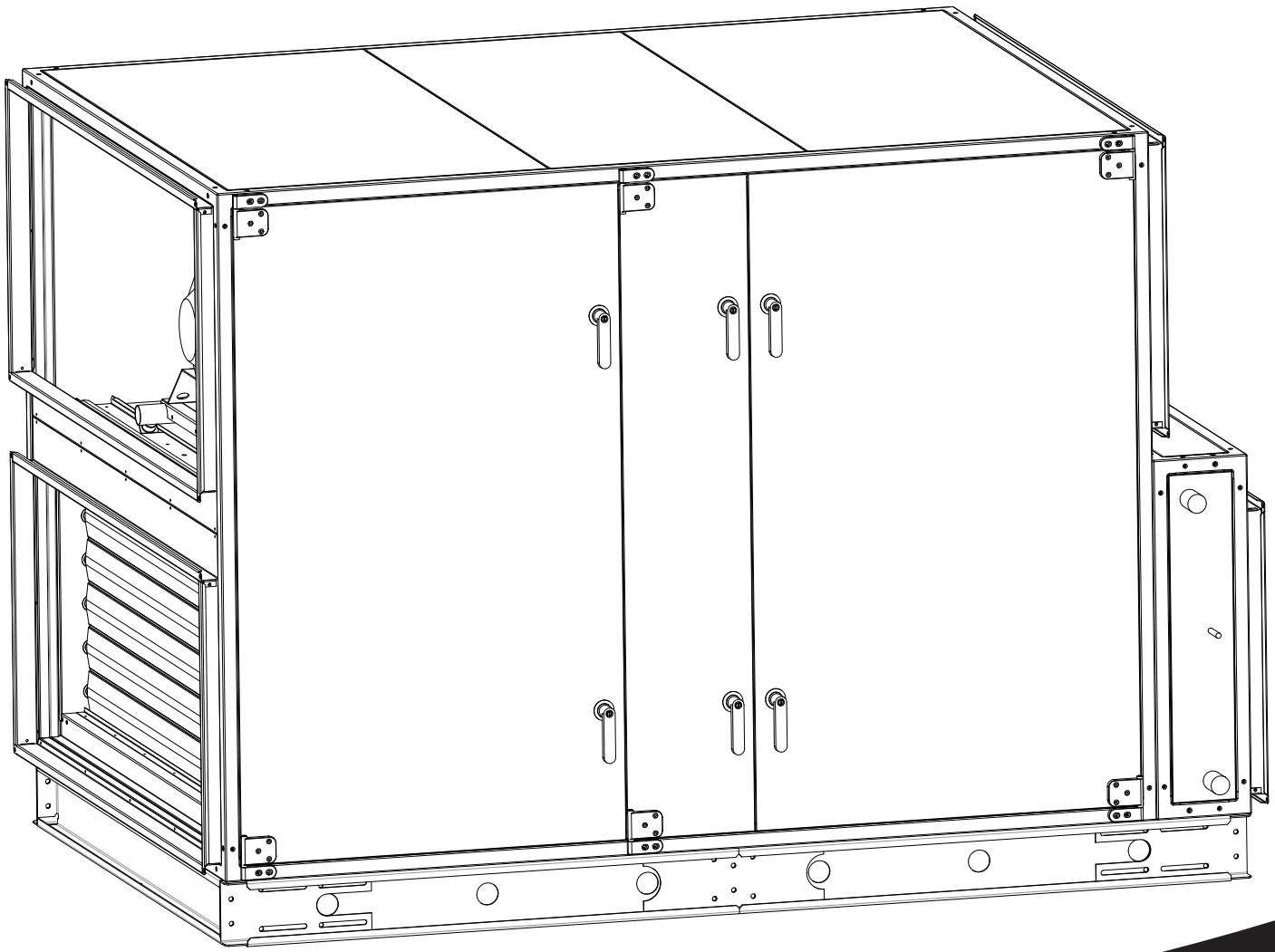
User manual for DV without control system

Air handling unit

User manual version 1.01.06

Part number for this manual 90925371



systemair

Detailed table of contents on the following pages

This manual has part number 90925371

Contents

a. Manufacturer

This User Manual covers all air handling units without control system delivered by Systemair A/S.

Manufacturer and supplier data:
Systemair A/S
Ved Milepælen 7
DK-8361 Hasselager

Responsible for documentation: Ulf Bang

b. Name of machines

This manual is about Systemair air handling units without control systems called DANVENT DV10, DANVENT DV15, DANVENT DV20, DANVENT DV25, DANVENT DV30, DANVENT DV40, DANVENT DV50, DANVENT DV60, DANVENT DV80, DANVENT DV100, DANVENT DV120, DANVENT DV150, DANVENT DV190 and DANVENT DV240.

c. Declaration of incorporation – example

Declaration of incorporation - example

Manufacturer:

Systemair A/S
Ved Milepælen 7
DK - 8361 Hasselager

Hereby declares that partly completed machinery of the flowing types:

Delivered without control system
DANVENT DV10, DANVENT DV15, DANVENT DV20, DANVENT DV25, DANVENT DV30, DANVENT DV40, DANVENT DV50, DANVENT DV60, DANVENT DV80, DANVENT DV100, DANVENT DV120, DANVENT DV150, DANVENT DV190 and DANVENT DV240.

Serial No:"YYMM-71800-X"

have been complied with the Machinery Directive 2006/42/EC, subchapters;

1.1.2, 1.1.5, 1.3.1, 1.3.2, 1.3.3, 1.3.4, 1.3.7, 1.3.8, 1.4.2
and the technical documentation is compiled in accordance with Annex VII(B) of the Directive.

The partly completed machinery is manufactured and delivered in accordance with following directives:

EMC - directive	2004/108/EC
Low voltage directive	2006/95/EC
Pressure equipment directive	97/23/EC
European Standard	EN378

Equipment type: **DVU-series**
Consisting of: Compressor, evaporator and condenser

Verification and Assessment by:
Notified Body Bureau VERITAS CE0041 for PED
Bureau VERITAS UK, "Parklands", Wilmslow Road
Didsbury, Manchester M20 2RE

Module: A1
Certificate no: CE-0041-PED-A1-SYA-001-10-DNK

We undertake to transmit, in response to a reasoned request by the appropriate national authorities, relevant information on the partly completed machinery identified above.

The machinery is incomplete and must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the provisions of the Directive.

Hasselager 24.06.2013

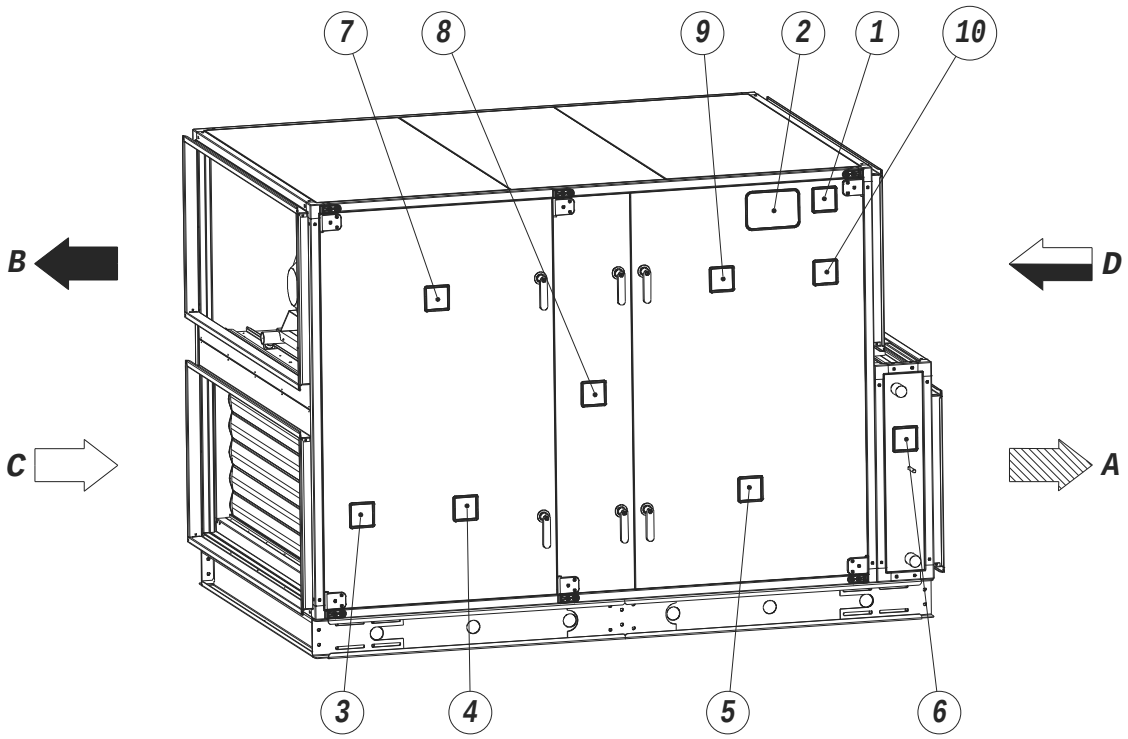
Ulf Bang, Udviklingschef

d. General descriptions, dangers and warnings

TIME and DV air handling units are order specific machines available in thousands of different configurations. Only a few examples of machine configurations are described below.
The air handling units are intended for the transport and treatment of air between -40 °C and + 40 °C
The units are exclusively for comfort ventilation.
Maintenance of the units must be carried out by skilled technicians.
On the drawing below, a right hand unit is shown because the inspection doors are mounted on the right hand side of the unit when looked in direction of SUPPLY airflow. The unit below is with rotary heat exchanger.

Position	Description	Symbol
A	Connection, supply air (to the rooms)	
B	Connection, exhaust air	
C	Connection, outdoor air in	
D	Connection, extract air (from the rooms)	

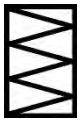
d.1 Overview via pictograms on the inspection side of the unit



This is a right hand unit because the inspection doors are mounted on the right hand side of the unit when looking in direction of the SUPPLY airflow.

d.1.1 Where are pictograms placed on the units

Example (Symbols and descriptions of functions for fast identification)

Position	Description	Symbol
1	The CE label and the unique production number of this machine	
2	Machine card	
3	Damper - supply air	
4	Filter - supply air	
5	Fan- supply air	
6	Heating battery - supply air	
7	Fan - extract air	
8	Rotary heat exchanger	
9	Filter – extract air	
10	Damper – extract air	

d.1.2 Label with production number

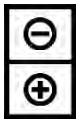
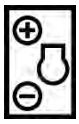
This is the mandatory informations with;
Product name (in this example Danvent DV 20, where 20 informs about the size of the unit), Production number for the complete unit (in this example YYMM-xxxxx-x, where YYMM informs about year and month for the manufacture), xxxxx-x is the unique production number.

d.1.3 Pictogram on a door for a fan in a DV unit

Example of the pictogram with the symbol for the function - fan, Systemair product name is DVE-20-BK where 20 informs about the size of the unit and BK is Backward Curved fan blades, production number for the complete unit (in this example 73004-2) and the customer's name for the unit, always written after – Plant no:_____

d.1.4 Pictograms for all available functions in the units

Id	Description	Symbol
DVA	Damper	
DVB	Damper	
DVM	Damper for mixing	
DVP	Damper for mixing	
DVG	Panel filter	

DVF	Bag filter	
DVC	Rotary heat exchanger	
DVQ	Plate heat exchanger (cross flow and counter flow)	
DVR	Run around heat exchanger	
DVH	Heating battery	
DVK	Cooling battery	
DVU	Heat pump unit	
DVE	Plug fan	
DVD	Silencer	
DVX	Humidifier	

d.1.5 Pictograms about warnings and dangers on the units

Pictograms according to EN1886 about

Warning about danger by rotating parts

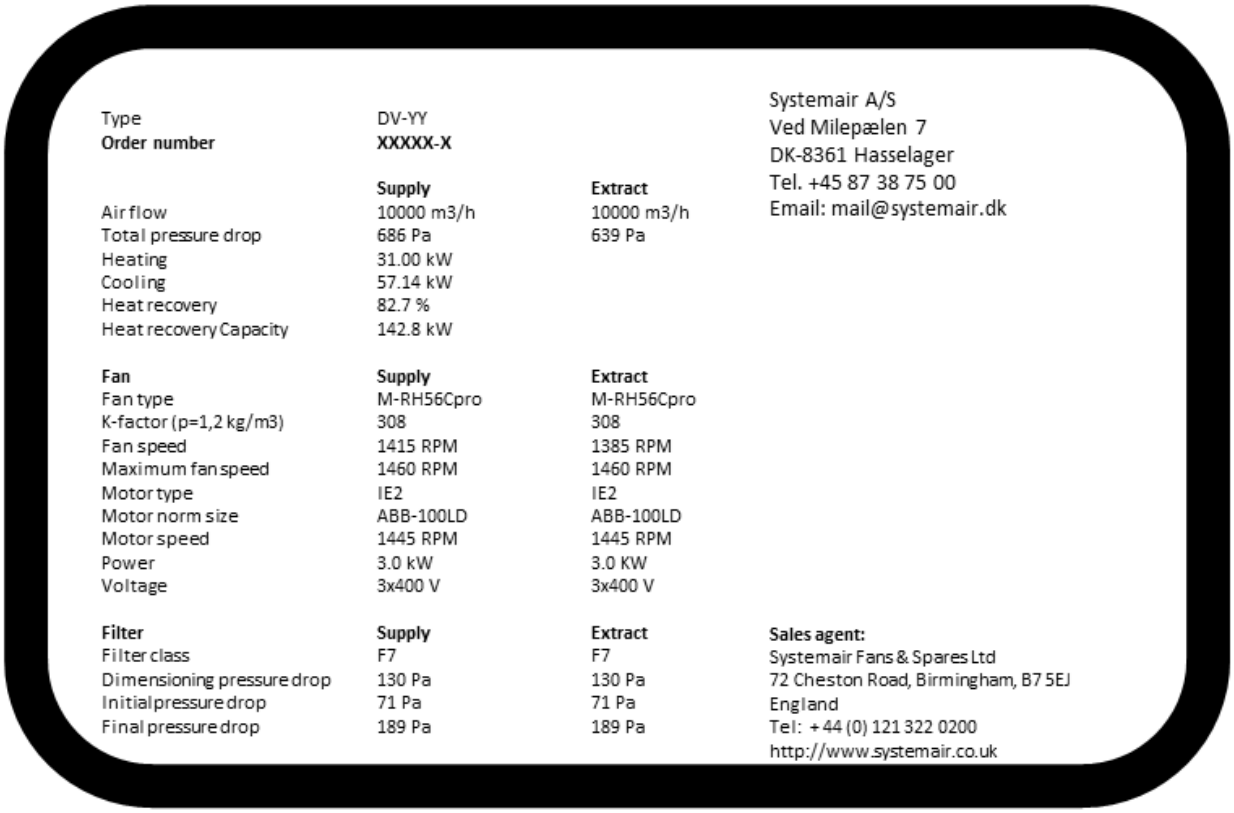
Warning about danger by electricity

Warning about danger by heat

d.2 Data about the unit according to cards and labels in and on the unit

d.2.1 Machine card with unique data on every unit

An example of a machine card is shown below.



Type	DV-YY	
Order number	**XXXXX-X**	
	Supply	**Extract**
Air flow	10000 m3/h	10000 m3/h
Total pressure drop	686 Pa	639 Pa
Heating	31.00 kW	
Cooling	57.14 kW	
Heat recovery	82.7 %	
Heat recovery Capacity	142.8 kW	
Fan	**Supply**	**Extract**
Fan type	M-RH56Cpro	M-RH56Cpro
K-factor (p=1,2 kg/m3)	308	308
Fan speed	1415 RPM	1385 RPM
Maximum fan speed	1460 RPM	1460 RPM
Motor type	IE2	IE2
Motor norm size	ABB-100LD	ABB-100LD
Motor speed	1445 RPM	1445 RPM
Power	3.0 kW	3.0 KW
Voltage	3x400 V	3x400 V
Filter	**Supply**	**Extract**
Filter class	F7	F7
Dimensioning pressure drop	130 Pa	130 Pa
Initial pressure drop	71 Pa	71 Pa
Final pressure drop	189 Pa	189 Pa

Systemair A/S
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DK-8361 Hasselager
Tel. +45 87 38 75 00
Email: mail@systemair.dk

Sales agent:
Systemair Fans & Spares Ltd
72 Cheston Road, Birmingham, B7 5EJ
England
Tel: +44 (0) 121 322 0200
http://www.systemair.co.uk

d. 3 Dimensions of the units

See annex 2 with information about the exact dimensions.

d.4 About operation and control.

The air handling units must be completed for fully automatic operation. Control must be limited to change of parameters via buttons and display on a hand terminal. The alternative is that the controller is connected to a BMS system with the ability to select new parameters via PC, tablet or Smartphone.

d. 5 Warnings about dangers

Pictograms are according to EN1886 about;

Warning about danger by rotating parts

Warning about danger by electricity

Warning about danger by heat

Disregards of instructions shown on warning signs are connected by risk for injury or damage on material.

e. Drawings, diagrams, guides and instructions for the use, maintenance and repair

All DV units with integrated control system and TIME units are manufactured in compliance with the EC Declaration of Conformity and they are CE marked as machines. Unique Declaration with production number of the machine is an integral part of the machine – enclosed as annex 1 to this manual. If the buyer carries out changes or adds components in or on the machine, the buyer must issue a new EC Declaration of Conformity and a new CE marking of the machine. To promote correct use of the machines, the below-mentioned instructions are an integral part of the machine:

- Unique drawings, data and description of functions for the delivered unit – annex 2

- Instructions for use of the machine – section k in this manual
- Instructions about adjustment and maintenance – section r in this manual
- Safety during adjustment and maintenance – section s

f. Employees in charge of operation/control/maintenance

After start-up and hand-over from installer to operators, the unit operates fully automatically.
Indications of operating status as well as indication of faults are visible in a display and on LEDs at a hand terminal. The operators can enter new parameters in a controller via buttons on a hand terminal. Alternatively, the controller can be connected to a BMS system so that new parameters can be selected via PC, tablet or Smartphone. The operators do not need to open inspections doors for the operation

Skilled technicians must carry care out maintenance as well as repairs.

g. Intended use and range of applications

The air handling units are intended for the transport and treatment of air between -40 °C and + 40 °C
The units are exclusively for comfort ventilation. The units are not for environments that exceed the corrosion class C4 according to EN ISO 12944-2.
Intended applications for the units are:
Offices, teaching rooms, hotels, shops, homes and similar comfort zones.

h. Unintended use and misuse – inappropriate applications for the machine

Units for outdoor installation must be specified and ordered for outdoor installation.
The units must not be used in environments that exceed corrosion class C4 according to EN ISO 12944-2, and for transport of solid particles.
Examples of not intended use:
Kitchen extraction, swimming pools, off-shore, Ex-areas, drying of washed clothes.
Do not use the unit with partly finished duct systems. Do not use the unit for ventilation of the building site until the unit is properly provided with guards.

h.1 Air handling unit in operation

The pressure difference between interior and exterior of the unit must not exceed 2000 Pa for the DV 10 and up to DV 150 (including DV 150), and 1500 Pa for DV 190 and DV 240.
Before start-up of the unit all ducts, safety guards and all protective devices must be mounted to prevent any access to rotating fan impellers. All inspection doors must be closed and locked when the unit is in operation.
Do not use the unit without filters.

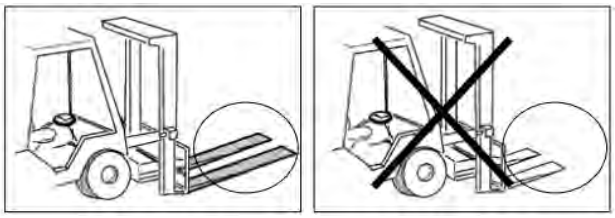
i. Instructions for unloading on the site as well as installation and connection

i.1. Unloading on the site

The air handling unit – AHU - is delivered as one section or in several sections, which are to be assembled on site. The AHU is delivered on transport pallets, legs or on a base frame. Loading and unloading as well as transport on the site is possible by fork-lift truck or by crane using suitable lifting straps.

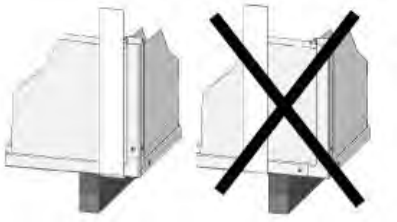
i.1.1 Unloading by fork-lift truck.

The forks of the truck must be sufficiently long to avoid any damage to the AHU underside.

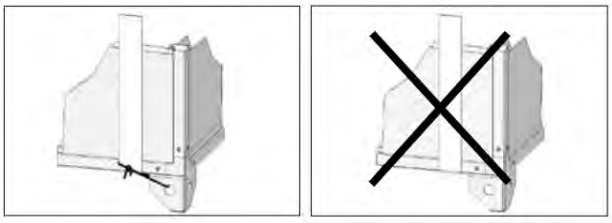


i.1.2 Unloading by crane

AHU delivered on transport pallet must be lifted by straps as shown in the illustration.



AHU delivered with legs must be lifted by straps secured to the legs as shown in the illustration.



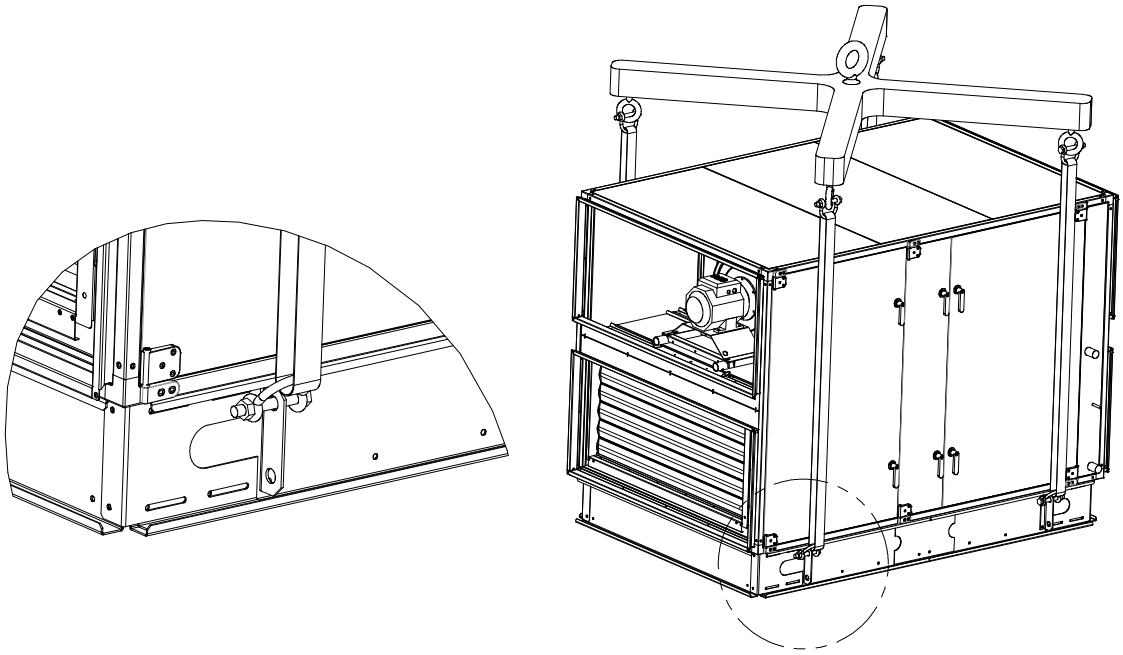
i.1.3 Transport of unit without base frame on the site

Units without base frame are always delivered in sections with each section on a pallet. Sections can be transported on the site by hand manual forklifts.

i.1.4 Lifting a unit with straps

Use an appropriate lifting beam with a sufficient span to avoid that the straps touch and damage the drip nose profiles and the inspection side with handles, pipes and accessories – for example manometers, cabinets, tabs for measuring the pressure.

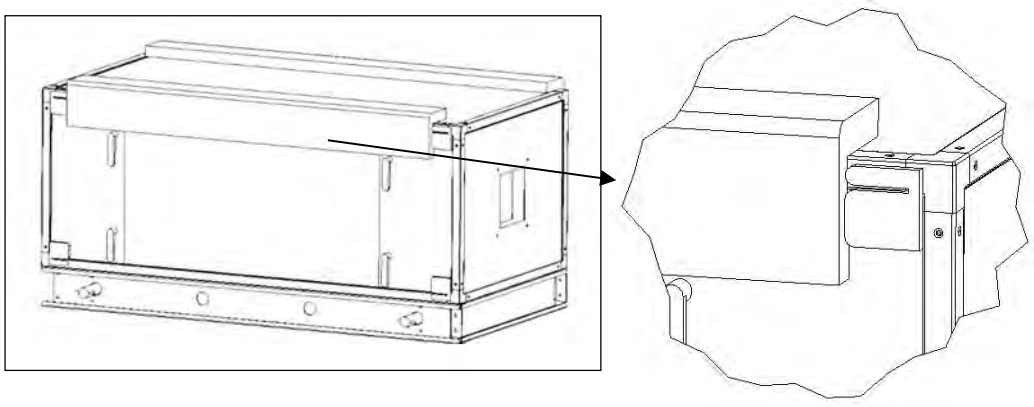
i.1.5 Lifting a unit with preinstalled brackets on the base frame for lifting.



Lifting beam and straps are not included in the delivery.

i.1.6 Roof unit with bitumen roof

Avoid damaging the drip nose profiles along the bitumen roof. Keep the protection profiles of Styrofoam on the unit until the installation has been completed. If the unit is lifted by straps, the straps must be kept away from the drip nose profiles by bars to avoid damage to roofing profiles.



i.1.7 Roof unit with steel roof

For units with steel plate roof, the steel plates are delivered uninstalled on a separate pallet. Do **not** step or walk on the plates.

i.1.8 Pre-assembly storage

The AHU must be protected from the weather and accidental impact. Plastic packaging **must** be removed and the unit covered with tarpaulin or similar materials. In order to minimize condensation, sufficient air circulation must be ensured between the covering and the unit.

i.1.9 Tilt less than 30˚ during transportation of the section with heat pump – DVU

During transportation, the unit section - DVU **must** always be in the upright position or tilted less than 30˚. If it is necessary to tilt the unit more than 30˚, the suction pipe of the compressor must point upwards to prevent the escape of oil from the compressor sump.

i.2. Installation - mechanical

i.2.1 Free area in front of and above the unit

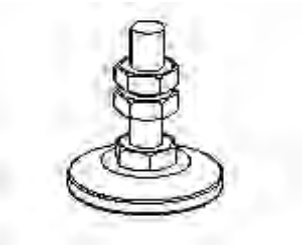
Important! When positioning the unit on the site, it must be ensured that an area with the same width as the unit is kept free for service and inspection and also for replacement of fans and exchanger, if needed. The width of the free area must be at least 900 mm.
Important! For safe access to the cabinet with electrical components, if the cabinet is placed on top of the unit, the free area from the upper edge of the cabinet to the ceiling must be at least 700 mm.

i.2.2 Supporting surface

The surface beneath the unit must be level, horizontal and vibration-free. The surface must be able to withstand the load of the AHU. Weights of the sections are written in Annex 2.
Remember! Duct work must be sound insulated and must not be mounted directly on beams, trusses or other critical building parts.

i.2.3 Adjustable feet under legs or base frame and transport of sections

Adjustable feet are provided in a carton box placed inside the unit. Adjustable feet are delivered for indoor units and not for outdoor units.
Sections can be transported on the site by hand manual forklifts or similar. The frame profiles in the edges of the sections have carrying capacity for lifting by the hand manual forklifts.



i.2.4 Base frame assembly

Base frame is delivered unassembled for the indoor units that are delivered in sections on pallets. Assembly of the base frame is illustrated on 4 pages in a manual in a plastic bag which is attached to one of the large base frame parts.

The 4 pages with the illustration regarding the assembly of the base frame are also available in this user manual in annex 4 , 5, 6 or 7.

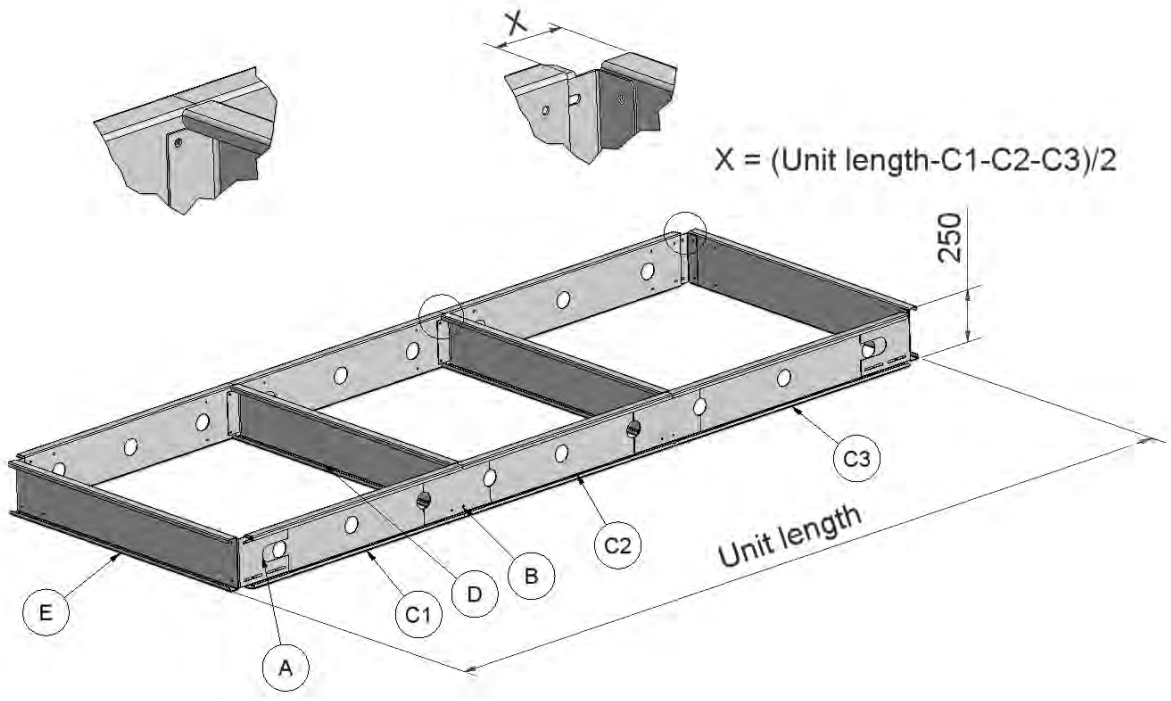
There are two types of base frames:

1. 150 mm high base frames
2. 250 mm high base frames

There are 4 different manuals and each of them illustrates the assembly of the 4 different types of base frames:

1. Manual about the 150 mm high base frames for AHUs in the sizes from DV 10 to DV 40. The name of this manual is – **Base frame 150 DVZ 10 - 40**
2. Manual about the 150 mm high base frames for AHUs in the sizes from DV 50 to DV 150. The name of the manual is – **Base frame 150 DVZ 50 - 150**
3. Manual about the 250 mm high base frames for AHUs in the sizes from DV 10 to DV 40. The name of the manual is – **Base frame 250 DVZ 10 - 40**
4. Manual about the 250 mm high base frames for AHUs in the sizes from DV 50 to DV 150. The name of the manual is – **Base frame 250 DVZ 50 – 150**

Example of 250 mm high base frame for AHUs in the size from DV 10 - 40



Mount adjustable feet with a distance of maximum 1500 mm between each foot under the base frame. The base frame can now be levelled by the adjustable feet. The next step is to place and assemble AHU sections on the base frame.

i.2.5 Base frames for outdoor units

Outdoor units must be installed on 250 mm high base frames and are always fitted to the AHU sections. Hot-dip galvanized base frames are recommended for outdoor units. Systemair delivers these base frames without the above mentioned adjustable feet.

i.2.6 Installation on the site of unit sections at the base frame when sections are delivered on pallets

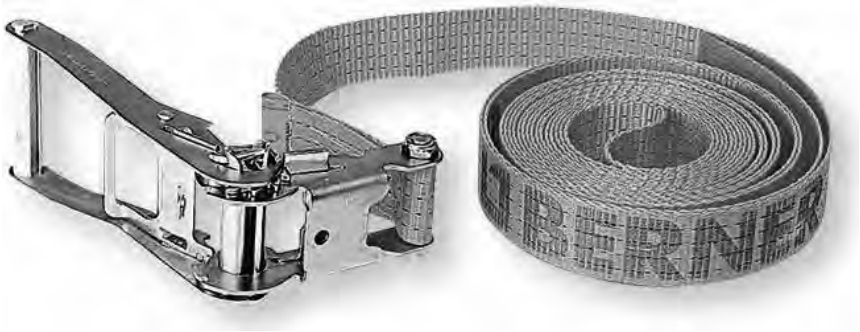
Lift up the section by hand manual forklifts to the level where the underside of the section is even with the overside of the base frame.

1. Pull the section to the correct position on the base frame by lifting straps – it is maybe necessary to support the section by heavy duty furniture trolleys (see the photos below)

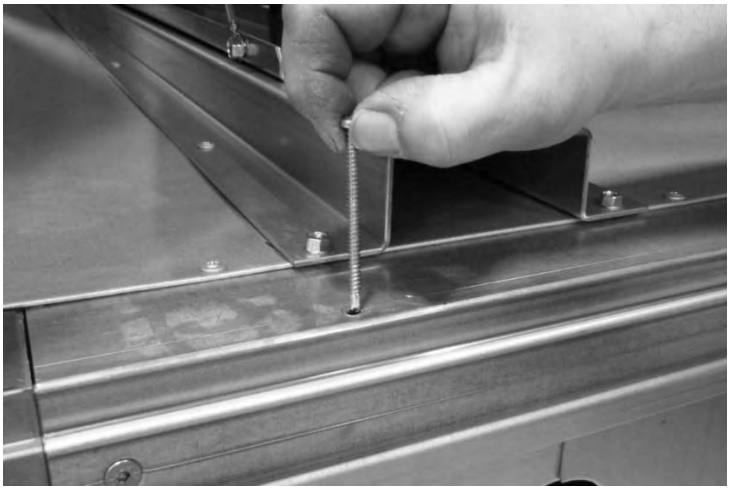
Example of heavy duty furniture trolley turned with the wheels upwards. Placed in this way on the forks of the hand manual forklifts the heavy duty furniture trolleys are suitable for safe and careful rolling of the unit sections over to the base frames.

