PLANT:

UNIT DESIGNATION:

C-

FläktGroup

eQ AIR HANDLING UNIT

>> INSTALLATION AND MAINTENANCE

GENERAL INSTRUCTION SAFETY DIRECTIVES

INSTALLATION INSTRUCTION

SAFETY DIRECTIVES

GENERAL INSTRUCTION

We reserve the right to make changes without prior notice

SAFETY DIRECTIVES

USING THE AIR HANDLING UNIT

CAUTION!

Before the air handling unit is taken into operation, all unprotected openings must be equipped with protective screens.

The air handling unit must not be taken into operation before all electrical and mechanical safety devices have been installed.

Take great care when opening the air purging connections for the hot water supplied to the air heater. Bear in mind the risk of water hammer or steam discharge.

Whenever service work or inspection is to be carried out, all safety isolating switches of the unit should be tripped 1 minute before the inspection doors are opened. Before restarting, all safety devices must be restored.

If the eQ air handling unit is disassembled prior to installation, FläktGroup declines any responsibility for conformance of the unit to its rated tightness class.

The air handling unit covers are equipped with lockable handles. Be sure that you always leave the unit with the covers locked and keep the keys inaccessible to unauthorized persons.

Follow seperate instruction for replacement of components.

There should be a service aisle in front of the electrical cabinet, this is to be arranged so that the cabinet can be serviced safely in accordance with local electrical safety regulations.

Planning for work of this type is a condition that must be complied with in order for the air handling unit to be CE marked. Local provisions and regulations shall be observed.

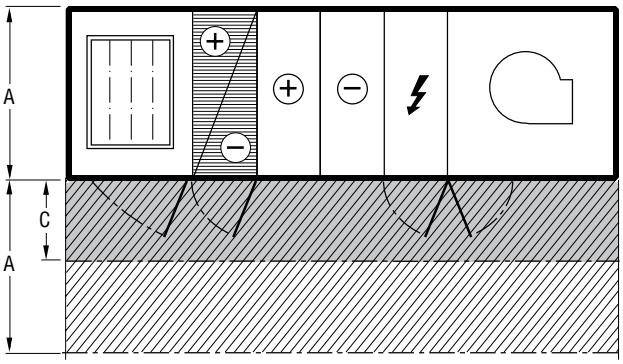
Read and understand these instructions before you begin installing the air handling unit. The owner or the fitter of the air handling unit is responsible for seeing to it that the safety regulations in force are followed.

No unauthorized person shall be allowed to work with the air handling unit. Only qualified personnel.

FREE SPACE FOR SERVICE AND REPAIR WORK

The space around the air handling unit shall be planned for routine service work such as filter replacement and cleaning fans and fan casings. Consideration must also be given to future replacement of components such as filter, heat exchangers, air heaters, air coolers, control box and fans.

Unit viewed from above



A = width for replacing components
C = width for replacing filter

Size	A	C
005	800	600
008	1100	800
009	800	600
011	1200	500
014	1100	600
018	1400	600
020	1100	600
023	1700	600
027	1400	600
032	1800	400
036	1400	600
041	2000	600

Size	A	C
045	1700	600
050	2300	500
054	2000	600
056	1700	600
063	2300	600
068	2000	600
072	2600	600
079	2300	600
090	2600	600

GENERAL INSTRUCTION

CHECKING PRIOR TO COMMISSIONING

1. Work through the following points depending on whether the components are present in the unit concerned. Start with the electrical connection switched off.

2a. Check that the unit is aligned horizontally.

2b. Check that the inspection doors operate easily. If necessary, adjust the hinges according to the separate instruction.

3. Check that the unit is clean internally and externally.

4a. Damper with actuator.
Check that the outdoor air and exhaust air dampers are closed when the actuating motor is in its end position, and that it opens the damper on starting the fan. The return air dampers shall be open in the corresponding position.

4b. Damper with manual adjustment.
The damper shall be locked in the open position before starting the fan.

N.B.!
The fan must never be started with the dampers closed.

5. Filter.
Check that the filter cassettes are in place, and that the locking device is closed.
   - For all air handling units placed on the European market after 1st January 2018 the EU regulation 1253/2014 states that they must be equipped with a visual signal or signal to the control system for filter change.
     All AHU:s with FläktGroup integrated controls is equipped with alarm or monitoring of filter pressure drop. For units without FläktGroup AHU controller this must be arranged by the installer.

6. Manometers and flow instruments.
Check that the instruments are zeroed and correctly connected (+/-) to the measurement socket.

7. Filter sensor.
Set the desired pressure difference on the filter sensor, if present, according to the separate instructions.

8. Check other functions according to separate instructions.

9. Check that all the transport safety devices have been removed.

DISMANTLING/REASSEMBLY

It is possible to dismantle the eQ unit. Dismantling should be carried out without damaging individual components. Reassembling the unit is associated with compromised functionality and leakage issues. Dismantling and reassembling of the eQ unit results in invalidation of any liability regarding functionality and leakage class from FläktGroup side.

Factory staff will discover if a unit has been dismantled and reassembled.

If possible, notify the factory if dismantling of the unit is planned. Facilitating and quality ensuring measures can be taken.

SOUND TRANSMISSION

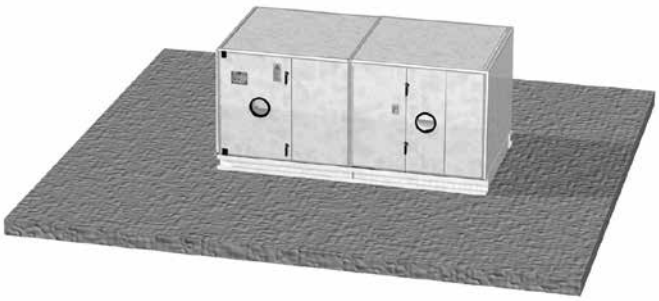
If a unit is located by a wall, low-frequency sound generated in the unit may create vibrations in the wall, even though the noise level in the fan room is acceptable.

The unit should preferably be installed by the wall in the fan room that does not border on a sound sensitive space. If such a wall is lacking, install the unit 400–500 mm from the wall.

Duct lead-throughs must be carefully designed so that there will not be any rigid contact between the duct and the wall. The insulation around the ducting must also be carefully fitted so as not to transmit sound to adjoining spaces.

It is advisable to interconnect the ducts by means of flexible connections if they are arranged through sensitive spaces.

Sound may correspondingly be transmitted through the floor if the composition/mass and rigidity of the floor is inadequate.



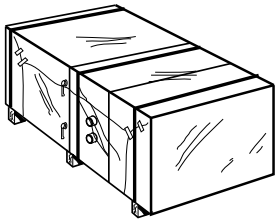
The mass must at least be equivalent to the recommendation specified in VVS AMA 98 (Part RA, Section QE) (General Material and Workmanship Specifications for Building Services Installations in Sweden), i.e. the mass of a floor having a surface that is 4 times the surface of the air handling unit must be at least 5 times the mass of the vibration-isolated object (i.e. the air handling unit above and supported on anti-vibration mountings).

If the floor has a light structure, its mass and rigidity can be improved by laying a heavy-duty insulation mat on the floor beneath the entire air handling unit. The whole bottom of the unit must then rest on the mat (and plate, if fitted).

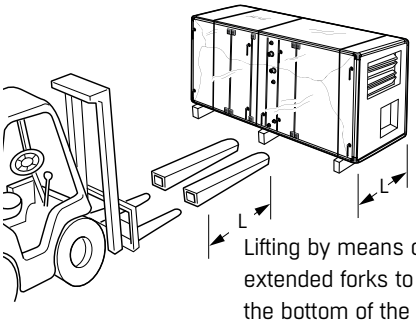
GENERAL INSTRUCTIONS

LIFTING AND TRANSPORT

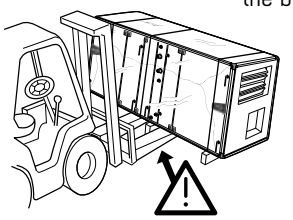
The weight of each multi-function block is specified on the rating plate.



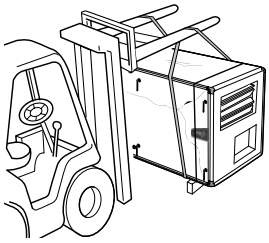
Each block is provided with packaging.



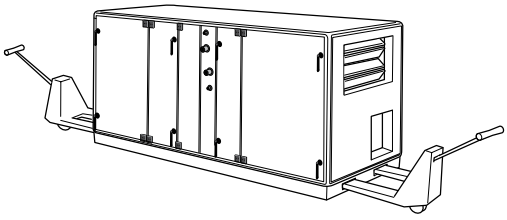
Lifting by means of a forklift truck with extended forks to avoid damaging to the bottom of the air handling unit.



NB!
The centre of gravity may be offset from the centre of the air handling unit.



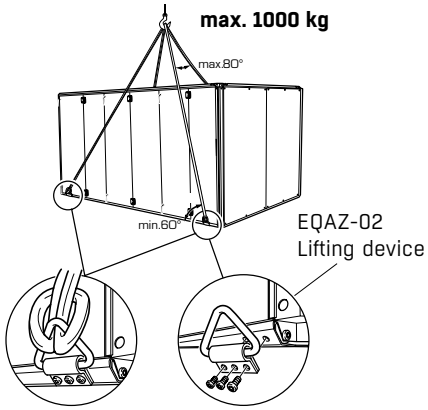
Using a forklift truck with the forks over the unit.
Unit sizes 005-090.



Larger and heavier units can be raised by using a hand-operated form loader on both short sides to avoid damage to the underside of the unit. **Not applicable for marine units.**

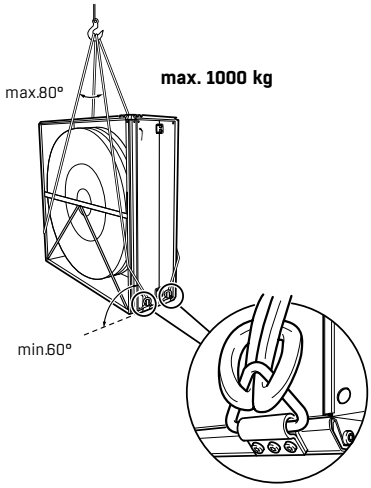
LIFTING A UNIT PROVIDED WITH LIFTING DEVICE EQAZ-02

Do not walk under a suspended load.
No persons shall be allowed to be beneath a suspended air handling unit.



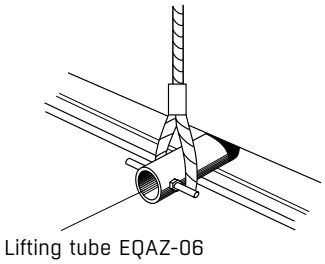
Important!
The EQAZ-02 lifting device must always be secured with three screws in the longitudinal bottom frame member.
Under no circumstances shall the lifting lug be secured to the upper corners.

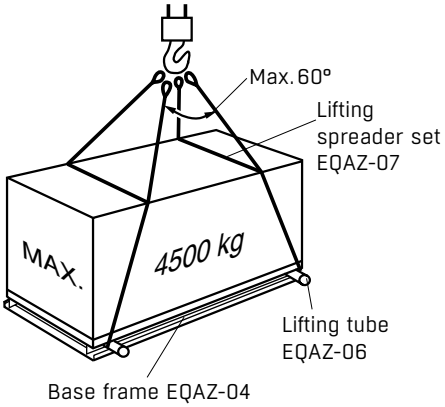
NOTE!
If there is a base frame, the screws that secure the base frame with the unit must always be checked before lifting to ensure they are intact.
The lifting of the unit must under no circumstances be carried out with a wooden rail mounted on the base frame.

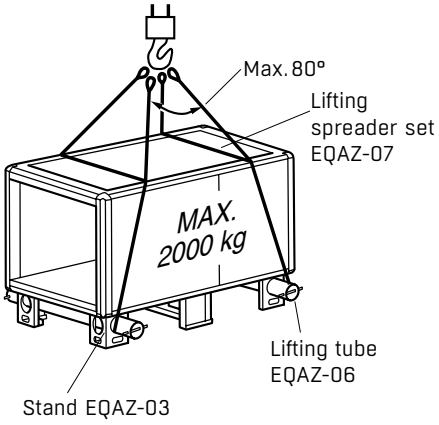


GENERAL INSTRUCTIONS

LIFTING A UNIT PROVIDED WITH A BASE FRAME EQAZ-04





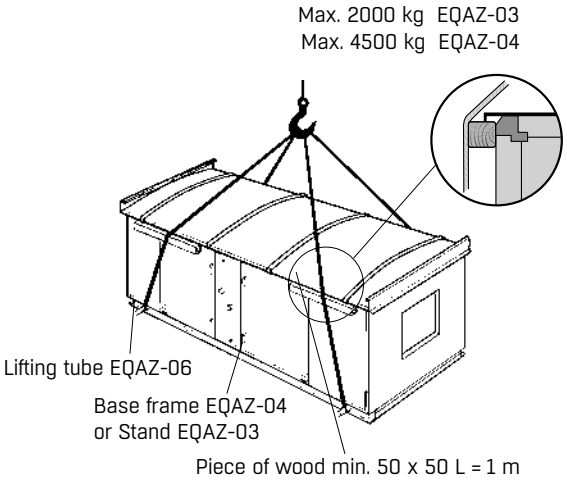


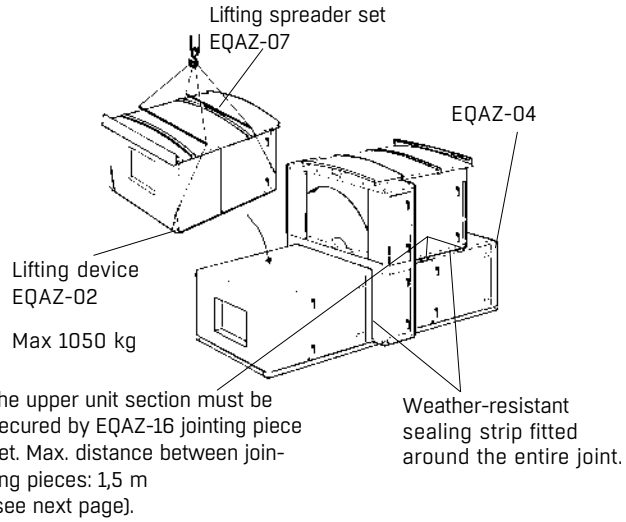
Note!

- Lift tubes are only suited for air handling units supplied from FläktGroup.
- The lift tubes must only be used for the specific unit that they have been ordered to.
- The lift tubes are adapted for each unit size.
- The lift tubes are intended to lift the unit once.
- If there is a base frame, the screws that secure the base frame with the unit must always be checked before lifting to ensure they are intact.

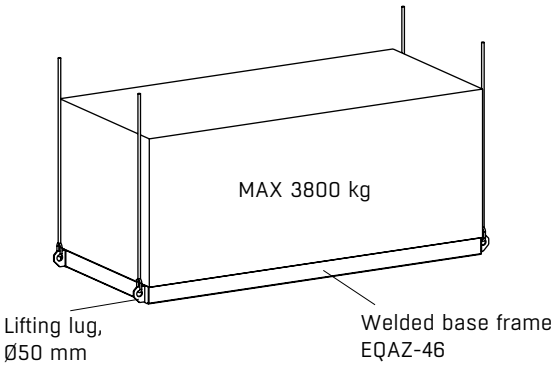
LIFTING AND TRANSPORT, OUTDOOR VERSION

The weight of each multi-function block is specified on the rating plate. Use EQAZ-06 lifting tubes and EQAZ-07 lifting spreader set to lift the unit/blocks on to the previously prepared foundation.





LIFTING A UNIT PROVIDED WITH A WELDED BASE FRAME EQAZ-46



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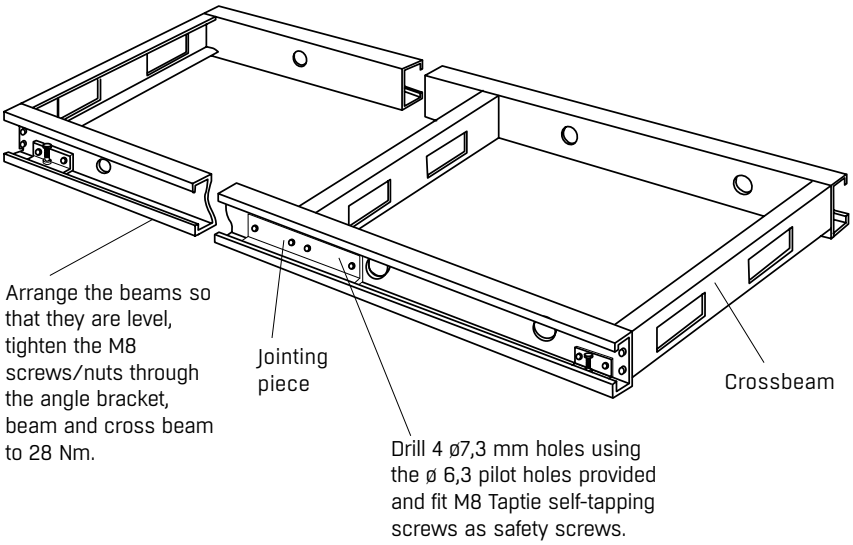
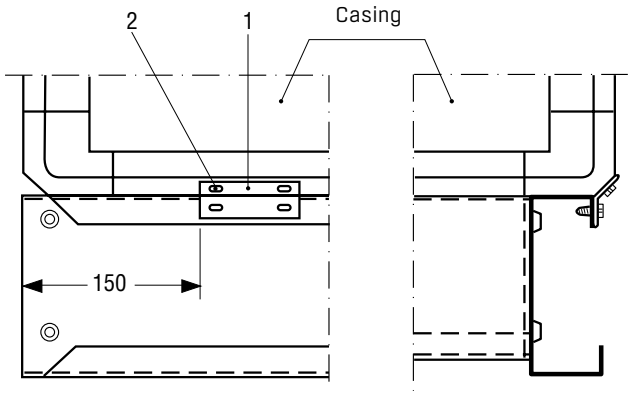
GENERAL INSTRUCTIONS

EQAZ-04 BASE FRAME, UNIT SIZES 005-090



ASSEMBLY OF THE EQAZ-04 IN SEPARATELY DELIVERED VERSION

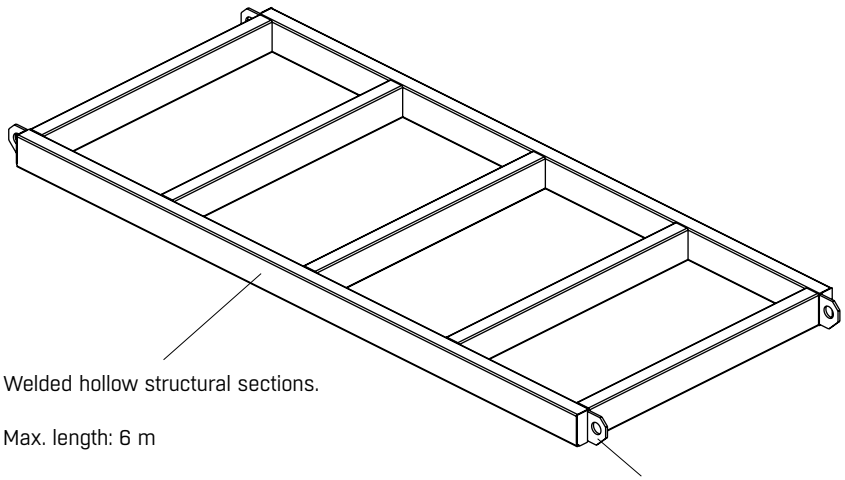
The base frame can be supplied either in assembled or unassembled condition. Assemble the base frame as shown, using one cross-beam at every beam joint and, if required, several cross-beams evenly distributed along the base frame.



TO FIT (SECURE) THE UNIT TO THE BASE FRAME

Fit one angle bracket (1), at each end of the base frame. Fit the remaining angle brackets spacing them evenly along the beams. Secure them with self-tapping screws (2).

EQAZ-46 WELDED BASE FRAME, UNIT SIZES 005-090



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GENERAL INSTRUCTIONS

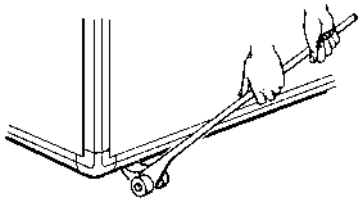
MOUNTING ON THE FLOOR

The floor on which the unit is mounted must be level, to ensure its problem-free function. Carefully check the floor to ensure that distortion and problems in opening and closing the doors are not built into the unit.

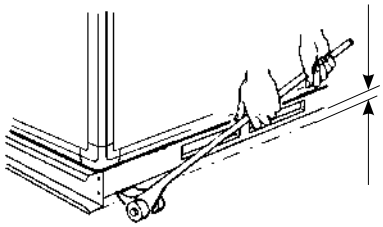
Base frame EQAZ-04 can be supplied with adjustable feet EQAZ-05 for individual height adjustment. These are available for unit sizes 005-090. Non-adjustable feet are available for larger sizes. It is important to ensure that the unit is positioned horizontally.

Space for a water trap (e.g. EQAZ-08) must be provided for air handling units which contain functional components with a drainage facility.

Lateral and longitudinal position adjustment is most easily performed with a roller crowbar or similar.



