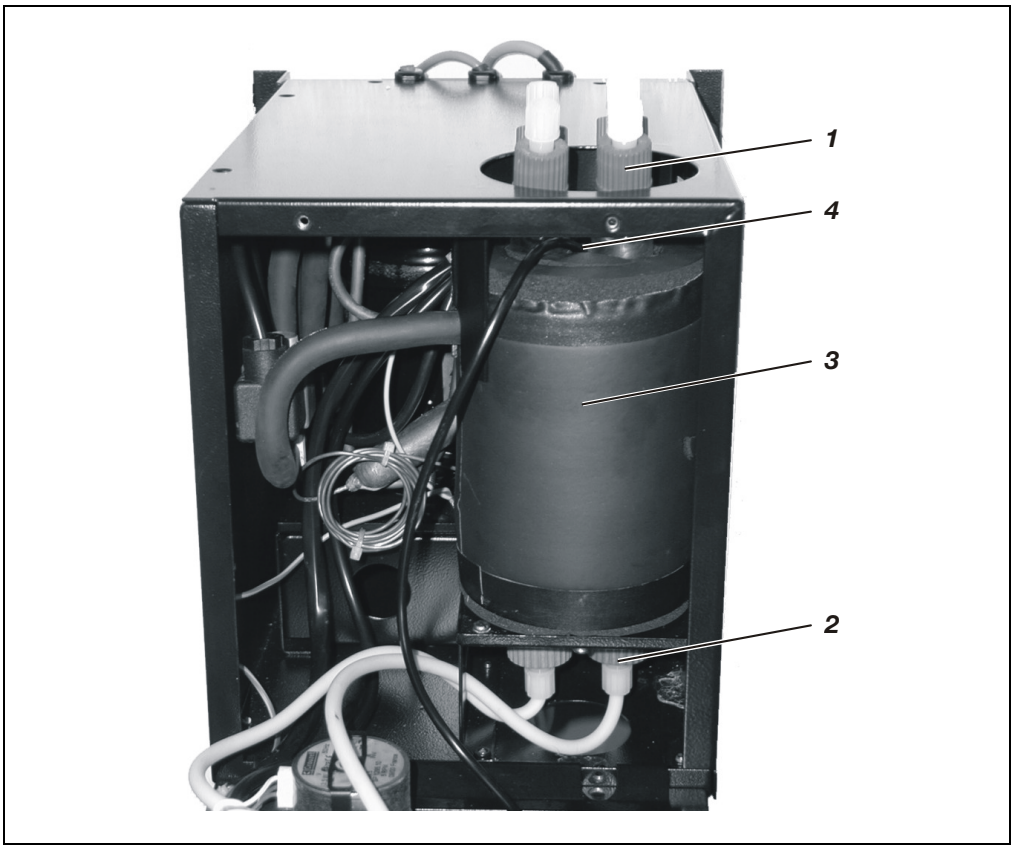
| Step | Action |
|---|---|
| 1 | Stop the sample gas supply and shut off the sample gas cooler power supply. |
| | Remove the heat exchanger: |
| 2 | Disconnect sample gas and condensate pipes from connections ***1*** and ***2*** respectively of the heat exchanger. |
| 3 | Turn the heat exchanger slightly and draw it upwards to remove it from the cooling block ***3***. |
| | Prepare for installation of the heat exchanger: |
| 4 | Using a cloth, clean and dry the opening in the cooling block and the heat exchanger. |
| 5 | Use some adhesive tape to close off the condensate outlet on the heat exchanger in order to prevent the ingress of thermal conductive paste into the heat exchanger during installation. |
| 6 | Spread an even thin coating of thermal conductive paste over the entire surface of the opening in the cooling block and the heat exchanger in order to ensure good thermal transition. |

*Continued on next page*

| Step | Action |
|---|---|
| | Install the heat exchanger: |
| 7 | Insert the heat exchanger in the opening in the cooling block ***3*** and, turning it slightly, push it downwards right to the limit stop. |
| 8 | Remove the adhesive tape from the condensate outlet on the heat exchanger and remove any thermal conductive paste that has been squeezed out. |
| 9 | Connect the sample gas and condensate pipes to connections ***1*** and ***2*** respectively of the heat exchanger.<br>Note the following points when installing a glass heat exchanger: Before fitting the GL coupling nuts you should check that the PTFE/silicone compression fittings are not damaged. The compression fittings should be fitted with their PTFE surface facing the glass. The GL coupling nuts should be hand-tightened. |
| 10 | Ensure that the temperature sensor ***4*** is inserted in the cooling block all the way to the limit stop. |
| | Start the sample gas cooler again: |
| 11 | Verify the integrity of the open gas path. |
| 12 | Switch power supply to sample gas cooler back on. |
| 13 | The sample gas flow should only be restarted after the lead time period. |

