Rittal – The System.

Faster – better – worldwide.

Luft/Wasser-Wärmetauscher
Air/water heat exchangers
Echangeurs thermiques air/eau
Lucht/water-warmtewisselaars
Luft/vatten värmeväxlare
Scambiatori di claore aria/acqua
Intercambiadores de calor aire/agua
水冷ヒートエクスチェンジャー

SK 3209.XXX
SK 3210.XXX

Montage-, Installations- und Bedienungsanleitung
Assembly and operating instructions
Notice d'emploi, d'installation et de montage
Montage- en bedieningshandleiding
Montage- och hanteringsanvisning
Istruzioni di montaggio e funzionamento
Instrucciones de montaje y funcionamiento
取扱説明書

ENCLOSURES | POWER DISTRIBUTION | CLIMATE CONTROL | IT INFRASTRUCTURE | SOFTWARE & SERVICES

FRIEDHELM LOH GROUP

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Contents

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1 Notes on documentation

These assembly instructions are aimed at tradespersons who are familiar with assembly and installation of the air/water heat exchanger, and at trained specialists who are familiar with the operation of the air/water heat exchanger.

1.1 Associated documents

There are two sets of instructions for the unit types described here:

– Assembly and installation instructions enclosed with the unit in the form of a paper document.
– Assembly, installation and operating instructions enclosed with the unit in the form of a PDF file (Adobe Acrobat) on CD-ROM.

We cannot accept any liability for damage associated with failure to observe these instructions. Where applicable, the instructions for any accessories used also apply.

1.2 CE labelling

The declaration of conformity is supplied with the unit as a separate document.

1.3 Retention of documents

These instructions and all associated documents constitute an integral part of the product. They must be given to the plant operator. The plant operator is responsible for storage of the documents so they are readily available when needed.

1.4 Symbols used

Please observe the following safety instructions and other notes in this guide:

Symbol identifying required actions:

■ The bullet point indicates an action to be performed.

Safety and other notes:

Danger!
Immediate danger to life and limb!

Caution!
Potential threat to the product and its environment.

Note:
Useful information and special features.

2 Safety notes

Please observe the following general safety notes when assembling and operating the unit:

– Assembly, installation and servicing may only be performed by properly trained specialists.
– The minimum water inlet temperature of +1 °C must not be reduced at any point in the water cycle. Otherwise there is danger of frost damage!
– Use antifreeze agents only with the manufacturer's consent.
– Do not obstruct the air inlet and air outlet of the air/water heat exchanger inside the enclosure (see also section 4.2.2).
– The heat loss of the components installed in the enclosure must not exceed the specific useful cooling output of the air/water heat exchanger.
– The air/water heat exchanger must always be transported in a vertical position.
– Use only original spare parts and accessories.
– Do not make any changes to the air/water heat exchanger other than those described in these instructions or associated instructions.
– The mains connector of the air/water heat exchanger must only be connected and disconnected with the system de-energised. Connect the pre-fuse specified on the rating plate.

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3 Device description

Depending on the model chosen, your air/water heat exchanger may vary in appearance from the illustrations contained in these instructions. However, the functions are identical in principle.

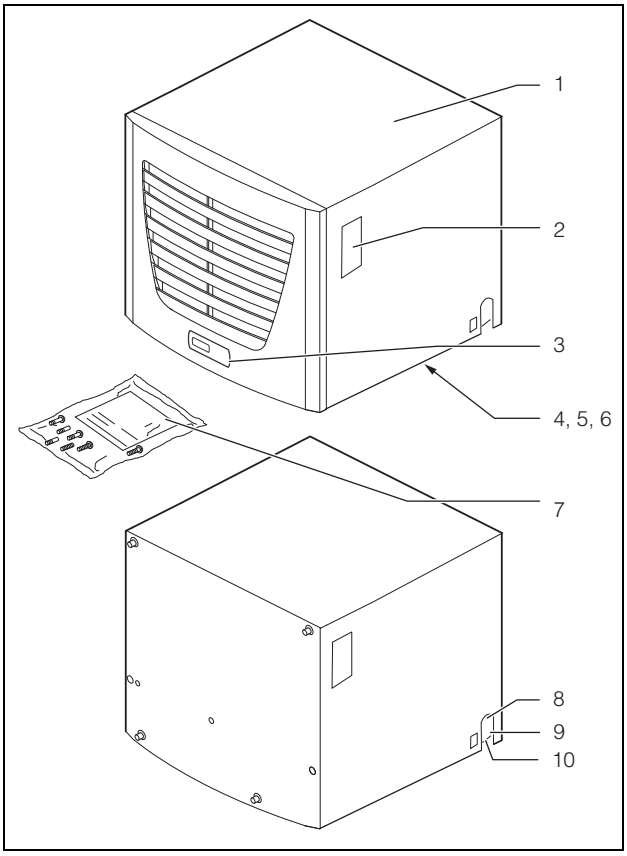

Fig. 1: Device description

Key

1 Cover
2 Rating plate
3 Display
4 X2 master/slave connection (Comfort controller)
5 X1 terminal strip (underside of the unit)
6 X3 optional serial interface (underside of the unit)
7 Dispatch bag
8 Cooling water inlet
9 Cooling water return
10 Condensate discharge

3.1 Functional description

Air/water heat exchangers are designed and built to dissipate heat from enclosures by cooling the air inside the enclosure and so protect the temperature-sensitive components. Air/water heat exchangers are particularly appropriate for the temperature range of up to +70 °C where comparable units, such as air/air heat exchangers, enclosure cooling units or fan-and-filter units, cannot be used for system reasons to effectively and economically dissipate heat loss. It is mounted on the roof of an enclosure.

3.1.1 How it works

The air/water heat exchanger comprises three main components (cf. fig. 2): Heat exchanger package (1), fan (2) and the magnetic valve (3) connected with each other using pipes.

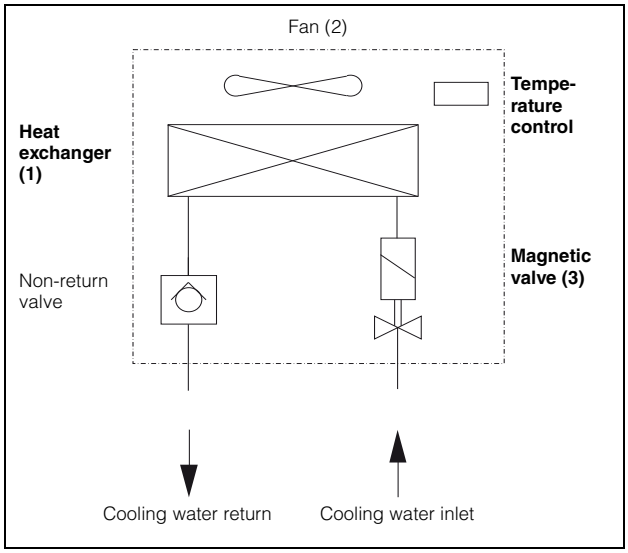

Fig. 2: Air/water heat exchanger

The heat loss of the enclosure is dissipated in a membrane heat exchanger to the water coolant. A fan (2) blows the internal enclosure air over the heat exchanger (1); except for the inlet and outlet water and the condensed water discharge, the unit is closed to the environment.

The flow regulator (3) controls the cooling output by changing the water flow volume depending on the required housing temperature and the water inlet temperature.

3.1.2 Control

Rittal enclosure air/water heat exchangers are fitted with a controller for setting the functions of the heat exchanger. Depending on the design, this is either a Basic controller (temperature display via LED) or a Comfort controller (display plus extended functions, see chapter “6 Operation”, page 15).

3.1.3 Bus mode (Comfort controller only)

The serial unit interface X2 allows you to create a bus connection with up to ten air/water heat exchangers using the master/slave cable (shielded, four-wire cable, Model No. SK 3124.100). This allows you to implement the following functions:

– Parallel unit control (the air/water heat exchangers in the network can be switched on and off simultaneously)
– Parallel door status message (“door open”)
– Parallel collective fault message

Data is exchanged via the master-slave connection. During commissioning, assign an address to each unit that also includes the identifier “master” or “slave”.

3.1.4 Safety equipment

– To protect against overcurrent and overtemperature, the fan is equipped with a thermal winding protection.
– The unit has one (in the case of the Basic controller) or two (in the case of the Comfort controller) integral floating contacts on the connection terminal (system message relay with change-over contact, terminal 3 – 5) which may be used to retrieve messages from the heat exchanger, e.g. via PLC.
– Units with Basic and Comfort controllers are also equipped with a condensate alarm.

3.1.5 Condensation

At high levels of humidity and low cooling water temperatures inside the enclosure, condensation may form on the heat exchanger.

Any condensation that forms on the heat exchanger (with high humidity and low water temperatures) is routed to the right and/or rear out of the unit via a drain opening in the plastic tray. For this purpose, a hose must be connected to one of the two condensate nozzles (see “4.4 Connecting the condensate discharge”, page 8). The drain which is not required should be tightly sealed. The condensate must be able to run off freely.

The hose used for draining off condensate must be laid free from kinks and checked for correct drainage.

Units with Basic and Comfort controllers are also equipped with a condensate alarm.

Condensate hoses are available as accessories (refer also to the accessories section in the Rittal Catalogue).

3.1.6 Leak detection

If a leakage or pipe breakage occurs in the water circuit of the air/water heat exchanger, a magnetic valve immediately stops the cooling water supply and the floating change-over contact is activated. In the case of a unit with Comfort controller, the fan is also switched off.

Basic controller: The system message “IA” appears in the display.

Comfort controller: The system message “A08” appears in the display.

3.1.7 Door limit switch (for units with Comfort controller only)

Air/water heat exchangers with Comfort controller may be operated with a door limit switch connected. The door limit switch is not included with the supply (available as an accessory, Model No. PS 4127.010).

The door limit switch function causes the fan and the magnetic valve in the air/water heat exchanger to be switched off after approximately 15 seconds when the enclosure door is opened (contacts 1 and 2 closed). This prevents the formation of condensation inside the enclosure while the enclosure door is open.

The fan will start up after about 15 seconds on closure of the door. The connection is made at terminals 1 and 2. The extra-low voltage is supplied by the internal power pack; the current is approx. 30 mA DC.

Note:
The door limit switches must only be connected free from potential.
No external voltages!

3.1.8 Additional interface X3 (Comfort controller only)

Note:
The electrical signals at the interface are of an extra-low voltage (not extra-low safety voltages to EN 60 335).

An additional interface card may be connected to the 9-pole SUB-D connector X3 in order to incorporate the air/water heat exchanger into higher-level monitoring systems (available as an accessory, interface card Model No. SK 3124.200).

3.2 Proper use

Rittal enclosure air/water heat exchangers were developed and designed in accordance with the state of the art and the recognised rules governing technical safety. Nevertheless, if used improperly, they may pose a threat to life and limb or cause damage to property. The unit is only intended for cooling enclosures. Any other use is deemed improper.

The manufacturer will not be liable for any damages caused as a result of improper use, or for incorrect assembly, installation or use. All risk is borne solely by the user.

Proper usage also includes the observation of all valid documents and compliance with the inspection and servicing conditions.

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3.3 Scope of supply

The unit is supplied in a packaging unit in a fully assembled state.
Please check the scope of supply for completeness.

Qty.	Designation
1	Air/water heat exchanger
1 1 1 1 1 1 2	Dispatch bag: – Plug-in terminal strip – Sealing frame – Assembly and installation instructions – Assembly, installation and operating instructions on CD-ROM – Declaration of conformity Hose sleeves
1	Drilling template

Tab. 1: Supply of supply

4 Assembly and connection

4.1 Choosing the installation site

When choosing the installation site for the enclosure, please observe the following:

– The air/water heat exchanger must be installed and operated in a vertical position.
– The ambient temperature must not exceed +70 °C.
– It must be possible to fit a condensate discharge (see “4.4 Connecting the condensate discharge”, page 8).
– It must be possible to fit a cooling water supply and return (see “4.5 Connecting the water connection”, page 9).
– The mains connection data as stated on the rating plate of the unit must be guaranteed.

4.2 Assembly instructions

4.2.1 General

– Check the packaging carefully for signs of damage. Any packaging damage may be the cause of a subsequent functional failure.
– The enclosure must be sealed on all sides (IP 54). Increased condensation will occur if the enclosure is not airtight.
– The air inlet and outlet must not be obstructed on the inside of the enclosure.
– In order to avoid excessive condensation inside the enclosure, we recommend installing a door limit switch (e.g. PS 4127.010) which deactivates the air/water heat exchanger when the enclosure door is opened (see “3.1.7 Door limit switch (for units with Comfort controller only)”, page 5).