Example of very heavy duty furniture trolleys. Turned with the wheels upwards and placed on the forks of hand manual forklifts these heavy duty furniture trolleys are very suitable for safe and careful rolling of the unit sections over to the base frames.

2. Pull sections together with lifting straps. We recommend the below shown type of brackets because this type is not damaging the frame profiles of the units. An example of lifting strap is shown below.



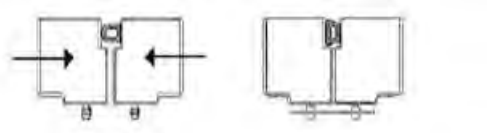
3. Sections are mounted to base frames with long self-drilling screws. The frame profile under the inspection doors is placed over the horizontal profile of the base frame. See the example on the photo below.



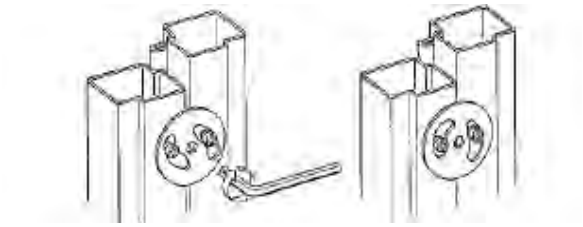
i.2.7 Joining the AHU sections

The sections must be placed on the base frame and if the unit is delivered with 100 mm legs, the sections must be positioned directly opposite each other.

1. Ensure that the internal factory-fitted rubber sealing is undamaged
2. The sections are then to be positioned directly opposite each other. If the sections are built with legs, the adjustable feet can be used to get the sections parallel and at the same height.
3. Press the sections hard together so that the rubber profiles are so flat that the iron frames of the two sections are joined. Straps with tensioner as shown below are suitable for pressing the sections hard together.



4. The sections are then to be locked permanently together with the black plastic-coated Systemair Disc-Locks. The Disc-Locks are delivered in a carton box placed inside the unit. Place each Disc-Lock over the 2 factory fitted locking pins. The discs and locking pins are not reliable for pulling the sections together. They are only sufficient for keeping the sections well together, so just turn each disc gently with the supplied Allen key. Use a sequence where each disc is tightened with only one click at a time. If the unit is placed too close to a wall with no space left for the mounting of Systemair Disc-Locks, brackets must be placed inside the unit to keep the sections permanently together (brackets for this purpose are not delivered by Systemair)



i.2.8 Fitting the ductwork

Flexible duct connections between AHU and ductwork must always be installed. Be sure that flexible duct connections are almost fully stretched. (Flexible connections are ordered as accessories and they are placed inside the unit). At the fan outlet on a centrifugal fan, the duct size should be as close to the outlet size as possible. Avoid blockage and turbulence at the fan outlet.

i.2.9 Risk of stack effect by vertical ducts and wind pressure on louvers

On special occasions stack effect – also called chimney effect – in the ducts create airflows that drives the impellers by turned off motors.
A rotating impeller is a potential hazard during cleaning and maintenance of the unit.
Eliminate this airflow by dampers with spring return motors for automatic closing of the dampers - even by power failure.
Important! The Systemair air handling units can be ordered and delivered without dampers, and the installer/user must check that duct systems with the described risk of stack effect (chimney effect) will be provided with dampers and spring return motors.

i.2.10 Refitting of guards

The guard is a safety guard installed inside the door. Tools are necessary for the removal of the guard. If the guard has been demounted during the installation on the site, the guard must be refitted before startup of the unit.

Insert the edges of the guard in the frame profile in the groove that is in the frame profile, and connect both parts of the guard at the middle with 2 screws.
Replace the vibration damping foam rubber list if it is damaged.

i.3. Installation - electrical

i.3.1 Necessary overvoltage protection device, that leads lightning overvoltage to an earth lead on a safe way.

The Installer and user must be aware of the fact that lightning strikes make a risk that requires installation of overvoltage protection devices to lead the lightning overvoltage to an earth lead in a safe way.
Installer and user must take care of this according to local statutory requirements.

i.4 Installation – Pipes for water – hot and chilled, valves and drains

i.4.1 Description

If ordered with the unit, the valves and valve motors are stored in a carton box placed inside the unit.
Water trap(s) – standard or optional - is (are) necessary to ensure escape of water from the tray under plate heat exchanger and (or) cooling coil. Water trap(s) is (are) stored in a carton box placed inside the unit.

i.4.2 Pipe connections

Connection pipes on heating- and cooling coils are provided with external thread. Drainage outlets on drip trays are provided with external thread.

i.4.3 Possibility of extracting components from the unit

Pipes and cables must not obstruct the inspection doors and components which can be extracted from the unit. Potential components for extraction are filters, fans and rotary heat exchanger.

i.4.4 Pipe connections to batteries

i.4.4.1 Heating coils

Pipes for hot water must be protected by insulation against frost and loss of heat. Further protection against frost can be obtained by installing electrical heating wires around the pipes and under the insulation combined with temperature sensors and a control system. Pipes, insulation, electrical heating wires, control system for heating wires and circulation pump are not delivered by Systemair.

i.4.4.2 Cooling coils

If ordered with the unit, the valves and valve motors are stored in a carton box placed inside the unit. Pipes for cooling must be protected by insulation against condensation on the pipes and loss of cooling in the summer. Pipes and insulation are not delivered by Systemair.

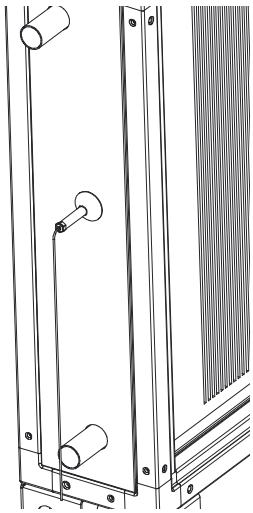
i.4.4.3 Rigid pipe mounting brackets for valves, circulation pumps and pipe system

The coil and pipes from the coil are not constructed to withstand the weight and stress from valves, circulation pumps, long pipes and insulation of pipes. The system must be supported carefully in rigid pipe mounting brackets to roof, floor and walls.

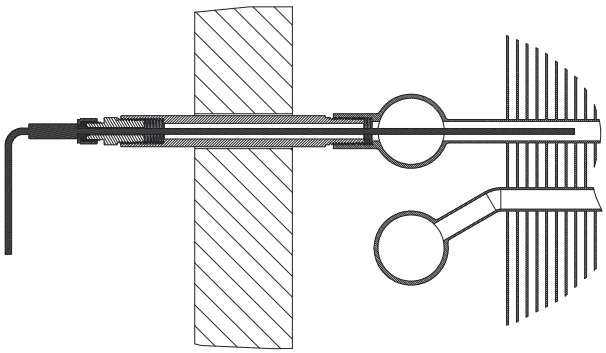
i.4.4.3.1 Pipe connection to heating coils

The heating capacity of the coil with only 2 rows is independent of the connection of the hot water in equal flow or in counter flow to the direction of the air, but connection of the hot water to the pipe marked for inlet and the return water to the pipe marked for outlet is very important to ensure that the sensor for transmission of the water temperature really will be placed in a return circuit of the coil (Screw-joint for the water temperature sensor is welded in the main collection pipe for return water).
For the frost protection of heating coil, the water temperature in the coil is transmitted to the controller The controller always generates a signal to the valve motor that keeps a sufficient flow of hot water to protect the coil against frost. This frost protection is also activated when the running mode is “off”.
Coils with 3 rows or more must always be connected in counter flow to the airflow.
NOTE: If glycol is added, the glycol must be without additives and auto glycol must not be used.Automatic bleeding has to be installed at the highest point of the 2 pipes — supply or return pipe.

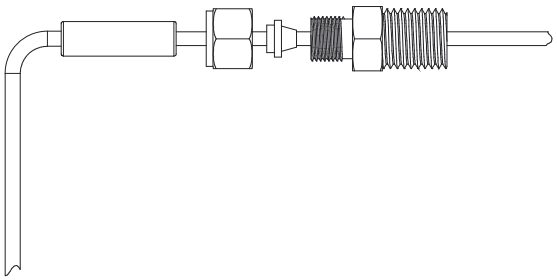
If the heating battery is built with 3 or more rows, the water flow must be in counter flow to the direction of the air.



To protect against frost a temperature sensor for the transmission of an analog signal to the controller is placed in a pipe on the collection pipe for return water. The sensor must be fitted water tight with a cap in the pipe before water under pressure is in the battery. The pipe for the sensor is soldered on the collection pipe and it is important to hold contra on the pipe, when the cap is tightened.



Battery seen from above. The sensor measures the water temperature of the water inside one of the small pipes for return water in the battery. The sensor reduces the area in this pipe and hereby also the flow of warm water in this pipe. The temperature in this pipe is reduced more than the temperature in all other pipes by the airflow through the battery. Because the lowest temperature in the battery probably is measured here, this system creates early and safe warning of frost.



It is important that the cap is tightened sufficient to keep the sensor system fully water tight.

i.4.4.3.2 Pipe connection to cooling coils for chilled water

Coils with 3 rows or more must always be connected in counter flow to the airflow.
NOTE: The glycol must be without additives and auto glycol must not be used.
Automatic bleeding has to be installed at the highest point of the 2 pipes — supply or return pipe.

i.4.5 Draining condensate water

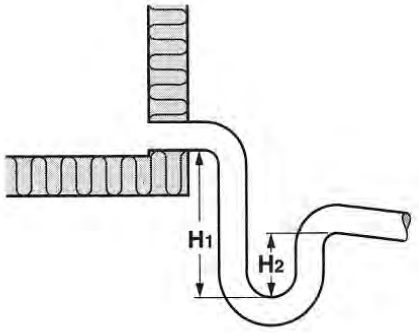
Drip trays for collection of condensate water are installed under plate heat exchanger and cooling coil. Each drip tray is provided with a drainage outlet. A water trap is always necessary. To avoid freeze ups and frost bursts of water trap and pipes, sufficient insulation is recommended and installation of heating between the insulation and water trap/pipes could even be necessary (insulation, heating and controller for the heating are not delivered by Systemair).

i.4.6 Draining condensate water from plate heat exchanger

Condensate from the plate heat exchanger is collected in the drip tray. Heavy negative air pressure in this section prevents the water from flowing out of the drainpipe. A water trap with sufficient closing level of the water is essential to ensure that condensate water flows out of the unit. The closing level of the water trap must be estimated correctly to ensure safe escape of the water (see the illustration and estimate the minimum closing level according to the table).The pipe diameter of the water trap and sewage system must be identical to the pipe diameter of the drainage outlet from the tray.
A water trap is optional and installation of the water trap is not included.
Remember to check that there is water in the water trap.

Negative pressure P (Pa)

P	H1 Minimum	H2
500 Pa	100 mm	40 mm
750 Pa	150 mm	55 mm
1.000 Pa	190 mm	70 mm

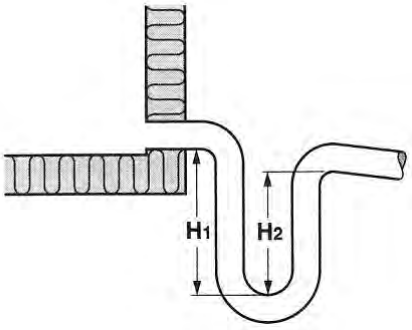


i.4.7 Draining condensate water from cooling battery

If the cooling battery and the drip tray is placed in the unit where negative pressure (underpressure) occurs, the closing level of the water trap must be estimated correctly. See the above-mentioned information in section i.4.6 – Draining condensate water from the plate heat exchanger.
If the cooling battery and the drip tray is placed in the unit where positive pressure (overpressure) occurs, the closing level of the water trap must be estimated correctly as shown on the illustration below. A water trap is optional and installation of the water trap is not included.
Remember to check that there is water in the water trap.

Positive pressure P (Pa)

P	H1 Minimum	H2
500 Pa	90 mm	65 mm
750 Pa	120 mm	90 mm
1.000 Pa	150 mm	120 mm



j. Installation and assembly instructions for reduction of noise and vibration emissions

Due to the design and construction of the units the (A) weighed sound pressure level from fans and other components do not exceed 70 dB (A) outside the units.
Data about sound in annex 2.
Installation of the units on springs will reduce the transmission of noise and vibrations to the building. Systemair does not deliver springs for this purpose.
Flexible connections between the units and the ducts are available as accessories.

k. Instructions for putting into service, adjustments, use and commissioning.

k.1 Print-outs on paper

The documents listed below are always printed on paper and delivered together with the units according to the Machinery Directive and the related national laws
This User Manual with;

- Declaration of incorporation – annex 1
- The unique technical data for this unit - annex 2
- Installation instructions including instructions for the Danfoss frequency converter – annex 4-12
- Printed form for Commissioning protocol - annex 13

k.2 Electronic media

A DVD is delivered with every unit. The below-mentioned documents are available on every DVD and this means that every DVD is provided with information about many components that are not delivered with every unit. The documents on the DVD:

Common

- This User Manual
- Operator's Guide
- Commissioning Protocol as a Word-file for modification by the installer

Components in the control system

- Danfoss frequency converter
- Damper motors
- Filter guards
- Pressure transmitters

k.3 Documentation is available for download from https://techdoc.systemair.dk

Your local Systemair company is able to provide the data.

k.4 Start-up by installer

All protection and safety measures must be met before start-up of the unit. The mains supply voltage must also be checked too.

k.4.1 Checklist, relevant values

k.4.1.1 Checklist prior to start-up

- Is the unit assembled correctly with its functions in the correct order? See annex 2.
- Are the sections and ducts assembled correct? See annex i.
- Check that fans and anti-vibration mounts are not damaged after transportation and installation.
- Is the rotary exchanger turning freely?
- Are safety guards installed correctly?
- If the unit includes integrated heat pump(DVU), check whether it is installed and supervised by qualified service personnel.
- If the unit contains Electric air heater, make sure that the supply isolator disconnects with the unit.
- Ducts - are all ducts installed?
- External components - are the valve and valve motor installed correctly?
- Is the circulation pump installed correctly?
- Is water under pressure in the coil and circulation pump?
- Are the pressure transmitters installed and connected correctly? (If this is a system with pressure transmitters in the ducts)
- Main power supply:
  - Connected correctly? (3x400 V + N + PE)
  - Are control signals for actuators connected correctly?

k.4.1.2 Switch on power

Do not start until all safety procedures have been completed and ensure that inspection doors are closed and locked.
Switch on power and the unit should be ready for the start-up.

k.5 Description of functions

k.5.1 Heating coil for hot water prepared for temperature sensor (frost protection)

From Systemair every heating coil for hot water is provided with a little pipe at the collection pipe for the return water. This little pipe is prepared for the installation of a temperature sensor for the transmission of the return water temperature to the controller. The temperature sensor is not included.

k.5.2 DX cooling

Cables and flow guard are not delivered by Systemair

k.5.3 Circulation pump, heating

Circulation pump is not included in the delivery from Systemair.

k.5.4 Electrical heater battery

k.5.4.1 Control of heating capacity connected to unit without Systemair control system

Electrical heater installed with separate controller beside the heater. The separate controller is designed for capacity conversion of 0-10 V control signal from the main control system. No power supply cables are connected to the electric heater. The separate controller for the heater is without supply disconnecting device.

k.5.5 Speed control of fans

k.5.5.1 Frequency converters inside the unit are IP 20

Fan motor revolutions are controlled by frequency converters. **Shielded cable must be used between the frequency converters and the motors.**

k.5.5.2 Frequency converters on the unit are IP 54

Fan motor revolutions are controlled by frequency converters. **Shielded cable must be used between the frequency converters and the motors.**

k.5.6 Pressure transmitters

Separate control of the air flow or duct pressure for supply fan and for extract fan. The required air flow or duct pressures with normal as well as reduced capacity are selected on the Control Panel.
The actual pressure is measured by pressure transmitters. PI calculation in the controller continuously transmits the necessary revolutions for the fans to the frequency converters to achieve the required pressure.

k.5.7 Damper motors

Four different types of damper motors are available;

- On/off damper motor, without spring return function. Torque is 20 Nm and run time is 150 seconds
- Modulating damper motor, without spring return function. Torque is 20 Nm and run time is 150 seconds
- On/off damper motor, with spring return function. Torque is 20 Nm and run time is 150/16 seconds
- Modulating damper motor, with spring return function. Torque is 20 Nm and run time is 150/16 seconds

k.5.8 Filter guards

Filter guard over pre-filter and primary filter installed and connected to the controller for display of alarm when the mechanically set limit is exceeded. Filter alarm will be displayed on the Control Panel.

k.6 Commissioning

When the installer has completed the installation and wants to hand over the finished installation to his customer for payment the commissioning protocol can be the written receipt for the full ended job. Fill in the blank spaces and sign the proposed commissioning protocol that is annex 13, or fill in the Word-file with a Commissioning Protocol that is included on the DVD delivered with the unit.

l. Information about the *residual risks* that remain despite the inherent safe design measures, safeguarding and complementary protective measures adopted.

l.1 Unit casing.

l.1.1. Design of the machine to make transport safe

Hazards/dangerous area:
Incorrect handling during transportation may cause that the unit is dropped.
Dangerous incident:

If a person is hit by a unit that is dropped, this could in unfortunate circumstances lead to irreversible injury or death.
Claim for reduction of danger:
Correct handling during transportation is described in this manual. If lifted by fork-lift truck the forks of the truck must be sufficiently long. Safety measures are also described in this manual by use of crane. Information about weight of each section is also visible.

I.2 Common for all unit sections

I.2.1 Risk caused by surfaces, edges and corners

Hazards/dangerous area:
Sharp edges on plates might occur inside the machines as well as sharp edges on frames of dampers. No sharp edges on the outside of the units.
Dangerous incident:
Cut fingers/hands.
Claim for reduction of danger:
Risk only exists during maintenance and cleaning. This takes place at least once every year. Use of gloves and helmet is described in this manual. Cut-resistant gloves for protection against injury from sharp metal plate edges. Use CE-marked gloves for this purpose. Lamps mounted inside the unit with sufficient lighting reduce the risk of injury.

I.3 Common for all unit sections by insufficient lighting

I.3.1 Risk caused by insufficient lighting inside sections

Hazards/dangerous area:
On the floors of the units there are handles to hold filters, profiles for the carrying of fan motors. Cables are between fan motors and frequency converters.
Dangerous incident:
By insufficient lighting, the above-mentioned obstacles are not visible with the risk of stumbling that becomes a fall, leading in unfortunate circumstances to irreversible injury or death.
Claim for reduction of danger:
Risk only exists during maintenance and cleaning. This takes place at least once every year. According to this manual and in the SystemairCAD software for configuration and selection of accessories, lamps for sufficient lighting inside the units are mandatory according to the latest interpretations of the Machinery Directive by the authorities. Use of helmets reduces the risk of injury.

I.4 Dampers type DVA – DVB – DVM – DVP – Bypass dampers in DVQ

I.4.1 Risk caused by maintenance and cleaning of dampers

Hazards/dangerous area:
Are between the damper blades and the system of bars and links between motor and damper blades.
Dangerous incident:
Crushing of fingers.
Claim for reduction of danger:
Examination is still under preparation in our own laboratory. Still no voluntary test persons are available.

I.5 Attenuators type DVD

I.5.1 Risk caused by maintenance and cleaning of attenuators

Hazards/dangerous area:
High concentration of dust on the surface of the baffles might be harmful to the health.
Dangerous incident:
To breathe in particles that is harmful to the health.
Claim for reduction of danger:
Risk only exists during maintenance and cleaning. This takes place at least one time every year. Use of particulate respirator is described in this manual. Particulate respirator – maintenance free including foam face-seal and adjustable pre-threaded headbands (same particulate respirator as recommended for change of filters).

I.6 Filters type DVG – DVF

I.6.1 Risk caused by missing change of filters

Hazards/dangerous area:
Missing change of filters and missing maintenance decrease the capacity and final consequence will be breakdown.
Dangerous incident:
By extensive lack of of filter change and maintenance the machine can break down.
Claim for reduction of danger:
In the manual is the method and schedule for change of filters and maintenance specified.

I.6.2 Risk caused by the execution of filter change

Hazards/dangerous area:
Filter panels and filter bags
Dangerous incident:
To breathe in particles that is harmful to the health.
Claim for reduction of danger:
Use of particulate respirator – maintenance free including foam face-seal and adjustable pre-threaded headbands (same particulate respirator as recommended for cleaning of attenuators.

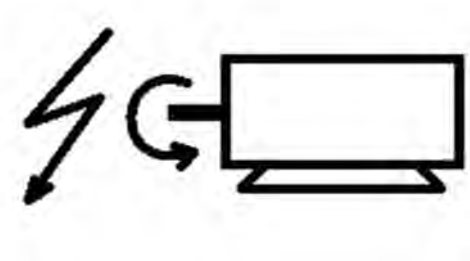
I.7 Plug fans type DVE

I.7.1 Risk caused by lightning strike

Hazards/dangerous area:
Lightning strike close to the machine.
Dangerous incident:
Lightning strike can create flash over between phases and conductive parts. This can cause fire or the overvoltage can make injury on persons
Claim for reduction of danger:
Installer and user must be aware of the fact that lightning makes a risk that requires installation of overvoltage protection devices to lead the lightning overvoltage to an earth lead on a safe way. The need for overvoltage protection devices depend on where the unit is placed in and on the building.
Installer and user must take care of this according to local statutory requirements. Overvoltage protection devices are also described in section i.3.1 of this manual.

I.7.2. Risk caused by permanent magnet motor

Hazards/dangerous area:
Rotation of the shaft generates electricity. This danger is always visualized by a yellow warning label on the inspection door where permanent magnet motors are installed.



Dangerous incident:
Persons touching conductive parts get electric shock, burns, heart flicker and so on.
Claim for reduction of danger:
By installation or repairs of conductive components, the shaft must be blocked to prevent any rotation.

I.7.3 Risk of rotating impeller caused by stack effect (chimney effect).

Hazards/dangerous area:
On special occasions stack effect – also called chimney effect – in the ducts create airflows that drives the impellers by turned off motors.
Dangerous incident:
Injury of fingers, hands and arms.
Claim for reduction of danger:
Eliminate this airflow for supply air and exhaust air by dampers with spring return motors for automatic closing of the dampers by turned off fan motors and by power failure.

I.8 Batteries for heating and cooling type DVR – DVH – DVK – DVU

I.8.1 Extreme temperatures - heating

Hazards/dangerous area:
Electrical heating elements can achieve surface temperature of 500 degree Celsius.
Batteries and pipes for hot water can achieve 95 degree Celsius.
Dangerous incident:
According to ISO 13732-1:2006, here is no direct risk of burns. (short-time contact – lesser than 2,5 sec).
Claim for reduction of danger:
No.

I.8.2 Extreme temperatures - cooling

Hazards/dangerous area:
Evaporator batteries and pipes connected to cooling compressor can achieve minus 10 degrees Celsius.
Dangerous incident:
According to ISO 13732-1:2006, here is no direct risk of burns. (short-time contact – lesser than 2,5 sec).
Claim for reduction of danger:
No.

l.9 Heat pump units type DVU

l.9.1 Risk of high temperature

Hazards/dangerous area:
Condenser batteries and pipes can achieve temperature of 60 degree Celsius.
Dangerous incident:
Vurderet ud fra ISO 13732-1:2006, der er umiddelbart ikke risiko for forbrændinger. (berøringstid 2,5 sek).
Claim for reduction of danger:
No.

l.9.2 Risk caused by lightning strike

Hazards/dangerous area:
Lightning strike close to the machine.
Dangerous incident:
Lightning strike can create flash over between phases and conductive parts. This can cause fire or the overvoltage can make injury on persons.
Claim for reduction of danger:
Installer and user must be aware of the fact that lightning makes a risk that requires installation of overvoltage protection devices to lead the lightning overvoltage to an earth lead on a safe way. The need for overvoltage protection devices depend on where the unit is placed in and on the building.
Installer and user must take care of this according to local statutory requirements. Overvoltage protection devices are also described in section i.3.1 of this manual.

m. Instructions on the protective measures to be taken by all service technicians during repair and maintenance

Use the below-mentioned personal protective equipment for maintenance:

- Cut-resistant gloves for protection against injury from sharp metal plate edges. Use CE-marked gloves for this purpose.
- Helmet
- Particulate respirator – maintenance free including foam face-seal and adjustable pre-threaded headbands – for replacing filters.
- Padlock for locking the automatic circuit breakers in off position
- Permanent magnet motor. The shaft must be blocked during repairs and maintenance of the electric system (the motor generates electricity by rotation – for example that the wind and thermic drives the fan/motor).
- Lighting inside the units. According to the latest interpretations of the Machinery Directive by the authorities sufficient lighting inside the units is mandatory.
- Tools to block the impeller during repairs and maintenance if stack effect – also called chimney effect – in the ducts create airflows that drives the impellers by turned off motors

n. The essential characteristics of tools which may be fitted to the machinery

The subject in the Machinery Directive about tools on the machine does not exist for the DV air handling units, because those tools does not exist.

o. The conditions of stability during use, transportation, assembly, dismantling when out of service

The unit must always be handled in an upright position. Never tilt any section more than 15 degrees. If sections must be tilted more than 15 degrees, sections with fans or rotating exchangers that can be drawn out for service must be secured carefully.
During transportation, installation, dismantling or other handling, it must be secured that all components in the unit are properly fastened and with additional attention to the control of anti-vibration mounts under the fans that they are undamaged. The mounting and smooth running of the fans must be controlled and handled with great care.

o.1 Installed reliable to avoid units to be tilted or moved by the any storm.

Units installed on roofs and other places with the risk of heavy winds must be installed reliable to avoid that they can be tilted or moved by the any storm. The base frame is provided with holes that are intended for fastening by sufficient bolts and fittings supplied by the installer.

o.2 Transport of section with heat pump unit

During transportation, the unit section – DVU - **must** always be in the upright position or tilted less than 30˚. If it is necessary to tilt the unit more than 30˚, the suction pipe of the compressor must point upwards to prevent the escape of oil from the compressor sump.

o.3 Disposal of the heat pump system - type DVU

Prior to the disposal of the DVU unit section, the refrigerant in the heat pump system must be drained off by a skilled technician from a certified company. After correct evacuation of the refrigerant, the disposal of the DVU unit section is similar to the disposal of the rest of the air handling unit.

o.4 Generel disassembly – sharp edges

Pay attention to several sharp edges during dismantling and disposal of the unit. To avoid injury, CE-marked cut-resistant gloves as well as helmet must be used. The measures are described further in the Maintenance, Dismantling and Disposal Manual.

p. Instructions for machinery where these are regularly to be transported

The subject in the Machinery Directive about machinery that are regularly to be transported does not exist for the DV air handling units, because those units are for specially made for one intended application.

q. The operating method to be followed in the event of breakdown. Safe restart.

Use the below mentioned procedure in the event of breakdown or blockage:

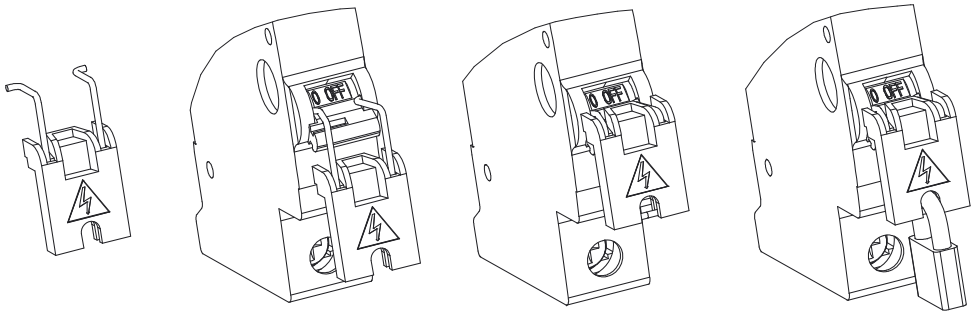
- Switch off the power and lock the automatic circuit breaker by padlocks in the off position.
- Remove the reason for breakdown or blockage.
- Follow the start-up procedure described in section k.

r. Adjustment and maintenance operations

Must be performed by skilled technicians.
In connection with demands for compensation, Systemair must have full and unhindered access to all relevant reporting on service, repair, modification and use since the unit was transferred from Systemair to a transport company at the Systemair factory. It is a condition for compensation that maintenance outlined on the following pages has as a minimum been performed.

r.1 Shutdown of the unit to a safe state.

Switch the unit to OFF on the control panel. Switch off the automatic circuit breakers and block them by padlocks. See the example in the illustration below about how to place a padlock on each automatic circuit breaker.



Switch on the lamps for light during the maintenance activities. Lamps is an accessory.
Use the start-up procedure described in section k, when the maintenance activities are completed.

r.2 Recommended maintenance intervals

Function	Maintenance	Number per year
Unit casing	Cleaning of the unit casing.	1
	Control of rubber seals on doors and between sections.	1
Filters	Change on demand by alarm and always minimum twice a year.	2
	Control of rubber seals. Control of the system with lateral locking rails and handles on TIME and DV10 – DV150. Control of the filter bank frames with fasteners on DV190 and DV240.	2
Fans	Cleaning of all parts.	1
	Check motors and bearings	1
	Check that the impellers are rotating without dissonance.	1
	Check that anti-vibration mounts are intact.	1
	Check that the unit is operation without vibrations after the cleaning, overhaul and maintenance.	1
Rotary heat exchanger	Check that leakage and dirt accumulation is insignificant	1
	Check that the rotor can turn freely and easily manually with a hand when the belt is removed from the drive	1
Plate heat exchanger	Check bypass function and sequence for de-icing	1
Run-around heat exchanger	Check the exchanger function and test the frost protection. The glycol must be without additives and auto glycol must not be used.	
Dampers	Test the operation.	1
	Visual inspection of seals and tightness when closed.	1
Hot water battery	Check the dirt accumulation and clean, if needed.	1
	Bleeding, if needed.	1
	Test of frost protection sequence	1
	Test of cirkulation pump	1
Electric heating battery	Check dirt accumulation and clean, if needed.	1
	Test the function of the system with the fuses for the safety.	1
Cooling battery	Check dirt accumulation and clean, if needed.	1
	Test the frost protection (glycol)	1
Heat pump unit	Mandatory annual control of the heat pump system. Must be done by certified technician from a certified company.	1
Condensate drain	Cleaning of tray, water trap and outlet. Check the electrical heating between insulation and pipes, if installed.	1

r.3. Filters – sizes and numbers

Filters in supply air and in extract air are always the same sizes and the same numbers. See the filters in supply or extract air below. REMEMBER to order filters for supply as well as for extract.

Size of unit	Numbers and sizes of frames for bag filters (WxH)
10	1x[792x392]
15	2x[490x392]
20	1x[490x490] + 1x[592x490]
25	2x[592x592]
30	1x[592x592]+ 1x[490x592] + 1x[287x592]
40	3x[490x742]
50	3x[592x490] + 3x[592x287]
60	8x[490x490]
80	4x[490x592] + 4x[490x490]
100	4x[592x592] + 4x[490x592]
120	4x[592x592] + 4x[592x490] + 4x[592x287]
150	9x[592x490] + 6x[490x490]
190	15x[592x592]
240	15x[592x592] + 3x[287x592] + 5x[592x287]

Size of unit	Numbers and sizes of frames for panel filters (WxHxD)
10	2x[376x376x44]
15	2x[448x448x44]
20	1x[241x495x44] + 1x[495x495x44] + 1x[391x495x44]
25	2x[445x622x44] + 1x[391x622x44]
30	3x[445x622x44]
40	6x[495x368x44]
50	6x[622x391x44]
60	8x[495x495x44]
80	4x[495x495x44] 4x[495x597x44]
100	10x[445x622x44]
120	15x[495x445x44]
150	21x[391x495x44]
190	15x[592x592x25]
240	15x[592x592x25] + 3x[287x592x25] + 5x[592x287x25]

NOTE that special sizes of filters are available by Camfil.

r.3.1 Bag filters

Release the bag filter cells by activating the handles and pull out the filter cells of the unit casing. The frame profiles are to be cleaned and all seals checked for damage. The handles and locking guide rails are also to be checked to ensure that they can operate unobstructed. The new filter bags must be pushed carefully into the unit in order to ensure that they are sealed properly. The various filter sizes should be placed in an order corresponding to the way in which the unit is designed, and the filters must have vertical bags.

r.3.2 Panel filters

The filter cell guide rails are to be cleaned before fitting the new filters.

r. 4 Other functions to maintain

r. 4.1 The unit

The unit should be cleaned once a year when operating with normal air quality for comfort ventilation with no special hygiene requirements.
To clean the unit, dry it off with a dry cloth, or use water mixed with a non-corrosive cleaning medium.
Any corrosion i.e. at the filters should be cleaned off immediately, and the surface treated.
In special operating conditions, where the air is aggressive or very humid, for example, or where there are special hygiene requirements, the unit shall be cleaned more frequently as required.
Cleaning medium and method should be adapted to the relevant conditions. Any corrosion should be cleaned off immediately, and the surface treated.
Closing mechanisms are to be lubricated at least once a year. Synthetic door hinges are service free. Seals around inspection doors are to be cleaned at least once a year and are to be checked for leakage.
It is recommended to treat the seals with a moisture repellent agent. Connecting pieces for the unit sections, including the Disc-Lock types, are to be checked for tightness at least once a year.
All seals are to be inspected at least once a year and are to be repaired if necessary.