**Fig. 4**

**Sample gas cooler, front view, with front cover open**




***1*** Heat exchanger sample gas connections
***2*** Condensate connections of the heat exchangers
***3*** Cooling block
***4*** Temperature sensor

# Replacing peristaltic pump hoses

**When should the hoses be replaced?**

Depending on the operating cycle, the peristaltic pump hoses should be replaced at least every 5 months.

**WARNING!**

**The hoses on the peristaltic pumps should never be lubricated.**

**The hoses can contain condensate residue. These materials can flow out when the hose connections are opened. Take appropriate measures where needed to collect residual condensates.**

**The condensate is often acidic. Appropriate precautions should be taken, and relevant regulations on disposal should be complied with.**

**Replacing peristaltic pump hoses**

(see Fig. 5)

| Step | Action |
|---|---|
| 1 | Stop the sample gas supply and shut off the sample gas cooler power supply. |
| | Remove the old hose: |
| 2 | Remove the hoses from the hose connections ***4***. |
| 3 | Using the handles, press the moving belt ***1*** together and turn the s-clip ***2*** in a clockwise direction as far as its limit stop. |
| 4 | Remove the moving belt ***1*** from the pump head and pull the old hose ***3*** by the hose connections ***4*** to release it from the moving belt's guides. |
| 5 | Press the pressure rollers ***5*** together and check the spring pressure; if it is too weak, then the pressure springs and possibly rollers should be replaced (see page 22). |
| | Fit a new hose: |
| 6 | Insert a new hose ***3*** with hose connections in the guides on the moving belt ***1***. |
| 7 | Insert moving belt ***1*** with the new hose in the dovetail guide ***6*** in the pump head; using the handles, press the moving belt together while at the same time turning the s-clip ***2*** counterclockwise until it engages. |
| 8 | Screw hoses to the hose connections ***4***.<br>Take care not to kink or crush the hoses. |
| | Restart the sample gas cooler: |
| 9 | Switch on power supply to sample gas cooler. |
| 10 | The sample gas flow should only be restarted after the lead time period. |

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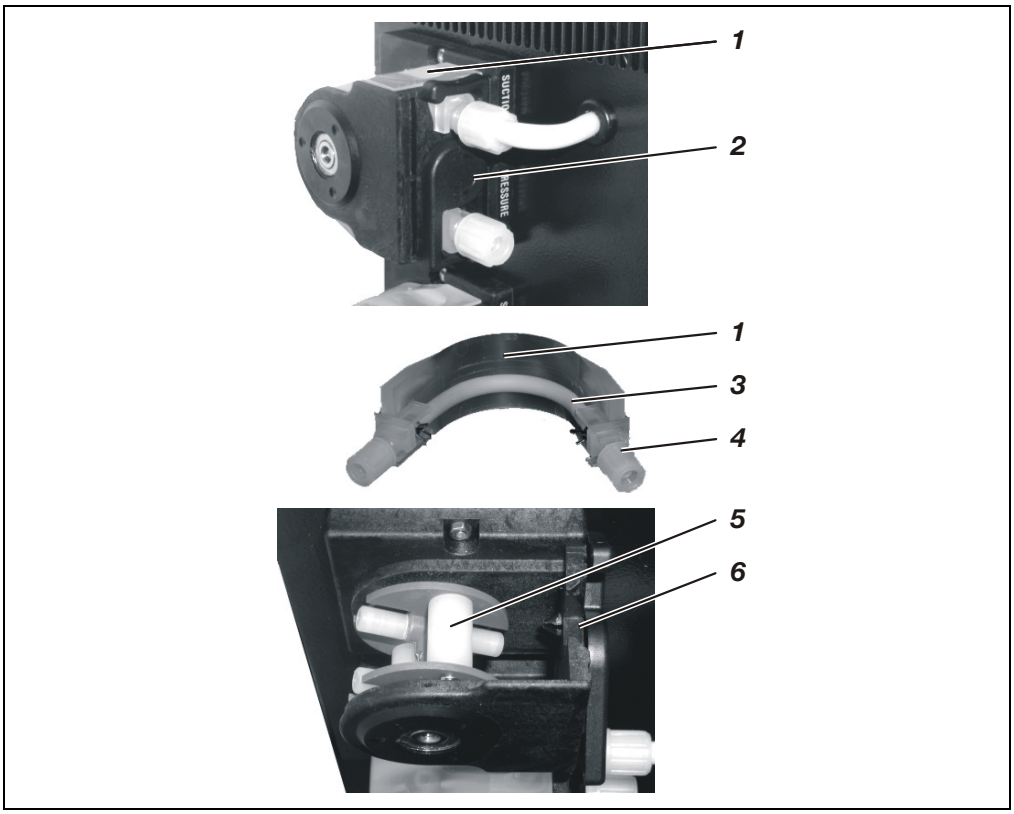
**Fig. 5**