4.2.2 Layout of the components in the enclosure

Caution!
Risk of condensation!
When arranging the components inside the enclosure, please ensure that the cold airflow from the air/water heat exchanger is not directed at active components. Please also ensure that the cold airflow is not directed at the warm exhaust airflow from active components such as converters. This may lead to an air short-circuit and therefore prevent adequate climate control, or may even cause the air/water heat exchanger's internal safety devices to cease cooling operation.

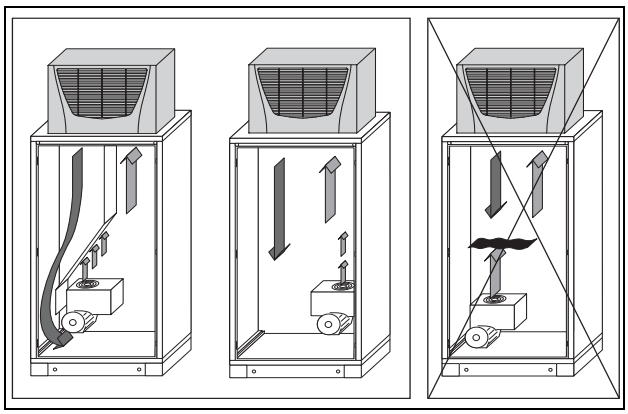

Fig. 3: Never direct the cold airflow at active components

Exercise particular caution with the airflow from the blowers of built-in electronic components (see fig. 3). Components for targeted air routing are available as accessories – please refer to the Rittal Catalogue.

Note:
When using an air duct system, care must be taken to ensure that it is laid straight and without kinks wherever possible. This minimises the resistance to the cold airflow.
It is important to ensure even air circulation inside the enclosure. Under no circumstances should air inlet and outlet openings be obstructed, otherwise the cooling performance of the unit will be reduced. Ensure a suitable distance from electronic components and other installed enclosures so that the required air circulation is not obstructed and prevented.
One cold air outlet from the air/water heat exchanger must be kept open at all times when operating with the air duct, to prevent the accumulation of cold air inside the unit.

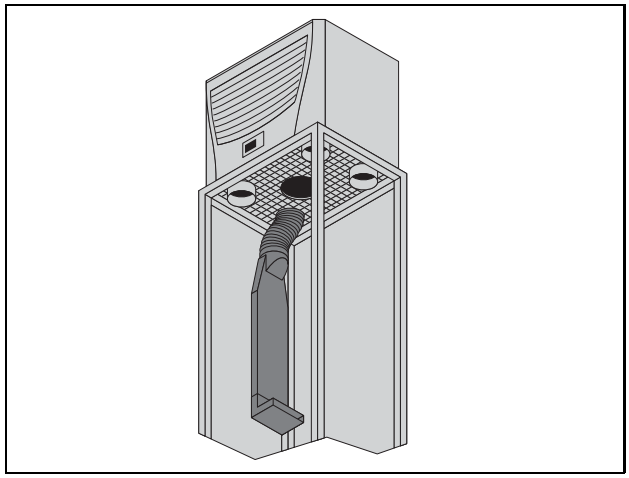

Fig. 4: Targeted air routing inside the enclosure

Note:
When using the cover bungs, no more than 2 cold air outlets should be sealed.

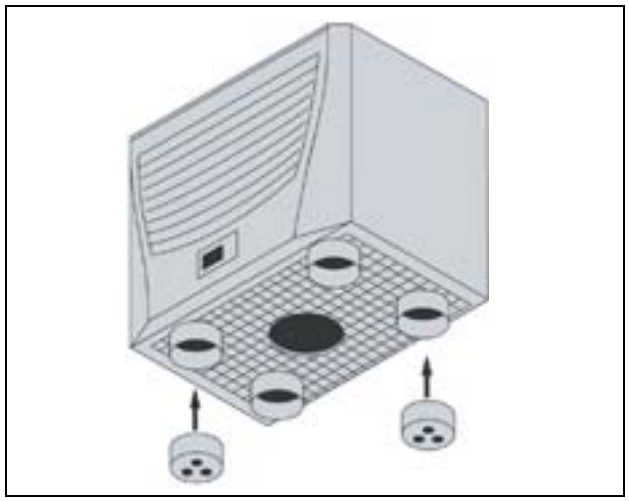

Fig. 5: Cover bungs

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4.3 Assembling the air/water heat exchanger

The enclosure air/water heat exchanger is fitted on the roof of the enclosure.

To this end, the roof plate must be cut out as per the drilling template included with the supply.

Note:
Pre-configured, reinforced roof plates with cut-outs to match your enclosure are available as accessories; refer to the Rittal Catalogue.

4.3.1 Producing the mounting cut-out

- Stick the supplied drilling template onto the roof of the enclosure using adhesive tape.

There are dimensioning lines on the drilling template to suit the installation type for your air/water heat exchanger.

Risk of injury!
Carefully deburr all cut-outs to prevent injuries caused by sharp edges.

- Make the cut-outs including the line width as per the drilling template.
  Deburr the cut-outs.

4.3.2 Assembling the air/water heat exchanger

- Stick the supplied sealing frame onto the cut out roof plate.

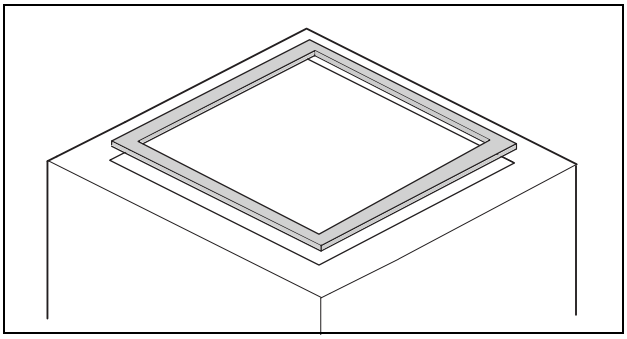

Fig. 6: Sealing frame on roof plate

- Mount the air/water heat exchanger on the enclosure roof.
- Screw the supplied twin-threaded bolts into the holes in the plastic base on the underside of the device.
- Secure the unit using the supplied washers and nuts.

Note:
In order to achieve a permanent seal between the air/water heat exchanger and the enclosure, the mounting surface should be reinforced or supported if necessary. This is particularly applicable with large roof areas.

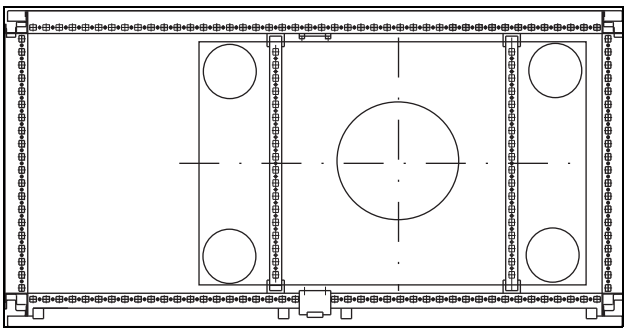

Fig. 7: Roof plate reinforcement for the TS 8 enclosure

Accessories for roof plate reinforcement with TS:
Punched rail
U nut
Fastening bracket
Threaded block
(refer also to Accessories in the Rittal Catalogue)

4.4 Connecting the condensate discharge

A flexible condensate discharge hose Ø 12 mm ($^1/_2$″) can be fitted to the air/water heat exchanger.

The condensate discharge
– must be laid with a suitable and constant gradient (no siphoning)
– must be laid without kinks
– must not have a reduced cross-section if extended

The condensate hose is available as an accessory (refer also to Accessories in the Rittal Catalogue).

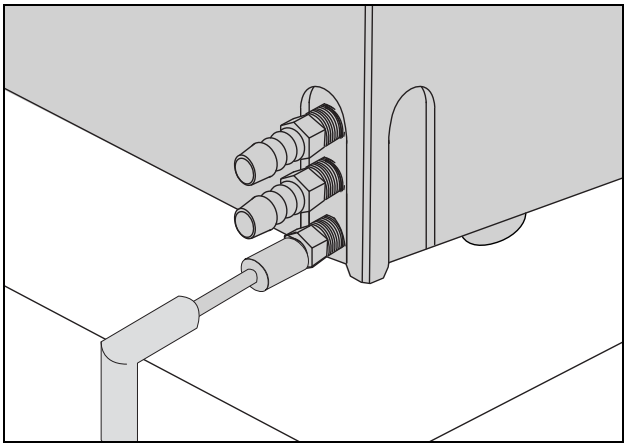

Fig. 8: Connect the condensate discharge to the side of the unit

- Connect a suitable hose from the right or rear to the condensate nozzle screwed into the unit, and secure it with a hose clip (with 2 Nm torque).
- Lay the condensate hose, e.g. into a drain. Alternatively, the condensate discharge can also be connected on the rear of the unit. In this case, proceed as described in section 4.5.2.

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Note:
To avoid kinking of the condensate hose, use the angled connector contained in the scope of supply.

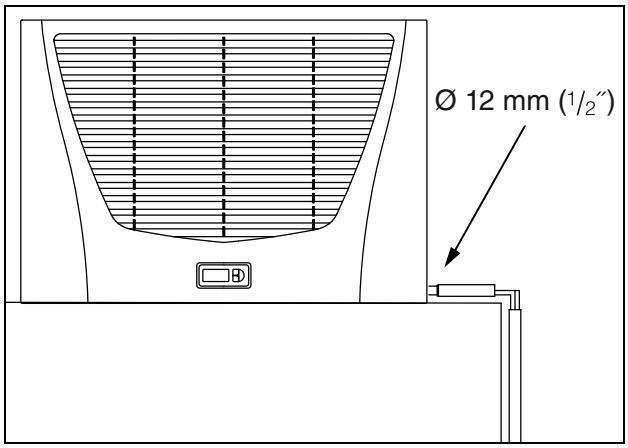

Fig. 9: Lay the condensate discharge to the side of the unit

4.5 Connecting the water connection

A compression-proof flexible condensate discharge hose Ø 12 mm (1/2″) for both the supply and the return can be fitted to the air/water heat exchanger.
The cooling water hose
– must be laid without kinks
– must not have a reduced cross-section if extended and, if necessary, must be insulated.

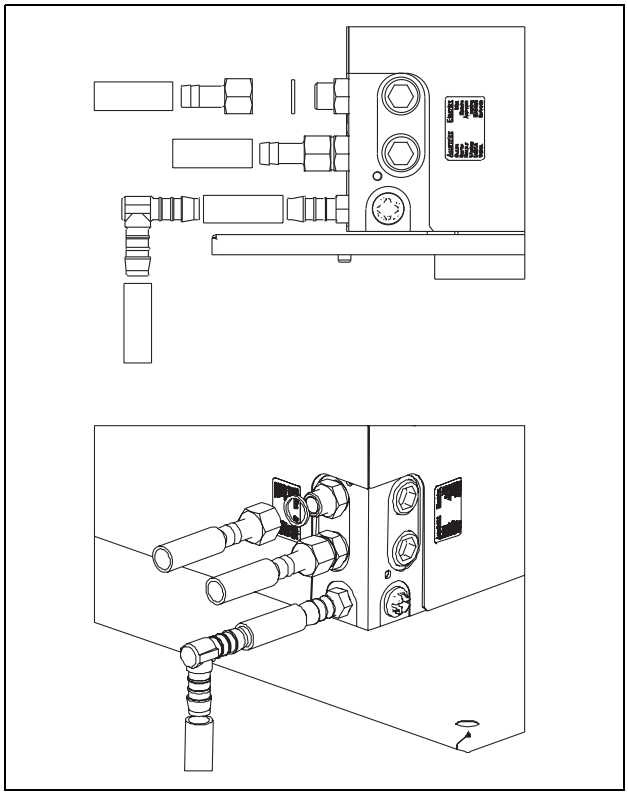

Fig. 10: Connect the cooling water inlet (top) and return (centre) to the side of the unit

4.5.1 Connection on the side of the unit

- Push the sealing rings onto the screw connector and tighten the nozzles contained in the accessory pack with min. 25 Nm and max. 30 Nm. When doing so, ensure that the pre-assembled screw connector is not loosened from the unit.
- Connect a suitable hose to each of the two cooling water connection nozzles (at the side or rear of the unit) and secure each one with a hose clip (with 25 Nm torque).

4.5.2 Connection on the rear of the unit

- Remove the sealing bung.
- Insert the screw connector removed from the side of the unit and re-seal the connector with Teflon tape or hemp and sealing paste.
- Proceed as described in section 4.5.1.
- Subsequently use the sealing bungs to close the open connector holes on the side of the unit.

Note:
The water circuit should be protected from ingress of dirt or excess pressure (maximum permitted operating pressure 10 bar)!

Note:
Observe the flow direction and check for leaks!

The unused cooling water connecting pieces must be closed appropriately with sealing bungs.