Grilles for air intake and exhaust air outlet are to be cleaned at least once a year to prevent blockage.

r. 4.2 Dampers

Rubber seals between the damper blades themselves and between the damper blades and the frame are to be checked once a year. These seals are not to be lubricated or treated in any other way.
Each damper blade is connected by a pivoting system. The steel rods and brass bushes do not require lubrication.
The damper blades are fitted with synthetic bearings requiring no lubrication. Air-tightness of the damper, when the damper motor is in the closed position, must be visually checked once a year. The damper motor is to be adjusted if the damper does not close tightly.

r. 4.3 Rotary heat exchanger DVC

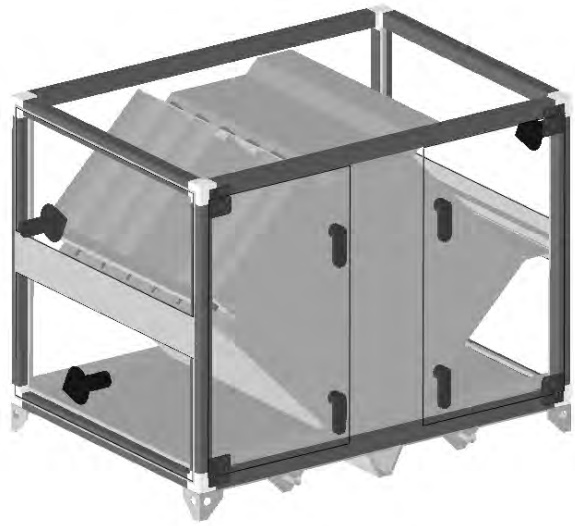
r. 4.3.1 Rotor

The rotor is to be checked at least once a year to ensure that it can turn freely and easily. This can be done by removing the belt drive at the motor and then turning the rotor manually with a hand on the peripheral rotor casing. At the same time the brush seals are to be checked for damage. The bearings are factory lubricated and do not require any service lubrication. During operation the rotor can become dirty. The rotor can be cleaned by blowing through with compressed air.
To ease inspection and service the rotor can be pulled out of the sizes 10, 15, 20, 25 og 30.

r. 4.3.2 Motor and belt drive

The bearings are factory lubricated and do not require any service lubrication. The belt drive is to be checked for correct tightness and that it is undamaged. On smaller AHU, the rotor is fitted with an elastic belt drive and supplied with a reserve belt on the rotor. This belt drive does not require service and cannot be shortened. A new belt can be fitted using specialist tools. On larger heat exchangers the rotor has a V-belt with a belt connector. If the belt is no longer tight, it must be shortened to a length which enables the motor base frame tightening spring to hold the belt tight. If new screws are used for the belt connector, they must not have a length which exceeds the thickness of the belt and connector. Remove the excess, if any, with a file.

r. 4.4 Cross flow and counter flow exchanger



Once a year the edges of the heat exchanger plates are to be checked for cleanliness and damage.
If there is dust on the edges of the plates, remove it with a soft brush. If grease or other such substances are present, then the edges must be washed using grease dissolving detergents.

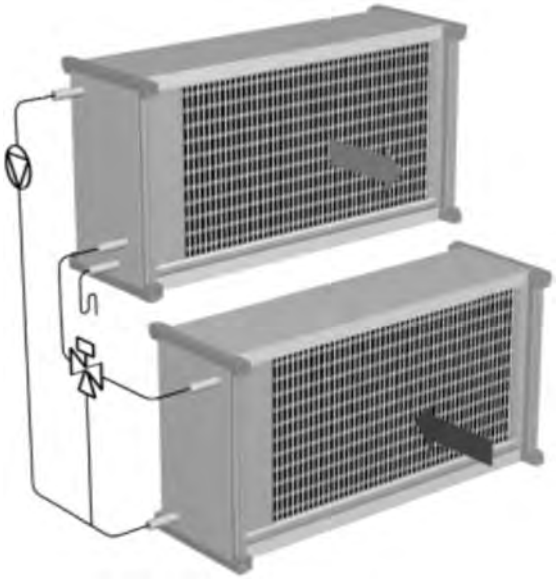
r. 4.4.1 By-pass damper

The damper blades are fitted with synthetic bearings requiring no lubrication. Each damper blade is connected by a pivoting system. The steel rods and brass bushes do not require lubrication. Air-tightness of the dampers, when the damper motor is in the closed position, must be visually checked once a year. The damper motor is to be adjusted if the damper does not close tightly.

r. 4.4.2 Condensate water drain

Once a year clean the drip tray beneath the heat exchanger, as well as the drain and the water trap.
Take care that that there is sufficient water in the water trap. If a droplet eliminator has been fitted, this must be checked once a year and cleaned if necessary.

r. 4.5 Run-around heat exchanger DVR



A heat recovery system of this type consists of a heating coil in the supply air- flow and a cooling coil in the exhaust air- flow. After an extended running period (normally a few years) dust particles can accumulate on the surface of the coils. This can reduce the efficiency of the coils. Cleaning must be carried out with the utmost care to ensure that the coil fins are not damaged.
The piping system must be vented once a year as air in the system can significantly reduce the capacity of the coils.

r. 4.5.1 Pump and pressure expansion

The service instructions issued by the pump manufacturer must be followed. The pressure expansion system must be checked once a year. If necessary, the pressure must be increased to the correct level.

r. 4.5.2 Condensate water drain

Once a year clean the drip tray beneath the heat exchanger, as well as the drain and the water trap.
Take care that that there is sufficient water in the water trap. If a droplet eliminator has been fitted to the cooling coil, this must be checked once a year and cleaned if necessary.

r. 4.6 Heating coil DVH, cooling coil DVK and change over coil DVHK

After an extended running period (normally a few years) dust particles can accumulate on the surface of the coil. This can reduce the efficiency of the coil. Cleaning must be carried out with the utmost care to ensure that the coil fins are not damaged. The piping system must be vented once a year as air in the system can significantly reduce the capacity of the coil.

r. 4.6.1 Heating battery

Check that the frost protection system is fully operational. A battery may burst due to frost if the frost protection system is not operational.

r. 4.6.2 Cooling battery

Once a year clean the drip tray beneath the cooling coil, as well as the drain and the water trap. Take care that that there is sufficient water in the water trap. If a droplet eliminator has been fitted to the cooling coil, this must be checked once a year and cleaned if necessary.

r. 4.6.3 Electeric heating battery

Check that the built-in safety thermostat with an automatic reset function and the overheat thermostat with manual resetting are fully operational.

r. 4.7 Plug fans DVE

Dust can accumulate on the fan impeller which can cause imbalance and vibrations. The fan impeller must therefore be checked once a year and cleaned, if necessary. Anti-vibration mounts and flexible connections should be checked at the same time. If the anti-vibration mounts are damaged in any way they must be replaced.

r. 4.7.1 Motor

The motor are usually fitted with factory lubricated bearings which require no further lubrication. Larger motors can be fitted with greasing nipples and bearings which require regular lubrication. Lubricating these types of bearings must be carried out according to the manufacturer's instructions.

r. 4.8 Silencer DVD

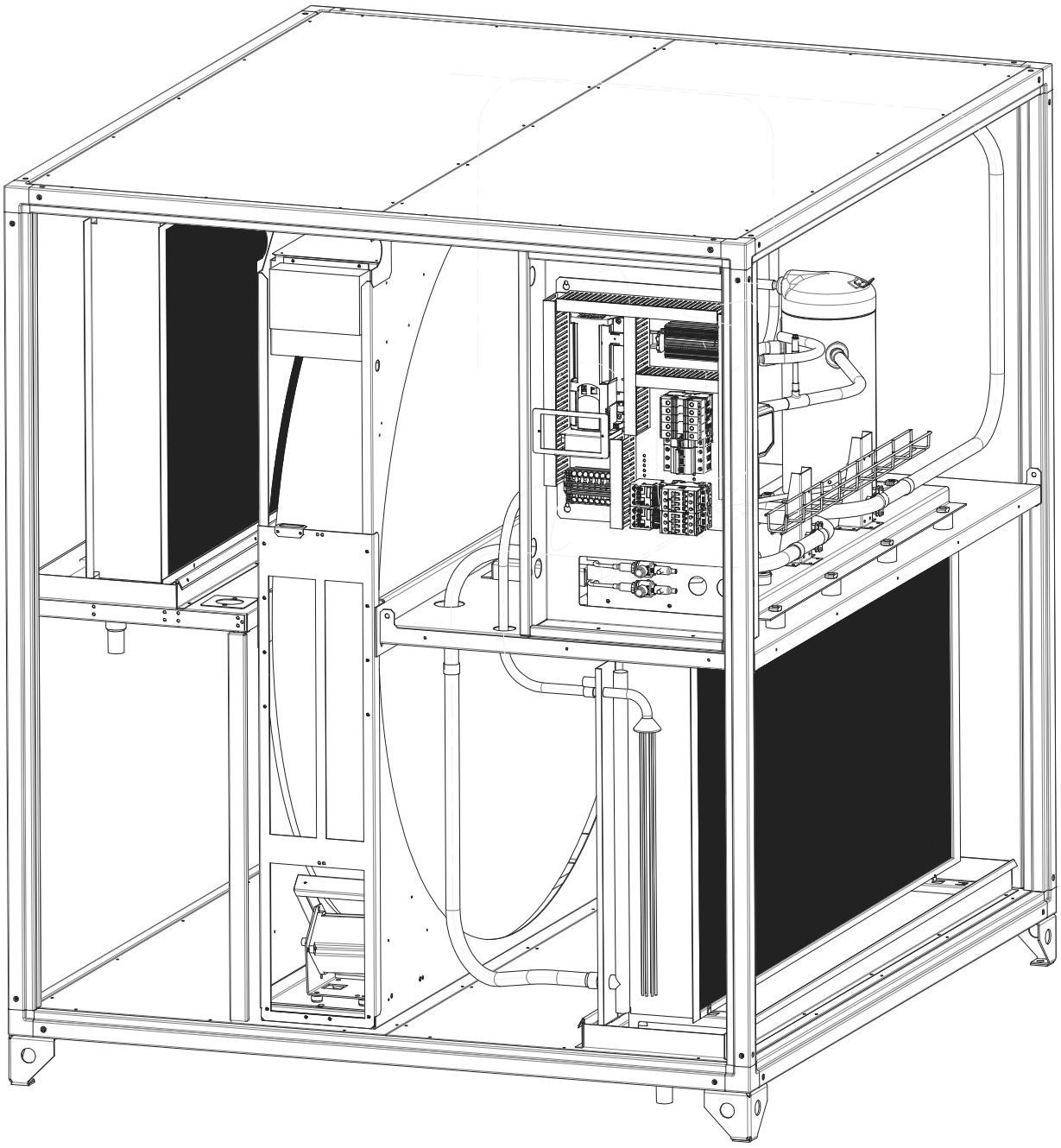
During operation dust particles can accumulate on the surface of the baffles. Silencers that are designed for dry and wet cleaning are fitted with baffles that can be extracted from the unit casing. Large inspection doors give access to easily extraction of the baffles. Baffles designed for dry cleaning can be cleaned using a soft brush or they can be vacuum cleaned. Baffles designed for wet cleaning can be washed down using a soft brush and soapy water. The detergent used must be non-aggressive. After washing, the baffles must be wiped dry with a cloth. Remember to clean the inside surface of the unit casing before refitting the baffles.

r. 4.9 Outdoor air section DVY

Dust and dirt can accumulate in this section. Large inspection doors give access for cleaning.

r. 4.10 Heat pump unit – DVU-HP

Mandatory annual control must be done by certified technicians from a certified company. See further description in annex 10 and 11.



s. Instructions designed to enable adjustment and maintenance to be carried out safely, including the protective measures that should be taken during these operations

s.1. Protective measures and additional protective measures

Adjustment and maintenance must be done by skilled technicians – usually based on service contracts for some years or long-term ESCO contracts.
The units are provided with guards to avoid unintended hazards and injury because of rotating parts in the unit. The potential sources of harm are the fans with fast rotating impellers. Hazards from the impellers are obvious during operation, but when power is cut-off, the impellers are still potential hazards due to after-run for at least 20 seconds. Notice that even cut-off the impellers are still potential hazards.
The fan guard's are the inspection doors and the doors are provided with locks. Inside the doors are additional protection installed – guards that only can be removed by use of tools.
Other motor-driven parts are dampers with damper motors and rotary heat exchangers, but the movement is so slow that guard measures are not necessary. Just keep your hands away from places with risk of injury.
Use particulate respirator when filters are replaced.

s.1.1 Necessary protection measures prior to start-up.

Ensure that all protection measures are installed correct before start-up.

s.1.1.1 Design of protection measures

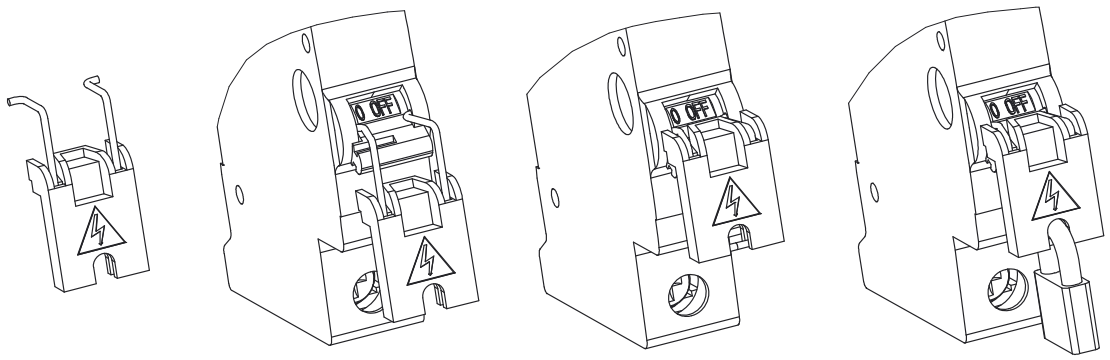
Inside the doors are additional protection installed – guards that only can be removed by use of tools.

s.1.1.2 Configuration of frequency converters with installed guard

A frequency converter is mounted beside the fan in some units. If the configuration of frequency is carried out with the fan in operation, the guard must be installed for safety reasons and a long cable must be installed between the frequency converter inside the unit and the control panel outside the unit.

s.1.2 Safe adjustment and maintenance

Before maintenance and repair, the unit must be switched off by switching off the automatic circuit breakers and block them by padlocks.. See the illustration below about how to place a padlock on each automatic circuit breaker. N**ote that lamps must be switched on during maintenance** (lamps are an accessory – only installed, if ordered).
Use cut-resistant gloves for protection against injury from sharp metal plate edges. Use CE-marked gloves for this purpose. Use helmet during maintenance work in the unit.



s.1.3 Personal protective equipment for maintenance staff – health and safety

Use the below-mentioned personal protective equipment for maintenance:

- Cut-resistant gloves for protection against injury from sharp metal plate edges. Use CE-marked gloves for this purpose.
- Helmet
- Particulate respirator – maintenance free including foam face-seal and adjustable pre-threaded headbands – for replacing filters.
- Padlock for locking the above mentioned automatic circuit breakers.
- Permanent magnet motor. The shaft must be blocked during repairs and maintenance of the electric system (the motor generates electricity by rotation – for example that the wind and thermic drives the fan/motor).

t. The specifications of the spare parts to be used, when these affect the health and safety of operators

DV units are operating automatically. Operators can control the unit by the control panel.

t.1 Spare parts - Mechanical

Annex 3 - available on demand

t.2 Spare parts - Electrical

Annex 3 – available on demand

u. Information on airborne noise emissions exceeding 70 dB(A)

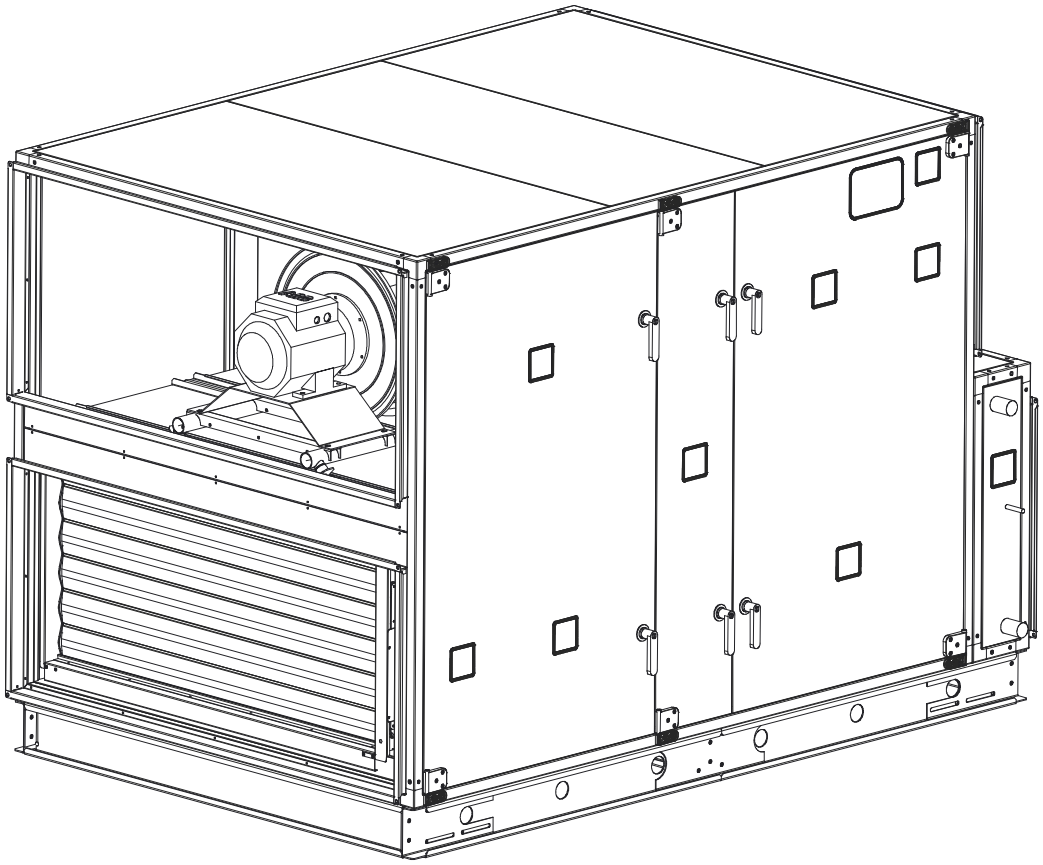
Due to the design and construction of the units the (A) weighed sound pressure level from fans and other components do not exceed 70 dB (A) outside the units.

Annex for the User Manual

Air Handling Units

Danvent DV

Without control system



Version 1.01.06

Overview of annexes

Annexes 1, 2, 3 and 13 are enclosed in a separate cover.

Annex 1 Declaration of incorporation with unique production number

Printed on separate page and delivered with every unit. Enclosed in separate cover.

Annex 2 Technical data – unique data for every unit

Printed on separate pages and delivered with every unit. Enclosed in separate cover.

Annex 3 spare part lists

Printed on separate pages but **not** delivered with every unit. Available on demand.

Annex 4 Assemble base frames – height 150 mm for units in the sizes 10-40

Annex 5 Assemble base frames – height 150 mm for units in the sizes 50-150

Annex 6 Assemble base frames – height 250 mm for units in the sizes 10-40

Annex 7 Assemble base frames – height 250 mm for units in the sizes 50-150

Annex 8 Installation of steel roof in the sizes 10-150

Annex 9 Rotary exchanger – speed control and assembly of divided rotor

Annex 10 Heat pump unit – DVU-HP

Annex 11 Menu for internal controller in the heat pump unit

Annex 12 Connection of fan motor and set-up manual for Danfoss VLT FC101 frequency converter

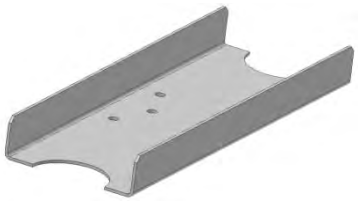
Annex 13 Commissioning protocol – proposal (receipt for hand-over)

Printed on separate pages and delivered with every unit. Enclosed in separate cover

Annex 4. Assemble base frames – height 150 mm for units sizes 10-40

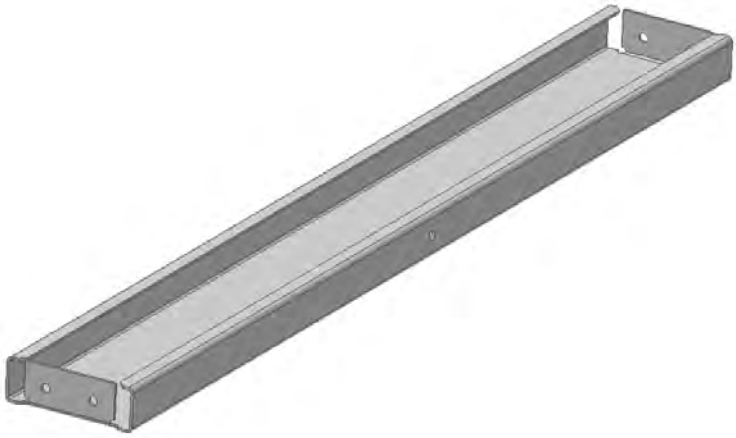
A = Corner

B = Splice

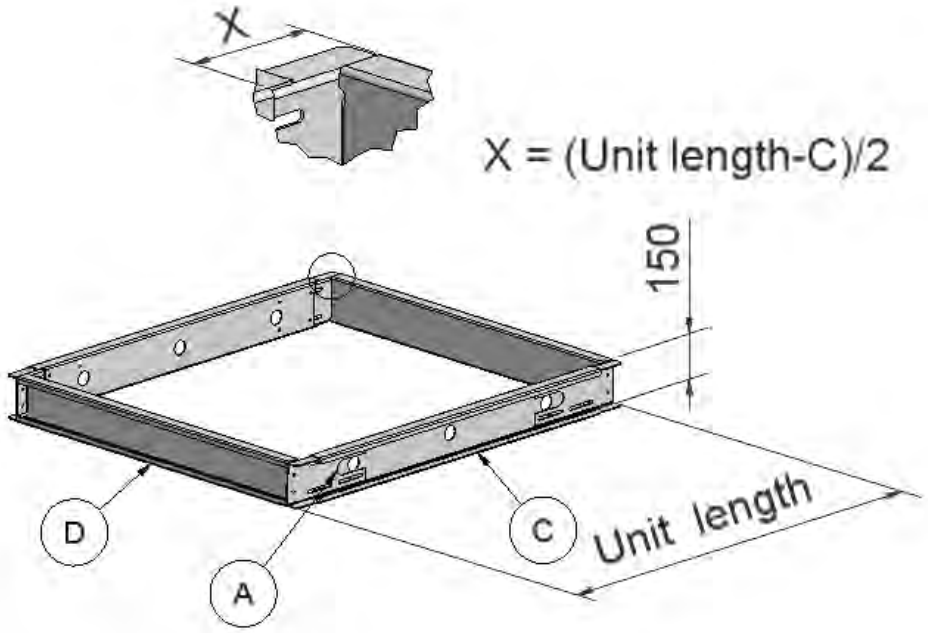


C = Length profile

D = Width profile



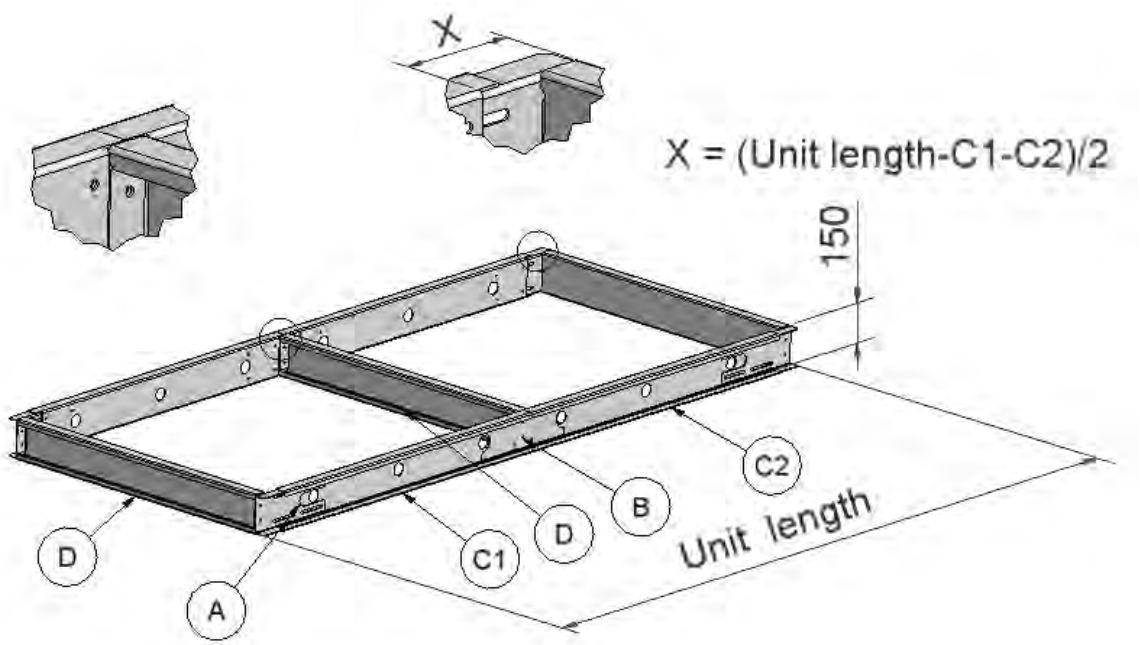
4.1 Base frame length 720 – 2420 [mm] Unit size 10-40



Width profile type D		
Unit size	***Quantity***	***Length [mm]***
DV-10	2	876
DV-15	2	1026
DV-20	2	1176
DV-25	2	1326
DV-30	2	1476
DV-40	2	1626

	C		**A**
Frame length [mm]	***Quantity***	***Length [mm]***	***Quantity***
700-770	2	520	4
770-920	2	670	4
920-1070	2	820	4
1070-1220	2	970	4
1220-1370	2	1120	4
1370-1520	2	1270	4
1520-1670	2	1420	4
1670-1820	2	1570	4
1820-1970	2	1720	4
1970-2120	2	1870	4
2120-2270	2	2020	4
2270-2420	2	2170	4

4.2 Base frame length 2420 – 4590 [mm] Unit size 10-40

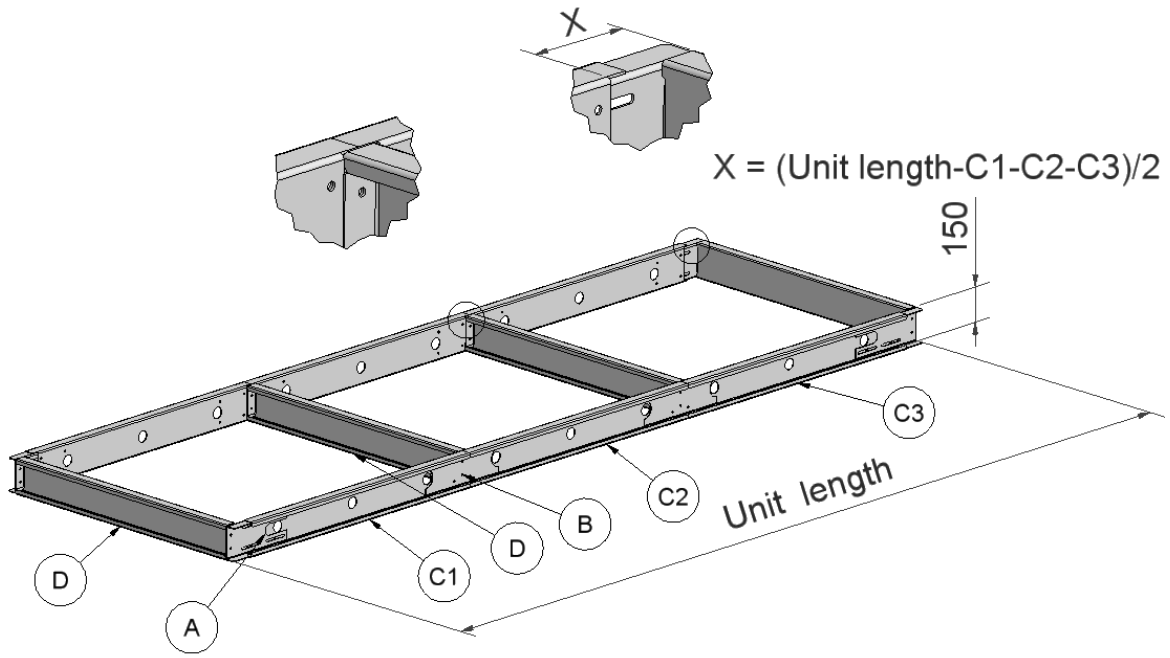


Width profile type D

Unit size	*Quantity*	*Length [mm]*
DV-10	3	876
DV-15	3	1026
DV-20	3	1176
DV-25	3	1326
DV-30	3	1476
DV-40	3	1626

	C1		**C2**		**A**	**B**
Frame length [mm]	*Quantity*	*Length [mm]*	*Quantity*	*Length [mm]*	*Quantity*	*Quantity*
2420-2570	2	1120	2	1200	4	2
2570-2640	2	1270	2	1200	4	2
2640-2790	2	1270	2	1270	4	2
2790-2940	2	1270	2	1420	4	2
2940-3090	2	1420	2	1420	4	2
3090-3240	2	1420	2	1570	4	2
3240-3390	2	1570	2	1570	4	2
3390-3540	2	1570	2	1720	4	2
3540-3690	2	1720	2	1720	4	2
3690-3840	2	1720	2	1870	4	2
3840-3990	2	1870	2	1870	4	2
3990-4140	2	1870	2	2020	4	2
4140-4290	2	2020	2	2020	4	2
4290-4440	2	2020	2	2170	4	2
4440-4590	2	2170	2	2170	4	2

4.3 Base frame length 4590 – 6200 [mm] Unit size 10-40



Width profile type D		
Unit size	***Quantity***	***Length [mm]***
DV-10	4	876
DV-15	4	1026
DV-20	4	1176
DV-25	4	1326
DV-30	4	1476
DV-40	4	1626

	C1		C2		C3		A	B
Frame length [mm]	***Quantity***	***Length [mm]***	***Quantity***	***Length [mm]***	***Number***	***Length [mm]***	***Qty***	***Qty***
4590-4740	2	1420	2	1500	2	1570	4	4
4740-4890	2	1570	2	1570	2	1500	4	4
4890-5040	2	1720	2	1500	2	1570	4	4
5040-5110	2	1720	2	1720	2	1500	4	4
5110-5260	2	1720	2	1720	2	1570	4	4
5260-5410	2	1720	2	1720	2	1720	4	4
5410-5560	2	1870	2	1720	2	1720	4	4
5560-5710	2	1870	2	1870	2	1720	4	4
5710-5860	2	1870	2	1870	2	1870	4	4
5860-6010	2	2020	2	1870	2	1870	4	4
6010-6160	2	2020	2	2020	2	1870	4	4
6160-6200	2	2020	2	2020	2	2020	4	4

Annex 5. Assemble base frames – height 150 mm for units sizes 50-150

A = Corner

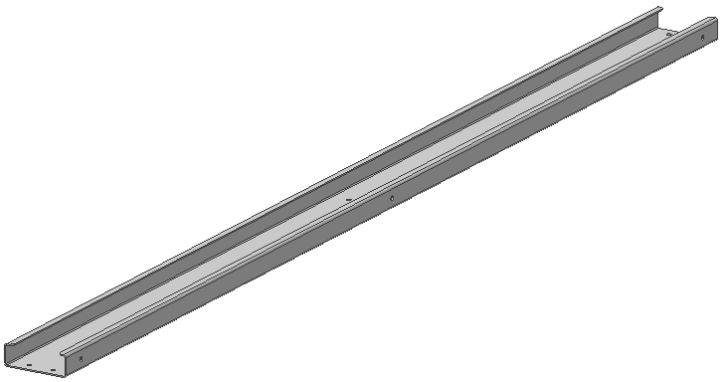
B = Splice

C = Spacer

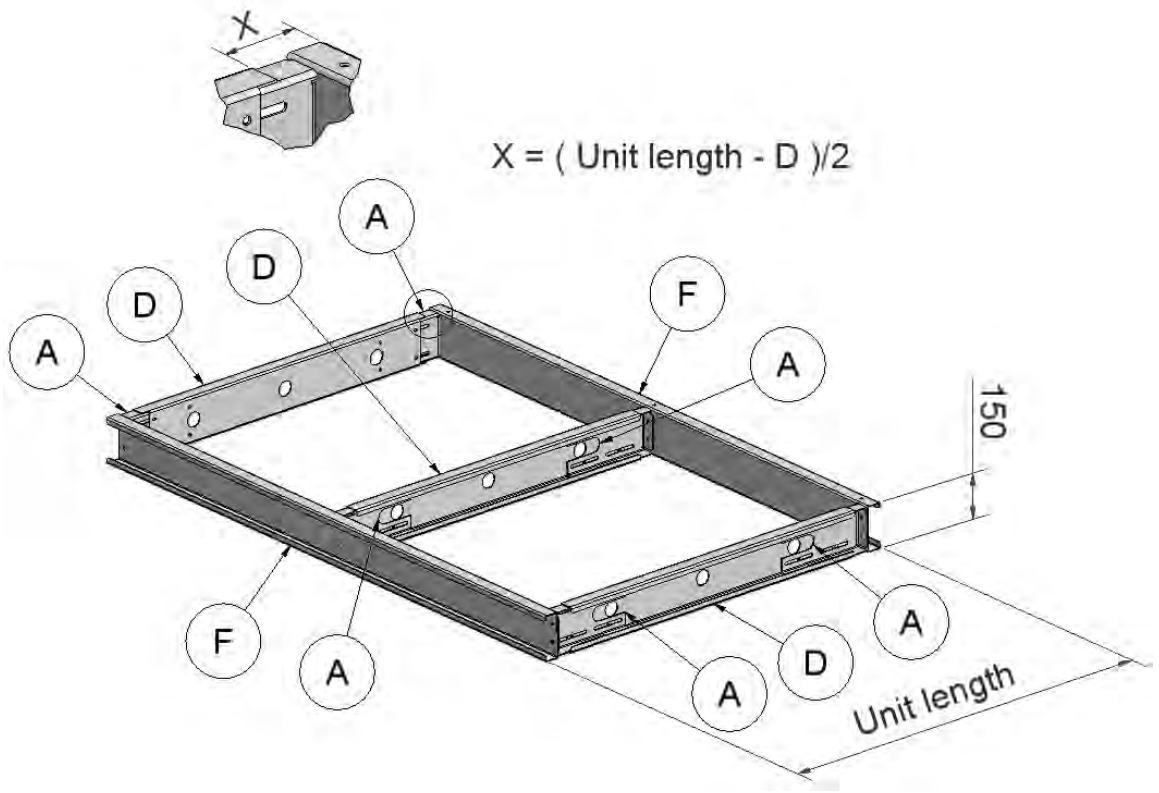
D = Length profile

E = Spacer profile

F = Width profile



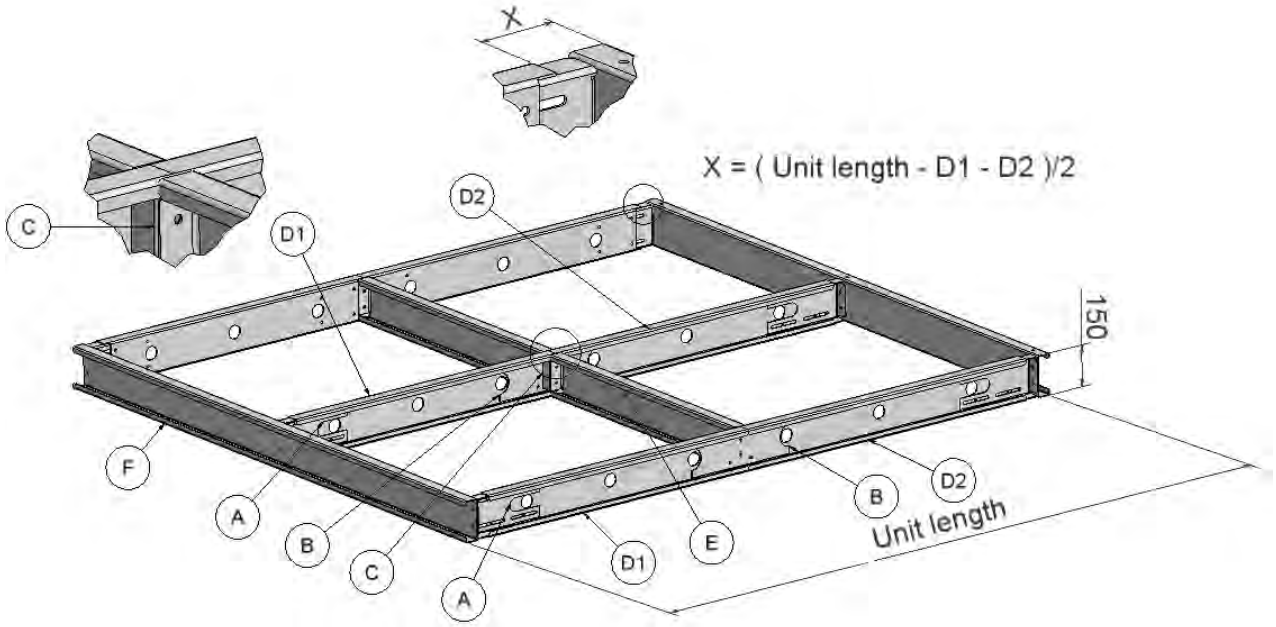
5.1 Base frame length 720 – 2420 [mm] Unit size 50-DV150