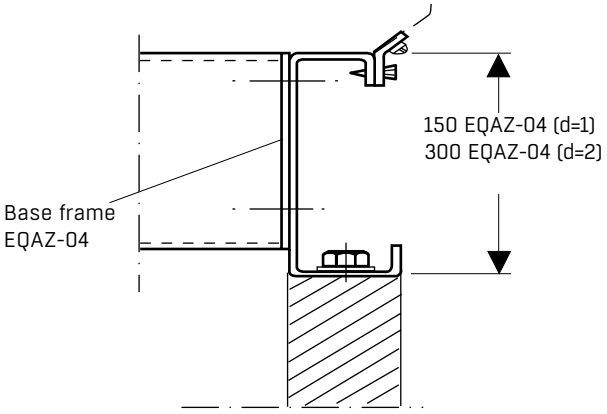
Multi-function block without base frame.



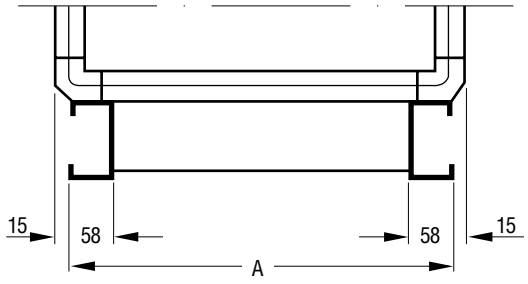
Multi-function block on base frame EQAZ-04, unit sizes 005-090.

MOUNTING ON THE FOUNDATION WITH EQAZ-04, OUTDOOR VERSION, UNIT SIZES 009-090

Secure the air handling unit base frame to the foundation by means of bolts. If necessary use shims to ensure that the unit is level. Distortion will occur if the unit is not level which can cause air leakage

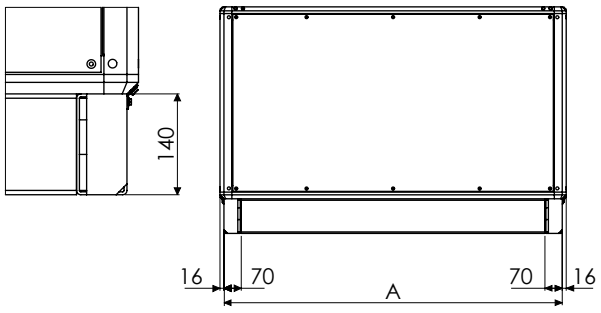


Size	A	Size	A
005, 009	774	032	1774
008, 014, 020	1074	041, 054, 068	1974
011	1174	047, 050, 063, 079	2274
018, 027, 036	1374	072, 090	2574
023, 045, 056	1674		



Important!
The EQAZ-16-30-1 or EQAZ-16-50-1 angle brackets must always be secured to the air handling unit in the version for outdoor installation.

MOUNTING ON THE FLOOR WITH EQAZ-46



Size	A	Size	A
005, 009	768	032	1768
008, 014, 020	1068	041, 054, 068	1968
011	1168	047, 050, 063, 079	2268
018, 027, 036	1368	072, 090	2568
023, 045, 056	1668		

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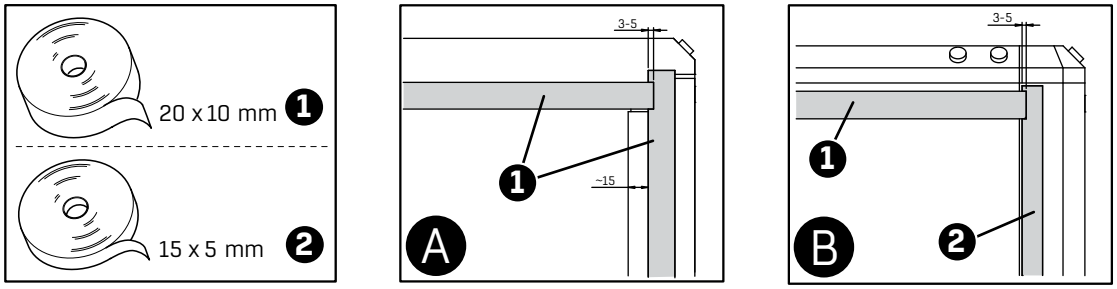
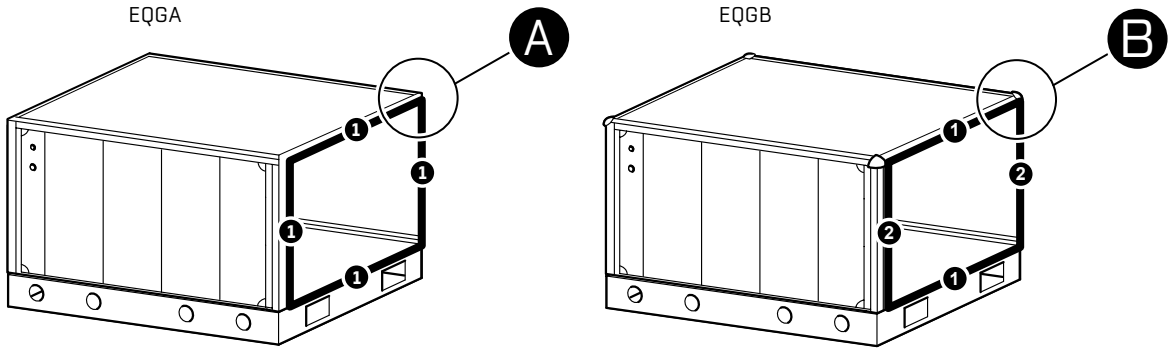
GENERAL INSTRUCTIONS

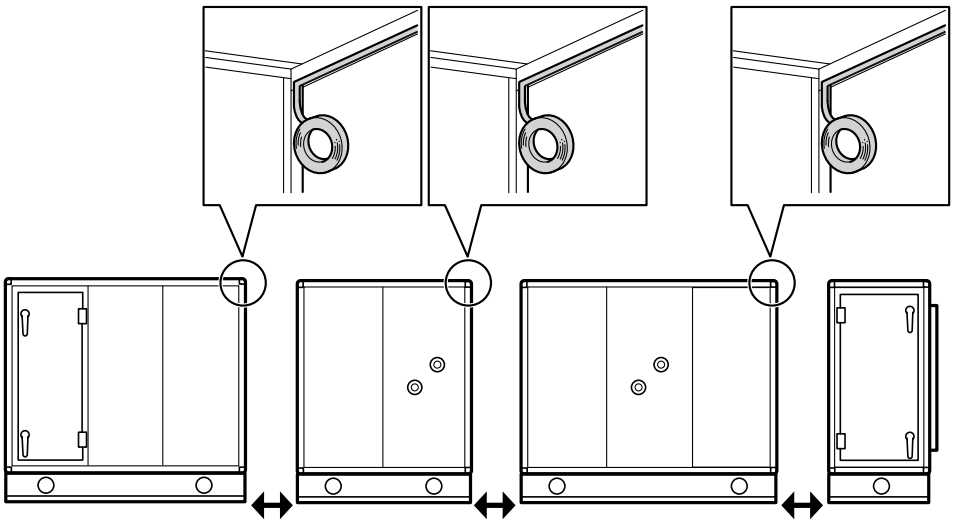
JOINTING OF AIR HANDLING UNIT BLOCKS

1

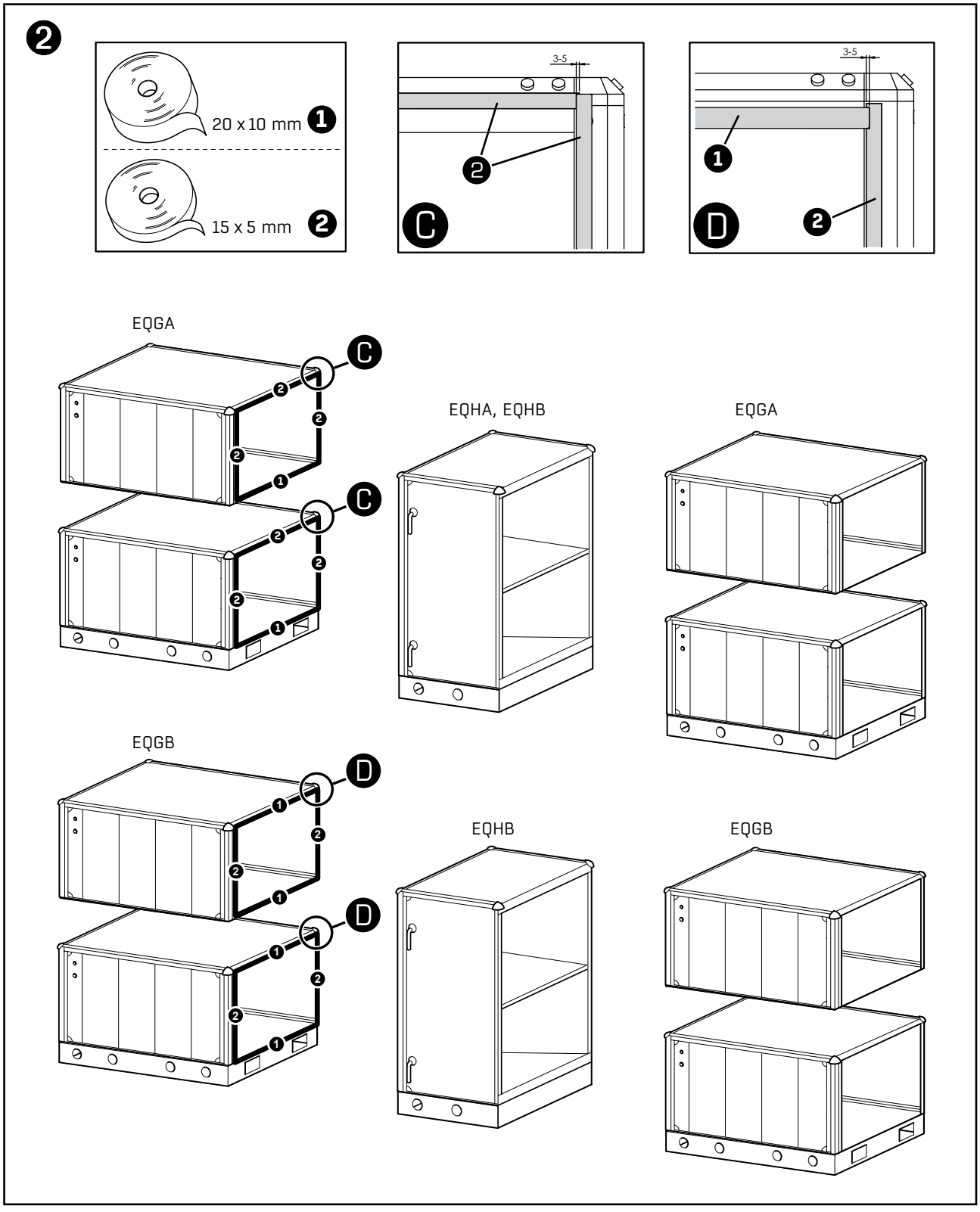
NOTE!
Install the sealing strip on one side prior to assembly.







GENERAL INSTRUCTIONS



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GENERAL INSTRUCTIONS

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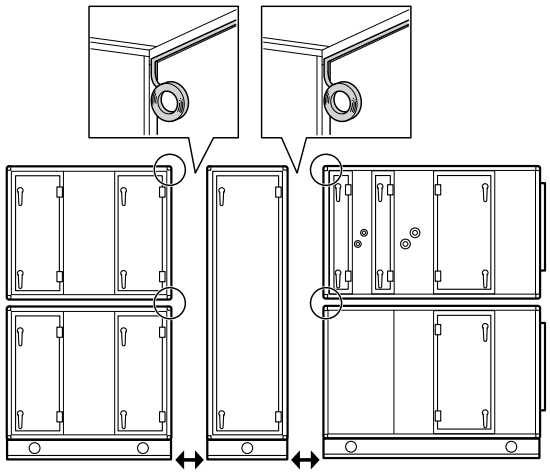

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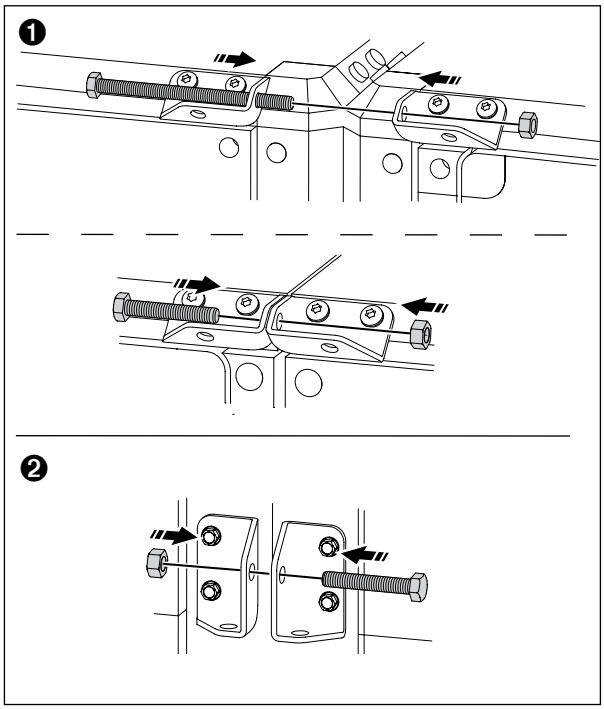
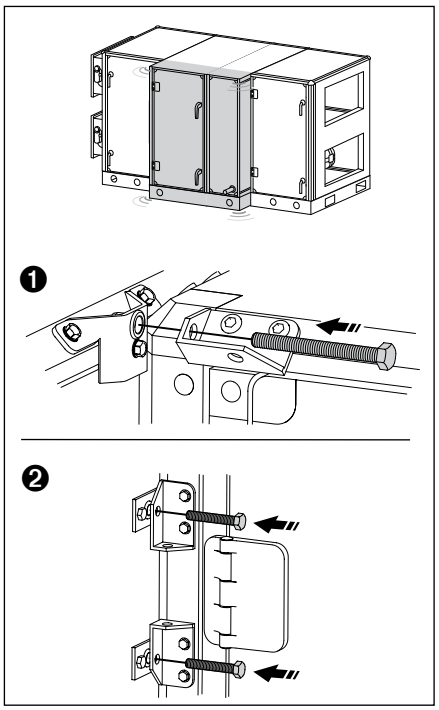
NOTE! Tighten the docking brackets in the corners first. Tighten the other docking brackets on the air handling unit last. To tighten the docking brackets in the incorrect sequence can cause noise and air leakage.

Externally

NOTE: If the unit is ordered with lifting devices they are mounted in the factory. After usage they should be removed and discarded. The docking devices should be mounted at the same location, using the same holes for the screws.

All docking brackets must be joined with the enclosed screws and nuts, or bolt screws and nuts.





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GENERAL INSTRUCTIONS

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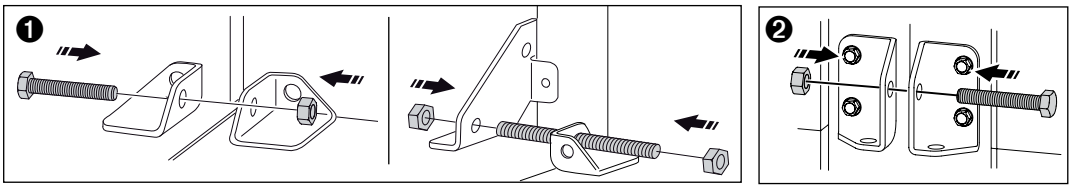
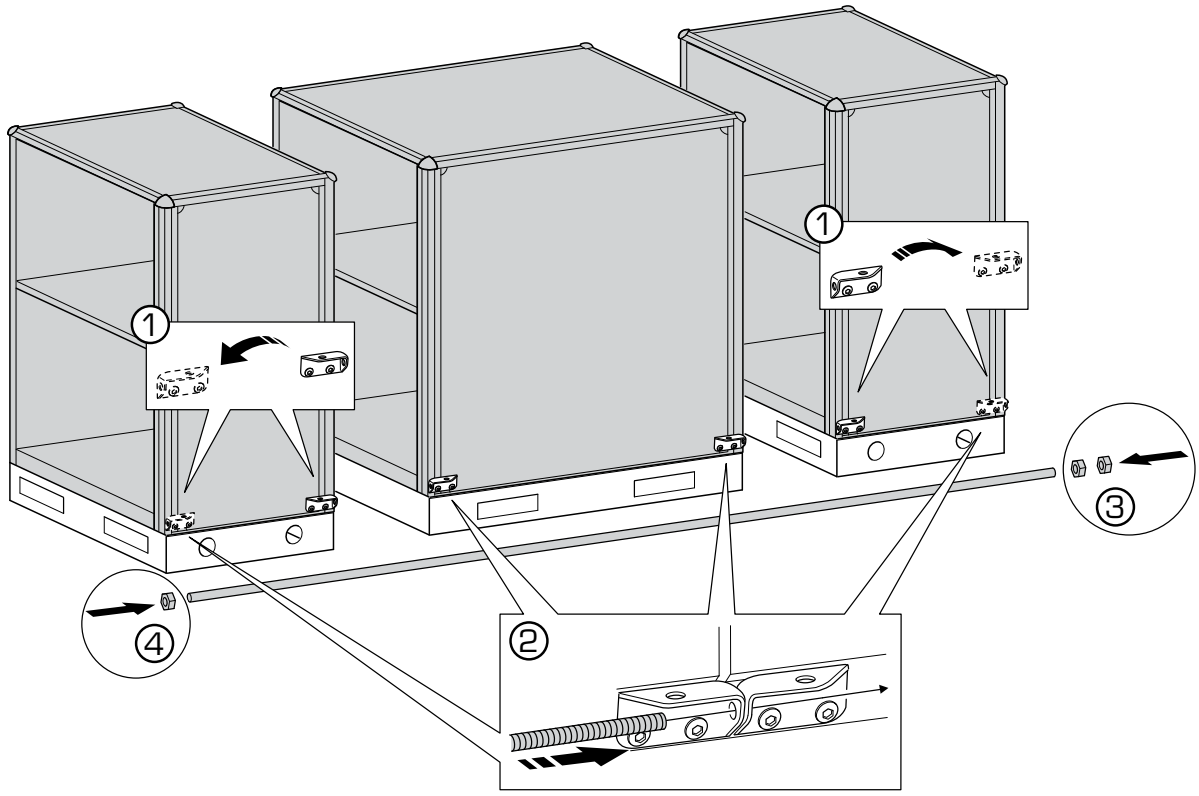
Internally



Rear side

Tip: In cases were accesability is limited on the rear side of the unit. A threaded bar can be used as docking.



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GENERAL INSTRUCTIONS

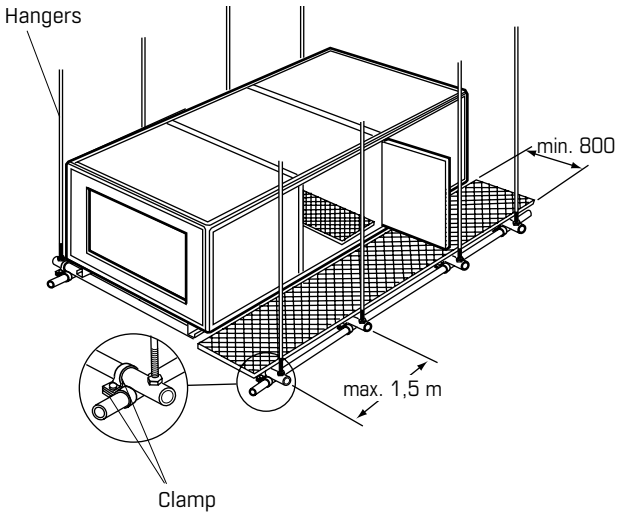
SUSPENDED MOUNTING FROM THE CEILING

Place the unit on a frame constructed on-site. See the Examples below. Suspend the frame from pendant hangers.

Larger units must be equipped with EQAZ-29 floor grating to enable service personel to enter.

The frame must also be executed so that so that the base panels have either transverse or longitudinal support rails on the underside.

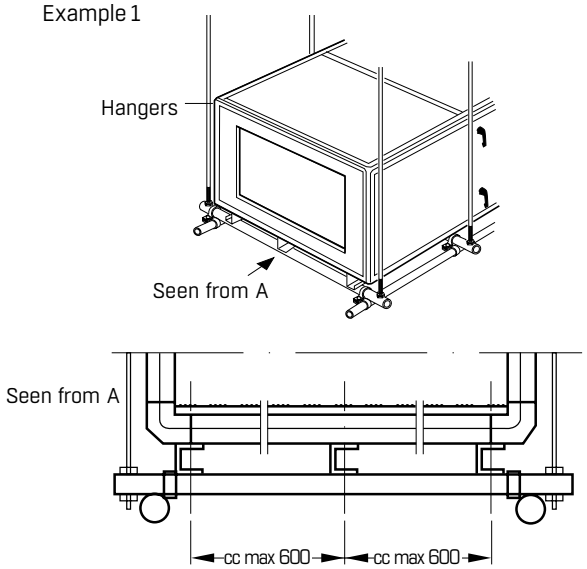
Important!
A frame of the kind shown in figure below permits easy adjustment of the hangers.