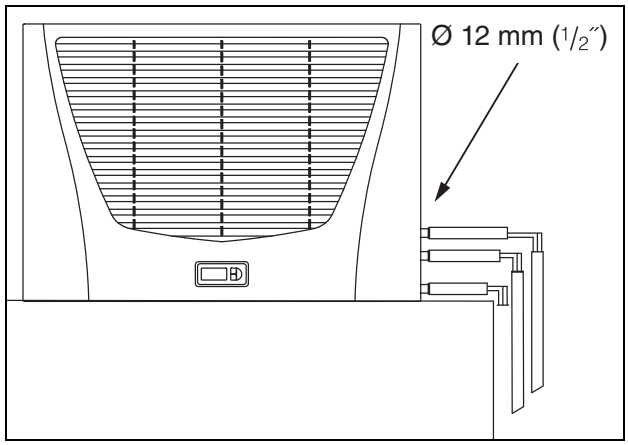

Fig. 11: Lay the cooling water hose

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4.5.3 Notes on water quality

To ensure the reliable operation of the above-mentioned units, the VBG guidelines for cooling water must be observed (VGB-R 455 P).

The cooling water must not contain any limescale deposits; in other words, it should have a low level of hardness, in particular, a low level of calcium hardness. In particular, for recooling within the plant, the calcium hardness should not be too high. On the other hand, the water should not be so soft that it attacks the materials. When recooling the cooling water, the salt content should not be allowed to increase excessively due to the evaporation of large quantities of water, since electrical conductivity increases as the concentration of dissolved substances rises, and the water thereby becomes more corrosive.

- Always add the appropriate volume of fresh water.
- Always remove part of the enriched water.

The following criteria for the cooling water must be observed:

– Water with high gypsum content is unsuitable for cooling purposes because it has a tendency to form boiler scale that is particularly difficult to remove.
– The cooling water should be free from iron and manganese, because otherwise deposits may occur that accumulate in the pipes and block them.
– At best, organic substances should only be present in small quantities, because otherwise sludge deposits and microbiological contamination may occur.

4.6 Notes on electrical installation

When performing the electrical installation, it is important to observe all valid national and regional regulations as well as the provisions of the responsible power supply company. Electrical installation must only be carried out by a qualified electrician who is responsible for compliance with the existing standards and regulations.

4.6.1 Connection data

– The connected voltage and frequency must correspond to the values stated on the rating plate.
– The air/air heat exchanger must be connected to the mains via an all-pin isolating device which ensures at least 3 mm contact opening when switched off.
– No additional temperature control may be connected upstream of the unit at the supply end.
– Install the pre-fuse cited on the rating plate to protect the cable and equipment from short-circuits.
– The mains connection must ensure low-noise potential equalisation.

4.6.2 Overvoltage protection and supply line load

– The unit does not have its own overvoltage protection. Measures must be taken by the operator at the supply end to ensure effective lightning and overvoltage protection. The mains voltage must not exceed a tolerance of ±10%.
– In accordance with IEC 61 000-3-11, the unit is intended solely for use at sites with a continuous current-carrying capacity (incoming mains power supply) of more than 100 A per phase and with a supply voltage of 400/230 V. If necessary, the power supply company must be consulted to ensure that the continuous current-carrying capacity at the point of connection to the public grid is sufficient for connection of such a unit.
– The fans in single- and three-phase units are intrinsically safe (thermal winding protection). The same also applies to all transformer versions and to special-voltage units which are likewise equipped with a transformer.
– Install the slow pre-fuse specified on the rating plate (miniature circuit-breaker with “K” characteristic, motor circuit-breaker or transformer circuit-breaker) to protect the cable and equipment from short-circuits. Select a suitable motor circuit-breaker/transformer circuit-breaker in accordance with the information specified on the rating plate: Set it to the minimum specified value. This will achieve the best short-circuit protection for cables and equipment.
Example: Specified setting range 6.3 – 10 A; set to 6.3 A.

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4.6.3 Door limit switch (for units with Comfort controller only)

– Each door limit switch must only be assigned to one air/water heat exchanger.
– Several door limit switches may be connected in parallel and operated on one air/water heat exchanger.
– The minimum cross-section for the connection cable is 0.3 mm^2 for a cable length of 2 m. We recommend the use of a shielded cable.
– The line resistance to the door limit switch must not exceed a maximum of 50 Ω.
– The door limit switch only supports a floating connection; no external voltages.
– The contact of the door limit switch must be closed when the door is open.

The safety extra-low voltage for the door limit switch is provided by the internal power pack: Current approx. 30 mA DC.

■ Connect the door limit switch to terminals 1 and 2 of the connector.

4.6.4 Potential equalisation

Rittal recommends connecting a conductor with a nominal cross-section of at least 6 mm^2 to the potential equalisation connection point on roof-mounted air/water heat exchangers and incorporating it into the existing potential equalisation system.
According to the standard, the PE conductor in the mains connection cable is not classified as an equipotential bonding conductor.

4.7 Carrying out the electrical installation

4.7.1 Bus connection (only when interconnecting several units with a Comfort controller)

When using several air/water heat exchangers, the serial unit interface can be used to connect up to ten air/water heat exchangers with the bus cable (Model No. SK 3124.100).

Note:
The electrical signals at the X2 interface are of an extra-low voltage (not extra-low safety voltages in accordance with EN 60 335-1).

When interconnecting, please note the following:
– De-energise the air/water heat exchangers to be connected.
– Ensure proper electrical insulation.
– Make sure the cables are not laid in parallel to power lines.
– Make sure that the lines are short.

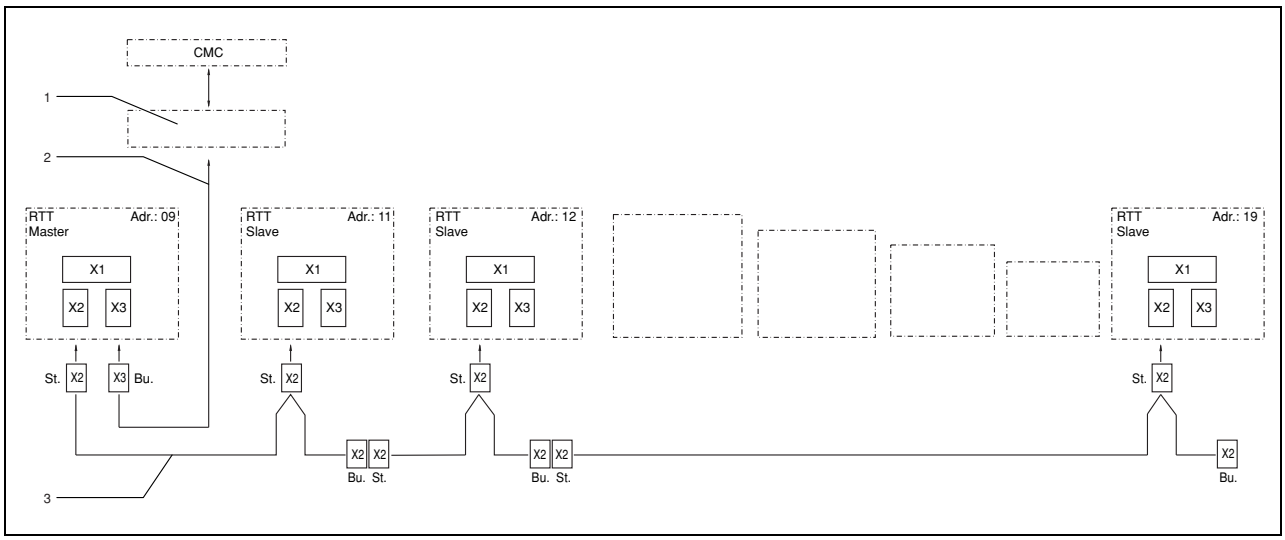

Fig. 12: Connection example: Master-slave operation

Key

1 Serial interface
2 Serial interface cable
3 Master-slave bus cable (Model No. SK 3124.100)
RTT Rittal TopTherm air/water heat exchanger
X1 Supply connection/door limit switch/alarms
X2 Master-slave connection Sub-D, 9-pole
X3 Serial interface Sub-D, 9-pole
St. Sub-D connector, 9-pole
Bu. Sub-D jack, 9-pole
Adr. Address

4 Assembly and connection

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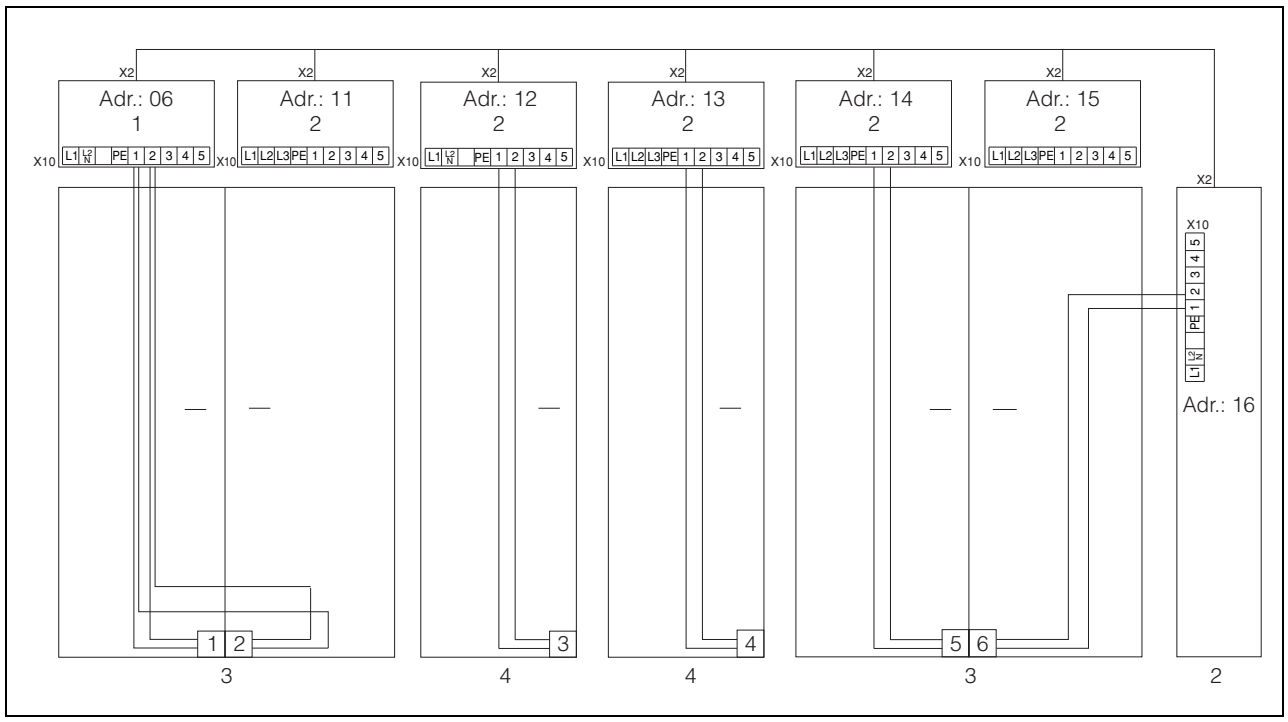

Fig. 13: Connection example: Door limit switch and Master-slave operation

Key

1 Master air/water heat exchanger
2 Slave air/water heat exchanger
3 2-door enclosure with two door limit switches
4 Enclosure with door limit switch

4.7.2 Installing the power supply

- Complete the electrical installation as per the wiring plan inside the air/water heat exchanger underneath the cover (see fig. 29 on page 25).
- To be able to evaluate the system messages of the air/water heat exchanger via the system message relay, a corresponding low-voltage cable must be connected additionally on terminals 3 – 5.