Width profile type F		
Unit size	***Quantity***	***Length [mm]***
DV-50	2	2020
DV-60	2	2170
DV-80	2	2170
DV-100	2	2370
DV-120	2	2590
DV-150	2	2890

		D	A
Frame length [mm]	***Quantity***	***Length [mm]***	***Quantity***
700-770	3	520	6
770-920	3	670	6
920-1070	3	820	6
1070-1220	3	970	6
1220-1370	3	1120	6
1370-1520	3	1270	6
1520-1670	3	1420	6
1670-1820	3	1570	6
1820-1970	3	1720	6
1970-2120	3	1870	6
2120-2270	3	2020	6
2270-2420	3	2170	6

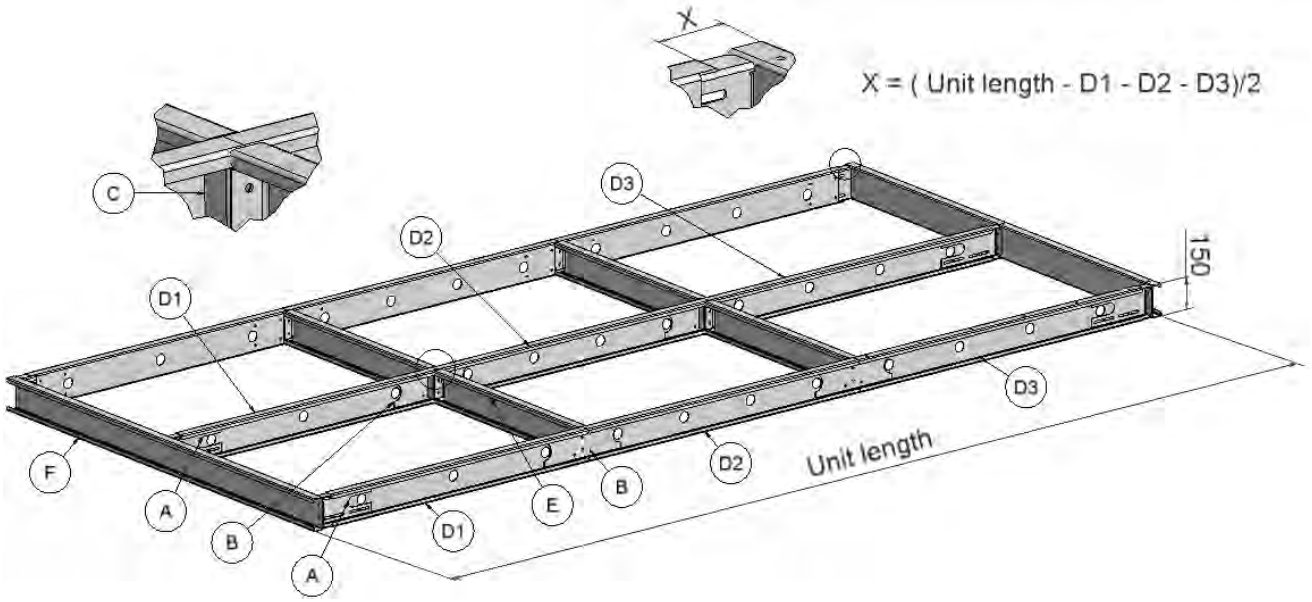
5.2 Base frame length 2420 – 4590 [mm] Unit size 50-150



	Width profile type F		Width profile type E
Unit size	*Quantity*	*Length [mm]*	*Length [mm]*
DV-50	2	2020	940
DV-60	2	2170	1015
DV-80	2	2170	1015
DV-100	2	2370	1115
DV-120	2	2590	1225
DV-150	2	2890	1375

	D1		D2		A	B	C	E
Frame length [mm]	*Quantity*	*Length [mm]*	*Quantity*	*Length [mm]*	*Quantity*	*Quantity*	*Quantity*	*Quantity*
2420-2570	3	1120	3	1200	6	3	1	2
2570-2640	3	1270	3	1200	6	3	1	2
2640-2790	3	1270	3	1270	6	3	1	2
2790-2940	3	1270	3	1420	6	3	1	2
2940-3090	3	1420	3	1420	6	3	1	2
3090-3240	3	1420	3	1570	6	3	1	2
3240-3390	3	1570	3	1570	6	3	1	2
3390-3540	3	1570	3	1720	6	3	1	2
3540-3690	3	1720	3	1720	6	3	1	2
3690-3840	3	1720	3	1870	6	3	1	2
3840-3990	3	1870	3	1870	6	3	1	2
3990-4140	3	1870	3	2020	6	3	1	2
4140-4290	3	2020	3	2020	6	3	1	2
4290-4440	3	2020	3	2170	6	3	1	2
4440-4590	3	2170	3	2170	6	3	1	2

5.3 Base frame length 4590 – 6200 [mm] Unit size 50-150



	Width profile type F		Width profile type E
Unit size	***Quantity***	***Length [mm]***	***Length [mm]***
DV-50	2	2020	940
DV-60	2	2170	1015
DV-80	2	2170	1015
DV-100	2	2370	1115
DV-120	2	2590	1225
DV-150	2	2890	1375

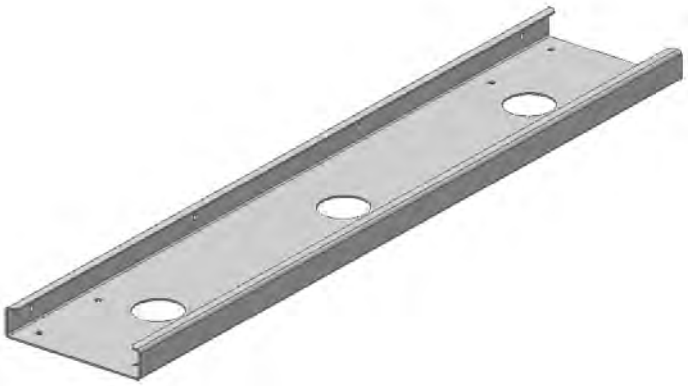
	D1		D2		D3		A	B	C	E
Frame length [mm]	***Qty***	***Length [mm]***	***Qty***	***Length [mm]***	***Qty***	***Length [mm]***	***Qty***	***Qtyl***	***Qty***	***Qty***
4590-4740	3	1420	3	1500	3	1570	6	6	2	4
4740-4890	3	1570	3	1570	3	1500	6	6	2	4
4890-5040	3	1720	3	1500	3	1570	6	6	2	4
5040-5110	3	1720	3	1720	3	1500	6	6	2	4
5110-5260	3	1720	3	1720	3	1570	6	6	2	4
5260-5410	3	1720	3	1720	3	1720	6	6	2	4
5410-5560	3	1870	3	1720	3	1720	6	6	2	4
5560-5710	3	1870	3	1870	3	1720	6	6	2	4
5710-5860	3	1870	3	1870	3	1870	6	6	2	4
5860-6010	3	2020	3	1870	3	1870	6	6	2	4
6010-6160	3	2020	3	2020	3	1870	6	6	2	4
6160-6200	3	2020	3	2020	3	2020	6	6	2	4

Annex 6. Assemble base frames – height 250 mm for units sizes 10-40

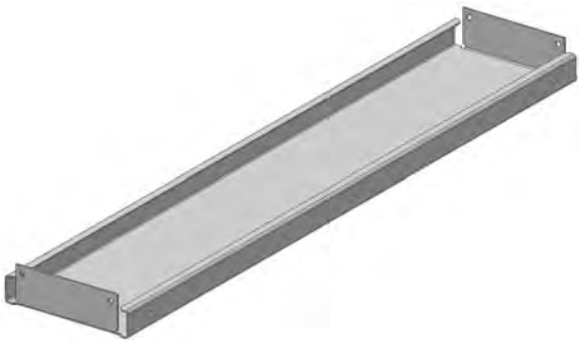
A = Corner

B = Splice

C = Length profile

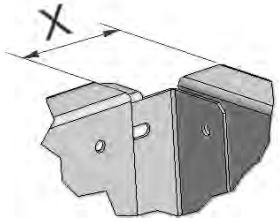


D = Spacer profile

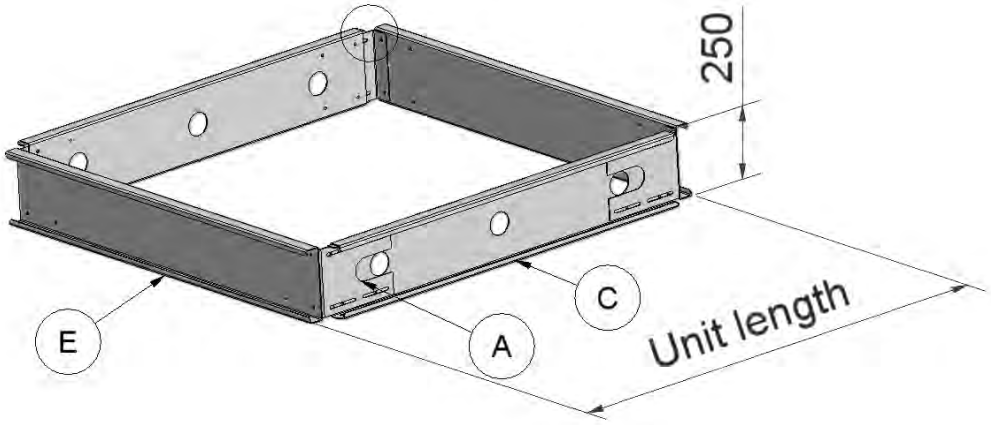


E = Width profile

6.1 Base frame length 720 – 2420 [mm] Unit size 10-40



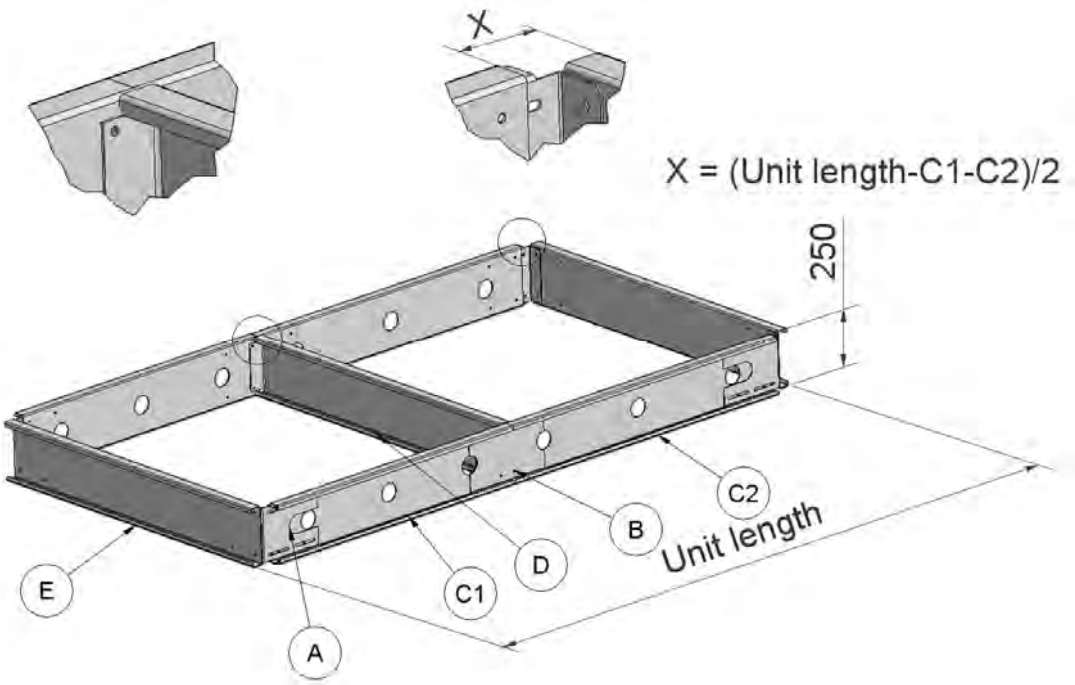
X = (Unit length-C)/2



Width profile type E		
Unit size	***Quantity***	***Length [mm]***
DV-10	2	870
DV-15	2	1020
DV-20	2	1170
DV-25	2	1320
DV-30	2	1470
DV-40	2	1620

		C	A
Frame length [mm]	***Quantity***	***Length [mm]***	***Quantity***
700-770	2	520	4
770-920	2	670	4
920-1070	2	820	4
1070-1220	2	970	4
1220-1370	2	1120	4
1370-1520	2	1270	4
1520-1670	2	1420	4
1670-1820	2	1570	4
1820-1970	2	1720	4
1970-2120	2	1870	4
2120-2270	2	2020	4
2270-2420	2	2170	4

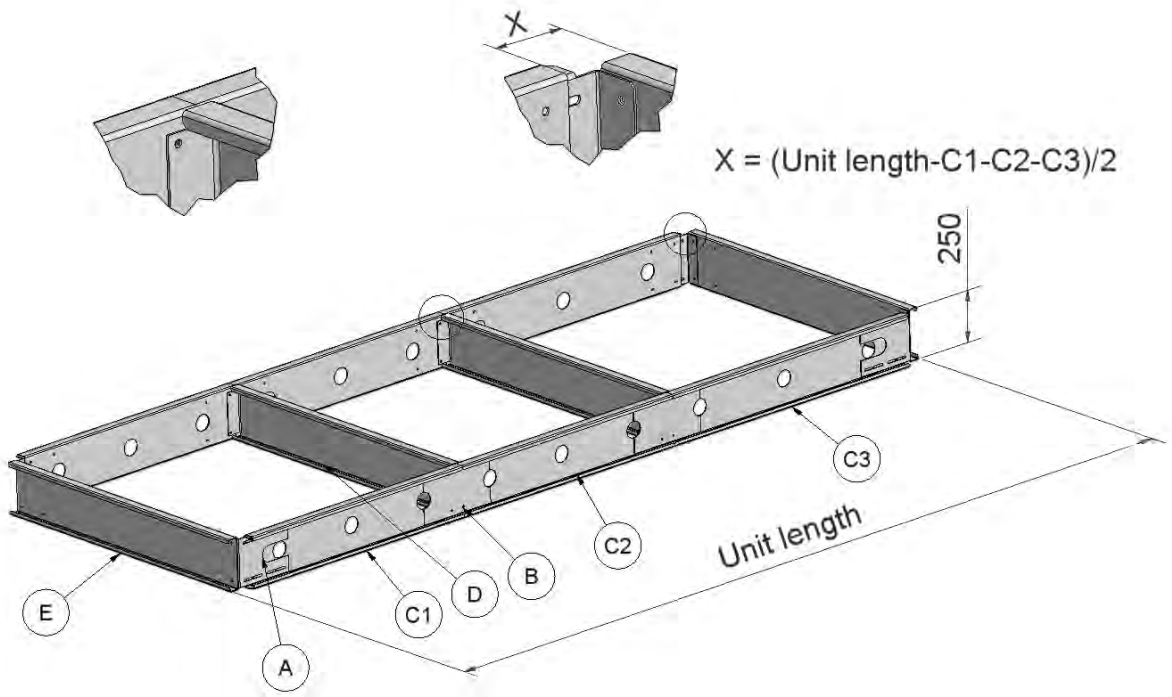
6.2 Base frame length 2420 – 4590 [mm] Unit size 10-40



	Width profile type E		Spacer profile type D
Unit size	*Quantity*	*Length [mm]*	*Length [mm]*
DV-10	2	870	870
DV-15	2	1020	1020
DV-20	2	1170	1170
DV-25	2	1320	1320
DV-30	2	1470	1470
DV-40	2	1620	1620

	C1		C2		A	B	D
Frame length [mm]	*Quantity*	*Length [mm]*	*Quantity*	*Length [mm]*	*Qty*	*Qty*	*Qty*
2420-2570	2	1120	2	1200	4	2	1
2570-2640	2	1270	2	1200	4	2	1
2640-2790	2	1270	2	1270	4	2	1
2790-2940	2	1270	2	1420	4	2	1
2940-3090	2	1420	2	1420	4	2	1
3090-3240	2	1420	2	1570	4	2	1
3240-3390	2	1570	2	1570	4	2	1
3390-3540	2	1570	2	1720	4	2	1
3540-3690	2	1720	2	1720	4	2	1
3690-3840	2	1720	2	1870	4	2	1
3840-3990	2	1870	2	1870	4	2	1
3990-4140	2	1870	2	2020	4	2	1
4140-4290	2	2020	2	2020	4	2	1
4290-4440	2	2020	2	2170	4	2	1
4440-4590	2	2170	2	2170	4	2	1

6.3 Base frame length 4590 – 6200 [mm] Unit size 10-40



	Width profile type E		Spacer profile type D
Unit size	*Quantity*	*Length [mm]*	*Length [mm]*
DV-10	2	870	870
DV-15	2	1020	1020
DV-20	2	1170	1170
DV-25	2	1320	1320
DV-30	2	1470	1470
DV-40	2	1620	1620

	C1		C2		C3		A	B	D
Frame length [mm]	*Qty*	*Length [mm]*	*Qty*	*Length [mm]*	*Qty*	*Length [mm]*	*Qty*	*Qty*	*Qty*
4590-4740	2	1420	2	1500	2	1570	4	4	2
4740-4890	2	1570	2	1570	2	1500	4	4	2
4890-5040	2	1720	2	1500	2	1570	4	4	2
5040-5110	2	1720	2	1720	2	1500	4	4	2
5110-5260	2	1720	2	1720	2	1570	4	4	2
5260-5410	2	1720	2	1720	2	1720	4	4	2
5410-5560	2	1870	2	1720	2	1720	4	4	2
5560-5710	2	1870	2	1870	2	1720	4	4	2
5710-5860	2	1870	2	1870	2	1870	4	4	2
5860-6010	2	2020	2	1870	2	1870	4	4	2
6010-6160	2	2020	2	2020	2	1870	4	4	2
6160-6200	2	2020	2	2020	2	2020	4	4	2

Annex 7. Assemble base frames – height 250 mm for units sizes 50-150

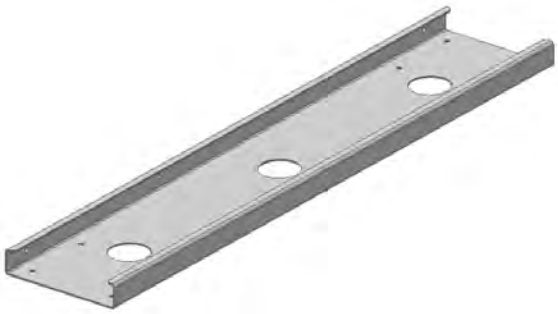
A = Corner

B = Splice

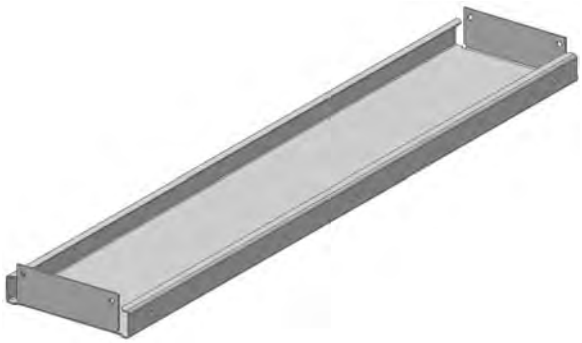
C = Splice

D = Spacer

E = Length profile

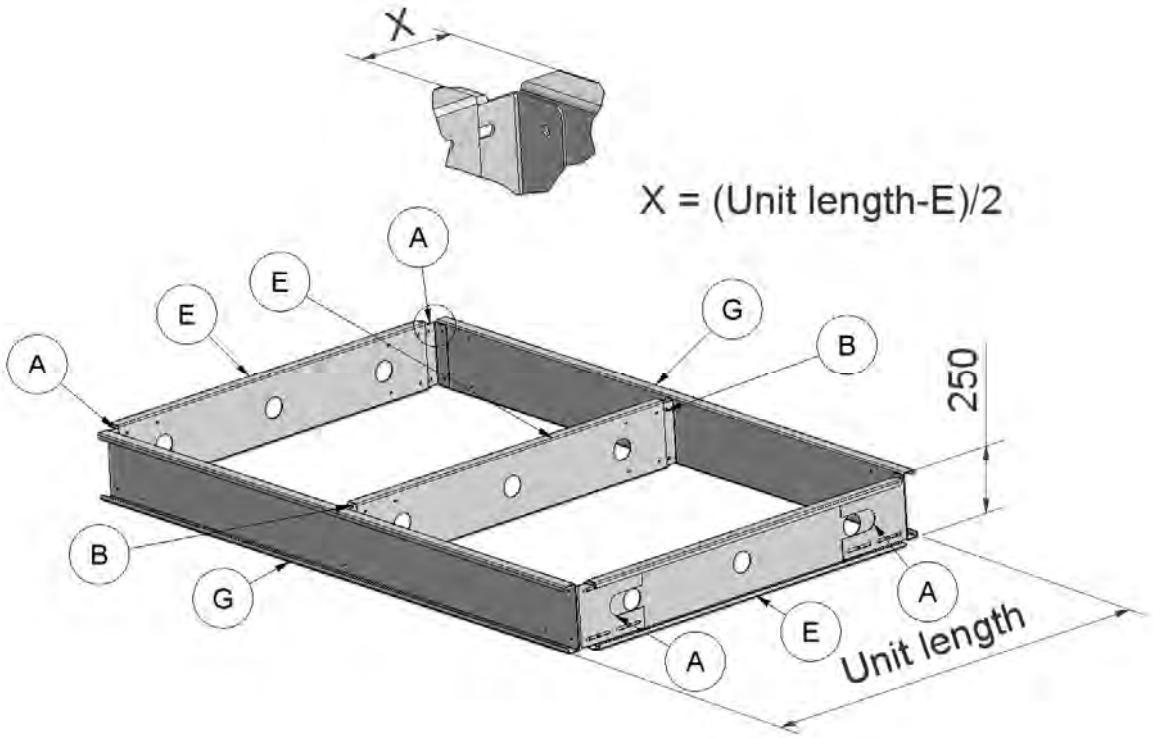


F = Spacer profile



G = Width profile

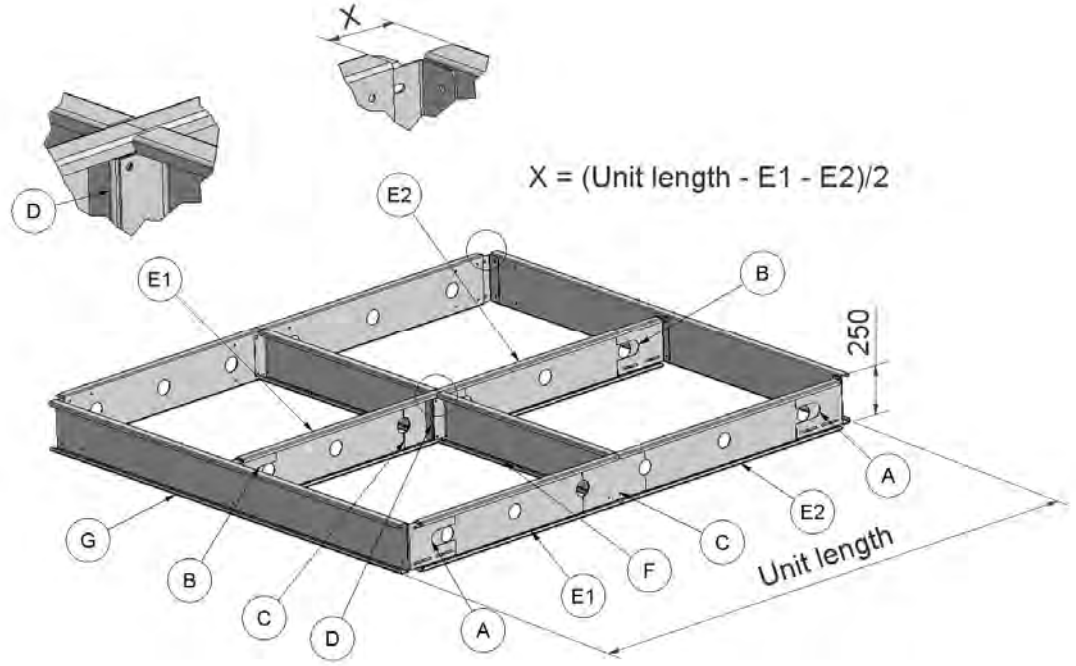
7.1 Base frame length 720 – 2420 [mm] Unit size 50-150



Width profile type G		
Unit size	***Quantity***	***Length [mm]***
DV-50	2	1920
DV-60	2	2070
DV-80	2	2070
DV-100	2	2270
DV-120	2	2490
DV-150	2	2790

		E	**A**	**B**
Frame length [mm]	***Quantity***	***Length [mm]***	***Quantity***	***Quantity***
700-770	3	520	4	2
770-920	3	670	4	2
920-1070	3	820	4	2
1070-1220	3	970	4	2
1220-1370	3	1120	4	2
1370-1520	3	1270	4	2
1520-1670	3	1420	4	2
1670-1820	3	1570	4	2
1820-1970	3	1720	4	2
1970-2120	3	1870	4	2
2120-2270	3	2020	4	2
2270-2420	3	2170	4	2

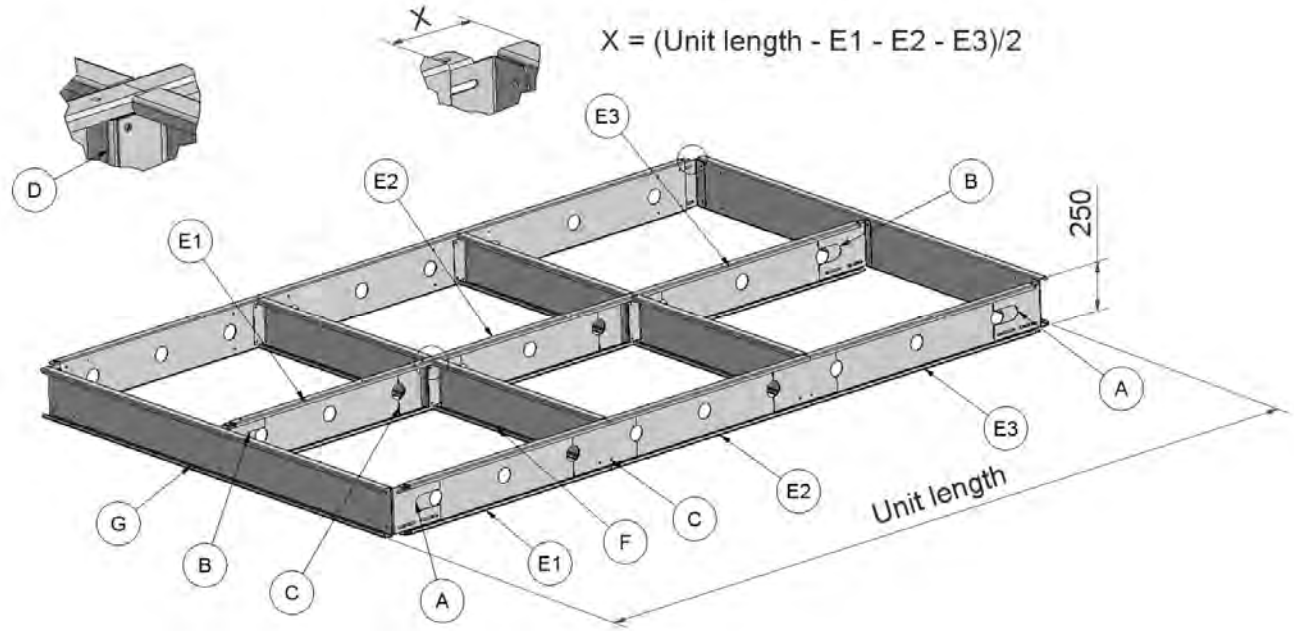
7.2 Base frame length 2420 – 4590 [mm] Unit size 50-150



	Width profile type G		Spacer profile type F
Unit size	***Quantity***	***Length [mm]***	***Length [mm]***
DV-50	2	1920	935
DV-60	2	2070	1010
DV-80	2	2070	1010
DV-100	2	2270	1110
DV-120	2	2490	1220
DV-150	2	2790	1370

	C1		C2		A	B	C	D	F
Frame length [mm]	***Qty***	***Length [mm]***	***Qty***	***Length [mm]***	***Qty***	***Qty***	***Qty***	***Qty***	***Qty***
2420-2570	3	1120	3	1200	4	2	3	1	2
2570-2640	3	1270	3	1200	4	2	3	1	2
2640-2790	3	1270	3	1270	4	2	3	1	2
2790-2940	3	1270	3	1420	4	2	3	1	2
2940-3090	3	1420	3	1420	4	2	3	1	2
3090-3240	3	1420	3	1570	4	2	3	1	2
3240-3390	3	1570	3	1570	4	2	3	1	2
3390-3540	3	1570	3	1720	4	2	3	1	2
3540-3690	3	1720	3	1720	4	2	3	1	2
3690-3840	3	1720	3	1870	4	2	3	1	2
3840-3990	3	1870	3	1870	4	2	3	1	2
3990-4140	3	1870	3	2020	4	2	3	1	2
4140-4290	3	2020	3	2020	4	2	3	1	2
4290-4440	3	2020	3	2170	4	2	3	1	2
4440-4590	3	2170	3	2170	4	2	3	1	2

7.3 Base frame length 4590 – 6200 [mm] Unit size 50-150



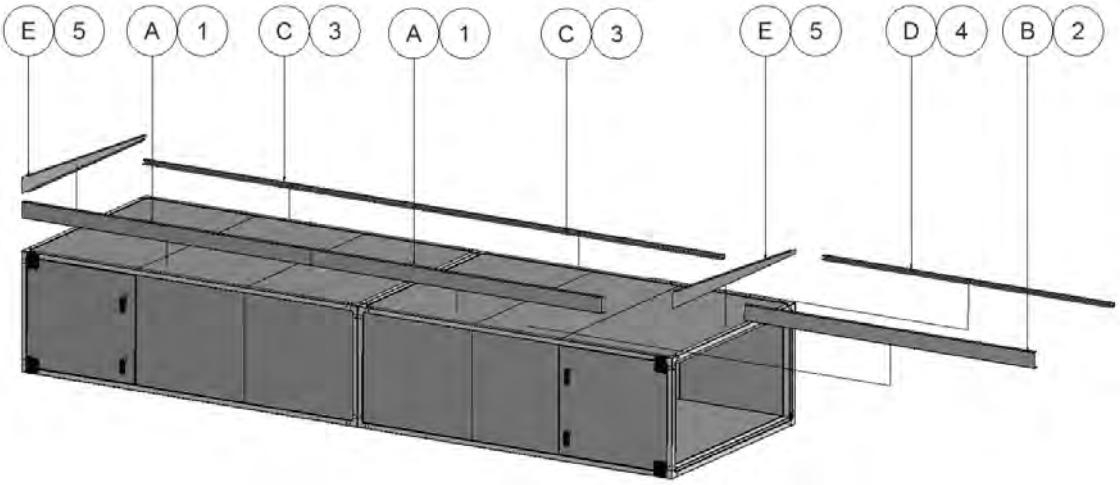
	Width profile type G		Spacer profile type F
Unit size	***Quantity***	***Length [mm]***	***Length [mm]***
DV-50	2	1920	935
DV-60	2	2070	1010
DV-80	2	2070	1010
DV-100	2	2270	1110
DV-120	2	2490	1220
DV-150	2	2790	1370

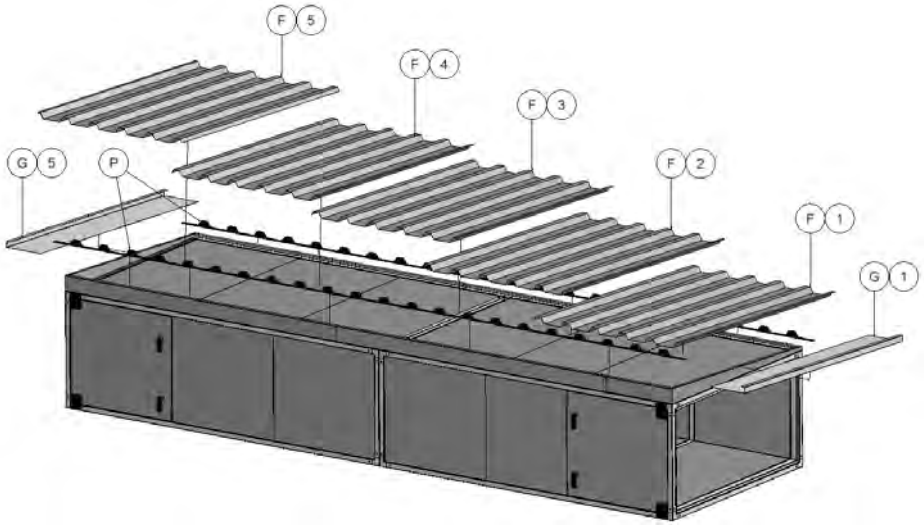
	E1		E2		E3		A	B	C	D	F
Frame length [mm]	***Qty***	***Length [mm]***	***Qty***	***Length [mm]***	***Qty***	***Length [mm]***	***Qty***	***Qty***	***Qty***	***Qty***	***Qty***
4590-4740	3	1420	3	1500	3	1570	4	2	6	2	4
4740-4890	3	1570	3	1570	3	1500	4	2	6	2	4
4890-5040	3	1720	3	1500	3	1570	4	2	6	2	4
5040-5110	3	1720	3	1720	3	1500	4	2	6	2	4
5110-5260	3	1720	3	1720	3	1570	4	2	6	2	4
5260-5410	3	1720	3	1720	3	1720	4	2	6	2	4
5410-5560	3	1870	3	1720	3	1720	4	2	6	2	4
5560-5710	3	1870	3	1870	3	1720	4	2	6	2	4
5710-5860	3	1870	3	1870	3	1870	4	2	6	2	4
5860-6010	3	2020	3	1870	3	1870	4	2	6	2	4
6010-6160	3	2020	3	2020	3	1870	4	2	6	2	4
6160-6200	3	2020	3	2020	3	2020	4	2	6	2	4

Annex 8. Installation of steel roof in the sizes 10-150

8.1 Overview

- Mount rails A1, B2, C3, D4, E5 on the unit for support of trapezoidal roof plates (mount also rails Y and Z on units of the size 30 and on units that are larger than size 30 longitudinally at the centre-line of the units).
- Place foam bands – P – on the horizontal rails A1, B2, C3 and D4 for support of roof plates.
- Calculate overhang of the roof at both ends of the unit and mount roof overhang profile – G1 on the first trapezoidal roof plate – F1 before the roof plate is mounted.
- Place and mount roof plates F1, F2, F3 and so on.
- Remember foam bands on the side laps between roof plates to prevent rainwater from passing through.
- Place roof overhang profile – G5 at the other end of the unit before the last roof plate is mounted.
- Mount sides and corners on the roof.
- Apply sealing where plates are joined to ensure water resistance - even in stormy weather.





