ABB MEASUREMENT & ANALYTICS | OPERATING INSTRUCTION | OI/SCC-C-EN REV. H

SCC-C

Sample gas cooler

Standard model and Category 3G explosion-proof version

Measurement made easy

scc-c

Introduction

The SCC-C compressor type gas cooler is used to lower the dew point of humid sample gas to avoid condensation in the analyzers.

An extremely stable and low gas dew point avoids water vapor cross-sensitivity and volumetric errors.

Additional Information

Additional documentation on SCC-C is available for download free of charge at www.abb.com/analytical. Alternatively simply scan this code:

Contents

		Page
	Preface	3
	Intended application, instrument designs	4
	General safety information	5
	Safety tips for handling electronic measurement devices	6
	Information on the Category 3G explosion-proof version	7
Chapter1	**Preparing the installation**	**8**
	Requirements for the installation site	8
	Power supply	8
	Sample gas inlet conditions	9
	Scope of delivery	9
	Dimensional drawing	10
Chapter 2	**Sample gas cooler installation and start-up**	**11**
	Sample gas cooler installation	11
	Sample gas and condensate pipe connection	12
	Reagent dosing connection	13
	Electrical line connection	14
	Power supply activation, lead time	17
Chapter 3	**Maintenance**	**18**
	Removing and installing heat exchangers	19
	Replacing peristaltic pump hoses	21
	Replacing peristaltic pump pressure rollers and springs	23
	Clean condenser fins	25
	Troubleshooting	26
Chapter 4	**Sample gas cooler shutdown and packing**	**27**
	Sample gas cooler shutdown	27
	Sample gas cooler packing	28
Appendix		**29**
	Sample gas cooler applications and functions	29
	Description	30
	Operating specifications	32
	Index	33

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. DS/SCC-EN
This publication can be ordered from your authorized ABB representative or from ABB AG,
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 design

The sample gas cooler in Category 3G explosion-proof design is suited for use in potentially explosive atmospheres (also refer to the notice on page 7). It complies with

- EN 60079-0 'Potentially explosive atmospheres – Part 0: Equipment – General Requirements' and
- EN 60079-7 'Explosive atmospheres – Part 7: Equipment protection by increased safety 'e''
- EN 60079-15 'Hazardous atmosphere – Part 15: device protection through type of protection 'n''.

Additional standards that should be complied with for the design, installation, maintenance and repair of the device are as follows:

- EN / IEC 60079-14
- EN / IEC 60079-17
- EN / IEC 60079-19

Details on the rating plate

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

Improper use

The following are considered to be instances of especially improper use of the device:

- Use as a climbing aid, for example for mounting purposes.
- Use as a bracket for external loads, for example as a support for piping, etc.
- Material application, for example by painting over the housing, name plate or welding or soldering on parts.
- Material removal, for example by spot drilling the housing.

The sample gas cooler may not be used for treating gases that attack the materials of wetted parts (e.g. gases containing chlorine).

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 “Explosive atmospheres – Part 0: Equipment – General requirements” and • EN 60079-7 ‘Explosive atmospheres – Part 7: Equipment protection by increased safety ‘e” • EN 60079-15 “Explosive atmospheres – Part 15: Equipment protection by type of protection 'n'”.
Marking	 II 3G Ex eC 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	Provide adequate natural air circulation around the sample gas cooler. Avoid heat build-up. The cooler should be installed away from sources of heat, with open ventilation and at a minimum distance of 10 cm from other components, so that no interfering heat build-up can occur.	
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) – 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 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 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

The sample gas line must be installed and connected in such a way that no condensation can occur upstream of the heat exchanger.

Unheated line sections must be covered by a suitable insulation material according to Fig. 2 (page 13).