SK 3209.1XX, SK 3210.1XX

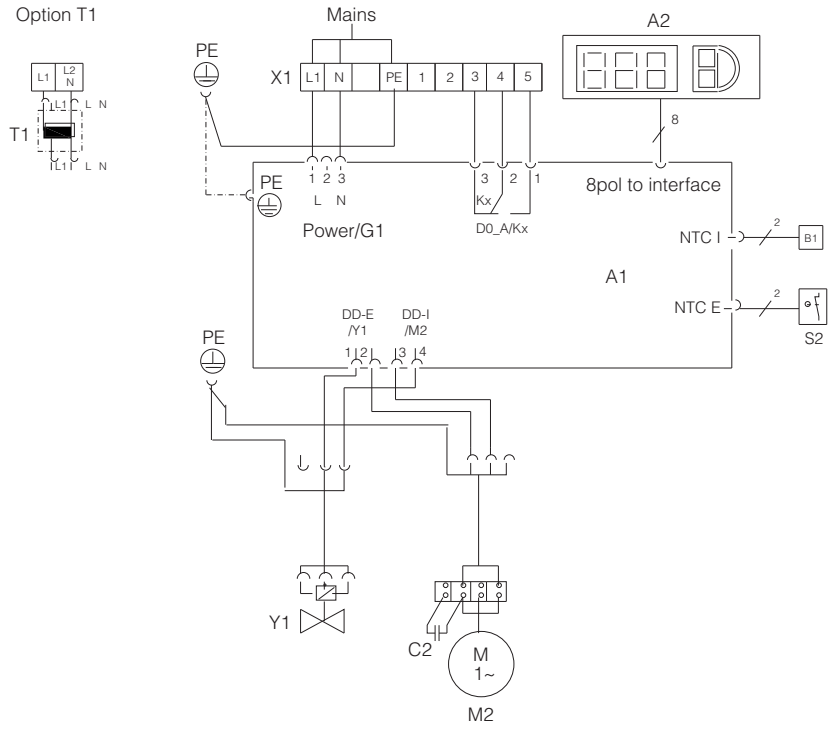

Fig. 14: Electrical wiring plan no. 1

Key

A1	Power PCB
A2	Display terminal
B1	Internal temperature sensor
C2	Operating capacitors
Kx	Collective fault relay
M2	Fan
S2	Float-actuated switch
T1	Transformer (optional)
X1	Main terminal strip Terminals 1 and 2 are free
Y1	Magnetic valve

EN

SK 3209.5XX, SK 3210.5XX

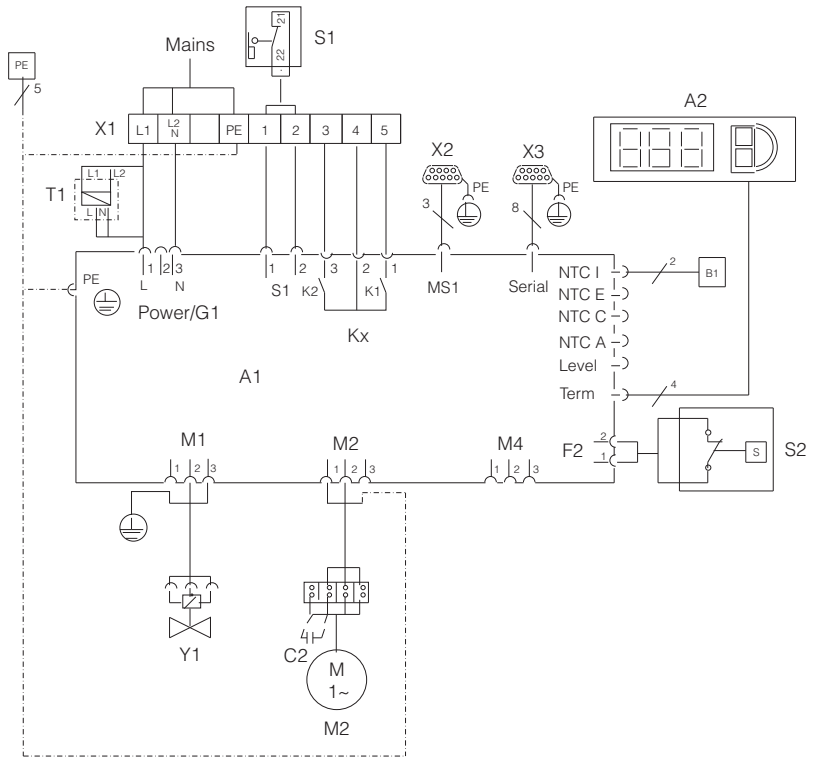

Fig. 15: Electrical wiring plan no. 2

Key

A1	Power PCB
A2	Display terminal
B1	Temperature sensor, internal temperature
C2	Operating capacitors
Kx	Relay K1 collective fault 1 Relay K2 collective fault 2
M2	Fan
S1	Door limit switch (without door limit switch: terminal 1, 2 open)
S2	Float-actuated switch (closed without water)
T1	Transformer (optional)
X1	Main terminal strip
X2	Master-slave connection
X3	Serial interface (optional)
Y1	Magnetic valve

Note:
For technical data, refer to the rating plate.

AC **cos f = 1**	**DC** **L/R = 20 ms**
I max. = 2 A U max. = 250 V	I min. = 100 mA U max. = 200 V U min. = 18 V I max. = 2 A

Tab. 2: Contact data

EN

5 Commissioning

- Once all the assembly and installation work is complete, switch on the power supply and the water supply to the air/water heat exchanger.

The air/water heat exchanger starts running:

– The enclosure internal temperature is displayed.
– With Comfort controller: The software version of the controller first appears for approx. 2 sec., then the enclosure internal temperature appears in the 7-segment display.

You can now make your individual settings on the unit, e.g. set the temperature or (with Comfort controller only) assign the network identifier, etc. (refer to the “Operation” chapter).

6 Operation

You can operate the air/water heat exchanger using the controller on the front of the unit (fig. 1, no. 2, page 4).

6.1 Control using the Basic controller

6.1.1 Display and system analysis

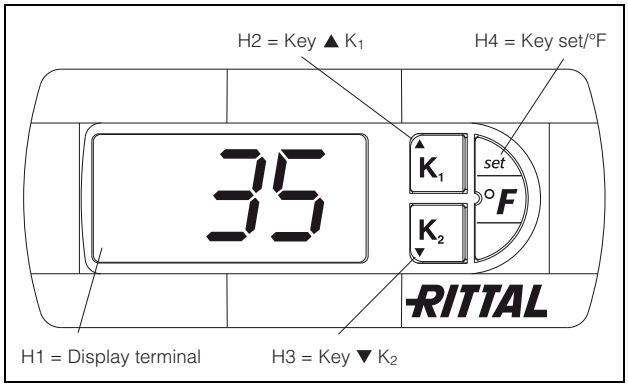

Fig. 16: Display and system analysis of the Basic controller

6.1.2 Properties

The air/water heat exchanger operates automatically, i.e. after switching on the power supply, the fan (see fig. 2, page 4) will run continuously and permanently circulate the internal enclosure air. The magnetic valve controls the cooling water flow as specified by the temperature setpoint. The built-in Basic controller ensures automatic normal shut-down operation of the air/water heat exchanger by the value of the fixed preset switching difference of 5 K.

6.1.3 General programming information

Using buttons H2, H3 and H4 (fig. 16) you can change 3 parameters within the preset ranges (min. value, max. value).

Tables 4 and 5 on page 16 show the parameters which can be altered.

6.1.4 Operation of the basic controller

The display terminal “H1” consists of a 3-position 7-segment display which indicates the temperature in °C as well as any system messages. The current enclosure internal temperature is usually displayed permanently. In the event of a system message, this will alternate with the internal temperature display.

Note:
With the Basic controller, the temperature is preset at the factory to +35 °C. In order to save energy, do not set the temperature lower than that actually necessary.

6.1.5 Setting the temperature

The setting of the enclosure internal temperature is preset at the factory to 35 °C. To change the value press key H2 (▲ K_1) or H3 (▼ K_2) for one second until °1 appears in the display, then confirm with the H4 “set” key.

The set value can then be altered within the preset parameters (+20 °C to +55 °C) via the keys H2 (▲ K_1) or H3 (▼ K_2). Press the H4 “set” key for 5 seconds to save the new value. The current enclosure internal temperature is displayed again.

Alarm no.	System message	Cause	Remedy
HI	Internal temperature of enclosure too high	Cooling capacity inadequate/ unit undersized/ unit defective	Check cooling capacity/ check unit
LO	Internal temperature of enclosure too low	Ambient temperature too low/ no heat loss in the enclosure	Check unit
IA	Leakage warning/ condensate warning	Heat exchanger leaky/condensate discharge kinked or blocked	Check heat exchanger for leaks/ check condensate discharge

Tab. 3: Warning messages on the display and monitoring of the min./max. internal temperature

EN

6.1.6 Setting of system messages

To change the system messages keep the H4 “set” key pressed for 5 seconds. The controller is now in programming mode. While in programming mode, if you do not press any buttons for approx. 60 sec., the display will first flash, then the controller will switch back to normal display mode.

You can then navigate in the levels with the H2 (▲ K_1) or H3 (▼ K_2) keys (see table 3).

The level is selected by pressing the H4 button. The parameters are changed with the H2 (▲ K_1) or H3 (▼ K_2) keys. Press the H4 “set” key for 5 seconds to confirm the new value.

6.1.7 Programming and control of the Basic controller

See also fig. 17 on page 17.

Progr. level	Display screen	Parameters	Min. value	Max. value	Factory setting	Description
0	Ps	–	–	–	–	No function
1	°1	Setpoint Enclosure internal temperature T_i	20	55	35	The setting of the enclosure internal temperature is preset at the factory to 35 °C and may be altered within a range of +20 °C to +55 °C. When the setpoint is reached, the H2 (▲ K_1) key is lit continuously.

Tab. 4: Setting the setpoint

Progr. level	Display screen	Parameters	Min. value	Max. value	Factory setting	Description
2	H5	Software version number	–	–	–	Displays the current version number of the device software.
3	AH	Alarm – maximum temperature	AL	+150	50	Maximum temperature alarm (NOT in relation to the nominal value). HI is displayed alternating with the internal temperature. The “HI” alarm is displayed when the internal temperature > HI. The alarm stops when the internal temperature < AH –2K.
4	AL	Alarm – minimum temperature	–50	AH	20	Minimum temperature alarm (NOT in relation to the nominal value). LO is displayed alternating with the internal temperature. The “LO” alarm is displayed when the internal temperature < LO. The alarm stops when the internal temperature > AL +2K.
5	r8	Reset of r6 and r7	0	1	0	Reset of r6 and r7. Set this parameter to 1 to reset the stored maximum and minimum values of r6 and r7 to the respective current actual value.
6	r7	Querying of the max. internal temperature	–50	+150	0	Stores the min. internal enclosure temperature occurring after > 1 min.
7	r6	Querying of the max. internal temperature	–50	+150	0	Stores the max. internal enclosure temperature occurring after > 1 min.

Tab. 5: Setting the system messages, monitoring of the min./max. enclosure internal temperature

EN

6.1.8 Reset of r6 and r7 (min./max. internal temperature)

To reset the stored internal temperatures keep the H4 “set” key pressed for 5 seconds.
Navigate to level r8 with the H2 (▲ K_1) or H3 (▼ K_2) keys. Press the H4 “set” key and change the parameter from 0 to 1 using the H2 (▲ K_1) or the H3 (▼ K_2) keys.
Press the H4 “set” key for 5 seconds to confirm resetting the values.

6.1.9 System message contact (K1; floating)

The relay is normally closed. All assigned system messages lead to the relay dropping out – and likewise to loss of the control voltage. Terminal strip X1 provides the connection.
For contact data and occupancy – see the wiring diagram in chapter “4.7.2 Installing the power supply”, page 13.
K1 fault signal relay (normally open contact/changeover contact)

- Terminal 3: NC (normally closed)
- Terminal 4: C (connection of the supply voltage to the fault signal relay)
- Terminal 5: NO (normally open)

The NC and NO definitions refer to the de-energised state.

6.1.10 Programming overview of Basic controller

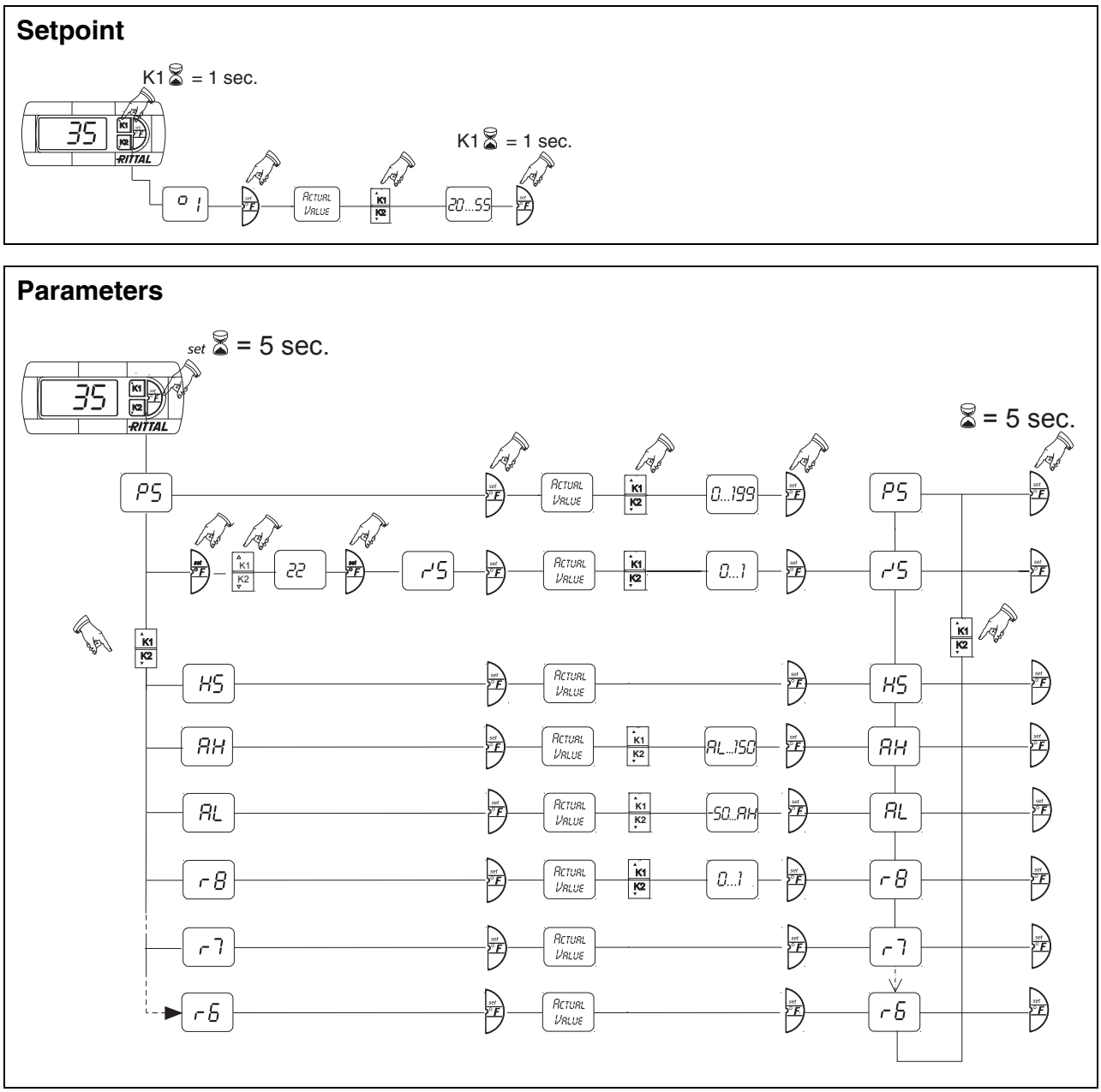

Fig. 17: Programming overview of Basic controller

EN

6.2 Control using the Comfort controller

For unit types SK 3209.5XX and SK 3210.5XX.