8.1.1 Mount rails. Units of size 10, 15, 20, and 25

Squeeze sealant in sufficient quantity between the underside of the rails A1, B2, C3, D4, E5 and the horizontal top side of the unit before the rails are mounted. This means that the rails are standing on

sealant to achieve the tightest connection between rails and unit to prevent rainwater from passing under the rails and into the unit. Mount the rails A1 and B2 on the front side (the side with the inspection doors) – use the simple self-drilling screws without the sealing washer – see the illustration of the screw below.

Note: Rail B2 fits into the rail A1, and this offers the advantage that the rail B2 can be slid inside the rail A1 to adjust the length of rail B2 accurately to the length of the unit. In this way it is not necessary to spend time and effort cutting the rail B2.

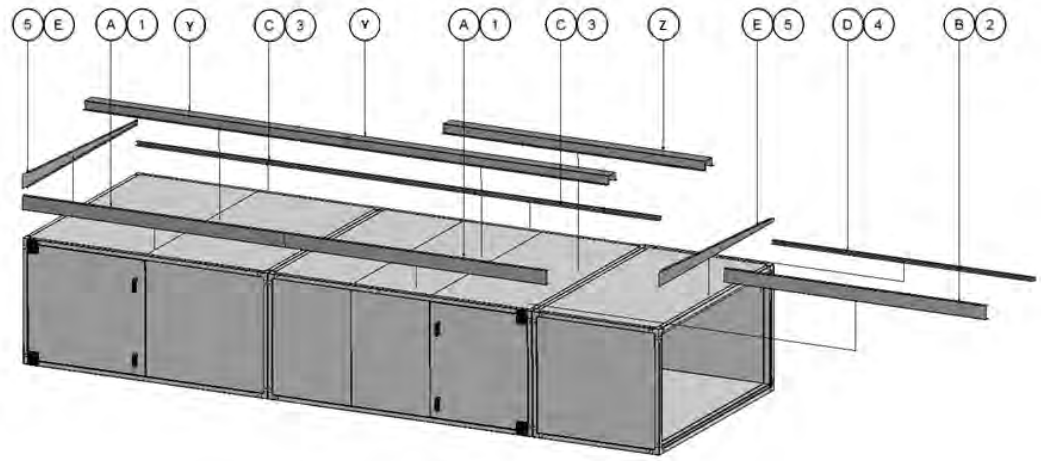
Mount the lower rails C3 and D4 on the back side of the unit.
Note: Rail D4 fits into the rail C3, and this offers the advantage that the rail D4 can be slid inside the rail C3 to adjust the length of rail D4 accurately to the length of the unit. In this way it is not necessary to spend time and effort on cutting the rail D4.

Mount vertical rail – E5 - with the roof slope at each end of the unit

It is important to place a screw in each hole – even though the number of holes for screws seems to be very large, a screw in each hole is necessary as the stress on the roof during stormy weather is extremely high.

8.1.2 Mount rails. Units of size 30 and units larger than size 30.

On units of size 30 and on units that are larger than size 30, rails A1, B2, C3, D4, E5 must be mounted on the unit for support of trapezoidal roof plates, but also rails Y and Z must be mounted longitudinally at the centre-line of the units to hold the trapezoidal roof plates.



Squeeze sealant in sufficient quantity between the underside of the rails A1, B2, C3, D4, E5 and the horizontal top side of the unit before the rails are mounted. This means that the rails are standing on sealant to achieve the tightest connection between rails and unit to prevent rainwater from passing under the rails and into the unit. Mount the rails A1 and B2 on the front side (the side with the inspection doors) – use the simple self drilling screws without the sealing washer – see the illustration of the screw below.

Note: Rail B2 fits into the rail A1, and this offers the advantage that the rail B2 can be slid inside the rail A1 to adjust the length of rail B2 accurately to the length of the unit. In this way it is not necessary to spend time and effort cutting the rail B2.

Mount the lower rails C3 and D4 on the back side of the unit.
Note: Rail D4 fits into the rail C3, and this offers the advantage that the rail D4 can be slid inside the rail C3 to adjust the length of rail D4 accurately to the length of the unit. In this way it is not necessary to spend time and effort cutting the rail D4.

Mount vertical rail – E5 - with the roof slope at each end of the unit.

Mount the rails Y and Z on the unit with the centre-line of the rails exactly over the centre-line of the unit. It is longitudinal on the middle of the units to hold the trapezoidal roof plates.

Notice, that rail Z fits over the lower rail Y, and this offers the advantage that the rail Z can be slided on the rail Y to adjust the length of rail Z accurately to the length of the unit. In this way it is not necessary to spent time and effort on cutting the rail Z.

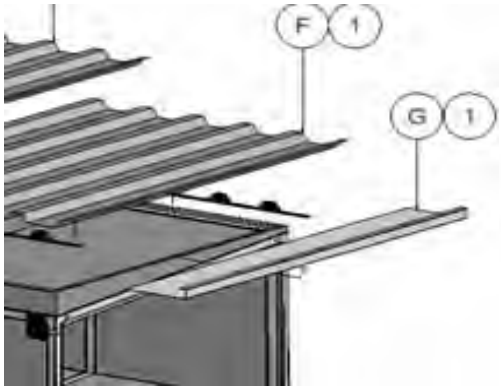
It is important to place a screw in each hole – even though the number of holes for screws seems to be very large, a screw in each hole is necessary as the stress on the roof during stormy weather is extremely high.

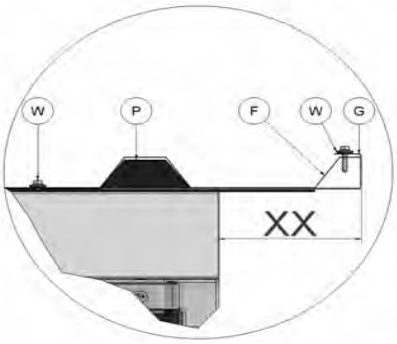
8.1.3 Roof overhang along the long sides of the unit

The roof plates are longer than the width of the unit to ensure sufficient overhang along the sides of the unit.
The overhang is 100 mm along each side of the smallest unit – size 10.
The overhang is 150 mm along each side of the units – size 15, 20, 25.
The overhang is 175 mm along each side of the biggest units – including size 30.

8.1.4 Calculation of the overhang at the ends of the unit. Mount overhang profile – G1.

The roof must be between 200 and 400 mm longer than the length of the unit to secure a roof overhang between 100 mm and 200 mm at the each of the 2 ends of the unit, and the length of this overhang must be calculated before the first roof plate is mounted.

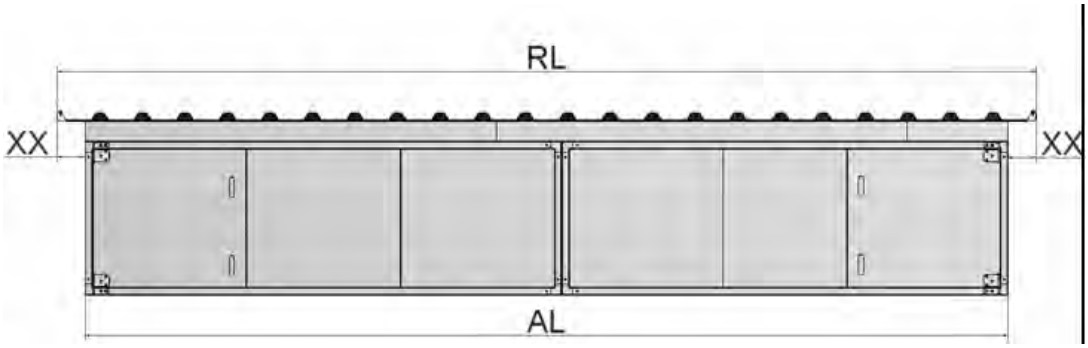




The unit is delivered with 2 similar overhang profiles - G1 and G5 - one for each end of the roof. Mount one of the 2 roof overhang profiles – G on a trapezoidal roof plate. Use the self drilling, painted screws with sealing washers - W - see the illustration.
Note: Foam bands - P – are necessary between the overhang profile G1 and the roof plate F1. See the illustration.

Self-drilling, painted screws supplied with sealing washer for the mounting of the trapezoidal plate to the roof overhang profile.

The total cover width of the trapezoidal roof plates always changes with the pitch of 205 mm between the trapezoidal ribs, making up a total length of the complete roof of - for example 2100 mm, 2305 mm, 2510 mm and so on. We call this length of the total roof for RL and we call the total length of the complete unit for AL. The trapezoidal roof must always be longer than the unit, to obtain a reasonable overhang called – XX - of the roof at both ends.



In the table below you will find 40 different lengths of roofs (always changing with the 205 mm) and the lengths of units that are ideal for each of the 40 alternative roof lengths.

Measure the total length – AL of the unit – for example 5000 mm between the 4982 and 5182 mm mentioned in the table below.

AHU length AL	Roof length RL
1670 – 1870	2100
1877 – 2077	2305
2084 – 2284	2510
2291 – 2491	2715
2498 – 2698	2920
2705 – 2905	3125
2912 – 3112	3330
3119 – 3319	3535
3326 – 3526	3740
3533 – 3733	3945
3740 – 3940	4150
3947 – 4147	4355
4154 – 4354	4560
4361 - 4561	4765

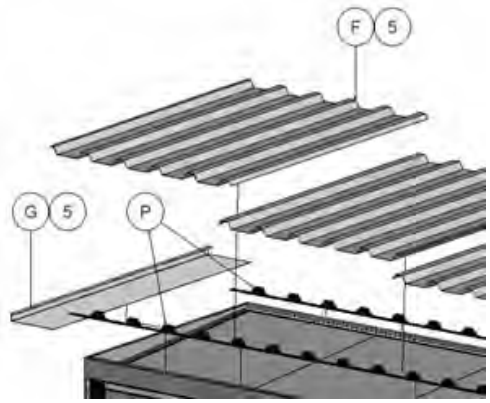
AHU length AL	Roof length RL
4568 – 4768	4970
4775 – 4975	5175
4982 – 5182	5380
5189 – 5389	5585
5396 – 5596	5790
5603 – 5803	5995
5810 – 6010	6200
6017 – 6217	6405
6224 – 6424	6610
6431 – 6631	6815
6638 – 6838	7020
6845 – 7045	7225
7052 – 7252	7430
7259 - 7459	7635

AHU length AL	Roof length RL
7466 – 7666	7840
7673 – 7873	8045
7880 – 8080	8250
8087 – 8287	8455
8294 – 8494	8660
8501 – 8701	8865
8708 – 8908	9070
8915 – 9115	9275
9122 – 9322	9480
9329 – 9529	9685
9536 – 9736	9890
9743 – 9943	10095

The mentioned length of roof – RL - for this length of unit is 5380 mm (the delivered trapezoidal plates can be combined to this length - RL = 5380 mm). 5380 mm minus 5000 mm is 380 mm overhang for both ends, and 380/2 mm = 190 mm is the overhang for each end. Place the trapezoidal roof plate F1 with the roof overhang profile G1 on rail E with an overhang of 190 mm.

8.1.5 Foam bands between rails and roof plates – mount roof plates.

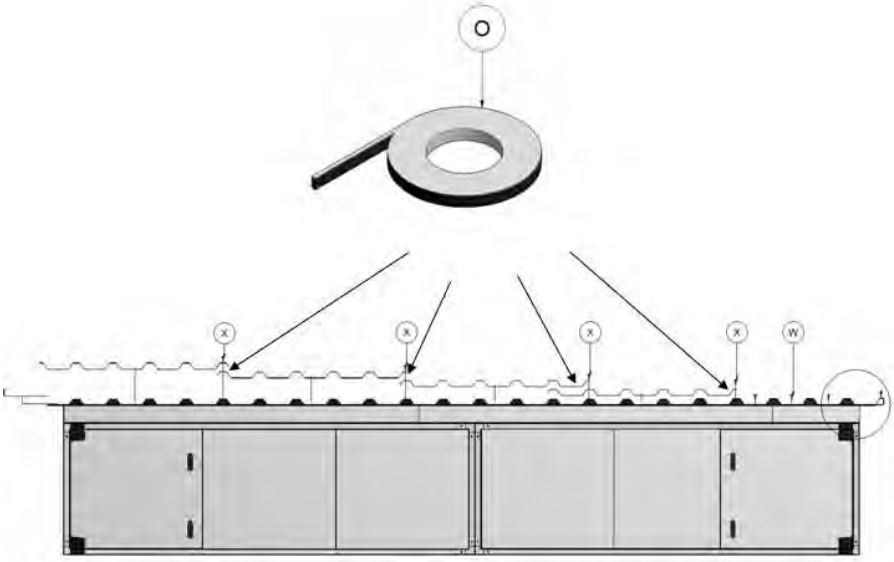
Place foam bands P between profiles A1, B2, C3, D4 and roof plates.



The trapezoidal roof plates are mounted with the self-drilling, painted screws supplied with sealing washer.

8.1.6 Foam bands between roof plates

Mount the self-adhesive foam band – O - on the underlapping rib for water resistant and effective sealing due to the small slope of the roof.

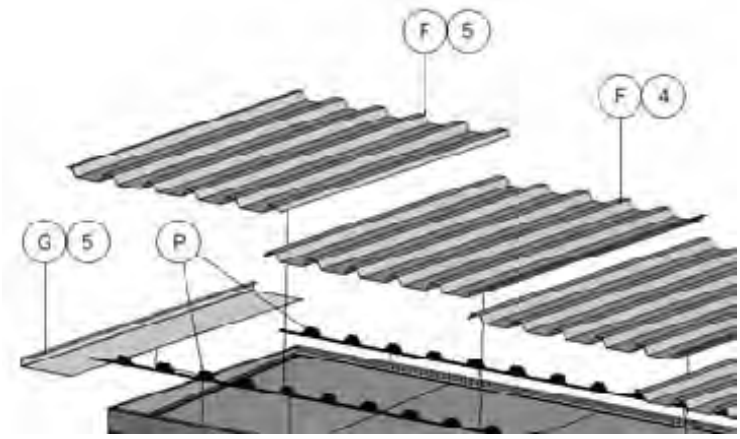


8.1.7 Mount roof plates – some of them are overlapping by 2 ribs

The width of each plate is always 1025 mm and some of the plates have to overlap by 2 ribs to achieve the optimal total length of the whole roof — see the illustration above.

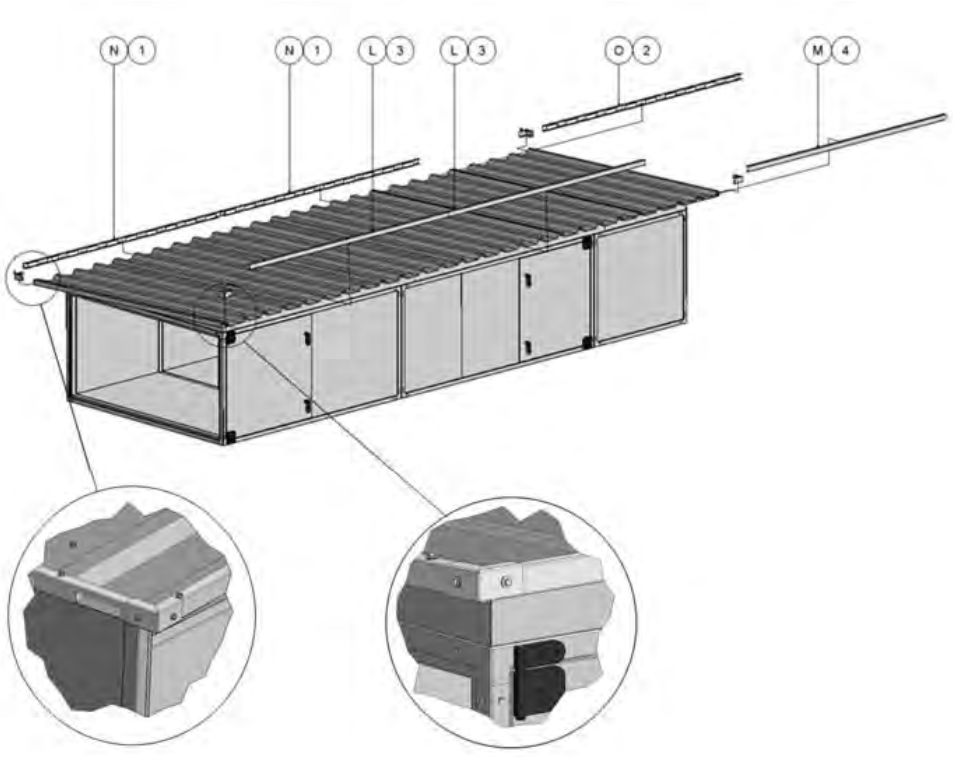
8.1.8 Mount overhang profile – G5 on the other end of the unit.

When the last trapezoidal plate (in this example F5) has been placed on the unit, the second roof overhang profile G5 must be pushed under the trapezoidal roof plate and mounted with the self-drilling, painted screw with sealing washer. Mounting must be similar to the mounting of roof overhang profile under the trapezoidal roof plate at the other end of the unit.



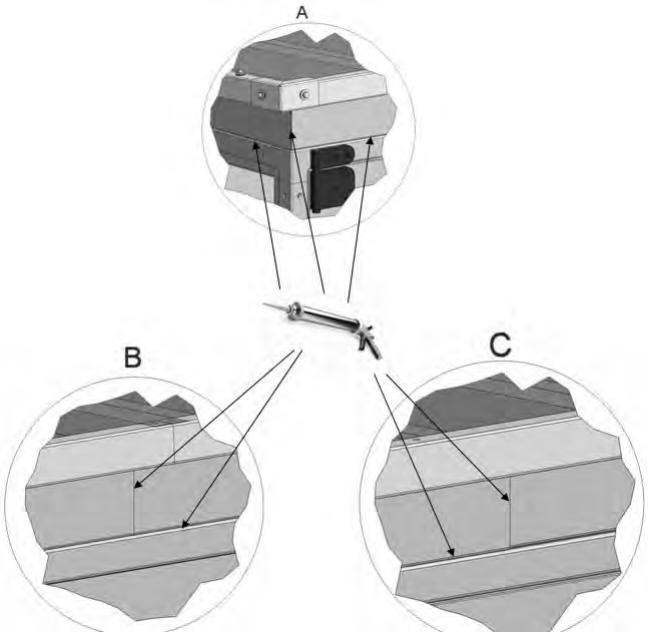
8.1.9 Mount side profiles and corners along the edges of the roof to protect persons

Profiles N and O with the rectangular holes are for the long and lower side of the roof because rain can escape through the holes. Mount the profiles type N first and the profile O last because the profile O goes over the profile N. Mounted in this order, the profile O can match the end of the roof and the surplus length of the profile O will just cover part of the previous profile N. Mount the profiles L and M along the long and higher front side of the roof. Mount the 4 protection corners.



8.1.10 Apply sealing on plate joints to ensure water resistance.

Finish installation of the steel roof by sealing all plate joints with silicone to prevent rainwater from passing into the unit. See examples below of joints to be sealed.

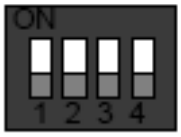

A
B
C

Annex 9. Speed control for rotor and assembly of divided rotor

9.1 Speed control

The cabinet with the speed control system for the rotor is installed behind the inspection door in the rotor section.
The cabinet contains the speed controller with all components, terminal blocks, LED displaying the operation mode, the dual position DIP switch with 4 sliding levers for programming the rotor motor signal and a button for the activation of the test mode.
Through the different combinations of the 4 sliding levers of this dual position DIP switch, the correct signal is available for the 3 different motors used for the 14 sizes of air handling units. The sliding levers are set and the function is checked at the factory. The positions of the levers appear from the tables below.

9.1.1 Selection of correct signal via the 4 DIP switch levers



The 4 DIP switch levers

Position	Function	Code
Up	Active = ON	1
Down	Deactivated = OFF	0

The factory sets the positions of the 4 DIP switch levers for the maximum of 10 revolutions per minute for standard temperature exchangers and for hygroscopic exchangers. The position of each DIP switch lever is shown below.

DV	Diameter of pulley	DIP switch position	Motor
10	50	0000	90TYD-S214-M 2.8Nm
15	50		
20	50		
25	65		
30	65		
40	65	1000	
50	71	0100	120TYD-S214-M 5.5Nm
60	80		
80	85		
100	95		
120	106		
150	112		
190	132	0010	120TYD-S214-L 7.5Nm
240	140		

The factory sets the positions of the 4 DIP switch levers for the maximum of 20 revolutions per minute for sorption exchangers. The position of each DIP switch lever is shown below.

DV	Diameter of pulley	DIP switch position	Motor
10	50	1000	90TYD-S214-M 2.8Nm
15	87	0100	120TYD-S214-M 5.5Nm
20	87		
25	107		
30	107		
40	107	1100	
50	118		
60	118		
80	140	1010	120TYD-S214-L 7.5Nm
100	150		
120	150	0110	
150	160		
190	160		
240	160		

9.1.2 Indication of operation mode via red and green LED as well as test of motor

The LED is in the cover of the cabinet.

LED indication	Value
No indication	Power off
Green	Ordinary operation
Green – flashes	Ready for operation
Constant green and red indication for activated rotor guard	Magnet on the rotor has activated rotor guard
Constant green and fast red flashes	Restart sequence active
Red	Rotor guard has not been activated

Number of red flashes in series	Value
1	Output current limit
2	Over voltage
3	Under voltage
4	Failure in the controller
5	Communication failure

Restart of rotor:

- Switch off power and switch on power again
  or
- Press the test button inside the cabinet

Test of motor by checking the resistance in all 3 vindings

Motor sizes	Ohm
90TYD-S214-M	40Ω
120TYD-S214-M	18Ω
120TYD-S214-L	10Ω

Setting of constant speed:

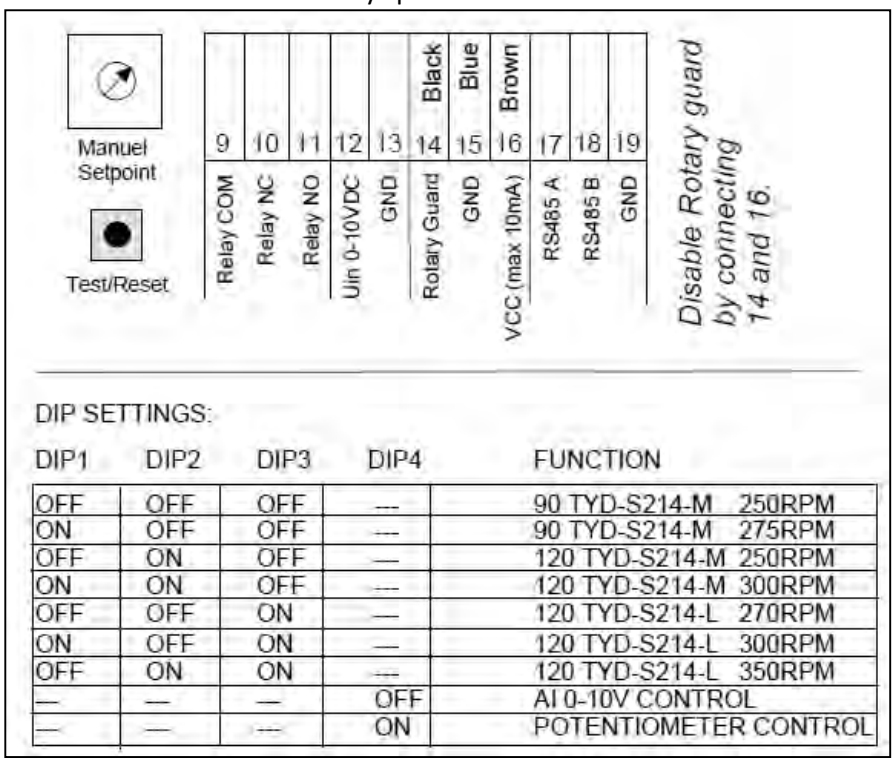
- Set fourth DIP switch lever in position - ON

Test:

- Set fourth DIP switch lever in position – ON
- Press the test button

9.1.3 Copy of the label with information about connection of cables

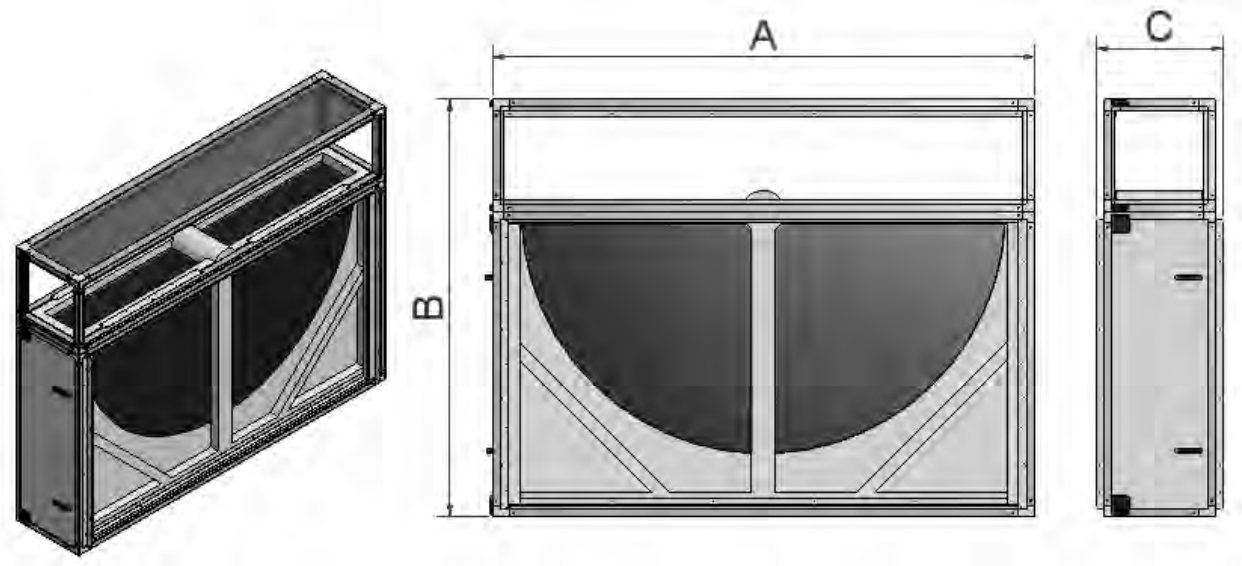
This self-adhesive label is always placed on the cover of the cabinet. The text is always in English.

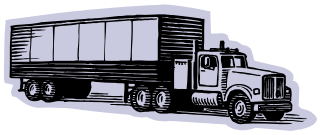


DIP SETTINGS:

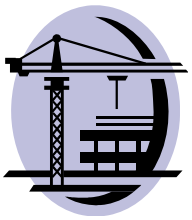
DIP1	DIP2	DIP3	DIP4	FUNCTION
OFF	OFF	OFF	---	90 TYD-S214-M 250RPM
ON	OFF	OFF	---	90 TYD-S214-M 275RPM
OFF	ON	OFF	---	120 TYD-S214-M 250RPM
ON	ON	OFF	---	120 TYD-S214-M 300RPM
OFF	OFF	ON	---	120 TYD-S214-L 270RPM
ON	OFF	ON	---	120 TYD-S214-L 300RPM
OFF	ON	ON	---	120 TYD-S214-L 350RPM
---	---	---	OFF	AI 0-10V CONTROL
---	---	---	ON	POTENTIOMETER CONTROL

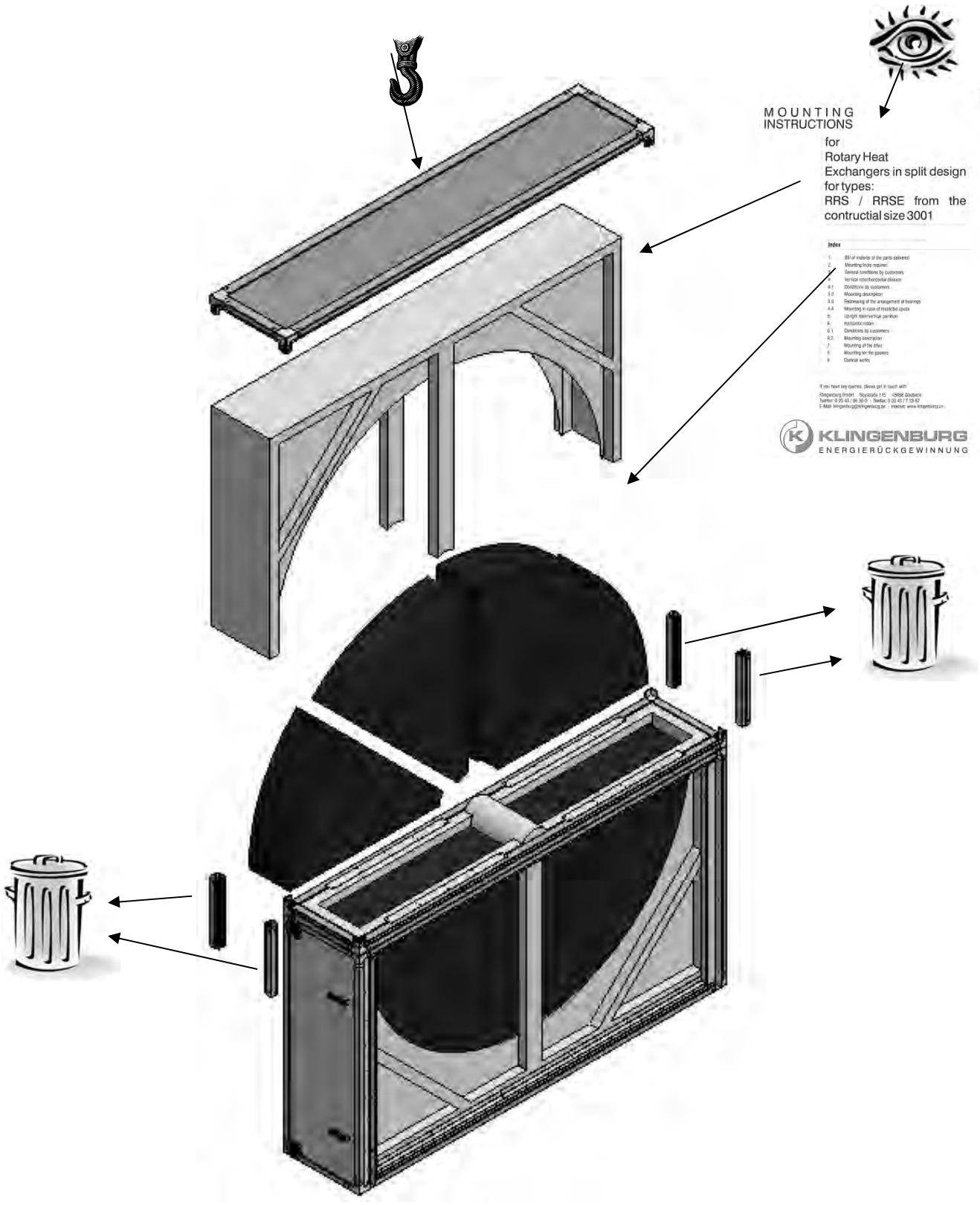
9.2 Assemble the Systemair casing for DV60, DV80, DV100, DV120 og DV150