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: GL coupling nuts with inset 6 x 4 x 1 threads for a hose or pipe (2 per heat exchanger)

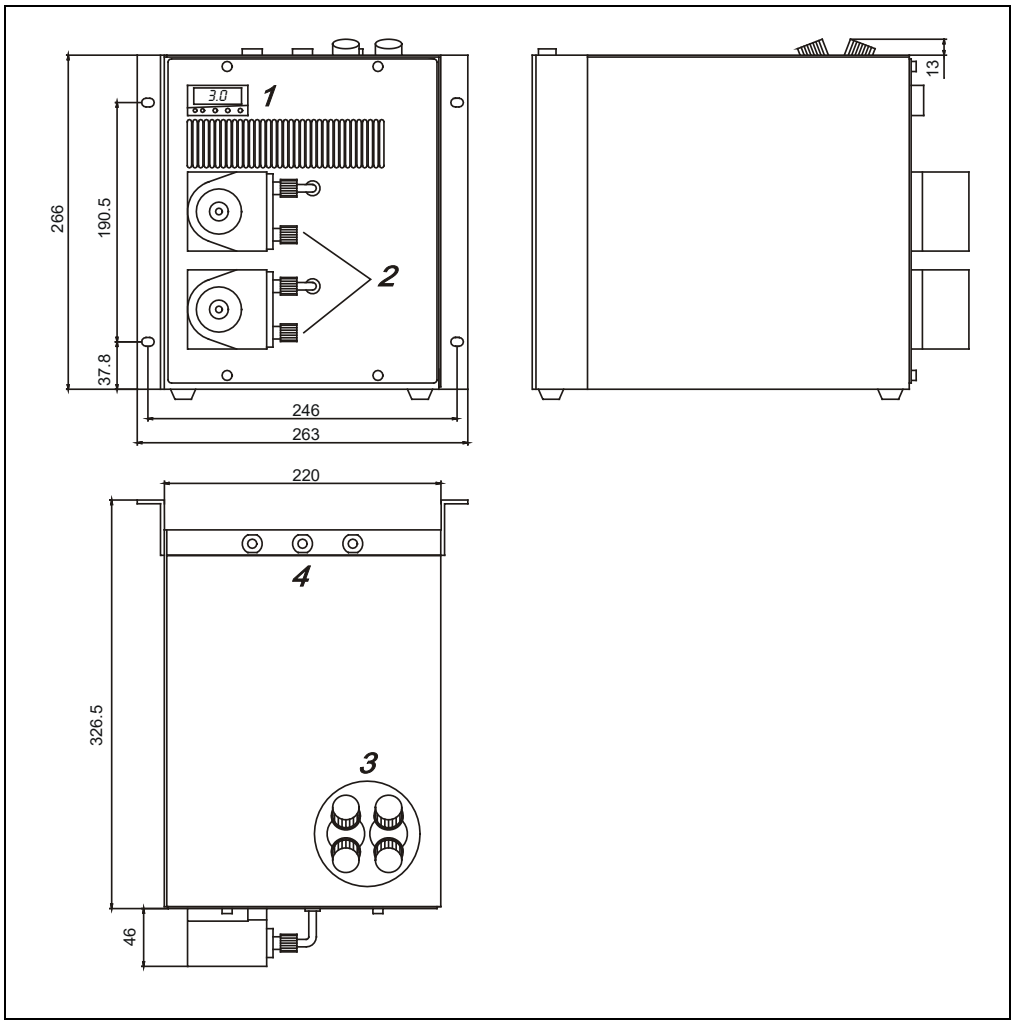
The fixing brackets are fitted by the factory.

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 9).
- 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. The fixing brackets required for this purpose are secured at the rear entry of the side walls in the factory. 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 9).

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.