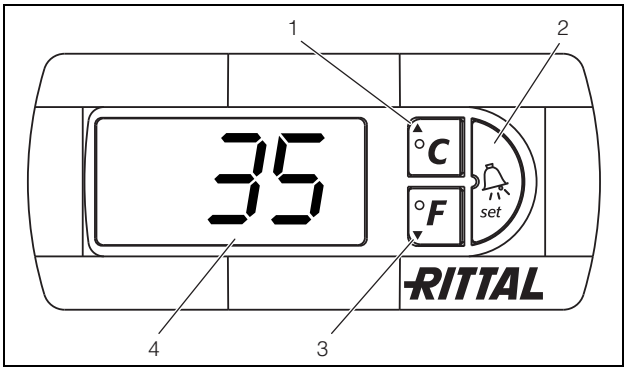

Fig. 18: Comfort controller

Key

1 Programming button, also display of the set temperature unit (degrees Celsius)
2 Set button
3 Programming button, also display of the set temperature unit (degrees Fahrenheit)
4 7-segment display

6.2.1 Properties

– Integral start-up delay and door limit switch function
– Monitoring of all motors (fans)
– Master-slave function with a maximum of ten units. One unit functions as a master unit. Once the set temperature is reached by one of the connected slave units or in the event of the door limit switch function, the affected slave unit will report to the master unit, which will switch all the other air/water heat exchangers on or off as required.
– Switching hysteresis: Adjustable from 2 – 10 K, preset to 5 K.
– Visualisation of the current enclosure internal temperature and all error messages in the 7-segment display.

The air/water heat exchanger operates automatically, i.e. after switching on the power supply, the fan (see page 4, fig. 2) will run continuously and permanently circulate the internal enclosure air. The fan and the magnetic valve are controlled by the Comfort controller.
The Comfort controller has a 7-segment display (fig. 18, no. 4). After switching on the power supply, the current software version initially appears on this display for approx. 2 seconds.
In regular operation, the display shows both the temperature (in degrees Celsius or Fahrenheit – users may switch between the two) and any error messages.

The current enclosure internal temperature is usually displayed permanently. In the event of an error message, this will alternate with the temperature display.
The unit is programmed using buttons 1 – 3 (fig. 18). The relevant parameters also appear in the display.

6.2.2 Launching test mode

The Comfort controller is equipped with a test function, whereby the air/water heat exchanger commences cooling operation independently of the set temperature or door limit switch function.

■ Simultaneously press buttons 1 and 2 (fig. 18) for at least 5 seconds.

The air/water heat exchanger starts running.
After approximately 5 minutes or upon reaching 15 °C, test mode will end. The unit switches off and changes to normal operation.

6.2.3 General programming information

Using buttons 1, 2 and 3 (fig. 18) you can change 24 parameters within the preset ranges (min. value, max. value).
Tables 6 and 7 show the parameters which can be altered. Fig. 20 on page 21 shows which buttons must be pressed.

Note on switching hysteresis:
With a low hysteresis and short switching cycles, there is a risk that cooling may not be adequate or that only partial sections of the enclosure are cooled.

Note on temperature settings:
With the Comfort controller, the temperature is preset at the factory to +35 °C.
In order to save energy, do not set the temperature lower than that actually necessary.

In principle, the programming is identical for all editable parameters.

To enter programming mode:

- Press button 2 (“Set”) for approx. 5 seconds.

The controller is now in programming mode. While in programming mode, if you do not press any buttons for approx. 30 sec., the display will first flash, then the controller will switch back to normal display mode. The “Esc” display indicates that any changes made have not been saved.

- Press the programming buttons ▲ (°C) or ▼ (°F) to switch back and forth between the editable parameters (see tables 4 and 5).
- Press button 2 (“Set”) to select the displayed parameter for editing.

The current value of this parameter is displayed.

- Press one of the programming buttons ▲ (°C) or ▼ (°F).

The “Cod” display will appear. In order to be able to change a value, you must enter the authorisation code “22”.

- Keep the programming button ▲ (°C) held down until “22” appears.
- Press button 2 (“Set”) to confirm the code.

You can now alter the parameter within the preset limits.

- Press one of the programming buttons ▲ (°C) or ▼ (°F) until the required value appears.
- Press button 2 (“Set”) to confirm the change.

You can now alter other parameters in the same way. There is no need to re-enter the authorisation code “22”.

- To exit programming mode, press button 2 (“Set”) again for approximately 5 seconds.

“Acc” will appear in the display to indicate that the changes have been saved. The display will then switch back to regular operation (enclosure internal temperature).

You can also program the Comfort controller using a diagnosis software package (Model No. SK 3159.100), the supply of which also includes a connection cable to the PC. The cable connector on the rear of the Comfort controller display serves as an interface.

6.2.4 Eco-mode

All Rittal TopTherm heat exchangers with e-Comfort controller from firmware 3.2 have the energy-saving eco-mode, which is activated in the delivered state.

The eco-mode is used to save energy in the heat exchanger if there is no thermal load, or there is a low thermal load in the enclosure (e.g. standby operation, no production or weekend).

During this process the heat exchanger fan in the internal circuit is switched off as appropriate if the actual enclosure internal temperature drops to 10 K below the setpoint temperature set. To reliably measure the internal temperature also during this process, the fan starts cyclically for 30 sec. every 10 minutes (see fig. 19). If the internal temperature reaches the range 5 K below the setpoint set again, the fan switches back to continuous operation.

If required, the eco-mode can be deactivated via the control display. For this purpose switch the parameter from 1 to 0 in the programming level (see table 6, page 20). The fan then runs continuously.

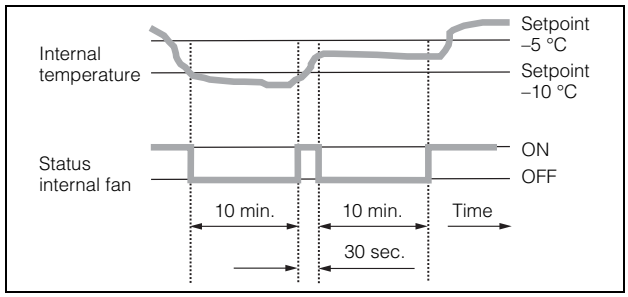

Fig. 19: Diagram of eco-mode

EN

6.2.5 Editable parameters

See also fig. 20 on page 21.

Progr. level	Display screen	Parameters	Min. value	Max. value	Factory setting	Description
1	St	Setpoint enclosure internal temperature T_i	20	68	35	The setting of the enclosure internal temperature is preset at the factory to 35 °C and may be altered within a range of 20 – 55 °C.
2	Mod	Control mode	0	1	0	Control mode setting. The temperature control is made as factory setting with the magnetic valve (0). It is, however, possible to change the temperature control by starting and stopping the internal fan (1); the magnetic valve then remains permanently open. You must obtain the manufacturer's consent before changing to control mode (1).
3	Ad	Master-slave identifier	0	19	0	See "6.2.8 Setting the Master-slave identifier", page 22.
4	CF	Changeover °C/°F	0	1	0	The temperature display can be switched from °C (0) to °F (1). The corresponding LED displays the current unit of temperature.
5	H1	Setting switching difference (hysteresis)	2	10	5	The air/water heat exchanger is preset in the factory to a switching hysteresis of 5 K. This parameter should only be changed in consultation with us. Please contact us for advice.
6	H2	Differential for error message A2	3	15	5	If the internal enclosure temperature exceeds the set value by more than 5 K, then error message A2 (enclosure internal temperature too high) appears on the display terminal. If necessary, the differential may be altered here within the range from 3 – 15 K.
26	ECO	Eco-mode operation	0	1	1	Eco-mode OFF: 0 / Eco-mode ON: 1

Tab. 6: Editable parameters

EN

6.2.6 Programming overview

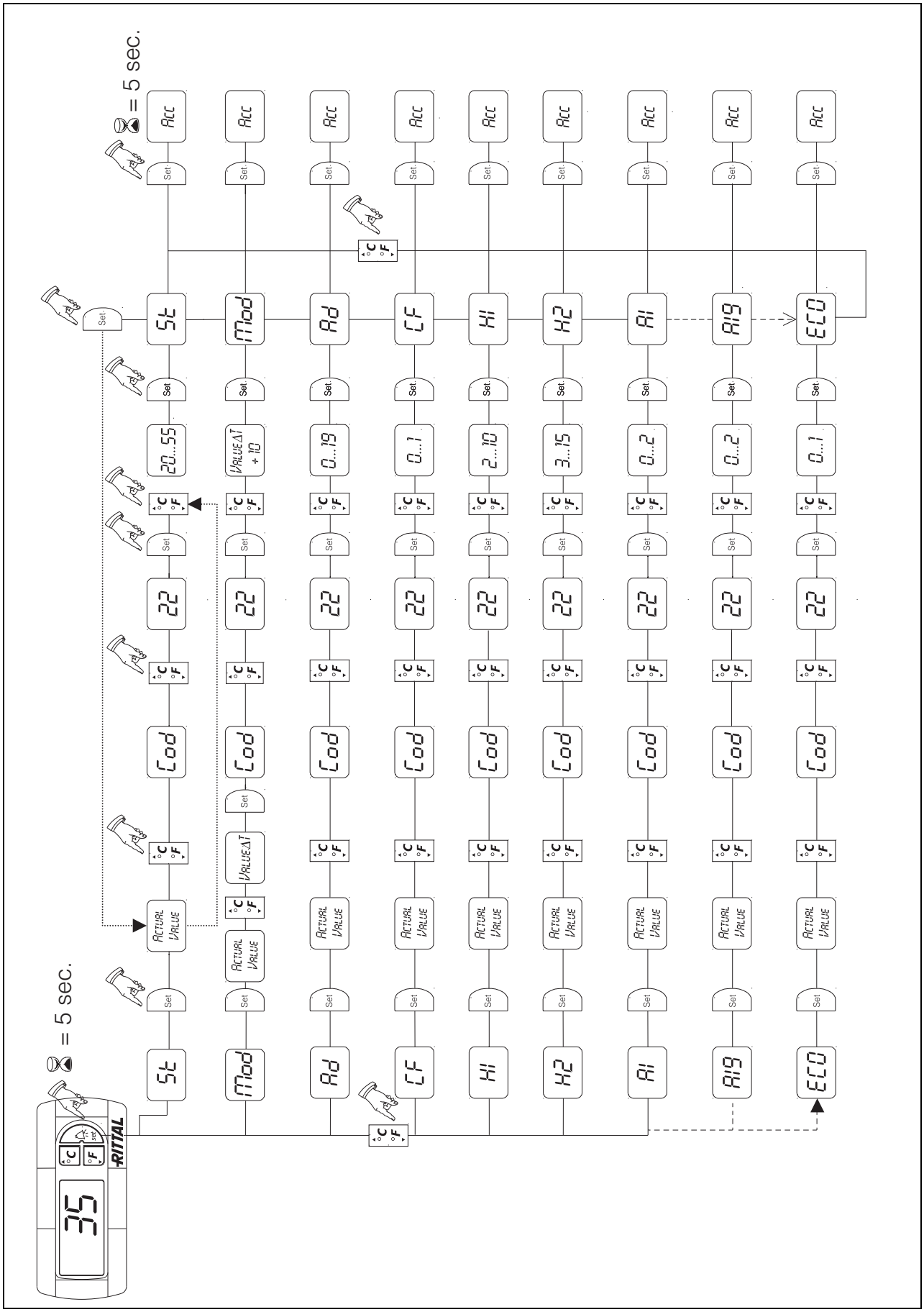

Fig. 20: Programming overview

EN

6.2.7 Defining system messages for evaluation

System messages are shown on the display screen of the Comfort controller via the displays A1 to A20 and E0.

