Operating and maintenance instructions

Airbox HVAC units

Important note

These operating and maintenance instructions contain important technical and safety information. Therefore, please read these instructions carefully before installation and before carrying out any work on the air handling unit.

The units must be installed and used in accordance with our instructions.
If installation is carried out contrary to these provisions and the defect/damage that has occurred is causally related to improper modification, processing or other treatment, all claims for damages or warranty are excluded.
The customer must provide evidence that the improper installation was not the cause of the damage.

The general maintenance instructions in the installation, commissioning and maintenance manual for central ventilation units of the S60 and T60 (C60) series must be strictly observed.

All work on air conditioning units must be carried out exclusively by qualified personnel or persons who have been instructed accordingly!

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1 Safety

1.1 Warnings regarding occupational safety

The following symbols indicate specific hazards or provide information on the safe operation of the ventilation unit:

Caution! Danger zone! Safety information!

Danger due to electric current or high voltage!

Risk of crushing!

Danger to life! Do not stand under suspended loads!

Caution! Hot surface!

Caution! Explosive atmosphere

Caution! Industrial trucks

Important note, information

1.2 Safety instructions

Rosenberg air handling units are designed and manufactured in accordance with the latest state of the art at the time of delivery. Extensive material, functional and quality tests ensure high performance and a long service life. Nevertheless, these machines can pose a hazard if they are used improperly or not in accordance with their intended purpose by untrained personnel. The operating instructions of the component manufacturers must be consulted for the individual components.

Only operate the air handling unit when it is installed or with properly fitted access protection or protective grilles (we usually supply suitable and tested protective grilles or can do so on request)! Read these instructions carefully before unpacking the goods, before installation work and before any maintenance work!

The following work must only be carried out by trained specialist personnel:

- Installation work
- Electrical connection
- Establishing supply connections
- Commissioning
- Repair work

All work must be carried out using personal protective equipment, including protective gloves due to the possibility of sharp edges, safety clothing and, if necessary, respiratory and eye protection. When cleaning and disinfecting, follow the instructions for the agents used!

Operate the air handling unit exclusively in accordance with its intended use and within the specified performance limits. These can be found in the technical data sheets or on the type plates on the unit.

Even a single instance of exceeding the specified performance limits will inevitably result in damage to the built-in components and subsequently pose a risk to the continued operational safety of the unit.

Only approved conveyor and operating equipment may be used. Please consult your local authorities and the relevant regulations for the respective area.
Before working on electrically powered machines, they must be disconnected from the mains at all poles (repair switches with padlock locks, adapted to the power and function, are usually included in the scope of delivery).

After carrying out work on the air handling unit, the person responsible must ensure that no persons are present in the system before it is put back into operation.

Authorised persons must be trained in accordance with the current accident prevention regulations (UVV) of the relevant professional associations and instructed in the work area.

See also:

DGUV Regulation 1	"Principles of Prevention"
DGUV Regulation 3	"Accident prevention regulation for electrical systems and equipment"
DGUV Regulation 52	"Cranes"
DGUV Regulation 68	"Industrial trucks"
DGUV Rule 100-500	"Operation of work equipment"
BetrSichV	"Industrial Safety Regulation"
DGUV Information 208-016	"Guidelines for the use of ladders and steps"
VDMA 24186-1	"Service programme for the maintenance of technical systems and equipment in buildings"
VDI 3803	"Ventilation and air conditioning systems: Structural and technical requirements"
VDI 6022	"Hygienic requirements for room air conditioning systems"

2 Device description

Rosenberg AHU´s are designed according to a modular principle and can be manufactured and installed in any sensible combination. Units marked "Eurovent" comply with the requirements of EUROVENT certification.

Depending on the size, the application range covers a volume flow range from 500 m^3/h to 100,000 m^3/h with a maximum medium density of 1.3 kg/m^3.

Air treatment functions such as filtering, heating, cooling, mixing, humidifying and moving are typical functions. In addition, various high-efficiency heat recovery systems are used.

Units for outdoor installation have been specially adapted for outdoor use. Modified or additional unit components compared to indoor units, such as weather protection grilles, intake or exhaust hoods on the air connections, rain roofs (usually as a kit with installation instructions) or powder/coil coatings on the outer surfaces, enable outdoor use.
Rosenberg air handling units must not be used to perform static or dynamic building functions, e.g. as part of the roof or roof function, by installing the unit above roof openings.

Hygienic units have been specially designed for use in hygienically sensitive areas. Particular emphasis has been placed on high-quality, hygienically sound materials and components. Good accessibility and cleanability are paramount. Rosenberg air handling units in hygienic design comply with the strict hygiene regulations of the German standard DIN 1946 Part 4.

2.1 Unit series

with 60 mm insulation thickness:

Unit series	External dimensions		Recommended volume flows		
	B	H	For from	supply air units v= 1.5 m/s	Exhaust air devices v= 2.0 m/s
S60/T60-0704	770 mm	480 mm	500 m³/h	1200 m³/h	1600 m³/h
S60/T60-0707	770 mm	770 mm	1100 m³/h	2200 m³/h	2900 m³/h
S60/T60-0710	770 mm	1090 mm	1600 m³/h	3300 m³/h	4400 m³/h
S60/T60-0713	770 mm	1390 mm	2100 m³/h	4300 m³/h	5800 m³/h
S60/T60-1004	1090 mm	480 mm	900 m³/h	1800 m³/h	2400 m³/h
S60/T60-1007	1090 mm	770 mm	1600 m³/h	3300 m³/h	4400 m³/h
S60/T60-1010	1090 mm	1090 mm	2400 m³/h	4900 m³/h	6600 m³/h
S60/T60-1013	1090 mm	1390 mm	3200 m³/h	6500 m³/h	8700 m³/h
S60/T60-1016	1090 mm	1720 mm	4100 m³/h	8200 m³/h	10,900 m³/h
S60/T60-1020	1090 mm	2020 mm	4800 m³/h	9700 m³/h	13,000 m³/h
S60/T60-1304	1390 mm	480 mm	1100 m³/h	2300 m³/h	3100 m³/h
S60/T60-1307	1390 mm	770 mm	2100 m³/h	4300 m³/h	5800 m³/h
S60/T60-1310	1390 mm	1090 mm	3200 m³/h	6500 m³/h	8700 m³/h
S60/T60-1313	1390 mm	1390 mm	4200 m³/h	8500 m³/h	11,400 m³/h
S60/T60-1316	1390 mm	1720 mm	5400 m³/h	10,800 m³/h	14,400 m³/h
S60/T60-1320	1390 mm	2020 mm	6400 m³/h	12,800 m³/h	17,100 m³/h
S60/T60-1322	1390 mm	2260 mm	7200 m³/h	14,400 m³/h	19,300 m³/h
S60/T60-1325	1390 mm	2570 mm	8300 m³/h	16,600 m³/h	22,100 m³/h
S60/T60-1607	1720 mm	770 mm	2700 m³/h	5400 m³/h	7300 m³/h
S60/T60-1610	1720 mm	1090 mm	4100 m³/h	8200 m³/h	10,900 m³/h
S60/T60-1613	1720 mm	1390 mm	5400 m³/h	10,800 m³/h	14,400 m³/h
S60/T60-1616	1720 mm	1720 mm	6800 m³/h	13,600 m³/h	18,200 m³/h
S60/T60-1620	1720 mm	2020 mm	8100 m³/h	16,200 m³/h	21,600 m³/h
S60/T60-1622	1720 mm	2260 mm	9100 m³/h	18,200 m³/h	24,300 m³/h
S60/T60-1625	1720 mm	2570 mm	10,400 m³/h	20,900 m³/h	27,900 m³/h
S60/T60-2010	2020 mm	1090 mm	4800 m³/h	9700 m³/h	13,000 m³/h
S60/T60-2013	2020 mm	1390 mm	6400 m³/h	12,800 m³/h	17,100 m³/h
S60/T60-2016	2020 mm	1720 mm	8100 m³/h	16,200 m³/h	21,600 m³/h
S60/T60-2020	2020 mm	2020 mm	9600 m³/h	19,200 m³/h	25,700 m³/h
S60/T60-2022	2020 mm	2260 mm	10,800 m³/h	21,700 m³/h	28,900 m³/h
S60/T60-2025	2020 mm	2570 mm	12,400 m³/h	24,900 m³/h	33,200 m³/h
S60/T60-2028	2020 mm	2870 mm	13,900 m³/h	27,900 m³/h	37,200 m³/h
S60/T60-2210	2260 mm	1090 mm	5500 m³/h	11,000 m³/h	14,700 m³/h

S60/T60-2213	2260 mm	1390 mm	7200 m³/h	14,400 m³/h	19,300 m³/h
S60/T60-2216	2260 mm	1720 mm	9100 m³/h	18,200 m³/h	24,300 m³/h
S60/T60-2220	2260 mm	2020 mm	10,800 m³/h	21,700 m³/h	28,900 m³/h
S60/T60-2222	2260 mm	2260 mm	12,200 m³/h	24,400 m³/h	32,600 m³/h
S60/T60-2225	2260 mm	2570 mm	14,000 m³/h	28,000 m³/h	37,400 m³/h
S60/T60-2228	2260 mm	2870 mm	15,700 m³/h	31,500 m³/h	42,000 m³/h
S60/T60-2510	2570 mm	1090 mm	6300 m³/h	12,600 m³/h	16,800 m³/h
S60/T60-2513	2570 mm	1390 mm	8300 m³/h	16,600 m³/h	22,100 m³/h
S60/T60-2516	2570 mm	1720 mm	10,400 m³/h	20,900 m³/h	27,900 m³/h
S60/T60-2520	2570 mm	2020 mm	12,400 m³/h	24,900 m³/h	33,200 m³/h
S60/T60-2522	2570 mm	2260 mm	14,000 m³/h	28,000 m³/h	37,400 m³/h
S60/T60-2525	2570 mm	2570 mm	16,000 m³/h	32,100 m³/h	42,800 m³/h
S60/T60-2528	2570 mm	2870 mm	18,000 m³/h	36,100 m³/h	48,100 m³/h
S60/T60-2810	2870 mm	1090 mm	7100 m³/h	14,200 m³/h	18,900 m³/h
S60/T60-2813	2870 mm	1390 mm	9300 m³/h	18,600 m³/h	24,800 m³/h
S60/T60-2816	2870 mm	1720 mm	11,700 m³/h	23,500 m³/h	31,300 m³/h
S60/T60-2820	2870 mm	2020 mm	13,900 m³/h	27,900 m³/h	37,200 m³/h
S60/T60-2822	2870 mm	2260 mm	15,700 m³/h	31,500 m³/h	42,000 m³/h
S60/T60-2825	2870 mm	2570 mm	18,000 m³/h	36,100 m³/h	48,100 m³/h
S60/T60-2828	2870 mm	2870 mm	20,200 m³/h	40,500 m³/h	54,000 m³/h
S60/T60-3210	3180 mm	1090 mm	7,900 m³/h	15,800 m³/h	21,000 m³/h
S60/T60-3213	3180 mm	1390 mm	10,300 m³/h	20,700 m³/h	27,600 m³/h
S60/T60-3216	3180 mm	1720 mm	13,000 m³/h	26,100 m³/h	34,900 m³/h
S60/T60-3220	3180 mm	2020 mm	15,500 m³/h	31,100 m³/h	41,500 m³/h
S60/T60-3222	3180 mm	2260 mm	17,500 m³/h	35,000 m³/h	46,700 m³/h
S60/T60-3225	3180 mm	2570 mm	20,000 m³/h	40,100 m³/h	53,500 m³/h
S60/T60-3228	3180 mm	2870 mm	22,500 m³/h	45,100 m³/h	60,100 m³/h
S60/T60-3513	3480 mm	1390 mm	11,300 m³/h	22,700 m³/h	30,300 m³/h
S60/T60-3516	3480 mm	1720 mm	14,300 m³/h	28,700 m³/h	38,300 m³/h
S60/T60-3520	3480 mm	2020 mm	17,000 m³/h	34,100 m³/h	45,500 m³/h
S60/T60-3522	3480 mm	2260 mm	19,200 m³/h	38,500 m³/h	51,300 m³/h
S60/T60-3525	3480 mm	2570 mm	22,000 m³/h	44,100 m³/h	58,800 m³/h
S60/T60-3528	3480 mm	2870 mm	24,700 m³/h	49,500 m³/h	66,000 m³/h

2.2 Information on materials and sealing joints

All metallic materials used are provided with additional corrosion protection (galvanisation, coating) or are themselves corrosion-resistant. The formation of the protective coating is a long-term, continuous process. Numerous elements are manufactured from galvanised steel using machines and craftsmanship.

Despite the utmost care taken throughout the manufacturing process, scratches are only avoidable to a limited extent, and discolouration may occur here and on the cut edges from time to time. These are harmless and state of the art and therefore not a defect. Before the top layer is fully formed, galvanised surfaces tend to form white rust. According to the state of the art, such circumstances are generally unavoidable and beyond our control and therefore do not constitute a defect. Affected areas must be cleaned and, if necessary, resealed. Coated surfaces are low-maintenance and there is a galvanised layer underneath the coating. Damage can be repaired with commercially available paints.

Sealing joints are subject to ageing and wear during operation, as well as environmental influences and temperature fluctuations. These lead to reduced flexibility, shrinkage and cracks. Despite the utmost care taken during the manufacturing process, the joints may crack during transport, installation or assembly of the modules and thus become leaky. In this case, the joints must be reworked or redone. Sealing joints must be checked annually and replaced if necessary.

3 Conditions of use

Rosenberg AHU´s are to be used exclusively for treating air or gaseous media in accordance with the criteria listed below.

The centrifugal fans used are suitable for conveying ...

- clean air with low dust or grease content (pre-filtration of at least ISO $ePM_{10} \geq 50\%$ recommended).
- Slightly aggressive gases and vapours. (Consultation with the factory is required in all cases!).
- Gaseous media up to a density of 1.3 kg/m^3.
- Gaseous media up to a relative humidity of max. 95%.
- Gaseous media in the temperature range from –20°C to +40°C (other ranges require special modifications!).
- Non-explosive gaseous media.

When using the air handling unit, series S60 only, in an explosive atmosphere or when conveying explosive media, the requirements for the individual installation and functional parts must be checked in advance by the factory.

- Clarification as to whether installation will take place in an explosive atmosphere.
- Clarification as to whether the unit conveys an explosive medium, FB-03-22 & FB-03-24.
- Expert assessment of zones, explosion groups and temperature classes in accordance with DIN EN 60079 and determination of the required type of protection in accordance with DIN EN 60079.
- Restriction of air velocities in relation to the respective installed functional parts in order to avoid static charges. Earthing of endangered parts by means of electrical potential equalisation is required.
- Reduction of the maximum fan operating speed by 15% of the maximum permissible peripheral speed of the impeller.
- Selection of material pairings between static and dynamic parts within an assembly.
- All electrically operated functional parts must comply with the respective requirements. A test certificate from the national or international supervisory authority is mandatory (e.g. in Germany: Physikalisch Technische Bundesanstalt Braunschweig or IBExU Freiberg).

Special instructions for the operation and maintenance of devices for explosive atmospheres can be found in Chapter 11.

4 Delivery, transport and storage

4.1 Delivery

Rosenberg AHU´s must be inspected for damage upon delivery. This should be done before unloading the individual modules from the transport vehicle. Furthermore, the completeness of the scope of delivery must be checked against the shipping documents.
Any missing parts or damage must be noted immediately on the freight documents and confirmed by the driver of the transport vehicle.

4.2 Transport

Smaller functional parts of Rosenberg AHU units are delivered on disposable pallets and can be moved using a forklift or pallet truck. Larger functional parts are equipped with wooden transport feet that allow them to be moved or stored underneath.

Functional parts with a folded base frame are provided with holes for inserting round profile tubes/transport tubes 1½" (in accordance with DIN EN 10255, not included in the scope of delivery). These enable transport by means of a hall gantry crane or mobile crane. The projection beyond the outer edges of the functional part should be at least 200 mm on both sides!

Pipe locks must be fitted on both sides to prevent the slings from slipping or the transport pipe from sliding out!

General information

- When lifting the functional part, avoid twisting or mechanical damage to the housing!
- Always keep operating doors closed during transport!
- Only use suitable lifting equipment for transport!
- Please note that excessive stress on the housing parts can lead to damage!
- For your own safety, wear suitable non-slip gloves and safety shoes during transport.

The following must be observed when transporting with a forklift or pallet truck:

- Transport using industrial trucks requires regular training of the personnel responsible in accordance with the relevant accident prevention regulations (in Germany, DGUV Regulation 68 "Industrial Trucks").
- The load capacity of the industrial truck must be checked before each loading operation!
- The fork length of the industrial truck must be longer than the depth of the transport container or functional part. Forks that are too short will cause damage to the base panels or the device frame!

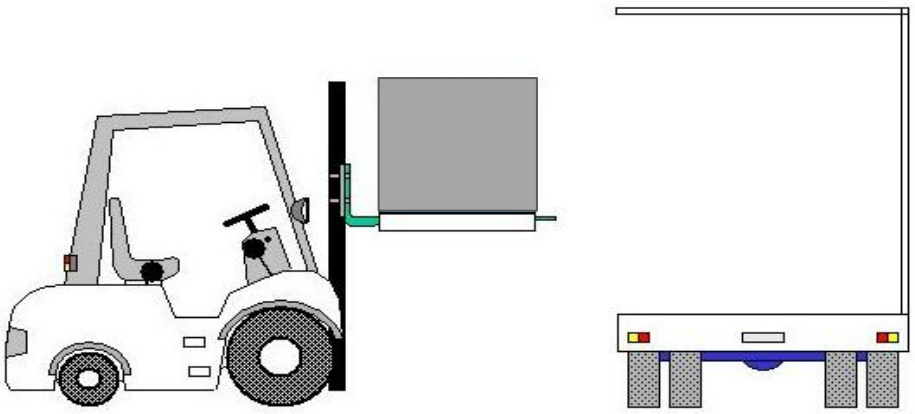
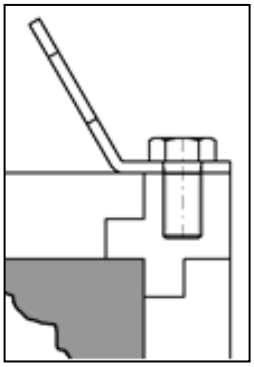


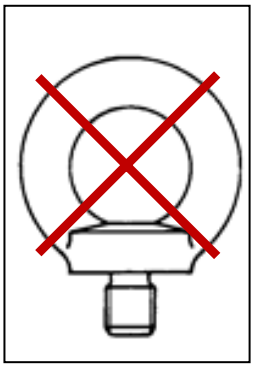
Illustration: Unloading using a forklift truck

When transporting goods using a hall portal crane or mobile crane, the following must be observed:

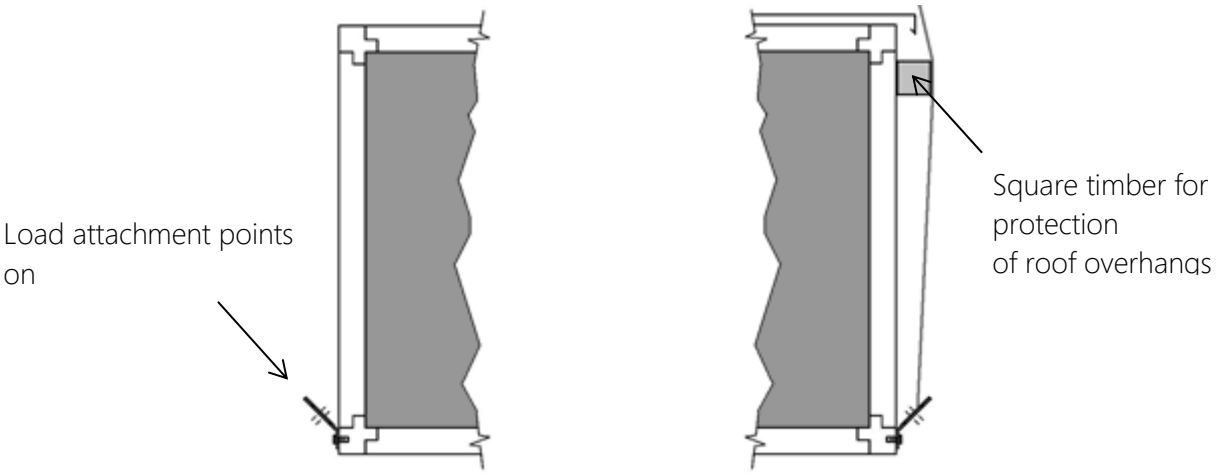
- Transportation using cranes and load-lifting equipment requires regular training of the personnel assigned to this task in accordance with the relevant accident prevention regulations.
- Danger to life! Persons are prohibited from standing under suspended loads!
- When attaching loads directly or using slings, only use approved, undamaged textile slings with a sufficiently large contact surface and edge protection. (e.g. lifting straps in accordance with EN1492-1 or round slings in accordance with EN1492-2).
- The use of sling chains or sling ropes for direct load attachment is not permitted!



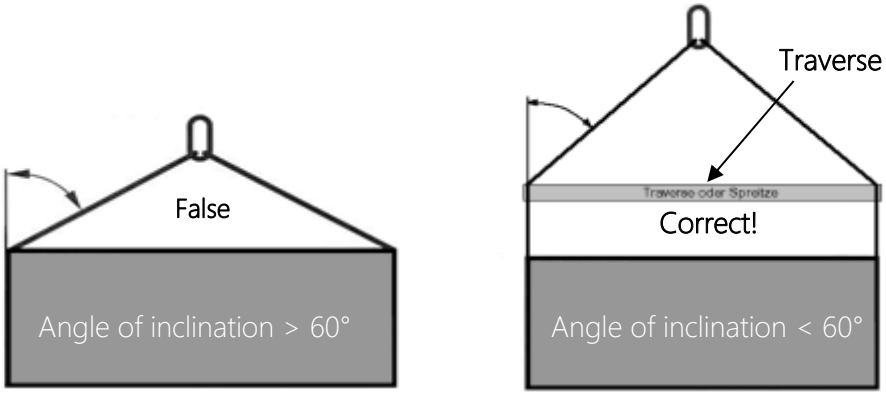
- Optional load attachment points (for the S60 series) in the form of M20 threaded holes in the module corners with crane eyes and high-strength machine screws must only be used in the configuration supplied.
- The use of eye bolts in accordance with DIN 580 – M20 C15 is not permitted!



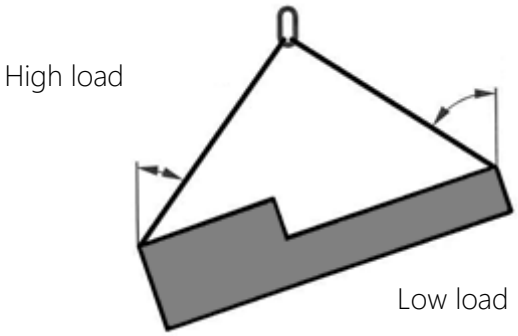
- Further optional load attachment points are located in the area of the lower horizontal corner profiles or the base frame.



- Avoid angles of inclination of the slinging equipment greater than 60°!



- When lifting, note that the load distribution in the functional part is usually asymmetrical! This is not obvious by looking at it from the outside!
- A separate sling must be used for each attachment point; looping through the crane hook is not permitted due to the risk of slipping!

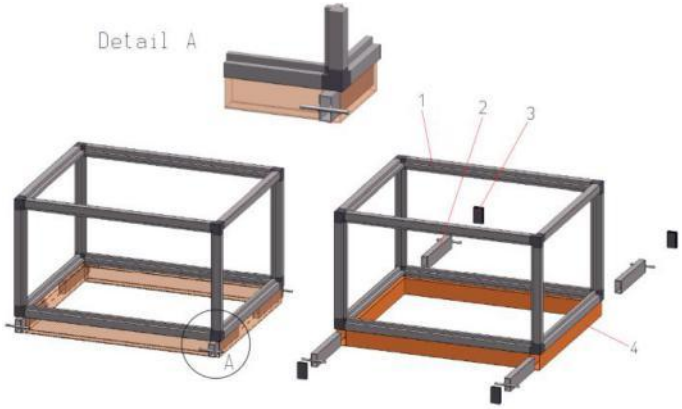


Lifting instructions for welded base frames (for transport companies and crane operators)

Caution: Danger to life! Do not stand under suspended loads!

These instructions apply to the crane lifting of modules with welded base frames measuring 100 x 60 mm. Before lifting the module, ensure that there is no damage to the module or its packaging.

1. The crane lifters (L. 500 mm) must be inserted into all external openings in the base frame for each module (square tube may protrude by max. 100 mm, see Fig. 1).



Pos.	Benennung	Art.Nr.	Werkstoff	Bemerkungen
1	Gehäuserahmen S40			
2	Kranhebe für Grundrahmen geschw.		Stahlprofil	80x40x4
3	Lamellenstopfen	LD-PE		alternativ
4	Grundrahmen geschweißt		Stahlprofil	100x60x3

Figure 1: Sketch showing how to insert the crane lifters

Figure 2: Correct attachment

2. The slip may only be attached to the square tube of the crane lift (see Fig. 2).
   0
   Note: Under no circumstances should the slip be attached to or around the welded rod of the crane lifter!

3. The slip length must be selected according to the module size and module design.

   Caution: Observe the permissible angle of inclination and the load capacity of the slip!

Figure 3: Practical example

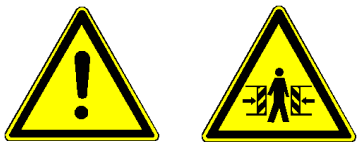
If defects are found during the required visual inspections of the sling before lifting, these must be rectified or, if necessary, the manufacturer must be contacted.

Instruction obligation – residual risks

When lifting loads with slings, the person below or next to the load is at risk. As the manufacturer, we must point out to you as the user that there are residual risks when handling slings, in particular because the connection between the sling and the load is not sufficiently secure or because the load swings after being lifted and endangers the slinger. Falling loads endanger people and goods. As a user, ensure that your slingers and crane operators are well trained.

4.3 Storage

- Equipment and equipment parts must be unpacked and stored in a dry place, protected against dirt and damage. Continuous moisture from condensation must be avoided at all costs due to the possibility of white rust formation!
- Cover open pallets with tarpaulins. Protect functional parts from dirt (e.g. chips, stones, wire, etc.).
- Even weatherproof functional parts must be covered, as weather resistance is only guaranteed after complete assembly.
- Unused openings and screw connections for cables, as well as module connections, connection pieces, doors, inspection openings, etc. must be closed. Any moisture ingress can lead to defects; no liability is accepted for this.
- Keep the storage temperature between -30°C and +40°C.
- To prevent white rust formation, ensure adequate ventilation.
- For storage periods of more than 12 months, check the bearings of the fans for smooth running before installation.



Turn the impeller by hand!
CAUTION: Risk of entrapment on the impeller and belt drive!

5 General installation instructions

Installation, commissioning and maintenance work may only be carried out by trained specialist personnel! Prescribed qualifications are required for inspections and cleaning in accordance with VDI 6022!

5.1 Device installation

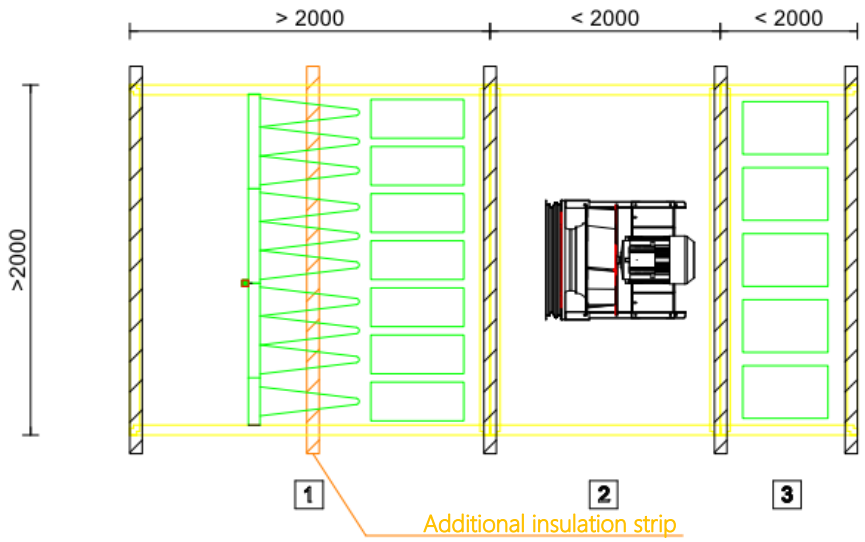
Substrate

A Rosenberg air handling unit may only be installed on a suitable foundation or substructure.

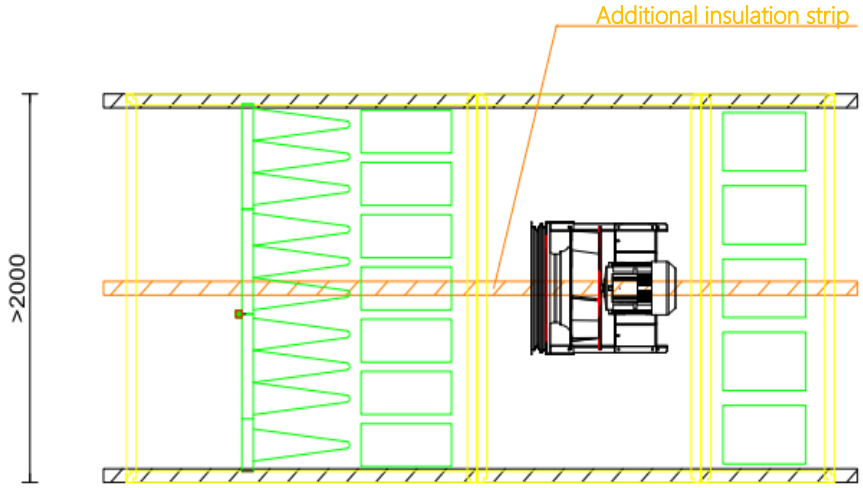
Rosenberg air handling units must not be used to perform static or dynamic building functions. Any damage to the units or consequential damage to the building resulting from this will invalidate the warranty obligation of Rosenberg Ventilatoren GmbH (see VDI 3803 for information).