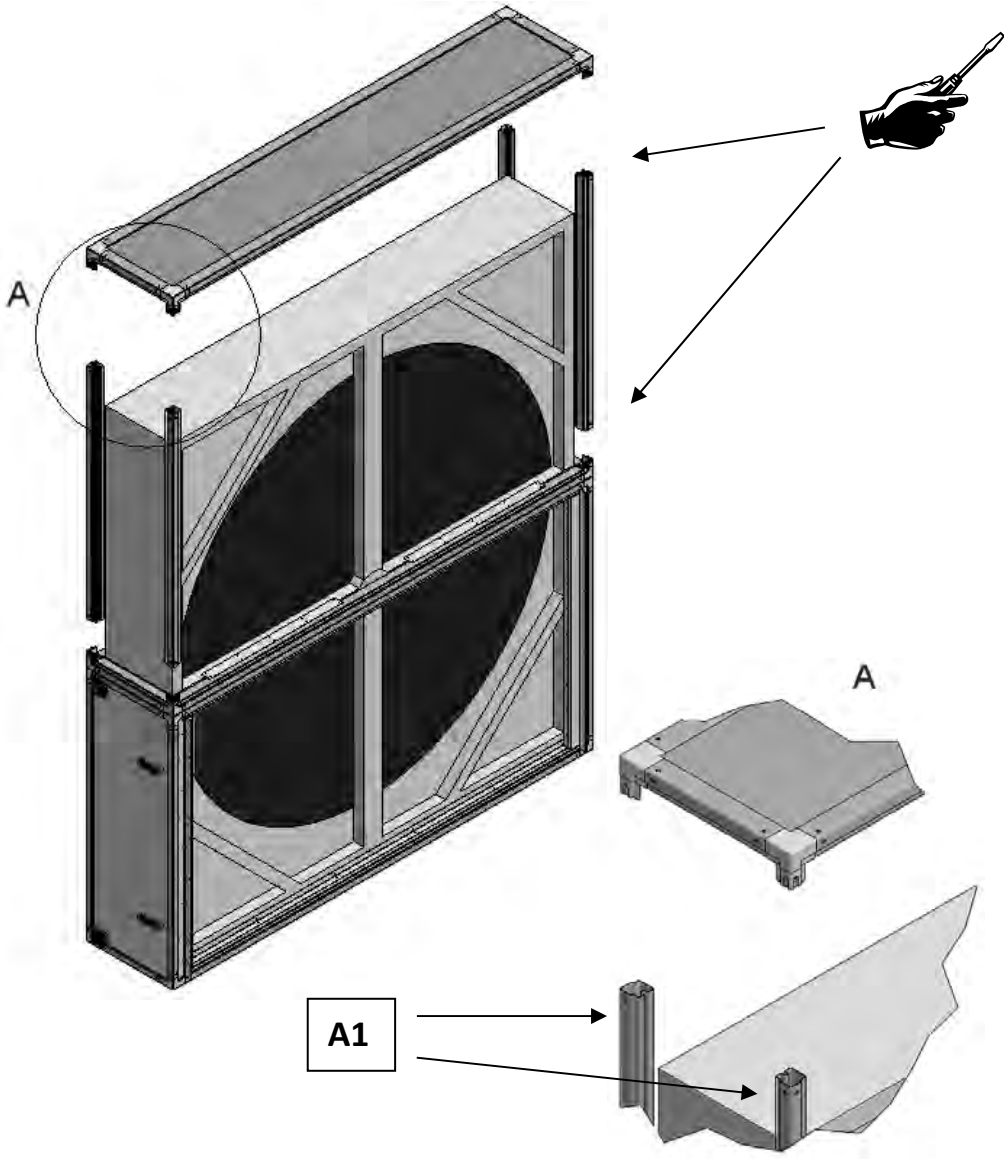




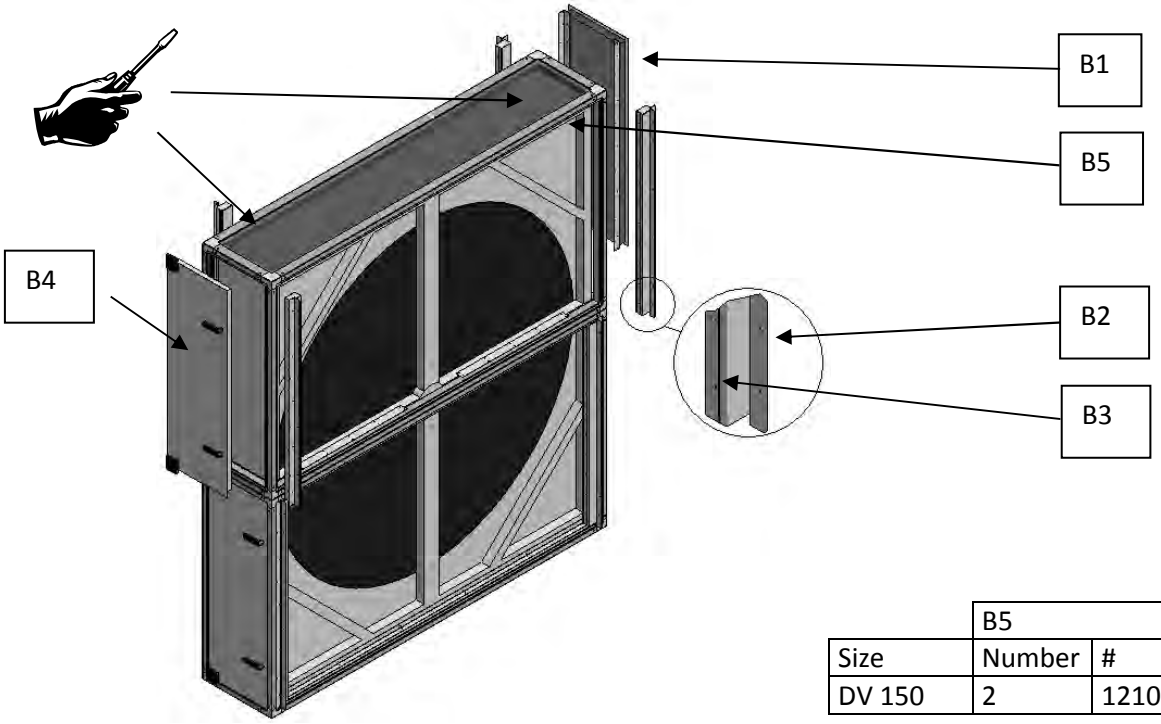
Size	A	B	C
DV 60	2170	1640	520
DV 80	2320	1790	588
DV 100	2520	1940	588
DV 120	2890	2090	558
DV 150	3040	2240	558




MOUNTING
INSTRUCTIONS
for
Rotary Heat
Exchangers in split design
for types:
RRS / RRSE from the
contructial size 3001
Index
KLINGENBURG
ENERGIERÜCKGEWINNUNG

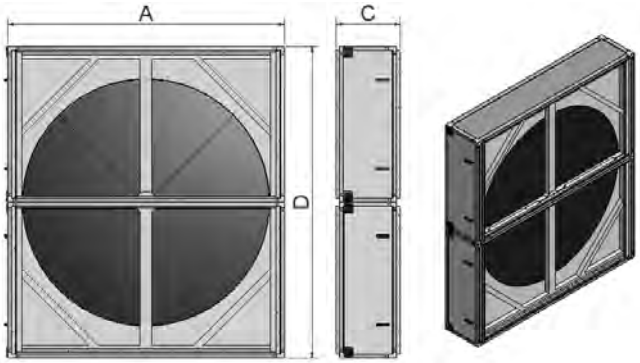


	A1	
Size	Quantity	Length (mm)
DV 60	4	1014
DV 80	4	1164
DV 100	4	1314
DV 120	4	1464
DV 150	4	1614



	B5	
Size	Number	#
DV 150	2	12100510

	B1		B2		B3		B4	
Size	Quantity	#	Quantity	#	Quantity	#	Quantity	#
DV 60	1	10122310	-	-	-	-	1	10722310
DV 80	1	10122610	4	11200400	4	21000200	1	10722610
DV 100	1	10122710	4	11200410	4	21000210	1	10722710
DV 120	1	10122810	4	12100410	4	21000230	1	10722810
DV 150	1	10122910	4	11200420	4	21000220	1	10722910



Size	A	C	D
DV 60	2170	520	2240
DV 80	2320	588	2540
DV 100	2520	588	2840
DV 120	2890	558	3140
DV 150	3040	558	3440

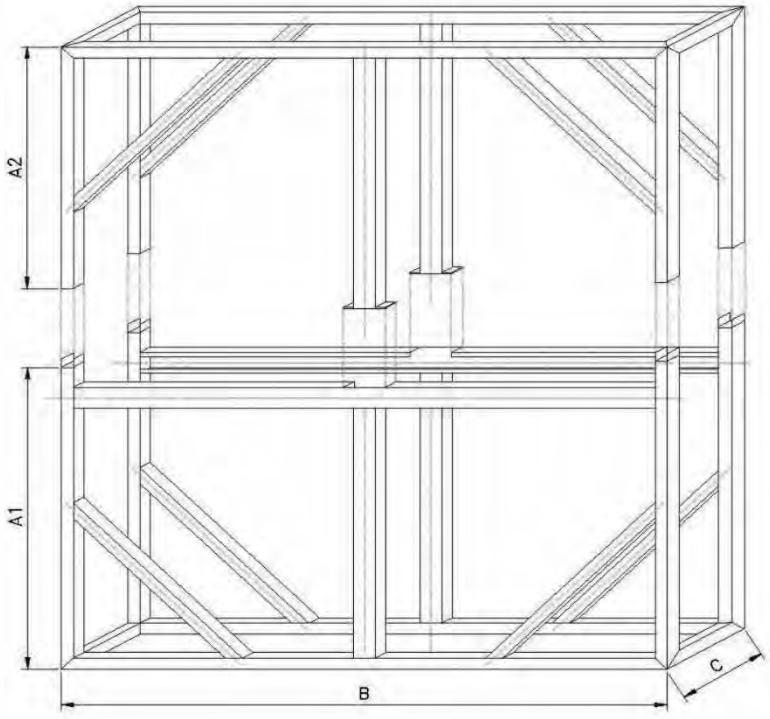
9.3 Assemble divided rotor for DV 60, DV 80, DV 100, DV 120 og DV 150

1. Bill of material of the parts delivered

As a standard the frames of the rotary heat exchangers of the constructional sizes RRS/RRSE up to 3000 are made of galvanized steel sheet.

Frame dimensions of the split heat exchangers (without packing) as follows:

RRS / RRSE	Height A1 + A2 (mm)	Lower frame A1 (mm)	Upper frame A2 (mm)	Width (mm)	Depth (mm)
2500	2500	1350	1150	2500	440
2750	2750	1475	1275	2750	440
3000	3000	1600	1400	3000	440



2. Mounting tools required

In addition to the normally used mounting tools we´d recommend the use of:

- Hammer 1500 gr.
- plastic tip hammer
- hardwood
- 2 pieces round bars, d = 25 mm, l = 600 mm
- 2 pieces of spanners, respectively, with openings of 17, 19, 24 mm
- flexible reversible ratched handle with
  - socket for wrenches with openings of 7, 8, 17, 19 mm
  - hexagon insert socket driver 4, 6, 8, 10 mm
- electr. impact screwdriver
- engineer´s pliers or side cutter
- double ladder
- screwdriver small 2,8 mm
- screwdriver big 10 mm
- 2 pieces drifts made of 12 mm round stock
- joint filling hand pistol, incl. permissable sealing materials

3. Gerneral conditions by customers

For stress-free positioning of the rotor the surface shall be flat. External forces of channel connections shall not be lead into the rotor frame. Observe that the rotor is evenly and straightly blown against. For inspection purposes the rotor shall be accessible within the installation.

4. Vertical rotor/horizontal division

4.1 Conditions by customers

A free space of at least 400 mm is required above the rotor because the upper part of the housing is placed after the mounting of the segments. In case this space is not available see details of item 4.3.

4.2 Mounting description

- Alignement of the lower part of the rotor and fixing to the floor.

  This work is **not** done by Klingenburg personnel.

  Important: Observe correct mounting direction of the rotor for in case of use of a scavenging chamber functioning is no longer given!

Table of frames and storage mass weights as well as the storage mass segments valid for rotory heat exchangers

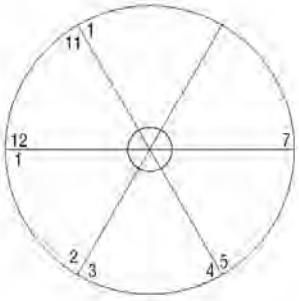
RRS / RRSE	Storage mass diameter (mm)	compl. weight exchanger (kg)	Weights frame weight (kg)	compl. Storage mass weight (kg)	Segments of storage mass
2500	2340	620	310	310	6
2750	2590	780	410	470	6
3000	2840	1000	600	400	6

Table of mounting accessories

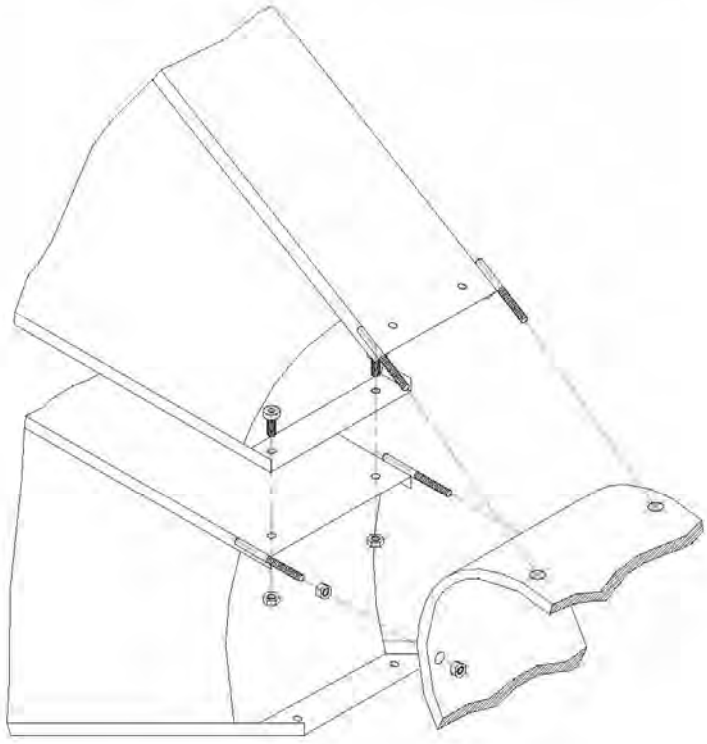
RRS / RRSE	Mounting accessories of the lower part of the exchanger					
	nut M 16 (DIN 934)	Screw M 10 x 95 and nut (DIN 931 / 985)	Screw M 12 x 16 and nut (DIN 912 / 934)	Screw M 8 x 16 (DIN 912)	V-belt SPA incl. Lock (m)	Dust cover for bearing cover (Piece)
2500	24	12	12	34	8,1	2
2750	24	12	12	34	9,1	2
3000	24	12	12	34	9,6	2

- At delivery, half of the amount of the rotor segments is already assembled and pread-justed. The connection points of the individual segments are numbered continuously.

RRS / RRSE 2500 - 3000

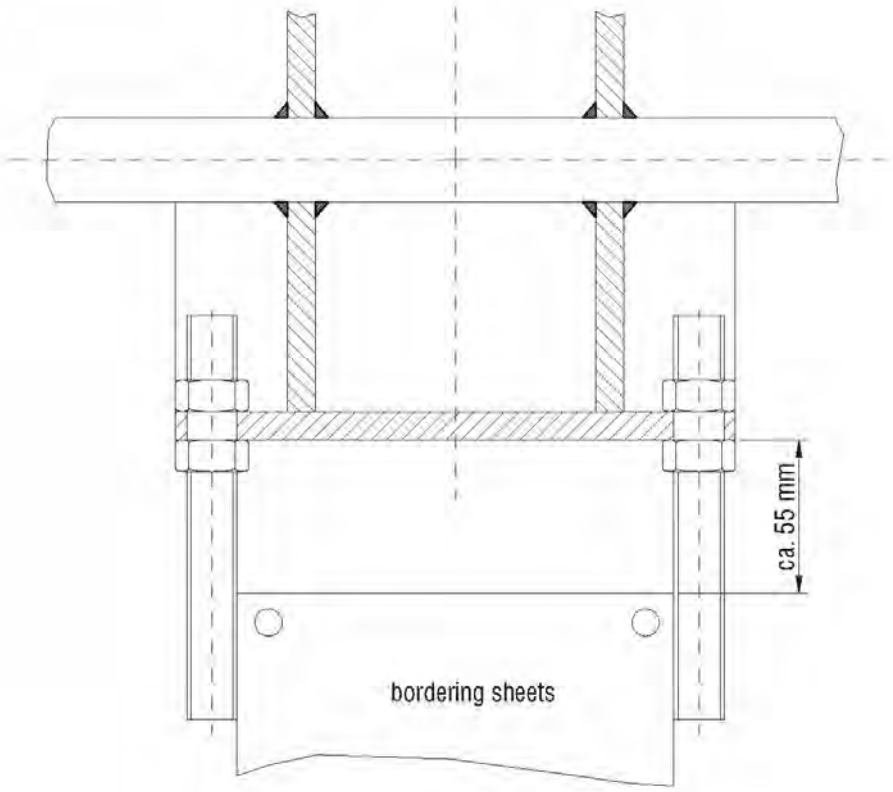


- Block rotor against rotation with 2 pieces round bars, (d = 25 mm, l = 600 mm) between the root of the rotor, the welded threaded rods at the bordering sheet and the bearing frame.
- Insert segments according to numbering. The rotor surface shall be protected during these works. Do not use plain washers!



- Fix nuts of the threaded rods by a locknut.

Attention: The space between the outer edge of the root of the rotor and the bordering sheets shall be at about 55 mm. This measure is only for your orientation to insert all segments. If this measure is not kept it is difficult to insert the last Segment.

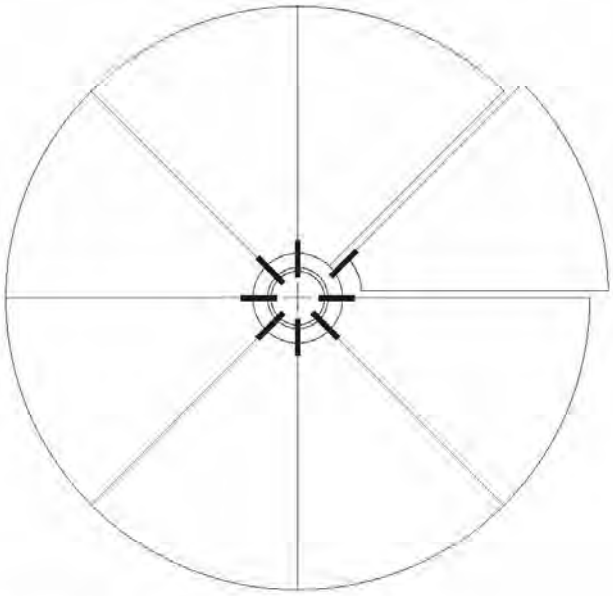


➤ Install external screw fitting of the bordering sheets. Drive home screws.

Important: The bordering sheets shall be contiguous without gap. In case of a gap the nuts at the threaded rods have to be adjusted accordingly.

- In case of jamming of the final segment slightly loosen the neighbouring segments from the root. The final segment can be inserted into the root of the rotor with the threaded rods. In case the air gap of the last mounted segment is too big all segments have to be fetched about 2 to 4 mm closer to the root of the rotor.

Important: Drive home all screws, otherwise depth impact!



4.3 Redressing of the arrangement of bearings

The rotor bearing is basically adjusted by the manufacturer. In case of twisted assembly of the rotor, however, it maybe necessary to redress the bearing.

- Mark segment bordering
- Turn rotor to the position where marked border is upside down
- Meter the distance of segment borders to rotor frame
- Turn marked border upside
- Repeat metering
- Both dimensions have to correspond with an allowance of + 2 mm
- Line bearing, if necessary
- Turn rotor to position where marked bordering is horizontal to rotor axle
- Meter distance of segment borderings to rotor frame
- Turn marked border to the other side
- Repeat metering
- Both dimensions have to correspond with an allowance of + 2 mm.
- Adjust one of the two bearings on the border frame, if necessary

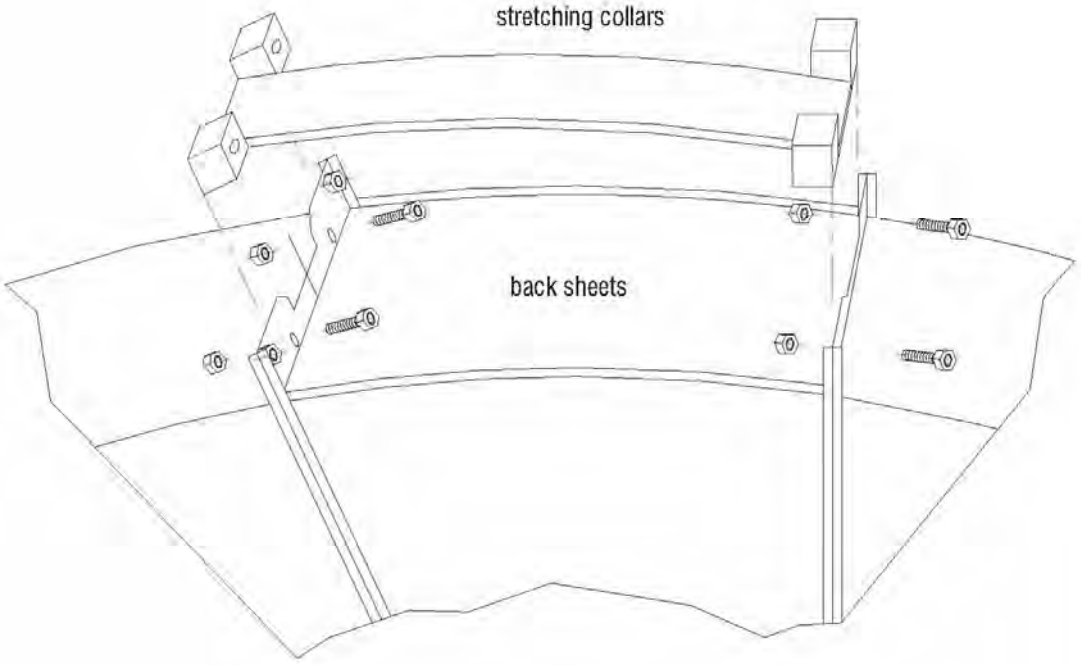
Now, the rotor bearing is adjusted.

- The individual segments are adjusted at the threaded rods of the root of the rotor. A side impact exceeding 3 mm shall not be permitted.

With rotors **up to the constructional size RRS/RRSE 3000**, now back sheets and allround-stretching collars are mounted and tensed. Check again rotor alignement before final fastening of the screw connections.

Important: Even screw down of the stretching collars (2 stages)

- Fasten screws until even tensioning of the segments is visible.
- Coining of the stretching collars along the entire circumferential by means of a plastic tip hammer or hard wood and hammer. Then, refastening of all screw connections.
- Check wobble and depth impact.

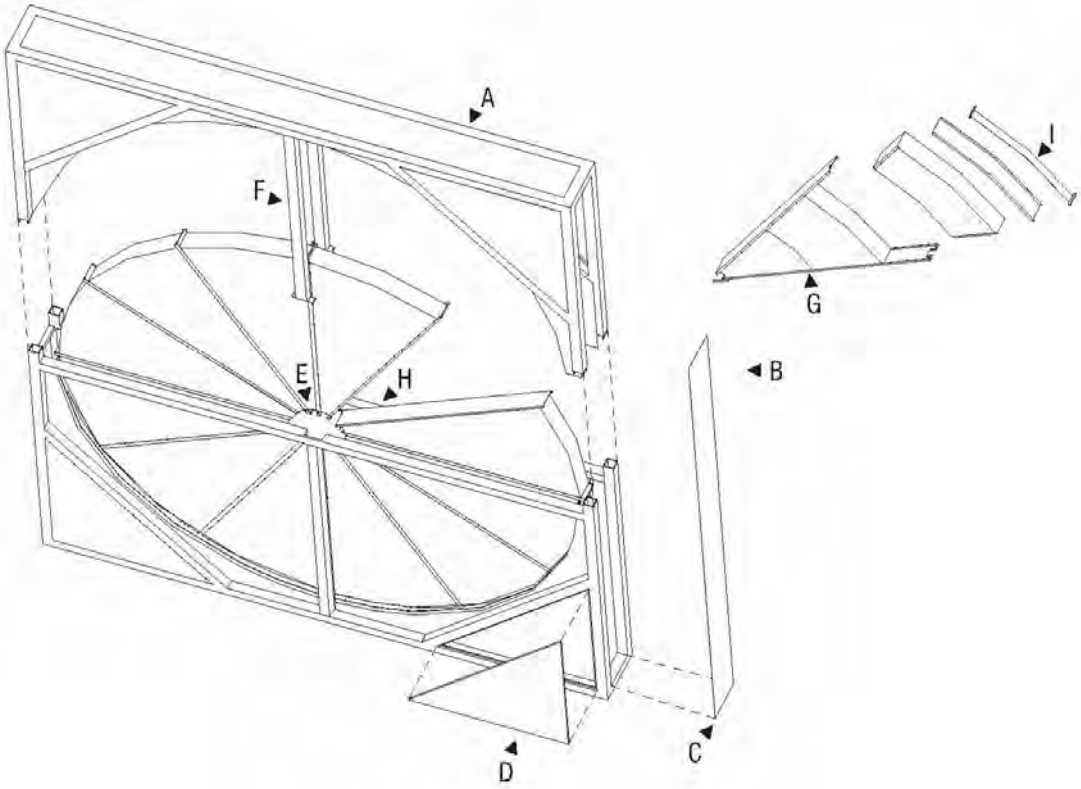


- Screw down tightly all screw connections.
- Place upper part of the housing and screw it down.

4.4 Mounting in case of restricted space

In case of insufficient space (400 mm) above the rotor the rotor housing can be assembled before inserting segments. According to the figure, the upper rotor edge can be removed. The unscrewable edge is always located above the driving motor. The rotor segments can be mounted through this opening.

➤ about this see item 4.2.



A) Housings are split from rotor size 2500 on
B) The rotors are lined with removable sheets
C) The motor is accessible from the front, from 2500 on by a triangular door
D) Mounting edge always located above driving motor
E) External bearings
F) Bearing support stretcher
G) Rotor sector
H) Rotor cup
I) Stretching collar

5. Upright rotor/vertical division

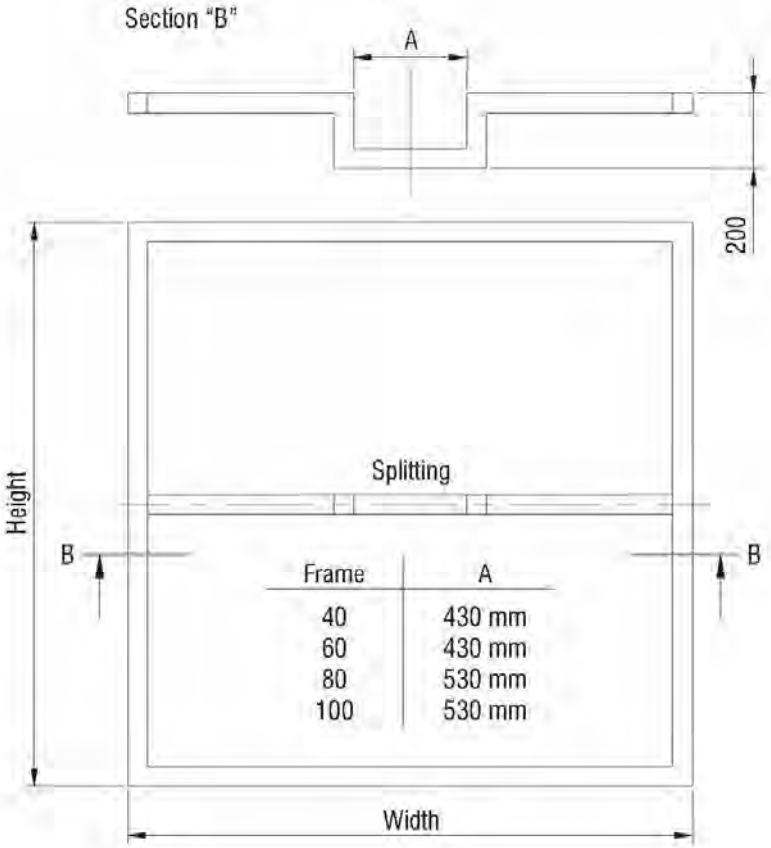
In some rare cases it may be necessary to vertically split the rotor housing. The housing, then basically, has to be completely assembled before inserting the segments. Mounting of the segments according to item 4.3.

6. Horizontal rotors

6.1 Conditions by customers

For stress-free positioning of the rotor the surface shall be flat. External forces of channel connections shall not be lead into the rotor frame. Observe that the rotor is evenly and straightly blown against.

Important: By customers, the point of support of the lower rotor bearing shall be solidly supported and easily accessible for maintenance purposes. The following describes our proposalfor for a corresponding design.



Frame	A
40	430 mm
60	430 mm
80	530 mm
100	530 mm

6.2 Mounting description

- Place housing part containing the premounted half of the rotor mass onto the seat construction.
- Stick second part of the housing and fasten frame with supporting construcion.

Important: Observe correct mounting direction of the rotor!

Due to its dead weight the rotor settles about 5 mm as soon as the rotor is layed down. Therefore, the premounted rotor segments are pretensioned to this measure. Mounting of the segments is done analoguous to the mounting of the upright rotors. For this see item 4.2. and 4.4.

7. Mounting of the drive

The rotor drive is premounted by the manufacturer. It is fixed to a motor-driven rocker dolly switch, which itself is kept tensioned by a tension spring. The V-belt is loosely attached. The flex connector is premounted on one side.

- Fix one end of the V-belt to the rotor circumferential by means of an adhesive or a wire and draw it around the wheel by turning the rotor.
- Shorten belt which is delivered with overlength to necessary size.
- Connect ends with flex connector.
- Put belt on pulley.
- See that V-belt is sufficiently tensioned and does not abrade at the housing.
- V-belt stretchens during operation. Thus, if necessary, it needs to be shortened.

8. Mounting of the gaskets

Center and circumferential gaskets are premounted by manufacturer. Do not press gaskets against rotor mass because the motor is exceedingly retarded and may be damaged.

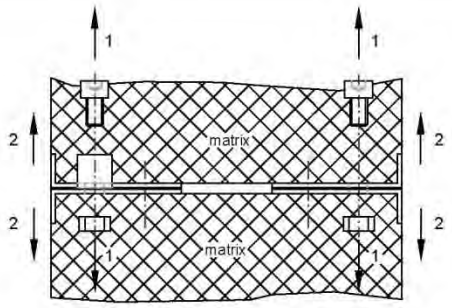
Hint: Push gaskets to final position during slow rotation of the rotor.

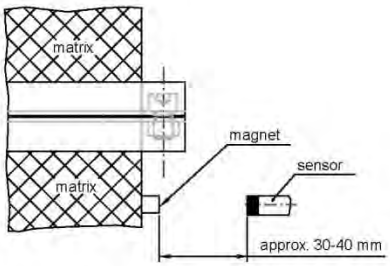
9. Controll works

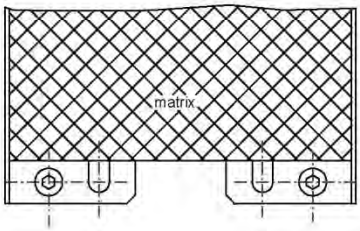
After mounting of lateral sheet and doors the eventually existing leakages can be caulked with permanently elastic sealing material.

- Check wobble an height impact of the rotor.
- Check fastening of all screw connections.
- Check correct tensioning of the V-belt.

For informations about the connection of the driving motor see controller documentation. Fix air conduits with sheet metal screws to aluminum frame.







One magnet are fitted to each rotor in order to check the rotor running.
Only 1 magnet per rotor is required in order to trigger the cleaning-off process.

	Drawing no: KL000758	magnet for proximity switches
	Date: 03.04.06	drawing applicable to all the rotors with a split design including running control system
	Processed by: Pog.	
	checked:	KLINGENBURG GmbH
	Material:	Boystraße 115
Änderung:	Scale: 1:2,5	45968 Gladbeck

9.4 Assemble divided rotor for DV 190 og DV 240

1. Stückliste | 1. Bill of material

1. Stückliste der geteilten Teile

Die Rahmen der Rotationswärmetauscher der Baugrößen RRS ab 3001 werden standardmäßig aus verzinktem Stahlblech produziert.

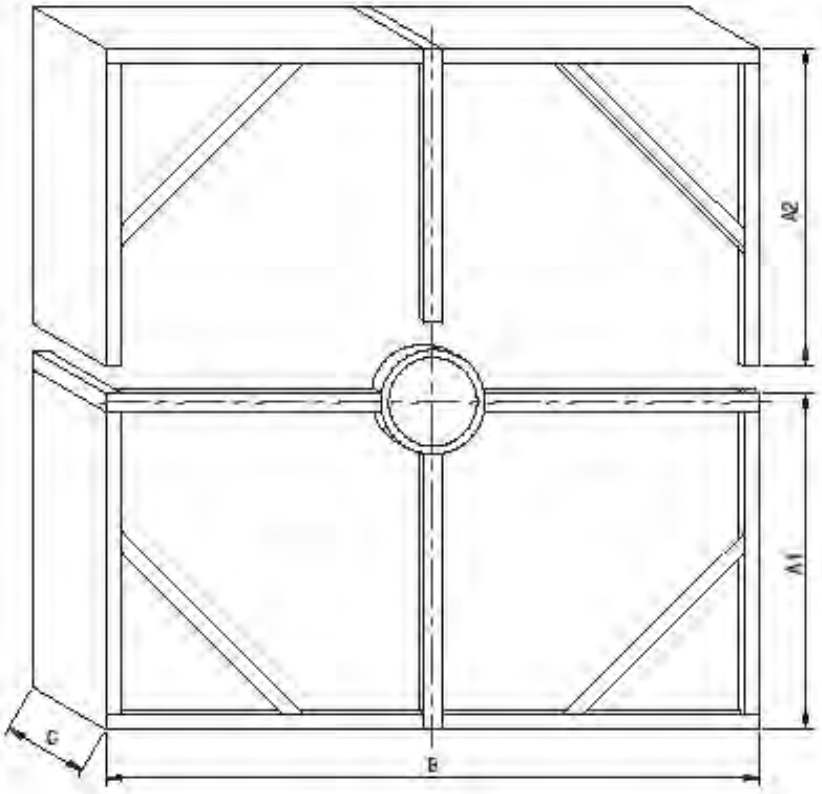
Nachfolgend die Rahmenmaße der geteilten Rotationswärmetauscher (ohne Verpackung):

1. Bill of material of the parts delivered

As a standard the frames of the rotary heat exchangers of the constructional sizes RRS from 3001 are made of galvanized steel sheet.