Material needed

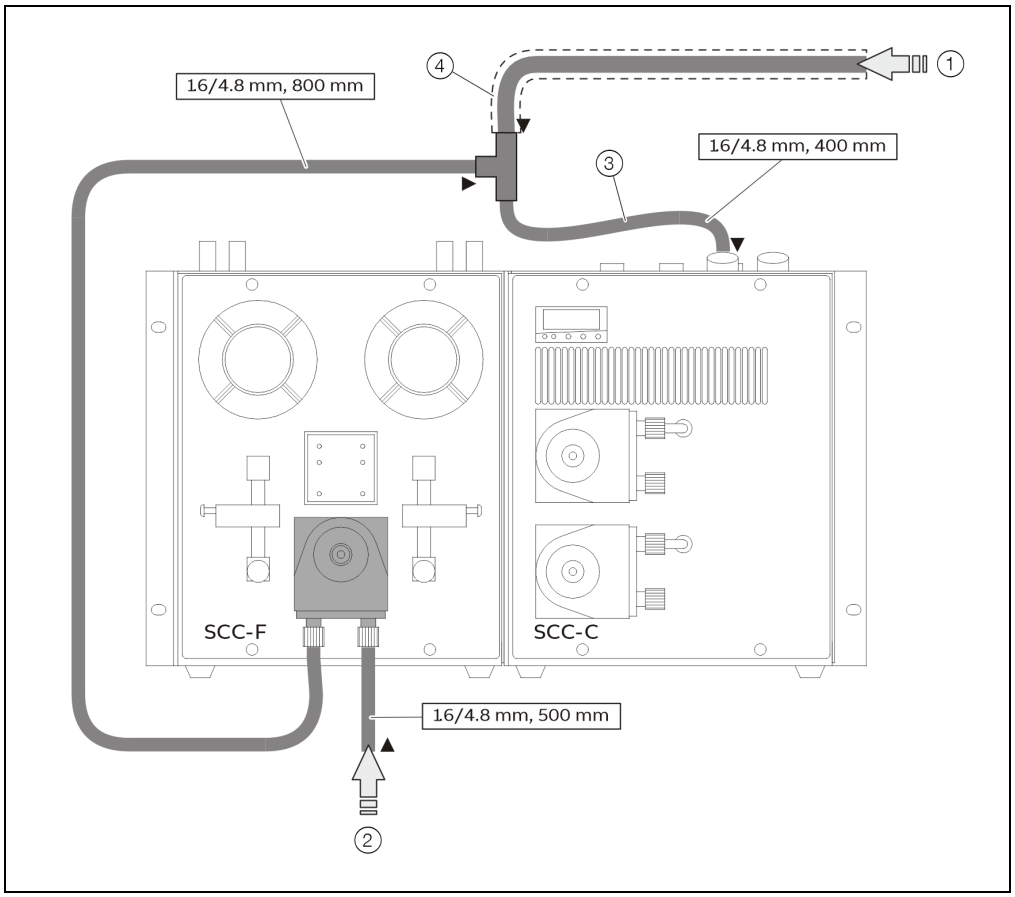
The pump’s feed performance is 15 ml/hour.
When the sample gas cooler has been ordered in the version “with dosing unit” (catalog no. 23070-0-x1xxxxxx0000) the following material is delivered with the instrument:

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)



1 Sample gas

2 Reagent supply bottle

3 Reaction line

4 Insulation

Electrical line connection

WARNING!

Observe the relevant national safety regulations for installing and operating electric systems, as well as the following safety instructions!

Before connecting the power supply, make sure that the operating voltage set on the sample gas cooler (see name plate) matches the mains voltage!

The protective ground connection should be connected to the protective ground before any other connection is made!

The sample gas cooler is potentially hazardous if the protective ground conductor is interrupted inside or outside the sample gas cooler or the protective ground conductor is loosened!

Do not start work on live parts until the environment has been approved as 'safe'.

The device must be grounded (potential equalization terminal). The leakage resistance must be < $10^{6\Omega}$ overall.

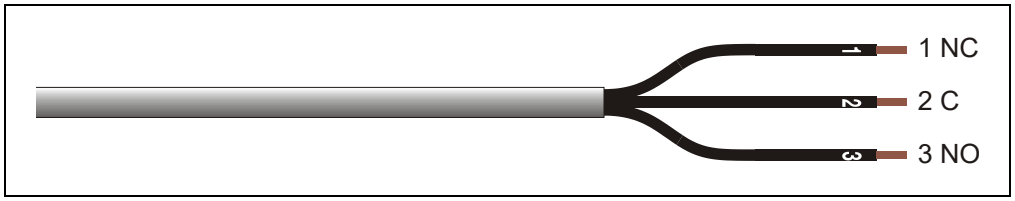
You should route the signal lines separately from the power supply lines.