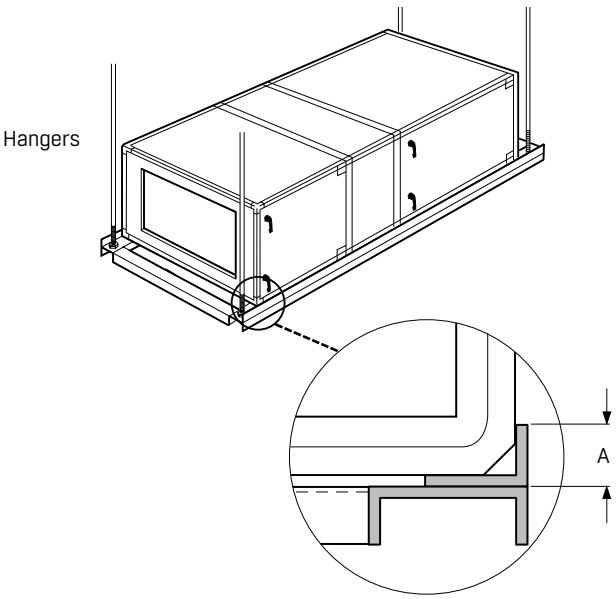


HEAVY DUTY INSTALLATION

Suitable installation for sizes 036-090.

Example 1





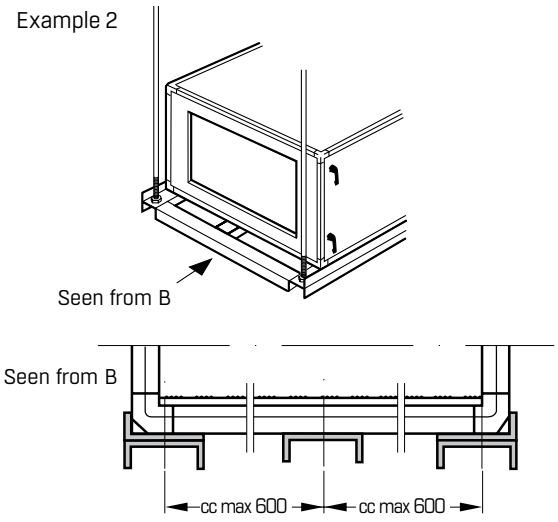
Retaining flange A – max. 35 mm along the inspection side unit sizes 005-090.
Cut and remove the edge "A" at the hinge locations to unit sizes 005-090.
Retaining flange A – max. 75 mm along the inspection side unit sizes 081-216.

N.B.!
If the air handling unit is equipped with a EQWZ-02 drainage trough, the edge of the retaining flange (A) can only be at the casing corner posts.

HEAVY DUTY INSTALLATION

Suitable installation for sizes 036-090.

Example 2



GENERAL INSTRUCTIONS

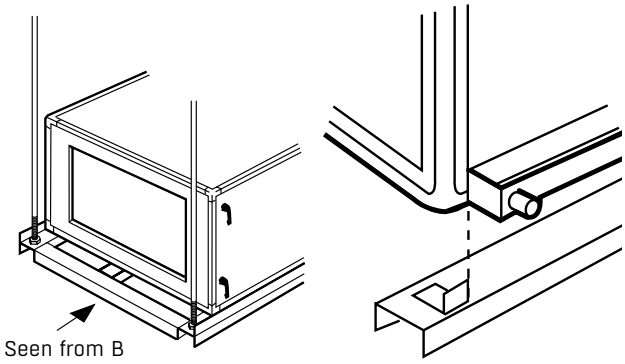
SUSPENDED INSTALLATION, HYGIENIC VERSION, UNIT SIZES 005-090

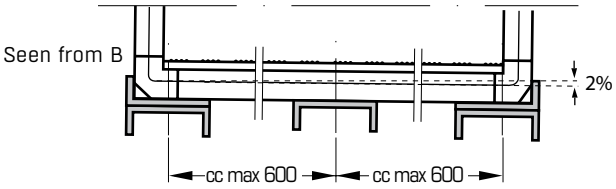
Place the unit on a stand made on site as shown in the examples below. Suspend the stand from hangers.

Larger units must be equipped with EQAZ-29 floor grating to enable service personel to enter.

The frame must also be executed so that so that the base panels have either transverse or longitudinal support rails on the underside.

N.B.!
If the unit is equipped with a EQWZ-02 drainage trough, there are retaining flanges (A) only at the casing corner pieces.





We reserve the right to make changes without prior notice

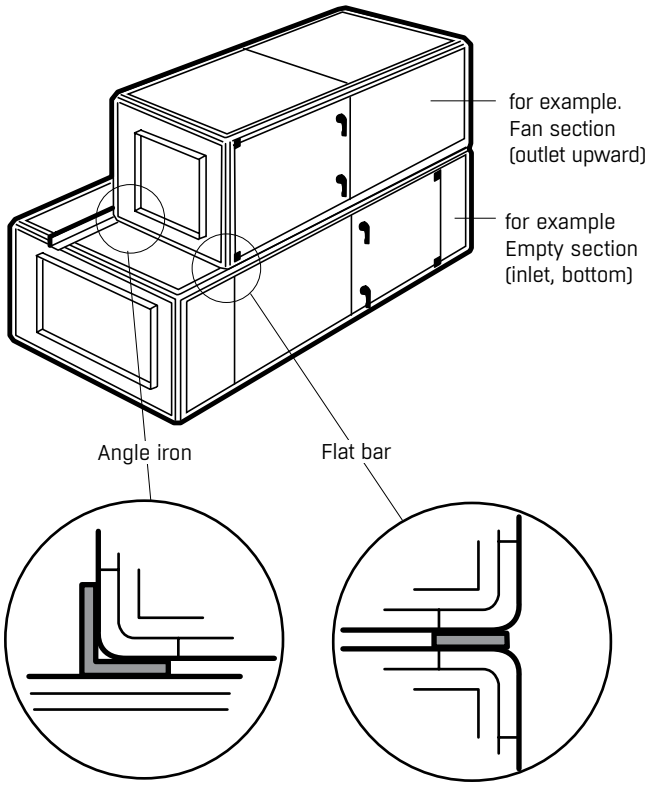
GENERAL INSTRUCTIONS

UNITS STACKED ON TOP OF ONE ANOTHER (ONLY FOR EQGA, EQGB)

Units of the same width can be stacked on top of one another. Up to two size 005-032 units can be stacked on top of one another.

EQGA, EQGB
Double deck
Unit sizes 005-032

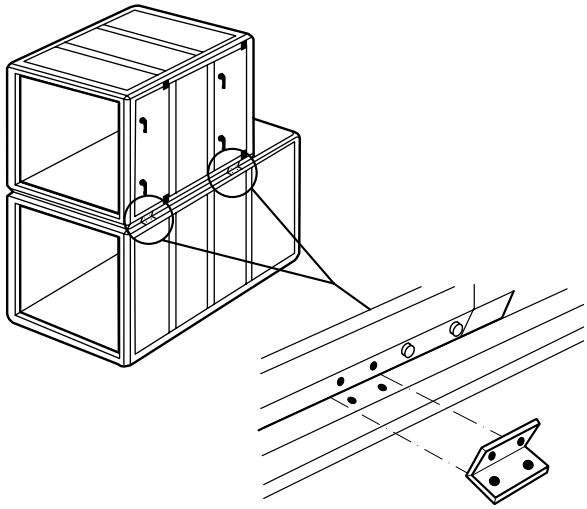
If the units are of different widths, arrange the inspection sides so that they are in the same plane. Place an angle profile under the rear frame profile of the top unit (length = length of lower unit) and fit a bar for height compensation under the front frame sectiion.
Fit EQAZ-16-01-1 sealing strip around the opening of the empty section before fitting the upper unit.



The EQAZ-16-30-1 (sizes 005-090), EQAZ-16-50-1 (unit sizes 108-216) jointing piece set is used for securing the upper units to the lower as shown.

The set consists of 6 angle brackets. Use the angle bracket as a template and secure it to the frame section with self-tapping screws. (Spacing, max. 1.5 m.)

Important!
The EQAZ-16-30-1 or EQAZ-16-50-1 angle brackets must always be secured to the air handling unit in the version for outdoor installation.



GENERAL INSTRUCTIONS

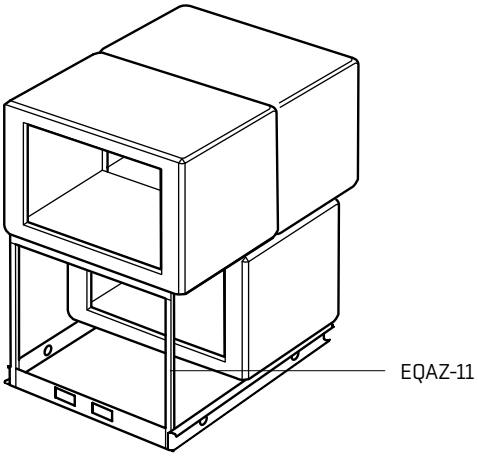
SUPPORTING FRAME FOR OVERHANGNING UNIT PARTS

Unit configurations where the upper block overhang the lower block needs to be supported and secured.

The accessory EQAZ-11 (Supporting frame), is used for this purpose as shown in the picture below.

In cases where EQAZ-11 hasn't been ordered, it is the responsibility of the installer to properly support and secure the unit.

FläktGroup does not take responsibility for any injuries or damages that may occur when other equipment than EQAZ-11 is used to support overhanging block parts.



Warning!
The unit should be secured in a professional manner.
Contact FläktGroup for consultation if needed. Overhanging and unsecured block parts can lead to personal injuries and material damages.

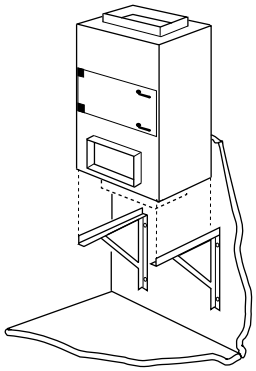
VERTICAL MOUNTING. THE UNIT MUST BE ORDERED FOR VERTICAL INSTALLATION.
UNIT SIZES 005-009 (SINGLE DECK CASING), 005-008 (DOUBLE DECK CASING)

The following supporting surface is required for a vertical arrangement:
Flat floor or frame made of angle steel, for example 50 x 50 x 5 with outer dimensions adapted to the outer dimensions A x B of the air handling unit.

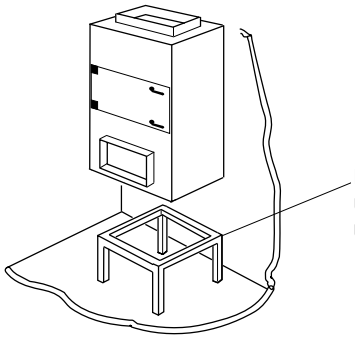
N.B !
Vertical installation can be employed only for unit sizes 005–009 in single deck casing and for unit sizes 005-008 double deck casing.

Important!
The stand must not be designed in such a manner that the inlet or outlet or the inspection doors are obstructed.
Anchoring the unit to a wall can appropriately be done with clamps or anchor brackets, such as perforated strips.

MOUNTING ON A WALL STAND



MOUNTING ON A FLOOR STAND

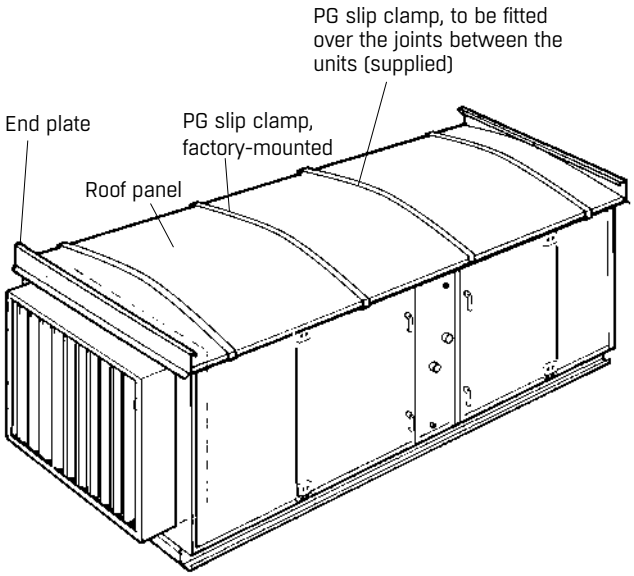


We reserve the right to make changes without prior notice

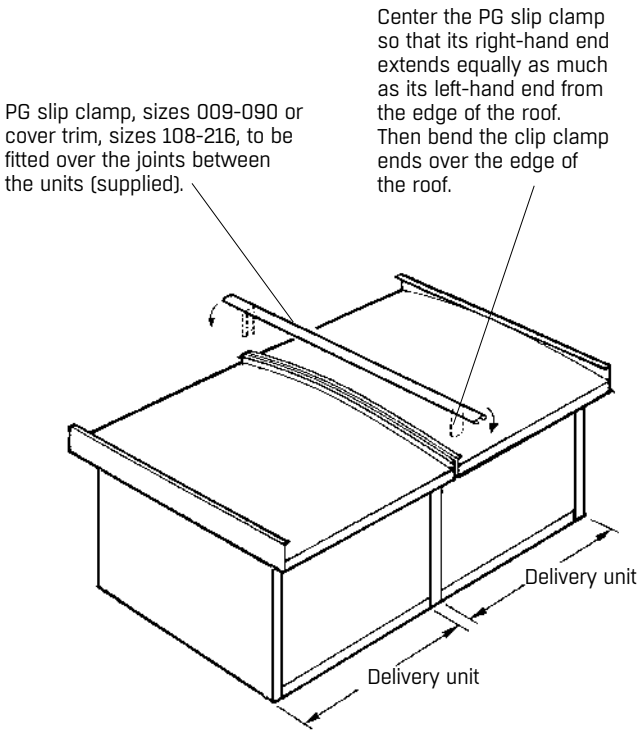
GENERAL INSTRUCTIONS

INSTALLATION OF THE JOINTS, ONLY APPLIES FOR OUTDOOR UNITS

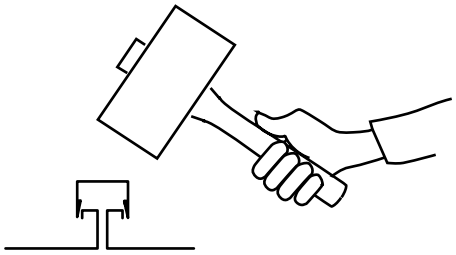
The EQBZ-01 roof is fitted to each individual unit at the factory as shown.



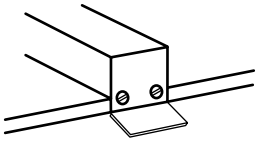
Roof joint to be fitted on site when multi-function blocks are delivered.



On size 108-216 units, place the cover trim on the joint where the folded edges of the roof sections meet and secure it by applying light hammer blows to "snap" it on.



Secured roof joint

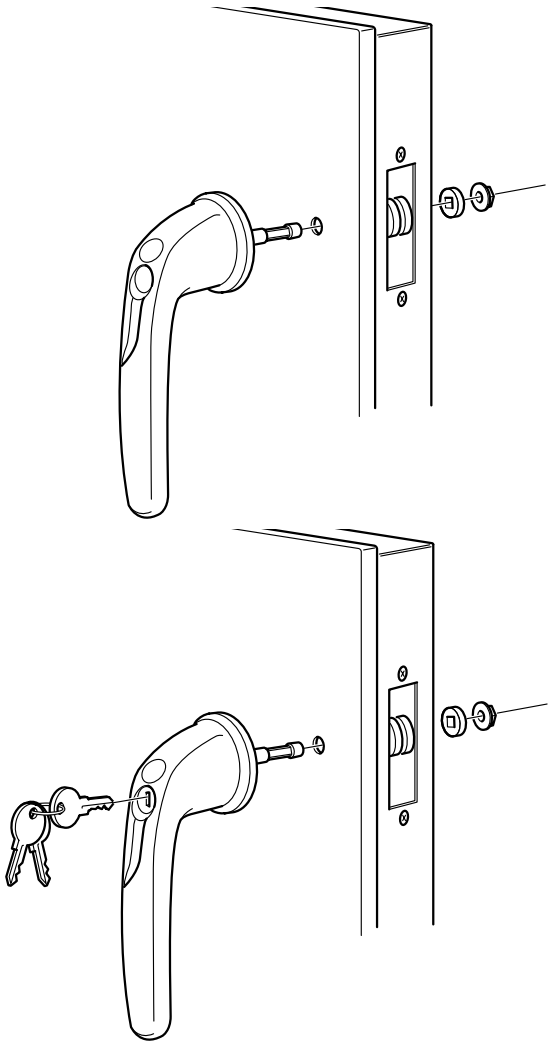


Secure the end pieces using self-threading screws.

We reserve the right to make changes without prior notice

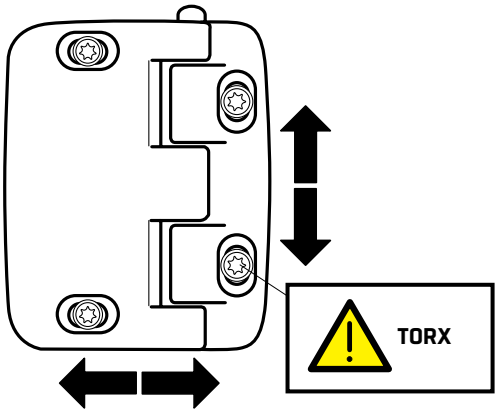
GENERAL INSTRUCTIONS

TO DISMANTLE THE HANDLES WITH/WITHOUT LOCK

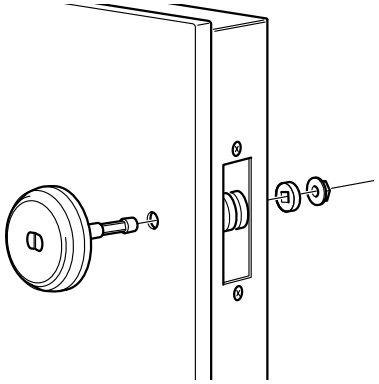


TO ADJUST THE HINGES

Back off the screws and shift the hinge in the appropriate direction. Tighten the screws and check that the door opens and closes easily.



LOCK WITHOUT HANDLE



We reserve the right to make changes without prior notice

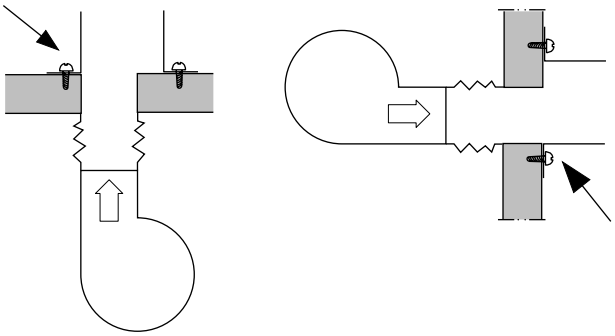
GENERAL INSTRUCTIONS

CONNECTION TO THE DUCTING

The external functional sections such as coils, sound absorbers, etc. can be connected directly to the outlet of the plenum fan.

INSTALLATION PRINCIPLE – DUCT FITTED TO FAN OUTLET

All connections should be fitted edge-to-edge with the back plate of the fan.



Important!
The weight of the air duct system with components must not load the unit.

MAINTENANCE

Maintenance should be carried at regular intervalls by qualified personell.

REPLACEMENT OF DOOR SEAL

The door seal is available as a spare part and must be replaced, if necessary, to ensure that the unit is airtigh.

SPARE PARTS

Spare parts and accessories for this unit can be ordered from our nearest sales office. If spare parts of a different make are used, FläktGroup declines guarantee liability for malfunctions that may result. The guarantee is valid for genuine components only and provided that the air handling unit has not been disassembled.

The order should also state the product code. The code can be found on a separate data panel located on the functional component concerned.

INSPECTION INTERVALS

A number of service schedule forms are included in separate instruction 8646, and these should be filled in by the person entrusted with the maintenance of the unit.

The service chart includes the service and inspection operations to be performed on functional components that may be part of an air handling unit. The unit contains one or more of these functional components. Any components that are not relevant may be deleted from the service chart.

The chart shall be dated and signed each time servicing is carried out. The length of the service interval is estimated at 2000 operating hours over a 12-month period and for an installation providing a normal comfort level.

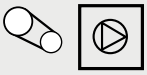
In environments with a high level of dust in the supply air or exhaust air, inspection of the air handling unit shall be performed at more frequent intervals.

We reserve the right to make changes without prior notice

SERVICE CHART, SIZE 005-090

INSTALLATION AND MAINTENANCE INSTRUCTIONS

Applicable from 20 .. .. .. to 20 .. .. ..