When constructing the foundation or substructure, the following must be taken into account in addition to the structural requirements:

- The installation surface must be level and free of distortion.
- If there is a risk of contact corrosion due to electrochemically unfavourable material combinations (of the unit base frame and support/substructure) in a damp or aggressive atmosphere, the unit must not be placed directly on the on-site support or substructure. The device and substructure must be separated from each other by a suitable intermediate layer (e.g. foil, sealing tape or vibration decoupling elements).
- Foundations must be full-surface or strip foundations.
  For strip foundations, cross beams must be installed at least at the beginning and end of the unit and at the module joints for unit widths greater than 2 m per air flow. For modules longer than 2 m, additional cross beams must be installed at a maximum distance of 2 m in the middle of the module or evenly spaced. Alternatively, full-length longitudinal beams can be used beneath the front and rear. Also in this case, for equipment widths greater than 2 m, additional longitudinal beams must be installed with a maximum spacing of 2 m. The same applies to steel substructures!



Or:



- To reduce transmission to the building structure, the use of insulation strips (not included in the scope of delivery) is recommended. The underlays should be placed at least on the front sides, module separation points and in the longitudinal direction from a module length of approx. 1,000 mm under the housing or base frame on all foundations/supports of the substructure.
- An elastic connection or an insulating connector (both available as options) must be provided and installed between the ventilation unit and the duct network to prevent structure-borne noise transmission.

Condensate tray and siphon

- The height between the installation surface and the floor must allow for proper drainage of condensate water from the functional parts (note the siphon height!).
- Condensate trays are installed with a slope on all sides; a siphon with non-return valve must be installed at the drain (optional accessory). Direct connection of water drains to the sewage system is not permitted.

Further information on the siphon can be found in Chapter 5.5.

Ambient temperature

The recommended ambient temperature for the installation and assembly of Rosenberg ventilation units is +5°C to +40°C in order to ensure the processing and subsequent function of sealants and sealing tapes for module connections, etc.

Outside this range, adhesion problems with the adhesives must be expected, and warranty claims cannot be asserted.

Notes on non-operation of the ventilation unit

Unused openings and screw connections for cables, etc. must be closed. Moisture ingress can lead to defects; no liability is accepted for this. Unclosed openings can also lead to increased leakage and impair the performance of the air handling unit.

The air inlet and outlet openings on installed systems that are not yet in operation and systems that may already be connected to the duct system must be closed to prevent the ingress of dirt and air due to circulation. Circulation can be caused by thermals, wind loads or the chimney effect, which lead to the ingress of moist air into the unit. Condensation can cause damage to the ventilation unit and its components, for which Rosenberg cannot be held responsible.
This effect can also occur during standstill and temporary shutdown and must be prevented by on-site measures (additional dampers) or control technology.

External dampers and connection pieces must generally be integrated into the insulation of ducts etc. provided by the customer in order to reduce/prevent condensation and avoid the aforementioned damage. The insulation must extend to the unit frame.

Distances between air outlets

Please note that any minimum distances required between the exhaust air outlet and the outside air inlet are not automatically taken into account in the design of the central unit, as these depend on local conditions. This also applies to the distances between these openings and adjacent buildings and the roof surface.

The applicable minimum requirements must be observed, checked on site and, if necessary, established using suitable means (ducts, etc.).

Cleaning

All units are cleaned during assembly and before packaging. Unfortunately, not all areas are always accessible, so that during transport, occasional chips from the manufacturing process may become visible. These must be removed using a vacuum cleaner or other suitable cleaning methods and do not constitute a defect!

Ensuring low-noise operation

To reduce the transmission of structure-borne noise, it is recommended to install insulating pads between the Rosenberg air handling unit and the installation surface. The installation instructions of the manufacturer of the insulating pads must be followed and the installation instructions must be observed.

When designing the damping system used (on site), the frequency of the vibration source must be sufficiently far removed from the natural frequency of the substructure or foundation!

If insulating pads are installed between the Rosenberg air handling unit and the installation surface to reduce structure-borne noise, proceed as follows:

1. Mark the entire outline of the unit on the already cleaned installation surface.
2. Lay out the insulating material in a single layer within the recorded unit floor plan or stick it to the floor plan area in accordance with the manufacturer's installation plan.
3. Place the individual functional parts one after the other on the insulating surface and align them individually, one after the other.
4. After alignment, the modules/functional parts must be mechanically connected using the sealing and connecting material supplied (see following chapter).
5. Connect the air connections of the ventilation duct network to the unit without tension using the elastic canvas connectors or insulation connectors supplied.

5.2 Installation

Note: The necessary assembly parts/connecting material are always located in the fan module (in supply air/exhaust air units in the supply air fan module)! These include sealing tapes, screws and, if necessary, covers for the module joints.

The following describes how the unit parts/modules of the S60 and T60/C60 series are connected to each other.

For weatherproof systems, special instructions apply to modules stacked on top of each other; these instructions can be found in Chapter 9.

Compared to the standard units described in this section, the procedure for connecting the individual modules differs for the hygiene version of the air handling units. Detailed instructions can be found in Chapter 10.

You can identify the series on the technical data sheet for the system, which is also part of the enclosed documentation.

Rosenberg Ventilatoren GmbH
Maybachstraße 1
D-74653 Künzelsau-Gaisbach

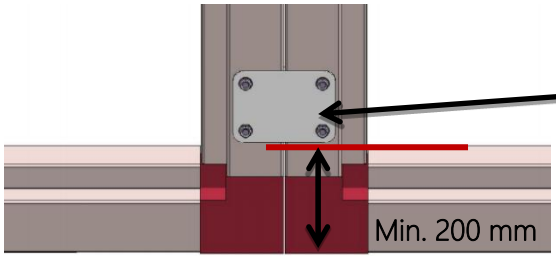
Pers. of Cont.:		**Date:**	**29.01.2026**	**Order No.:**
Project-No.:		**Pos-No:**	**1**	**Customer:**
Project:				**Offer No.:**
Supply:	Airbox T60-1613	Height: 2980mm	Width:	1720mm
Exhaust:	Airbox T60-1613	AHU-T601613IW	Length:	2850mm

The internal seals, e.g. on the joint covers of the module joints, may generally only be made with suitable sealant that complies with VDI 6022. In multi-module systems, the modules are connected with gusset plates (corner brackets) and connecting brackets. The position specified in the following chapters must be adhered to, as otherwise unforeseeable leaks and damage may occur.

Up to size 1010, the modules can be pulled together; if necessary, use fitting water or similar as a lubricant for the insulation underlay. During the entire assembly process, check that there is no torsion of the corner profiles or other deformations.

This procedure is not possible for sizes 1310 and above due to the greater weight of the components. In these cases, suitable aids such as lashing straps and tensioning straps must be used in the area of the lower module frame (e.g. looping around the modules, looping around the base frame).

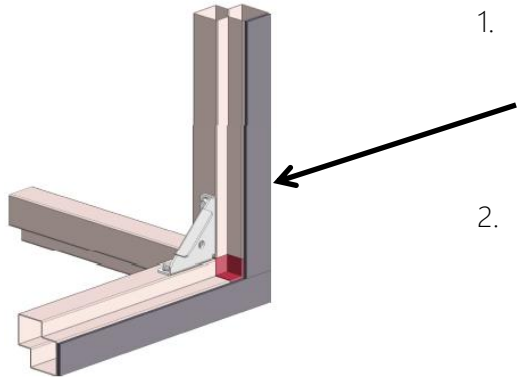
Attach the straps to the holes in the transport tube on the base frame (D=50 mm) or use the crane eyes on the lower housing frame, if available. The outer connection is made in all series using 80x60 mm plates, which connect the corner profiles of devices standing on top of or next to each other. Ensure that the load is evenly distributed across the connecting edges. All internal module connections must be fully assembled and tightened beforehand!



Only assemble once the internal module connections have been completely assembled and tightened!

Screw fastening is carried out using 4.8x19 mm self-drilling screws with Torx drive.

5.2.1 S60 series



1. Before setting up and pulling or pushing the modules together , PE sealing tape (40x5mm) must be applied to all joints on one side. Align the sealing tape with the inner edge (self-adhesive on one side).

2. The modules must be placed flush against each other and aligned. Lateral and height offset is not permitted and must be avoided; if necessary, use spacer plates.

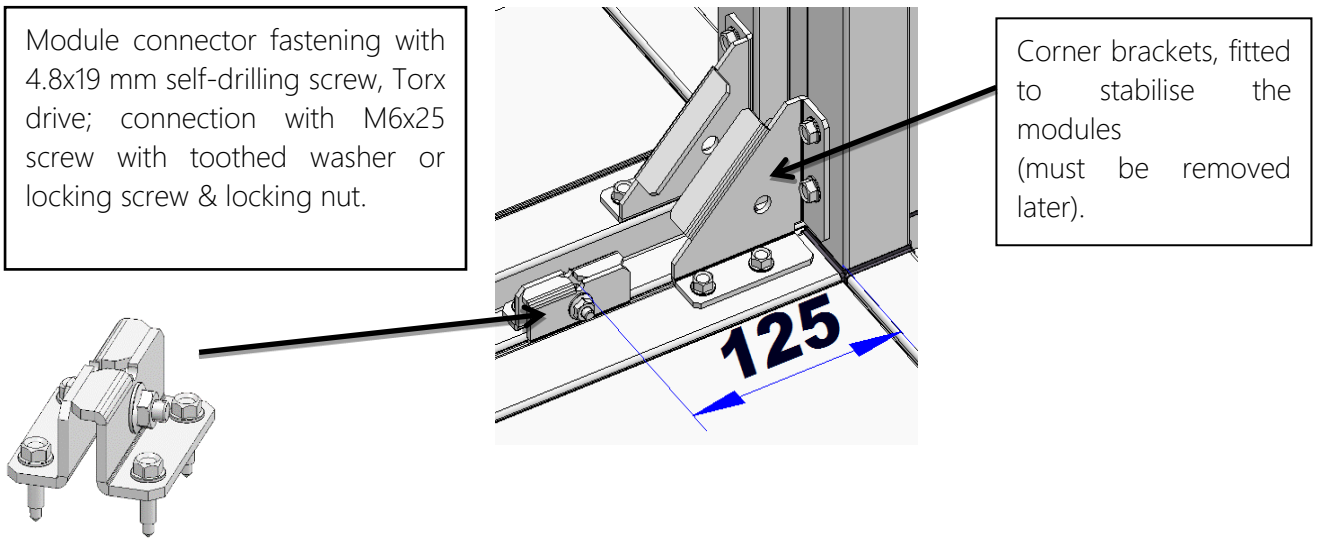
Devices in the S60 series are equipped with corner brackets as standard.

Depending on the enclosure size, two types of corner brackets can be fitted:

- Leg length approx. 80x80 mm (type 1)
- Leg length approx. 150x150 mm (type 2)

These serve to ensure the stability of the modules during transport and installation. Before screwing the modules together, they must be joined tightly together, pressing the sealing tape. With the help of the corner brackets, the modules can be fixed in place until the module connectors are finally installed.

3. The module connectors must be installed starting from the corners at a distance of 125 mm for corner brackets type 1 and 175 mm for corner brackets type 2, both in height and depth. All others are distributed evenly (see table).



Size depth	Number
07, 10	2
13,16	3
20, 22, 25	4
28	5
32, 35	6
40 (2x20)	8

Construction size height	Number
07, 10	2
13, 16	3
20, 22, 25	4
28	5
32, 35	6

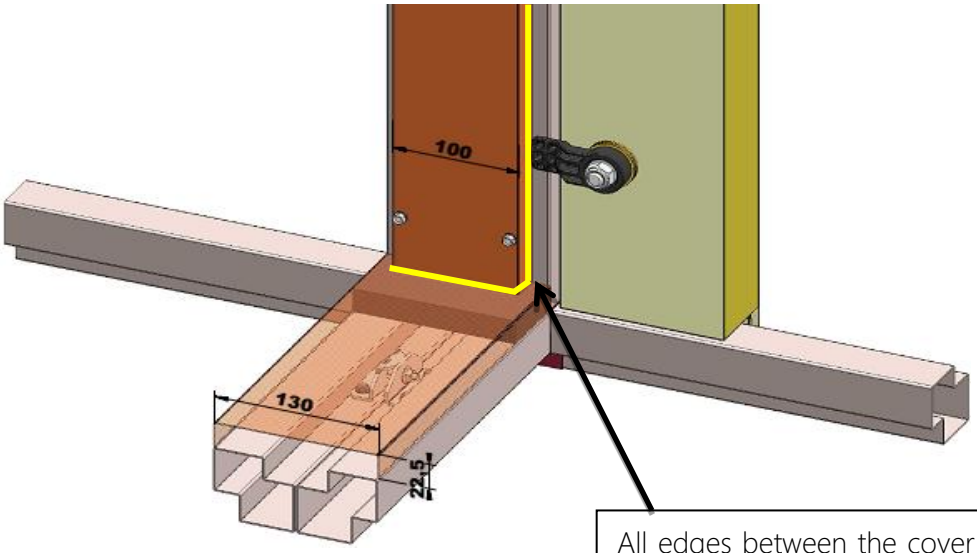
Table S60: Module connectors between the corners

4. After installing all module connectors, remove the corner brackets so that the joint covers can be inserted.

5. In the final step, the cover plates for the module joints must be inserted and screwed in place, 4.8x38mm, external hexagon wrrench. The covers are factory-fitted with insulation on the inside.

Differentiation between cover plates:

- Cover plates for the base and lid are approx. 45 mm longer than those for the rear wall and operating side.
- Width of cover on the operating side: 100 mm.
- Width of cover for rear wall, base and lid: 130 mm.



All edges between the cover plates and between the cover plate and the housing must be sealed with sealant that complies with VDI 6022!

Illustration: Cover plates mounted on the operating side

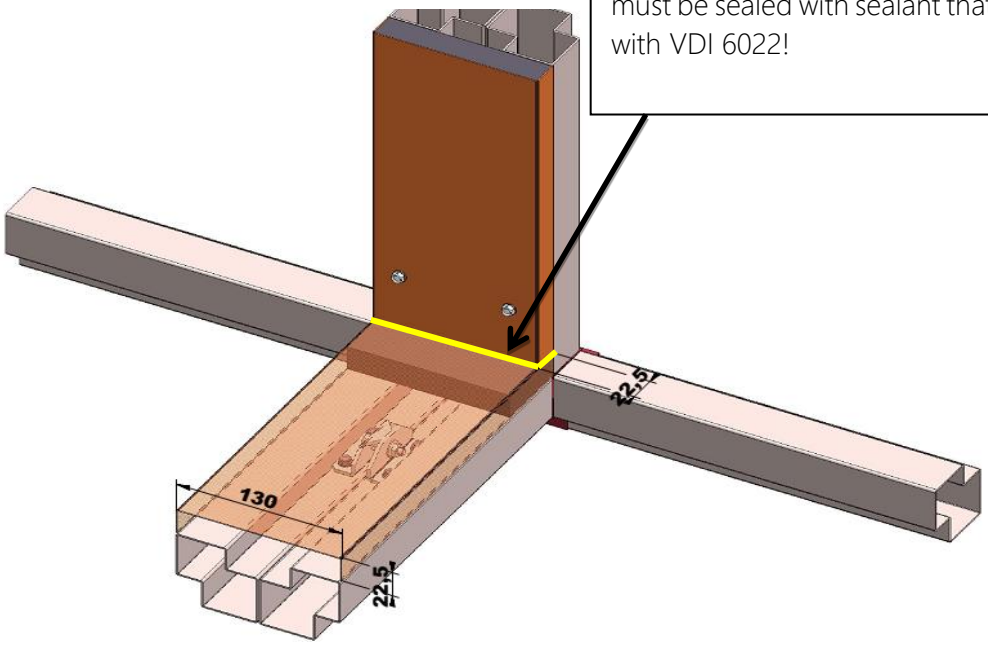
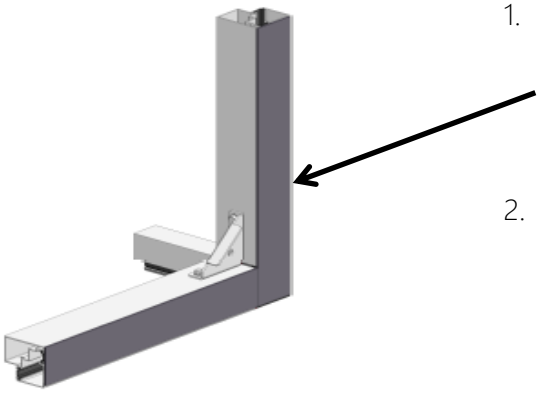


Illustration: Cover plates mounted on the rear wall

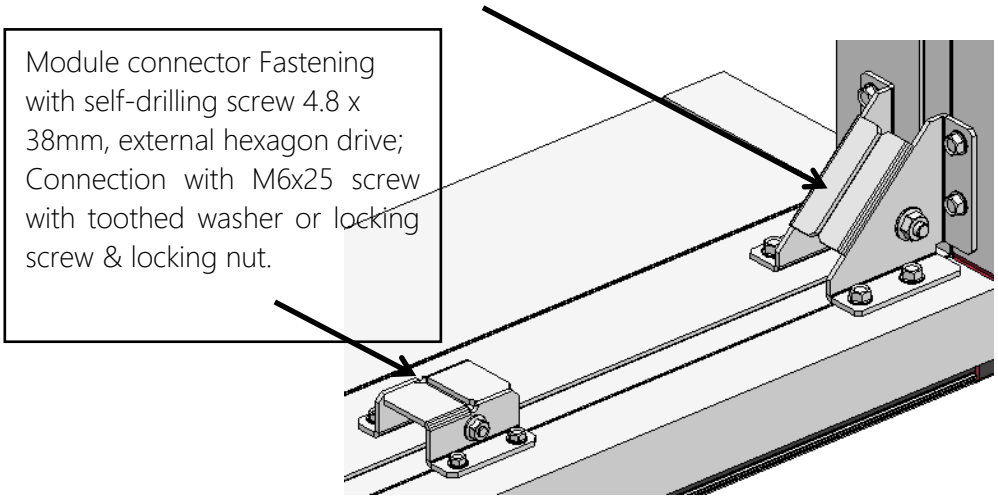
5.2.2 T60 series



1. Before setting up and pulling or pushing the modules together, PE sealing tape (60x3mm) must be applied to all joints on one side. Alignment with the inner edge (self-adhesive on one side).

2. Modules must be placed flush against each other and aligned. Lateral and height offset is not permitted and must be avoided; if necessary, use spacer plates.

3. Devices in the T60/C60 series are equipped with corner brackets as standard. The modules are screwed together using holes in the corner brackets (M8x60 screw with toothed washer or locking screw & locking nut).



4. Additional connecting brackets are used in the larger sizes. This is to ensure that the front profiles of the modules are flush with each other across the entire module joint and that the sealing tape has sufficient pressure. These are installed on site and must be distributed evenly between the corners in the appropriate number (see table).

Size depth	Number
07, 10	0
13, 16	1
20, 22, 25	2
28	3
32, 35	4
40 (2x20)	4

Size height	Number
07, 10	0
13, 16	1
20, 22, 25	2
28	3
32, 35	4

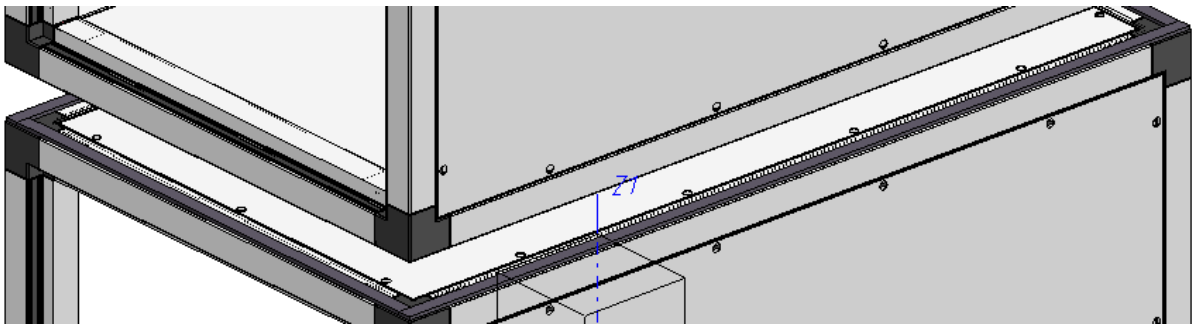
Table T60 (C60): Additional module connectors between the corners

5.2.3 Special notes for units with intermediate base frames – indoor installation

For devices with modules stacked on top of each other, depending on the size, an intermediate base frame may be provided between the modules. The module and intermediate base frame may be made of different materials.

This combination of different materials, in conjunction with high relative humidity in the installation room, can cause corrosion between the frame and the module. For this reason, it is recommended to seal the intermediate base frame against the lower module if high humidity is to be expected in the room.

To seal the frame, stick 5x20mm sealing tape around the housing profiles (covers) of the lower modules. Align the tape with the outer edge of the profile. Then place the intermediate base frame and the module on top.



5.3 Electrical installation

All electrical connection work must be carried out exclusively by trained specialist personnel and checked by an independent third party. A functional and safety check must be carried out in accordance with DIN EN 60204-1 and VDE 0660 Part 500 (this applies, among other things, to the electrical protective conductor and the insulation test on electrical devices).

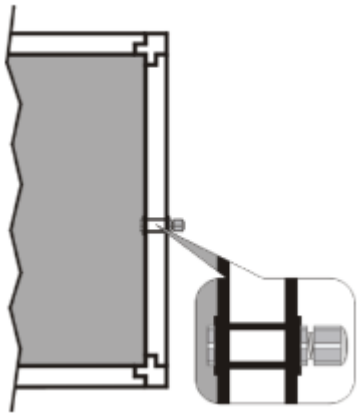
The device may only be connected to circuits that can be switched off with an all-pole disconnecting switch in accordance with EN 60204-1!

The electrical connections of the electrical consumers installed in the device, such as electric motors for fans and pumps, electric air heaters, servomotors, etc., must be carried out in accordance with the specifications of the manufacturers of these components and in accordance with the regulations of the regional energy supply company, the type of electrical network and the applicable national and international standards and guidelines.

Partially assembled equipotential bonding conductors on the flexible connectors of fan modules and the remaining duct connections must be professionally fastened and checked for galvanic connection. All electrical consumers/components must be integrated into the protective conductor system on site. The same applies to side panels or housing parts to which electrical components are attached. In addition, all electrically non-conductive connection points must be bridged with equipotential bonding conductors. Perform protective conductor test!

Additional cable entries through the housing walls must be made airtight using standard metric cable glands.

Unused openings and screw connections for cables must be sealed. Moisture ingress can lead to defects; no liability is accepted for this.



Holes for cable glands		
Thread of the cable gland	Hole in inner plate	Hole in outer plate
M12	16 mm	13 mm
M16	20 mm	17 mm
M20	26 mm	21 mm
M25	32 mm	26 mm
M32	39 mm	33 mm
M40	52 mm	42 mm
M50	62 mm	52 mm
M63	74 mm	65 mm

- Do not use metal screw connections with plastic junction boxes.
- The mains voltage must correspond to the information on the type plates.
- When connecting the light switches, ensure that an external power supply is available for the lighting.
- After connection, repair and inspection switches must be set to the zero position (OFF) and secured against unintentional activation. Auxiliary contacts (normally closed contacts, normally open contacts) for signalling the switch position may remain live.

- Since all working machines must be disconnected from the power supply of the air conditioning unit at all poles during inspection and maintenance, this disconnection must be carried out in the control cabinet.
- Free-swinging functional parts must be provided with sufficiently long cables in the event of subsequent (non-factory) cabling to prevent them from being torn off.
- Plug-in electrical connections must be checked for mechanical locking. This also applies to retrofitting.

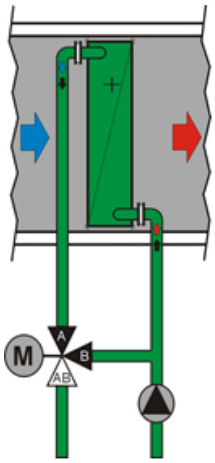
Further information on the electrical accessories of the air handling unit can be found in Chapter 8.11.

5.4 Hydraulic circuits for heat exchangers

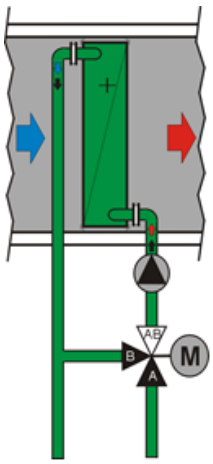
The hydraulic circuit used to connect a finned heat exchanger depends on the existing pipe network and the possible control strategies.

The following hydraulic circuits are generally possible:

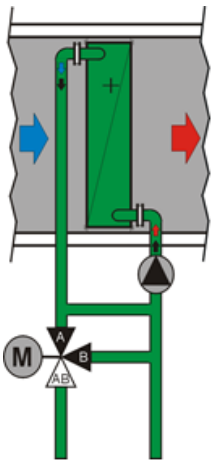
Diverter circuit



Mixing circuit



Injection circuit



Diverter circuit
The output of the heat exchanger is regulated by adjusting the mass flow of the medium (water or water/glycol). In the consumer circuit, the mass flow varies, while it remains constant in the primary circuit. The pressure conditions within the pipe network are largely stable, meaning that mutual interference between the control circuits is generally not expected.

Mixing circuit
The heat exchanger's output is regulated by changing the flow temperature. The mass flow of the medium (water or water/glycol) is constant in the consumer circuit, but variable in the primary circuit. Mutual influence between the control circuits is possible.

Injection circuit
The heat exchanger's output is controlled by changing the flow temperature. The mass flow of the medium (water or water/glycol) is constant in both the primary and consumer circuits. In principle, mutual interference between the control circuits is not possible.

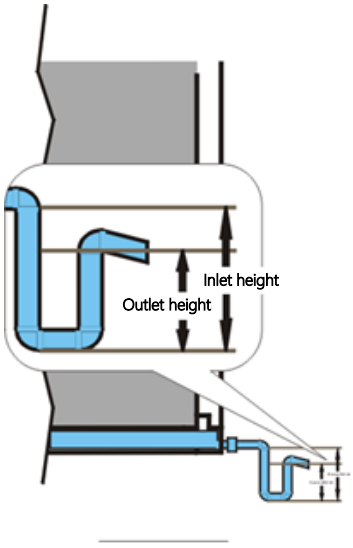
5.5 Connection of the condensate, drain and overflow pipes

If condensate, drain and overflow pipes are present (e.g. on the cooler, droplet separator or humidifier module), a siphon (recommendation: with non-return valve and self-filling) must be provided on site to ensure proper drainage of the condensate via the condensate tray.

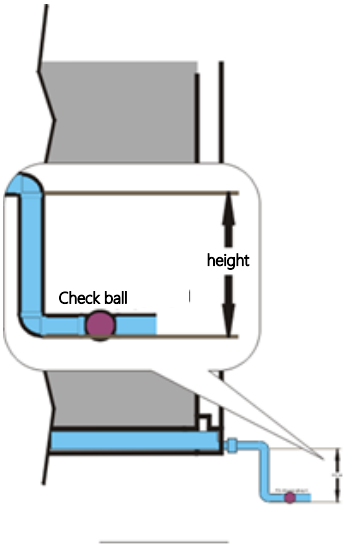
The height of the respective siphon must be adjusted to the negative or positive pressure of the air handling unit to prevent air from being sucked in or blown out of the connected waste water pipe. The condensate must be drained without pressure. The siphon should be filled with water before commissioning and the fill level should be checked regularly.

General information

- A separate siphon must be installed on each drainage outlet; the condensate drains must not be connected to each other.
- The outlet must not be connected directly to the sewage system, but must have a free outlet. A floor drain in the room or a collection funnel with a second siphon as an odour trap to the sewage network is suitable for this purpose. The siphon and collection device must be easily accessible for maintenance purposes.



Siphon, pressure side



Siphon, suction side

Siphon from Rosenberg

Rosenberg offers various siphons as optional accessories. These are not included in the standard scope of delivery and must be ordered separately if required.

Siphon dimensions

The dimensions described below for installing the siphons apply to the Rosenberg siphons supplied. The siphons may be installed at a maximum distance of 1 m from the condensate tray drain.

Dimension table for pressure-side siphon		
Overpressure in the device	Siphon inlet height	Siphon outlet height
1900 Pa	355 mm	325 mm
1800 Pa	340 mm	310 mm
1700 Pa	325 mm	295 mm
1600 Pa	310 mm	280 mm
1500 Pa	295 mm	265 mm
1400 Pa	280 mm	250 mm
1300 Pa	265 mm	235 mm
1200 Pa	250 mm	220 mm
1100 Pa	235 mm	205 mm
1000 Pa	220 mm	190 mm
900 Pa	205 mm	175 mm
800 Pa	190 mm	160 mm
700 Pa	175 mm	145 mm
600 Pa	160 mm	130 mm
500 Pa	145 mm	115 mm

Dimension table for siphon suction side			
Negative pressure in the device	Siphon height	Negative pressure in the device	Siphon height
3500 Pa	410 mm	2000 Pa	260 mm
3400 Pa	400 mm	1900 Pa	250 mm
3300 Pa	390 mm	1800 Pa	240 mm
3200 Pa	380 mm	1700 Pa	230 mm
3100 Pa	370 mm	1600 Pa	220 mm
3000 Pa	360 mm	1500 Pa	210 mm
2900 Pa	350 mm	1400 Pa	200 mm
2800 Pa	340 mm	1300 Pa	190 mm
2700 Pa	330 mm	1200 Pa	180 mm
2600 Pa	320 mm	1100 Pa	170 mm
2500 Pa	310 mm	1000 Pa	160 mm
2400 Pa	300 mm	800 Pa	140 mm
2300 Pa	290 mm	600 Pa	120 mm
2200 Pa	280 mm	400 Pa	100 mm
2100 Pa	270 mm		

For further important information on the special features of the individual functional parts, please refer to Chapter 8, "Information on installation parts and components".