**Peristaltic pump, pump hose and pump head with roller mounting**




***1*** Moving belt
***2*** S-clip
***3*** Peristaltic pump hose
***4*** Hose connections
***5*** Pressure rollers
***6*** Dovetail guide

# Replacing peristaltic pump pressure rollers and springs

**When do the pressure rollers and springs need to be replaced?**

The pressure rollers in the peristaltic pumps must be replaced when their surface is damaged.

The pressure springs in the peristaltic pumps must be replaced when they are broken.

**Replacing pressure rollers and springs**

(see Fig. 6)

| Step | Action |
|---|---|
| 1 | ⚠ Stop the sample gas supply and shut off the sample gas cooler power supply. |
| | Remove the hose from the peristaltic pump: |
| 2 | Using the handles, press the moving belt ***1*** together and turn the S-clip ***2*** in a clockwise direction as far as its limit stop; then remove the moving belt and peristaltic pump hose from the pump head. |
| | Dismantle the pump head: |
| 3 | Unscrew the two nuts ***3*** that secure the pump head (spanner size 5.5). |
| 4 | Pull the pump head ***4*** off the roller bearing axle, and remove the roller support ***5*** from the pump head. |
| | Replace pressure rollers and springs: |
| 5 | Remove the pressure springs ***6*** from the hole in the roller support ***5*** and from the retaining slot in the roller axle ***7***. Remove the roller axle from the roller support and pull the pressure roller ***8*** off the roller axle. |
| 6 | Push the new pressure roller ***8*** onto the roller axle ***7*** and secure with new pressure springs ***6*** in the roller support ***5***. |
| | Fit the pump head: |
| 7 | Insert the roller support ***5*** in the pump head ***4***, and push both components together onto the roller support axle. During this process, check to endure that the roller support axle and roller support fit together properly. |
| 8 | Secure the pump head ***4*** with the two nuts ***3***.<br>ⓘ It is expedient to open the front cover forwards: this enables the pump's base plate with the fastening screws to be secured from inside. |
| | Refit the peristaltic pump hose: |
| 9 | Insert moving belt ***1*** with the peristaltic pump hose in the pump head; using the handles, press the moving belt together while at the same time turning the S-clip ***2*** counterclockwise until it engages. |
| | Start the sample gas cooler again: |
| 10 | Switch power supply to sample gas cooler on. |
| 11 | The sample gas flow should only be restarted after the lead time period. |