Symbol	3-month/9-month service			6-month service		12-month service	
	Operation	Mon.	Date Sign.	Operation	Date Sign.	Operation	Date Sign.
Air treatment unit. Casing. 	Cleaning	3 9		Cleaning		Cleaning Check the door seal	
Filter 	Check pressure drop and need for filter replacement.	3 9		Check pressure drop and need for filter replacement.		Check pressure drop and need for filter replacement.	
Carbon filter 	General inspection.	3 9		Replace cylinders or carbon as required, or cassette.		Replace cylinders or carbon as required, or cassette.	
Damper 	Check function and gasket. Replace gasket if required.	3 9		Check function and gasket. Replace gasket if required.		Check function and gasket. Replace gasket if required.	
Rotary heat exchanger 	General inspection. Check seals.	3 9		Clean rotor		Clean rotor. Check equipment for monitoring and purging.	
Plate heat exchanger 	General inspection. Check damper function.	3 9		Clean exchanger cube.		Clean exchanger cube, bypass damper and casing.	
Cooling unit 	Follow instruction 9567 and local regulations.	3 9		Follow instruction 9567 and local regulations.		Follow instruction 9567 and local regulations.	
Air heater Air cooler Liquid-connected heat exchanger Air heaters, electric. 	General inspection.	3 9		Clean finned body, droplet eliminator and drain tray		Clean finned body, droplet eliminator and drain tray. Check door seal at droplet eliminator	
Humidifier 	Check of Casing, Humidifier inserts, Droplet separator, Water filter, Basin, Sprinkler tube, Waterflow, Constant-flow valve.	3 9		Check of Casing, Humidifier inserts, Droplet separator, Water filter, Basin, Sprinkler tube, Waterflow, Constant-flow valve.		Clean casing.	
Fan 	General inspection.	3 9		Check belts, belt drive and fan bearings		Check belt tension clean impeller wheel, cover and unit casing. Check bearings and lubrication of bearings, if required, in plummer block housing.	
Plenum fan 	General inspection.	3 9		General inspection.		Check belt tension clean impeller wheel, cover and unit casing. Check bearings and lubrication of bearings, if required, in plummer block housing.	
Sound attenuator 	Cleaning as required.	3 9		Cleaning as required.		Cleaning as required.	

Specifications are subject to alteration without notice

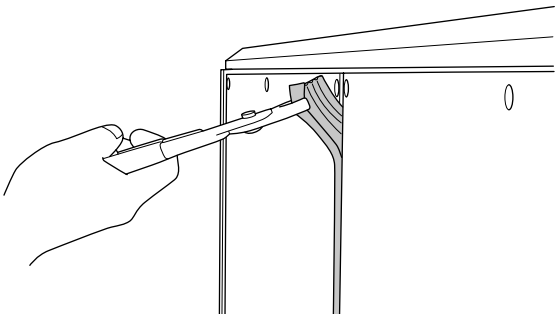
EQ EXCHANGE PANEL

INSTALLATION AND MAINTENANCE INSTRUCTIONS

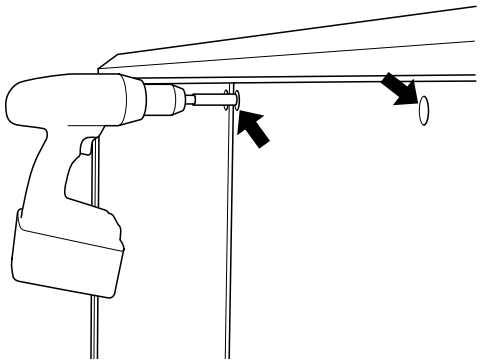
Warning!
Do not enter the air handling unit when you are replacing panels.

Warning!
In the frameless casing version, the panel is a supporting part of the structure

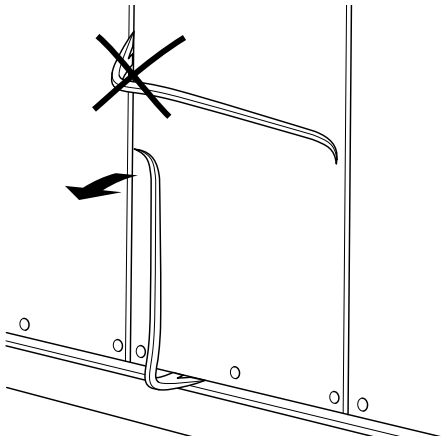
Before you begin replacing the panel, you must sufficiently brace the roof and/or intermediate floor with a secure stay that will carry the load of the functional components in the upper level of the unit. Read the code on the unit identification plate to determine whether or not the casing is frameless.



Pull off the sealing strip seated on the outside of the unit at both ends of the panel that you are replacing.



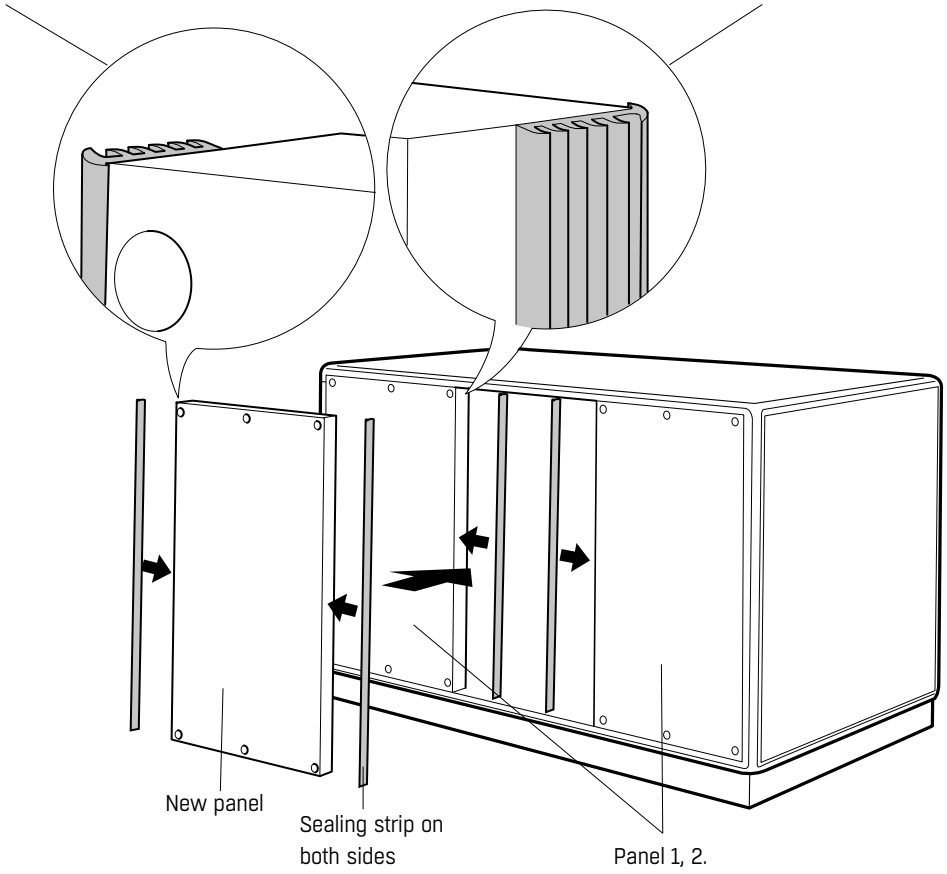
Remove all the screws that secure the panel that you are replacing.



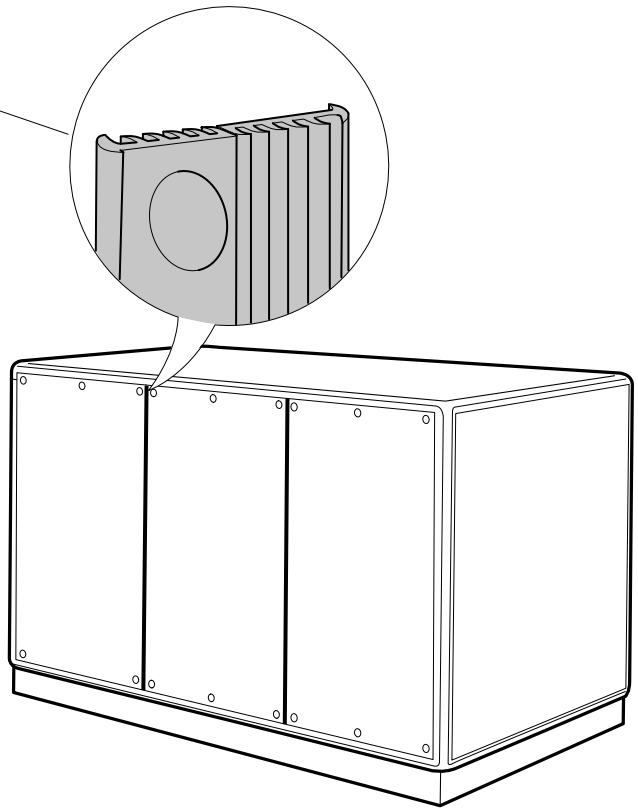
Then remove the panel. If there are two panels next to one another, you can remove them by prising them loose from underneath. N.B.! Do not prise them loose from the side as doing so may damage adjacent panels.

Be very exact about fitting the sealing strip correctly:
Sealing strip on the front part.

Panel 1 and 2:
Sealing strip on the rear part.



Be very exact about fitting the sealing strips correctly.
Push the panel into position and tighten its fixing screws.



CONNECTION ACCESSORIES

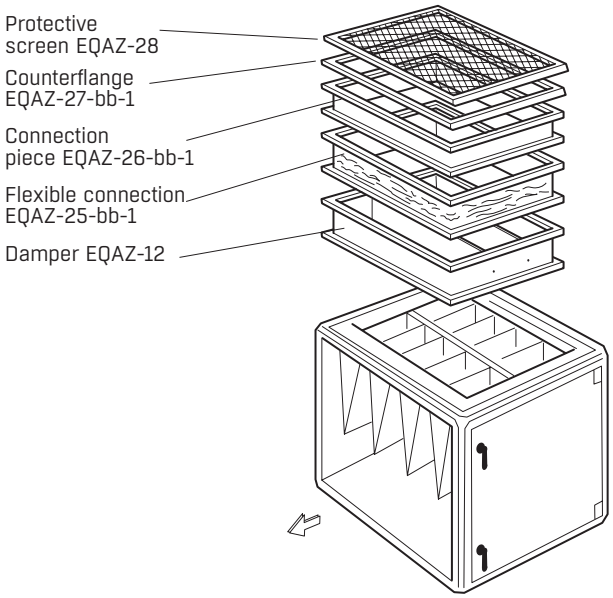
INSTALLATION AND MAINTENANCE INSTRUCTIONS

EQAZ -12 DAMPER
EQAZ-25 FLEXIBLE CONNECTION
EQAZ-26 CONNECTION PIECE
EQAZ-27 COUNTERFLANGE
EQAZ-28 PROTECTIVE SCREEN

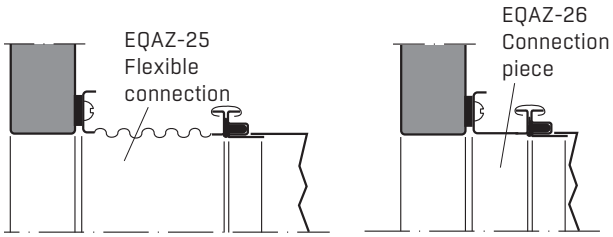
CONNECTION ACCESSORIES

Connection accessories EQAZ-25 flexible connection, EQAZ-26 connection piece and EQAZ-28 protective screen are factory-fitted to the unit section. The EQAZ-27 counterflange is delivered separately and should be fitted as shown in figure.

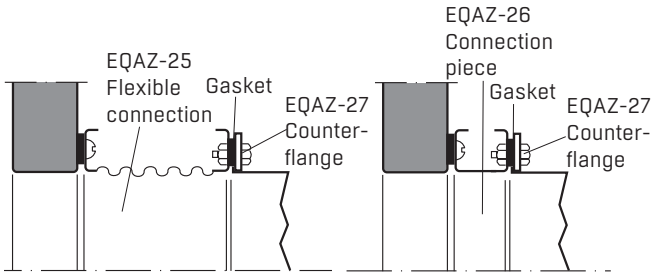
CONNECTION DUCT



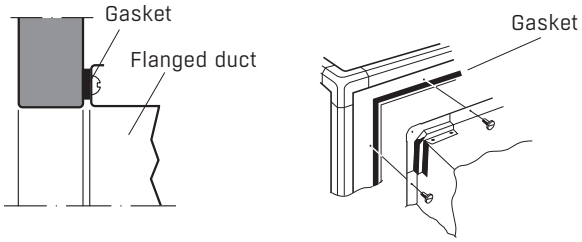
PG-JOINT



FLANGE CONNECTION



FLANGED DUCT

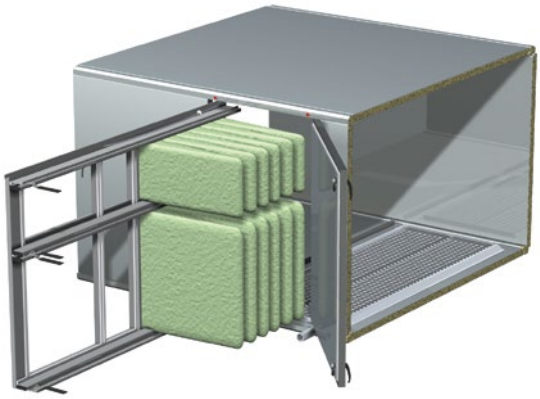


N.B.
The weight of the air duct system must not load the unit.

We reserve the right to make changes without prior notice

EQPB BAGFILTER

INSTALLATION AND MAINTENANCE INSTRUCTION



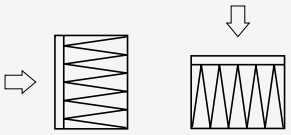
DIRECTION OF AIRFLOW

The direction of airflow is indicated by arrows on the filter section and the filter inserts.

CAUTION!

APPLIES TO SIZES 005–032.

The EQPB filter can only be installed with a horizontal or downward direction of airflow.



GENERAL

As dust is gradually collected in the filter, the flow resistance of the filter correspondingly increases. This causes a reduction in the airflow. The filter must therefore be changed regularly, at intervals determined by the dust concentration in the air.

Indication of when the filter should be changed is indicated by an electric signal from some type of filter monitor.

A set of replacement filters should be available for every installation. This also applies to cleanable filter mats, since when the mats that have been in service must be cleaned, the spare mats can be fitted thus preventing stoppage of the system.

WARNING!

Dust from dirty filters can be a health hazzard, wear face mask (lowest class FFP2) when handling.

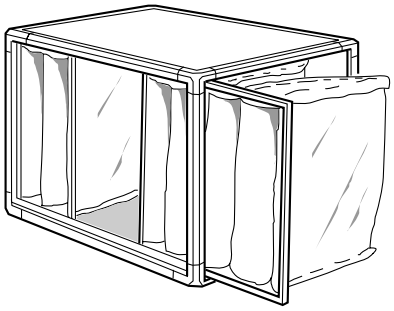
Dirty filters must be disposed of an environmentally responsible way accordance with local regulations.

DRAIN TRAY

Before you begin cleaning, remove the perforated spacer plate.

We reserve the right to make changes without prior notice

TO CHANGE THE EQPB FILTER, SERVICING THE CLEAN SIDE



A. Open the inspection cover.

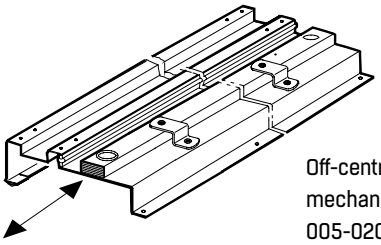
B. Unfasten the filter cassettes by pulling the hand-actuated off-centre bolt with your finger (sizes 005-020, 027, 036) or lever (023, 032, 041-090), see Fig. 1- 2.

   This will disengage the locking mechanism and allow the cassettes to by withdrawn without damaging the sealing strips.

C. Check that the sealing strip is not damaged.

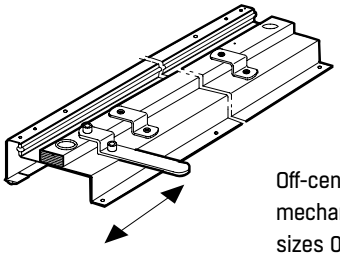
D. Insert the new filter inserts and check that the sealing strip is tight against the filter insert. Insert the filter insert along the guide rails and push the offcentre bolt/lever in again.

E. Check that the sealing strip on the inspection door is not damaged.



Off-centre locking mechanism, sizes 005-020, 027, 036.

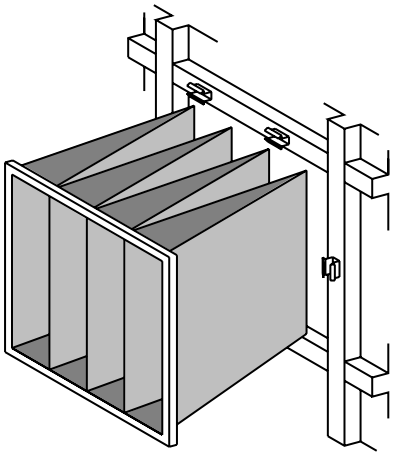
Fig. 1



Off-centre locking mechanism with lever, sizes 023, 032, 041-090.

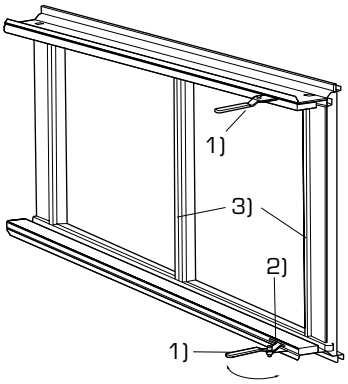
Fig. 2

TO CHANGE THE EQPB FILTER, SERVICING THE CONTAMINATED SIDE SIZES EQPB-081 - EQPB-090



The filter bag is held in position by locking springs. Make sure that the rubber gasket is intact as you are changing the filter bags.

TO CHANGE FILTERS, SIZES 023, 032, 041-090



Press in the lever, 1, for the off-centre bolt, 2, to release the filter cassettes. Remove the contaminated filter.

Wipe the filter space clean with a cloth. Check that the rubber gaskets, 3, are not damaged before fitting a new filter.

No sealing strip is required between the cassettes.

Carefully insert the new filter cassettes so that the filter bagswill not be damaged.

We reserve the right to make changes without prior notice

TO ORDER REPLACEMENT FILTERS

Replacement filters can be ordered from your nearest FläktGroup sales representative.

Replacement filter for the EQPB, set **EQPZ-03-bbb-cc-dd-e-f-1**

Unit size **(bbb)**
005-090

Filter class **(cc)**
04 = G 4
05 = F 5
06 = F 6
07 = F 7
08 = F 8
09 = F 9

Type of filter **(dd)**
01 = synthetic
03 = compact
04 = Cityflo (glass fibre with carbon)
22 = glass fibre, P-marked
24 = glass fibre, standard

Length of filter **(e)**
3 = short bag (applies to upright filter pockets only)
4 = long bag (applies to upright filter pockets only)
5 = compact and carbon filter (d=03,04, 05)
6 = extra long bag

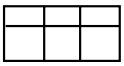
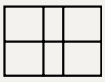
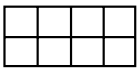
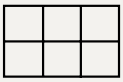
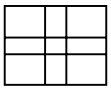
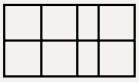
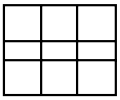
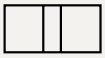
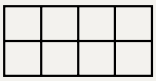
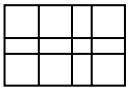
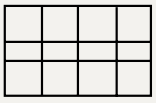
Filter frame **(f)**
1 = galvanised sheet steel
2 = plastic (PP)

Pre-filter for the EQPB, set **EQPZ-05-bbb-c-d-1**

Unit size **(bbb)**
005-090

Filter class **(c)**
2= G2 50 mm aluminium, galvanized sheet steel cassette
3= G3 50 mm synthetic/cotton, paper cassette
8= G4 50 mm synthetic/cotton, plastic cassette

Type of filter **(d)**
1 = 50mm glass fibre, cardboard cassette
2 = 50mm glass fibre, sheetmetal cassette

Unit size	Filter dimensions and Filter arrangement	Unit size	Filter dimensions and Filter arrangement
005	592x287 	**041**	3x(592x592) + 3x(592x287) 
008	792x392 	**045**	4x(592x592) + 2x(287x592) 
009	592x592 	**050**	8x(492x492) 
011	2x(492x492) 	**054**	6x(592x592) 
014	592x592 + 287x592 	**056**	4x(592x592) + 2x(592x287) + 2x(287x592) + 287x287 
018	2x(592x592) 	**063**	6x(592x592) + 2x(287x592) 
020	592x592 + 287x592 + 592x287 + 287x287 	**068**	3x(592x592) + 3x(592x287) 
023	2x(592x592) + 287x592 	**072**	8x(592x592) 
027	2x(592x592) + 2x(592x287) 	**079**	6x(592x592) + 3x(592x287) + 2x(287x592 + 287x287 
032	4x(392x792) 	**090**	8x(592x592) + 4x(592x287) 
036	4x(592x592) 		

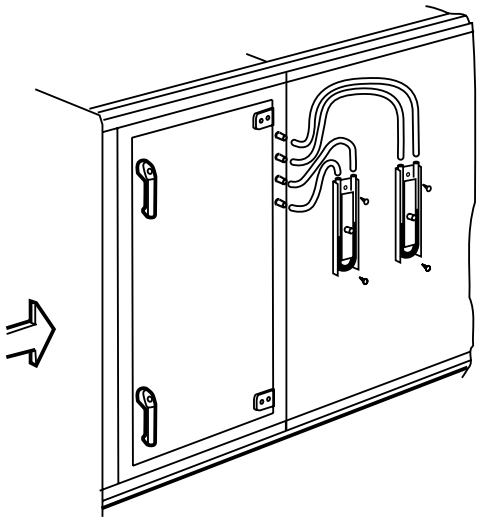
We reserve the right to make changes without prior notice

PRESSURE MEASURING EQUIPMENT

INSTALLATION INSTRUCTION

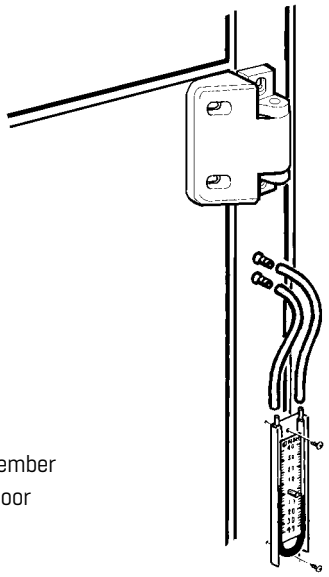
EQPZ-12 (B=1) MANOMETER

Version for sizes 005-090



Manometer (manometers) EQPZ-12 (b=1) mounted on panel filter EQPA or filter EQPB.