A more detailed explanation of the system messages may be found in section “6.2.9 Evaluating system messages”, page 23.
See also fig. 20 on page 21.

Progr. level	Display screen	Min. value	Max. value	Factory setting	Type or location of fault
7	A01	0	2	0	Enclosure door open
8	A02	0	2	0	Internal temperature of enclosure too high
9	A08	0	2	1	Condensate warning
10	A10	0	2	1	Fan blocked or defective
11	A16	0	2	1	Internal temperature sensor
12	A18	0	2	1	EPROM
13	A19	0	2	0	LAN/Master-Slave
14	A20	0	2	0	Voltage drop

Tab. 7: System messages which may be evaluated via relays

The system messages A01 – A20 may additionally be evaluated via two floating system message relays. In this way, one of the two system message relays may be allocated to each system message.
See wiring diagrams at section “4.7.2 Installing the power supply”, page 13:
– Terminal 3: NO (normally open, relay 2)
– Terminal 4: Connection of the supply voltage to the system message relay
– Terminal 5: NO (normally open, relay 1)

The definition NO refers to the de-energised state. As soon as power is applied to the air/water heat exchanger, both system message relays (relay 1 and 2) energise.
This is the normal operating state of the air/water heat exchanger.
As soon as a system message occurs or the power supply is interrupted, the corresponding relay will drop out and open the contact.

Program system messages with the value
0: System message is not sent to the system message relays, but merely appears in the display
1: System message is evaluated by relay 1
2: System message is evaluated by relay 2

6.2.8 Setting the Master-slave identifier

When several air/water heat exchangers are connected together (maximum ten), one of the air/water heat exchangers must be defined as the “master” and the others as “slaves”. For this purpose, assign a corresponding identifier (address) to each air/water heat exchanger which will enable the air/water heat exchanger to be identified in the network.
If one of the slave units reaches the set temperature or if the door limit switch function is activated, the affected slave unit will report to the master unit, which then deactivates all the other air/water heat exchangers.

Notes:
– Only one unit may be configured as master, and its identifier must match the number of connected slave units.
– The slave units must have different identifiers.
– The identifiers must be numbered in ascending order without any gaps.

On the **master air/water heat exchanger** (00 = factory setting), set the number of slave units present in the network:

01: Master with 1 slave air/water heat exchanger
02: Master with 2 slave air/water heat exchangers
03: Master with 3 slave air/water heat exchangers
04: Master with 4 slave air/water heat exchangers
05: Master with 5 slave air/water heat exchangers
06: Master with 6 slave air/water heat exchangers
07: Master with 7 slave air/water heat exchangers
08: Master with 8 slave air/water heat exchangers
09: Master with 9 slave air/water heat exchangers

On the **slave air/water heat exchanger** (00 = factory setting), set its own address:

11: Slave air/water heat exchanger no. 1
12: Slave air/water heat exchanger no. 2
13: Slave air/water heat exchanger no. 3
14: Slave air/water heat exchanger no. 4
15: Slave air/water heat exchanger no. 5
16: Slave air/water heat exchanger no. 6
17: Slave air/water heat exchanger no. 7
18: Slave air/water heat exchanger no. 8
19: Slave air/water heat exchanger no. 9

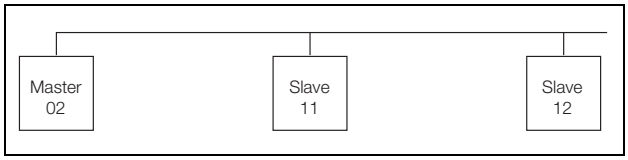

Fig. 21: Master-slave connection (example)

For further connection examples, see “4.7.1 Bus connection (only when interconnecting several units with a Comfort controller)”, page 11.

For details of how to set the identifier, see “6.2.5 Editable parameters”, page 20 or “6.2.6 Programming overview”, page 21, parameter “Ad”.

6.2.9 Evaluating system messages

In the Comfort controller, system messages are indicated by a number in the display.

Display screen	System message	Possible cause	Measures to rectify the fault
A01	Enclosure door open	Door open or door limit switch incorrectly positioned	Close door, position door limit switch correctly, check connection if necessary
A02	Internal temperature of enclosure too high	Cooling capacity inadequate/ unit undersized	Check cooling capacity
A08	Condensate warning	Condensate discharge kinked or blocked	Check condensate discharge; repair any kinks or blockages in the hose
A10	Fan	Blocked or defective	Clear the blockage; replace if necessary
A16	Temperature sensor internal temperature	Open or short-circuit	Replace
A18	EPROM error	New board obstructed	Software update needed (only following board installation with more recent software): Enter the programming level with Code 22; press button 1 and confirm with “Set” until “Acc” appears. Next, disconnect the unit from the mains and reconnect.
A19	LAN/Master-Slave	Master and slave not connected	Check setting and/or cable
A20	Voltage drop	Error display not shown	Event is stored in the log file
E0	Display message	Connection problem between the display and the controller board	Reset: Switch power supply off, then switch on again after approx. 2 sec.
		Cable defective; connection loose	Exchange the boards

Tab. 8: Troubleshooting with the Comfort controller

EN

7 Inspection and maintenance

Risk of electric shock!
The unit is live.
Switch off the power supply before opening, and take suitable precautions against it being accidentally switched on again.

7.1 General

The air/water heat exchanger is largely maintenance-free. The water circuit is checked at the factory for leaks and subjected to a function trial run.

The installed maintenance-free fan is mounted on ball bearings, protected against moisture and dust, and fitted with a temperature monitor. The life expectancy is at least 30,000 operating hours.

The air/water heat exchanger is consequently largely maintenance-free. If dirt is present in the cooling water, a filter must be fitted.

Maintenance interval: 2000 operating hours.

Caution!
Risk of fire!
Never use flammable liquids for cleaning.

Sequence of maintenance measures:
– Check the level of dirt.
– Cooling membranes soiled? Clean if necessary.
– Activate test mode; cooling function OK?
– Check the noise generation of the fan.

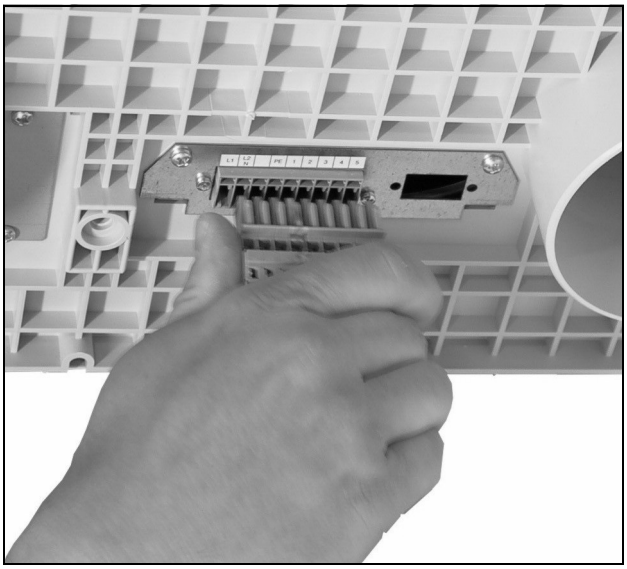

Fig. 22: Disconnect the mains plug

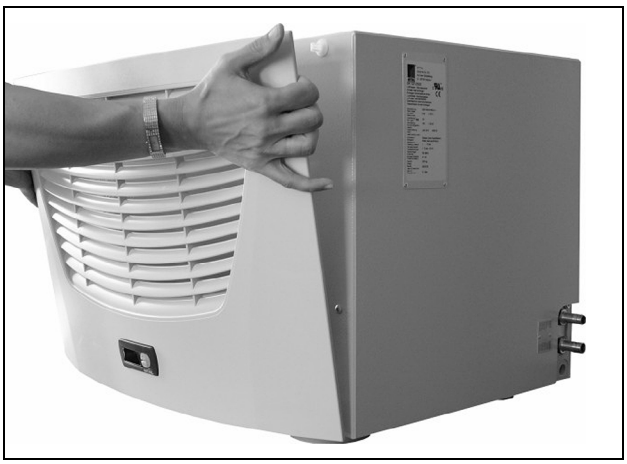

Fig. 23: Release the louvred grille

Fig. 24: Remove the louvred grille

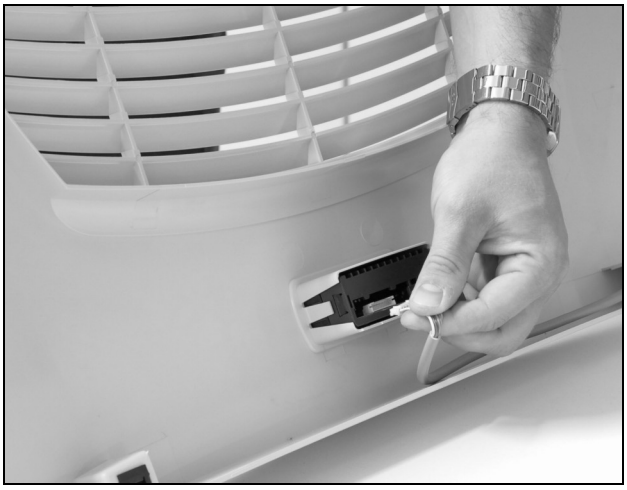

Fig. 25: Disconnect the connector from the display

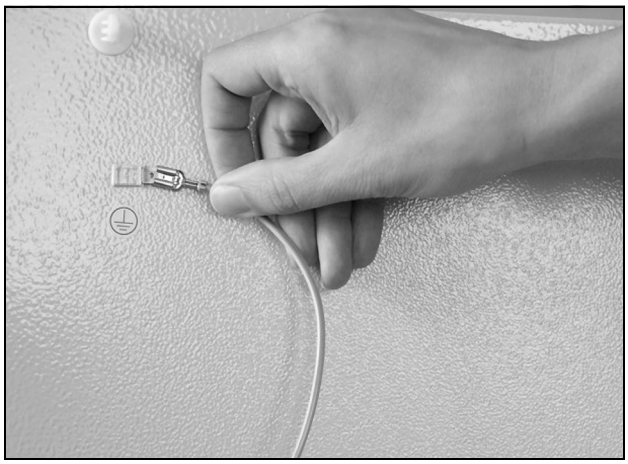

Fig. 26: Disconnect the earthing cable

Fig. 27: Remove the assembly screws from the cover (loosen four screws)

Fig. 28: Remove the cover

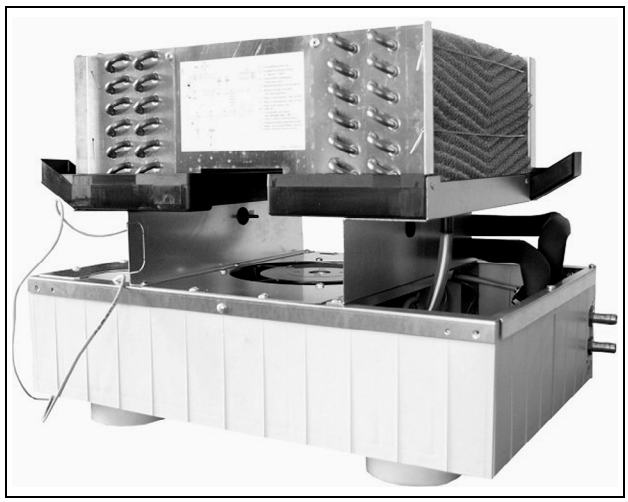

Fig. 29: Air/water heat exchanger without cover (front view)

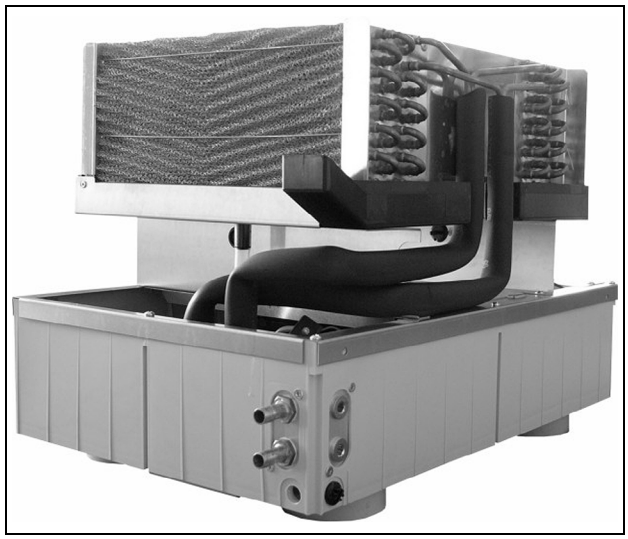

Fig. 30: Air/water heat exchanger without cover (rear view)

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8 Emptying, storage and disposal

Caution! Risk of damage!
The air/water heat exchanger must not be subjected to temperatures above +70 °C during storage.