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

CAUTION!

Increased device internal voltage in devices for 120 V AC line voltage

Devices that connect to a line voltage of 120 V AC have an internal transformer to generate the device internal voltage of 240 V AC required.

The live parts in the device thus have a voltage of 240 V AC.

WARNING!

Damage to the device due to incorrect line voltage

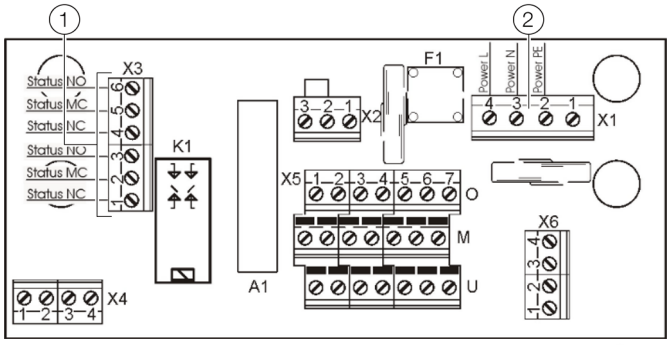
Incorrect line voltage may destroy the device.

Pay attention to the correct line voltage in accordance with the name plate when connecting the device!

Connecting the power supply

Observe the following points when connecting the power supply:

- The requirements of VDE 0100 as well as their relevant standards and regulations must be observed when installing high-voltage systems with nominal voltages of up to 1000 V!
- A circuit breaker with a maximum rated current of 10 A must be installed in the power supply connection lead.
- A mains separator (main switch) must be installed in the power supply connection lead.



(1) Terminal **–X3** status message

(2) Terminals **–X1** power supply

Terminal strip –X1 for power supply

Terminal	Terminal
4 (POWER L)	4 (POWER L)
3 (POWER N)	3 (POWER N)
2 (POWER PE)	2 (POWER PE)
1	1

Step	Action
1	The terminals are located behind the front plate of the SCC-F housing.
2	Remove the front plate of the SCC-F housing.
3	Connect the power supply: Pull a suitable cable* through a cable gland in the cover of the sample gas feed unit and connect to connector strip –X1 in accordance with the electrical connection.
4	Connect status messages: Pull a suitable cable (outer diameter between 8.3 and 9.1 mm) through a cable gland in the cover of the cooler and connect to terminal –X3 or –X16 in accordance with the electrical connection
5	Reattach the front plate of the SCC-F housing.
6	Connect the power supply wiring to the power supply. The sample gas cooler may start when the power supply is connected.

* The cable must meet the following minimum requirements: Outer cable diameter 8.3 - 9.1 mm, cross-section: 1.04 mm2 (17/3 AWG), nominal voltage: 300 V, temperature resistance 60 °C, flammability class in accordance with VW-1, FT2 or EN60332-1-2/-2-2

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 work described in this chapter requires special knowledge and may require activities to be done on the sample gas cooler while it is open and under voltage! Therefore, they should only be performed by qualified and specially trained personnel.

Repairs and replacement of parts on the device may only be done by ABB service.

Modifications and repairs to the product may only be performed if expressly permitted by these instructions.

Special notice for the Category 3G explosion-proof design:
The activities listed below may not be performed until the environment has been declared as an explosion-free zone – free of a hazardous atmosphere

- **Work on live parts.**
- **Replacing fuses.**
- **Opening the cover of the controller flap**

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)