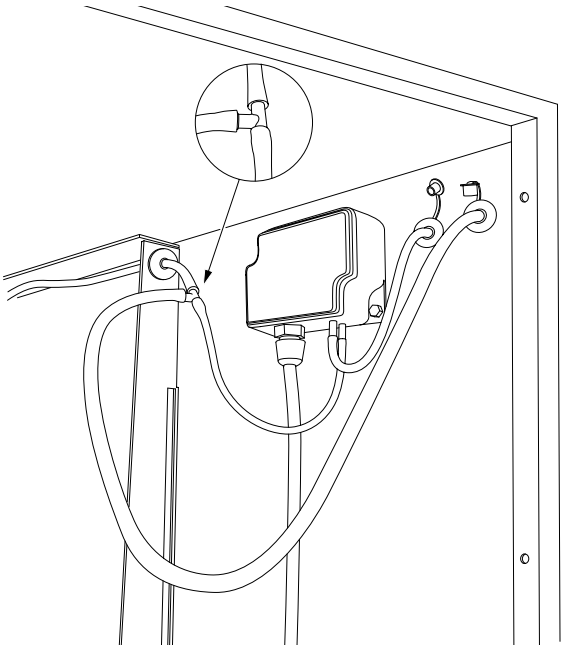
Version for sizes 081-216



1. EQ-frame member
2. Inspection door

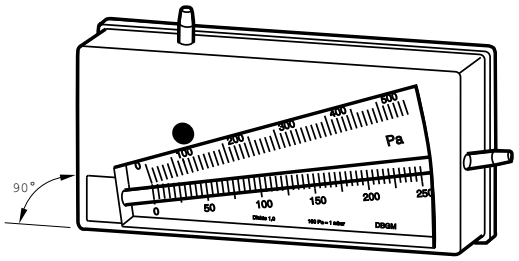
Measurement range of the manometer: up to 400 Pa.
Temperature range –25 °C → +100 °C.
Use screws to secure the manometer (manometers) to the adjacent panel or to a separatelymounted plate, and connect the hoses supplied as shown to the measurement tappings on the framework.

Note!
When connecting a analog manometer, connect T-coupling and tube as shown in the image.



Note!
Two manometers for installations with pre-filter (EQPB).

EQPZ-12 (B=3) DIFFERENTIAL MANOMETER

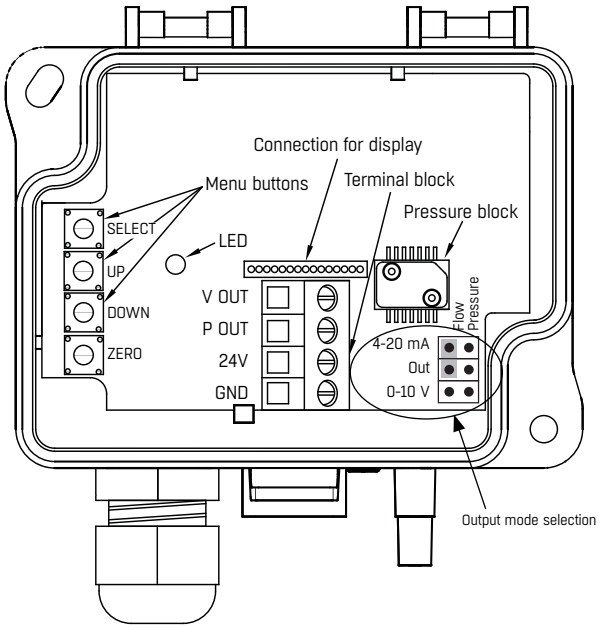


Differential Manometer EQPZ-12 (b=3)
Temperature range –20 °C → + 50 °C

Connect EQPZ-12 (b=3) differntial manometer with a tube in the same manner as EQPZ-12 (b=1). To ensure correct measurements, it is important that the manometer bemounted horizontally and in right angle.

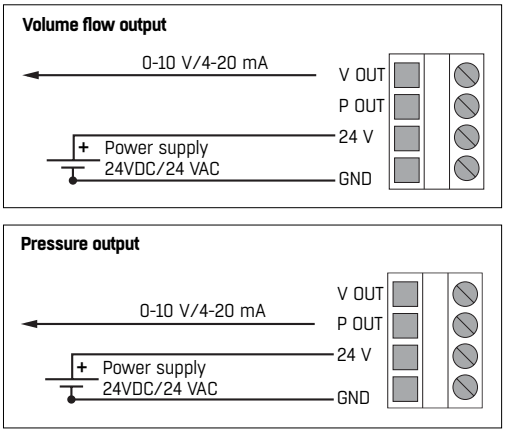
EQPZ-12 (B=4) PRESSURE MEASURING EQUIPMENT

INTERNAL OVERVIEW

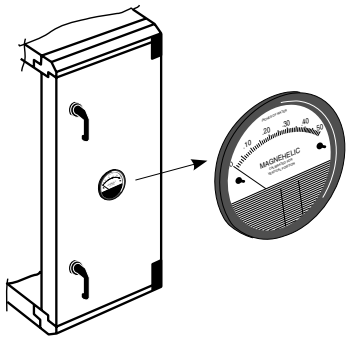


WIRING DIAGRAMS

For CE compliance, a properly grounded shielding cable is required.



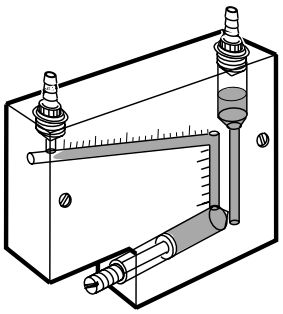
EQPZ-25, EQPZ-26 DIFFERENTIAL MANOMETER



The differential manometer is delivered mounted in a recess in the cover and with the tubes connected.
Temperature range –6 °C → +60 °C.

Note!
EQPZ-26 consist of two differential manometers.

EQPZ-12 (B=2) DIFFERENTIAL MANOMETER



Temperature range –40 °C → + 50 °C

FläktGroup

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FläktGroup is the European market leader for smart and energy efficient Indoor Air and Critical Air solutions to support every application area. We offer our customers innovative technologies, high quality and outstanding performance supported by more than a century of accumulated industry experience. The widest product range in the market, and strong market presence in 65 countries worldwide, guarantee that we are always by your side, ready to deliver Excellence in Solutions.

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Air Management | Air Conditioning & Heating | Controls | Service

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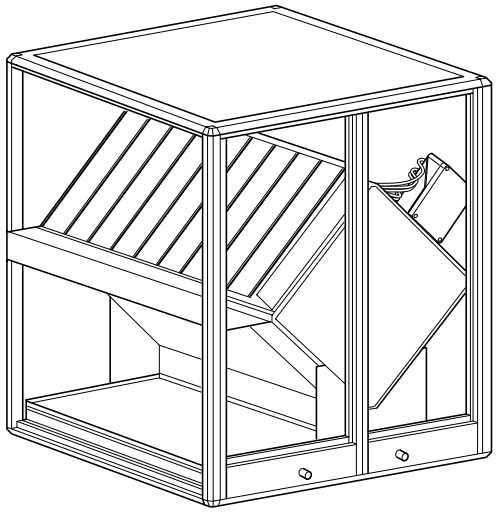
RECUTERM® EQRK CROSSFLOW - PLATE HEAT EXCHANGER

INSTALLATION AND MAINTENANCE



GENERAL DESCRIPTION

The Recuterm Crossflow is delivered complete with the plate heat exchanger, drain tray, by-pass section and dampers. The high efficient Recuterm Crossflow has to be protected from freezing during winter period.

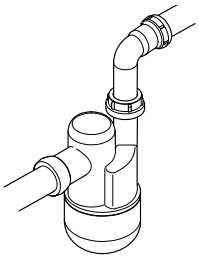
There are 3 levels of frost protections available:

- Level 1 By pass damper, a simplified frost protection. For warm winter climate > -5 °C
- Level 2 Advanced frost protection, sectionalized frost protection combined with a by pass function. For winter climate > -26 °C.
- Level 3 Advanced frost protection + preheater. Function as Level 2 combined with an electrical preheater. For cold winter climate < -26 °C or/and high humidity level in extract air.

Level 2 and 3 includes a stand alone frost protection controller with necessary sensors, an active frost protection function.
See page 2 for further details.

The eQ unit is delivered complete with factory fitted frost protection controls (Level 2 and 3), this functionality is included.

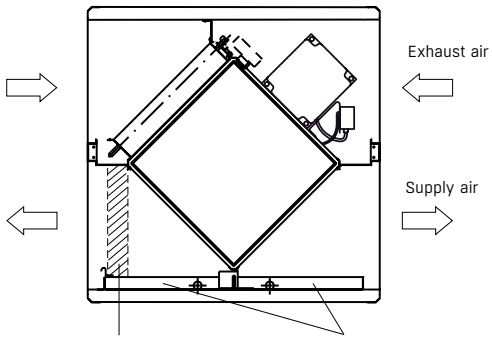
Where controls are fitted on site, this control signal must be provided on site. The Recuterm Crossflow is equipped with a sloping drain tray on the supply and exhaust air side for collecting the condensate. The drain trays have separate drain connections and should be connected to a water trap. The drain connection has an outside diameter of 32 mm. The EQAZ-08 water trap is available as an accessory.



EQAZ-08

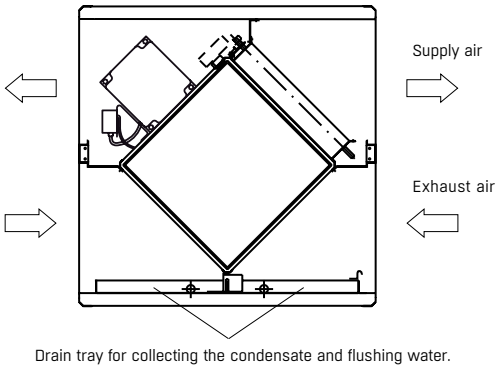
BASIC DESIGN

Supply air at the bottom



Ensure that the damper blades are open during flushing.

Supply air at the top (Climate winter >-5 °C)



Ensure that the damper blades are open during flushing.

FROST PROTECTION

LEVEL 1

FROST PROTECTION WITH SHUT-OFF AND BY-PASS DAMPER

The by-pass and shut-off dampers of the heat exchanger are mechanically interconnected. As one of the dampers closes, the other will open. The dampers are designed for heat transfer control and defrosting.

LEVEL 2 AND 3

ADVANCED FROST PROTECTION

The advanced frost protection, level 2/3 includes a stand alone freezing protection controller with necessary components, a temperature and humidity sensor in the extract air and temperature sensor in the exhaust air.

The function is based on dew point control on the exhaust air side and frost is prevented by controlling a 4 damper sectional defrosting, a by-pass damper and for very cold climates, a preheater. The dampers are intended for heat transfer control and defrosting. During the defrosting period, one damper section at a time closes for a time depending on the outdoor temperature. In extreme cases two dampers can be closed. The by-pass damper is closed. Since only a small part of the heat exchanger is shut off, the supply air flow rate will be reduced by not more than 5-10 % during the actual defrosting period. During extreme conditions the flow can decrease further. The magnitude of the flow reduction is dependent on the fan type and the operating point of the fan.

When section-by-section defrosting is not sufficient, the by-pass damper function will be activated. For extremely cold climates an electrical preheater is required and will be activated when the out door reaches the set point (-26 °C dependent on the type of Recuterm). If water/liquid heater is choosen instead of the electrical preheater the coil control must controlled by the AHU controller. This is included in FläktGroup AHU controller if used.

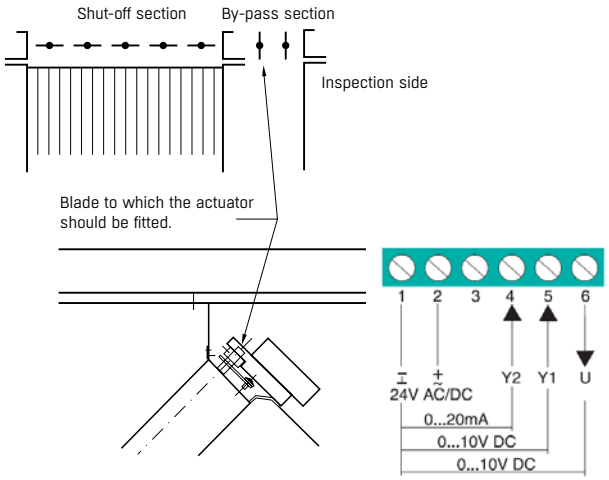
INSTALLATION

LEVEL 1

FITTING THE ACTUATOR TO THE BY-PASS DAMPER (IF NOT MOUNTED)

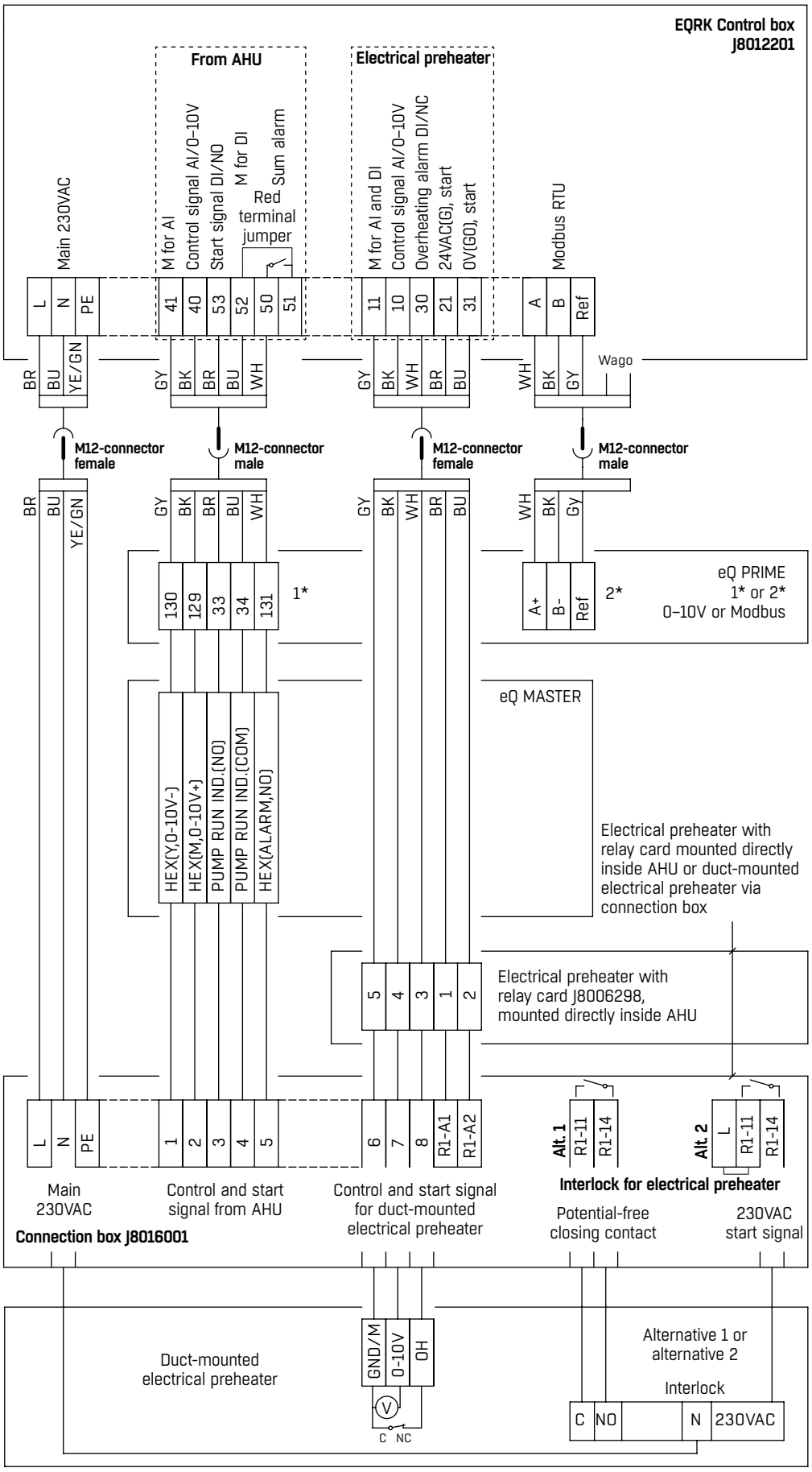
Fit the actuator to the blade which is nearest to the heat exchanger. As an example, if the exchanger has two blades as by-pass section, fit the actuator to the second shaft viewed from the inspection side.

Check that the damper closes and opens at the end of the actu-ator travel.



LEVEL 2 AND 3

CONNECTION DIAGRAM FOR RECUTERM - COUNTERFLOW, EXCHANGER WITH SECTION-BY SECTION DEFROSTING



The EQRK control box can be connected to several different control systems. It needs three different signals from and to a control system:

1. A control signal 0-10V for 0-100% recovery from control system to EQRK.
2. A start signal from the control system to EQRK that the AHU is in operation, potential-free closed contact.
3. A sum alarm to the control system that something has gone wrong. In the basic version, this output closes to reference (M) or GND, which is the same in this system.

If the sum alarm is desired as a potential-free closing contact, the red bracket between terminals 51 and 52 must be removed. This gives a potential free contact between terminals 50 and 51. This solid state output can be loaded with a maximum of 60V AC/DC and 200mA.

In areas with very low outdoor temperatures in the winter, EQRK can control an electrical preheater. There are three different signals to and from an external electrical preheater:

1. A control signal 0-10V for 0-100% of the power of the electrical preheater.
2. An alarm from overheating of the electrical preheater.
3. Interlocking of the electrical preheater, 24VAC.

From the EQRK control box there is a 24VAC start signal available to put the electrical preheater in operating mode. When the electrical preheater is in operating mode, the control system can control heating power via the control signal 0-10V. The start signal is interlocked over a pressure switch that measures the pressure drop across the supply air fan, the overheating protection, and the start signal from the control system.

If the start signal needs to be a potential-free contact that can handle 230VAC, a relay must be connected between the control box and the electrical preheater. In the electrical preheater mounted inside of the AHU, there is a relay card mounted that has this function.

For duct-mounted electric prehetaer, the connection box may be needed to obtain a relay between 24VAC and 230VAC. With the connection box, you can also switch to an active 230VAC start signal if needed. In the connection diagram, this is shown as option 1 and 2.

EQRK control box	
41	GND. Reference to analogue control signal (40).
40	Analogue control signal 0-10VDC to VVX from external control system with (41) as reference.
53	External interlocking of the electrical preheater. Potential-free connection to (52) for operation.
52	Measuring zero M for digital input (53).
50	Potential-free closing contact for sum alarm from VVX (C).
51	Potential-free closing contact for sum alarm from VVX (NO) Max load 60V 200mA.

11	GND. Reference to analogue control signal (10) and digital alarm input (30).
10	Analogue control signal 0-10VDC from VVX to preheating battery with (11) as reference.
30	Digital overheating alarm input from the electrical preheater to VVX. Potential-free closed contact from (11, NC)
21	24VAC start signal of the electrical preheater.
31	0V to start signal of the electrical preheater.

ELECTRICAL PREHEATER CONTROL

For the start signal to be activated, three closed contacts and recovery signal need to be available in EQRK:

1. Pressure switch that measures the pressure drop across the supply air fan is connected to DI1 terminals 13 and 14.

Note: The pressure switch is connected directly on the green circuit board, not the grey terminals. The signal is to give a close contact to DI1 when there is an air flow through the electrical preheater.

2. Overheating protection is connected to DI2, 30 and 11 on the grey terminals. The signal is normally closed.
3. Start signal from external control system is connected to DI7, 53 and 52 on the grey terminals. The signal must be closed for operation.
4. Recovery signal from AHU must be more than 0%.

When these four signals are present at the same time, DO5, 21 and 31 will send out a 24VAC start signal to the electrical preheater. At the same time, the controller is started and will, via the control signal 0-10V, keep the intake temperature constant at the set setpoint. Factory value for EQRK -26° C. Local variations may occur as needed.

Connection box	
1	GND. Reference to analogue control signal (40) and digital start signal (53).
2	Analogue control signal 0-10VDC to VVX from external control system with (41) as reference.
3	External interlocking of the electrical preheater. Potential-free connection to (41) for operation.
4	Potential-free closing contact for sum alarm from VVX (C).
5	Potential-free closing contact for sum alarm from VVX (NO) Max load 60V 200mA.