6 Commissioning

Before commissioning the air conditioning unit, the following essential points must be ensured:

- Check for open air connections/unobstructed intake openings
- Doors are closed or door protection grilles are fitted
- The transport locks on the fans have been removed
- Check that the fan impellers rotate freely
- Functional test of the fans has been carried out
- Valves on heat exchanger units are closed
- Screw connections on all connections have been checked
- Electric heating coil only switches on after fan start-up
- Any protective films that may still be present have been removed
- Visual inspection of the device seals for damage was carried out
- Operating doors equipped with hinges (3D) have been readjusted

ATTENTION: If the points in the checklist above are not checked, dangerous system conditions may occur during subsequent initial commissioning!

If increased leakage is detected at the doors, the following measures must be checked and carried out if necessary:

- Align doors
- Check that the modules are installed level and without distortion
- Perform depth adjustment on the hinge
- Tighten toggle locks by hand

These measures must be checked before requesting a service call. If the measures above have not been carried out, Rosenberg Ventilatoren GmbH reserves the right to charge for all costs incurred for the service call.

When switching off or taking the unit out of operation, ensure that no air from the supplied rooms flows back into the ventilation unit. Causes of circulation can be thermals, wind loads or the chimney effect, which lead to moist air entering the unit. Condensation can cause damage to the ventilation unit and its components. Appropriate measures, e.g. louvre dampers in the supply and exhaust air ducts or other measures, must be provided.

The unit may only be connected to electrical circuits that can be switched off with an all-pole disconnecting switch in accordance with EN 60204-1.

Further information on commissioning the air handling unit can be found in the component-specific Chapter 8 "Notes on installation parts and components".

7 Maintenance and cleaning

7.1 General maintenance instructions

The maintenance intervals specified in these instructions refer to the conveyance of normally contaminated air. Rosenberg recommends that maintenance and repair work be carried out in accordance with VDMA 24186 and VDI 6022. If the air handling unit conveys particularly contaminated air, the maintenance intervals must be shortened accordingly.

Before carrying out any maintenance work:

- Shut down fans and other electrically operated components properly and disconnect them from the mains at all poles!
- Wait for the impellers to come to a standstill, at least 2-3 minutes!
- Secure the system against unauthorised restarting!
- Shut down the water circuit and secure it against restarting!
- Allow the heat exchanger to cool down!

For information on maintaining the functional parts, see Chapter 8, "Information on built-in parts and components".

7.2 General cleaning instructions

Recommended cleaning agents for surface disinfection:

- Dismozon plus (Bode Chemie)
- Melsitt (B.Braun)
- Clorina (Lysoform)

All disinfectants are approved and listed by the Robert Koch Institute (as of 30 June 2022).

It must be checked in each individual case whether the recommended cleaning agents may be used!

In order to guarantee the hygienic condition of the air handling units, the following points must be observed.

Cleaning work and inspections may only be carried out by qualified and specially trained personnel (in Germany in accordance with VDI 6022).

Hygiene inspections must be carried out on the air handling units at the following times/intervals:

- After initial commissioning,
- For units with air humidification: every 2 years,
- For units without air humidification: every 3 years.

The purpose of the regular hygiene inspections is to identify hygiene deficiencies in the air handling unit at an early stage and to remedy them by taking appropriate measures. The results of the hygiene inspection, cleaning and disinfection of the air handling unit must be documented in a suitable form (e.g. operating log).
The relevant regulation for the hygiene requirements for air handling units is VDI 6022. It serves as a guideline for the information provided here. All work must be carried out in accordance with the latest version of this VDI guideline.

The water or cleaning agent used should have a neutral pH value (6-8).

Instructions for cleaning and hygiene inspection of the individual functional parts of the air handling unit can be found in Chapter 8 "Information on built-in parts and components".

7.3 Maintenance and cleaning of the housing

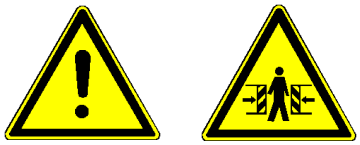
The following points must be observed during periodic maintenance work (usually at 3-month intervals):

- Check the seals on the operating doors and replace them if necessary.
- Check the door catch devices (pressure side) for proper functioning.
- Check panels for damage and corrosion.
- Regularly treat moving parts, such as door levers and hinges, with a suitable lubricant spray.
- Remove coarse dirt with a vacuum cleaner.
- Use a damp cloth for other types of dirt.

8 Information on built-in parts and components

8.1 Blind flap and connector

Observe the safety instructions in Chapter 1 and the general instructions for commissioning in Chapter 6!



CAUTION: Risk of crushing! If the devices are freely accessible, external rods or gear wheels must be covered.

Before connecting to the power supply, initial commissioning must be carried out in accordance with VDE guidelines.

Commissioning of louvre dampers

- Motor-driven dampers must be secured against unintentional closure during work on the damper (disconnect the servomotor from the mains, deactivate the damper control, mechanical lock).
- All screw connections and connections must be checked to ensure they are sufficiently secure.
- The external air dampers must be installed internally or insulated.
- For coupled dampers: Check the connecting linkage for correct fit and function.
- The servomotors or linkages must be adjusted so that the damper blades describe a rotation angle of 90° and reach their end position when closing.
- The servomotors must be mounted on the actuated axis of the dampers so that they are easily accessible. The installation instructions of the servomotor manufacturer must be observed.
- For internal servomotors, the connection cables must be routed to the outside using the cable glands provided.
- On devices in accordance with DIN 1946 T. 4, external air dampers must close automatically in the event of a power failure. This can be achieved using servomotors with spring return.

Further information on damper actuators can be found in Chapter 8.11.2.

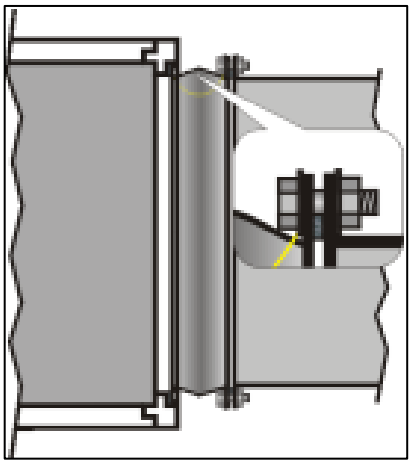
Important manufacturer information

As part of our factory final inspection, all installed dampers were checked for smooth operation. In order to maintain this smooth operation, it is very important during installation that the devices are aligned and mounted cleanly so that the dampers remain smooth even after installation and module connection.
If tension and stiffness do occur, the fastening screws of the flaps must be loosened and the flap(s) aligned so that they are tension-free and move smoothly. The fastening screws are then tightened again and, after tightening the screws, the flap must be checked once more to ensure that it moves smoothly.

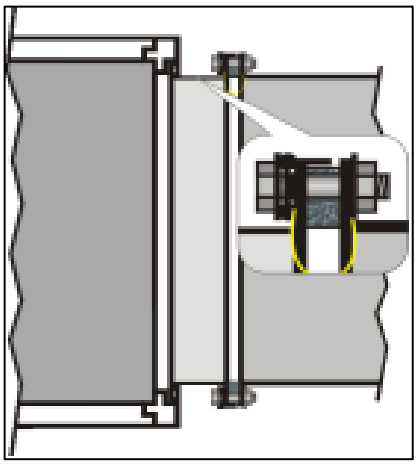
We expressly point out that we will charge for customer service visits due to poorly functioning flaps if it can be proven that the steps above were not carried out by the system installer.

Connection of the connections

- The duct connections of an air handling unit must be vibration-decoupled.
- The flexible connectors must be installed so that they can move freely in all directions without tension (connectors stretched 140 mm, installed 120 mm).
- A horizontal or vertical offset between the two connection frame is not permitted.
- Insulation connectors with foam rubber insulation strips must be decoupled from the duct network using the screws and insulation washers provided.
- An equipotential bonding must be installed to bridge the non-conductive, flexible fabric or the insulation connector in accordance with VDE regulations.



Flexible connector



Insulation connector

Operation of louvre dampers

- Manual damper locking levers must be adjusted and locked in accordance with the desired damper position.
- Motor-driven dampers are controlled by the central device control system. The position of the damper blades can be identified externally by a notch on the drive shaft.

Maintenance and cleaning

Blinds are frequently moved during system operation, so regular inspection of the actuators, linkages, gears and slat bearings is necessary.

Flexible connectors and insulated connectors are static components that should be checked regularly for integrity.

Maintenance Dampers & connectors	Periodically 3 months	As required	Hygiene inspection
Check valves for function (mobility), contamination, defects and corrosion	X		X
Check that the linkage, gear wheels and servomotors are securely fastened.	X		
Check the connecting linkage of coupled flaps for a secure connection and function, i.e. direction of rotation/end position.		X	
Check the bearing of the damper blades, relubricate the brass bearings if necessary (do not grease or oil dampers with gear drive)	X		
Clean the dampers		X	
Check the connections for proper functioning, contamination and defects.	X		X
Check that the connecting screws, frame and equipotential bonding are secure	X		
Clean the connection if necessary		X	

8.2 Fans

Observe the safety instructions in Chapter 1 and the general commissioning instructions in Chapter 6 as well as in the manufacturer-specific documentation!

Important general information

- Before commissioning, ensure that the fans are equipped with a multi-stage drive or speed control as described in Regulation EN1253/2014.
- Before connecting to the power supply, initial commissioning must be carried out in accordance with VDE guidelines.
- The maximum fan/impeller speed (nameplate, technical data sheet) must not be exceeded.
- The motors are generally wired for a power supply of 400V / 50Hz, unless the type plates or technical data sheets contain other information.
- Only operate the fans when they are installed and with the protective device (door guard, V-belt guard, intake or exhaust guard) fitted in accordance with the regulations. The fan chamber door must be closed. Impeller breakages cause serious personal injury and property damage.
- At the start of commissioning, check the existing fan type. Observe the instructions for belt-driven fans (Section 8.2.1) and direct-driven, free-running impellers (Section 8.2.2).
- Commissioning must be carried out in accordance with the fan type.

CAUTION: Risk of entrapment between the belt and pulley on belt-driven fans!

Important information for commissioning

- Before entering the fan chamber, set the corresponding device/repair switches to the ZERO position (OFF) and secure them against being switched back on.
- Before commissioning, check the device for any tools, foreign objects and dirt that may have been left behind and clean it if necessary.
- At outside temperatures below 5°C, the heat recovery system, heaters and their frost protection devices must be checked and put into operation accordingly before starting up the fans in order to prevent frost damage to the device and the air handling unit.
- Before switching on the power supply, it is necessary to check and adjust all system components to ensure they are in working order.
- Check that the impeller rotates freely by turning it by hand.
- During commissioning, monitor the correct functioning of the fan (air flow, smooth running, vibrations or imbalances). If unusual vibrations occur, stop commissioning/operation of the fan!
- Connected frequency converters or EC controllers must be set to the operating conditions in accordance with the enclosed manufacturer's instructions and secured against unauthorised changes (programming password).

CAUTION: The access door is under positive pressure. Wait until the fan has come to a standstill and allow the pressure to equalise!

8.2.1 Commissioning of belt-driven fans

1. Check fasteners

All fasteners on the fan unit must be checked for correct fit:

- Fan mounting,
- Motor fastening including clamping slide,
- Suction nozzle and impeller (even gap, see section 8.2.3),
- Flat or V-belt pulleys on motor and fan shaft (check for tight fit and alignment),
- Flat or V-belt (check belt tension, see below, check that the belts are intact),
- Vibration dampers (remove transport locks, check for tilting),
- Flexible outlet nozzle.

2. Checking moving parts

The following moving parts must be checked for proper functioning:

- Motor and fan bearings,
- fan impeller,
- vibration damping.

If the fan and motor are not used for a long period of time, check that the bearings run smoothly and apply new bearing grease if necessary. Maintenance-free or sealed bearings must be replaced if they no longer function properly.

3. Checking the electrical connection of the motor

The electrical connection of the motor must be checked with regard to the circuit, the connected voltage and the motor protection in accordance with the attached type plate.

4. Checking system components

Before switching on the power supply, all system components must be checked and adjusted to ensure they are in working order. The direction of rotation of the fan must be checked using the direction arrow on the housing. Incorrect direction of rotation can lead to overload of the drive motor.

For speed-controllable fan drives, the maximum fan speed specified on the type plate must not be exceeded.

5. Checking the V-belt tension

The flat belt or V-belt tension must be checked after commissioning and retensioned if necessary. The work must be documented in the system maintenance log.
Check 1: Commissioning + 24 hours
Check 2: Commissioning + 72 hours

Any deviating specifications from the documentation/operating and maintenance instructions of the fan manufacturer take precedence!

Checking the V-belt tension

- Press the drag indicator/display arm all the way in (1),
- Place the measuring device in the middle between the two pulleys on the back of a belt (if possible, on the middle pulley in the case of belt sets).
- Carefully press down the measuring device with one finger in the loop until you hear a click.
- Remove the measuring device without applying any further pressure and read the tension at the intersection of the drag pointer and the scale (2).
- Increase or decrease the tension according to the specifications on the installation sheet (included in the product documentation).

The measuring device can be obtained from the factory if necessary. However, similar devices can also be used.

6. Testing and documentation of fan current consumption

After the fan has been commissioned, the current consumption across all connected phases must be checked and documented.

For information on checking the gap dimension, see chapter 8.2.3!

CAUTION: The access door is under positive pressure; wait until the fan has come to a standstill and allow the pressure to equalise!

8.2.2 Commissioning of directly driven, free-running wheels

1. Checking fastening elements

Check that all fasteners on the fan unit are correctly seated:

- Fan fastening,
- Motor fastening,
- Suction nozzle and impeller (even gap dimension, see section 8.2.3),
- Vibration dampers (remove transport locks, check for tilting),
- Flexible connection piece.

2. Inspection of moving parts

The following moving parts must be checked for proper functioning:

- Motor and fan bearings,
- Fan impeller,
- Vibration damping.

3. Checking the electrical connection of the motor

The electrical connection of the motor must be checked with regard to the circuit, the connected voltage and the motor protection in accordance with the attached type plate.

4. Checking system components

Before switching on the power supply, all system components must be checked and adjusted to ensure they are in working order. The direction of rotation of the fan must be checked using the direction arrow on the housing. Incorrect direction of rotation can lead to overload of the drive motor.

If the fans have a speed-controlled drive, the maximum fan speed specified on the type plate must not be exceeded.

5. Testing and documentation of fan current consumption

After the fan has been commissioned, the current consumption across all connected phases must be checked and documented.

CAUTION: The access door is under positive pressure; wait until the fan has come to a standstill and allow the pressure to equalise!

EC FanGrid

The EC-FanGrid is a parallel operation of several EC fans. The wiring is identical to that of a single fan.

The volume flow or pressure constant control is carried out via a ring measuring line. Defective fans can be closed with the enclosed plates until they are replaced.

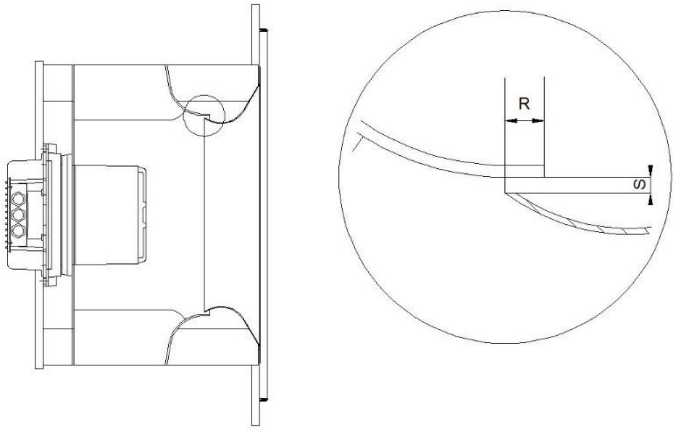
CAUTION: The access door is under positive pressure; wait until the fan has come to a standstill and equalise the pressure!

See below for information on checking the gap dimension!

8.2.3 Checking the gap dimension and gap coverage

Checking the gap dimension and gap coverage between the impeller and the suction nozzle.

The gap dimension and gap coverage can be checked according to the following diagram:



- The gap dimension S should be constant over the entire circumference of the impeller.
- The gap coverage R should be approx. 1 to 2 % of the impeller diameter.

8.2.4 Operation, maintenance and decommissioning

Operation

The fans must be monitored during operation to ensure that they are functioning correctly. If vibrations, pressure fluctuations or other deviations from the specified operating parameters occur, the work carried out during commissioning must be checked again and, if necessary, repeated.

A volume flow display with the target and limit values must be installed and made visible on fans in ventilation and air conditioning systems in accordance with DIN 1946 T.4. The display can be mounted directly on the fan chamber or in the control cabinet.

Maintenance and cleaning

Regardless of the design and size, the fan must be monitored for the following points during the first four to twelve weeks of operation:

- Smooth running, unusual noises, vibrations.
- Fastening of the fan, motor and vibration dampers.
- For belt-driven fans: the belt drive and belt tension.

As a high-speed component, the fan requires regular monitoring and maintenance every three months. If the standard operating conditions (air temperature, increased dust exposure or consistently high humidity) are not met, or if the fan is in continuous 24-hour operation, a shorter maintenance interval should be selected.

Dirt and deposits on the intake protection grille must be thoroughly removed using suitable cleaning agents or a high-pressure cleaner. If necessary, this can also be dismantled.

Maintenance Fan unit	Periodic 3 months	As required	Hygiene inspection
Check fan for contamination, mechanical defects, corrosion and fastenings	X		X
Check for uniform gap spacing on free-running wheels (Section 8.2.3)	X		
Clean fan housing and impeller if necessary		X	
Check impeller for any imbalances	X		
Check for smooth running and bearing noise	X		
Relubricate or replace bearings if necessary		X	
Check flexible connector for leaks and mechanical damage	X		
Check vibration dampers for proper functioning	X		
Check the fastenings of the protective devices	X		
Check drainage for proper functioning	X		X

Maintenance Belt drive	Periodically 3 months	As required	Hygiene inspection
Check belt drive for contamination, mechanical defects, belt tension, wear and fastening	X		X
Retighten belt drive if necessary.		X	
Replace flat or V-belts (only replace V-belts in sets)		X	
Clean belt drive		X	
Check that protective devices are present and securely fastened	X		

Maintenance Drive motor	Periodically 3 months	As required	Hygiene inspection
Check motor for contamination, mechanical defects, corrosion and fastenings	X		X
Clean engine (housing)		X	
Check the direction of rotation of the motor	X		
Check smooth running and bearings for noise	X		
Relubricate or replace bearings if necessary		X	
Check power consumption	X		
Check electrical connection for corrosion and tightness	X		

Maintenance Drive coupling	Periodically 3 months	As required	Hygiene inspection
Check drive coupling for contamination, mechanical defects, corrosion and fastenings	X		X
Readjust drive coupling if necessary in accordance with manufacturer's instructions.		X	
Clean the drive coupling if necessary.		X	
Check temperature after operation	X		
Change oil if necessary		X	

Decommissioning belt-driven fans

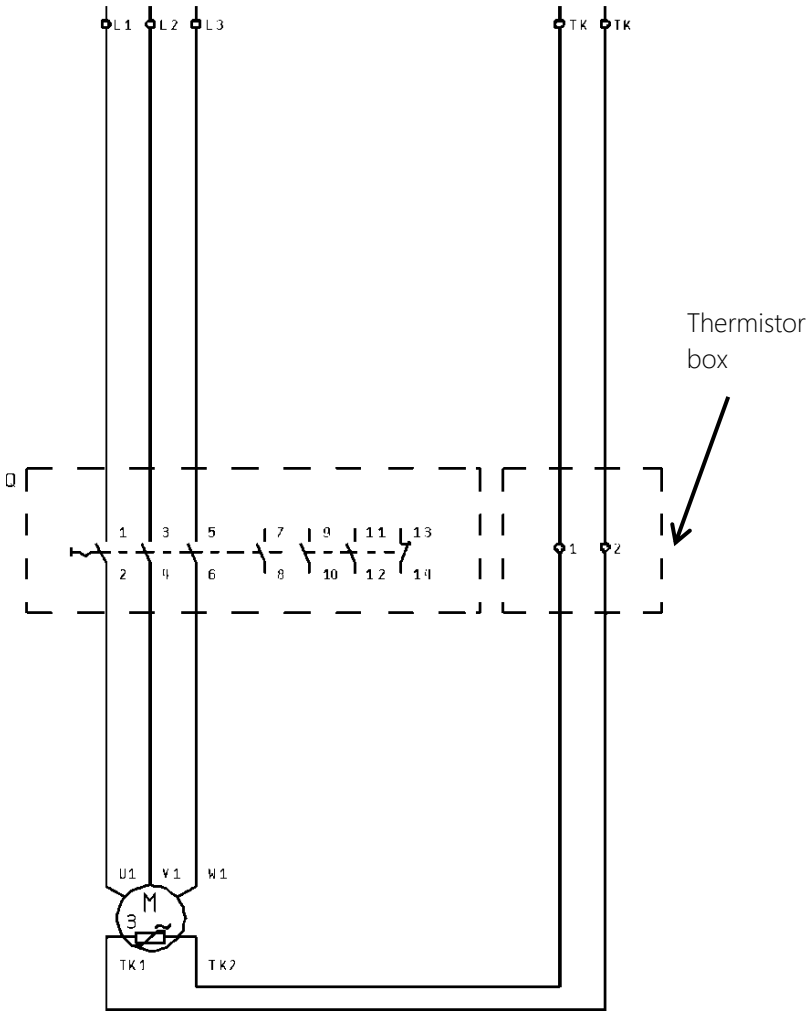
For longer periods of inactivity lasting more than three months, the belts must be removed from belt-driven fans to avoid point loads on the bearings. When restarting, the commissioning instructions must be observed.

8.2.5 Electrical wiring of drive motors

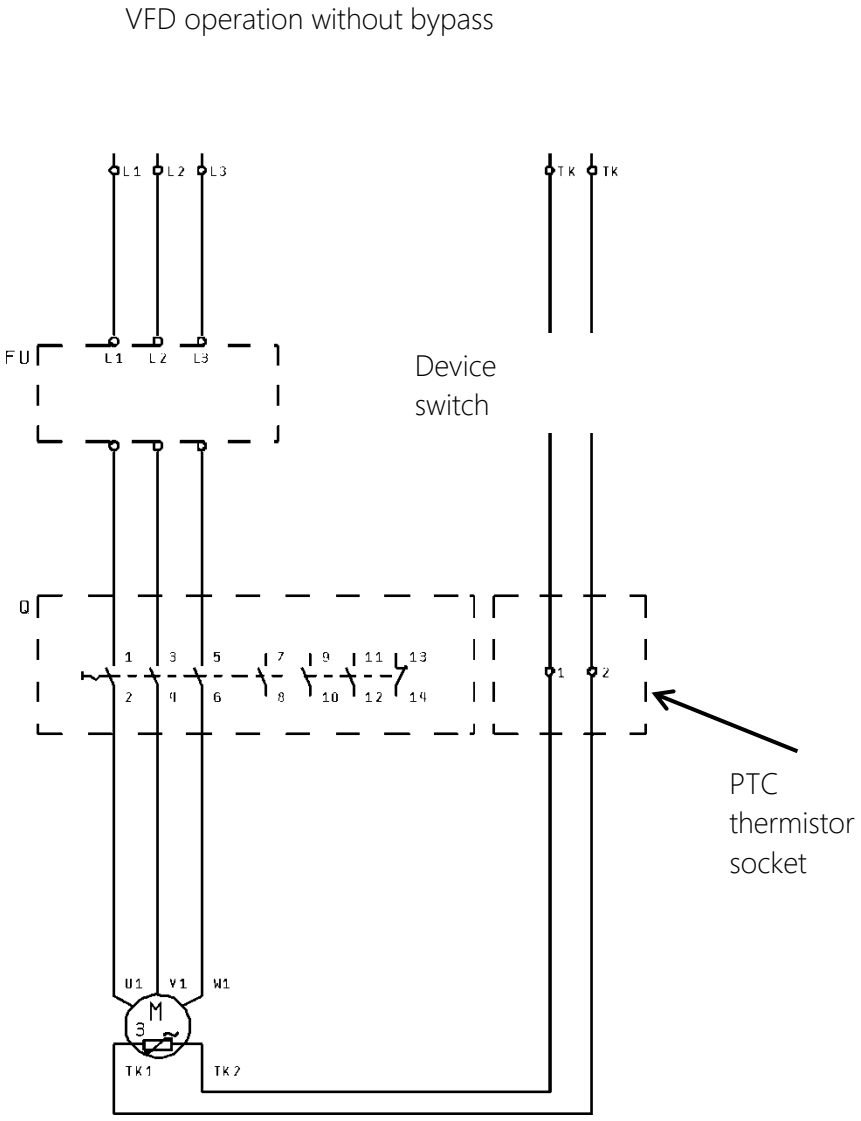
CAUTION: Only trained and authorised personnel may wire and connect motors!

Connection diagram for single-phase motor:

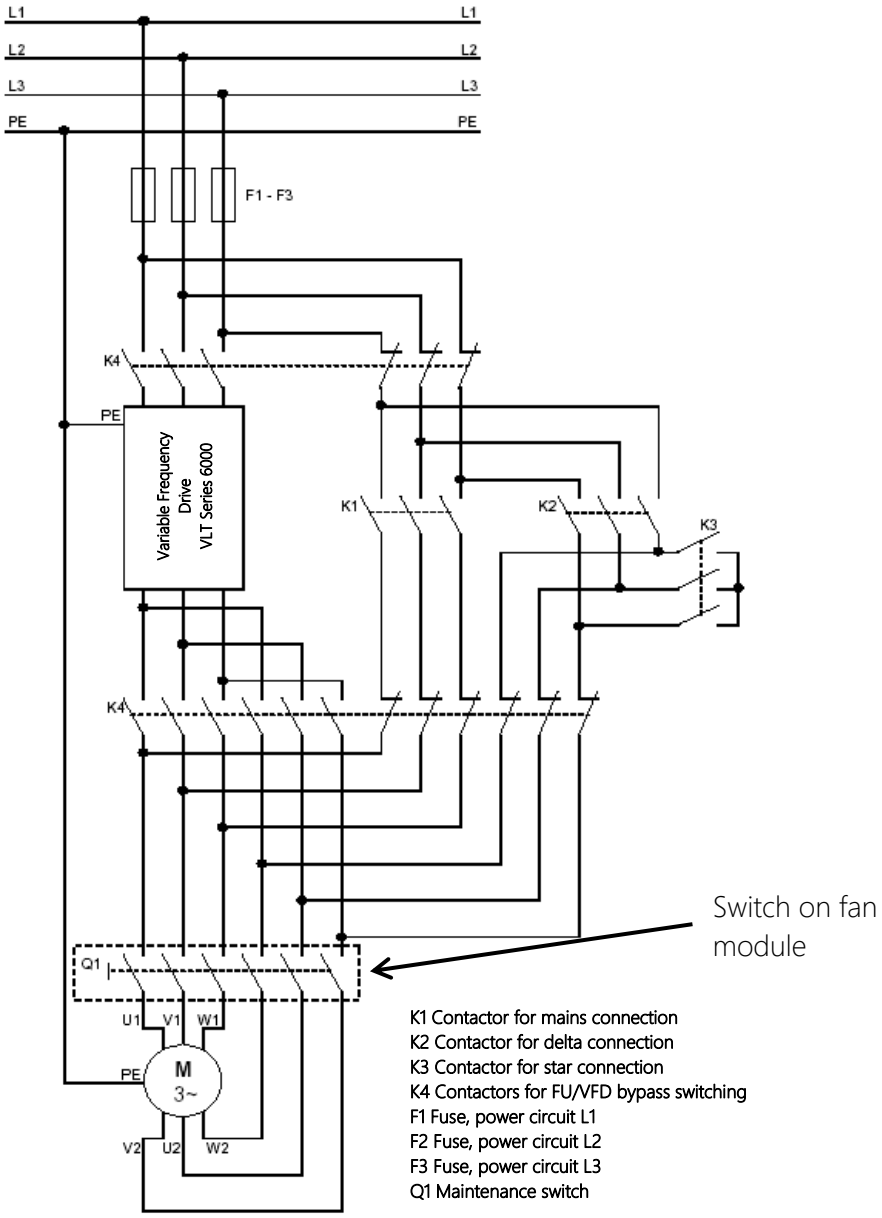
Three phase motor with PTC Thermistor



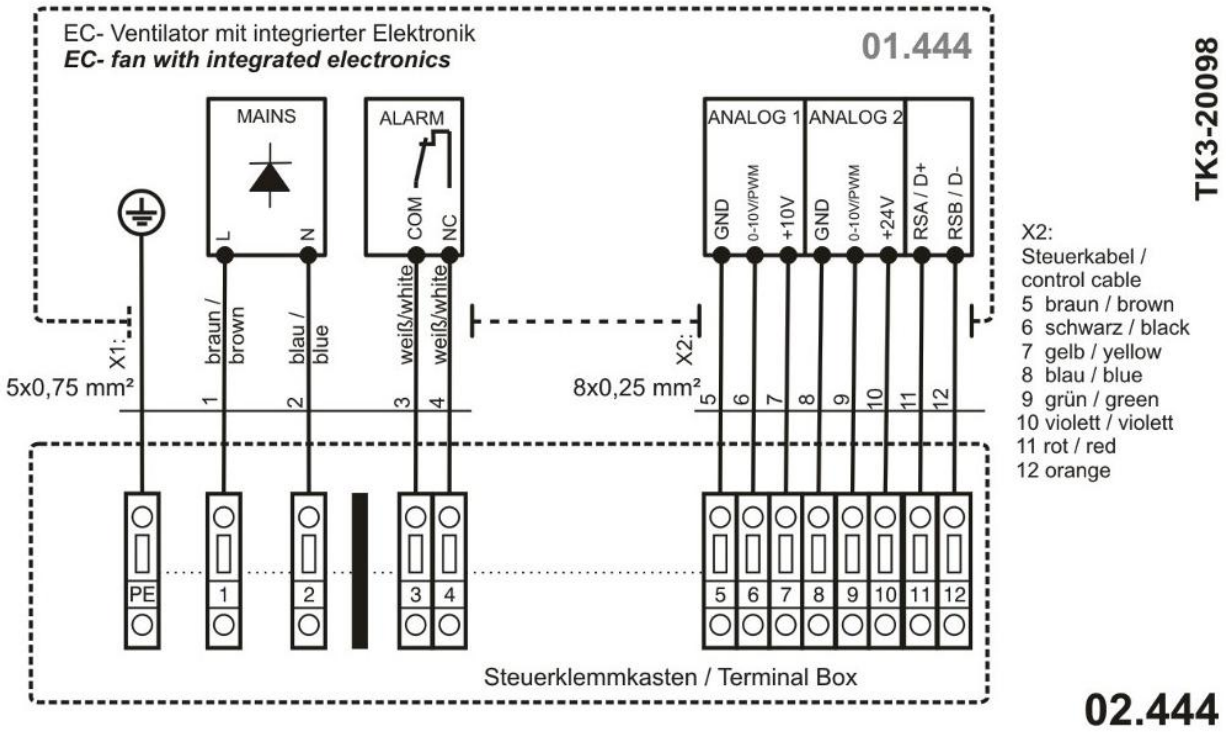
Connection diagram for direct drive with PTC thermistor:



Connection diagram for FU bypass operation:



Connection diagram for single-phase EC fan:



Wiring of EC fans:

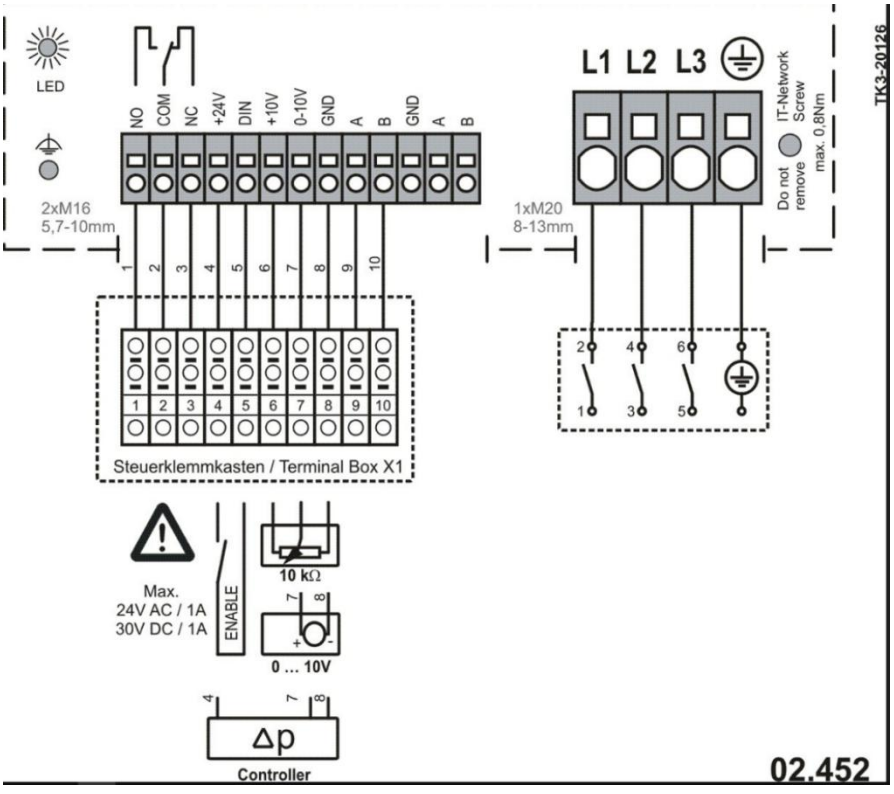


Figure: Connection diagram for EC fan with integrated electronics

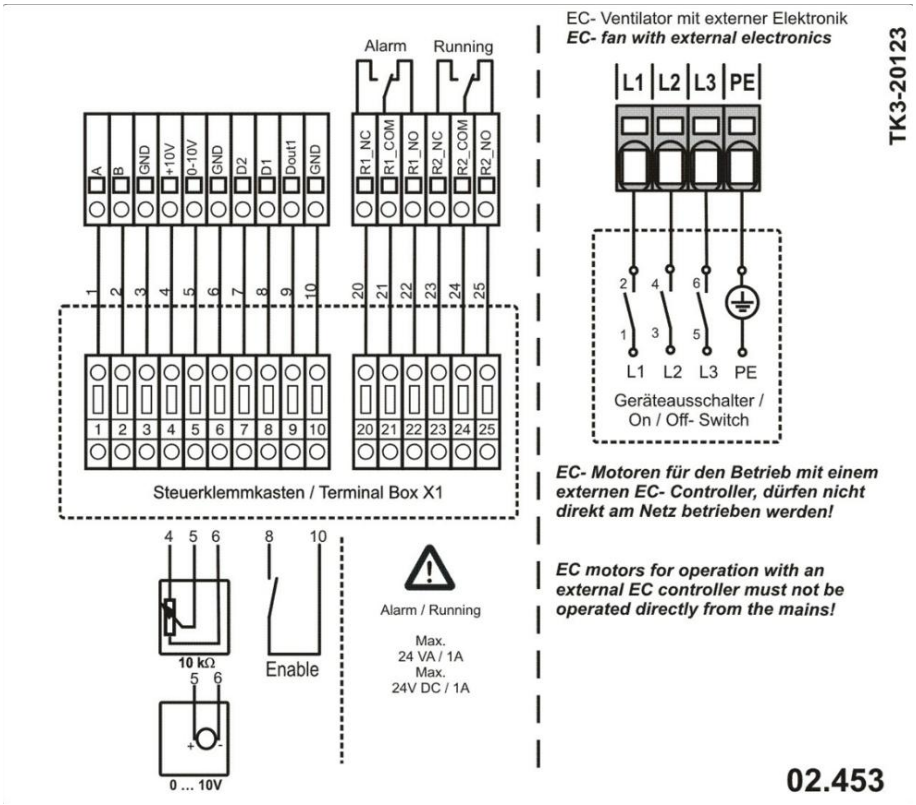
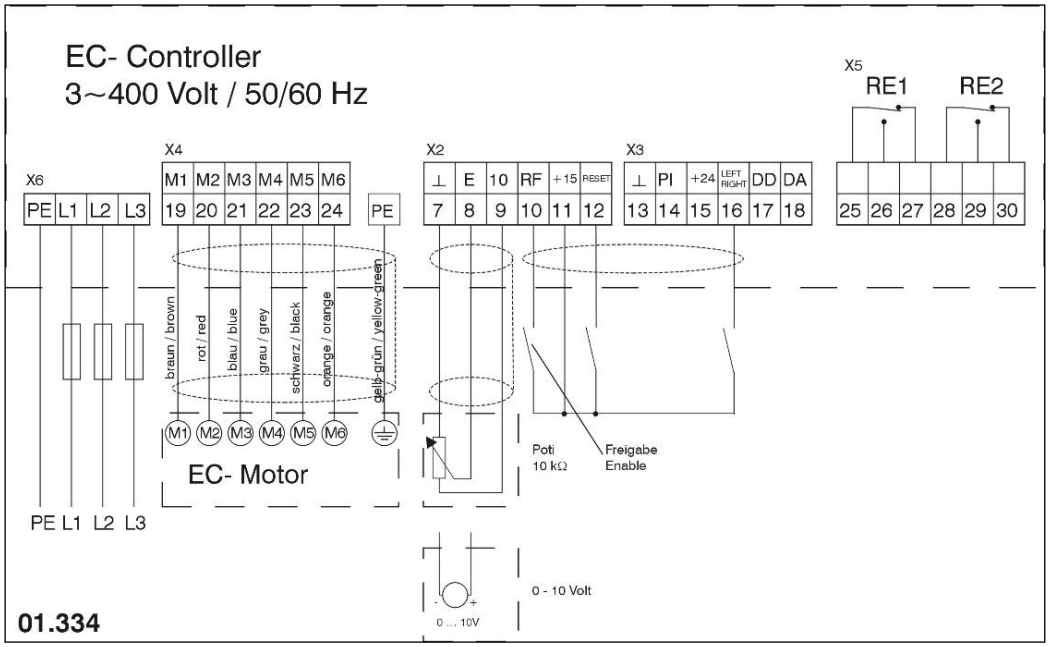


Figure: Connection diagram for EC fan with external electronics

Connection diagram for EC controller:



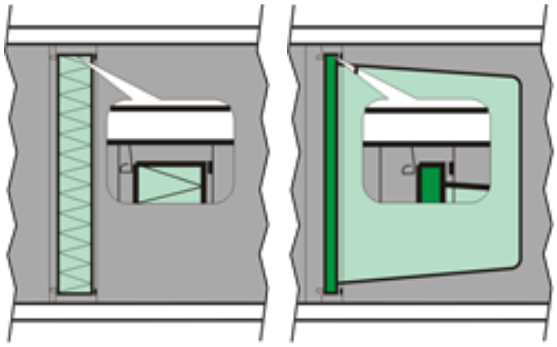
8.3 Filters (panel, pocket, compact and activated carbon filters)

Observe the safety instructions in Chapter 1 and the general commissioning instructions in Chapter 6!

Filter differential pressure monitoring with local display (display of the degree of contamination of the filters) must be carried out in accordance with DIN EN 13053. A pressure gauge with analogue display and an additional electronic pressure switch can be used (available as accessories).

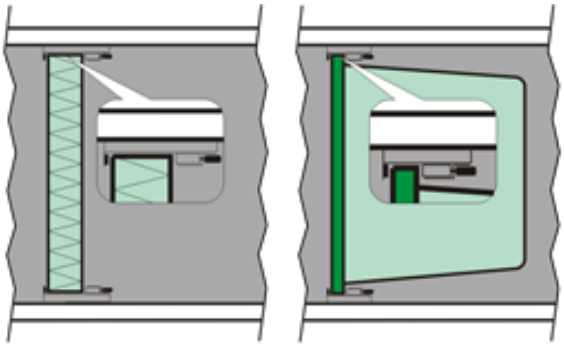
Notes on panel, pocket and compact filters

- Before installing the filters, check that all seals are correctly seated. The housing bases must be cleaned.
- The pocket filters must be inserted so that the pockets are arranged vertically. The filter material must be checked for damage.
- Take particular care with the snap-in tabs on the filter clamps so as not to damage the filters during installation!
- Observe the air direction arrow on the filters.
- Panel, pocket and compact filters are secured in the mounting frame with clamping clips. Ensure that the filter is correctly seated in the frame. When changing the filters, check the seal and replace it if necessary.
- For the side-loading version with clamping rails, the U-rails between the filter elements must be used as spacers. The filter is securely seated after the clamping rail is closed.



Filter frame

Panel filter Bag filter

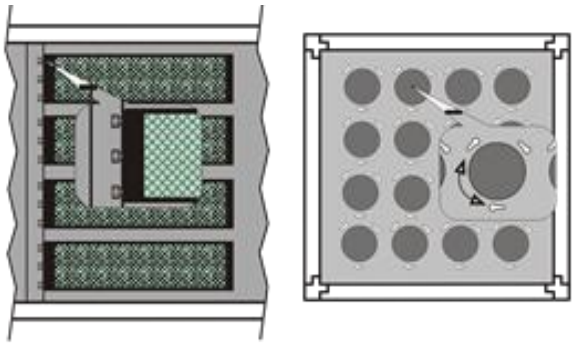


Clamping rail

Panel filter Bag filters

Information on activated carbon filters (cartridges)

The activated carbon cartridges are inserted into the sheet metal frame using a bayonet lock. Ensure that the seal and cartridges are correctly positioned and undamaged. Filters are delivered loose in cardboard boxes (key for bayonet lock available as an optional accessory).



Activated carbon filters

Maintenance and cleaning

Max. permissible terminal resistances:

Coarse filters (ISO coarse)	formerly G1 – G4	150 Pa
Filter class ISO $ePM_{10} \geq 50\%$	formerly M5	200 Pa
Filter class ISO $ePM_{2.5} \geq 50\%$	formerly M6	200 Pa
Filter class ISO $ePM_1 \geq 50\%$	formerly F7	200 Pa
Filter class ISO $ePM_1 \geq 70\%$	formerly F9	300 Pa
Particulate filter/activated carbon filter	E10 – H14	According to manufacturer's specifications

Filter dust may cause allergic reactions on contact with skin, eyes and respiratory organs.
Special protective clothing (disposable coveralls), safety goggles and a respirator mask are recommended for all work on filter walls.

Metal filters can be cleaned with hot steam cleaners or in the dishwasher.

Pocket and panel filters must always be replaced completely. The filter material is classified as hazardous waste and must be disposed of accordingly.

The activated carbon cartridges are recycled by the manufacturer or refilled with fresh activated carbon. The effectiveness of the activated carbon cartridges can be tested for sufficient function using a test tube (for the respective pollutants) (available from the manufacturer).
For ventilation and air conditioning systems in accordance with DIN 1946 T.4, only reversible seals (plugged, clamped) are permitted. Glued seals are only permitted on filters for single use. These seals must be certified in accordance with DIN EN ISO 846.

When changing the filter, the housing base must be cleaned before installing the new filter.

A dirty filter has a negative effect on the performance and energy efficiency of the ventilation unit.

The filter should be changed after 12 months of operation or service life at the latest (first stage). For the second stage, 24 months are prescribed. This applies regardless of the filter end resistances. The filter must always be replaced for the entire filter wall. The replacement of individual elements is not permitted. The filter replacement must be documented with the name and date on the unit, in the filter verification card and in the operating log. For more information, please refer to the currently valid VDI 6022 or DIN EN ISO 16890.

Contamination on the filter frame must also be thoroughly removed with suitable cleaning agents after removing the filters. Deposits and cleaning agent residues must then be completely removed.

Maintenance Filters	Periodic 3 months	As required	Hygiene inspection
Check for contamination by monitoring differential pressure	X	X	X
Check filter medium for damage	X		
Replace filter insert		X	
Check filter seat for leaks	X	X	X
Check differential pressure measuring device	X		X

Notes on cleaning grease traps

Grease traps and the associated drip tray must be cleaned with hot water or steam; grease removers may be used if necessary. To do this, remove the filter elements and the drip tray from the device.

Local environmental and waste disposal regulations must be observed and complied with!

8.4 Heater (PWW)

Observe the safety instructions in Chapter 1 and the general commissioning instructions in Chapter 6!

CAUTION: When working on the heater, there is a risk of scalding from hot media (above 60°C)!

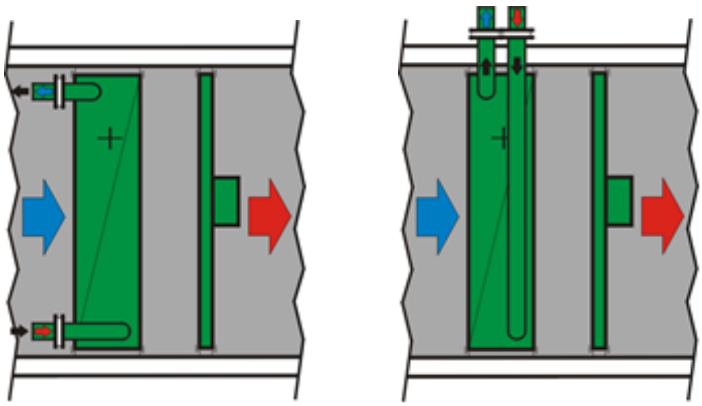
Commissioning

During installation and connection piping, it is essential to ensure that inspection doors can be opened. Accessibility for maintenance must be guaranteed.

The pressure rating of the pipe network and heater must be checked. The heater must have a pressure rating that is equivalent to or higher than that of the pipe network.

During all pipework (fitting flanges or screw connections), ensure that the heater pipes are held in place with pipe wrenches or similar tools.

The pipe connections must be checked. Unless otherwise specified on the device, the heaters are connected according to the counterflow principle, i.e. water inlet on the air outlet side. Preferably, the medium flow should be installed at the bottom and the medium return at the top. For steam as the medium, ensure that the steam connection and condensate drain are correct.



Counterflow principle

All pipe connections to heaters must be free of tension and vibration. Appropriate venting and draining options as well as detachable connections (above the device or on the side of the heater) for maintenance purposes must be provided in the piping on site. Incomplete venting leads to air pockets in the heat exchanger and, as a result, to reduced performance.

The extractability of the register must be ensured up to an internal device height of 1.6 m.

The pipe network and the heater must be filled with the medium specified in the technical data sheet in the appropriate concentration. Flushing in accordance with VDI 2035 is recommended before filling in order to remove contamination.

Before starting up the circulation pumps, vent properly and check the position of the control and regulating valves. After start-up, check the heater and the connections for leaks.

The frost protection thermostat (with capillary tube) on the air outlet side or the frost protection sensor in the medium return must be checked for proper functioning and adjusted if necessary (recommendation 4°C).

At high flow temperatures, slight vapour emissions from unavoidable stamping oil residues on the fins may occur during the first few hours of operation.

The hydraulic circuits for PWW heaters are explained in Chapter 5.4.

Operation

The heater must be checked regularly for leaks (visual inspection). Control is carried out by the central device control system.

If the heater or the associated heat supply is shut down for a longer period of time, appropriate frost protection must be provided. If necessary, the register must be completely emptied. To ensure complete emptying, the heater must be blown through with compressed air after the water has been drained.

When restarting, the commissioning instructions in this chapter must be observed.

Maintenance and cleaning

As a static component, the PWW heater is low-maintenance. The steam heater should be checked regularly for deposits and corrosion.

The heater can be pulled out on the existing rails after removing the pipe system and taking off the panel. The pipes must be connected in such a way that they can be easily removed for cleaning. Contamination on the fins can then be removed using compressed air or a low- or high-pressure cleaner.

In larger systems, the heater can also be cleaned while installed, e.g. with compressed air against the air flow. Contamination and cleaning residues on the frame, connections or rails must also be completely removed.

Maintenance Heaters	Periodic 3 months	As required	Hygiene inspection
Checking the hygiene status			X
Check heaters for contamination, damage and corrosion	X		
Clean the air side of the heater		X	
CU/AL fins: blow out with compressed air or low-pressure water cleaner against the direction of air flow		X	
Vent heater		X	
Check the function of the frost protection thermostat or frost protection sensor.	X		

Note: Water mixed with antifreeze must not be discharged into the sewage system. It is classified as hazardous waste.

During all work, care must be taken to ensure that the fins are not deformed. If necessary, the fins must be combed out with a suitable fin comb.

8.5 Electric air heater heater

Observe the safety instructions in Chapter 1 and the general commissioning instructions in Chapter 6!

CAUTION: With wire heaters, there is a risk of electric shock from the heating wire!
CAUTION: There is a risk of burns when working on the heater!

Commissioning

The manufacturer's operating and maintenance instructions must be observed; in the event of discrepancies, these take precedence over the Rosenberg BWA instructions.

Before connecting to the power supply, initial commissioning must be carried out in accordance with VDE guidelines.

A safety temperature limiter (STB) with manual reset must be installed on the outlet side of the electric air heater. This is already integrated in the electric heating register. Function must be checked, e.g. with a hot air dryer.

The electric air heater must be equipped with an upstream flow monitor. The flow monitor is included in the scope of delivery of the electric air heater.

The fan must have a run-on function that prevents the electric air heater from overheating after it has been switched off during operation. An exception can only be made if the heater has an operating licence without fan run-on. Without sufficient cooling, manual shutdown via the main switch or emergency shutdown of the system via safety devices may result in damage due to overheating. The components must be checked before switching back on.

The power consumption of all connected phases must be checked. The characteristic data can be found on the type plate.

Operation

If the electric air heater malfunctions, check the register and manually unlock the STB if necessary.

Maintenance and cleaning

As a static component, the electric air heater requires very little maintenance. Periodic maintenance mainly involves inspection and cleaning work. The manufacturer's operating and maintenance instructions must be observed; in the event of discrepancies, these take precedence over the Rosenberg BWA instructions.

Maintenance Electric air heater	Periodic 3 months	As required	Hygiene inspection
Checking the hygiene status			X
Check air flow monitoring function: When removing the air hoses from the differential pressure monitor, the monitoring system must be triggered (switching of the differential pressure monitor).	X		
Check electric air heater for contamination, damage and corrosion	X		
Clean the electric air heater.		X	X

The heater must be vacuumed for cleaning. Cleaning with water is only permitted on the frame and NOT on live parts. All residues of cleaning agents must be removed before switching the heater back on!

8.6 Cooler

Observe the safety instructions in Chapter 1 and the general commissioning instructions in Chapter 6!

CAUTION: When working on the cooler, there is a risk of chemical burns from the brine medium!

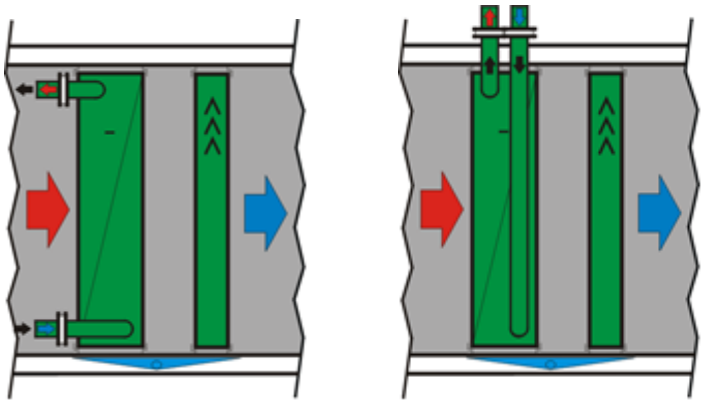
Commissioning

During installation and connection piping, it is essential to ensure that inspection doors can be opened. Accessibility for maintenance must be guaranteed.

The pressure rating of the pipe network and cooler must be checked. The cooler must have a pressure rating that is equal to or higher than that of the pipe network.

During all pipework (fitting flanges or screw connections), ensure that the cooler pipes are held in place with a pipe wrench or similar tool.

The pipe connections must be checked. Unless otherwise specified on the device, the coolers are connected using the counterflow principle, i.e. water inlet on the air outlet side. Preferably, the medium flow should be installed at the bottom and the medium return at the top.



Counterflow principle

All pipe connections to the cooler must be free of tension and vibration. Appropriate venting and draining options as well as detachable connections (above the unit or on the side of the cooler) for maintenance purposes must be provided in the piping on site. Incomplete venting leads to air pockets in the heat exchanger and, as a result, to reduced performance.

The extractability of the register must be ensured up to an internal unit height of 1.6 m.

The pipe network and the cooler must be filled with the medium specified in the technical data sheet in the appropriate concentration. Flushing in accordance with VDI 2035 is recommended before filling in order to remove contamination.

Before starting up the circulation pumps, vent properly and check the position of the control and regulating valves. After start-up, check the cooler and the connections for leaks.

Due to the condensate that accumulates, air coolers have droplet separators and drain pans with a slope on all sides, through which the condensate is drained. A siphon with a non-return valve must be installed at the drain (optional accessory). Direct connection of water drains to the sewage system is not permitted. For information on connecting the siphon to the condensate drain, see Chapter 5.5.

The hydraulic circuits for car coolers are explained in section 5.4.

Special note for direct evaporators

Before commissioning, the register must be filled with protective gas. When cutting off the caps, this must escape audibly.

Operation

The cooler must be checked regularly for leaks (visual inspection). Control is carried out by the central device control system.

If the cooler is not in use for a long period of time, appropriate frost protection must be provided or, if necessary, the register must be completely emptied. To ensure complete emptying, the cooler must be blown through with compressed air after the coolant has been drained.

A condensate tray with a slope on all sides is installed under coolers with a dehumidification function. A siphon with a non-return valve must be installed at the drain (optional accessory). Direct connection of water drains to the sewage system is not permitted.

When restarting the system, the commissioning instructions in this chapter must be observed.

Maintenance and cleaning

As a static component, the car or DV cooler requires little maintenance. The cooler should be checked regularly for deposits and corrosion. In addition, care must be taken to ensure that the droplet separator and condensate tray are cleaned regularly.

The cooler can be pulled out on the existing rails after removing the pipe system and taking off the panel. The pipes must be connected in such a way that they can be easily removed for cleaning. Dirt

on the fins can then be removed using compressed air or a low- or high-pressure cleaner, and the tray can be easily wiped with suitable cleaning agents. Any dirty water and cleaning agent residues must be removed completely.

In larger systems (from BG 1313 upwards), the cooler can also be cleaned while installed, e.g. with compressed air against the air flow. The tray is designed to provide sufficient space for wiping. Contamination and cleaning residues on the frame, connections or rails must also be removed completely.

The drip separator can be pulled out on the existing rails after opening the inspection door. The slats can be pulled out of the frame individually. The frame and slats must then be thoroughly cleaned. The tray can then be easily wiped with suitable cleaning agents. Any dirty water and cleaning agent residues must be removed completely.

Maintenance Cooler	Periodic 3 months	If necessary	Hygiene inspection
Checking hygiene conditions			X
Check the radiator for dirt, damage and corrosion	X		
Clean the air side of the radiator		X	
CU/AL fins: blow out with compressed air or low-pressure water cleaner against the direction of air flow		X	
Ventilate the cooler		X	
Check antifreeze for proper functioning (medium or antifreeze thermostat)	X		

Maintenance of drip separator and condensate tray	Periodically 3 months	As required	Hygiene inspection
Check of hygiene condition			X
Check drip separator and condensate tray for contamination, damage and corrosion	X		
Clean the droplet separator: To do this, remove and dismantle the cassette, then clean the profiles individually. The droplet separator must be descaled and free of grease		X	
Clean the condensate tray.		X	
Check the condensate drain and siphon for proper functioning.	X		
Clean condensate drain and siphon		X	
Check the water level in the siphon and top up if necessary	X		

Note: Water mixed with antifreeze or coolant must not be discharged into the sewage system. This is hazardous waste.

During all work, care must be taken to ensure that the fins are not deformed. If necessary, the fins must be combed out with a suitable fin comb.

8.7 Plate heat exchanger

Observe the safety instructions in Chapter 1 and the general commissioning instructions in Chapter 6!

CAUTION: The maximum permissible pressure drop (ZUL/ABL) must not be exceeded in order to avoid damage.

Commissioning

Before commissioning, check the functionality and direction of movement of the bypass damper of the plate heat exchanger in accordance with Chapter 8.1. Instructions for closing shut-off dampers can also be found in this chapter.

Ensure that the bypass damper is in the closed position when the fans are started up and that the damper above the plate heat exchanger is open. The supplied or pre-assembled mounting brackets for servomotors are generally suitable for Belimo products.

Ensure that the existing drain pans at the bottom of the plate heat exchanger module are connected to the condensate water pipe with a siphon (suction or pressure side). For more information on the siphon, see Chapter 5.5.

Operation

Plate heat exchangers usually have an automatic bypass damper adjustment via an actuator. This is controlled by the central device control system .

A differential pressure monitor must be installed across the exhaust air flow to monitor for icing. The set value is approx. 50 Pa above the design pressure loss according to the technical data sheet for the exhaust air flow.

If the alarm is triggered without icing being present, the value can be increased slightly; an inspection is required.

Maintenance and cleaning

As a fixed installation component, the plate heat exchanger requires very little maintenance. However, in terms of hygiene requirements, inspection and maintenance measures in accordance with VDI 6022 are necessary. In addition, any damper actuators must be maintained in accordance with section 8.1.

A flat nozzle should be used for cleaning with compressed air or a high-pressure cleaner. Plate heat exchangers consisting of several packages may need to be dismantled and cleaned individually.

Maintenance Plate heat exchangers	Periodic 3 months	As required	Hygiene inspection
Checking the hygiene status			X
Check plate heat exchangers for contamination	X		
Clean the plate pack with compressed air or a high-pressure cleaner (water or steam; always direct the jet parallel to the plate pack; from top to bottom)		X	
Carefully clean the module chamber		X	
Remove all dirty water		X	
Check condensate trays for contamination	X		
Clean condensate trays		X	
Check condensate drain and siphon for proper functioning	X		
Clean condensate drain and siphon		X	
Check water level in siphon, top up if necessary	X		
Check bypass valve for smooth operation and repair if necessary	X		

8.8 Rotary heat exchanger

Observe the safety instructions in Chapter 1 and the general commissioning instructions in Chapter 6!

Commissioning

The manufacturer's operating and maintenance instructions must be observed; in the event of discrepancies, these take precedence over the Rosenberg BWA instructions.

Before connecting to the power supply, initial commissioning must be carried out in accordance with VDE guidelines.

Before commissioning the rotary heat exchanger, check that the storage mass can rotate freely. It is important that no objects block the free movement of the rotor. Any sealing strips or sealing brushes fitted must be aligned so that they are positioned as close as possible to the rotor mass without touching the rotating mass.

The rotor mass bearing is already aligned at the factory. If the bearing needs to be adjusted due to the installation situation, this must be done in accordance with the enclosed manufacturer's documentation.

The tension of the drive belt must be checked before commissioning and during the first 500 operating hours.

The operating instructions for the rotor control unit must be observed during commissioning. After completing the above steps, connect the rotor drive motor or the rotor control unit to the power supply.

Check the direction of rotation of the rotary heat exchanger using the direction arrows on the rotor housing.