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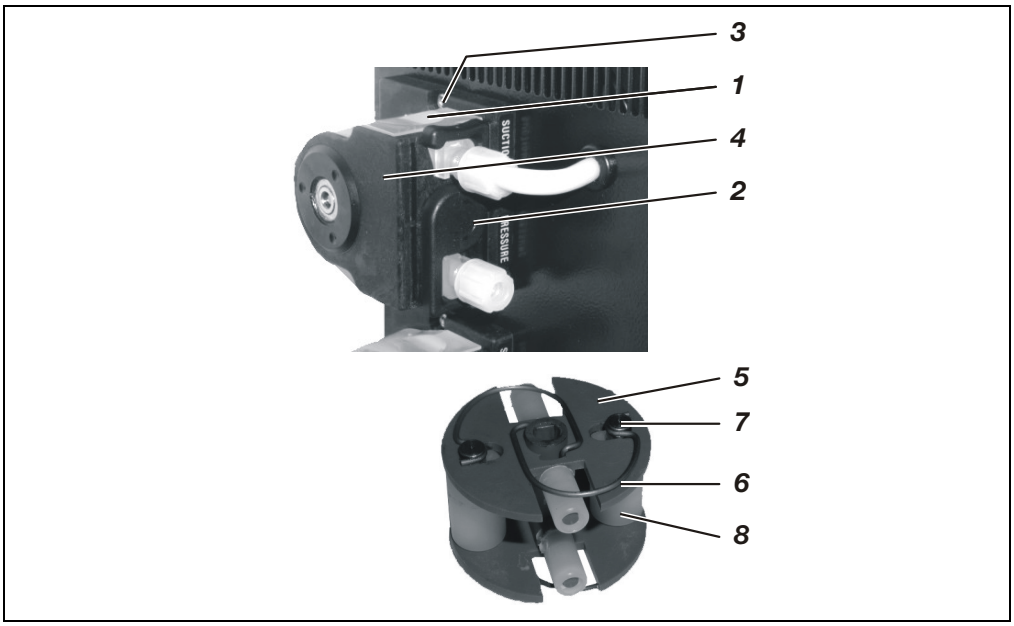
**Fig. 6**

**Peristaltic pump, roller support**




***1*** Moving belt
***2*** S-Clip
***3*** Nuts for securing the pump head (x 2)
***4*** Pump head
***5*** Roller support
***6*** Pressure springs (x 4)
***7*** Roller axle
***8*** Pressure roller (x 2)

# Clean condenser fins

**When should the condenser fins be cleaned?**

Cooling performance is reduced by the accumulation of dust on the condenser fins.

For this reason the condenser fins should be inspected regularly and cleaned if any dust deposits are visible.

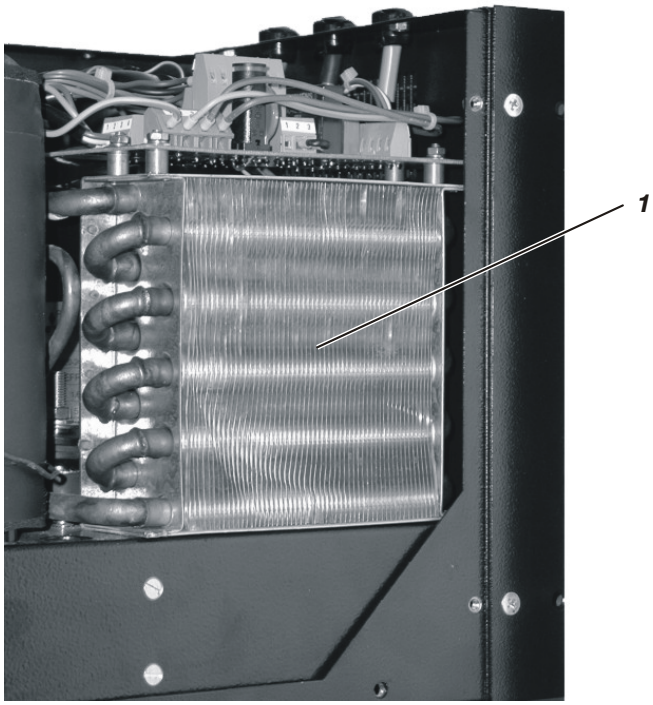
**Cleaning the condenser fins**

(see Fig. 7)

| Step | Action |
|---|---|
| 1 | ⚠ Stop the sample gas supply and shut off the sample gas cooler power supply. |
| 2 | Undo the 4 fastening screws on the front cover and open it forwards (the front cover remains attached in the rebate of the base plate). |
| 3 | Undo the 8 fastening screws on the covering hood, release the cable lug of the protective leads from the quick terminal on the inside of the covering hood, then lift the covering hood off. |
| 4 | Carefully blow compressed air onto the condenser fins ***1***. |
| 5 | Press the cable lug of the protective leads onto the quick terminal on the inside of the covering hood, put the covering hood in place (taking care not to trap any cables or hoses), and secure it in place with the 8 screws. |
| 6 | Close front cover (taking care not to trap cables or hoses), and fasten it with the 4 screws. |
| 7 | Switch power supply to sample gas cooler on. |
| 8 | The sample gas flow should only be restarted after the lead time period. |