During storage, the air/water heat exchanger must stand upright.
Disposal can be performed at the Rittal plant. Please contact us for advice.

Emptying (for units with Basic controller only):
During storage and transportation below freezing point, the air/water heat exchanger should be drained completely in the water supply direction using compressed air. This requires that the magnetic valve be opened.
For the Comfort controller, this is achieved by simultaneously pressing the H2 (°C key) and H4 (/set key) keys for five seconds. The magnetic valve is then opened for approximately five minutes.

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9 Technical specifications

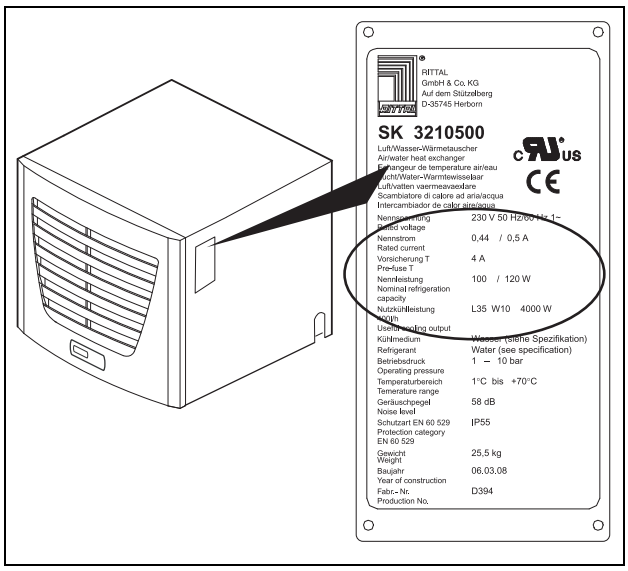

Fig. 31: Rating plate (technical data)

– Observe the mains connection data (voltage and frequency) as per the rating plate.
– Observe the pre-fuse as per the specifications on the rating plate.

	Unit	Model No. SK					
Basic controller, RAL 7035	–	**3209.100**	**3209.110**	**3209.140**	**3210.100**	**3210.110**	**3210.140**
Comfort controller, RAL 7035	–	**3209.500**	**3209.510**	**3209.540**	**3210.500**	**3210.510**	**3210.540**
Rated voltage	V Hz	230, 1~, 50/60	115, 1~, 50/60	400, 2~, 50/60	230, 1~, 50/60	115, 1~, 50/60	400, 2~, 50/60
Rated current	A	0.40/0.48	0.85/0.95	0.25/0.30	0.44/0.50	0.90/1.0	0.25/0.30
Pre-fuse T	A	4.0/4.0	4.0/4.0	4.0/4.0	4.0/4.0	4.0/4.0	4.0/4.0
Motor circuit-breaker	–	–	–	–	–	–	–
Transformer circuit-breaker	–	–	–	–	–	–	–
Miniature circuit-breaker	–	■	■	■	■	■	■
Useful cooling output $\dot{Q}_k$ L 35 W 10 to DIN 3168	W l/h	2500 400			4000 400		
Admissible pressure	bar	1 to 10					
Water inlet temperature	°C	+1 to ±30					
Temperature setting range	°C	+1 to +70					
Noise level	dB (A)	58	58	58	58	58	58
Electrical connection	–	Plug-in terminal strip					
Water connection	–	Hose nozzle or $^3/_8$″ external thread					
Protection category to IEC 60 529	–	IP 55					
Dimensions (W x H x D)	mm	597 x 417 x 475					
Air throughput of fans (unimpeded airflow)	m^3/h	1030					
Weight	kg	23.5	27.5	27.5	25.5	29.5	29.5

9 Technical specifications

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	Unit	Model No. SK					
Basic controller, RAL 7035	–	**3209.104**	**3209.114**	**3209.144**	**3210.104**	**3210.114**	**3210.144**
Comfort controller, RAL 7035	–	**3209.504**	**3209.514**	**3209.544**	**3210.504**	**3210.514**	**3210.544**
Rated voltage	V Hz	230, 1~, 50/60	115, 1~, 50/60	400, 2~, 50/60	230, 1~, 50/60	115, 1~, 50/60	400, 2~, 50/60
Rated current	A	0.40/0.48	0.85/0.95	0.25/0.30	0.44/0.50	0.90/1.0	0.25/0.30
Pre-fuse T	A	4.0/4.0	4.0/4.0	4.0/4.0	4.0/4.0	4.0/4.0	4.0/4.0
Motor circuit-breaker	–	–	–	–	–	–	–
Transformer circuit-breaker	–	–	–	–	–	■	–
Miniature circuit-breaker	–	■	■	■	■	–	■
Useful cooling output Q_k L 35 W 10 to DIN 3168	W l/h	1875 400			3000 400		
Admissible pressure	bar	1 to 10					
Water inlet temperature	°C	+1 to ±30					
Temperature setting range	°C	+20 to +55					
Noise level	dB (A)	58	58	58	58	58	58
Electrical connection	–	Plug-in terminal strip					
Water connection	–	Hose nozzle or $^3/_8$″ external thread					
Protection category to IEC 60 529	–	IP 55					
Dimensions (W x H x D)	mm	597 x 415 x 475					
Air throughput of fans (unimpeded airflow)	m^3/h	1030			925		
Weight	kg	23.5	27.5	27.5	25.5	29.5	29.5

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10 List of spare parts

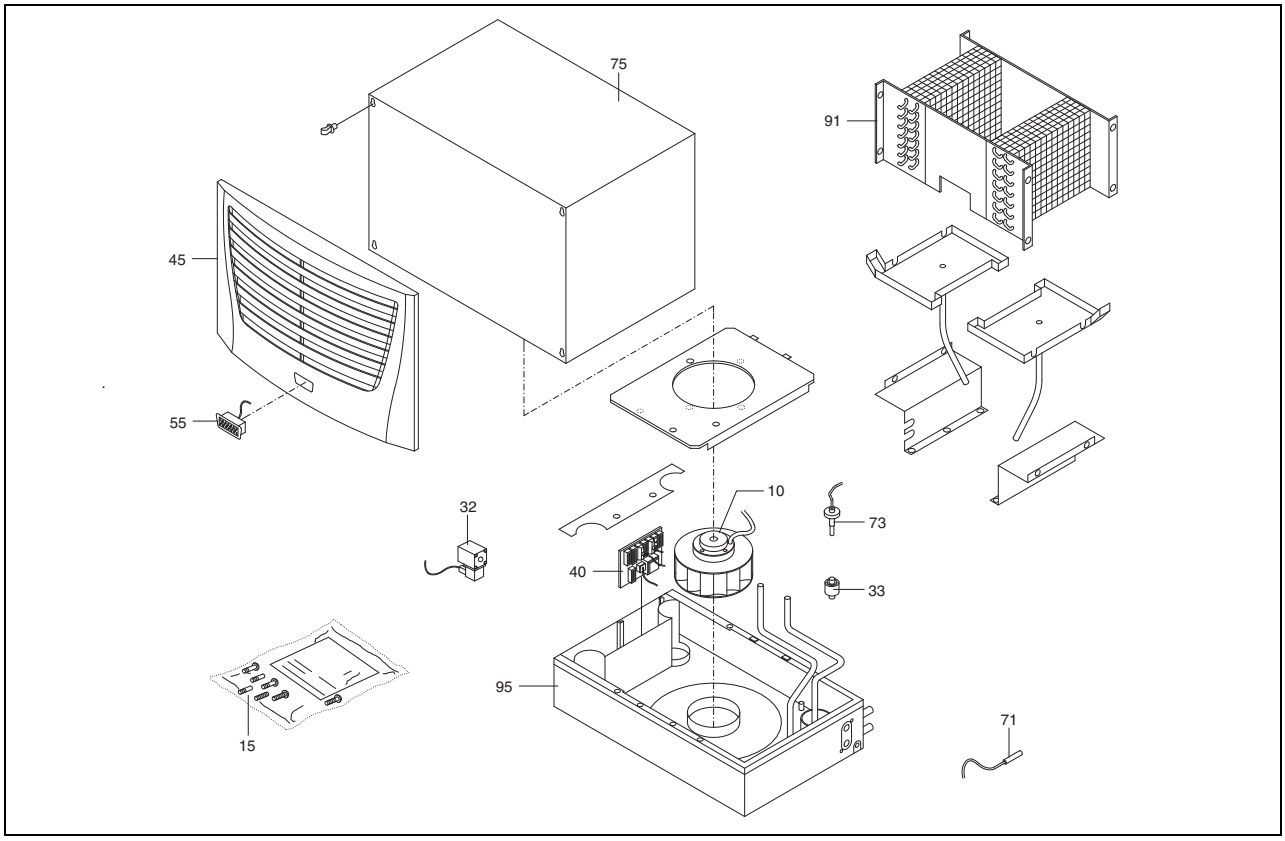

Fig. 32: Spare parts for SK 3209.XXX, SK 3210.XXX

Key

10 Fan, complete
15 Dispatch bag
32 Magnetic valve, complete
33 Non-return valve
40 Controller board
45 Louvred grille
55 Display
71 Temperature probe
73 Float-actuated switch
75 Cover
91 Heat exchanger
95 Base tray

Note:
As well as the spare part number, when ordering spare parts the following information must be provided:
– Unit model
– Fabrication number
– Date of manufacture
This information may be found on the rating plate.

EN

11 Further technical information

11.1 Hydrological data

To avoid system damage and to ensure safe operation, Rittal GmbH & Co. KG recommends the use of system water or an additive whose composition does not differ from that presented in the following summary:

Hydrological data	Unit	Model No. SK	Model no. SK[1)]
	–	**3209.100/3209.110/3209.140 3209.500/3209.510/3209.540 3210.100/3210.110/3210.140 3210.500/3210.510/3210.540**	**3209.104/3209.114/3209.144 3209.504/3209.514/3209.544 3210.104/3210.114/3210.144 3210.504/3210.514/3210.544**
pH value		7 – 8.5	6 – 9
Calcium hardness	°dH	3 < 8	1 – 2
Free carbonic acid	mg/dm³	8 – 15	1 – 100
Corresponding carbonic acid	mg/dm³	8 – 15	free
Aggressive carbonic acid	mg/dm³	0	0 – 400
Sulphides	mg/dm³	free	free
Oxygen	mg/dm³	< 10	< 10
Chloride ions	mg/dm³	< 50	< 200
Sulphate ions	mg/dm³	< 250	< 500
Nitrates and nitrites	mg/dm³	< 10	< 100
COD	mg/dm³	< 7	< 40
Ammonia	mg/dm³	< 5	< 20
Iron	mg/dm³	< 0.2	free
Manganese	mg/dm³	< 0.2	free
Conductivity	µS/cm	< 2200	< 4000
Evaporation residue	mg/dm³	< 500	< 2000
Potassium permanganate	mg/dm³	< 25	< 40
Suspended matter	mg/dm³	< 3	
		> 3 < 15: Partial current purification recommended > 15: continuous purification recommended	

[1)] The complete absence of corrosion under experimental conditions suggests that solutions with a significantly higher salt content and greater corrosion potential (such as seawater) can still be tolerated.