The transmission ratio of the drives is designed so that the rotor reaches the optimum speed. For condensation rotors, the speed should not exceed 12 rpm. For rotor exchangers with moisture transfer (sorption rotors), the target speed is a maximum of 20 rpm.

Operation

The rotor controller is controlled by the central device control system. The operating and fault indicators of the rotor controller must be monitored regularly, unless they are processed by the device control system.

Maintenance and cleaning

The power supply must be disconnected at all poles and secured against being switched back on during all work on the rotor. **There is a risk of crushing and abrasion due to sudden start-up!**

As a slowly rotating built-in component, the rotor heat exchanger is largely maintenance-free. The rotor bearings, belts and drive motor are designed for a long service life and do not require maintenance under normal operating conditions.

After opening the maintenance doors, the rotor storage mass can be cleaned of dirt using compressed air or a high-pressure cleaner. The jet must always be directed at right angles to the storage mass and against the direction of air flow. Any dirt deposits on the frame must be removed using suitable cleaning agents. If there are floor trays, dirt and cleaning residues must also be removed completely. A round nozzle should be used for cleaning with compressed air or a high-pressure cleaner.

Special instructions regarding the storage mass and the materials used therein can be found in the rotor manufacturer's instructions and must be observed!

Maintenance Rotary heat exchangers	Periodic 3 months	As required	Hygiene inspection
Checking the hygiene status			X
Check rotor for contamination	X		
Clean the storage mass using compressed air		X	
The use of a water-based high-pressure cleaner must be checked separately		X	
Always direct the water, steam or air jet parallel to the storage mass and against the direction of air flow		X	
Clean the module chamber carefully		X	
Remove all dirty water.		X	
Check sealing strips and sealing brushes for damage, contamination and correct positioning	X		
Clean and readjust sealing strips or sealing brushes		X	
Check drive belts for wear and tension, tighten or replace if necessary.	X		

During all work, care must be taken to ensure that the slats are not deformed. If necessary, comb the slats with a suitable slat comb.

8.9 Circulation system

Observe the safety instructions in Chapter 1 and the general commissioning instructions in Chapter 6!

CAUTION: When working on the circulating system, contact with the heating/cooling medium poses a health hazard.

Commissioning

During installation and connection piping, it is essential to ensure that inspection doors can be opened. Accessibility for maintenance must be guaranteed.

A KV system is a closed circuit. During installation, it is essential to proceed in accordance with the heating system regulations. A pressure expansion vessel and safety valve must be integrated into the circuit.

During all pipework (fitting flanges and screw connections), ensure that the register pipes are held in place with a pipe wrench or similar tool. All pipe connections to the registers must be free of tension and vibration.

The pipe connections must be checked. Unless otherwise specified on the device, the registers are connected according to the counterflow principle, i.e. water enters on the air outlet side. Preferably, the medium flow should be installed at the bottom and the medium return at the top.

Appropriate venting and draining options as well as detachable connections (above the device or on the side of the heater) for maintenance purposes must be provided in the piping on site. Incomplete venting leads to air pockets in the heat exchanger and, as a result, to reduced performance.

The heat exchangers must be removable.

The pipe network of the KVS coolers and KVS heaters must be filled with the medium specified in the technical data sheet in the appropriate concentration. In the case of KV systems, particular attention must be paid to ensuring adequate frost protection.

All further information on commissioning can be found in chapter 8.4 for the KVS heater and in chapter 8.6 for the KVS cooler.

Split KVS registers

Due to existing regulations, it may be necessary to divide the KVS register into supply air and/or exhaust air (i.e. into two registers).

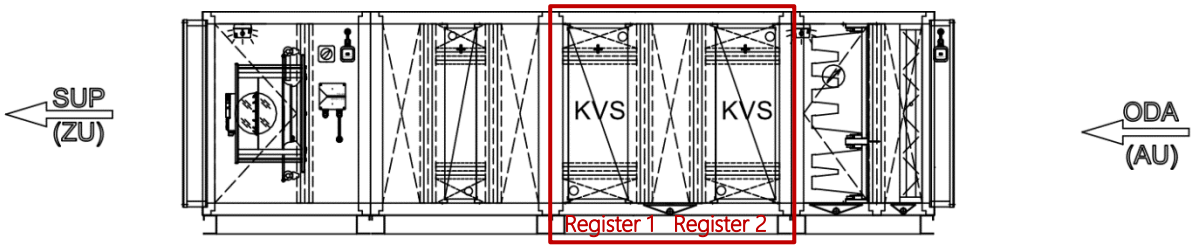


Illustration: KVS register in supply air in split design with inspection opening

Both registers are designed with a connection for water inlet and outlet. On site, the connection for the water outlet of register 1 must be connected to the connection for the water inlet of register 2 so that there is only one connection each for water inlet and outlet for the subsequent connection of the KVS register to the hydraulic station.

When installing the connecting piping, it is essential to ensure that any inspection doors can be opened. Accessibility for maintenance must be guaranteed.

Operation

The KVS registers must be checked regularly for leaks (visual inspection). Control is carried out by the central device control system.

If the KV system is shut down for a longer period of time, appropriate frost protection must be provided or, if necessary, the registers must be completely emptied. To ensure complete emptying, the registers must be blown through with compressed air after the coolant has been drained.

When restarting the system, the commissioning instructions in this chapter must be observed.

Maintenance and cleaning

Instructions for maintenance and cleaning of the cooling/heating system can be found in Chapter 8.4 (Heater) and Chapter 8.6 (Cooler).

Note: Water or coolant mixed with antifreeze must not be discharged into the sewage system. This is hazardous waste.

During all work, care must be taken to ensure that the fins are not deformed. If necessary, the fins must be combed out with a suitable fin comb.

8.10 Silencer

Observe the safety instructions in Chapter 1 and the general commissioning instructions in Chapter 6!

Commissioning

Check the splitters for damage and contamination. For repair and cleaning instructions, refer to the chapter "Maintenance and cleaning".

Operation

The baffles can be pulled out or removed after removing the housing wall. Mounted intermediate bars in front of sound insulation baffles are designed to be removable, i.e. they can be removed.

To remove the bar, it may be necessary to push the enclosure (base and cover) apart using a spreader so that the bar can be removed and/or reinserted more easily.

When applying the spreader, care must be taken not to damage the surfaces of the device/frame. The use of protective mats is recommended.

Image: Spreader with rubber pads to prevent scratches

Maintenance and cleaning

Clean glass fibre covered baffles with a damp cloth.

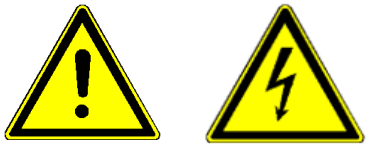
Moist backdrops are an ideal breeding ground for bacteria and fungi. They must be replaced.

Damage to the cover fleece must be repaired using a repair kit.

Maintenance	Periodic 3 months	As required	Hygiene inspection
Check scenery for dirt and damage	X		X
Check the silencer chamber for moisture	X		X
Clean the surface of the baffle		X	

8.11 Electrical accessories

Observe the safety instructions in Chapter 1 and the general commissioning instructions in Chapter 6!



CAUTION: All electrical connection work must only be carried out by trained specialists!

General information on electrical installation can be found in Chapter 5.3 of this operating manual. All electrical consumers/components must be integrated into the protective conductor system on site. The same applies to side panels or housing parts to which electrical components are attached.

8.12 Device lighting

If required, the air handling units can be equipped with internal lighting. This is normally completely pre-wired. This means that the supply cable for the lighting can be connected directly to the light switch, which is located on the outside of the unit.

The electrical supply for the unit lighting must be provided by a separate circuit so that lighting is still possible when the system is shut down for maintenance purposes.

The light switch (IP 66) has a red glow lamp that indicates when the internal lighting is in operation. In weatherproof units, the light switch is protected from the elements by a protective cover.

Oval lights (IP 40) are installed in standard units. The light source used is a 9 W LED. Alternatively, an 8 W LED damp-proof tubular light with an IP 65 housing is available. When replacing, an equivalent make must be used!

Hygienic devices are equipped with an 8 W LED damp-proof tubular luminaire (IP 65) as standard. When replacing, an equivalent product must be used!
Dirt on the device lighting must be removed regularly by wiping with suitable cleaning agents, paying particular attention to thoroughly cleaning the space between the lamp and the ceiling!

8.13 Damper actuator

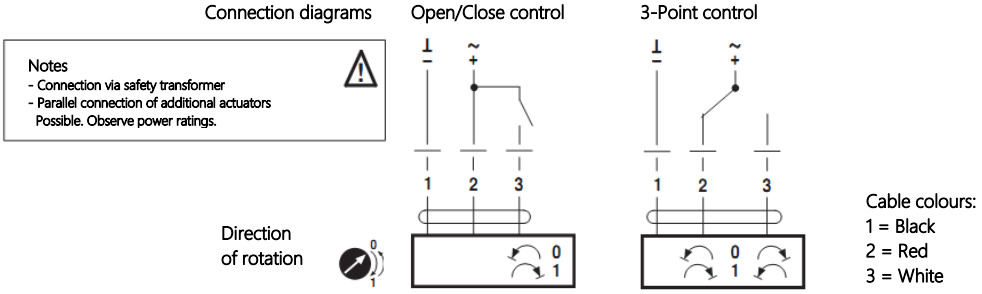
Information on the louvre dampers can be found in chapter 8.1. This section provides information on connecting non-pre-wired damper actuators.

Belimo damper actuators are used as standard in Rosenberg air conditioning units. These can be mounted either externally (→ , indoor installation) or inside the unit (→ , weatherproof version).

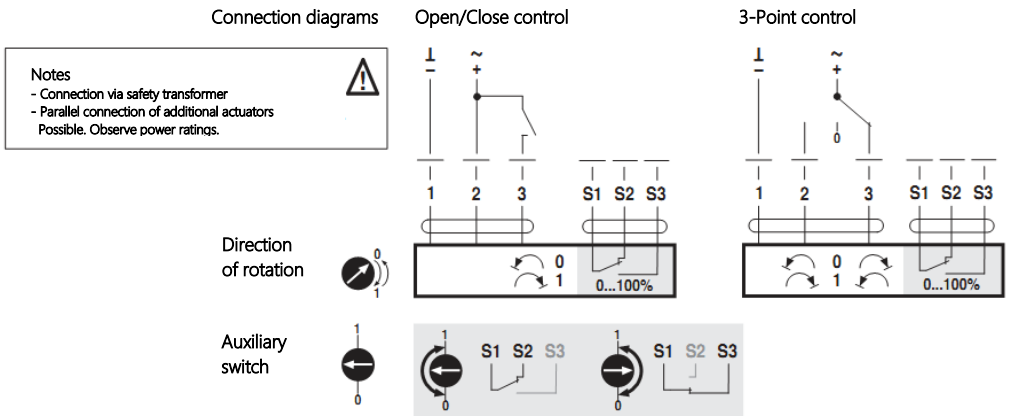
There are several different damper actuators depending on the mains voltage, damper size and damper function. The differences in the functions of the actuators (open-close or continuous) are explained by the different possible uses of the dampers, e.g. as supply air or bypass dampers.

An overview of these circuit diagrams is shown below. This allows the correct connection to be found for a known servomotor type (printed on the housing).

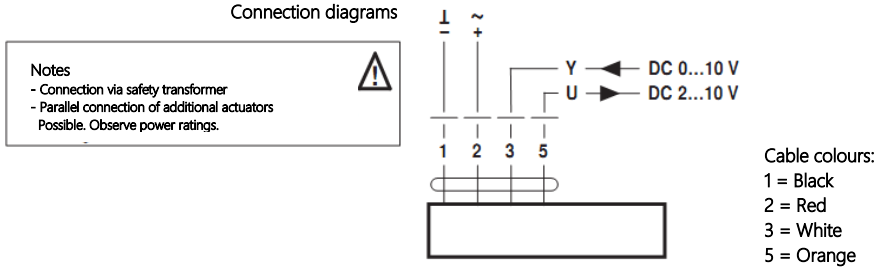
LM24A, NM24A, SM24A:



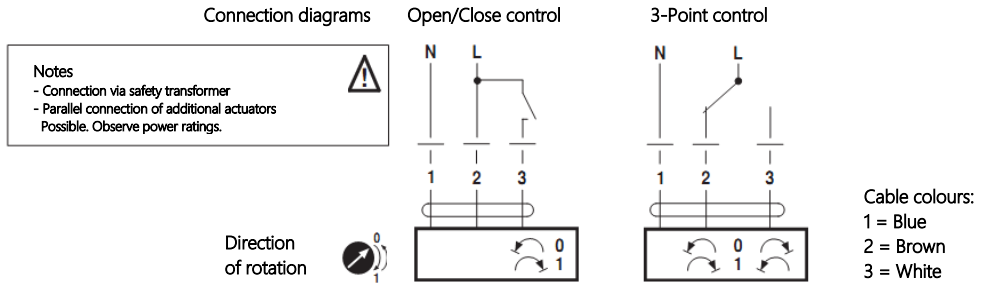
LM24A-S, NM24A-S, SM24A-S:



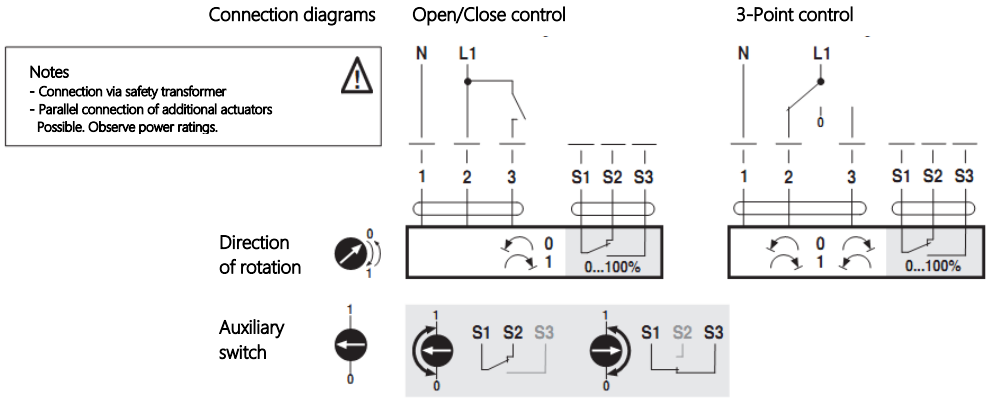
LM24A-SR, NM24A-SR, SM24A-SR:



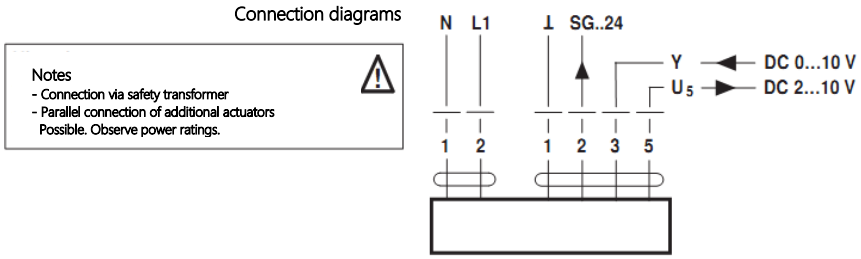
LM230A, NM230A, SM230A:



LM230A-S, NM230A-S, SM230A-S:

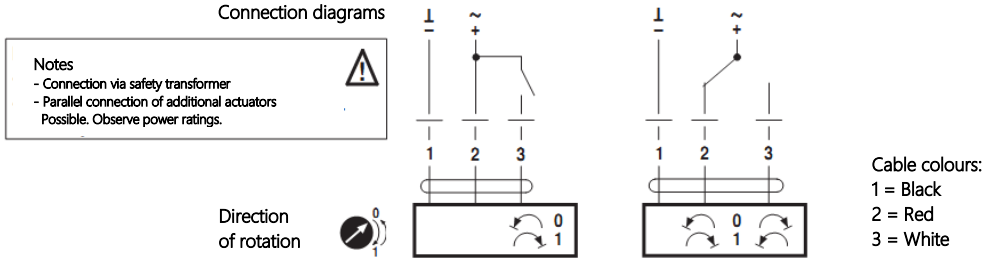


LM230ASR, NM230ASR, SM230ASR:



When connecting the damper actuators and during commissioning, ensure that the automatic damper position is working correctly (correct direction of rotation of the damper, etc.). It may be necessary to reverse the polarity of the damper actuator or adjust the control parameters.

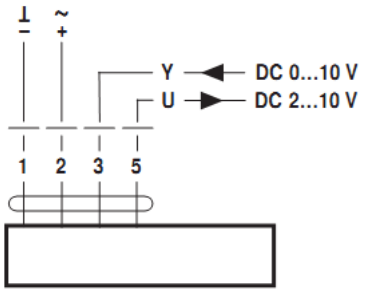
GM24A:



GM24A-SR:

Connection diagrams

AC/DC 24 V, steady

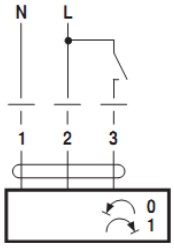


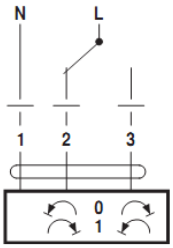
Cable colours:
1 = Black
2 = Red
3 = White
5 = Orange

GM230A:

Connection diagrams

Notes
- Connection via safety transformer
- Parallel connection of additional actuators Possible. Observe power ratings.



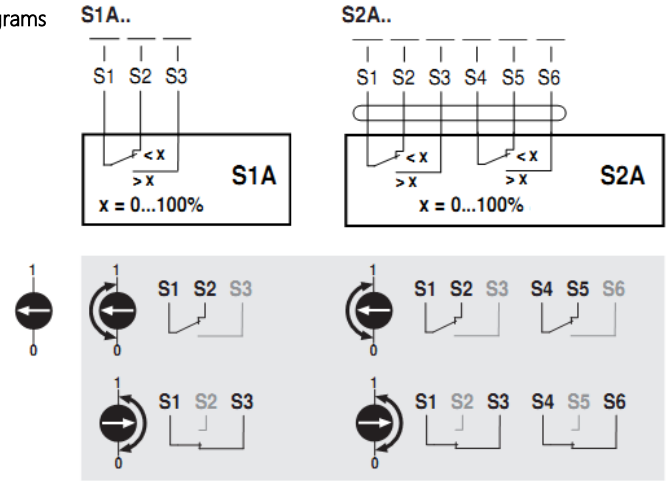


Direction of rotation

Cable colours:
1 = Black
2 = Brown
3 = White

Auxiliary switches S1A.., S2A..:

Connection diagrams



Cable colours:
S1 = Violet
S2 = Red
S3 = White
S4 = Orange
S5 = Pink
S6 = Grey

8.14 Differential pressure switch

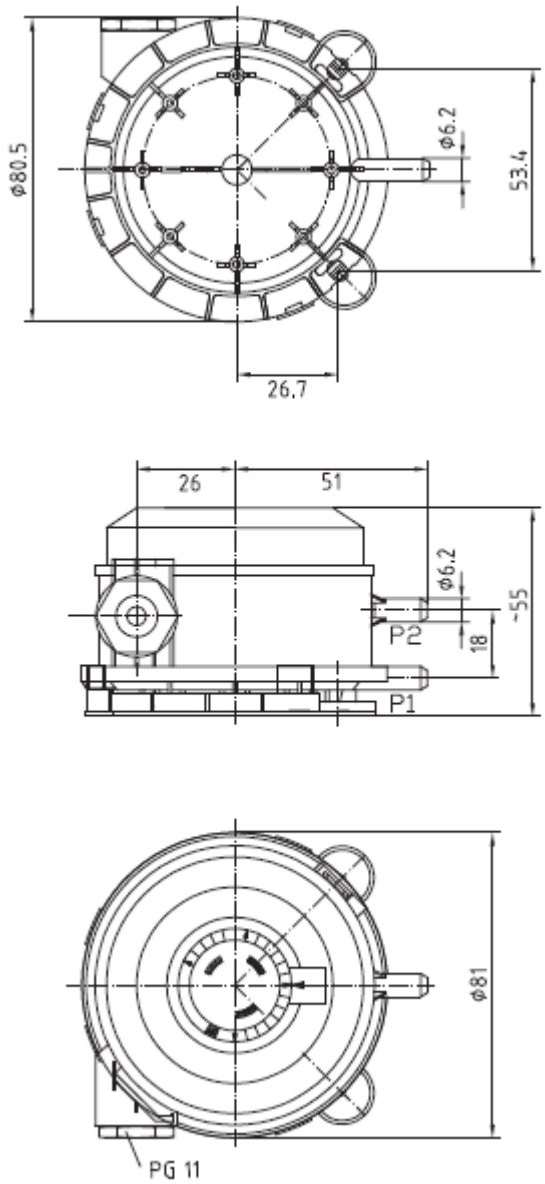


Figure: Sketch

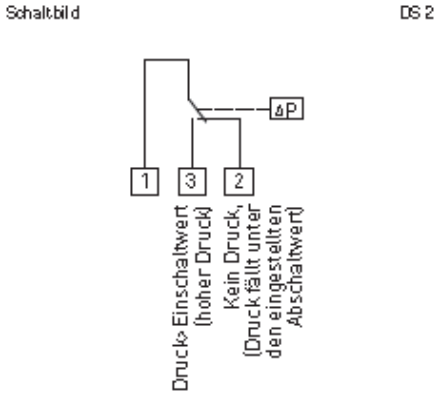


Figure: Circuit diagram, connection diagram

8.15 Humidifier

Basics

The following types of humidifiers are generally used in Rosenberg air handling units:

- Steam humidifiers,
- Spray humidifiers,
- Evaporative humidifiers.

In steam humidifiers, steam is generated in an external steam generator and distributed into the air stream via a steam distribution pipe. The advantage here is that the air temperature remains almost constant because the water is already in gaseous form when it is introduced, meaning that no heat is extracted from the air through evaporation.

In spray humidifiers, water is finely atomised through a nozzle and sprayed into the air stream. Here, humidification is adiabatic.

In evaporative humidifiers, also known as honeycomb humidifiers, the air flows through a honeycomb structure that is humidified by water trickling down it. Here, too, adiabatic humidification takes place.

When using a humidifier, in addition to these instructions, the manufacturer's instructions supplied must also be observed. The water qualities described or specified by the manufacturer must be strictly adhered to.

The water fed into the humidifier must comply with the requirements of the current Drinking Water Ordinance. Feedback into the drinking water network must be prevented.

Commissioning

Observe the safety instructions in Chapter 1 and the general commissioning instructions in Chapter 6!

The manufacturer's operating and maintenance instructions must be observed; in the event of discrepancies, these take precedence over the Rosenberg BWA instructions.

To avoid microbial contamination, it is essential to ensure that the humidifier chamber is darkened. Any viewing windows must therefore be darkened.

Before commissioning, the proper condition of the humidifier unit must be checked (check for transport and installation damage), regardless of the humidification technology used.

It must be ensured that the humidifier water is of the required quality in accordance with the manufacturer's instructions.

For information on installing siphons for draining waste water or condensate, refer to section 5.5 of these operating instructions.

Special notes on steam humidifiers

Before commissioning, the condensate tray must be cleared of foreign objects and cleaned with water and detergent (pH value 6 to 8).

To commission the steam humidifier, it is essential to follow the manufacturer's operating instructions supplied!

It should be ensured that the humidifier is locked against the fan, i.e. that the humidifier only runs when the fan is in operation.

Special notes on spray humidifiers

Before commissioning, the condensate tray must be cleared of foreign objects and cleaned with water and detergent (pH value 6 to 8).

To start up the spray humidifier, it is essential to follow the manufacturer's operating instructions supplied!

It should be ensured that the humidifier is locked against the fan, i.e. that the humidifier can only run when the fan is in operation. In addition, for hygienic reasons, the spray humidifier must be run dry after operation. For this purpose, the fan must have a run-on function.

After commissioning, the bacterial count of the circulating water should be checked weekly for some time. The blowdown device or the automatic hygiene system may need to be adjusted.

If it is found that the bacterial count exceeds the recommended limits by a significant margin, the system must be cleaned immediately. If high bacterial counts recur quickly, it is advisable to consult a specialist. Under certain circumstances, additional water treatment may be necessary.

Special notes on evaporative humidifiers

Before commissioning, the condensate tray must be cleared of foreign objects and cleaned with water and detergent (pH value 6 to 8).

To start up the spray humidifier, it is essential to follow the manufacturer's operating instructions supplied!

It should be ensured that the humidifier is locked against the fan, i.e. that the humidifier can only run when the fan is in operation. In addition, for hygienic reasons, the evaporative humidifier must be run dry after operation. For this purpose, the fan must have a run-on function.

After commissioning, the bacterial count of the circulating water should be checked weekly for some time. The blowdown device or automatic hygiene system may need to be adjusted.

If it is found that the bacterial count exceeds the recommended limits by a significant margin, the system must be cleaned immediately. If high bacterial counts recur quickly, it is advisable to consult a specialist. Under certain circumstances, additional water treatment may be necessary.

Operation

The humidifier units are normally operated by an automatic control system. The control strategy can also be specified here. Information on controlling the humidifiers can be found in the enclosed manufacturer's operating instructions.

When the system is shut down, the tanks, pumps and fittings of the humidifier units must be completely emptied. Outside operating hours, the humidifier tanks must be cleaned and dry.

When restarting operation, the tanks of humidifier systems that use recirculating water must be refilled with fresh water. The specifications of the respective manufacturer must be observed.

Maintenance and cleaning

Humidifiers require extremely careful and regular maintenance to ensure hygienic operation.

Inadequately maintained humidifiers can compromise the hygiene of the air conditioning unit. The operator is responsible for ensuring that the unit is properly maintained. With appropriate maintenance, every humidification system will operate in a 100% hygienic manner.

The maintenance intervals for humidifiers depend on the dust content of the air (i.e. the pre-filter system), the quality of the fresh water and the humidification system. The intervals should be shortened in unfavourable conditions.

Further information on maintenance intervals can be found in the currently valid VDI 6022.

The maintenance instructions in the manufacturer's operating and maintenance manual must be observed; in the event of deviations, these take precedence over Rosenberg-BWA.

Steam humidifier maintenance	Periodic 3 months	As required	Hygiene inspection
Checking the hygiene status	X		X
Visual inspection of electrical and mechanical connections and joints	X		
Remove limescale deposits in the steam cylinder, water drain hose and blowdown pump	X		
Check electrodes in the steam cylinder for burn-off	X		
Check hose connections for leaks	X		
Clean and descale drip separators and trays	X		
Clean and refill the condensate tray siphon	X		

Maintenance of spray humidifiers	Periodically (*)	As required	Hygiene inspection
Checking the hygiene status	X		X
Check the bacterial count of the circulating water and compare it with the permissible values (see manufacturer's operating instructions).	2W		X
Empty humidifier trays and clean with water (can also be done using an automatic hygiene system)	1W		
Check the inner surfaces for biofilm, clean and disinfect if necessary.	2W		X
Check for limescale deposits.	2W		X
If there are limescale deposits, add limescale remover (see manufacturer's instructions) to the circulating water and run the circulation pump until the limescale has dissolved. Then rinse the humidifier with fresh water and neutralise it, clean the suction basket.		X	
Clean the pump suction basket with fresh water.	X		
Check the float valve.	X		
Unscrew and clean/descale the humidifier nozzles.	X		
Clean and refill the siphon	X		
Clean and descale the drip separator, trays and flow rectifier	X		

(*) Explanation of abbreviations:
1W = weekly
2W = fortnightly
X = every three months, as with the other components
The water or cleaning agent used should have a neutral pH value (6 – 8). Only use agents approved by the manufacturer for descaling.

Maintenance of evaporative humidifiers	Periodic (*)	As required	Hygiene inspection
Check the hygiene status	X		X
Checking the bacterial count of the circulating water and comparing it with the permissible values (see manufacturer's operating instructions)	2W		X
Check the inner surfaces for biofilm, clean and disinfect if necessary.	2W		X
Check for limescale deposits	2W		X
Clean, descale and disinfect humidifier modules using a circulation process (for cleaning agents, see manufacturer's operating instructions)	X		
Replace humidifier cartridges if deposits are highly insoluble.		X	
Clean the holes in the distribution pipe.		X	
Check the desalination rate.	X		
Check whether the contact surface of the honeycomb humidifier is evenly wet on both sides.	X		
Clean the pump filter with fresh water	X		
Check the float valve.	X		
Check drainage behaviour, clean drain pipe if necessary; clean siphon and refill	X		
Check hose connections for leaks	X		
Clean and descale drip separators and trays	X		

(*) Explanation of abbreviations:
1W = weekly
2W = fortnightly
X = every three months, as with the other components
The water or cleaning agent used should have a neutral pH value (6 – 8). Only use agents approved by the manufacturer for descaling.

8.16 DiBe – Therm (directly fired registers)

General device description

The Rosenberg devices in the DiBe-Therm series are directly heated functional units that are operated with gas or oil fan burners.

The DiBe-Therm combustion chamber is made of chrome-alloyed, highly heat-resistant stainless steel. The shell-and-tube heat exchanger is made of stainless steel with flue gas swirlers. The combustion chamber/heat exchanger unit operates in a 3-pass system. The combustion chamber and heat exchanger are bolted together via a flange connection. This means that the entire unit can be easily dismantled into two parts. Installation in confined spaces, access routes and any replacement or partial renewal can therefore be carried out easily and quickly

.

For special applications of the units in the field of process engineering or directly heated supply air units, the heat exchanger is also supplied in high-quality stainless steel with a condensate drain connection.

The manufacturer's operating and maintenance instructions must be observed; in the event of discrepancies, these take precedence over the Rosenberg BWA instructions.

Safety instructions

The respective local building and fire safety regulations must always be observed.

The units...

- May only be operated by qualified personnel who have been instructed in the operation of the units.
- Must be installed and operated in such a way that employees are not endangered by radiant heat and no fires can occur.
- May only be installed and operated in rooms if they are supplied with sufficient air for combustion. If this cannot be ensured, a separate burner fresh air intake from the outside must be installed.
- May only be installed on non-combustible surfaces.