**Fig. 7**

**Condenser**




***1*** Condenser fins

# Troubleshooting

| Problem | Cause | Remedy |
|---|---|---|
| **Condensate in the sample gas outlet** | Ambient temperature < 5 °C | • Heat the downstream assemblies. |
| | Sample gas cooler overloaded | • Ensure sample gas inlet conditions (see page 10) and operating specifications (see page 31) are followed. |
| | Defective peristaltic pump | • Replace the peristaltic pump. |
| | Defective pump hose | • Replace hose (see page 20). |
| | Cooling performance inadequate although sample gas cooler not overloaded | • Provide adequate cooling air flow.<br>• The fan should operate.<br>• Maintain the minimum clearance with respect to adjacent units or walls (see page 11).<br>• Clean condenser fins (see page 24). |
| | Compressor motor breaker tripped | • Eliminate the thermal overload caused by the sample gas flow or excessive ambient temperature.<br>• Clean condenser fins (see page 24).<br>• Ensure sample gas inlet conditions (see page 10) and operating specifications (see page 31) are followed.<br>• Allow the compressor to cool before the next run. |
| **Sample gas flow blocked** | Sample gas paths contaminated | • Contamination can result from the failure to remove dust or sublimates. Ensure dust is removed before the sample gas enters the sample gas cooler; eliminate sublimates prior to this point.<br>• Clean the sample gas lines and cooling system; consider the effects of corrosion and reduced service life when using chemical cleaners and flush with an inert gas in order to avoid any cleaning agent influence on measurement results. |
| **Inaccurate temperature indication** | Defective temperature controller | • Replace temperature controller. |
| | Refrigerant escaping | • Send the sample gas cooler to the service department for service. |
| **Defective sample gas cooler** | Power supply disconnected | • Reconnect the sample gas cooler power supply. |
| | Defective motor breaker or winding, i.e. the compressor motor is not running | • Measure the electrical resistance of the motor winding (guide value is approx. 40 Ω).<br>• If the difference is considerable (with measuring circuit open or short-circuited), then the motor breaker should be replaced.<br>• If the motor winding is defective, send the sample gas cooler to the service department for repair. |
|  | **Special information on the Category 3G explosion-proof version:**<br>**Work on live parts may not be carried out until the environment has been cleared as “safe”. The fuses may not be changed until the sample gas cooler has been switched off-circuit or the environment has been cleared as “safe”. The controller flap cover may not be opened until the environment has been cleared as “safe” (free of explosive atmosphere).** | |

# Chapter 4 Sample gas cooler shutdown and packing

## Sample gas cooler shutdown

**Sample gas cooler shutdown**

| Step | Action |
|---|---|
| 1 | Disconnect the sample gas cooler power supply. |
| 2 | Shut off the sample gas supply to the sample gas cooler. |
| 3 | Loosen the sample gas and condensate lines from the sample gas cooler ports.<br>⚠ The condensate that accumulates is often acidic. Neutralize the condensate if necessary, and comply with relevant regulations on disposal. |
| 4 | Thoroughly purge the sample gas cooler gas paths with an inert gas. |
| 5 | Fully tighten the gas connections. |
| 6 | Remove the electrical lines from the connectors. |

If the sample gas cooler is returned to ABB Service, e.g. for repair, please indicate which gases have been supplied to the sample gas cooler. This information is needed so that service personnel can take any safety precautions required for harmful gases.

Make sure the sample gas cooler is free of residual moisture that can freeze if low temperatures are encountered during shipping and storage.

Ambient temperature for storage and transportation: –25 to +60 °C

# Sample gas cooler packing

**Activate compressor transportation restraints**

Using a Ph2 cross-head screwdriver, turn the two screws clockwise through the holes in the base plate to the point at which the compressor housing is in contact with the base plate (noticeable resistance).