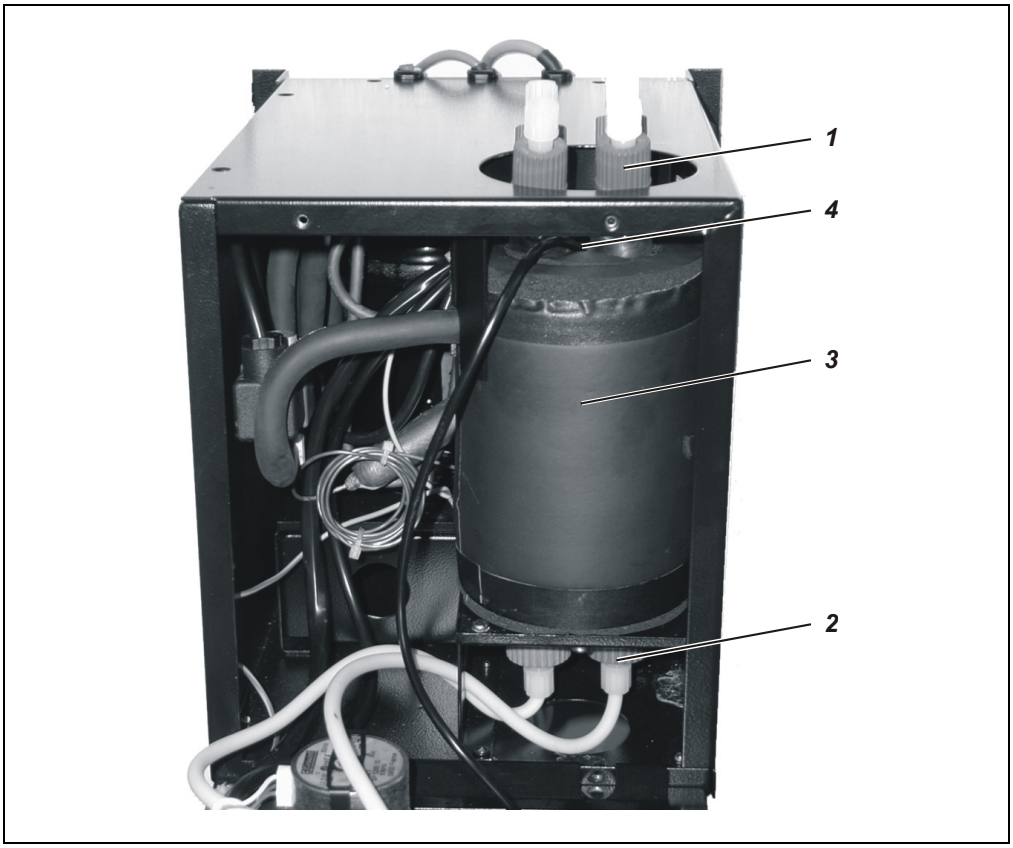
Step	Action
1	Stop the sample gas supply and shut off the sample gas cooler power supply.
	Remove the heat exchanger:
2	Disconnect sample gas and condensate pipes from connections ***1*** and ***2*** respectively of the heat exchanger.
3	Turn the heat exchanger slightly and draw it upwards to remove 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. 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 23).
	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***. 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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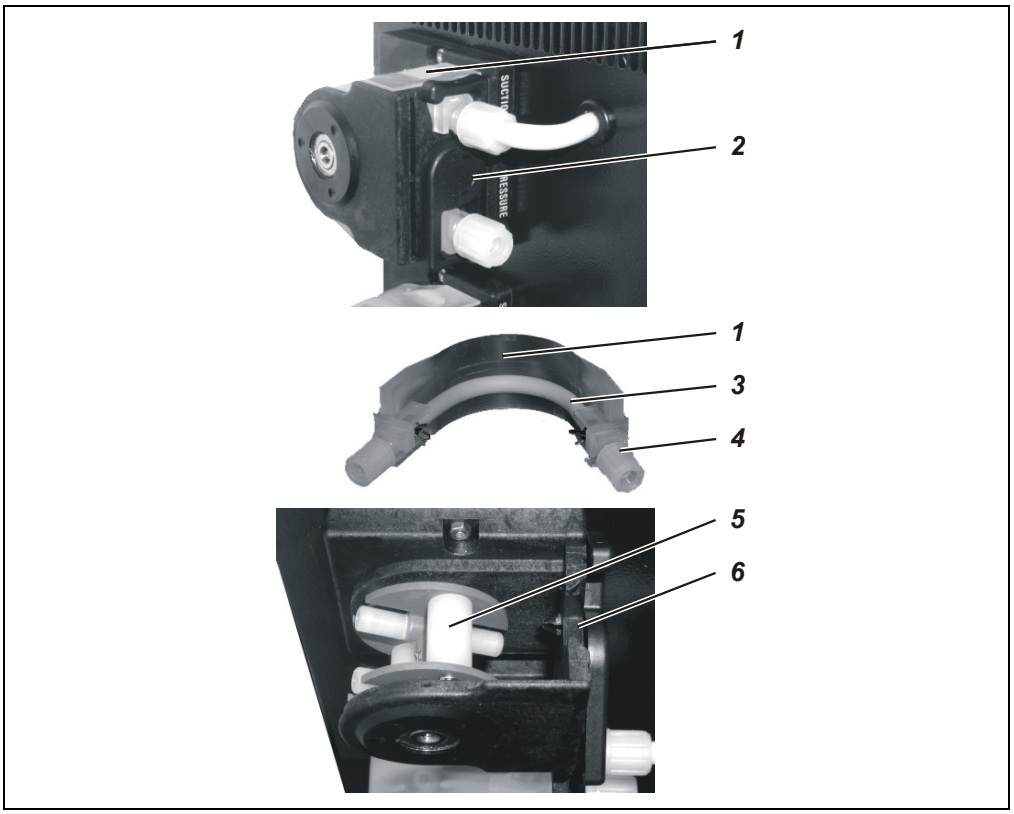
Fig. 5