- May only be attached to load-bearing structures or ceilings made of non-combustible materials with sufficient load-bearing capacity. The attachment must be carried out using materials suitable for the building material.
- Must not be installed and operated in environments at risk of fire or explosion.
- Must be installed outside traffic zones, e.g. also away from cranes.
- Require a protective zone of one metre.
- Must not be exposed to direct water jets.
- Are not suitable for heating living spaces or similar areas.
- The intake protection grilles must always be kept free of dirt and loose objects.
- The burner chamber must be kept free of foreign objects.
- All electrical cables outside the devices must be protected from damage (e.g. by animals, etc.).
- During maintenance or repair work, the device must always be disconnected from the mains (remove the fuses or switch off the main switch on site). It is not sufficient to switch off the device using the operating switch!

Notes on installation

When installing the devices, the guidelines of the state building regulations and combustion regulations (FeuVo) of the respective federal states must always be observed. The regulations for the implementation of the Federal Immission Control Act (BImSchG) and the legal provisions issued thereafter must also be observed.

Only type-tested oil burners in WLE design or gas burners may be used. If the devices are delivered including oil or gas burners, the separate operating instructions supplied with the burner must be observed.

Particular attention must be paid to the official installation guidelines for air heaters, the generally applicable safety requirements for installation and operation in accordance with DIN 4794 Part 5, the fuel supply in accordance with DIN 4755 and DIN 4756, the TRGI of the DVGW (worksheet G 600), the VDE regulations, the accident prevention regulations and other safety-related regulations and guidelines.

DiBeTherm appliances are subject to approval and notification as fireplaces.

Choice of installation location

When determining the installation location, the requirements must be coordinated with regard to:

- fire protection and operational hazards,

- Function (e.g. room heating, free exhaust or duct system, negative or positive pressure in the installation room),
- Operational requirements (heat demand, nominal air flow rate, demand for recirculated or outside air, humidity, room temperature, air distribution, space requirements),
- Connection options to the chimney,
- Installation, repair and maintenance options,
- Sufficient combustion air supply.

Appliances with a rated heat output of up to 50 kW may generally be installed outside boiler rooms in compliance with the Fire Protection Regulations.

Appliances with a rated heat output of more than 50 kW must be installed in boiler rooms. This does not apply to appliances that, according to their intended use, must be installed in rooms other than boiler rooms or in commercial areas. The building regulations "Guidelines for the installation of fireplaces with a total rated heat output of more than 50 kW in rooms other than boiler rooms" must be observed. These guidelines prohibit the installation of fireplaces in areas where there is a risk of dangerous concentrations of hazardous substances according to the Working Materials Ordinance.

Installation

When installing the appliance, the safety instructions in this chapter (see above) must be observed. In addition, the appliances must be installed and mounted in such a way that they are easily accessible for repair and maintenance work. Appliances in rooms other than boiler rooms must be installed in such a way that they can be constantly monitored. The appliances must not be installed and operated in rooms and areas at risk of fire or explosion.

Combustion air intake

The appliances may only be installed and operated in rooms if they are supplied with sufficient air for combustion and the exhaust gases are discharged to the outside via exhaust flues.

A sufficient natural air supply for combustion is provided if, for example, the room volume in m^3 corresponds to at least 10 times the nominal heat load in kW of all heating appliances in operation in the room and a natural air exchange is ensured through windows and doors.

Good natural ventilation is ensured if, for example

a) the room volume in m^3 is at least 30 times the nominal heat output of all appliances in operation in the room and natural air exchange is ensured through windows and doors, or

b) there are non-closable openings for supply and exhaust air near the ceiling and floor, the size of which in m^2 corresponds to at least 0.003 times the nominal heat load in kW of all heating appliances in operation in the room.

The combustion air should be free of any pollutants. If production-related pollutants (e.g. chlorides, CKW, FCKW, etc.) occur that could reach the installation site of the DiBe-Therm, the combustion air for the burner must be drawn in from outside and a burner cover (device accessory) must be used.

A sufficient supply of combustion air is ensured when drawing air from:

- The installation room, if it meets the building regulations for the ratio of room volume to total nominal heat output (4 m^3/kW).
- The installation room, if this is heated by the appliance in outside air or mixed air mode with a guaranteed outside air rate; a specific room-to-power ratio does not need to be maintained in this case.
- The installation room, if it has openings to the outside that cannot be closed, in accordance with building regulations for boiler rooms.
- Outdoors, through a continuous pipe of sufficient cross-section connected to the burner or its casing; this must be adapted to the available suction capacity of the burner and the pipe resistances (including the suction protection grille) so that proper combustion is ensured.

Discharge of combustion gases

The appliances must generally be connected to their own chimneys. The chimneys must be designed in accordance with DIN 18160 Part 1, and the chimney dimensions must comply with DIN 4705 Part 1 or Part 2. To ensure that the fireplace functions properly, they should be erected close to the ridge and extend at least 0.5 m above it. If back pressure is to be expected, e.g. due to downdrafts or neighbouring buildings, this must be taken into account when designing the chimney head.

The flue gas connection must always be made to approved chimneys.

The chimneys can be brick or metal.

DIN 1298 applies to the flue pipe connectors between the appliance and the chimney. The length of the connectors should not exceed 2 m.

Fuel supply

The fuel supply must be installed in accordance with DIN 4755 for oil-fired WLE, DIN 4756 or DVGW worksheet G 600 for gas-fired WLE and TRF for liquid gas.

Installation – burner installation

The warm air generator may only be operated with oil fan burners in accordance with DIN 4787 or gas fan burners in accordance with DIN 4788 using natural gas or liquid gas. The burner must be equipped with an automatic ignition device approved for warm air generators in accordance with DIN 4794 Sheet 2.
The burner supplied by the factory (optional) is mounted on the front of the unit with four flange screws. The operating instructions supplied for the burner must be observed in all cases! For burners from

other manufacturers, installation must be carried out in accordance with the instructions of the respective manufacturer. The combustion chamber must not be overloaded or underloaded.

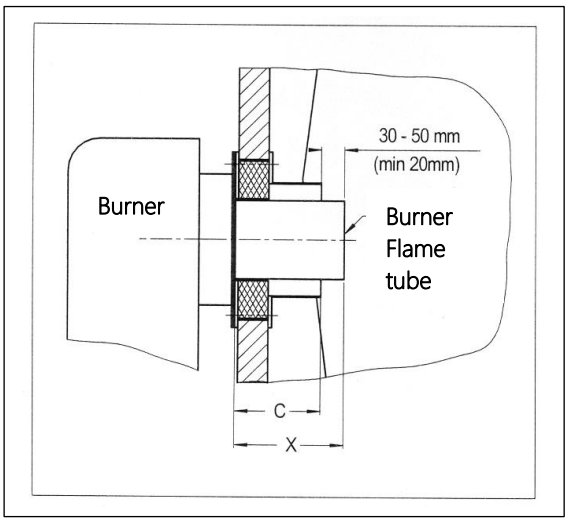
Do not allow the exhaust gas temperature to fall below 160 Kelvin above room temperature (condensation formation). To prevent condensation, two-stage burners may only be operated in the partial load range during the start-up process.

The fuel flow rate must correspond to the heat output specified in the order.

Adjust the burner so that an even combustion chamber load is achieved. **The flame tips must not hit the rear wall!** Recommended nozzle angle for oil burners: 60 degrees!

The length of the flame tube "X" must at least reach the dimensions "C" in the table below. It is recommended that the flame tube protrudes 30 to 50 mm into the combustion chamber. If necessary, a flame tube extension must be used.

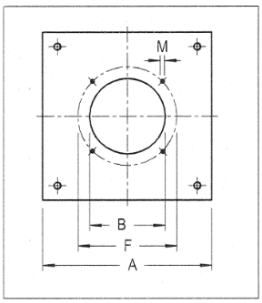
Device type	DiBe-Therm 25 – 105	DiBe-Therm 130 – 3400	DiBe-Therm 430 – 660
C = minimum	130	150	210



Burner plate

The holes for securing the burner are located in the centre of the burner plate and are pre-drilled in accordance with the table below. Other dimensions for diameters B and F are possible if specified separately

Dimension in mm C = minimum	Device type DiBe-Therm 25 – 105	DiBe-Therm 130 – 340	DiBe-Therm 430 – 660
A	250	290	330
B ∅	130	130	160
F ∅	150 + 170	150 + 170	226
M	M8	M8	M10



Electrical connection of burners

ROSENBERG DiBe-Therm devices are designed so that any tested burner brand can normally be used. The electrical connection for factory-supplied burners for 230 V alternating current is made via a 7-pin quick-mount plug connection attached to the device. Hard wiring is required for burner versions rated at 400 V or higher.

If oil or gas burners are supplied on site, the 7-pin connection plug supplied with each burner must be installed at 230 V and 400 V in accordance with the enclosed circuit diagram.

If the burner is provided on site, please specify whether it is equipped with a 230 V AC or 400 V three-phase motor and send a valid circuit diagram so that the terminal designation can be transferred to the device circuit diagram.

Fuel oil connection

A sufficient fuel supply must be ensured.

The heating oil supply must be installed by authorised specialist personnel in accordance with DIN 4755 for oil-fired warm air generators.

Particular attention must be paid to ensuring that the pipe cross-section is designed for the total pipe resistance, the suction height and increased viscosity at lower temperatures. If necessary, an oil delivery unit must be used! The suction pipe must always be fitted with a foot valve in the tank base.

ATTENTION: Even at low outside temperatures, a sufficient quantity of flowable heating oil must be available. Paraffin formation can begin at temperatures as low as 5 °C. Appropriate measures must be taken to prevent this.

Gas connection

In accordance with the appliance output, the required gas quantity and gas pressure must be available at all times during appliance operation.

The gas connection must be installed by authorised specialist personnel in accordance with DIN 4756 or DVGW worksheet G 600 for gas-fired warm air generators and the TR for liquid gas.

Gas pressure regulators, shut-off valves and thermal shut-off devices (TAS) must always be provided by the customer.

The pipe cross-section must be designed according to the appliance connection value, the total pipe resistance and the gas inlet pressure. Before initial commissioning, the gas supply pipe must be thoroughly cleaned and checked for leaks in accordance with the standard.

Triple combination regulator in accordance with DIN 3440.

The device has 3 functions:

TR - Fan regulator
Controls the switching on and off of the recirculation fan

TW - Temperature monitor for the burner
Controls the switching on and off of the forced-air burner

STB - Safety temperature limiter
takes over the control function of the temperature monitor

Fan controller (TR)

The switching point is set via the "fan control lever" (setpoint approx. 45 °C).

Temperature monitor for the burner (TW)

The switching point is set using the "burner adjustment lever" (setpoint approx. 75 °C).

Safety temperature limiter (STB)

The switching point is fixed in accordance with DIN 3440. A restart lock prevents the burner from restarting after it has been triggered.

Before resetting, the operating conditions of the device must be checked to prevent the STB temperature from being exceeded again.

CAUTION: The safety devices must not be bypassed or blocked during device operation!

Flue gas ducting / chimneys

The devices must generally be connected to chimneys.

Each fireplace must have its own chimney.

The installation of chimneys is subject to approval in all cases and must be agreed in advance with the responsible district chimney sweep. The following are particularly important for the planning and installation of chimneys:

- The respective combustion plant regulations (FeuVo),
- the respective state building regulations,
- DIN 18160 Part 1, Domestic Chimneys,
- DIN 4705 Parts 1 and 2, Chimney dimensions,
- DIN 1056, solid chimneys,
- Technical rules for gas installations DVGW-TRGI 1986.

The chimney dimensions must be adapted to the appliance output. The effective chimney height must be at least 4 m.

The appliance connection must be sealed and secured against accidental loosening (rivet or screw). Preferably, the horizontal flue gas duct should be as short as possible (slope 2% equal to 2 cm per metre).

The double-walled stainless steel chimney systems are approved by the Institute for Building Technology in accordance with DIN 18160 Part 1. Sheet steel chimneys for reduced requirements must be approved by way of an exemption (building application). No type testing is required in this case, but consultation with the responsible district chimney sweep is necessary.

The chimney must be installed and assembled professionally in accordance with the applicable regulations.

Commissioning

Observe the safety instructions in Chapter 1 and the general commissioning instructions in Chapter 6!

According to DIN 4794 Sheet 5, the initial commissioning of a combustion chamber or the associated system must be carried out by the manufacturer or another expert designated by the manufacturer.

Only oil or gas burners may be installed. The burner must be installed in accordance with the manufacturer's instructions. The burner is then connected to the oil or gas line. The manufacturer's operating instructions must be followed precisely when making the connection.

Install and wire sensors and thermostats, if not already done at the factory.

Complete the electrical connection of the device, observing chapters 5.3 (Electrical installation) and 8.11 (Electrical accessories).

ATTENTION: The direct-fired register must be equipped with its own emergency switch!
→ Heating EMERGENCY STOP

Connection to the chimney: The connection of the direct-fired register to the chimney must comply with structural and official regulations.

Initial commissioning

- Vent the oil or gas line,
- Check the housing for damage, tighten any loose connections,
- Check the settings of the triple thermostat:
  - Burner: approx. 75 °C
  - Fan: approx. 45 °C
  - Position of the sensor approx. 10 cm in the direction of air flow after the combustion chamber,
- Single thermostats must be set to 60 °C.
- Start up the fan (see section 8.2),
- Start up the burner. Follow the manufacturer's instructions. The fan must always be running when the burner is in operation. The fuel supply must be adjusted so that the nominal output of the DiBe-Therm register is not exceeded. A gas meter must be used for gas burners. The flame must not touch the walls of the combustion chamber.

Tests during initial commissioning

1. Triple thermostat:

- Set the rocker switch to "Auto",
- Set the room thermostat higher than the room temperature,
- Start the burner,
- Heat up the combustion chamber,
- At 40 °C (= fan setting value), the fan must switch on,
- At 70 °C (= burner setting value), the burner must switch off. This condition may need to be brought about by temporarily throttling the air flow.
- Once the setpoints mentioned above have been exceeded, the burner must switch on again and then the fan must switch off again.
- Heat up the burner chamber again without fan operation. The burner must switch off at 100 °C and the combination controller must lock. If this does not happen, stop the system with the EMERGENCY STOP, replace the thermostat and repeat the test.

2. Simple thermostat (if available):

Test in the same way as for the triple thermostat. However, in this case, the second burner stage must be switched on or off at
60 °C (= burner setting value).

3. The room temperature must be set to the setpoint.

4. Determination of the exhaust gas value. Observe DIN 4794 and the latest version of the BimSchV. All set values must be recorded and retained.

Additional commissioning work for DiBeTherm with bypass:

1. Check the bypass damper (see section 8.1).
2. Check the room/duct sensor:

- Set the sensor setpoint to the minimum value (simulation of a high actual value):
  The bypass damper must open and the burner damper must close.
- Set the sensor setpoint to the maximum value (simulation of a low actual value):
  The bypass damper must close and the burner damper must open. If necessary, check the direction of rotation of the servomotor.

Operation

The DiBe-Therm register is controlled fully automatically via the device's control system.

The control system must be programmed so that the fan starts up first, followed by the DiBe-Therm register.

The system may only be switched off via the control system. For manual shutdown, a fan run-on time of approx. 5 minutes must be ensured.

During operation, the function of the register must be monitored regularly by visually inspecting the combustion system and safety device.

If the STB is triggered, the system must be kept out of operation until it has cooled down completely. Before manually unlocking the STB, the system must be checked for faults or defects.

If the STB is triggered repeatedly, a thorough inspection of the system by qualified personnel is necessary and must be documented.

Maintenance and cleaning

The housing in which the DiBe-Therm register is installed requires maintenance and cleaning in accordance with Section 7.3. Any bypass dampers must be maintained in accordance with Section 8.1.

Maintenance	Periodic (*)	As required	Hygiene inspection
Combustion chamber Remove burner, check combustion chamber for contamination and damage using a strong light source	X		X
If damage is found, the manufacturer must be informed immediately. The combustion chamber must not be put into operation until the damage has been repaired.	X		X
After cleaning the secondary heating surfaces, clean the combustion chamber.	X		X
Secondary heating surface Remove the inspection panel and cleaning cover of the combustion	X		

chamber. Remove the installed swirlers and check them for damage. If there is severe corrosion, replace the affected ones with new ones.			
Clean all pipes of the secondary heating surfaces and all swirlers with a suitable steel brush.		X	
Burner Once the combustion chamber has been cleaned, carry out burner maintenance in accordance with the manufacturer's documentation.	X		
Check exhaust gas in accordance with BimSchV.	X		
All work and measured values must be documented.	X		

(*) Maintenance intervals:

- Operation 8 to 12 hours daily:
  - at least once a year
- Operation 12 to 18 hours daily:
  - at least twice a year
- Continuous operation:
  - at least 3 times a year

8.17 Special instructions for using a crane for fan motors

Danger to life! Persons are prohibited from standing under suspended loads!

Before starting up the crane, check that all screws on the extension rail are tight!

Item A Ceiling mounting
Item B Securing end stop
Item C Securing the running rail
Item D Fastening end stop

If the running rail causes noise due to vibration during fan operation, it is possible to secure the rail additionally at each ceiling sleeve with an M10 screw.

The fastenings, stops and construction must not be modified!

The system may only be operated, maintained and repaired by qualified and authorised personnel.

Maximum permissible weights must not be exceeded.

Only undamaged and approved slings and lifting gear may be used, see also:
Machinery Directive 2006/42/EC,
EN 1492-1, EN 1492-2, BetrSichV, DGUV

Operation

Loosen the lateral locking screws (item C) on the ceiling sleeves and pull the rail out of the device as far as it will go.

Then retighten the securing screws.

Never shake attached loads! It is prohibited to tear off or pull loads at an angle!

Transporting persons is prohibited!

Loads must be lifted and lowered slowly.

It is prohibited to remain in the travel area of the running rail, especially when a load is attached, as there is a risk of entrapment!

Observe the provisions of UVV BGR 500 for load-bearing equipment for the form-fitting and force-fitting attachment of loads!

After using the crane, the trolley can be removed. To do this, the end stop (item D) and the additional safety device (item C) on the door side must be dismantled and reinstalled after removing the trolley.

Reason:
To prevent noise caused by a loose trolley during operation of the ventilation unit (vibrations).

After using the fan motor crane, insert the rail and tighten the locking screws (item C).

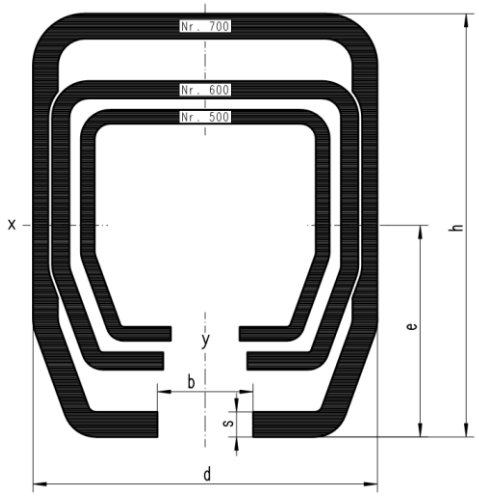
Maintenance and cleaning

The running rail, rollers and fastenings should be cleaned regularly to prevent corrosion damage and functional impairments.

The rollers and swivel joint should be kept running smoothly by applying low-viscosity maintenance oil.

Maximum permissible loads

The maximum permissible loads are indicated on the crane or the running rail.



System	d mm	h mm	b mm	s mm	Max. load capacity
No. 500	65	60	18	3.6	175 kg
No. 600	80	75	22	4.5	350 kg
No. 700	90	110	25	6.5	500 kg

The load capacities in the table correspond to the standard design. Higher load capacities are only possible in consultation with the technical department and with reinforcement measures to the construction. Higher load capacities must be approved for the specific order!

9 Special notes on weatherproof units

The general information in Chapter 5, "General installation instructions", applies. In addition, air conditioning units that are installed outdoors, e.g. on flat roofs, require some installation work on site to protect the air conditioning units from the effects of the weather.

Air conditioning units must not/cannot take over the protective function of a roof!

9.1 Special notes on transporting the modules

Welded base frames offer the option of using welded square tubes (100 x 60 mm) for transport. Folded sheet metal base frames are provided with holes (50 mm) for inserting round profile tubes.

Please also refer to Chapter 4 for transport information.

9.2 Special notes on installing the modules

9.2.1 Base frames

Base frame

The modules are installed on the base/base frame provided for the air conditioning unit and aligned and connected in accordance with Chapter 5. Depending on the delivery condition of the base frame, various work may still be required on site (see below).

Pre-assembled sheet metal base frame

In this case, the modules of the air conditioning unit must be installed, aligned and connected on the pre-assembled base frame supplied in advance. The base frame must then be screwed to the air conditioning unit in accordance with the diagram "Assembly of sheet metal base frame with module".

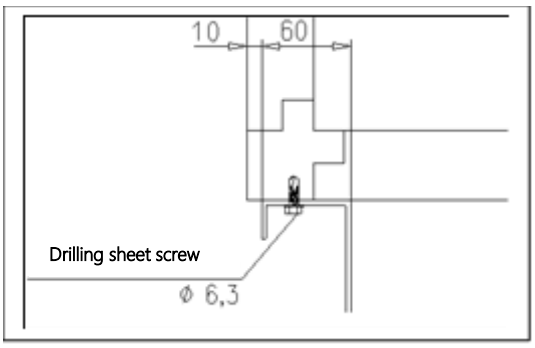
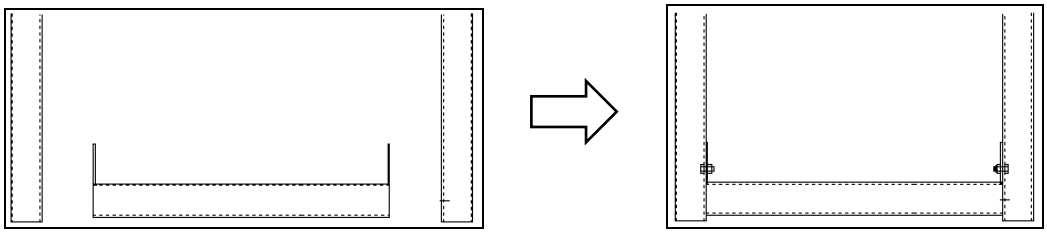


Figure: Diagram for mounting sheet metal base frame with module

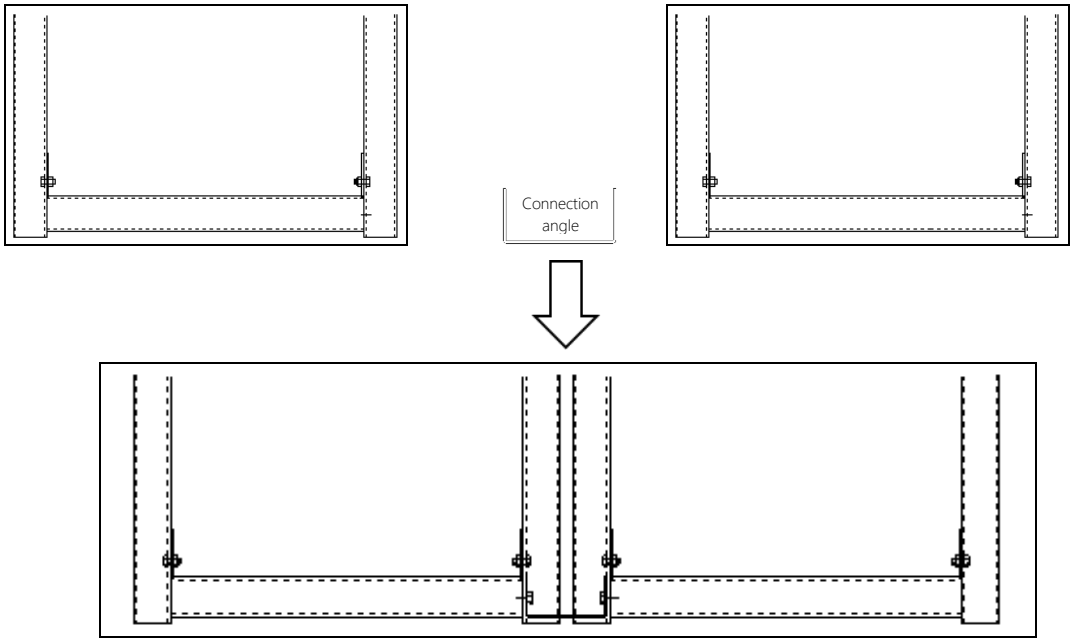
Sheet metal base frame delivered in disassembled form

In this case, the base frame must first be assembled. The modules of the air conditioning unit can then be placed on it, aligned and connected.

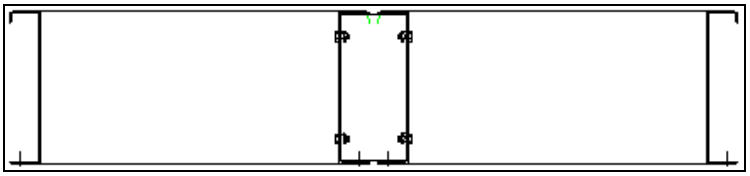
The following sketch shows the assembly of the base frame parts in a top view:



For units installed side by side, the two fully assembled base frames must be connected as follows:

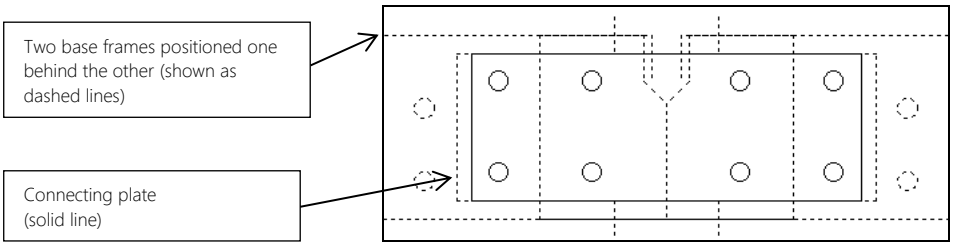


Top view



View from front

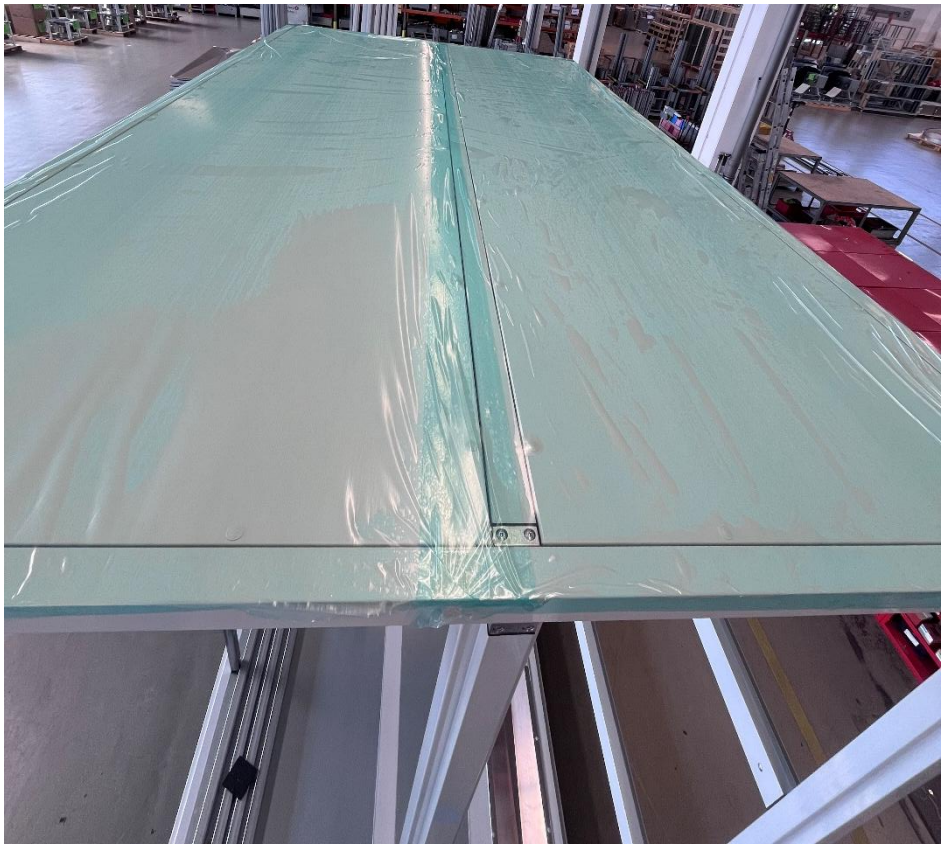
Connecting base frames arranged one behind the other in the direction of air flow by mounting a connecting plate on the side (side view):



9.2.2 Protective film

The modules of the ventilation unit are delivered without pre-mounted rain covers. The rain cover must be installed on site after the unit has been set up. Further information on installing the rain cover can be found in section 9.5.

To protect the modules from the weather until the roof is erected, they are delivered from the factory with a film applied to the cover.



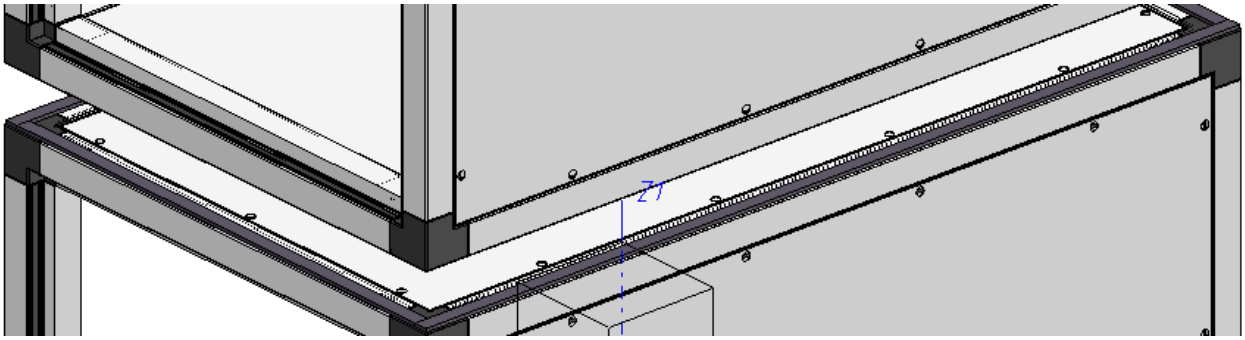
CAUTION: The film on the cover must not be removed until shortly before installing the rain cover to prevent water etc. from entering the unit!