**Packing**

| Step | Action |
|---|---|
| 1 | If the original packaging is not available, cover the sample gas cooler with bubble foil or corrugated cardboard.<br>When shipping overseas additionally place the sample gas cooler in a 0.2-mm thick polyethylene bag, add a drying agent (such as silica gel) and seal the bag air-tight.<br>Use an amount of drying agent appropriate for the package volume and the planned shipping schedule (at least 3 months). |
| 2 | Place the sample gas cooler in an adequately sized box lined with shock-absorbing material (e.g. foam).<br>The shock-absorbing material's thickness should be adequate for the sample gas cooler's weight and the mode of shipping.<br>When shipping overseas additionally wrap the box in a layer of protective waterproof wrapping. |
| 3 | Mark the box "Fragile item" and "Transport upright". |

**Ambient temperature**

Ambient temperature for storage and transportation: –25 to +60 °C

## Sample gas cooler applications and functions

**Sample gas cooler applications**

The SCC-C sample gas cooler forms part of the sample gas conditioning system in an analysis system.

The moist sample gas is cooled in the sample gas cooler to such a degree that the temperature does not fall below the dew point at any point further on in the system, and thus no condensate can penetrate the analyzer.

**Sample gas cooler functions**

The functions of the SCC-C sample gas cooler are:
- Cooling the sample gas,
- Separating off the condensate and
- Removing the condensate.

With some specific measuring tasks the dew point of the sample gas must be kept constant in order to nullify the influence of the water vapor on the measurement result. In these cases, turning on the test gas before the sample gas cooler has the effect of keeping the water vapor percentage in calibration constant.

**Use in conjunction with the SCC-F sample gas feed unit**

The SCC-C sample gas cooler can be used in conjunction with the SCC-F sample gas feed unit.

The functions of the SCC-F sample gas feed unit are:
- Monitoring condensation,
- Feeding the sample gas, and
- Setting and monitoring the flow rate.

The functionality and operation of the SCC-F sample gas feed unit are described in the operating manual (document no. 42/23-51 EN).

The SCC-F sample gas feed unit is not available in a Category 3G explosion-proof version.

**Principle**

The SCC-C sample gas cooler contains 1 or 2 heat exchangers in which the sample gas is cooled down to around +3 °C.

**Refrigerant circuit**

(see Fig. 8)

Depending on the operating conditions, the refrigerant compressor ***1*** compresses the vaporous refrigerant from suction pressure of around 100 kPa (= 1.0 bar) to 800–1700 kPa (= 8–17 bar).

In the downstream air-cooled refrigerant condenser ***2*** the vaporous refrigerant is condensed by means of cooling. The liquid refrigerant flows through the refrigerant drier ***3*** to the capillary pipe ***4***.

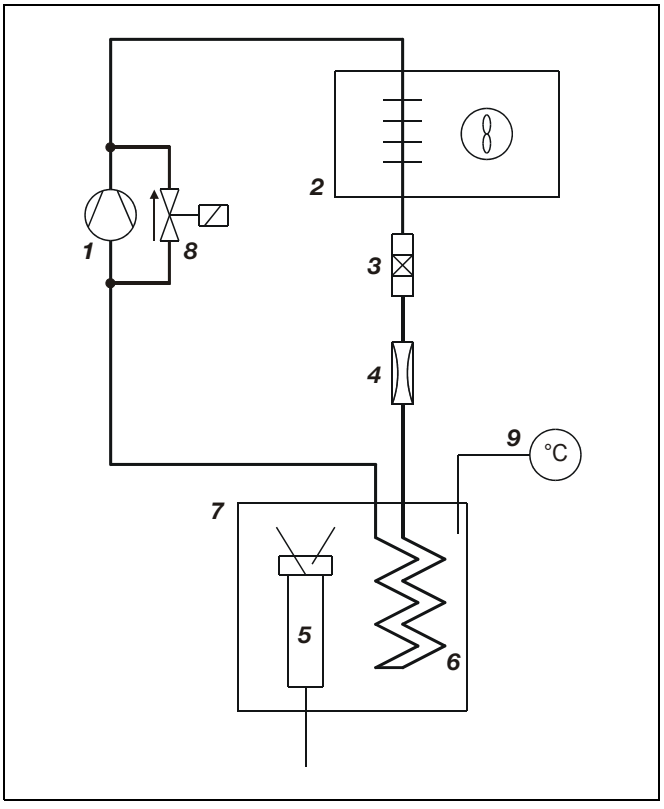
In the capillary tube ***4*** the pressure of the liquid refrigerant is reduced from its condensation pressure 800–1700 kPa (= 8–17 bar) to a lower pressure (evaporation pressure) 100 kPa (= 1.0 bar), and the refrigerant passes into the evaporator ***6***.