Peristaltic pump, pump hose and pump head with roller mounting



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

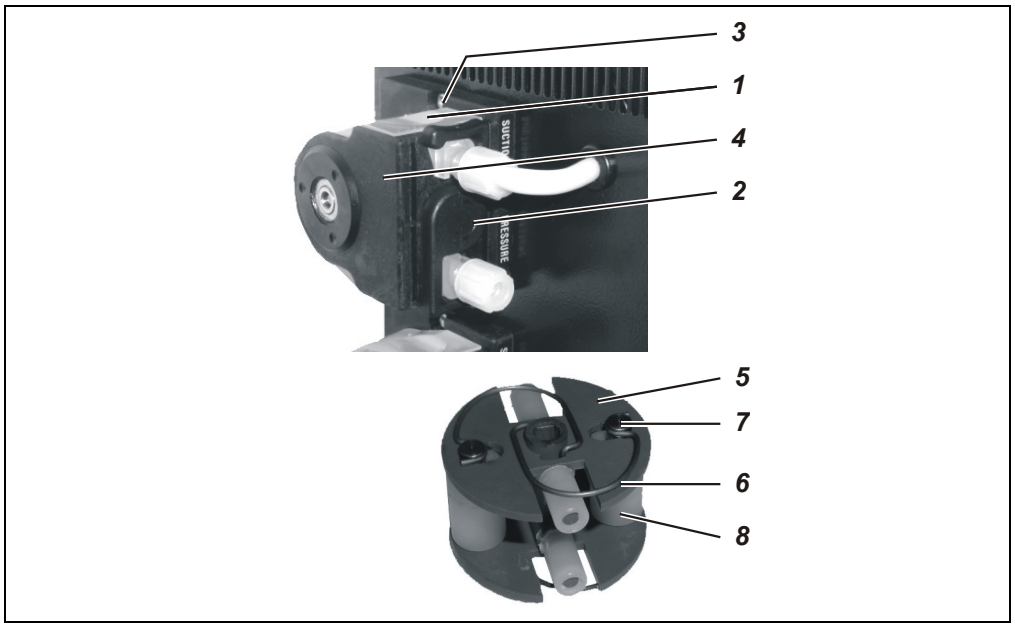
(see Fig. 6)

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***. ⓘ 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.

Continued on next page

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.