9.3 Sealing modules mounted on top of each other

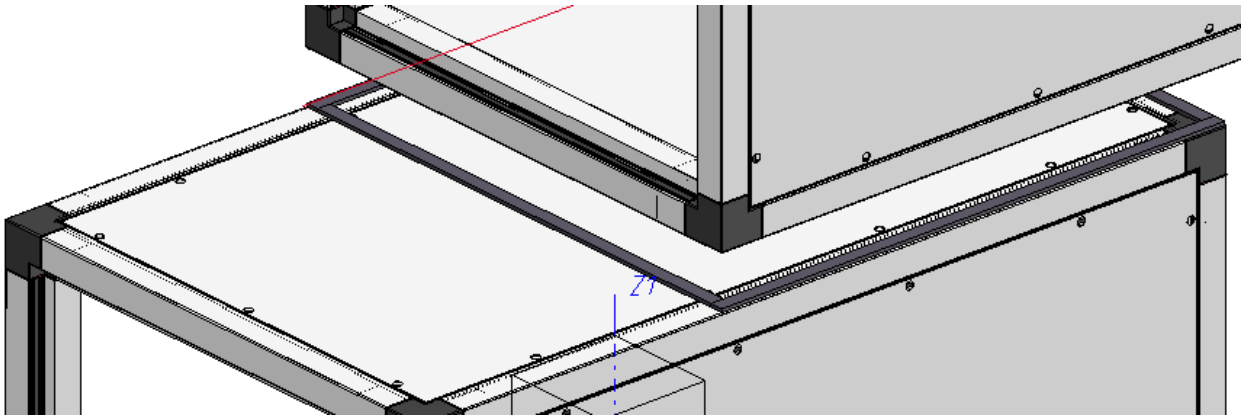
On weatherproof devices with modules mounted on top of or next to each other, additional sealing of these modules is necessary to prevent water from entering between the modules via capillary action.

ATTENTION: Sealing is also necessary opposite an existing intermediate base frame. Otherwise, there is a risk of water entering the device.

To do this, stick 5x20 mm sealing tape around the lower modules on the upper housing profiles. Align the tape with the outer edge of the modules.
For devices/modules next to each other, use the same procedure, sticking the sealing tape to the side of the contact surfaces of the modules, aligned with the outer edge.



If a module is shorter, the position of the sealing tape for sticking on the shorter module must be determined and applied. The sealing tape must seal the modules around the contact surfaces.



The modules are connected using 80x60mm rectangular plates, see chapter 5.2.

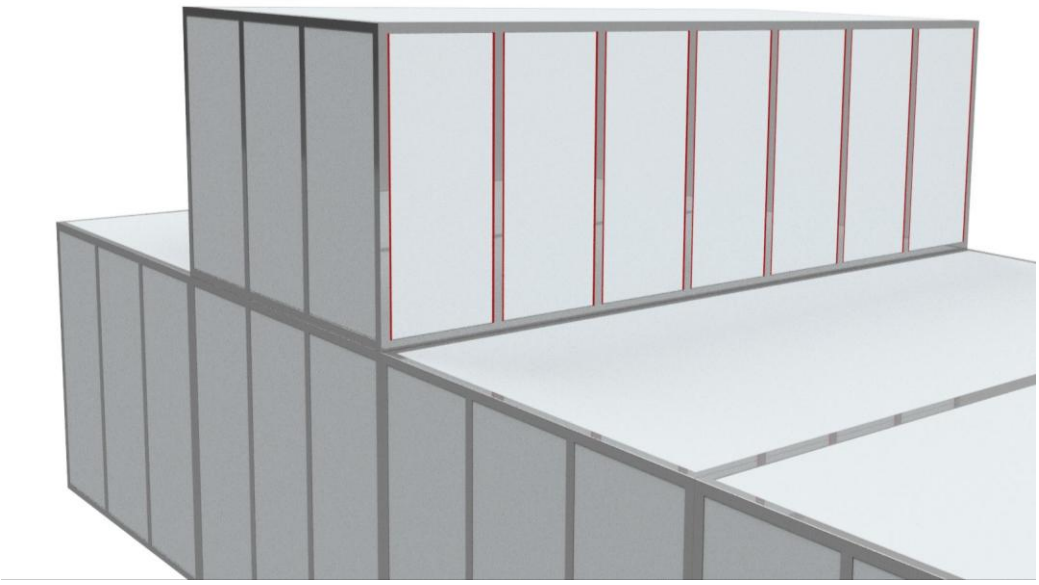
Any openings that could allow water to penetrate between the modules must be sealed on site!

9.4 Additional sealing measures for protruding rotary heat exchanger modules

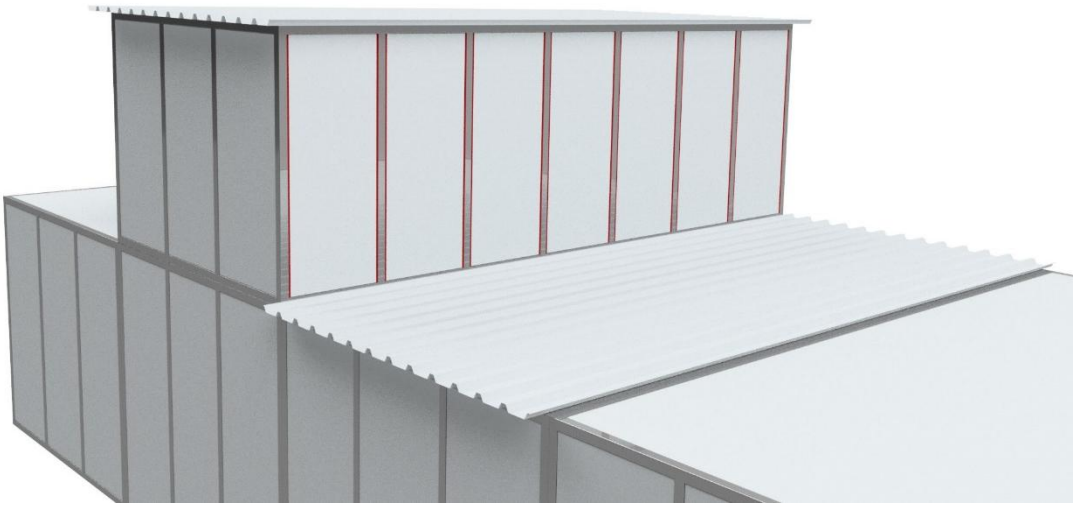
In the case of protruding rotors, as can occur with units installed side by side, these must be additionally sealed from the outside using a suitable duct sealant to prevent water from entering the unit.

Procedure:

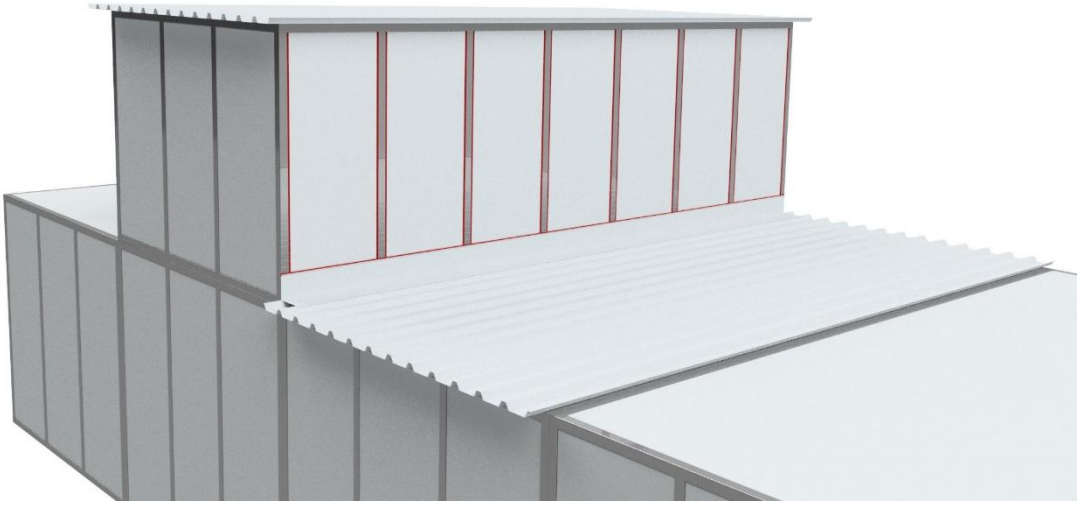
1. Seal vertical joints between panels and frame profiles with duct sealant.



2. Install the rain cover (see following chapter).



3. Install the wall connection plate and seal the horizontal connection of the wall connection plate with duct sealant.



9.5 Installation of the rain canopy

9.5.1 Standard canopy

First, any crane eyes must be removed and the holes sealed with plugs.

Next, attach an EPDM strip (20 x 20 mm or 20 x 30 mm) to the air conditioning unit in the middle along the long side from front to back (item 1 in the diagram below). This will create a slight curve from the middle to the outside when the roof is installed later.
Then the roof parts are aligned on the unit with a 100 mm overhang all around and screwed directly onto the profile with sealing screws (item 2). The positions of the screws are predefined by centre points so that the rain cover is screwed into the housing frame. Finally, the joints on the front and top of the rain cover are taped with aluminium-laminated butyl tape and covered with a stainless steel strip, which is fastened with screws or rivets (item 3).

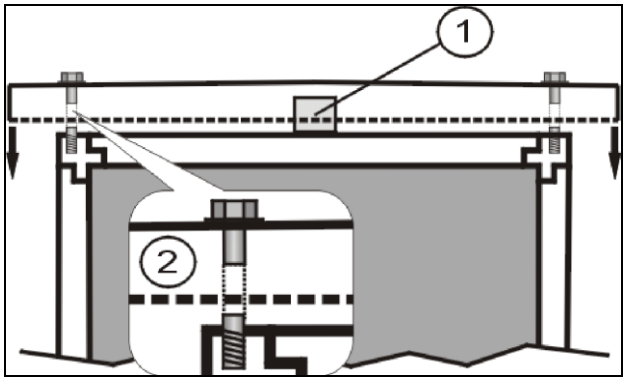


Illustration: Sketch for roof mounting View from front

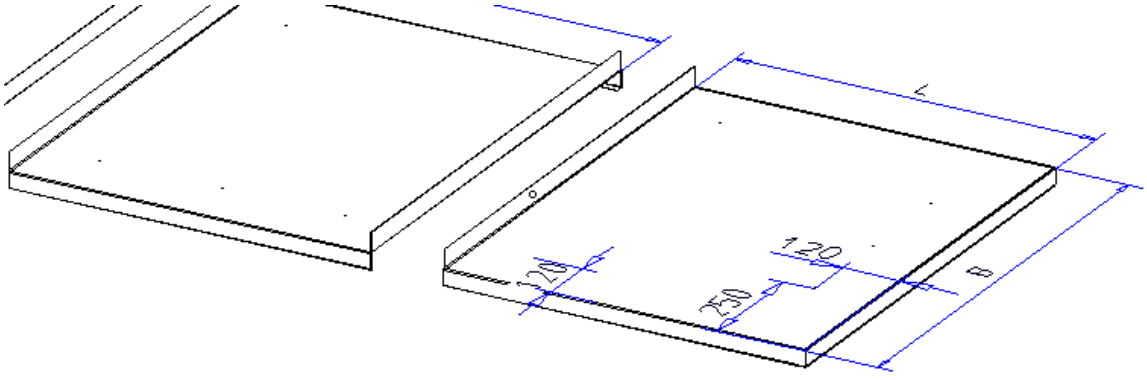


Illustration: Position of centre points for screwing the roof to the device

3 Stainless steel cover strip
(riveted or screwed at the ends, approx. 30-50 mm from the outside, rivet 4x12)

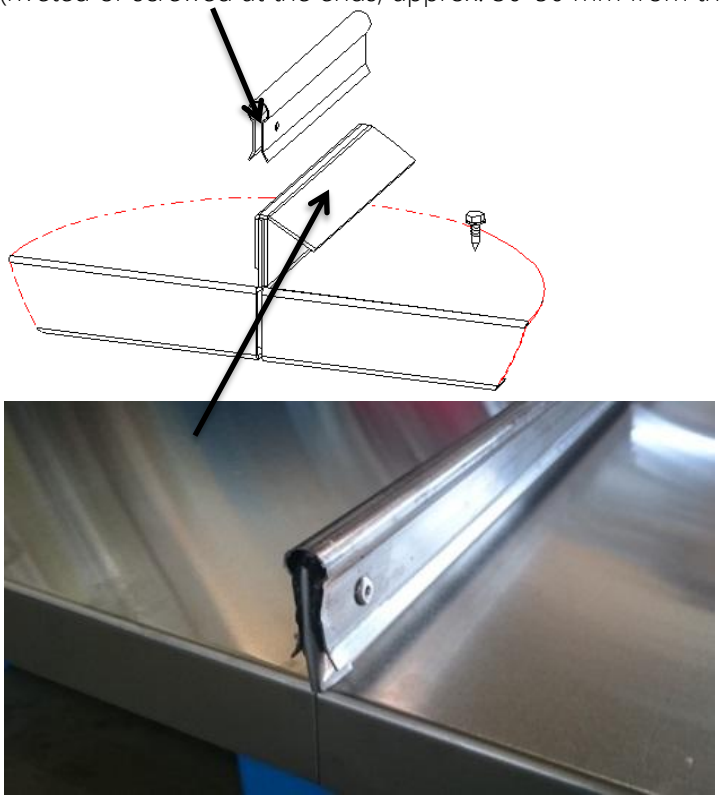
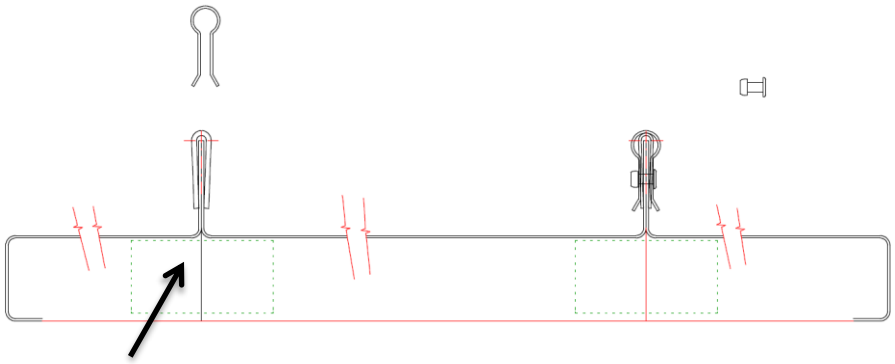
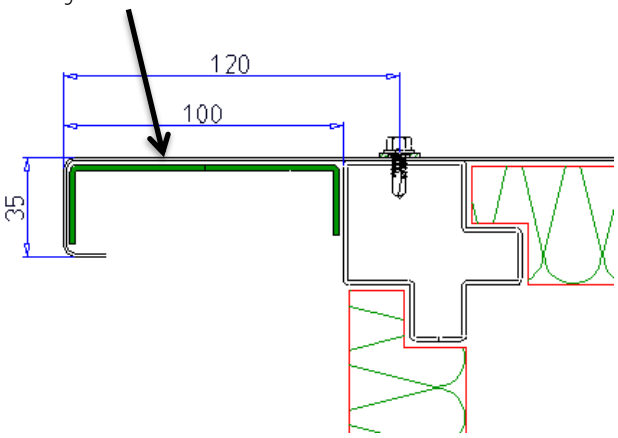


Figure: Aluminium-laminated butyl tape



The upstands of the roof elements must be covered with aluminium butyl tape and covered with the stainless steel strip, which is fastened with screws or rivets.

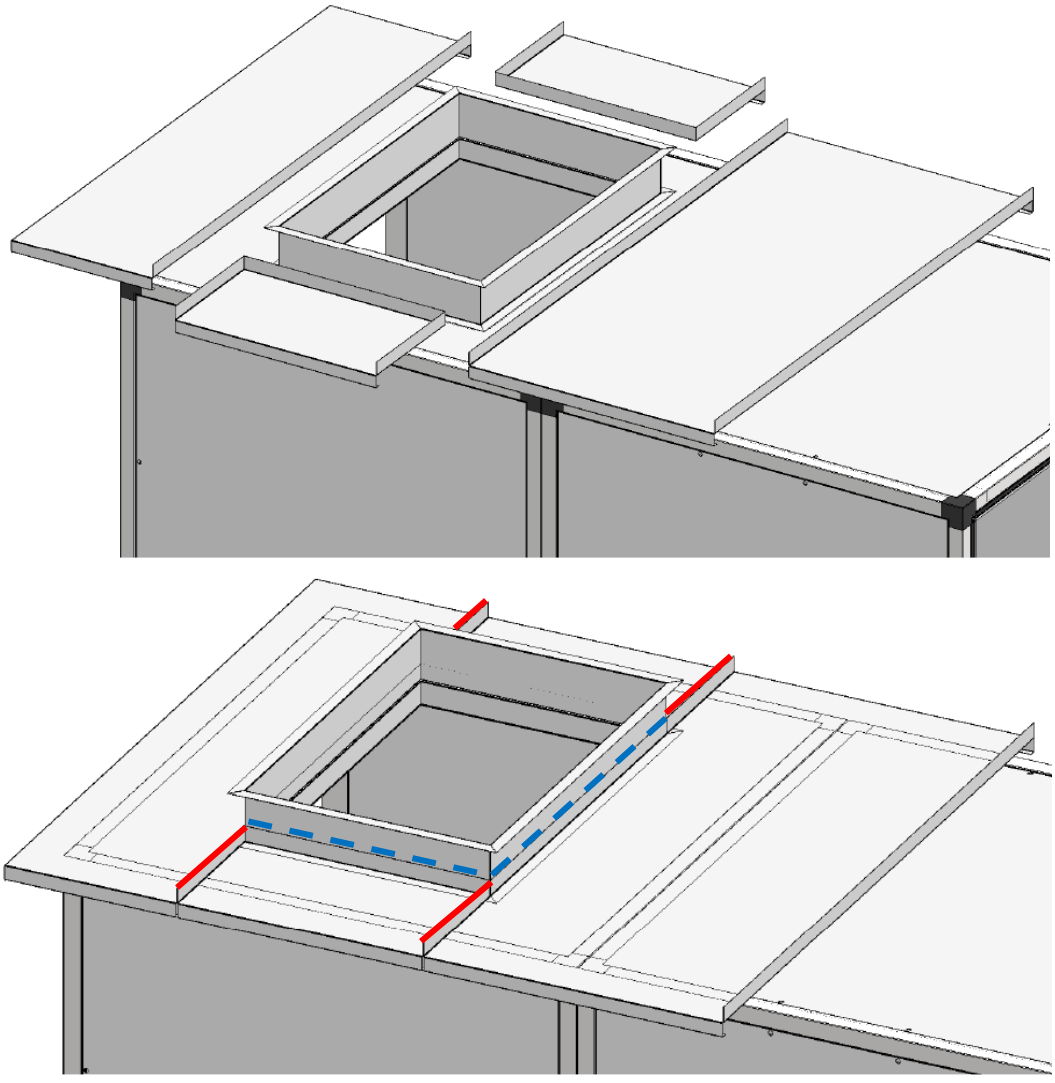
The joints are sealed from below with aluminium butyl tape.



9.5.2 Rain canopy on vertical channel connections

The parts of the rain canopy must be placed against the channel connection on all sides, screwed tight and the transition sealed with butyl tape.

The upstands of the roof elements must be covered with aluminium butyl tape and covered with the stainless steel strip, which is fastened with screws or rivets (see standard roof)!



Butyl tape
Cover profile

9.5.3 Trapezoidal roof

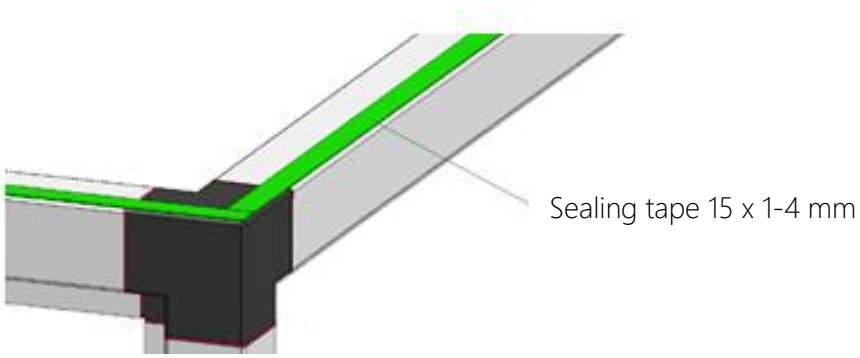
Note: Separate assembly instructions from the manufacturer are included with each trapezoidal roof, as there are various options available, the implementation of which is described therein.

The trapezoidal roof is a special version of the rain roof. The following parts are required for assembly; deviations in accessories are possible, please refer to the enclosed assembly instructions:

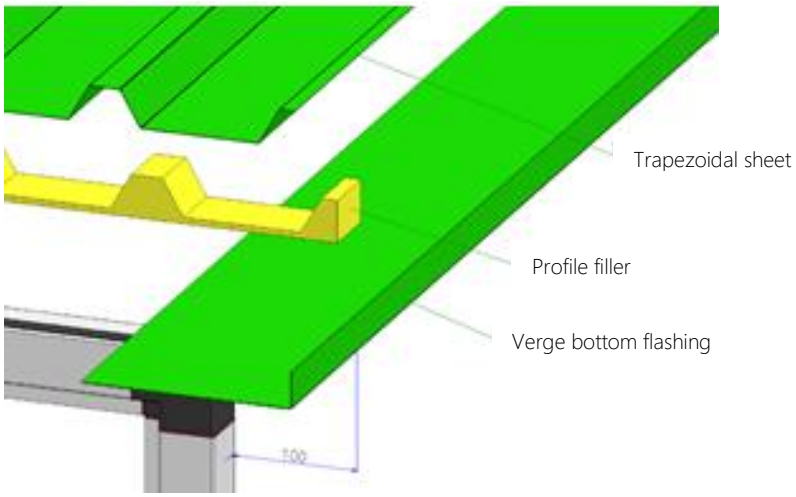
- Trapezoidal sheets, verge sheets, verge underlay sheets
- Angle profiles for systems with height offset
- Profile filler, Blocoband 0.2 x 15 mm, putty cord (white butyl) or butyl sealing tape
- Moulded screws 4.8 x 20 S14 RAL 7035, drill screws 5.5 x 22 mm

During installation, the following steps must be carried out in sequence:

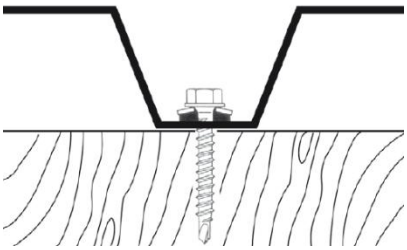
1. Place the Blocoband (sealing tape) under the verge flashing on the housing profile.



2. Mount the verge flashing with a 100 mm overlap on the front sides of the unit. The trapezoidal sheet metal panels are laid on top of the verge flashing. The trapezoidal sheets are centred in the housing depth (overlap approx. 100 mm). Place the profile filler between the housing frame profile and the trapezoidal sheet metal.



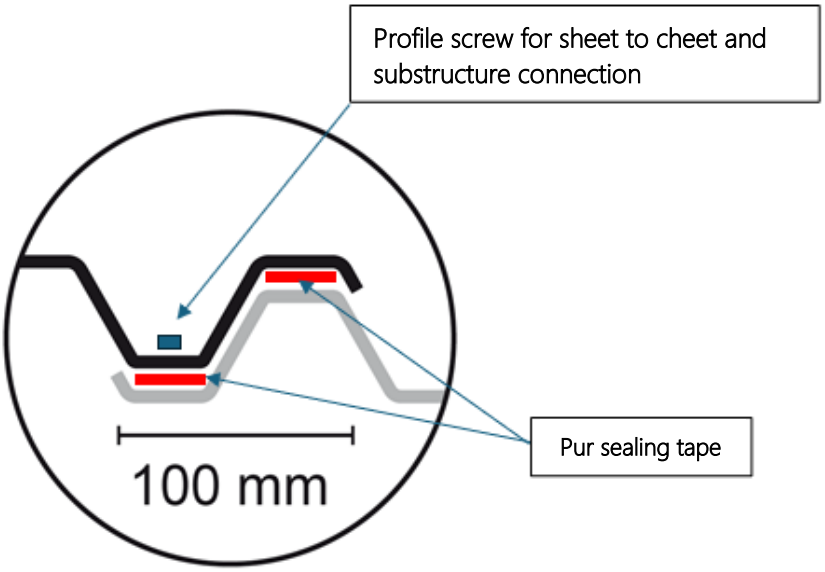
3. Connect the trapezoidal sheets to each other using moulded screws, taking care to observe the existing trapezoidal profile (see below)!



Circumferential screw connection/normal screw connection

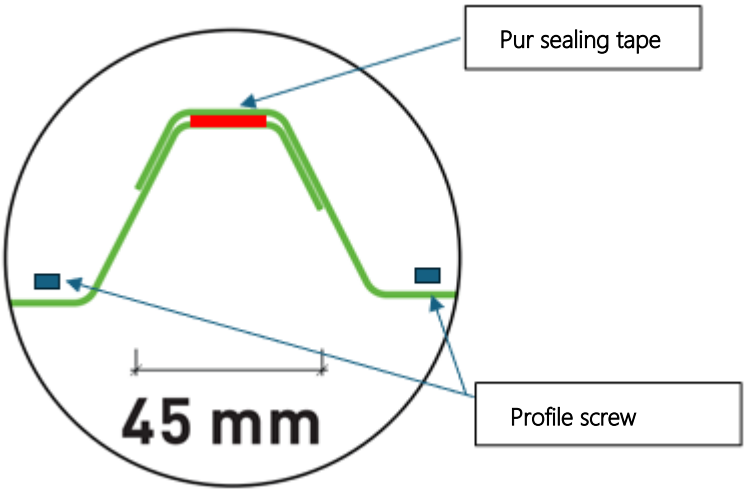
Trapezoidal profile 40-100:

Place two sealing cords (butyl, white/sealing tape) between the overlapping trapezoidal sheets (100 mm overlap) (one bead at the top, one bead at the bottom).



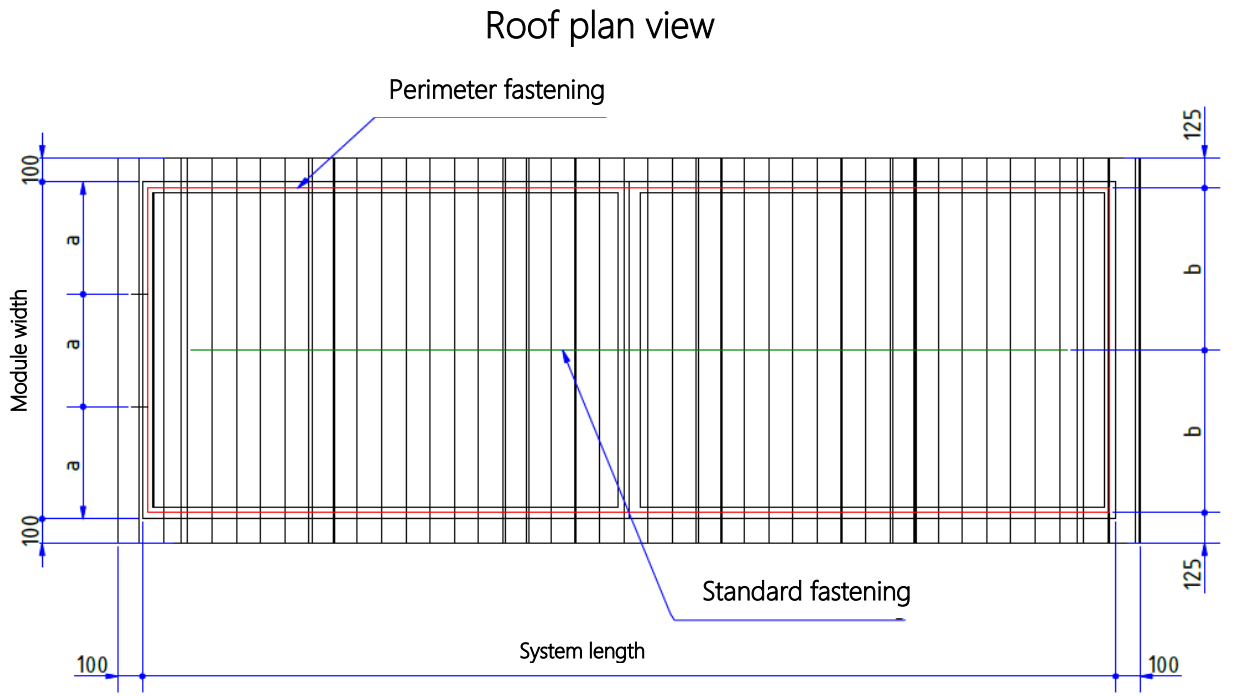
Trapezoidal profile 45-150:

Place a butyl sealing tape between the overlapping (100 mm overlap) trapezoidal sheets (corrugation at the top).