In the heat exchanger ***5***, which is inset in a hole in the cooling block ***7***, energy is extracted from the sample gas; the sample gas is cooled, and the energy is fed into the vaporous refrigerant at an evaporation pressure of 100 kPa (= 1.0 bar, approx. –10 °C). The vaporous refrigerant is sucked in once more by the refrigerant compressor ***1***.

In order to keep the sample gas outlet temperature (dew point) constant, the refrigerant mass flow is regulated by the temperature-controlled valve ***8*** in the bypass of the refrigerant compressor ***1*** in accordance with the output required. The valve is open when no cooling is required.

**Fig. 8**

**Refrigerant circuit**




***1*** Refrigerant compressor
***2*** Refrigerant condenser
***3*** Refrigerant drier
***4*** Capillary Tube
***5*** Heat exchanger
***6*** Evaporator
***7*** Cooling block
***8*** Valve
***9*** Temperature controller

*Continued on next page*

**Condensate removal**

The condensate that accumulates comes out via the condensate nozzle on the heat exchanger ***5*** (see Fig. 8).

The condensate is removed automatically by the peristaltic pump, which is incorporated as an optional extra.

**Sample gas outlet temperature measurement and display**

The measuring gas outlet temperature is measured using the Pt-100 temperature sensor in the cooling block ***7*** of the sample gas cooler, and displayed in digital form in °C on temperature controller ***9*** (see Fig. 8). The sample gas outlet temperature is set in the factory to +3 °C.

**Sample gas outlet temperature monitoring**

The temperature controller sends out a status signal if the temperature rises above/falls below the respective limit values of +3 °C ± 3 °C as set up in the factory. This signal is present at a floating change-over contact that is rated up to 250 V AC/2 A.

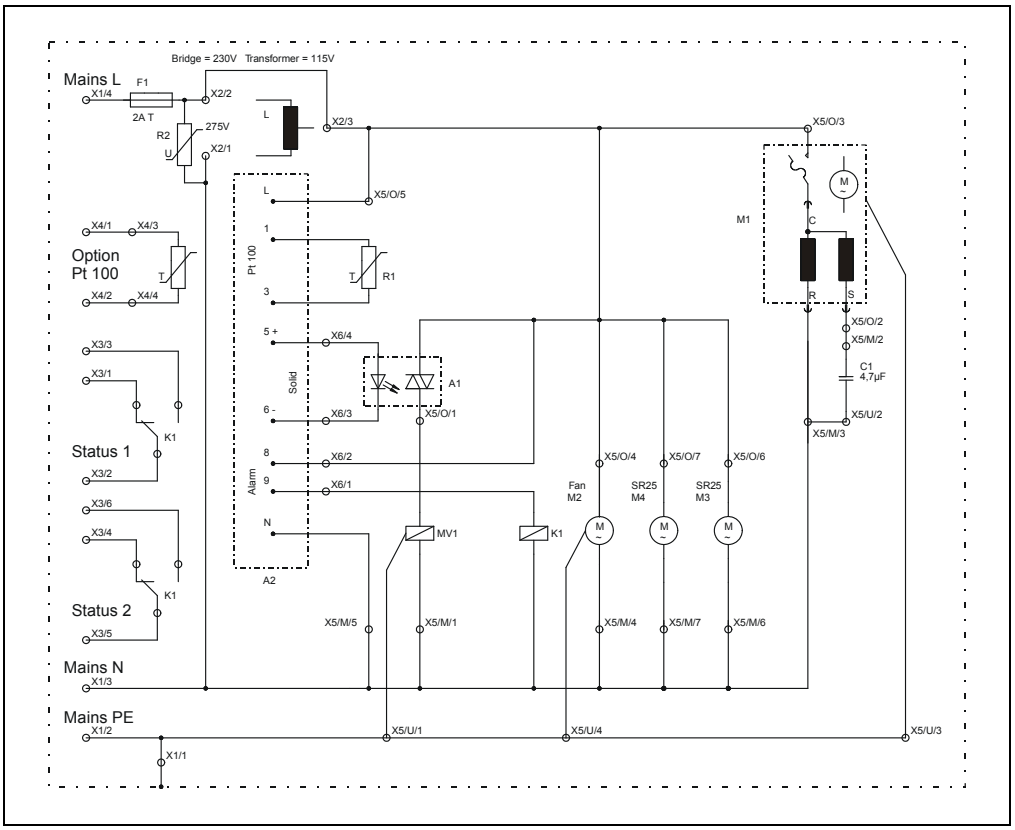
**Set point adjustment**

The set point for the sample gas outlet temperature can be set at the temperature controller:

Press key P; the set point is displayed. Use arrow keys to adjust the set point. Press key P; the new set point is stored.