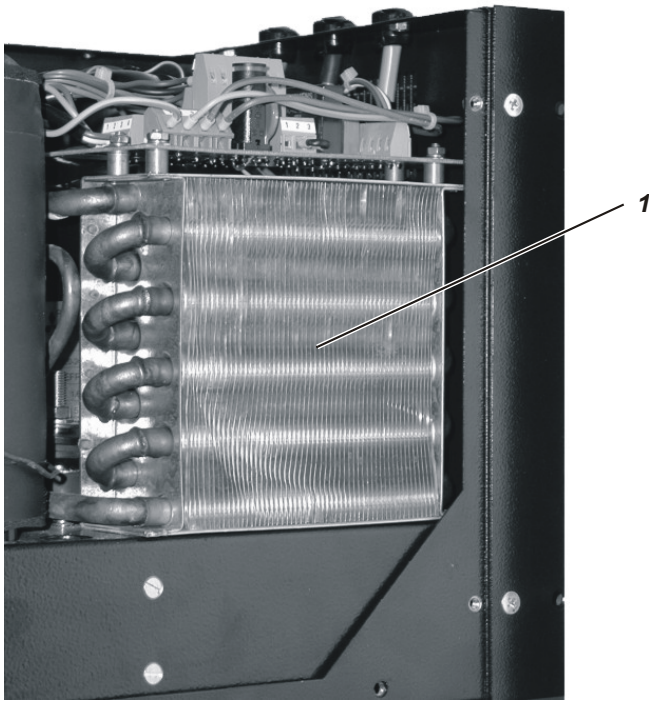
Cleaning the condenser fins

(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 9) and operating specifications (see page 32) are followed.
	Defective peristaltic pump	• Replace the peristaltic pump.
	Defective pump hose	• Replace hose (see page 21).
	Cooling performance inadequate although sample gas cooler not overloaded	• Provide adequate cooling air flow. • The fan should operate. • Maintain the minimum clearance with respect to adjacent units or walls (see page 10). • Clean condenser fins (see page 25).
	Compressor motor breaker tripped	• Eliminate the thermal overload caused by the sample gas flow or excessive ambient temperature. • Clean condenser fins (see page 25). • Ensure sample gas inlet conditions (see page 9) and operating specifications (see page 32) are followed. • 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. • 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). • If the difference is considerable (with measuring circuit open or short-circuited), then the motor breaker should be replaced. • 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:** **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. ⚠ 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. 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. 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). The shock-absorbing material's thickness should be adequate for the sample gas cooler's weight and the mode of shipping. 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

Appendix

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.

Description

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***.

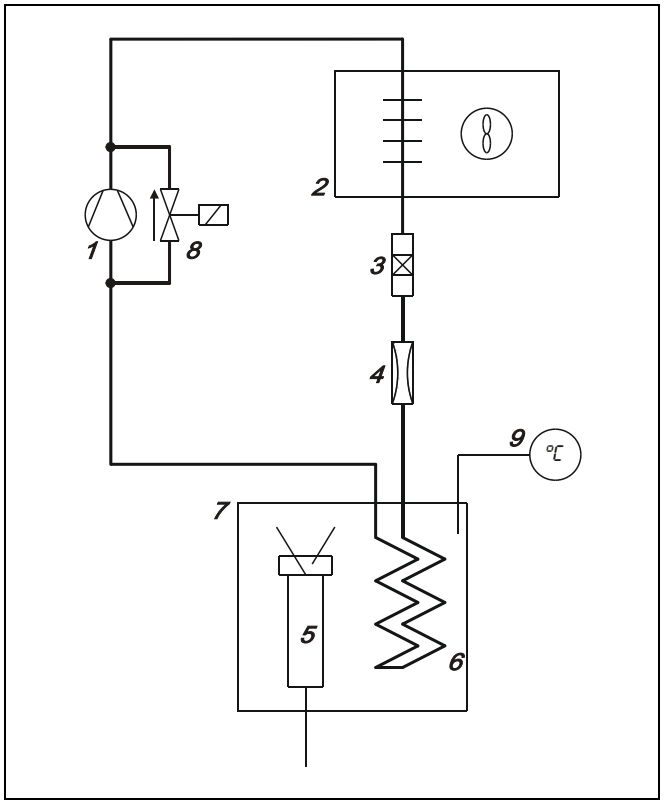
In the capillary tube ***4*** the pressure of the liquid refrigerant is reduced from its condensation pressure 800–1800 kPa (= 8–18 bar) to a lower pressure (evaporation pressure) 100 kPa (= 1.0 bar), and the refrigerant passes into the evaporator ***6***.