Frame dimensions of the split heat exchangers (without packing) as follows:

3500	3500	1800	1700	3500	550
4000	4000	2050	1950	4000	550
4500	4500	2300	2200	4500	550



2. Erforderliche Montagewerkzeuge

Zusätzlich zu normalen Montagewerkzeugen empfehlen wir:

- Hammer 1500 gr.
- Kunststoffhammer
- Hartholz
- 2 Stück Rundstangen D = 25 mm, L = 600 mm
- je 2 Stück Maulschlüssel 17, 19, 24 mm Schlüsselweite
- Gelenk-Umschaltknarre mit
  - Steckschlüsseleinsätze 7, 8, 17, 19 mm Schlüsselweite
  - Einsätze für Innensechskant 4, 6, 8, 10 mm
- elektr. Schlagschrauber
- Kombizange oder Seitenschneider
- Steh- oder Bockleiter
- Schraubendreher klein 2,8 mm
- Schraubendreher groß 10 mm
- 2 Stück Dorne aus 12 mm Rundmaterial
- Handfugenpistole incl. Kartuschen mit zulässigen Dichtungsmitteln

2. Mounting tools required

In addition to the normally used mounting tools we recommend the use of:

- Hammer 1500 gr.
- plastic tip hammer
- hardwood
- 2 pieces round bars, d = 25 mm, l = 600 mm
- 2 pieces of spanners, respectively, with openings of 17, 19, 24 mm
- flexible reversible ratched handle with
  - socket for wrenches with openings of 7, 8, 17, 19 mm
  - hexagon insert socket driver 4, 6, 8, 10 mm
- electrical impact screw driver
- engineer´s pliers or side cutter
- double ladder
- screw driver small 2,8 mm
- screw driver big 10 mm
- 2 pieces drifts made of 12 mm round stock
- joint filling hand pistol, incl. permissable sealing materials

3. Allgemeine bauseitige Voraussetzungen

Der Untergrund muß eben sein, so daß der Rotor spannungsfrei aufsteht. Äußere Kräfte durch Kanalanschlüsse dürfen nicht in den Rotorrahmen eingeleitet werden. Es ist darauf zu achten, daß der Rotor gleichmäßig und gerade angeströmt wird. Der Rotor muß in der Anlage zugänglich sein, um Inspektionsarbeiten durchführen zu können.

3. General conditions by customers

For stress-free positioning of the rotor the surface shall be flat. External forces of channel connections shall not be lead into the rotor frame. Observe that the rotor is evenly and straightly blown against. For inspection purposes the rotor shall be accessible within the installation.

4. Stehender Rotor / waagerechte Teilung

4.1 Baoseitige Voraussetzungen

Da das Gehäuseoberteil nach der Montage der Segmente aufgesetzt wird, ist oberhalb des Rotors ein freier Raum von mindestens 400 mm erforderlich. Steht dieser Raum nicht zur Verfügung, lesen Sie bitte die Ausführungen unter Punkt 4.4 auf Seite 10.

4.2 Montagebeschreibung

Ausrichten des Rotorunterteils und Befestigung am Boden. Diese Arbeit wird **nicht** durch Klingenburg-Monteure durchgeführt.

Wichtig:

Achten Sie darauf, daß der Rotor richtig herum montiert wird, da ansonsten beim Einsatz einer Spülkammer die Funktion nicht mehr gegeben ist.

4. Vertical rotor/horizontal splitting

4.1 Conditions by customers

A free space of at least 400 mm is required above the rotor because the upper part of the housing is placed after the mounting of the segments. In case this space is not available see details of item 4.4 on page 10.

4.2 Mounting description

Alignement of the lower part of the rotor and fixing to the floor. This work is not done by Klingenburg personnel.

Important:

Observe correct mounting direction of the rotor for in case of use of a scavenging chamber functioning is no longer given!

Aufstellung der Rahmen und Speichermassengewichte sowie Anzahl der Speichermassensegmente gültig für geteilte Rotationswärmetauscher

Table of frames and storage mass weights as well as the storage mass segments valid for rotary heat exchangers

[illegible]	[illegible] Storage mass [illegible]	[illegible] complete weight exchanger [illegible]	[illegible] frame weight [illegible]	[illegible] compl. storage mass weight [illegible]	[illegible] Segments of storage mass [illegible]
3500	3260	1170	630	540	8
4000	3760	1790	990	800	12
4500	4260	2120	1125	995	12

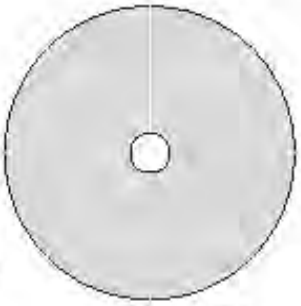
Aufstellung des Montagezubehörs

Table of mounting accessories

[illegible]	[illegible] Mounting accessories of the lower part of the exchanger			
	[illegible] Nut M10 [illegible]	[illegible] Screw M10x25 and nut [illegible]	[illegible] Screw M12x10 and nut [illegible]	[illegible] Drill screw 4,8x15
3500	32	16	32	20
4000	48	24	48	20
4500	48	24	48	20

[illegible]	[illegible] Shaft SPN incl. Lock [illegible]	[illegible] Dust cover for bearing cover [illegible] Piece	[illegible] Metal inset steel 3x8 mm	[illegible] Screw M12x30 [illegible]	[illegible] Self locking nut M12 [illegible]
3500	11,2	2	20	8	8
4000	12,9	2	20	8	8
4500	14,6	2	20	8	8

Bei Anlieferung sind bereits die Hälfte der Rotorsegmente montiert und vorgerichtet. Die Verbindungsstellen der einzelnen Segmente sind fortlaufend numeriert.



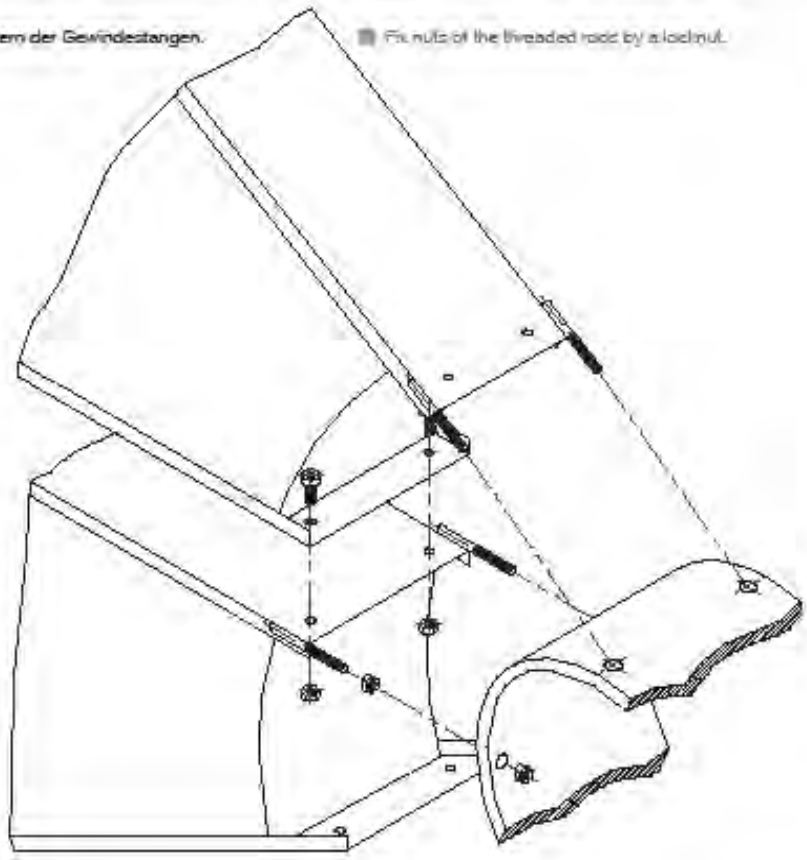
RRS D=2801 - 3759

RRS D=3760 - 4760

At delivery, half of the amount of the rotor segments is already assembled and preadjusted. The connection points of the individual segments are numbered continuously.

- Blockieren Sie den Rotor mit 2 Stück Rundstangen (D=25 mm, Länge=600 mm) zwischen Rotornabe, den angeschweißten Gewindestangen am Einfassungsblech und dem Lagersteg gegen Drehung.
- Einsetzen der Segmente gemäß Numerierung. Die Rotoroberfläche sollte dabei geschützt werden. Keine Unterlegscheiben verwenden!
- Kontern Sie die Muttern der Gewindestangen.

- Block rotor against rotation with 2 pieces round bars, (d=25 mm, l=600 mm) between the root of the rotor, the welded threaded rods at the bordering sheet and the bearing frame.
- Insert segments according to numbering. The rotor surface shall be protected during these works. Do not use plain washers!
- Fix nuts of the threaded rods by a locknut.

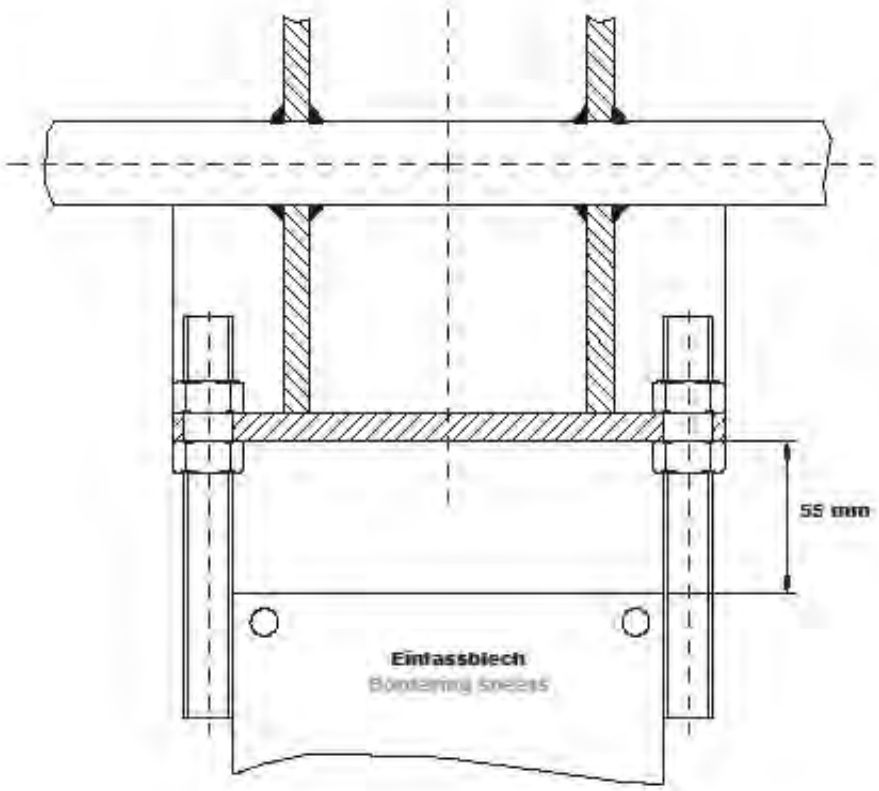


Achtung!

Der Abstand zwischen Außenkante Rolornabe und den Einlassblechen sollte ca. 55 mm betragen. Dieses Maß ist nur ein Anhaltswert, um alle Segmente einbringen zu können. Wird dieses Maß unterschritten, treten Schwierigkeiten beim Einbringen des letzten Segmentes auf.

Important

The space between the outer edge of the roll of the rotor and the bordering sheets shall be at about 55 mm. This measure is only for your orientation to insert all segments. If this measure is not kept it is difficult to insert the last segment.



Bringen Sie die Außenverschraubungen der Einfassungsbleche an. Schrauben festziehen.

Install external screw fitting of the bordering sheets. Order home screws.

Wichtig

Die Einfassungsbleche der Segmente müssen ohne Spalt aneinanderliegen. Falls ein Spalt vorhanden ist, müssen die Muttern an den Gewindestangen verstellt werden.

Important

The bordering sheets shall be contiguous without gap. In case of a gap the nuts at the threaded rods have to be adjusted accordingly.

- Sollte das letzte Segment klemmen, schrauben Sie bitte die benachbarten Segmente etwas aus der Nabe heraus.

Mit den Gewindestangen in der Rotornabe können Sie das letzte Segment einbringen. Ist der Luftspalt des zuletzt montierten Segmentes zu groß, müssen sämtliche Segmente um ca. 2 bis 4 mm näher an die Rotornabe herangezogen werden.

Wichtig:

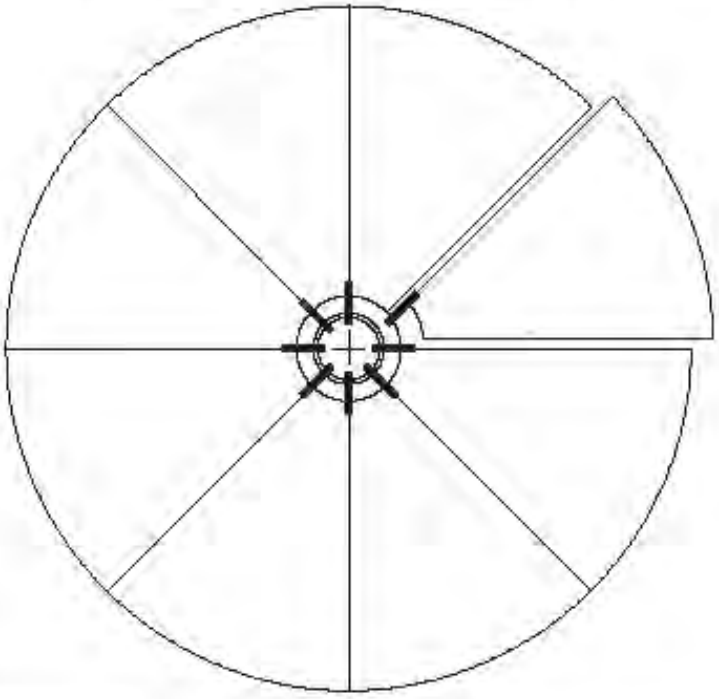
Alle Segmente nachziehen, sonst Tiefenschlag!

- In case of jamming of the final segment slightly loosen the neighbouring segments from the root.

The final segment can be inserted into the root of the rotor with the threaded rods. In case the air gap of the last mounted segment is too big all segments have to be fetched about 2 to 4 mm closer to the root of the rotor.

Important:

Drive home all screws, otherwise depth impact!



4.3 Nachrichten der Rotorlagerung

Grundsätzlich ist die Rotorlagerung im Werk ausgerichtet. Sollte der Rotor jedoch verspannt eingebaut sein, kann ein Nachrichten erforderlich werden.

- Markieren Sie hierzu eine Segmenteinfassung
- Drehen Sie den Rotor, so daß die markierte Einfassung unten liegt.
- Messen Sie den Abstand der Segmenteinfassung zum Rotorrahmen

4.3 Readjusting of the arrangement of bearings

The rotor bearing is basically adjusted by the manufacturer. In case of twisted assembly of the rotor, however, it maybe necessary to redress the bearing.

- Mark segment bordering
- Turn rotor to the position where marked border is upside down
- Meter the distance of segment borders to rotor frame

- Drehen Sie die markierte Einfassung nach oben
- Wiederholen Sie die Messung
- Beide Maße müssen mit einer Abweichung von + 2 mm übereinstimmen
- Falls erforderlich, unterfüttern Sie die Lagerung
- Drehen Sie den Rotor, so daß die markierte Einfassung horizontal zur Rotorachse liegt
- Messen Sie den Abstand der Segmenteinfassung zum Rotorrahmen
- Drehen Sie die markierte Einfassung auf die andere Seite.
- Wiederholen Sie die Messung
- Beide Maße müssen mit einer Abweichung von + 2 mm übereinstimmen
- Falls erforderlich, verschieben Sie eines der beiden Lager auf dem Lagersteg

Die Rotorlagerung ist nun ausgerichtet.

- Die einzelnen Segmente werden an den Gewindestangen in der Rotornabe ausgerichtet. Ein Seitenschlag von mehr als 3 mm sollte nicht erlaubt sein

Bei Rotoren **ab der Baugröße RRS 3001** werden nun die Rückenbleche und Rundumspannreifen montiert und gespannt. Prüfen Sie vor dem endgültigen Anziehen der Verschraubungen noch einmal die Rotorausrichtung.

Wichtig: Gleichmäßiges Verschrauben der Spannreifen (2 Durchgänge):

- Schrauben anziehen, bis ein einheitliches Verspannen der Segmente zu sehen ist
- Mit einem Kunststoffhammer bzw. Hartholz und Handhammer die Spannreifen über den ganzen Umfang nachschlagen. Dann alle Verschraubungen nachziehen
- Seiten- und Tiefenschlag überprüfen
- Ziehen Sie sämtliche Verschraubungen fest an
- Setzen Sie das Gehäuseoberteil auf und verschrauben Sie es

- Turn marked border upside
- Repeat metering
- Both dimensions have to correspond with an allowance of + 2 mm
- Line bearing, if necessary
- Turn rotor to position where marked bordering is horizontal to rotor axle
- Meter distance of segment borderings to rotor frame
- Turn marked border to the other side
- Repeat metering
- Both dimensions have to correspond with an allowance of + 2 mm
- Adjust one of the two bearings on the border frame, if necessary

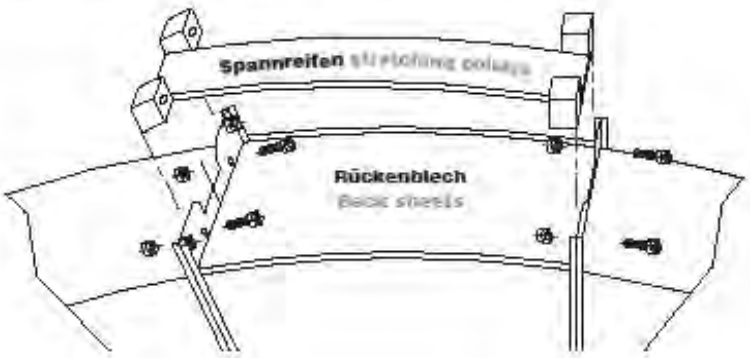
Now, the rotor bearing is adjusted.

- The individual segments are adjusted at the threaded rods of the root of the rotor. A side impact exceeding 3 mm shall not be permitted.

With rotors from the construction size RRS 3001, now back sheets and all-round-stretching collars are mounted and tensed. Check again rotor alignement before final fastening of the screw connections.

Important: Even screw down of the stretching collars (2 stages):

- Fasten screws until even tensioning of the segments is visible.
- Coining of the stretching collars along the entire circumferential by means of a plastic bit hammer or hard wood and hammer. Then, refastening of all screw connections.
- Check wobble and depth impact.
- Screw down tightly all screw connections.
- Place upper part of the housing and screw it down.



4.4 Montage unter beengten Platzverhältnissen

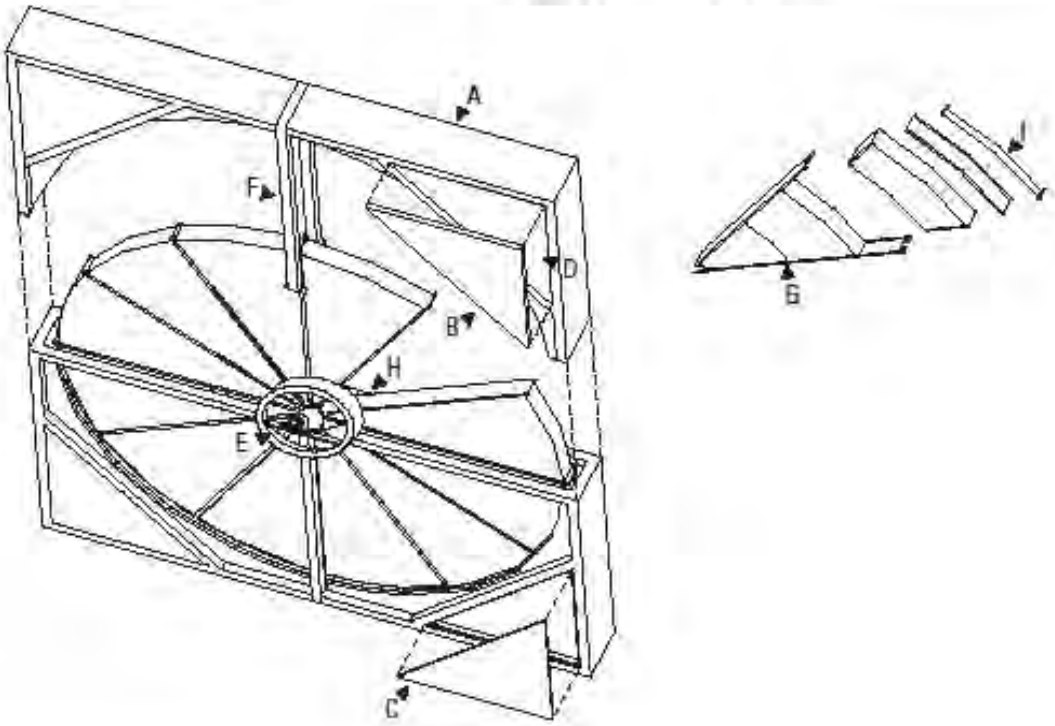
Steht Ihnen oberhalb des Rotors kein ausreichender Raum (ca. 400 mm) zur Verfügung, können Sie das Rotorgehäuse vor dem Einbringen der Segmente zusammensetzen. Wie in der Zeichnung ersichtlich, kann dann eine obere Rotorecke demontiert werden. Diese abschraubbare Ecke befindet sich immer überhalb des Antriebsmotors. Durch diese Öffnung werden dann die Rotorsegmente montiert.

Siehe hierzu Punkt 4.2

4.4 Mounting in case of restricted space

In case of insufficient space (400 mm) above the rotor the rotor housing can be assembled before inserting segments. According to the figure, the upper rotor edge can be removed. The unscrewable edge is always located above the driving motor. The rotor segments can be mounted through this opening.

About this see item 4.2.



A) Ab Rotorgröße 2500 sind die Gehäuse geteilt
B) Die Rotoren sind mit abnehmbaren Dreeckblechen ausgekleidet
C) Der Motor ist durch Dreieckstür zugänglich
D) Montageecke immer überhalb des Antriebsmotors.
E) Außenliegende Lager
F) Lagerstützstrebe
G) Rotorsektor
H) Rotortopf
I) Spannreifen

A) Housings are split from rotor size 2500mm
B) The rotors are lined with removable sheets
C) The motor is accessible by a triangular door
D) Mounting edge always located above driving motor
E) External bearings
F) Bearing support strebe
G) Rotor sector
H) Rotor cup
I) Stretching collar

5. Stehender Rotor / Senkrechte Teilung

In seltenen Fällen kann es erforderlich sein, das Rotorgehäuse senkrecht zu teilen. Das Gehäuse muß dann grundsätzlich vor dem Einbringen der Segmente komplett zusammengebaut werden. Die Montage der Segmente erfolgt dann wie unter Punkt 4.2 beschrieben.

5. Upright rotor / vertical division

In some rare cases it may be necessary to vertically split the rotor housing. The housing, then basically, has to be completely assembled before inserting the segments. Mounting of the segments according to item 4.2.

6. Liegende Rotoren

6.1 Bauseitige Voraussetzung

Der Untergrund muß eben sein, so daß der Rotor spannungsfrei aufliegt. Äußere Kräfte durch Kanalanschlüsse dürfen nicht in den Rotorrahmen eingeleitet werden. Es ist darauf zu achten, daß der Rotor gleichmäßig und gerade angeströmt wird.

Wichtig:

Der Auflagepunkt des unteren Rotorlagers ist bauseits stabil zu unterstützen und zwecks Wartungszwecken leicht zugänglich sein. Hierzu unseren Vorschlag einer entsprechenden Konstruktion.

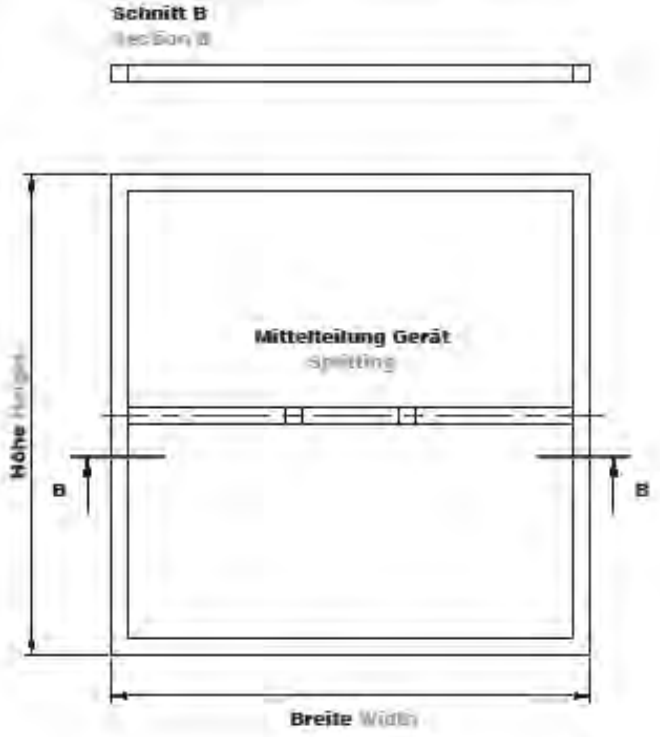
6. Horizontal rotors

6.1 Conditions by customers

For stress-free positioning of the rotor the surface shall be flat. External forces of channel connections shall not be lead into the rotor frame. Observe that the rotor is evenly and straightly blown against.

Important:

By customers, the point of support of the lower rotor bearing shall be solidly supported and easily accessible for maintenance purposes. The following describes our proposal for a corresponding design.



6.2 Montagebeschreibung

Legen Sie die Gehäusehälfte, in der die halbe Rotormasse vormontiert ist, auf die Aufnahmekonstruktion.
Stecken Sie die andere Gehäusehälfte auf und befestigen Sie den Rahmen mit der Stützkonstruktion.

Wichtig:

Achten Sie darauf, daß der Rotor richtig herum montiert wird!

Die Rotorpakete setzen sich aufgrund ihres Eigengewichtes um ca. 5 mm, sobald der Rotor gelegt wird. Deshalb sind die vormontierten Rotorpakete um dieses Maß vorgespannt. Die Montage der Segmente verläuft analog zu der der stehenden Rotoren. Lesen Sie dazu bitte unter Punkt 4.2. und Punkt 4.4.

6.2 Mounting description

Place housing part containing the premounted half of the rotor mass onto the seat construction.
Stick second part of the housing and fasten frame with supporting construction.

Important:

Observe correct mounting direction of the rotor!

Due to its dead weight the rotor settles about 5 mm as soon as the rotor is layed down. Therefore, the premounted rotor segments are pretensioned to this measure. Mounting of the segments is done analogulous to the mounting of the upright rotors. For this see item 4.2. and 4.4.

7. Montage des Antriebs

Der Rotorantrieb ist werkseitig vormontiert worden. Er ist auf einer Motorwippe befestigt, die durch eine Zugfeder unter Spannung gehalten wird. Der Keilriemen ist lose beigelegt. Der Gelenkverbinder ist einseitig vormontiert.

- Befestigen Sie ein Ende des Riemens mit einem Klebeband oder Draht am Rotorumfang und ziehen Sie es durch Drehung des Rotors um das Rad herum.
- Kürzen Sie den Riemen, der mit Überlänge geliefert wird, auf das erforderliche Maß.
- Verbinden Sie die Enden mit dem Gelenkverbinder
- Legen Sie ihn auf die Riemenscheibe auf
- Achten Sie darauf, daß der Keilriemen ausreichend gespannt ist und nicht am Gehäuse schleift
- Während des Betriebes verlängert sich der Keilriemen. Er muß gegebenenfalls gekürzt werden

7. Mounting of the drive

The rotor drive is premounted by the manufacturer. It is fixed to a motor-driven rocker daily switch, which itself is kept tensioned by a tension spring. The V-belt is loosely attached. The flex connector is premounted on one side.

- Fix one end of the V-belt to the rotor circumferential by means of an adhesive or a wire and draw it around the wheel by turning the rotor.
- Shorten belt which is delivered with overlength to necessary size.
- Connect ends with flex connector.
- Put belt on pulley
- See that V-belt is sufficiently tensioned and does not abrade at the housing.
- V-belt stretches during operation. Thus, if necessary, it needs to be shortened.

8. Montage der Dichtungen

Die Mittel- und Rundumdichtungen sind ab Werk vormontiert. Zu starkes Andrücken der Dichtungen gegen die Rotormasse ist zu vermeiden, da der Motor dadurch zu stark gebremst wird und beschädigt werden kann.

Tipp:

Schieben Sie die Dichtungen bei langsam drehendem Rotor in ihre endgültige Position.

8. Mounting of the gaskets

Center and circumferential gaskets are premounted by manufacturer. Do not press gaskets against rotor mass because the motor is exceedingly retarded and may be damaged.

Hint:

Push gaskets to final position during slow rotation of the rotor.

9. Kontrollarbeiten

Nachdem Sie die Seitenbleche und Türen angebracht haben, können Sie eventuelle Undichtigkeiten mit dauerelastischem Dichtungs-material abdichten.

- Prüfen Sie den Seiten- und Höhenschlag des Rotors
- Prüfen Sie, ob sämtliche Verschraubungen angezogen sind
- Prüfen Sie, ob der Keilriemen ausreichend gespannt ist

Informationen zum Anschluß des Antriebsmotors entnehmen Sie bitte den Reglerunterlagen.

Die Luftkanäle werden mit Blechtreibschrauben am Aluminium-rahmen befestigt.

9. Controll works

After mounting of lateral sheet and doors the eventually existing leakages can be caulked with permanently elastic sealing material.

- Check wobble an height impact of the rotor.
- Check fastening of all screw connections.
- Check correct tensioning of the V-belt.

For informations about the connection of the driving motor see controller documentation.

Fix air conduits with sheet metal screws to aluminum frame.

Wir hoffen Ihnen mit dieser Anleitung geholfen zu haben. Sollten jedoch einmal Probleme oder Fragen auftauchen, so kontaktieren Sie uns:

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We hope to be of assistance to you with this information. If there are any further questions, please do not hesitate to contact us anytime.

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9.5 Installation of motor that turns rotor and sensor for rotation

Installation of rotor motor and sensor for control of rotation in DVC module after assembly of divided rotor

Fig. 1

Fig.2

Fig. 1, 2 and 6

By delivery of a DVC module with divided rotor, the motor is installed before delivery to the customer

Fig.3

Fig.4

Fig.5

Fig. 2

The drive belt must be placed around the rotor and the ideal distance is 9 cm from the 2 sides of the rotor. The rotors are always 20 cm thick. The distance to the drive belt from a side of the rotor must be between 9–11 cm. the 2 sides of the rotor.

Fig.6

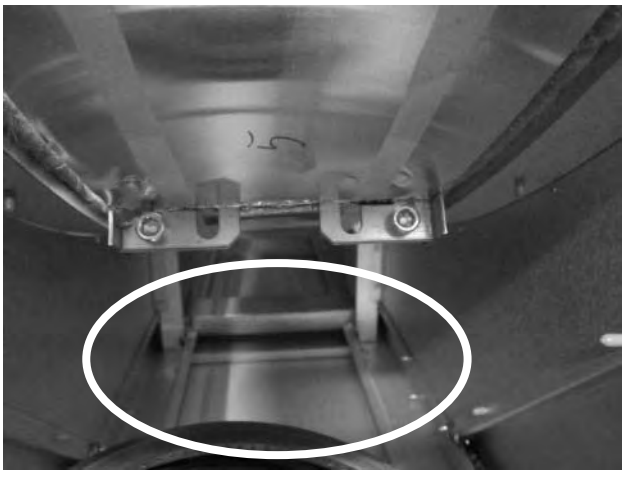


Fig. 3, 4 and 5

Motor is mounted on the motor console plate and 4 shock absorbers are mounted under the plate with M8 bolts.

Fig.7

Fig.8

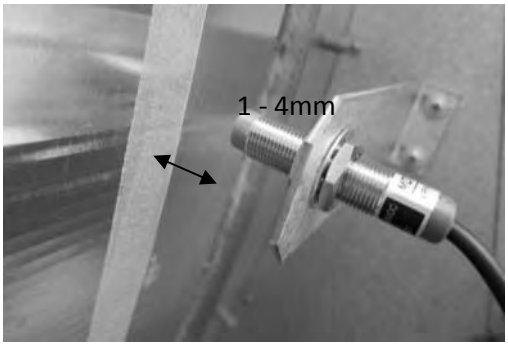


Fig. 7 and 8

Sensor for control of rotation must be installed by the installer. Distance must be 1-4 mm between sensor and rotor. Check that the brackets which are used for the assembly of the rotor segments do not hit the sensor.

Fig.9

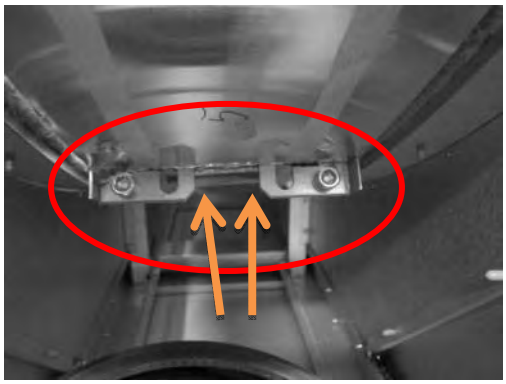


Fig. 9

Pay attention to the heights of the brackets which are used for the assembly of the rotor segments. Please turn the rotor in order to verify that the sensor will not be hit by the brackets.

Annex 10. Reversible heat pump for cooling and heating

10.1 DVU-HP section (reversible heat pump unit)

The air handling unit section – DVU-HP – is a separate section in the air handling unit, containing a complete stand-alone reversible heat pump system (heating and cooling). The system has been tested and optimized before delivery. The refrigerant is evaporated and condensed directly in the integrated batteries and the capacity is controlled automatically and steplessly between 5 and 100 %.