6	GND. Reference to analogue control signal (7) and digital alarm input (8).
7	Analogue control signal from VVX to electrical preheater 0-10VDC.
8	Digital alarm input from the electrical preheater to VVX. Potential-free closed contact (NC) when normal.
R1-A1	24VAC relay for start signal of the electrical preheater.
R1-A2	0V relay for start signal of the electrical preheater.

The connection box is an aid for using one or more multi-conductors to move the connection of control signals to the outside of the unit. The connection box also contains an interlock relay for starting the electrical preheater if it needs a potential-free contact or operation 230VAC. In the delivery, the contacts R1-11 and R1-14 are potential-free.

On relay R1 there is a potential-free contact 11-14 to use for starting and stopping the electrical preheater. For active control with 230VAC, a terminal jumper must be made in the connection box between L and R1-11. Then the controlled 230VAC on R1-14 is available to use together with N. This connection requires good electrical skills.

MAINTENANCE

SERVICE INTERVALS

Inspection and possible cleaning should normally be carried out at intervals of 6 months.

This interval is based on an assumed operating time of about 2000 hours over a 12-month period and a normal comfort ventilation installation. If the dust content in the supply and/or exhaust air is high, the unit should be inspected more frequently.

TO REMOVE DRY DUST

Vaccum or blow trough the heat exchanger with compressed air. Check the inspection door gasket.

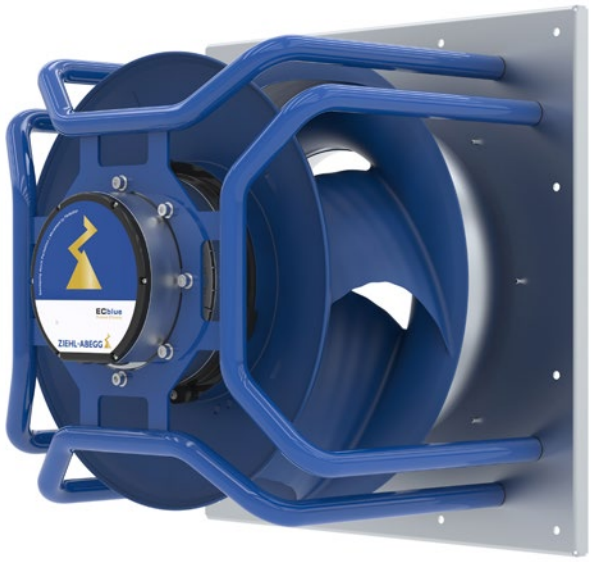
TO REMOVE FATTY DUST

A. Apply cleaning agent to the face areas of the heat ex changer. A suitable degreasing agent is ULCZ-01 which can be ordered from your nearest sales office.
B. Wait for 10–15 minutes.
C. Flush with water.
D. Vacuum clean or blow clean with compressed air.
E. Check the inspection door gasket. Cleaning can also be carried out by high-pressure spraying, and the nozzle should then be held 3 - 5 cm from the face. After flushing, remove the water as above.

Caution!
If a nozzle that delivers 2 l/min at 7 bar is used, the pressure at the nozzle must not exceed 25 bar if the nozzle is used at an angle of more than 20 ° to the face. The face area may otherwise be deformed.

EQLC PLENUM FAN, DIRECT-DRIVEN
PLENUM FAN, DIRECT-DRIVEN

INSTALLATION AND MAINTENANCE INSTRUCTION



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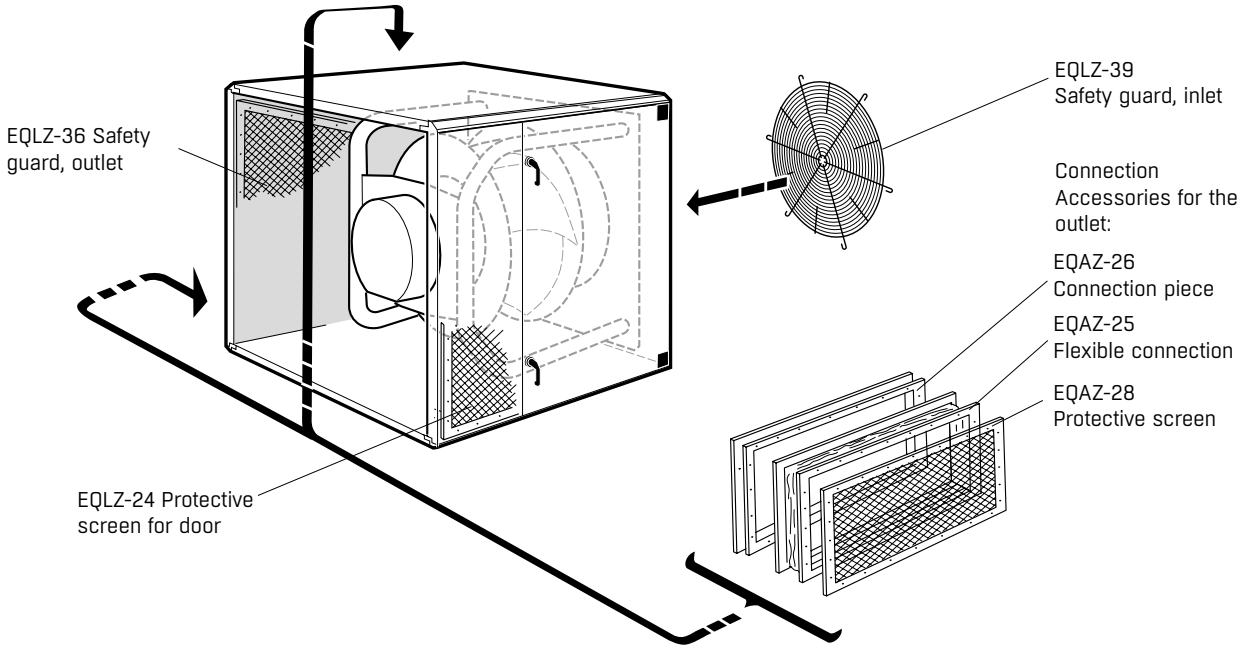
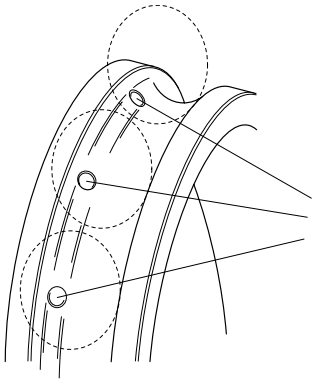
EQLC FAN, INSTALLATION OPTIONS



CHECKS TO BE MADE PRIOR TO COMMISSIONING

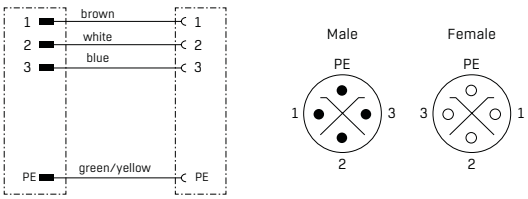
- Check that the fan complies with the EU machinery directive. All inspection doors on the fan section and other function is equipped with door locks with a key. Additional safety can be added. EQLZ-37 is a protective screen which can be placed at the inlet to the fan section. EQLZ-36 is a protective screen that can be added to the outlet of the fan section if another AHU function is placed downstream of the fan. EQAZ-28 is protective screen when the fan section is placed at the outlet of the AHU. EQLZ-24 is additional protection behind the inspection door at the fan section.
- Check that a qualified electrician has handed over written approval for commissioning.
- Check that the fan impeller rotates freely and that no objects which can be drawn in and damage the fan have been left in the installation.
- Make sure all screws and nuts that secure the wall and fan are tightened.

Important!
If the fans are idle for more than 3 months prior to or after installation, the fans should be occasionally rotated by hand at regular intervals.
If this is not done, the bearings are liable to become damaged due to overloading as shown in the adjacent illustration.



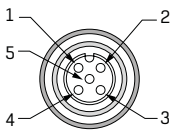
ELECTRICAL CONNECTIONS

M12 Power connector, M12 signal connector and Modbus control is supplied by default.



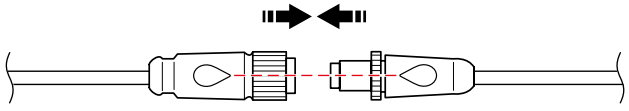
In use of 0-10V control or other cables. Unscrew the plastic lid and remove the M12 connectors. Use cable gland M16x1.5, E1476702.

Pin designation and cable color for m12 contact (female)

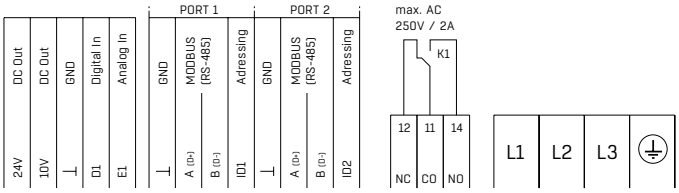


KEY
1 = Brown
2 = White
3 = Blue
4 = Black
5 = Grey

White	A+
Black	B-
Grey	Ref



The cables need to be connected correctly and aligned in the right position.



Note: *Port1 or port2 can be used.*

Modbus connection

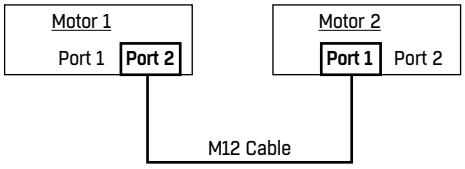
GND	Ref
A (D+)	A+
B (D-)	B-

0-10V

D1 (start signal)	GND
E1 Analog In	Ctrl signal (0-10V)

K1 Relay

During operation	Relay energized
Failure	Relay de-energized



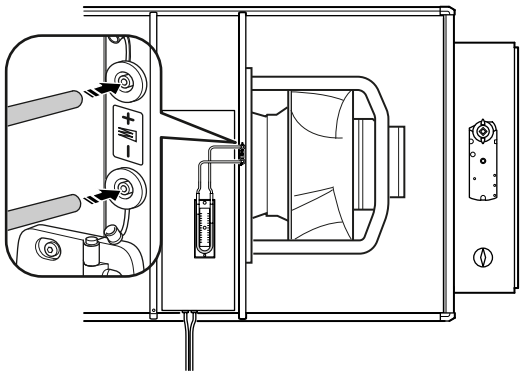
"In case of two fans, connect M12 cable from port2 in motor1 to port1 in motor2."

MEASURES BEFORE STARTING

The fan must not be started with the damper on the suction or delivery side closed. However the fan motor may be briefly energized with the inspection door open for checking that the direction of impeller rotation is correct.

Check before starting the fan that the impeller rotates freely and that no objects, which can be drawn in and damage the fan, have been left in the installation.

AIRFLOW MEASUREMENT



The EQLC has equipment for measuring the airflow.

The airflow, q, can be measured by applying a manometer reading of Δp (Pa), and a constant, k, using the following formula:

$$q = \frac{1}{k} \cdot \sqrt{\Delta p} \quad m^3/s$$

The manometer reading, Δp, which is the difference between the pressure in the suction chamber by the fan inlet and the pressure inside the inlet cone, can be read with a manometer (pressure range of up to 6000 Pa) which should be connected with a 4 mm dia. tube to 2 externally located pressure tappings. The value of the constant k is specified in the table below.

Important!

For EQLZ-42 U-tube manometers, use only the blue manometer fluid supplied with the instrument. Never use any other type of fluid. Precision-adjust the zero point with the zero adjustment screw.

A flow indicator with built-in pressure transducer STAZ-23, STBZ-23 (available as an accessory) should be connected by means of tubes to the external pressure tappings. This instrument converts the mano-meter pressure reading to a flow (m^3/s) which is shown on a display screen and transmits a 0–10 V output signal, linear with the flow.

If the air handling unit is supplied with a control system, the flow can be read directly in the control panel display.

NB!

In the case of air handling units supplied with a control system, the pressure tappings in the end connection panels of the unit are not connected to the airflow sensor of the fan.

If you still want to read the manometer pressure with an external manometer, you can connect the tubes from the airflow sensor of the fan across T-nipples to the pressure tap-pings in the end connection panel of the air handling unit.

If this external means of measuring flow will not be permanent, the tubes must be restored to their original condition.

Composite fan		
Size GAEC-aaa-b	k-factor	Size
005-2-f	53,7	025
008-2-f	42,4	028
008-3-f	34	031
009-2-f	42,4	028
009-3-f	34	031
011-2-f	34	031
011-3-f	25,7	035
014-1-f	34	031
014-2-f	25,7	035
014-3-f	20	040
018-1-f	25,7	035
018-2-f	20	040
018-3-f	16,4	045
020-1-f	25,7	035
020-2-f	20	040
020-3-f	16,4	045
023-1-f	16,4	045
023-2-f	12,9	050
023-3-f*	10	040
027-1-f	16,4	045
027-2-f	12,9	050
027-3-f*	10	040
032-1-f	12,9	050
032-2-f*	10	040
032-3-f*	8,2	045
036-1-f	12,9	050
036-2-f*	10	040
036-3-f*	8,2	045
041-1-f*	10	040
041-2-f*	8,2	045
041-3-f*	6,5	050
045-1-f*	10	040
045-2-f*	8,2	045
045-3-f*	6,5	050
050-1-f*	8,2	045
050-2-f*	6,5	050
050-3-f*	5,1	056
054-2-f*	6,5	050
054-3-f*	5,1	056
056-2-f*	6,5	050
056-3-f*	5,1	056
063-2-f*	6,5	050
063-3-f*	5,1	056
068-2-f*	5,1	056
068-3-f	-	-
072-2-f*	6,5	050
072-3-f*	5,1	056
072-3-f*	5,1	056
079-2-f*	5,1	056
079-2-f*	5,1	056
079-3-f	-	-
090-2-f	-	-
090-3-f	-	-

* Dual fans

Aluminum fan		
Size GAEC-aaa-b	k-factor	Size
005-2-f	60	025
008-2-f	48	028
008-3-f	37,9	031
009-2-f	48	028
009-3-f	37,9	031
011-2-f	37,9	031
011-3-f	29,8	035
014-1-f	37,9	031
014-2-f	29,8	035
014-3-f	23,4	040
018-1-f	29,8	035
018-2-f	23,4	040
018-3-(3-5)	18,3	045
018-3-6	14,3	050
020-1-f	29,8	035
020-2-f	23,4	040
020-3-(3-5)	18,3	045
020-3-6	14,3	050
023-1-(3-5)	18,3	045
023-1-6	14,3	050
023-2-f	14,3	050
023-3-f*	11,7	040
027-1-(3-5)	18,3	045
027-1-6	14,3	050
027-2-f	14,3	050
027-3-f*	11,7	040
032-1-f	14,3	050
032-2-f*	11,7	040
032-3-(3-5)*	9,15	045
032-3-6*	7,15	050
036-1-f	14,3	050
036-2-f*	11,7	040
036-3-(3-5)*	9,15	045
036-3-6*	7,15	050
041-1-f*	11,7	040
041-2-(3-5)*	9,15	045
041-2-6*	7,15	050
041-3-f*	7,15	050
045-1-f*	11,7	040
045-2-(3-5)*	9,15	045
045-2-6*	7,15	050
045-3-f*	7,15	050
050-1-(3-5)*	9,15	045
050-1-6*	7,15	050
050-2-f*	7,15	050
050-3-f*	5,85	056
054-2-f*	7,15	050
054-3-f*	5,85	056
056-2-f*	7,15	050
056-3-f*	5,85	056
063-2-f*	7,15	050
063-3-f*	5,85	056
068-2-f*	5,85	056
068-3-f	-	-
072-2-f*	7,15	050
072-3-f*	5,85	056
079-2-f*	5,85	056
079-3-f	-	-
090-2-f	-	-
090-3-f	-	-

* Dual fans

If two fans are installed in the fan section, the k-value is appli-cable to the total airflow generated by both fans

TEMPERATURE CORRECTION

The flow scale on the indicating instrument and the flow formula above apply to air with a temperature of +20 °C. For other temperatures, the flow must be corrected using the following formula:

$$q = q_{20} \sqrt{\frac{(273 + t)}{293}}, \ m^3/s$$

where q = the actual flow through the fan, q_{20} = the flow reading and t = the current temperature in °C.

MAINTENANCE

Warning!
In order to prevent personal injury and damage to machinery, the safety isolating switch must be switched off and the safety fuses of the fan must be removed before beginning work on the fan.

The fan must be inspected and cleaned every 6/12th month. The length of the interval has been determined on the basis of approx. 2000 hours of operation during a 12-month period and for a normal comfort installation. In environments where the dust content is high in the supply and/or extract air, the air handling unit will have to be inspected and cleaned-more often.
The fan is accessible through the inspection door and cleaned with the fan in place.

CLEANING

Both the supply air and the extract air fan should be inspected and cleaned whenever the need arises. Dust tends to collect mainly on the inner side of the fan blades.
The best way to clean the fan impeller is by using a vacuum cleaner equipped with a soft nozzle. Be careful to remove all the impurities from the fan blades so that the fan will not come out of balance.
After adjusting or cleaning the fan, check that it runs free of vibration.

TO REMOVE THE FAN FROM THE AIR HANDLING UNIT CASING

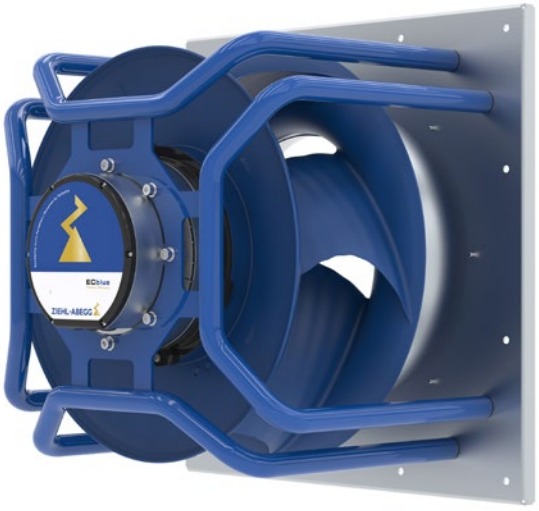
1. Remove the power and control cables from the fan and the fan wall.
2. Remove the frame of the inspection door including the door and the fixed panel by removing the bolts beneath the cover plenums. Do not remove the cable from the door post.
3. Remove the screws attaching the fan wall to the top and bottom guides in the unit. Warning! Support the fans at the back before removing any screw to prevent the walls and fans to fall over and cause injury.
4. Pull the fan wall out. Take care not to damage the gasket on the unit corner post. The fan can be removed halfway without external support.
5. To remove the fan from the wall, remove all the nuts and bolts around the inlet plate. Observe! The weight of the fan requires assistance to avoid personal injury.
6. Reassemble in reverse order.

TO REPLACE THE MOTOR

Carry out maintenance on the motor according to the instructions provided by the motor supplier.

EC-FANS AND MOTORS WITH HIGHEST EFFICIENCY

ELECTRICAL INSTALLATION



CONTENT **Page**

1 SAFETY INSTRUCTIONS

1.1 PRODUCT SAFETY

The device conforms to the state of the art at the time of delivery and is fundamentally considered to be reliable. The device and its accessories must only be used in a flawless condition and installed and operated in compliance with the assembly instructions and/or operating instructions. Operating outside the device's technical specifications (see name plate and attachment/technical data) can lead to a defect in the device and additional damage!

INFORMATION

A separate fault and performance monitoring-system with an alarm signal function is necessary in order to prevent personal injuries and material damages during malfunctions and in case the device fails. Substitute operation must be taken into consideration! The design and installation of the system must comply with local regulations and directives.

1.2 REQUIREMENTS PLACED ON THE PERSONNEL/DUE DILIGENCE

Persons entrusted with the planning, installation, commissioning and maintenance and servicing in connection with the frequency inverter must have the corresponding qualifications and skills for these jobs.

In addition, they must be knowledgeable about the safety regulations, EU/EC directives, rules for the prevention of accidents and the corresponding national as well as regional and in-house regulations. Personnel to be trained or instructed and apprentices are only permitted to work on the device under the supervision of an experienced person. This also applies to personnel undergoing general training. Comply with the legal minimum age.

1.3 WORK ON THE DEVICE

INFORMATION

Mounting, electrical connection, and start-up operation may only be carried out by an electrical specialist in accordance with electrotechnical regulations (e.g. EN 50110 or EN 60204)!

Danger due to electric current

- It is generally forbidden to carry out work on electrical live parts. Protection class of the device when open is IP00! It is possible to touch hazardous voltages directly.
- The rotor is not protected against indirect contact neither by supplementary or reinforced insulation nor by connection to safety-earth in accordance with EN 60204-1, therefore the system constructor must provide protection by enclosure in accordance with EN 61140 before the motor is connected to a power source. This protection can be achieved for example by a guard grille (→ Product overview: Application operational area and Installation: General).
- When the motor runs independently due to air flowing through or if it continues to run down after being turned off, dangerous voltages of over 50 V can arise on the motor internal connections through operation of the generator.
- The safe isolation from the supply must be checked using a **two-pole** voltage detector.
- Even after disconnecting the mains voltage, life-threatening charges can appear between the protective ground "PE" and the mains connection.
- The protective earth is conducting high discharge currents (dependent on the switching frequency, current-source voltage and motor capacity). Earthing in compliance with EN specifications shall therefore be observed even for testing and trial conditions (EN 50 178, Art. 5.2.11). Without earthing, dangerous voltages can be present on the motor housing.
- Maintenance work may only be carried out by suitably qualified personnel.