Tab. 9: Hydrological data

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11.2 Characteristic curves

11.2.1 Water resistance

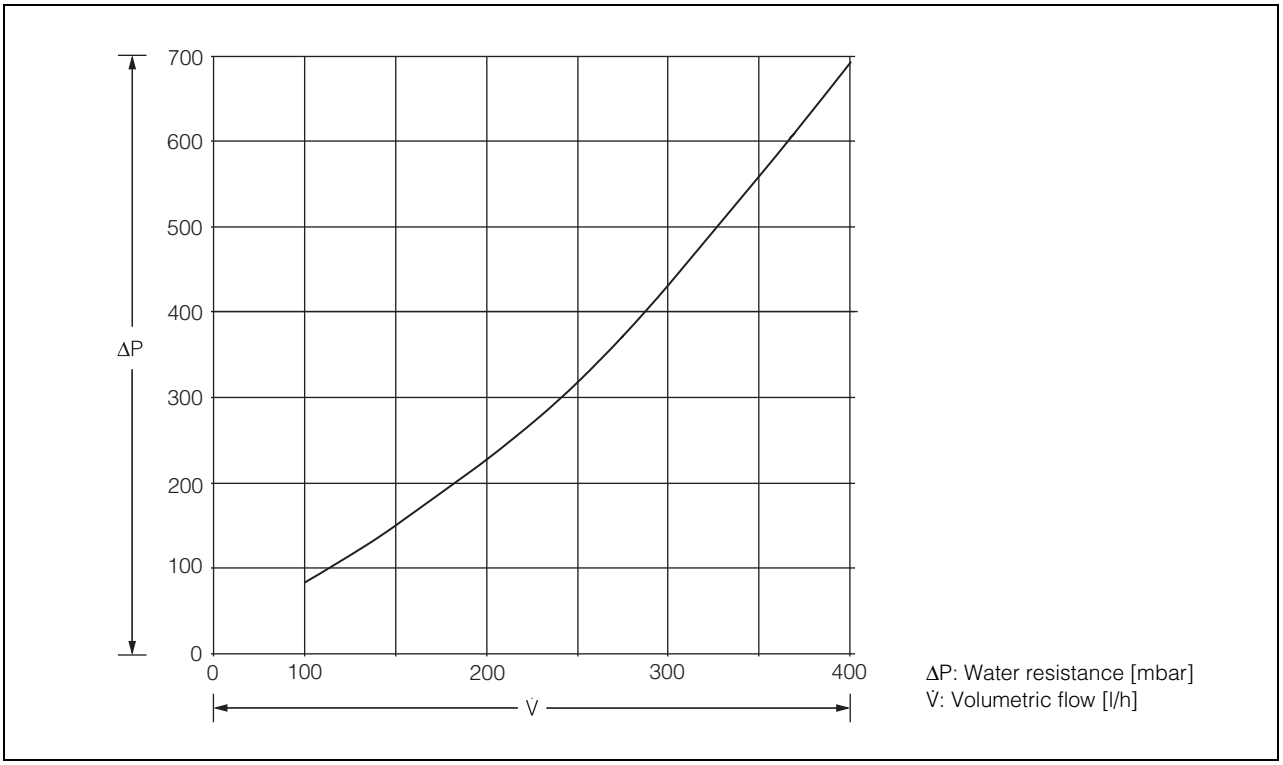

Fig. 33: Water resistance SK 3209.100

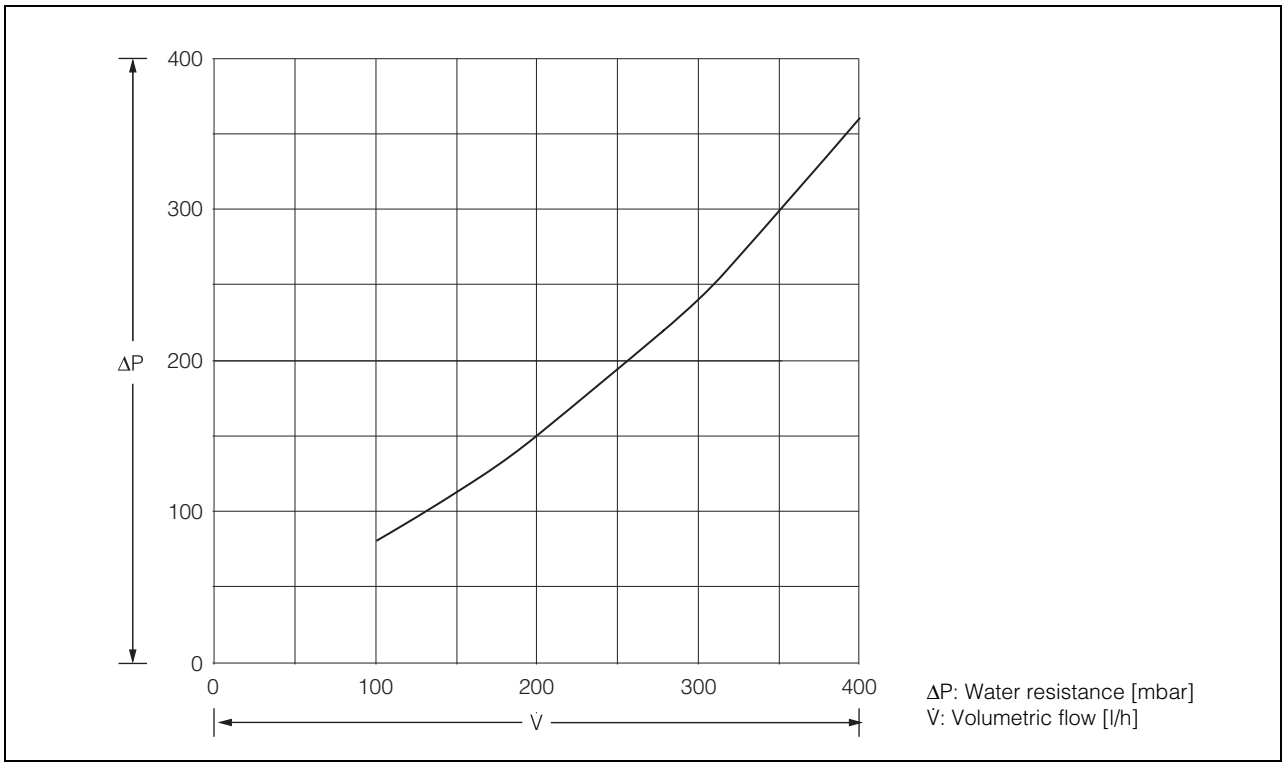

Fig. 34: Water resistance SK 3209.104

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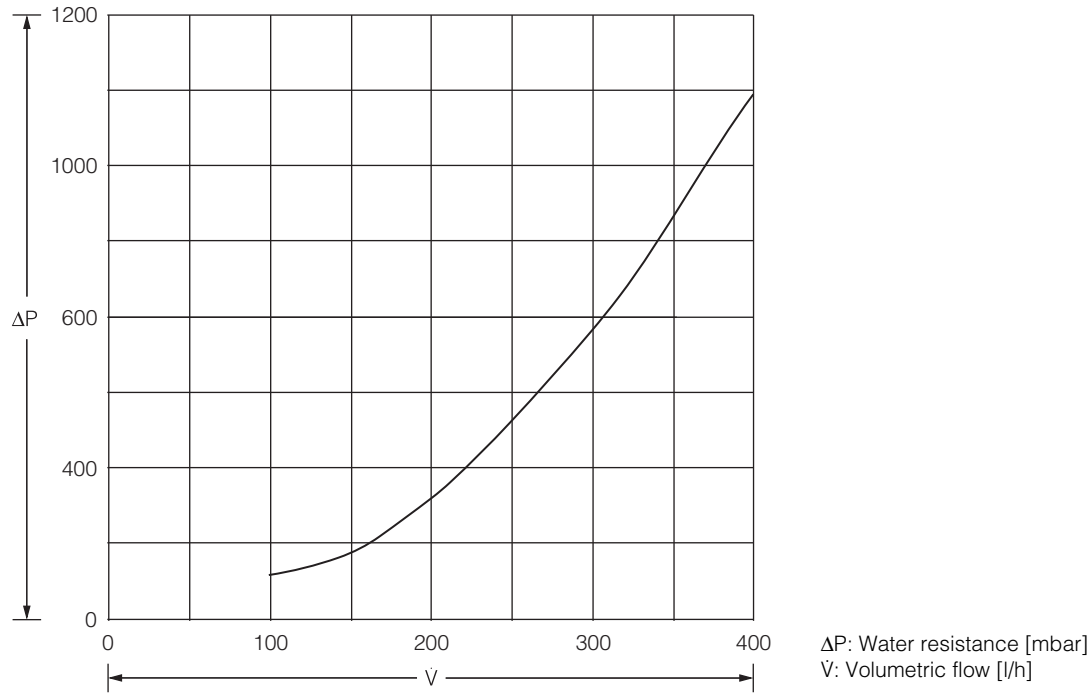

Fig. 35: Water resistance SK 3210.XX0

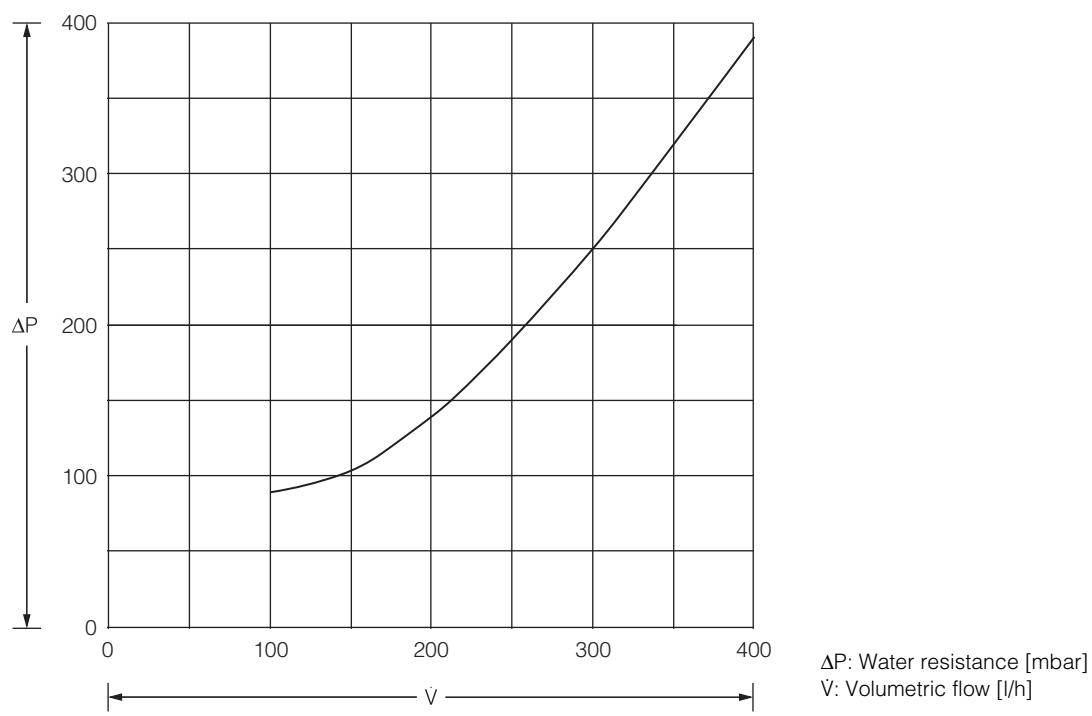

Fig. 36: Water resistance SK 3210.XX4

12 Appendix 1: Cut-out and hole sizes

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12.1 Dimensions for assembly

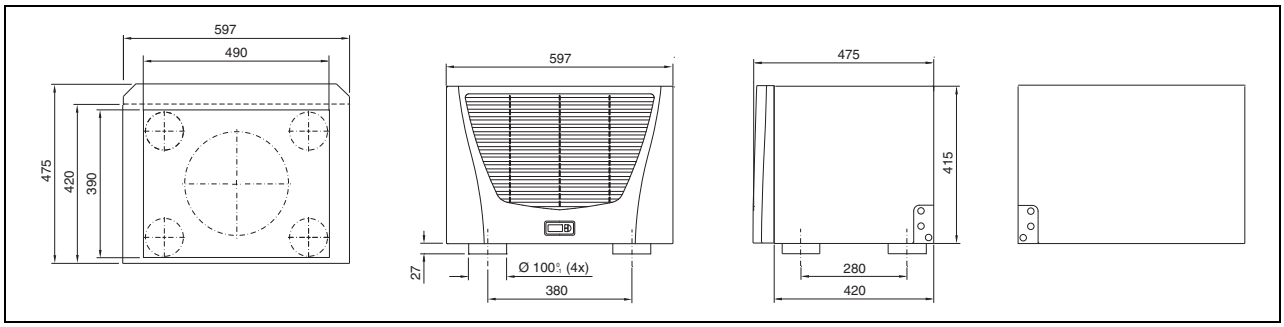

Fig. 37: SK 3209.XXX/SK 3210.XXX assembly

13 Appendix 2: Preparation and maintenance of the water in recooling systems

Depending on the type of installation to be cooled, certain requirements are placed on the cooling water with respect to purity. According to the level of contamination and the size and design of the recooling systems, a suitable process is used to prepare and/or maintain the water.

The most common types of contamination and most frequently used techniques to eliminate them in industrial cooling are:

Contamination of the water	Procedure
Mechanical contamination	Filter the water using: – Mesh filter – Gravel filter – Cartridge filter – Precoated filter
Excessive hardness	Water softening via ion exchange
Moderate content of mechanical contaminants and hardness components	Addition of stabilisers and/or dispersing agents to the water
Moderate content of chemical contaminants	Addition of passifiers and/or inhibitors to the water
Biological impurities myxobacteria and algae	Addition of biocides to the water

Tab. 10: Water contaminants

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