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

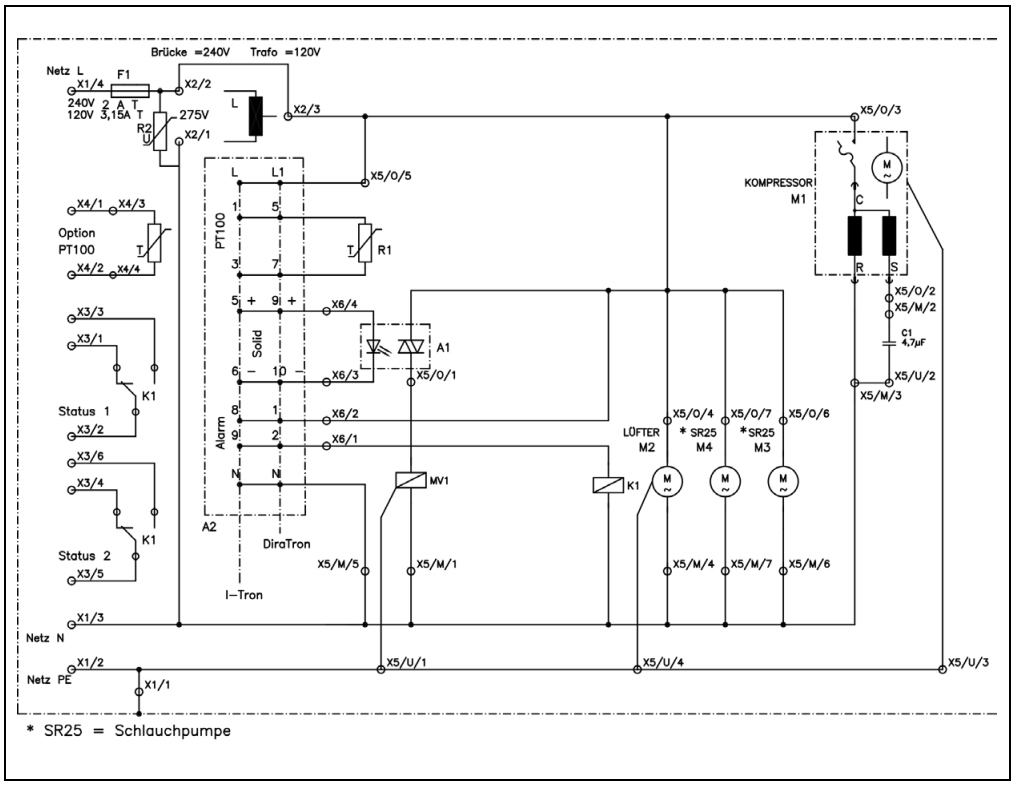
The temperature controller sends out a status signal if the temperature rises above / falls below the respective limit values of +3 °C ± 3 °C as set up in the factory. This signal is present at a floating change-over contact that is rated up to 250 V AC / 2 A.

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,
≤ ±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)
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: 5×10^{-6} hPa l/s

Index

Ambient temperature 9

Circuit diagram 30
Condenser fins cleaning 24

Dimensional drawing 11
Electrical line connection 15

Explosion-proof version 8
Gas connections 13
Gas pipe connection 13

Heat exchanger
  Removing and installing 18

Installation 12
Installation site 9

Operating specifications 31

Peristaltic pump
  Replacing hoses 20
  Replacing pressure rollers and springs 22
Power supply 10, 17

Reagent dosing 14
Refrigerant circuit 29

Safety information 6, 7
Sample gas feed unit 12, 15, 28
Sample gas inlet conditions 10
Scope of delivery 10

Temperature alarm 17
Temperature controller 30
Transportation restraints 12, 27
Troubleshooting 25
Type examination certificate 32

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