Waiting period at least 3 minutes!

- Through use of capacitors, danger of death exists even after switching off the device through directly touching the energized parts or due to parts that have become energized due to faults.
- The controller housing may only be removed or opened when the power line has been switched off and a period of three minutes has elapsed since switching it off.

Attention, automatic restart!

- The fan/motor may switch on and off automatically for functional reasons.
- After power failure or mains disconnection an automatic restart of the fan takes place after voltage return!
- Wait for the fan to come to a complete standstill before approaching it!
- The exterior rotor turns during operation of the external rotor motor!

2 ELECTRICAL INSTALLATION

2.1 SAFETY PRECAUTIONS

Danger due to electric current

- Work on electric components may only be carried out by trained electricians or by persons instructed in electricity under the supervision of an electrician in accordance with electrical engineering regulations.
- The 5 electrical safety rules must be observed!
- It is forbidden to carry out work on electrically live parts! Even after disconnection, the dc-link is still live. Always wait at least 3 minutes.
- Cover neighbouring electrical equipment during installation work.
- Other measures may be necessary to achieve safe electrical isolation.
- Connect fan only to electrical circuits that can be disconnected with an all-pole isolating switch.
- Operating the device with the housing cover removed is prohibited because energized, exposed parts are present inside the device. Disregarding this regulation can lead to severe personal injury.
- The device owner is responsible for the EMC of the entire plant according to the locally applicable standards.
- Electrical equipment must be checked regularly: Loose connections are to be retightened and damaged cables must be replaced immediately.

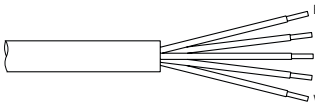
2.2 VERSION WITH CONNECTION CABLES

INFORMATION

- In versions with connecting leads the connection is made to the colour coded wires. Note the cable bands on the connecting leads and the connection plan in the enclosure to the assembly instructions.
- The type, length, colour coding and connection assignment of the connecting leads may vary depending on the version.
- Read the following chapter “Connection to terminals in the terminal compartment” for a new connection to the terminals in the terminal compartment.

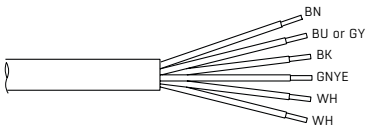
Example for possible version

1 ~ ECblue, for line and relay: hose cable 5 x 1.5 mm² (LiF9Y11Y-JB)



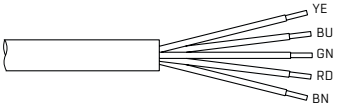
Brown	L1	Line
Blue	N	
Green-yellow	PE	
White	11	Relay K1
White	14	

3 ~ ECblue, for line and relay: hose cable 6 x 1.5 mm² (LiF9Y11Y-JB)



Brown	L1	Line
Blue or grey	L2	
Black	L3	
Green-yellow	PE	
White	11	Relay K1
White	14	

1 ~ and 3 ~ ECblue, for control: hose cable 5 x 0.5 mm² (LiF9Y11Y-0B)

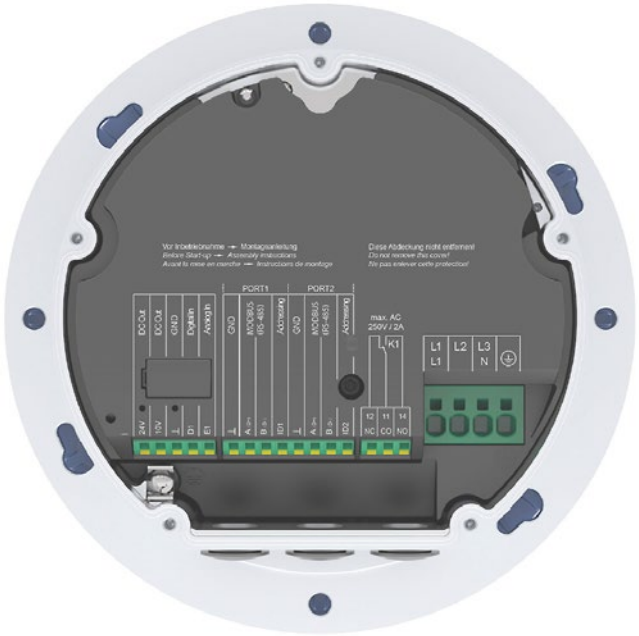


Yellow	E1	Analog In 1
Blue	GND	
Green	D1	Digital In 1
Red	10V	DC OuT
Brown	24V	DC OuT

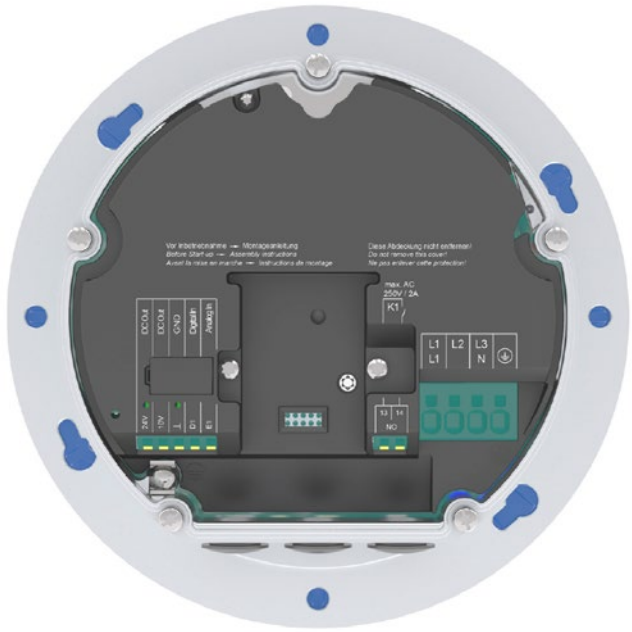
2.3 CONNECTION VERSIONS

Each version can be supplied with an integrated AM-STICK-WB Bluetooth communication module, and this option is indicated by the addition of "WB" to the type designation (see rating plate), e.g. ECblue BASIC WB.

ECblue BASIC-MODBUS (ECblue MB)



ECblue BASIC



Connection options	Versions	
	ECblue BASIC-MODBUS	ECblue BASIC
Analog input for rotational speed specification via analog signal, PWM signal, potentiometer	0...10 V, 0...20 mA, 4...20 mA, PWM, R 10 kΩ	0...10 V, 0...20 mA, 4...20 mA, PWM, R 10 kΩ
Bus interface for MODBUS (RS-485) with 2 ports, automatic addressing possible	X	-*
Voltage supply for external devices	10 V, 24 V	10 V, 24 V
Digital input functional programmable, factory enable (device ON/OFF)	X	X
Digital output functional programmable, factory fault indication	Changeover contact	Normally open contact (NO)
Slot for auxiliary module with universal control function or for integration into different networks	-	X

* With AM-MODBUS auxiliary module possible

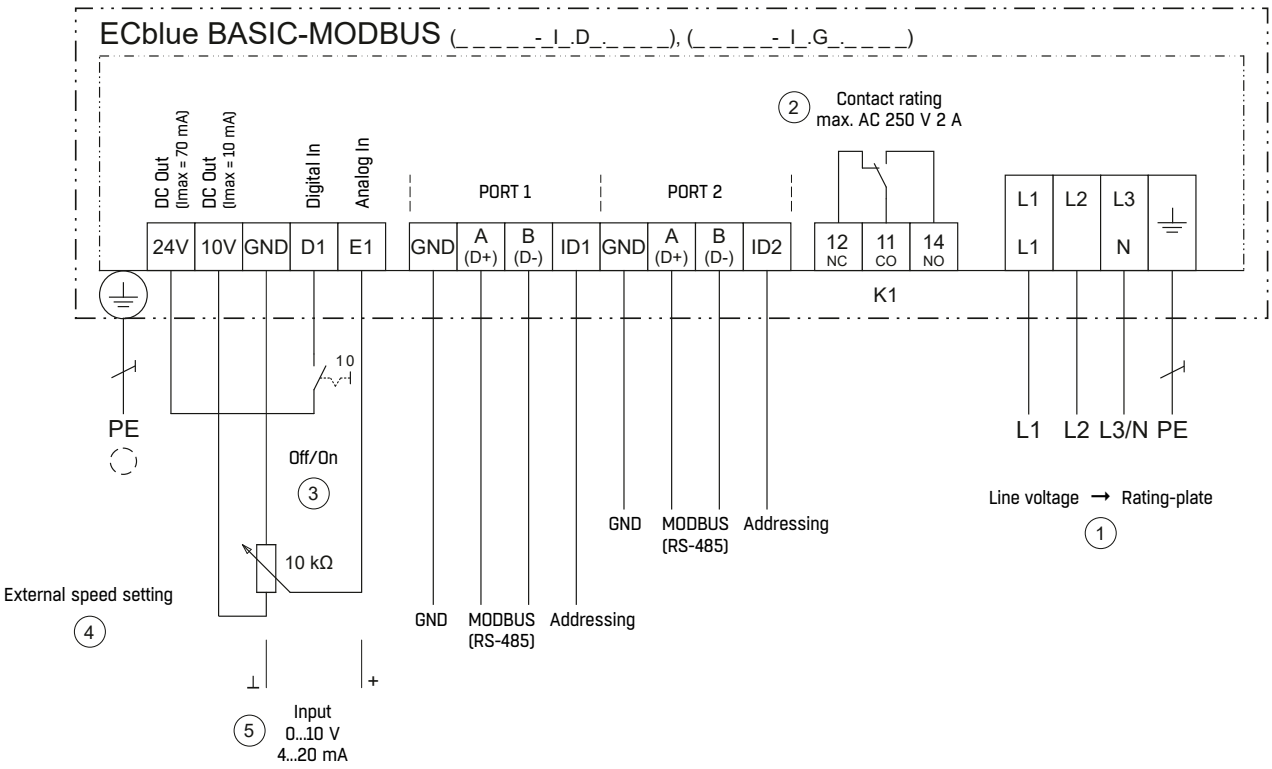
2.4 CONNECTION DIAGRAM

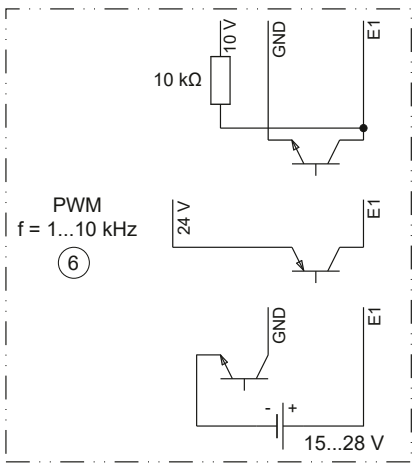
Note the following information and select the correct connection diagram for the relevant version.

Residual-current-operated protective devices
For ECblue 3 ~ types and when connecting 1 ~ types between two outer conductors, only all-current sensitive fault current circuit breakers (type B) are allowed (see EN 50 178, Art. 5.2).

INITIALISATION TIME FOR RELAY

After switching on the line voltage, an initialisation time of a maximum 7.5 seconds is required for the device's electronics to be operational. Subsequently, a reliable status message will be possible. If no malfunction is detected, the relay will be energised after the initialisation time.

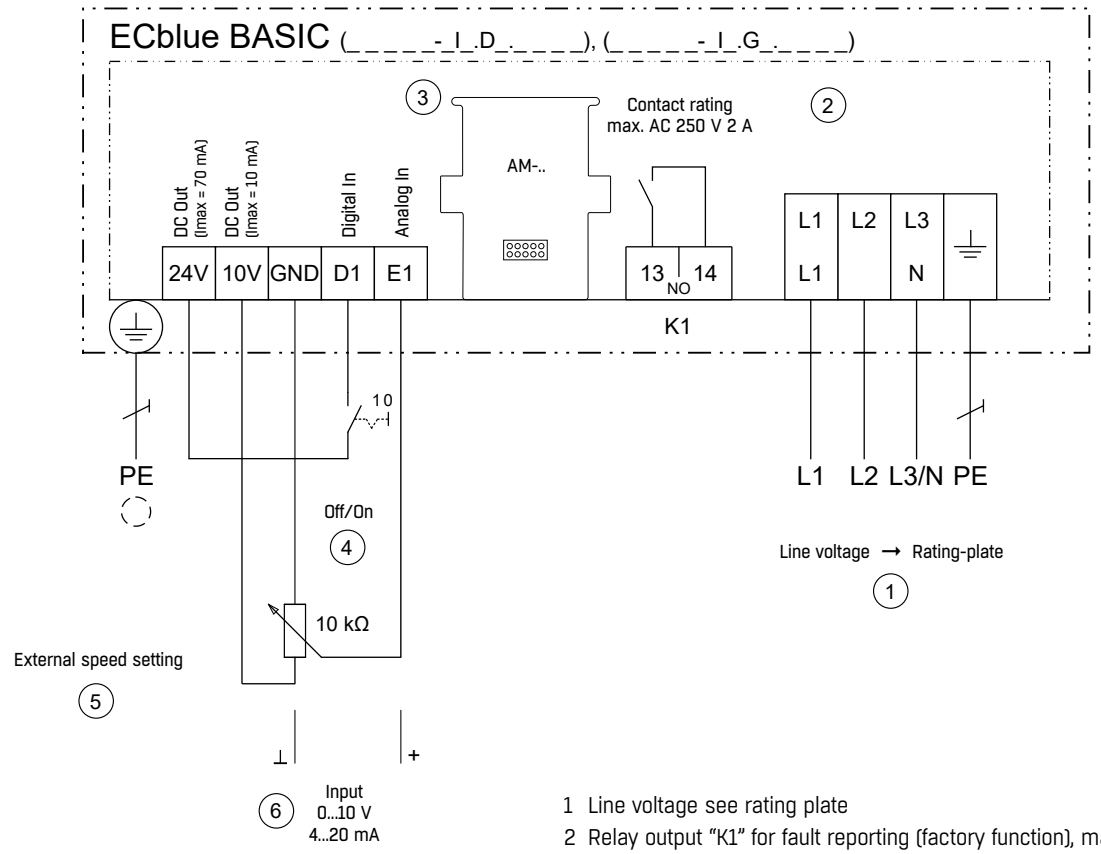


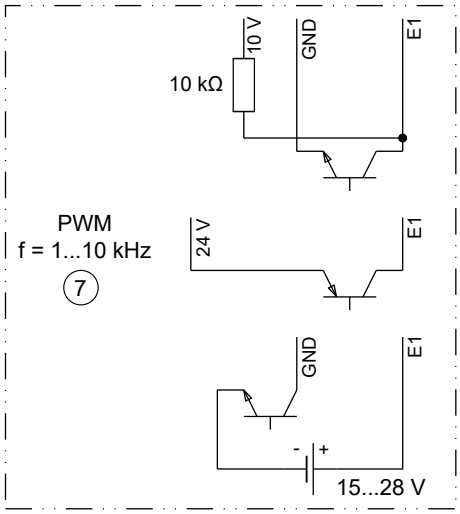


1 Line voltage see rating plate
2 Relay output "K1" for fault reporting (factory function), max. contact load AC 250 V 2 A
- During operation the relay is energised, i.e. the connections "11" and "14" are bridged
- In case of a fault, the relay is de-energised, i.e. the connections "11" and "12" are bridged
- In case of a shutdown using the enable (D1 = Digital In 1) the relay remains energised

3 Digital enable input (factory function)
- Device "ON" when contact closed
- Device "Off" when contact open

4 External speed setting
5 Input 0...10 V, 4...20 mA
6 PWM input, f = 1...10 kHz





1 Line voltage see rating plate
2 Relay output "K1" for fault reporting (factory function), max. contact load AC 250 V 2 A
- During operation the relay is energised, i.e. the connections "13" and "14" are bridged
- In case of a fault, the relay is de-energised
- In case of a shutdown using the enable (D1 = Digital In 1) the relay remains energised

3 Slot for AM-add-on module
4 Digital enable input (factory function)
- Device "ON" when contact closed
- Device "Off" when contact open

5 External speed setting
6 Input 0...10 V, 4...20 mA
7 PWM input, f = 1...10 kHz

Attention!

- Temperatures up to 80 °C can be present on the controller housing.
- To connect, always use heat resistant wires or, as an alternative, silicon tubes.
- Only use lines which can guarantee a permanent seal around the cable glands (pressure-resistant, dimensionally-stable, round-centred jacket; e.g. by means of gusset filling)! Lines with filling fleece are not permissible because moisture can penetrate due to the capillary effect!
- Two lines may only be fed through one cable screw-type gland with the sealing insert for two lines.
- When using the seal insert for two cables it is not permissible to use the corresponding cable gland with only one cable.
- Make absolutely sure that different connections do not come into contact (e.g. by splaying or loose connecting wires).
- Remants from installation and foreign object may not remain on the inside! Remants from installation, foreign objects and dirt has to be removed from the sealing area between cover and controller housing!

INFORMATION

The respective connections are represented in the enclosure of this assembly instructions (→ Connection diagram)!

Tightening torque M_A

	Thread size	Tightening torque M_A		Remarks
		[Nm]	[Lb In]	
Cable gland	M16	2.5	22	Sealing area cable diameter 4...10 mm
Cable gland	M20	4	35	Sealing area for cable diameter 6...12 mm
Locking screw	M16 + M20	2.5	22	Slotted screwdriver
Cover of controller housing	M4	2.5	22	
Protective earth connection	M4	2.5	22	
Mains supply terminals *	M3	0.6	5	
Terminals relays and control	M3	0.6	5	
Fastening add-on module	M4	1.3	11	
Terminals add-on module	M2	0.24	2.2	

* Specification for versions without spring force terminals

Max. cross section of terminals

Mains connection: PE, L1, N or PE, L1, L2, L3	max. 2.5 mm² and/or AWG12
Connection control: +24 V, +10 V, GND, D1, E1, K1	max. 1.5 mm² and/or AWG16
Add-on modules:	1.5 mm2 (0.75 mm² with wire end sleeve) and/or AWG16

2.5 EMC-COMPATIBLE INSTALLATION

2.5.1 HARMONICS CURRENT FOR 3 ~ TYPES

According to EN 61000-3-2 these devices are to be classified as "professional" devices. Connection to a low voltage supply (public networks) is allowed insofar as this has been clarified with the respective energy supply company responsible.

2.5.2 CONTROL CABLES

Pay attention to sufficient distance from powerlines and motor wires to prevent interferences. The control cable may not be longer than 30 m. Screened control cables must be used when the cable length is longer than 20 m. When using a shielded cable connect the shielding to one side only, i.e. only to the signal source with the protective earth (keep cable short and with as little inductance as possible!).

2.6 MAINS CONNECTION

2.6.1 LINE VOLTAGE

Danger due to electric current

- It must be strictly observed that the line voltage complies with specified on the rating plate and lies within the allowable tolerance specifications (→ technical data).
- Between the mains connection of the device and the protective earth "PE" is in no case a higher voltage permissible than the indicated line voltage of the device!

For 1 ~ fan types

Mains connection to: PE, L1 and N.
Alternatively a supply of DC voltage is possible (→ Technical data).
The polarities on "L1" and "N" are irrelevant.

Attention!

To activate the on current limitation, you must wait at least 90 seconds after switching off the line voltage before switching back on!

For 3 ~ fan types

Mains connection to: PE, L1, L2 and L3.
Alternatively a supply of DC voltage is possible (→ Technical data).
Connect to any two terminal clips for "L1", "L2" and "L3", the polarity is irrelevant.

2.6.2 REQUIRED QUALITY ATTRIBUTES FOR THE MAINS VOLTAGE

Danger due to electric current

The mains voltage must comply with the EN 50160 quality characteristics and the defined standard voltages in IEC 60038!

2.6.3 LINE PROTECTION FUSE

The mains connection must be fused depending on the used cable, the type of routing, the operating conditions and according to the standards applicable on site. The specification for the maximum admissible line fuse of the device must be observed (see technical data).

Possible components for the line protection (recommendation):

- Safety fuses of operating class "gG" (whole range fuse cartridges for general applications according to EN 60269-1).
- Line protection switch with characteristic "C" (according to EN 60898-1).
- Motor protection switch with overload and short-circuit trigger (according to EN 60947-4-1). Setting overcurrent trigger to maximum permissible current of the line.

2.6.4 OPERATING IN IT-SYSTEM

Danger due to electric current

- In the IT-System the neutral point of voltage supply is not grounded; in the case of a short-circuit between a phase (e.g. "L1") and protective earth "PE" becomes the protective earth potential = phase.
- Between the mains connection of the device and the protective earth "PE" is in no case a higher voltage permissible than the indicated line voltage of the device!

For 1 ~ fan types

1 ~ types can be used in IT-System in standard version. These may only be used in 3 ~ IT-Systems if no higher voltage to the "PE" can occur than the specified mains voltage of the device even in case of a fault to earth of a mains phase which is not used by the device (of none of the two power supplies). In order to ensure a trouble free operation in IT-System the "GND" potential of the control ports have to be connected with the protective earth potential. As a consequence of these connection must be considered for the control ports (exception floating relay contacts):

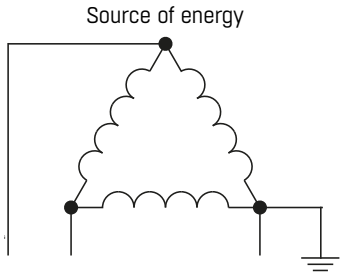
1. Connection only with wires, suitable for mains voltage and surrounding area.
2. Connection with suitable isolated amplifiers only.