**Fig. 9**

**Circuit diagram**



# Operating specifications

**Operating specifications**

| | |
|---|---|
| Sample gas outlet temperature | Factory-set to + 3 °C |
| Dew point stability | ≤ ±0.3 °C per 10 °C temperature change,<br>≤ ±0.3 °C per 10 l/h flow change |
| Overall cooling performance | 40 W (at +10 to +50 °C) |
| Lead time | Approx. 15 min |
| Heat exchanger pressure loss | Approx. 1 hPa (1 mbar)<br>Approx. 4 to 8 hPa (4 to 8 mbar) for HE125 |

Heat exchanger dead volume

| Heat exchanger material | HE125 | HE250 |
|---|---|---|
| Glass | 40 ml | 140 ml |
| PVDF | 25 ml | 100 ml |
| Stainless steel | 30 ml | 100 ml |

Gas seal integrity: $5 \times 10^{-6}$ hPa l/s

Translation

1 **Type Examination Certificate**

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

3 Type Examination Certificate Number: **BVS 16 ATEX E 056 X**

4 Product: **Gas cooler type SCC-C**

5 Manufacturer: **ABB Automation GmbH**

6 Address: **Stierstädter Straße 5, 60488 Frankfurt, Germany**

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

8 DEKRA EXAM GmbH 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 16.2137 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 60079-15:2010 Type of Protection "n"**

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 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:

**Ⓔx II 3G Ex nA nC IIC T4 Gc**

DEKRA EXAM GmbH
Bochum, 2016-08-08

Signed: Dr. Franz Eickhoff
Certifier

Signed: Ute Hauke
Approver




DEKRA EXAM GmbH, Dinnendahlstrasse 9, 44809 Bochum, Germany,
telephone +49.234.3696-105, Fax +49.234.3696-110, zs-exam@dekra.com

*Continued on next page*

13 **Appendix**

14 **Type Examination Certificate**
**BVS 16 ATEX E 056 X**

15 **Product description**

15.1 **Subject and type**

Gas cooler type SCC-C

15.2 **Description**

The gas cooler type SCC-C is used for the dew point of humid sample gases in the Analysis technology to prevent condensation in analysers.

The gas cooler type SCC-C consists of a hermetically sealed cooling circuit of the type of protection nC with an electrical connection of type of protection nA.

The functional components of the control unit are also carried out in type of protection n.

15.3 **Parameters**

15.3.1 Electrical data

| | |
|---|---|
| Rated voltage | 115/230 VAC, 50-60 Hz |
| Rated current | 4.5/ 2.5 A |
| Rated powermax. | 200 VA |

15.3.2 Thermal data

| | |
|---|---|
| Ambient temperature range | +5 °C up to +45 °C |
| Maximum sampling gas input temperature | 130 °C |

15.3.3 Other data

| | |
|---|---|
| Maximum coolant operating pressure | 18 bar |
| Coolant | R134a |




DEKRA EXAM GmbH, Dinnendahlstrasse 9, 44809 Bochum, Germany,
telephone +49.234.3696-105, Fax +49.234.3696-110, zs-exam@dekra.com

*Continued on next page*

16 **Report Number**

BVS PP 16.2137 EU, as of 2016-08-08

17 **Special Conditions for Use**

The equipment has to be installed in a protective enclosure which meets the requirements for IP54 defined in EN 60079-0 clause 26.4.

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 2016-08-08
BVS-Pe/Nu A 20160340

Certifier

Approver




DEKRA EXAM GmbH, Dinnendahlstrasse 9, 44809 Bochum, Germany,
telephone +49.234.3696-105, Fax +49.234.3696-110, zs-exam@dekra.com

# Index

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**ABB Automation GmbH**
Analytical
Stierstaedter Strasse 5
60488 Frankfurt am Main
Germany
Fax: +49 69 7930-4566
E-Mail: cga@de.abb.com

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