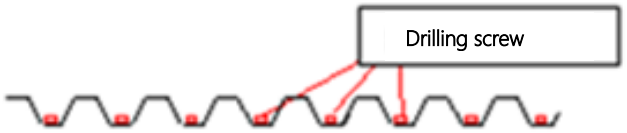
4. Screw the trapezoidal sheets to the housing frame profile all the way around using self-tapping screws (each lower bead).

Screw connection example:

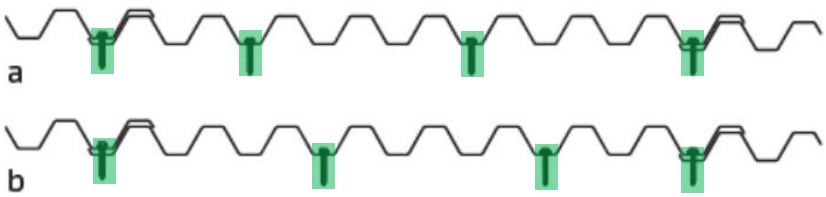


a: max. 600 (Perimeter fastening)
b: max. 1000 (Normal fastening)

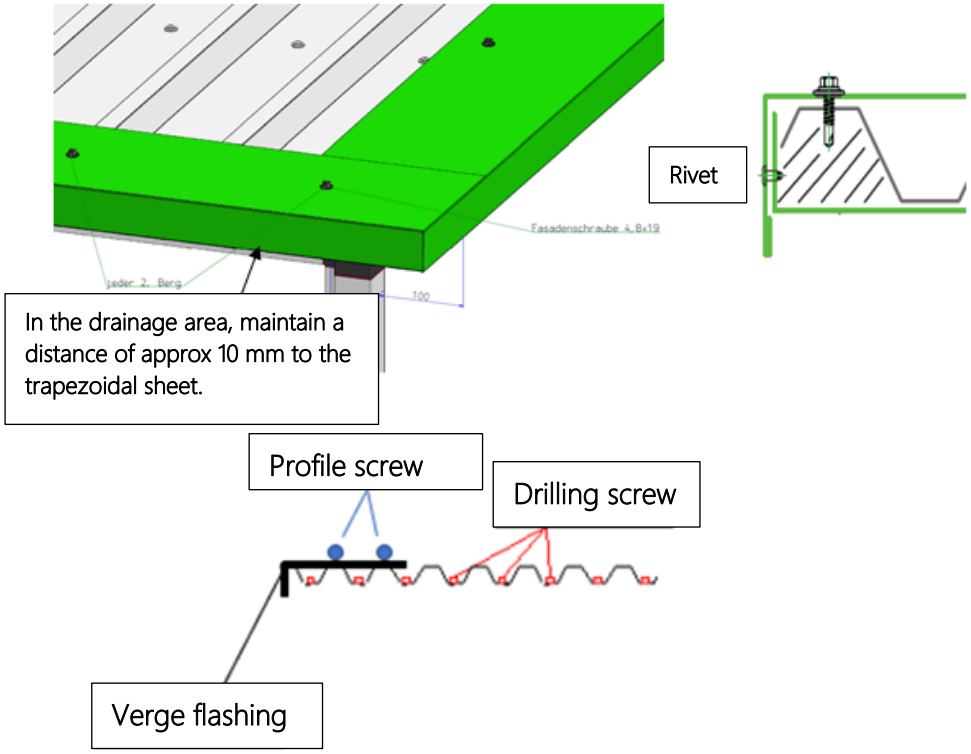
Circumferential screw connection (red, see top view of roof)



Normal screw connection (green, see roof plan view)

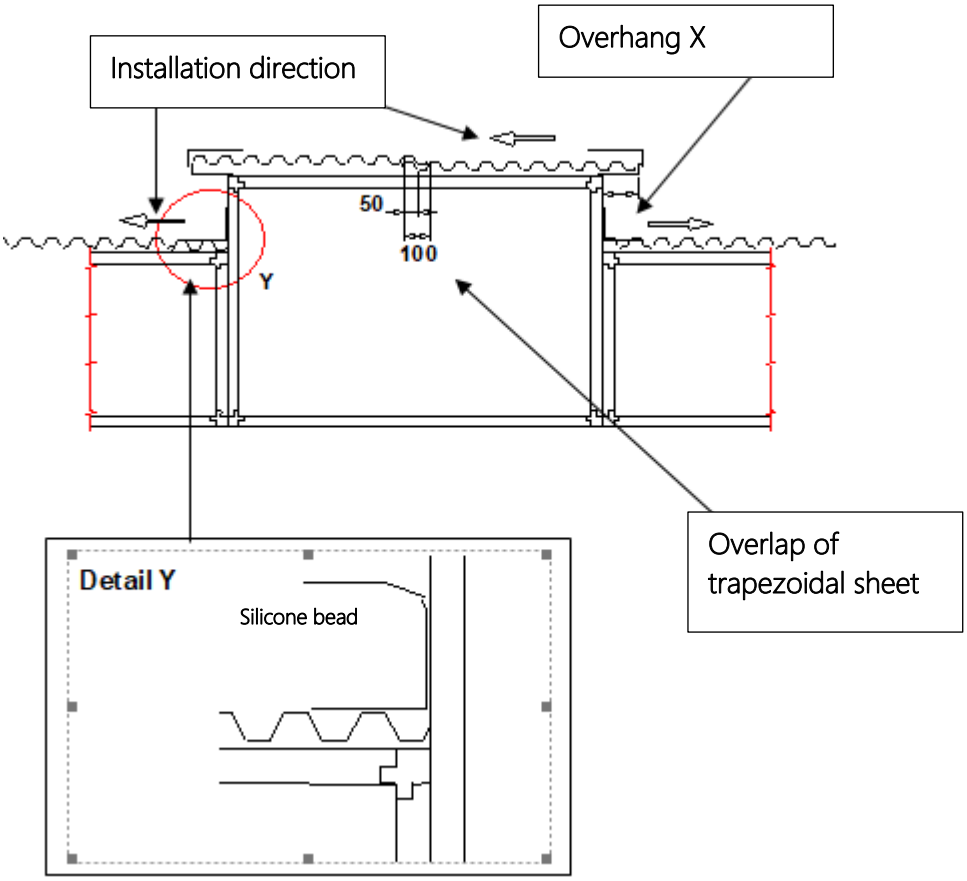


5. Screw the verge sheets to the upper bead of the trapezoidal sheet metal using moulded screws and rivet them to the front side of the verge bottom sheet metal.



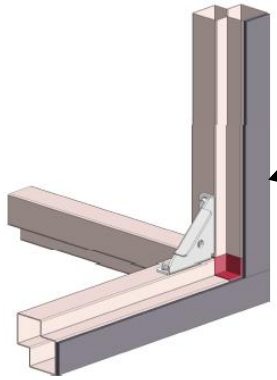
Note: Mechanical adjustments (cuts) to the rain canopy on site may only be made with a sheet metal nibbler, as otherwise corrosion will occur on the cut edges.

Devices with height offset:



10 Special notes on hygienic design appliances

S60 series



1. Before setting up and pulling or pushing the modules together, apply PE sealing tape (40x5mm) to one side of all joints. Align the sealing tape with the inner edge (self-adhesive on one side).

2. The modules must be brought flush with each other and aligned. Lateral and height offset is not permitted and must be avoided; if necessary, use spacer plates.

Devices in the S60 series are equipped with corner brackets as standard.

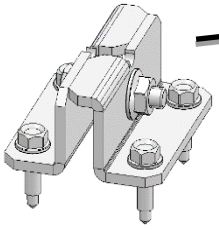
Depending on the housing size, two types of corner brackets can be fitted:

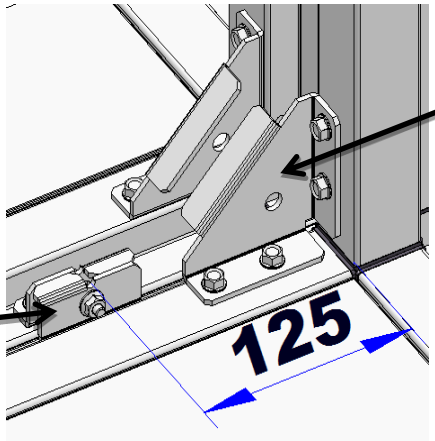
- Leg length approx. 80x80 mm (type 1)
- Leg length approx. 150x150 mm (type 2)

These serve to ensure the stability of the modules during transport and installation. Before screwing the modules together, they must be joined tightly, pressing the sealing tape. With the help of the corner brackets, the modules can be fixed in place until the module connectors are finally installed.

3. The module connectors must be installed starting from the corners at a distance of 125 mm for corner brackets type 1 and 175 mm for corner brackets type 2, both in height and depth. All others are distributed evenly (see table).

Module connectors Fastened with 4.8x19 mm self-drilling screws, Torx drive; connected with M6x25 screws with toothed washers or locking screws & locking nuts





Corner brackets, fitted to stabilise the modules (must be removed later).

Size	Number in Height	Number in depth	Size	Number in Height	Number in depth
0704, 0707, 0710, 1007, 1010	2	2	2020, 2220, 2222, 2522, 2525	4	4
1307, 1310, 1610	2	3	2825	4	5
1313, 1316, 1613, 1616	3	3	28	5	5
2010	2	4	3228, 3528	5	6
2016, 2013, 2213, 2216	3	4			

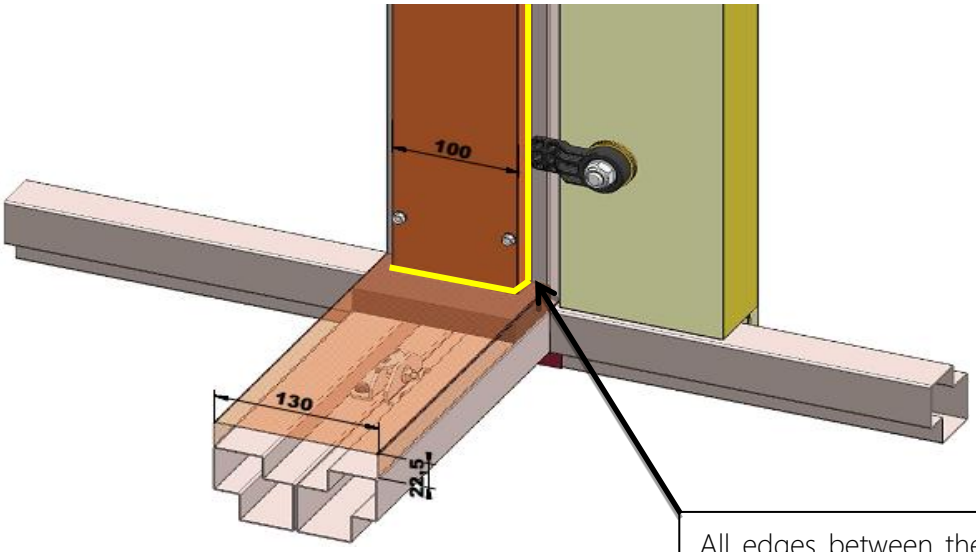
Table S60: Module connectors between the corners

4. After installing all module connectors, remove the corner brackets so that the joint covers can be inserted.

5. In the final step, the cover plates for the module joints must be inserted and screwed in place, 4.8x38mm, external hexagon drive. The covers are factory-fitted with insulation on the inside.

Differentiation between cover plates:

- Cover plates for the base and lid are approx. 45 mm longer than those for the rear wall and operating side.
- Width of cover on the operating side: 100 mm.
- Width of cover for rear wall, base and lid: 130 mm.



All edges between the cover plates and between the cover plate and the housing must be sealed with sealant that complies with VDI 6022!

Illustration: View of cover plates mounted on the operating side

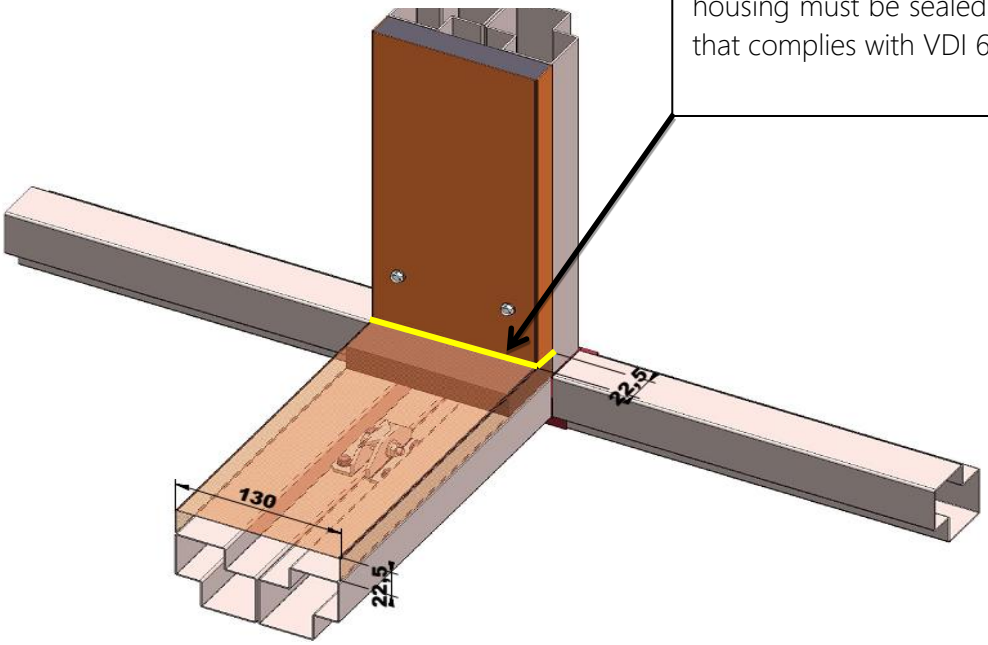
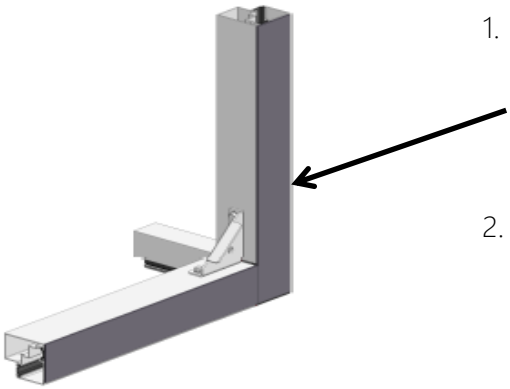


Illustration: View of cover plates mounted on the rear panel

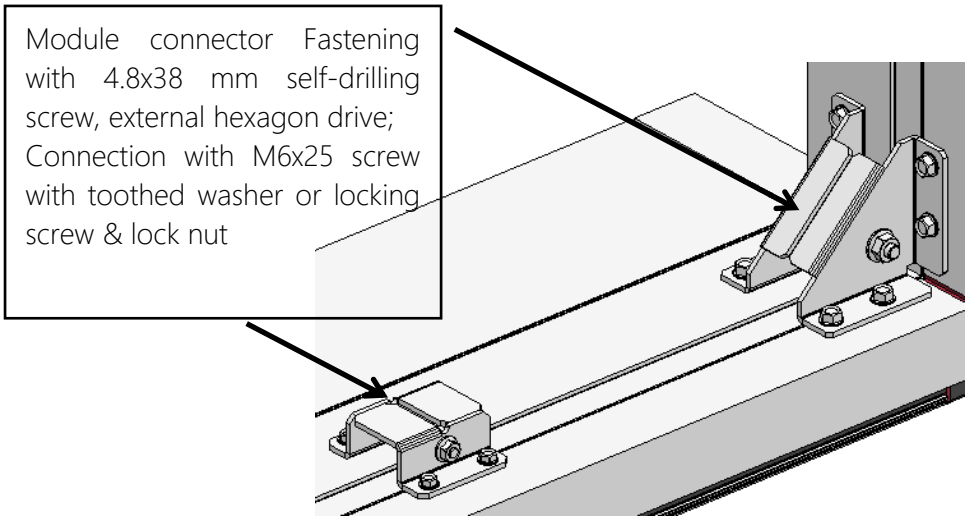
T60 series



1. Before installing and pulling or pushing the modules together, PE sealing tape (60 x 3 mm) must be applied to one side of all joints. Align with the inner edge (self-adhesive on one side).

2. Modules must be placed flush against each other and aligned. Lateral and height offset is not permitted and must be avoided; if necessary, use spacer plates.

3. Devices in the T60/C60 series are equipped with corner brackets as standard. The modules are screwed together using holes in the corner brackets (M8x60 screw with toothed washer or locking screw & locking nut).



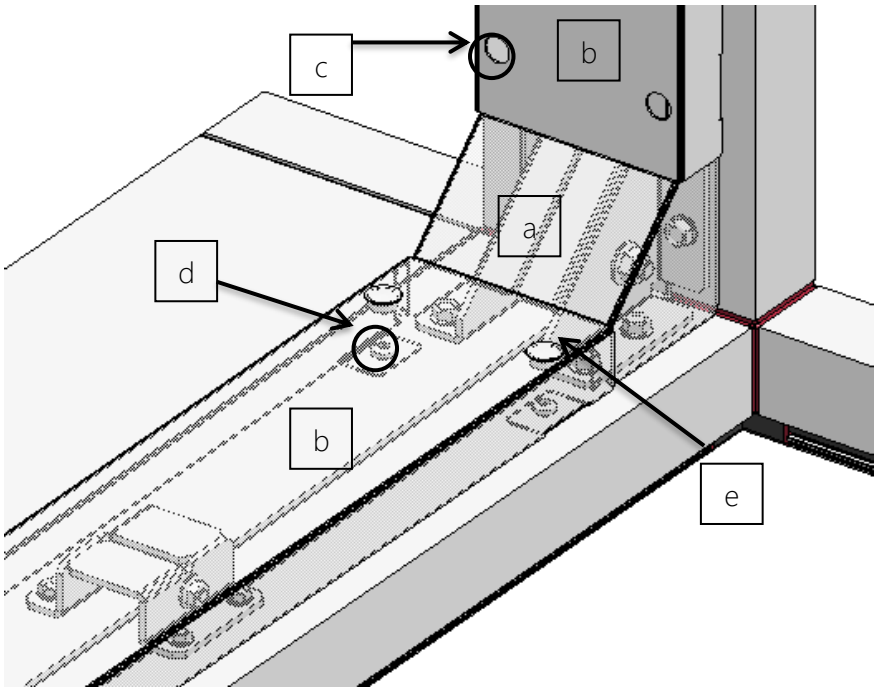
4. Additional connecting brackets are used in the larger sizes. This is to ensure that the front profiles of the modules are flush with each other across the entire module joint and that the sealing tape has sufficient pressure. These are installed on site and distributed evenly between the corners in the appropriate number (see table).

Size	Number in height	Number in depth	Size	Number in height	Number in depth
1310, 1307, 1610	0	1	2020 – 2525	2	2
1313 - 1616	1	1	2825	2	3
2010	0	2	2825	3	3
2013, 2213, 2216	1	2	3228, 3528	3	4
2016	1	2			

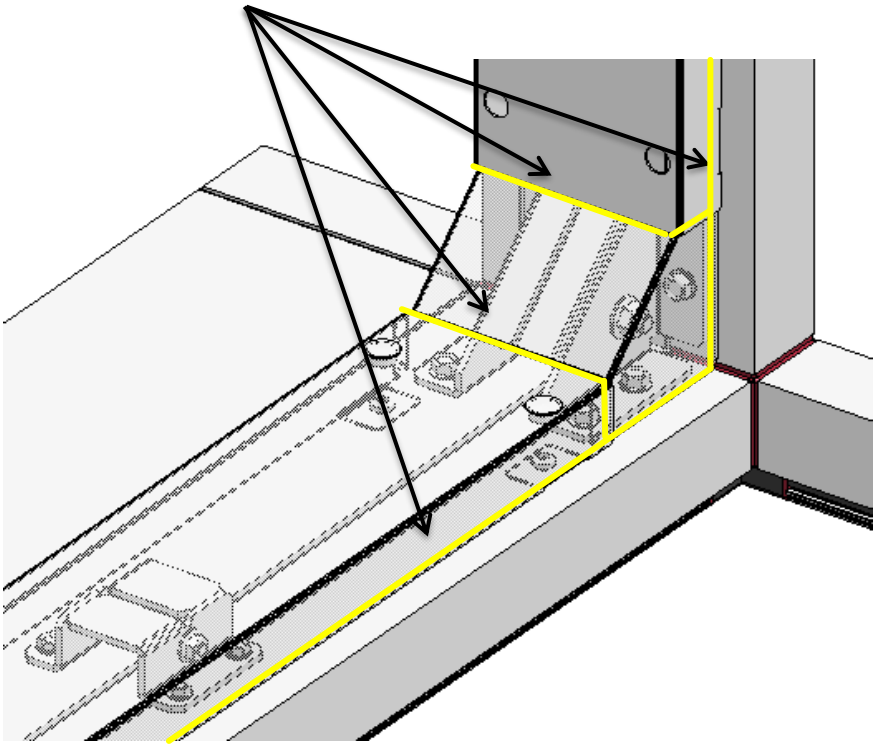
Table T60 (C60): Additional module connectors between the corners

5. The corner brackets and module connectors are covered below:

- Place covers over corner brackets (a),
- Insert longitudinal profiles between these covers all around (b),
- Screw the cover plates through the hole (c) with the tab (d) on the frame profile using a 4.8x19 mm self-drilling screw with Torx drive,
- Close holes with cover caps (e).



- Finally, ALL edges, joints, etc. must be sealed with an approved sealant!



Special cleaning instructions

Air conditioning units in hygienic design according to DIN 1946 T.4 must be cleaned with particular care. For recommended cleaning agents, see section 7.2. This includes wiping down all rails on coolers, heaters, droplet separators, pull-out frost protection frames, filters, etc. If the area behind the flow distributor is inaccessible, it must be removed for cleaning.

For information on cleaning the functional parts, see chapter8 Information on built-in parts and components .

11 Special information on explosion-proof units

The information in chapter 5 "General installation instructions" applies. In addition, some installation work is mandatory for air conditioning units that are installed in explosion-proof areas.

Please refer to the relevant data sheet for the system for the complete ATEX classification in accordance with the ATEX directive.

Installation and commissioning

Observe the safety instructions in Chapter 1, the operating conditions in Chapter 3 and the general commissioning instructions in Chapter 6!

The individual device modules must be connected to each other with an equipotential bonding. Each module must also be connected to the base frame with an equipotential bonding.

A professional lightning protection system must be installed for weatherproof explosion-proof devices. All metal parts must be connected to the earth conductor. To prevent flashovers and approximations between metal components and the lightning protection system's interception device, the components must be included in the lightning protection equipotential bonding in accordance with DIN EN 62305 or VDE 0185-305.

In the case of explosion-proof devices for indoor installation, all electrically conductive parts must be protected by a professional earthing measure (equipotential bonding) so that lightning currents are diverted and cannot lead to ignition sources.

All existing equipotential bonding conductors must be checked before commissioning. A resistance measurement must be carried out to check the conductivity.

Suitable measures (e.g. pre-filtering) must be taken to prevent the ingress or occurrence of flash rust inside and outside the system.

It is recommended to monitor the operation and, if necessary, the vibration of the fans.

The statutory, regionally applicable and customer-specific regulations must be strictly observed.

The sensors and actuators used, as well as other electrical attachments, must have an appropriate device classification, such as the air-handling unit.

Frequency converters must not be used in potentially explosive areas. If frequency converters are used to operate fans, only pressure-resistant encapsulated motors (Ex d; Ex de) may be used.

Operation

Before commissioning, check that the system has been installed correctly. All maintenance doors and inspection openings must be closed.

Ensure that the ATEX classification is complied with during operation. Other operating conditions are only permitted after consultation with and written confirmation from the manufacturer.

Further information on the operation of the individual components can be found in the relevant chapters of this operating manual.

Maintenance and cleaning

Before carrying out any maintenance work, the system must be shut down properly and disconnected from the mains at all poles!

Care must be taken to ensure that no potentially explosive atmosphere can form.

No ignition sources may arise during maintenance work in potentially explosive areas. Here, care must be taken to ensure that all work equipment is approved for the relevant zone (see EN 1127 Part 1, Annex A and BGR 104 or DGUV 113-001). Otherwise, it must be ensured that the work area is sufficiently inerted.

Built-in parts and device components may only be replaced with components approved by Rosenberg Ventilatoren GmbH.

The necessary safety, maintenance and cleaning work on the built-in parts of the air conditioning unit can be found in the relevant chapters of this operating manual.

12 Special notes on high-temperature units

12.1 Scope and definitions

High-temperature units in the context of our air handling units are units or unit configurations that are operated at elevated conveying medium or component temperatures (> 70 °C). This results in special requirements for housings, insulation, materials, drives and operating procedures.

12.2 Risks and hazards upon contact

- Risk of burns on hot external surfaces (housing panels, doors, inspection openings, pipes, heat exchanger areas). Short-term burns are possible at temperatures as low as ~60°C; prolonged contact at temperatures above ~43°C is critical.
- Heat stress for personnel in the immediate vicinity of hot equipment or when working inside the equipment.
- Material damage (seals, insulation materials, cables, electrical components) due to permanent thermal stress.
- Fire/explosion risks in the event of leaks in connection with combustible materials or ignition sources.
- Operating errors (e.g. opening before the cooling-down period has elapsed).

The plant operator must ensure that none of the risks or hazards mentioned above can occur!

12.3 Protective measures (STOP principle)

- S – Substitution: Use of non-combustible insulation materials and temperature-resistant materials. (e.g. for on-site insulation measures in high-temperature areas)
- T – Technical: Use of suitable insulation/shielding, temperature limits, safety shut-offs, visual/acoustic warnings, continuous temperature monitoring.
- O – Organisational: Set and adhere to mandatory cooling times, access controls, operating instructions, release processes, documented maintenance plans within the scope of the requirements.
- P – Personal: Use of suitable PPE – personal protective equipment (e.g. heat protection clothing in accordance with DIN EN ISO 11612, protective gloves in accordance with DIN EN 407-A1), training and regular refresher courses.

12.4 Cooling times: principle, formula and application

12.4.1 Purpose

Cooling times define the minimum interval between shutdown and the start of maintenance/inspection work in order to avoid burn hazards and material damage.

12.4.2 Calculation approach (approximate)

For a technically reliable estimate (with natural convection and uniform temperature distribution), the following energy balance can be used:

$$t_c = \frac{m \cdot c \cdot (T_i - T_f)}{h \cdot A}$$

Parameter:

t_c = cooling time [s]
m = mass of the relevant component/housing [kg]
c = specific heat capacity [J/(kg·K)] (steel ≈ 500 J/(kg·K))
T_i = initial temperature [°C]
T_f = safe target temperature/hand contact limit [°C]
h = heat transfer coefficient [W/(m²·K)] (natural convection typically 5–12)
A = effective outer surface area [m²]

Notes:

- This approach provides a **conservative initial estimate**. For accurate values, the device geometry, multi-layer structure (insulation), radiation component, air movement and heat storage of the internal components must be taken into account.
- For complex devices, **validation by measurement** (surface temperature curve vs. time) and specification of **device-related cooling times** in the operator documentation is recommended.

12.5 Sample calculation

Objective: Cooling of a device outer surface from 100 °C to 40 °C at 20 °C ambient temperature, natural convection.

Assumptions:

- Housing/steel mass m = 250 kg
- Surface area A = 6 m²
- Heat capacity of steel c = 500 J/(kg/K)
- Heat transfer h = 10W/(m²/K)
- ΔT = 100 – 40 = 60K

Calculation:

$$t_c = \frac{250 \cdot 500 \cdot 60}{10 \cdot 6} = \frac{7{,}500{,}000}{60} = 125{,}000\ \text{s} \approx 34{,}7\ \text{h}$$

Interpretation: This purely convective estimate is very conservative (some surfaces cool down faster in reality when radiation/internal air flow and internal temperature gradients are taken into account). For occupational safety, the following applies: Only begin maintenance after the documented device cooling time and measured surface temperature ≤ approved limit values.

Practical recommendation:

- For the instructions, record device-specific measurement curves (temperature-time) and specify the release temperature (e.g. ≤ 40 °C contact surface).
- Describe the release process (measurement point(s), measuring device, documentation) in a binding manner.

12.6 Table – Approximate cooling times (natural convection)

The table below serves as a working template for BetrSichV-compliant instructions. Values are approximate (assumptions as above: steel, c=500; h=10; A=6m²; m=250kg; Tamb=20°C). Device-specific values must be determined and substituted.

Initial temp. (°C)	Target temp. (°C)	Ambient (°C)	Material	Mass (kg)	Surface area (m²)	Cooling time (h)
80	40	20	Steel (insulated housing)	250	6	≈ 23.1
100	40	20	Steel (insulated housing)	250	6	≈ 34.7
120	40	20	Steel (insulated housing)	250	6	≈ 46.3
80	30	20	Steel (insulated housing)	250	6	≈ 26.9
100	30	20	Steel (insulated housing)	250	6	≈ 38.4

Important: These guidelines do not replace device-specific calculations. With active ventilation/forced convection (higher) or significant heat radiation (dark, large surfaces), the times may be significantly shorter. With large masses, multi-layer insulation or shielded areas, they may be longer.

12.7 Binding work instructions

1. Switch off and secure (interrupt energy supply, lock/lock-out).
2. Wait for the cooling time specified in the device list in Appendix X or until the surface temperature reaches ≤ release value (e.g. 40 °C).
3. Document the temperature measurement at defined measuring points (e.g. door panel at handle height, panel next to inspection opening) with a calibrated thermometer/infrared device.
4. Approval by authorised person (signature/documentation).
5. Wear PPE and work in accordance with the operating instructions.
6. Final inspection and documentation (maintenance log, report any deviations/defects).

12.8 Responsibilities and documentation

- Equipment operator/occupational safety: Determination of the release temperature, validation of cooling times, maintenance of measurement/release lists.
- Maintenance: Implementation, measurement, documentation (date, time, measuring points, values, signature).
- Training: Instructions on high-temperature risks, PPE use, measurement procedures, release process (annually or in the event of changes).

Notes