For 3 ~ fan types

3 ~ types in the version described here are suitable for use in the IT-System! Capacitors are installed between the housing potential and the intermediate circuit to reduce radio interference voltages. This must be considered for the choice of insulation monitoring device!

2.6.5 OPERATION IN GROUNDED DELTA SYSTEM

A device must be selected which allows operation on the existing network type.



In Delta System with earthed line phase the maximum voltage between a phase and the protective earth is as high as the voltage between two phases.

In the ECblue versions described here, the specified line voltage (→ Technical Data) is permitted at the maximum between the mains connection and the "PE" conductor and they are therefore suitable for use in a Grounded Delta System!

2.7 RESIDUAL-CURRENT-OPERATED PROTECTIVE DEVICE

For 1 ~ fan types

Residual current circuit breaker (type A) To ensure as high a degree of reliability as possible we recommend a release current of 300 mA, where a residual current circuit breaker (type A) is used.

Danger due to electric current
Exception: All-current-sensitive fault current circuit breaker on the 3 ~ 230 V line
When connecting the device between two outer conductors, "all-current-sensitive" fault current circuit breakers must be used
(→ EN 50 178, Art. 5.2).

For 3 ~ fan types

Residual current circuit breaker (type B)

Danger due to electric current
For an installation of r.c.d. protection, it shall be observed that this must be of "universalcurrent sensitivity". In accordance with EN 50 178, Section. 5.2. other types of currentoperated protective devices may not be used. To ensure as high a degree of reliability as possible , we recommend a tripping current of 300 mA.

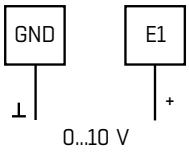
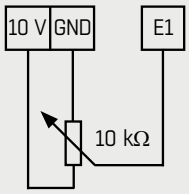
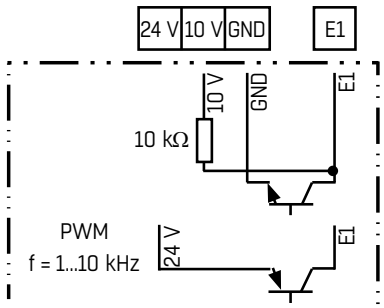
2.8 MOTOR PROTECTION

Integrated overload protection, preceding motor protection device unnecessary (max. line fuse see Technical data).

2.9 ANALOG INPUT "E1" FOR SETTING SPEED

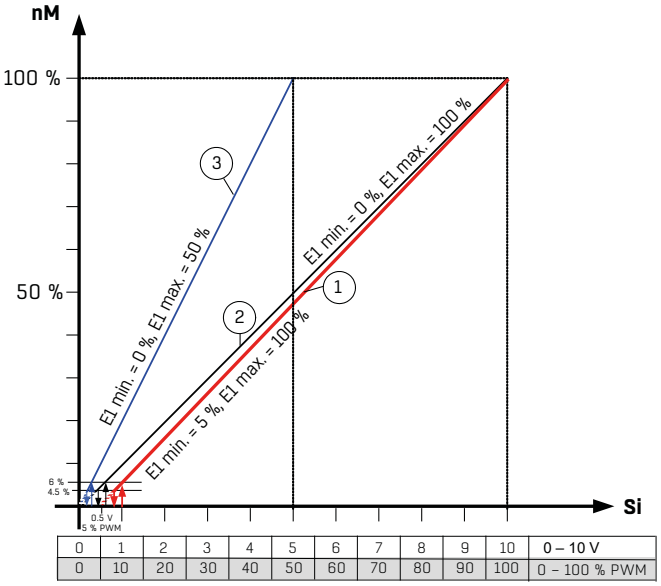
The device has an analog input for setting the motor speed. Connection "E1" / GND (Analog In 1).

Danger due to electric current
- Ensure correct polarity!
- Never apply line voltage to analog inputs!

Possibilities for speed setting	
	• Control via external setting signal 0...10 V • By external wiring with a resistor (499 Ω / 0,25 W) between the terminals "E1" and "GND" parallel to the input signal, activation with a 0...20 mA signal is possible. • The "AM-MODBUS" communication module enables a inverted set-point signals to be programmed (10...0 V).
	• Speed setting by 10 kΩ potentiometer at terminals "+10 V" and "GND" pick-off at terminals "E1".
	• Control by external setting signal PWM (connection "24 V" only for motor sizes "D" and "G" available).

The motor always starts with at least 6 % of the rated speed and stops below 4.5 % of the rated speed (providing that the "Min. Speed" setting is "0" rpm → add-on-modules). With the settings "E1 min." and "E1 max." (→ add-on-modules) it is possible to adapt the setting signal/speed characteristic, e.g. for setting signal: 0...5 V, 2...10V.

Diagram setting signal and motor speed



0	1	2	3	4	5	6	7	8	9	10	0 – 10 V
0	10	20	30	40	50	60	70	80	90	100	0 – 100 % PWM

nM Motor speed
100 % Rated speed
6 % Height of start speed
4.5 % Height of stop speed
0.5 V / 5 % PWM Value start analog input (factory setting)
Si Speed setting signal 0...10 V / 0...100 % PWM

1	Factory setting: E1 min. = 5 %, E1 max. = 100 % 0.5...10 V ≙ 0...100 % speed setting I.e. the motor starts with 6 % of the rated speed at a setting signal of approx. 1 V.
2	Example: E1 min. = 0 %, E1 max. = 100 % 0....10 V ≙ 0...100 % speed setting
3	Example: E1 min. = 0 %, E1 max. = 50 % 0....5 V ≙ 0...100 % speed setting

2.10 OUTPUT VOLTAGE "10 V"

Voltage supply e.g. for speed setting by external potentiometer (PELV current source according to EN 60204-1).

Connection: "10 V" - "GND" (max. load → Technical data und connection diagram). It is not permissible to connect outputs of several devices to each other!

2.11 VOLTAGE SUPPLY FOR EXTERNAL DEVICES (+24 V, GND)

Integrated voltage supply for external devices (PELV current source according to EN 60204-1). Terminals "+ 24 V" (→ Technical data).

During an overload or short-circuit (24 V - GND), the control voltage (and thus the device) is disconnected. Automatic start after elimination of the cause of error. It is not permissible to connect outputs of several devices to each other!

2.12 DIGITAL INPUT "D1" FOR ENABLE (DEVICE ON / OFF)

Electronic ON/OFF control via floating contact at terminals "D1" - "+24V" (input resistance and voltage range Technical data).

Function factory setting for "D1":
- Device "ON" for closed contact.
- Device "OFF" with opened contact.
  Relay "K1" remains energized, connections 11 - 14 bridged.
  Status Out with flash code: |1|(→ Diagnostics/Faults).

Danger due to electric current
- No disconnection (no potential isolation in accordance with VBG4 §6) in remote control of the device!
- Never apply line voltage to the digital input!

2.13 RELAY OUTPUT "K1" FOR FAULT INDICATION

An external fault indicator is available over the potential-free contact of the built-in relays (max. contact rating → Technical data and connection diagram).

Function factory setting for "K1":

- For operation the relay is energized, connections "11" and "14" are bridged. For fault the relay is de-energized (→ Diagnostics/faults).
- When switching off via enable (D1 = Digital In 1), the relay remains energized.

INFORMATION

After switching on the line voltage, an initialisation time of a maximum 7.5 seconds is required for the device's electronics to be operational. Subsequently, a reliable status message will be possible. If no malfunction is detected, the relay will be energised after the initialisation time. Since both line voltage fluctuations and ambient conditions affect the initialisation time, a different delay might occur in individual cases.

2.14 POTENTIAL AT CONTROL VOLTAGE CONNECTIONS

The control voltage connections (< 50 V) relate to the joint GND potential (Exception: Relay contacts are potential free). There is a potential separation between the control voltage connections and the protective earth. It must be ensured that the maximum external voltage at the control voltage connections cannot exceed 50 V (between "GND" terminals and "PE" protective earth). If necessary, a connection to the protective earth potential can be established, install bridge between "GND" terminal and the "PE" connection (terminal for screening).

2.15 OPTION ADD-ON MODULES

An additional module can be retrofitted in the slot provided if required (mounting → operating instructions of the additional modules).

The range of additional modules is constantly being extended and adapted to market requirements. The currently available additional modules can be requested from ZIEHL-ABEGG.

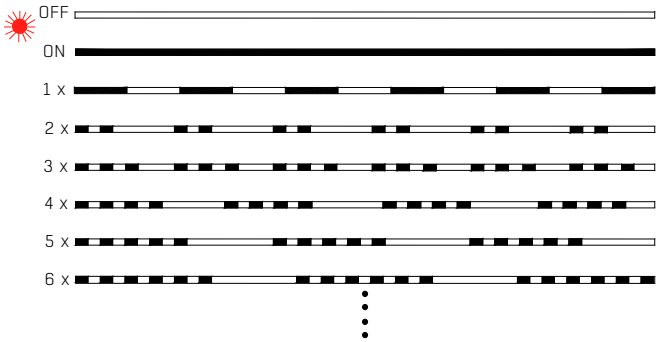
3 DIAGNOSTICS/FAULTS

3.1 TROUBLE SHOOTING

Type of error	Possible cause	Adjustment
Fan does not run (anymore)	No line voltage Line failure Under - or overvoltage	Check line voltage
	Earth fault	Check motor connection and line voltage
	Short circuit winding	Replace fan
	Thermal motor protection has triggered (motor is overheated)	Check for free air passages; remove foreign bodies if necessary see "Impeller blocked or dirty" Check temperature of supply air Check voltage
	Impeller blocked or dirty	- Switch off power to the motor and secure against switching back on - Check safe isolation from supply - Remove safety grille - Remove foreign bodies or soiling - Remount the safety grille - Further procedure as in the chapter "Start-up"
Fan will not start	Temperature too low for bearing grease	Insert bearing with cold greasing
	Air stream wrong direction (Motor turns in wrong direction at high speed)	Check air stream (see behaviour in rotation by air current in reverse direction)
	see "Fan does not run"	
Fan turns too slowly	Impeller/blade scrapes/brushes	When indicated, clear foreign bodies/dirt from the fan
	Active temperature management effective (Motor or electronics overheated)	Check for free air passages; remove foreign bodies if necessary see "Impeller blocked or dirty" Check temperature of supply air Check installation space (air speed over heat sink)
Air flow to low	Fan turns too slowly	see "Fan turns too slowly"
	Airways blocked	Check for free air passages (supply/exhaust air vents, filters) see "Impeller blocked or dirty"
	Pressure loss different to planned	Check fan selection
Vibrations	Imbalance	Check blades for damage, soiling or ice (see "Impeller blocked or dirty")
	No or wrong vibration dampers (only in radial)	Install correct vibration dampers
Unusual noises	Bearing damaged/worn	Change bearings in motor size 055"(Z"/"B" at cross flow) change the fan
	Impeller/blade scrapes/brushes	When indicated clear foreign bodies/dirt from the fan (see "Impeller blocked or dirty")
	Operation beyond stall point (for axial fans)	Check for free air passages (supply/exhaust air vents, filters)
	Wrong overlap on nozzle (for centrifugal fans)	Observe the installation instructions

3.2 STATUS OUT WITH FLASH CODE

Vision panel for status LED in the case of plastic coverdesign



Description valid from software version 13.31

LED Code	Relays K1*	Cause Explanation	Reaction of Controller Adjustment
OFF	de-energized, 11 - 14 interrupted	No line voltage	Line voltage available? Unit switch OFF and automatically ON when the voltage has been restored
ON	energized, 11 - 14 bridged	Normal operation without fault	
1 x	energized, 11 - 14 bridged	**No enable = OFF** Terminals "D1" - "24 V" (Digital In 1) not bridged.	Switch OFF by external contact (→ digital input).
2 x	energized, 11 - 14 bridged	**Temperature management active** The device has an active temperature management to protect it from damage due to too high inside temperatures. In case of a temperature rise above the fixed limits, the modulation is reduced linearly. To prevent the complete system being switched off externally (in this operation permissible for the controller) in case of reduced operation due to too high an internal temperature, no fault message is sent via the relay.	With a drop in temperature the modulation rises again llinear. Check cooling of the controller
3 x	de-energized, 11 - 14 interrupted	**HALL-IC** Incorrect signal from the Hall-ICs, error in the commutation. Internal plug connection faulty.	EC controller switches off and does not switch on again. Reset by disconnecting the line voltage necessary.
4 x	de-energized, 11 - 14 interrupted	**Line failure** (only for 3 ~ types) The device is provided with a built-in phase-monitoring function for the mains supply. In the event of a mains interruption (failure of a fuse or mains phase) the unit switches off after a delay (approx. 200 ms). Only functioning with an adequate load for the controller.	Following a shutoff, a startup attempt is made after approximately 15 seconds, if the voltage supply is high enough. This keeps occurring until all 3 supply phases are available again. Check power supply
5 x	de-energized, 11 - 14 interrupted	**Motor blocked** If after 8 seconds of commutation no speed is measured > 0, the fault "Motor blocked" is released.	EC-Controller switches off, renewed attempt to start after about 2.5 sec. Final shut-off after five unsuccessful startup attempts. It is then necessary to have a reset by disconnecting the line voltage. Check if motor is freely rotatable.
6 x	de-energized, 11 - 14 interrupted	**IGBT Fault** Short circuit to earth or short circuit of the motor winding.	EC-Controller switches off, renewed attempt to start after about 60 sec. → Code 9. Final shutoff, if - following a second starting test – a second fault detection is detected within a period of 60 seconds. It is then necessary to have a reset by disconnecting the line voltage.
7 x	de-energized, 11 - 14 interrupted	**Intermediate under voltage** If the DC-link voltage drops below a specified limit the device will switch off.	If the intermediate circuit voltage again rises above the specified limit, an automatic startup attempt is run. If the intermediate circuit voltage remains below the specified limit for more than 75 seconds, an error message will appear.
8 x	de-energized, 11 - 14 interrupted	**Intermediate circuit overvoltage** If the DC-link voltage increases above a specified limit, the motor will switch off. Reason for excessively high input voltage or alternator motor operation.	If the intermediate circuit voltage again drops below the specified limit, an automatic startup attempt is run. If the intermediate circuit voltage remains above the specified limit for more than 75 seconds, an error message will appear.

LED Code	Relays K1*	Cause Explanation	Reaction of Controller Adjustment
9 x	energized, 11 - 14 bridged	**IGBT cooling down period**	IGBT cooling down period for approx. 60 sec. Final shutoff after 2 cooling-off intervals → Code 6.
11 x	de-energized, 11 - 14 interrupted	**Error motor start** If a starting command is given (enable available and Setpoint > 0) and the motor does not start to turn in the correct direction within 5 minutes, then an error message will appear.	If it is possible to start the motor in the target direction of rotation after the error message, the error message will disappear Should a voltage interruption occur in the meantime, the time taken up to the switch off will begin again. Check if motor is freely rotatable. Check if the fan is driven in reverse direction by an air stream (→ Behaviour in rotation by air current in reverse direction).
12 x	de-energized, 11 - 14 interrupted	**Line voltage too low** If the DC-link voltage drops below a specified limit the device will switch off.	If the line voltage again rises above the specified limit, an automatic startup attempt is run. If the line voltage remains below the specified limit for more than 75 seconds, an error message will appear.
13 x	de-energized, 11 - 14 interrupted	**Line voltage too high** Cause to high input voltage If the line voltage increases above a specified limit, the motor will switch off.	If the line voltage again drops below the specified limit, an automatic startup attempt is run. If the line voltage remains above the specified limit for more than 75 seconds, an error message will appear.
14 x	de-energized, 11 - 14 interrupted	**Error Peak current** If the motor current increases above the specified limit (even in a short time-frame) the device will switchoff.	After a switch off the controller waits for 5 seconds then the controller attempt a start. Arises within 60 sec. in series 5 further disconnections a final switch off with fault indication follows. Should no further switch off be exceeded in 60 sec. the counter will be reset.
17 x	de-energized, 11 - 14 interrupted	**Temperature alarm** Excess of the max. permissible inside temperature.	Controller switches off motor. Automatic restarting after cooling down. Check cooling of the controller

***** K1: programmed function at factory: Fault indication not inverted

3.3 BRAKE FUNCTION AND BEHAVIOUR IN ROTATION BY AIR CURRENT

At applied line voltage, enable and a setting signal above "0", the speed control is active and the speed is stable even under load fluctuations.

If the motor is not controlled with line voltage applied, i.e. without enable or with enable with setting signal "0", the brake function becomes active to hold the motor until start (holding brake).

- If the line voltage is switched on whilst the fan is rotating in reverse (wrong turning direction), this is decelerated and started in the correct turning direction at a setting signal above "0". To protect the electronics against too high braking current, this function is partly (fan-dependent) only possible up to a certain speed value.
- The braking function also becomes active to bring the fan to a standstill when this is driven with a speed below 100 min-1 (without control). At speeds above 100 min^{-1} the motor control does not intervene.
- When driven in correct direction of rotation and with enable with a setting signal above "0", the motor is started whilst the fan is rotating.

Behaviour in strong drive in reverse direction (e.g. suction)

The braking effect with applied line voltage is limited, strong reverse acting forces can lead to rotational movement despite the holding brake.

From a certain level (fan-dependent) it is no longer possible to start the fan in the correct turning direction (=> message: Fault motor start). Further start attempts follow; the error message disappears if start is successful.

INFORMATION

- Do not switch off the line voltage so that the braking function can prevent rotation of the fan in reverse (wrong) direction and safe starting is possible.
- If the application requires safe starting after switching on the line voltage, too strong an air current (suction effect) in reverse direction must be prevented by suitable measures.
- Special settings are possible which can lead to deviations from the above functional description.

4 ENCLOSURE

4.1 TECHNICAL DATA

Line voltage* (→ rating plate)	AC: 1 ~ 200...277 V (+/- 10 %), 50/60 Hz	DC: 280...400 V (+/- 10 %)
	AC: 3 ~ 200...240 V (+/- 10 %), 50/60 Hz	DC: 280...340 V (+/- 10 %)
	AC: 3 ~ 380...480 V (+/- 10 %), 50/60 Hz	DC: 500...680 V (+/- 10 %)
	AC: 3 ~ 200...480 V (+/- 10 %), 50/60 Hz	DC: 280...680 V (+/- 10 %)
		DC supply not UL approved!
Maximal line fuse**	16 A for all types 1 ~ and 3 ~	
Max. load limit integral of cut-in current approx.	1.22 A^2s	
Switching Freq.	16 kHz	
Input resistance for signal set for the rotational speed	R_i > 100 kΩ	
Specification speed setting signal PWM	Voltage: 15...28 VDC Switching Frequency: 1...10 kHz On-off ratio: 0...100 %	
Voltage supply for external devices	+10 V, Imax 10 mA (short-circuit-proof)	
	+24 V ±20 %, I_{max} 70 mA	
Digital input "D1"	Input resistance: Ri approx. 4 kΩ Voltage range high level: 10....30 V DC Voltage range low level: 0....4 V DC	
Permissible minimal and maximal ambient temperature for operation	-35...60 °C → rating plate (up to 70 °C ***) See the technical documentation of the product for the minimum and maximum ambient temperature valid for the respective fan ; these may deviate from the specified permissible ambient temperatures. To avoid condensation the drive must be continuously energized due to the application of heat, with interruptions such that cooling to the point of condensation does not occur.	
Permissible installation height	0...4000 m amsl ≤ 1000 m: no limitation > 1000 m: max. permissible input current = current indication rating plate minus 5 %/1000 m > 2000 m: max. permissible line voltage = max. voltage indication rating plate minus 1.29 %/100 m	
Permissible rel. humidity	The motor is released for a relative humidity of 100 % at continental climate without other ambient influences. Other ambient conditions on request.	
Permissible temperature range for storage and transport	-40...+80 °C	
Electromagnetic compatibility for the standard voltage 230/400 V according to IEC 60038	Interference emission EN 61000-6-3 (domestic household applications)	
	Interference immunity EN 61000-6-2 (industrial applications)	
Harmonics current	**For 1 ~ types** Active power factor adjustment for sinusoidal input current (PFC = Power - Factor - controller), harmonic current in accordance with EN 61000-3-2 are guaranteed.	
	For 3 ~ types According to EN 61000-3-2 (→ Assembly instructions/Electrical installation/EMC-compatible installation/ Harmonics current for 3 ~ types).	
Contact rating of the internal relay	AC 250 V 2 A	
Max. leakage current according to the defined networks of EN 60990	< 3.5 mA	
dB(A) values	→ product catalog	
Ball bearings grease service-life (F_{10h})	during standard usage ca. 30 - 40,000 h	
Protection class of motor according to EN 60529	P54	

* Regarding the mains connection, these devices are to be classified as category "C2" devices according to the relevant EN 61800-3. The increased requirements placed on electrical interference > 2 kHz for category "C1" devices are complied with in addition.

** Max. line fuse on site (line protection fuse) according to EN 60204-1 Classification VDE0113 Part 1 (see also Assembly instructions/ Electrical installation/Mains connection/Line protection fuse).

*** In case of a temperature increase above the predetermined threshold values modulation is linearly reduced by active temperature management. With fire mode activated, the fan can operate in full performance at 70°C for at least 1h. After operation in fire mode at temp range 60 °C-70 °C the fan is considered as spent/exhausted and needs replacement.