The system is delivered with the refrigerant R-410a in the circuit. In the section an internal controller - pCOOEM - and a complete system control all safety functions as well as the capacity of the digital scroll compressor (digital compressor and additional on/off compressor in the larger units DV 20 – DV 80). The system creates exactly the capacity requested by the main air handling unit controller via a 0-10V DC control signal. When a demand for heating or cooling occurs, the main air handling unit controller sends a start signal for heating or a start signal for cooling as well as a capacity signal 0-10V DC to the internal controller in this section. When the signal exceeds 1.6 V DC, the digital compressor starts. After start-up the capacity is regulated between 5 and 50 % by the digital scroll compressor - C1 and Q6 - in the illustration below. When more than 50 % of the capacity is demanded, the control signal exceeds 5.0 V DC and the second compressor, C2 starts. Then the capacity of the digital compressor is reduced to the minimum and with increasing demand gradually increased to 100% capacity. The reverse sequences are activated by declining demand until the demand is less than 5 %. If the control signal is below 0.5V DC, the system will stop.

A full envelope control system in the internal control system prevents operation that exceeds safe conditions for any of the components. Signals from the high and low pressure transmitters, K3 and K4, contribute with information to ensure maximum performance without exceeding the set value and thereby prevent safety switches for the HP and LP, K1 and K2 from disconnecting cooling or heating. This system ensures maximum performance under the given flows and temperatures of supply air and exhaust air.

The system includes 2 electronic expansion valves. One for heating mode - Q3, and one for cooling mode - Q2. Super heat is controlled by the build-in controller and is based on signal showing the evaporating pressure measured by LP transmitter and temperature sensor placed in the common suction line at the compressor console. This ensures a very accurate and efficient performance of the system under all operating conditions.

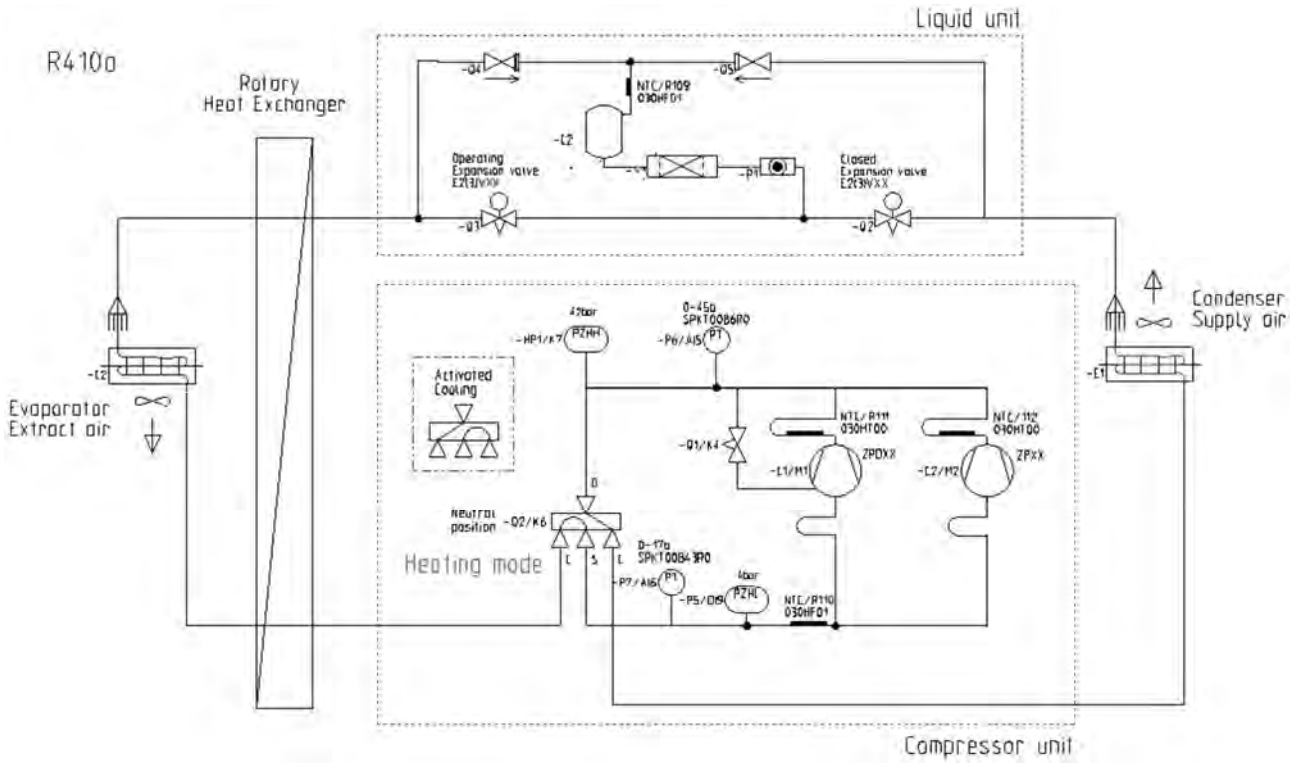
A 4-way valve Q1 changes the function of the system between heating and cooling mode.

The evaporator (condenser in cooling mode) on the DVU-HP unit is placed in the extract air flow after the rotary heat exchanger. This makes it possible to utilize the heat exchanger in booth heating and cooling mode for recovery of energy. This will minimize the power consumption of the compressor system.

A heating element has been installed below the evaporator in the drip tray to prevent ice buildup during heating operation.

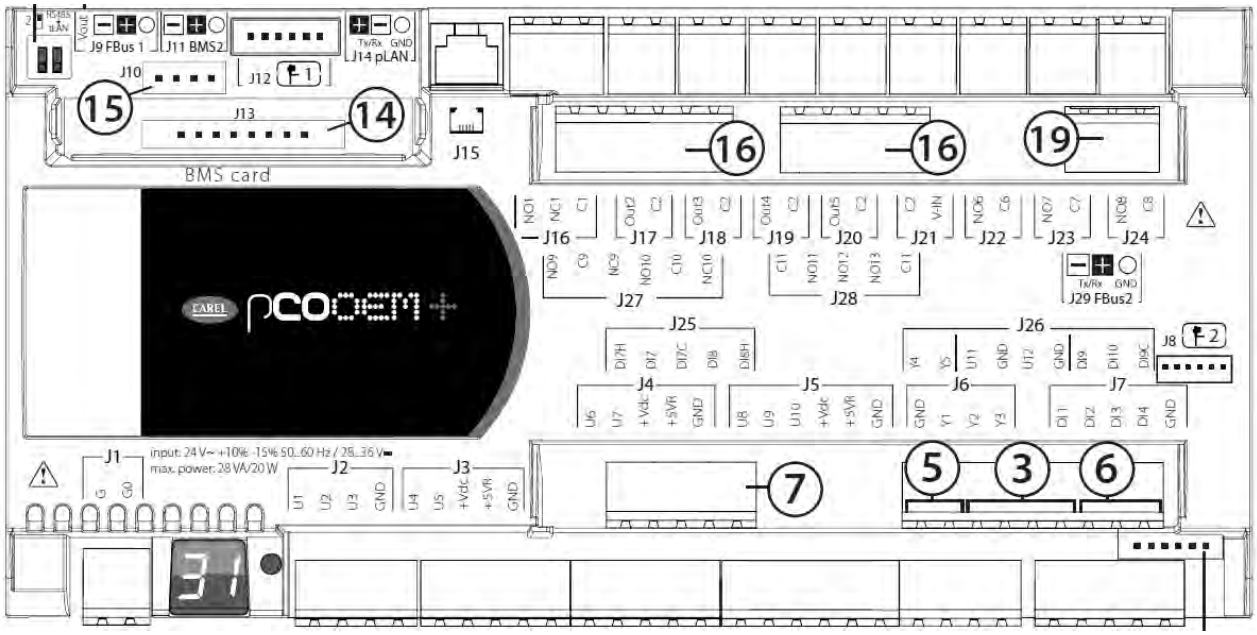
During heating operation, it is necessary to deice the evaporator in the exhaust air when operating at low outdoor temperatures. In the integrated control system, there is an advanced software function to detect the ice build-up. When ice build-up is at a certain level, a deicing cycle is initiated. During this cycle, the refrigeration system will reverse to bring energy to the coil in the exhaust air, to melt the ice. Once the control system detects that ice is gone, the system returns to normal heating operation. A very quick and efficient cycle.

10.1.1 DVU-HP – Heat pump circuit



10.1.2 DVU-HP- Electrical documentation

Wiring diagram for the integrated control system is available in a separate document.
At power up, 2-segment LED display will light up with moving dots until controller and display is ready for operation.



10.1.3 Control signals

Signal:	Terminals:	Electrical:
Start (Heat mode)	X5; 18-19	Potential free contact
Cooling demand	X5; 16-17	Potential free contact
Capacity	X5; 10-11	10: gnd. 11: 0-10V_{DC}
Alarm	X5; 25-26	Potential free contact

10.2 DVU-HP-internal controller for the compressor system

Control panel pGD1 placed inside the integrated control cabinet

The control panel has 6 buttons with the following functions

- Alarm	Display the list of active alarms Manually reset alarms
- Prg	Access the service menu
- Esc	Return to the previous screen
- Up *- Down*	Navigate between the display screens or increase/decrease values
- Enter	Switch from parameter display to edit Confirm value and return to the parameter list

By flashing red alarm light, there is an active alarm and display is not in alarm view.
By permanent red alarm light, there is an active alarm and display is in alarm view

10.3 Background illumination of the display

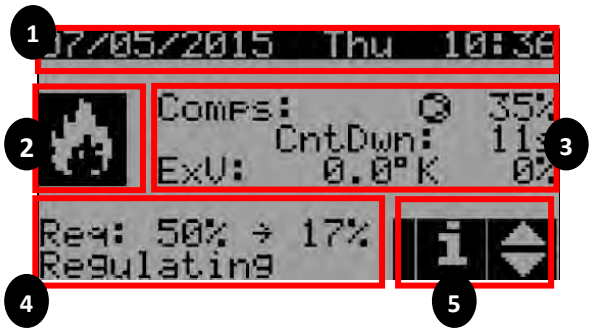
Background illumination of the display switches on automatically when the first push button is activated. The illumination switches off some time after the last activation. By alarm the red alarm button flashes until the alarm is acknowledged.

10.4 Menu – drawing of the menu structure to guide the user

Overview of the menus appears from annex 11.

10.5 The start display, Main menu

The following screen displays an example of the main screen with an active unit, highlighting the fields and icons used:



1. Date and Time
2. Current unit status:

OFF	Unit OFF
	Summer mode (cooling)
	Winter mode (heating)
	Defrosting in progress

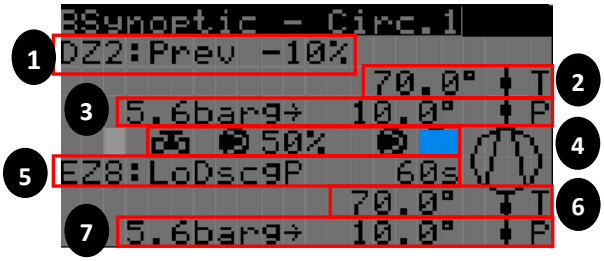
3. Devices status
    a. Compressors in operation and digital capacity. Digital 35% output, fixed off)
    b. Timer in action, Min on/off time, Min time between starts
    c. Super Heat and Expansion valve opening
4. System capacity request and actual power output
    a. System status
        i. System OFF
        ii. ON by input, but no capacity signal
        iii. Regulating
        iv. Pump-Down, and count down
        v. Defrosting, and count up
        vi. Manual mode
        vii. OFF alarm
5. Indicates access to the info menu using the DOWN button

10.6 Settings

From the main screen, the DOWN (UP) button can be used to scroll through the status of devices. No password is needed to access these variables.

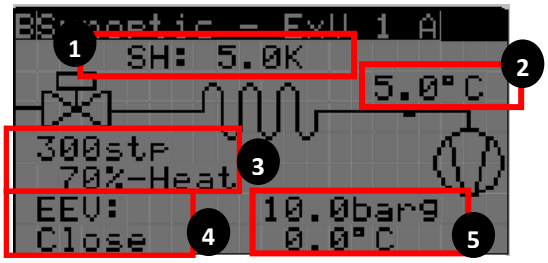
The physical status of inputs, outputs and transmitters are all available in the menus. The individual screens are shown below.

Compressor status:



1. Discharge temperature zone and prevent action.
2. Discharge temperature
3. Condensing pressure and temperature
4. Compressors status and digital percentage;
5. Envelope zone and time:
    - EZ1:Ok: zone within operating limits
    - EZ2:HiDP: High compression ratio
    - EZ3:HiDscgP: High condensation pressure
    - EZ4:HiCurr: High motor current
    - EZ5:HiSuctP: High suction pressure
    - EZ6:LoDP: Low differential pressure
    - EZ7:LoPRat: Low compression ratio
    - EZ8:LoDscgP: Low condensation pressure
    - EZ9:LoSuctP: Low evaporation pressure
6. Suction gas temperature
7. Evaporating pressure and temperature

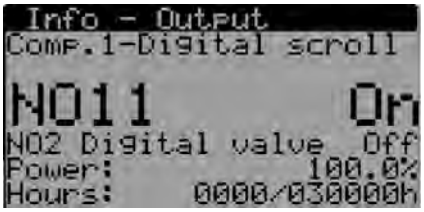
Expansion Valve Overview:

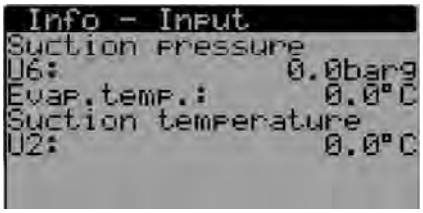


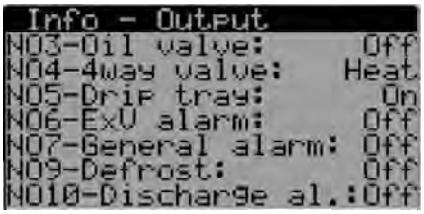
1. Super Heat and actual set-point
2. Suction gas temperature
3. Valve opening mode, percentage and steps;
4. Valve status:
    - Close: valve closed
    - Std-by: system stop position
    - Pos: fixed position during sequence
    - Wait: after positioning and in case of change of cooling capacity greater than 10%, the valve to do large movement that can take some seconds. Wait will be displayed during this phase.
    - On: valve in regulation
    - Init: driver initialization
5. Evaporating pressure and temperature

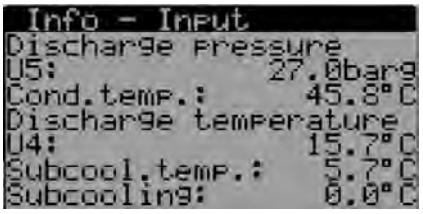
Status Information:

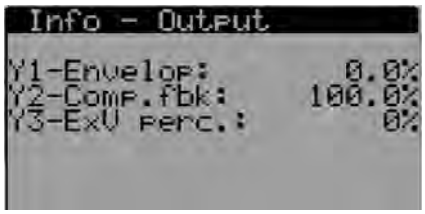
Push Enter to get the following information:

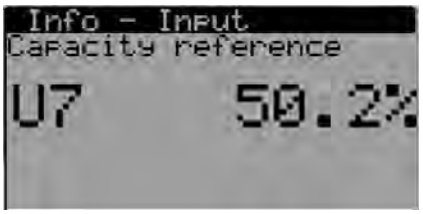


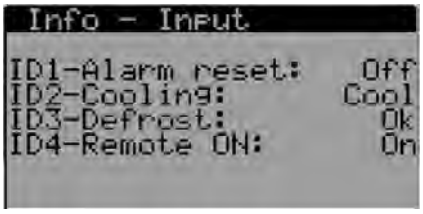


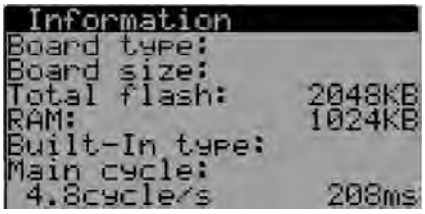










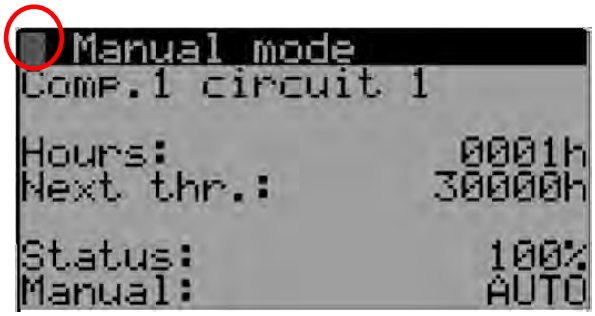


10.7 Service

Regardless of the displayed screen, pressing the programming key accesses the password entry screen which allows access to the menu shown below for service level. Enter the password (1111) and push enter. Once the password is entered, it will be maintained for 5 minutes from the last time a key was activated. Then the password will have to be re-entered in order to access the service level again. In the Log-Out menu, you can log-out without waiting 5 minutes.

Service level gives read access to all parameters with the ability to edit some of them. For more information on the parameters that can be changed, see the parameter table. Default password: 1111.

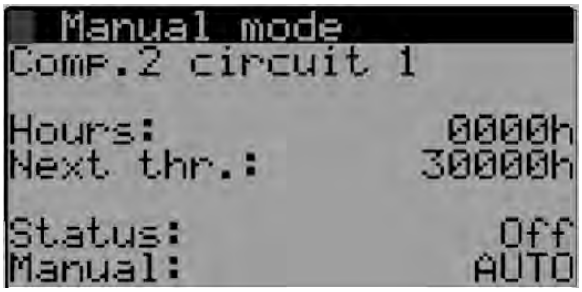
As soon as the password is entered in the log in screen, and function selected, the access level needed to edit the values is shown. As shown in the following screens, S flashing for Service and M for Manufactor:



10.8 Manual operation

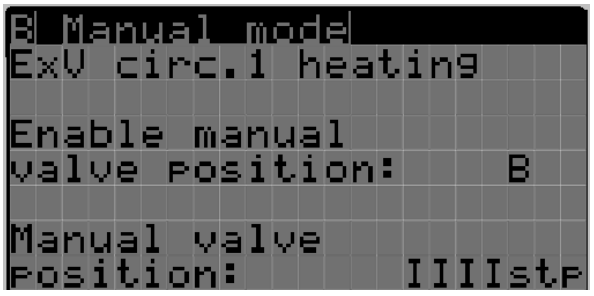
From the menu – Manual mode – it is possible to operate components manually. The technician can control the operation of components manually. This procedure is relevant for the test during the annual maintenance with the control of all safety and control functions or after exchange of components. Menus as follows:

In the first screen above: Compressor 1 status. Actual operating hours. Next threshold of operating hours for service can be set. Current capacity and selection of manual mode.



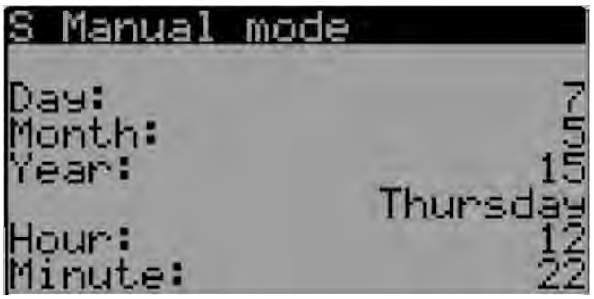
Compressor 2 status. Actual operating hours. Next threshold of operating hours for service can be set. Current status and manual selection.

When operating compressors manually, Super Heat control will still be active as long as set to Auto.

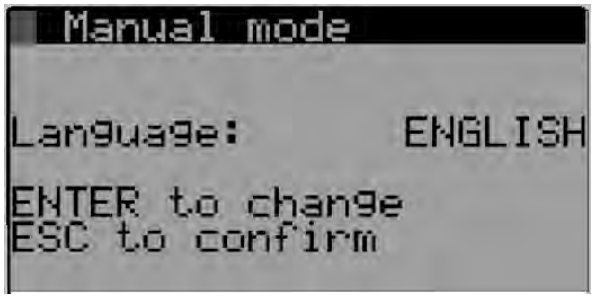


Preliminary

Expansion valves can be operated manual individually. The valve do have 0-480 steps



Date and time



Only English is available

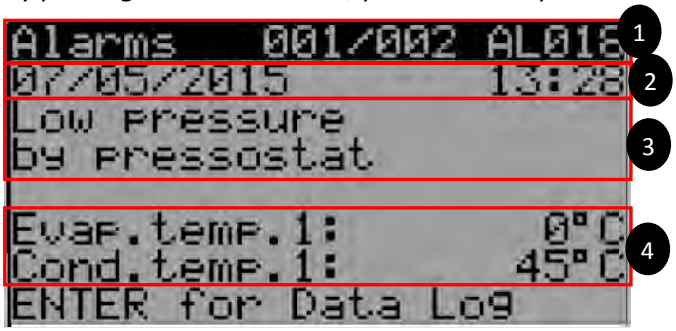
10.8.1 Running hours

This is available in the menu for maintenance.

10.9 Alarm

10.9.1 Alarm

By pushing the Alarm button, you can see any active alarm.



1. Alarm 1 of 2 active alarms which has not been reset. Alarm number from list below
2. Time and date of alarm
3. Alarm type
4. Operating conditions at the point of alarm

10.9.2 Alarm Log

By using the enter key you can enter the alarm log. Up to 100 alarms are saved.

10.9.3 Alarm reset

Alarms can be reset manually, automatically or with retries.

- Manual reset: When the alarm condition is no longer present, you must enter alarm menu and acknowledge the alarm by pushing the alarm button. Now the unit can restart.
- Automatic reset: When the alarm condition is gone, the system will automatically restart. Still holding min off time.
- Automatic reset with retries: Retry conditions are checked, if OK, it will be automatic reset mode. If not, it will be manual reset mode.

10.9.4 Alarm list

Code	Description	Reset	Action	Delay
AL001	Probe U1 broken or disconnected	A	None	10s
AL002	Probe U2 broken or disconnected	A	Circuit OFF	No
AL003	Probe U4 broken or disconnected	A	Circuit OFF	10s
AL004	Probe U5 broken or disconnected	A	Circuit OFF	No
AL005	Probe U6 broken or disconnected	A	Circuit OFF	10s
AL006	Probe U7 broken or disconnected	A	None	No
AL007	Probe U8 broken or disconnected	A	None	10s
AL008	Probe U9 broken or disconnected	A	None	10s
AL009	Probe U10 broken or disconnected	A	None	10s
AL010	Probe U11 broken or disconnected	A	Compressor 2 OFF	10s
AL011	Probe U12 broken or disconnected	A	Compressor 3 OFF	10s
AL012	Low SH alarm	M	Circuit OFF	180s
AL013	LOP alarm	A	Circuit OFF	180s
AL014	MOP alarm	A	Circuit OFF	180s
AL015	Low suction temp.	A	Circuit OFF	180s
AL016	High discharge press.	M	Circuit OFF	3 retries
AL017	Low suction pressure	A	Circuit OFF	3 retries
AL018	Low pressure by pressostat	A	Circuit OFF	3s
AL019	Envelope alarm	A	Circuit OFF	300s
AL020	Motor phase alarm	A	Circuit OFF	No
AL021	High pressure by pressostat	M	Circuit OFF	3 retries
AL022	High discharge temp. compressor 1	A	Circuit OFF	60s
AL023	High discharge temp. compressor 2	A	Compressor 2 OFF	No
AL024	High discharge temp. compressor 3	A	Compressor 3 OFF	No
AL025	Pump-down end for max time circuit 1	A	None	No
AL026	Maintenance request compressor 1	A	None	Parameter
AL027	Maintenance request compressor 2	A	None	Parameter
AL028	Maintenance request compressor 3	A	None	Parameter
AL029	Clock alarm	A	None	No
AL030	Memory expansion damaged	A	None	No
AL031	BMS Offline	A	50%	60s

10.10 Maintenance

General maintenance must be carried out according to national and local regulations by a skilled technician from a certified company.
List of spare parts as well as datasheets from the manufacturers are available on the DVD delivered with the unit.

10.11 DVU-HP- Data

Dimensions, heating and cooling capacity, refrigerant content

DVU-HP	10	15	20	25	30	40	50	60	80
Width in mm	970	1120	1270	1420	1570	1720	2020	2170	2170
Height in mm	970	1120	1270	1420	1570	1720	2020	2240	2540
Length in mm	1420	1420	1420	1420	1570	1570	2320	2460	2460
Weight in kg	190	240	280	375	400	550	700	1000	1200
Power supply – 3 phase + N + PE 3x400V + N + PE									
Pre fuse Amp.	10A	16A	20A	25A	32A	40A	50A	63A	63A
Refrigerant	R410a	R410a	R410a	R410a	R410a	R410a	R410a	R410a	R410a
Refrigerant content in kg	3	4	6	8	10	12	24	26	28
Test pressure, 46,2 bar									
Nominal air volume, m3/s	1.0	1.4	1.9	2.4	2.9	3.6	5.0	5.9	6.7
Cooling capacity, kW	14	18	27	32	37	47	64	78	80

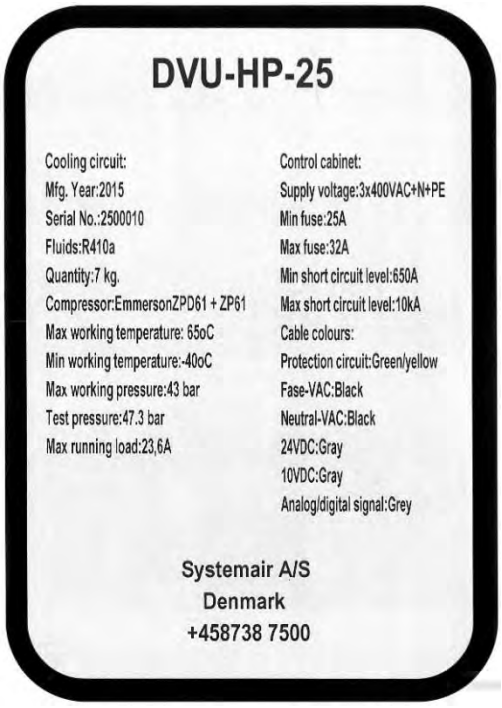
Values based on 50°C condensing temperature and 10° evaporating temperature

Detailed performance data can be found by using design program SystemairCAD

10.12 Data plate

The data plate for the cooling unit is mounted inside the unit section – DVU-HP – behind one of the doors.
An example of the data plate is shown below.

Inside the unit



Outside on the unit

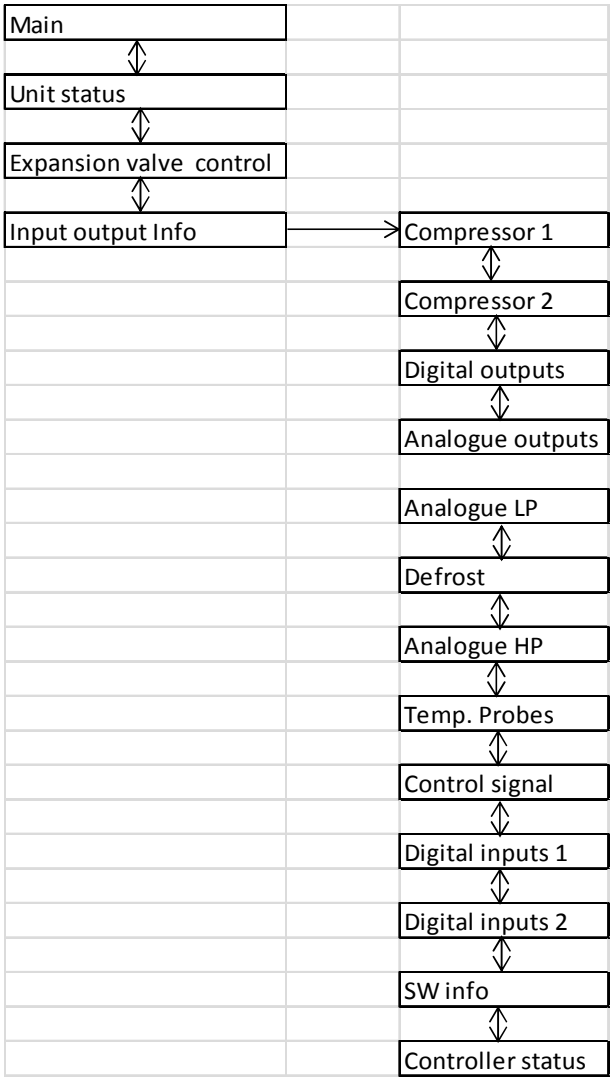
Control cabinet:

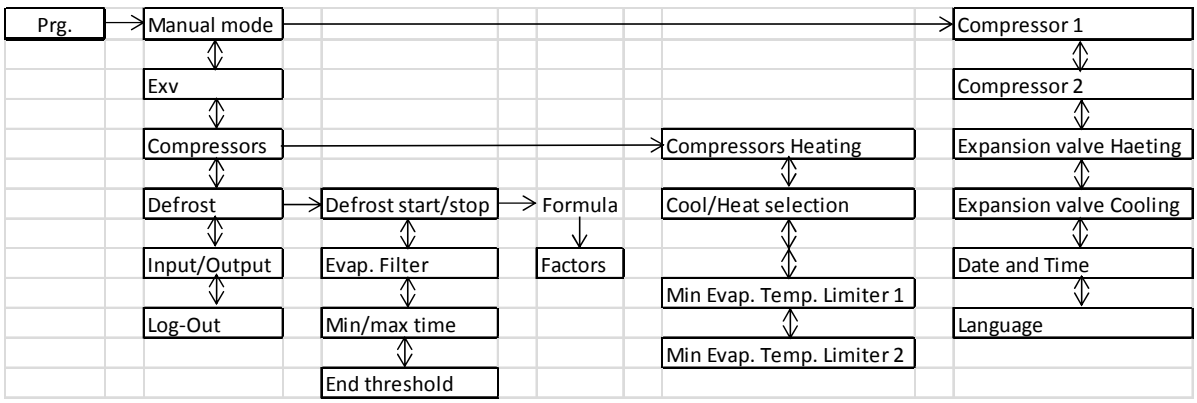
Supply voltage:	3x400VAC+N+PE
Min fuse:	63A
Max fuse:	80A
Min short circuit level:	650A
Max short circuit level:	10kA

Cable colors:

Protection circuit:	Green/yellow
Fase-VAC:	Black
Neutral-VAC:	Blue
24VDC:	White
0VDC:	White
Analog/digital signal:	Grey

Annex 11. Menu for internal controller in the DVU-HP

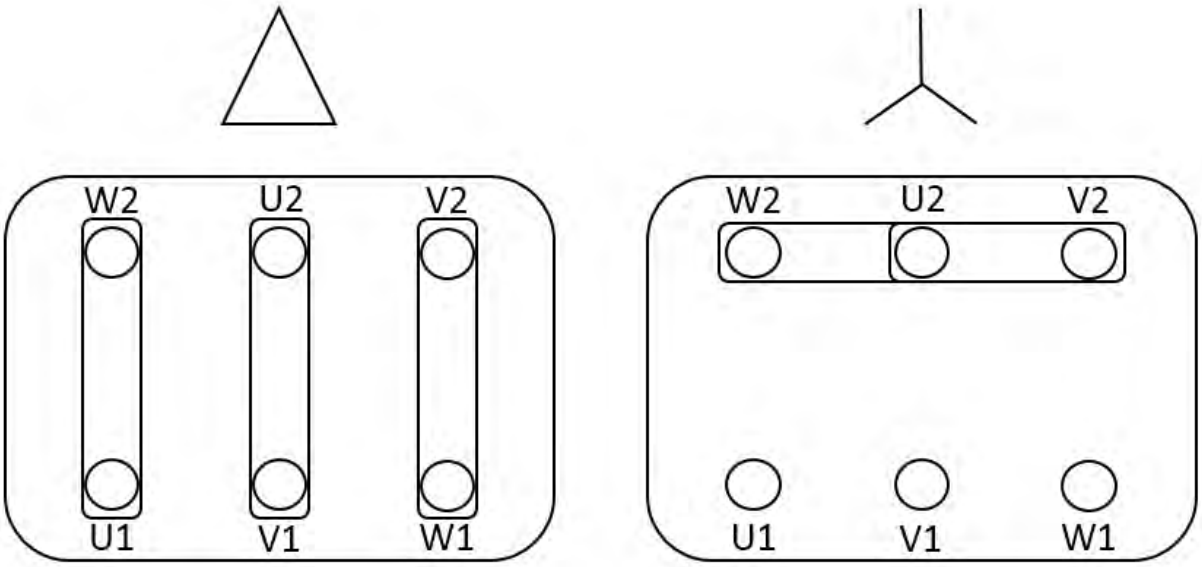




Annex 12. Connection of fan motor and set-up for frekv. conv.

12.1 Connection of fan motor

Delta connection is shown to the left, and star connection is shown to the right.



AC motor

PM motor

12.2 Set-up for Danfoss FC101 for DV-units with AC motors

SETUP IS DONE IN FACTORY BEFORE DELIVERY

To reload Systemair factory settings from the control panel:

0-50: **LCP Copy:** [2]

Systemair factory set-up is based on Danfoss initialization.

14-22: **Operation mode:** [2] Initialisation (Danfoss Initialisation)
Turn power off and on.

Systemair factory set-up:

0-01: **Language selection:**

1-03: **Torque characteristic:** Single fan: [3] Auto-Energy optim.
With twin fan set-up: [1] Variable Torque

1-20: **Motor Power:** According to motor plate / order papers
With twin fan set-up total power must be used

1-24: **Motor Current:** According to motor plate / order papers
With twin fan set-up total current must be used

1-25: **Motor Nominal Speed:** According to motor plate / order papers

1-42: **Motor Cable Length:** 3m

1-50: **Motor Magnetisation at zero speed.:** 0 %

1-52: **Min. Speed Normal Magnetisation:** 10 Hz

1-73: **Flying Start:** [0] Disabled

1-90: **Motor Thermal Protection:** [2] Thermistor trip

3-15: **Reference 1 Source:** [2] Analog input AI54

1-93: **Thermistor Source:** [1] Analog input AI53

3-03: **Maximum Reference:** Max. Hz from order papers

3-16 + 3-17: **Reference 2- and 3 Source:** [0] No function

3-41 + 342: **Ramp 1 up and down:** 20 Sec.

4-19: **Max. Output Frequency:** 90Hz

4-14: **Motor Speed High Limit:** 90Hz

4-18: **Current limit:** 100 %

5-12: **Terminal 27 Digital input:** [0] No operation

5-40.0: **Function Relay:** [3] Drive ready/remote

5-40.1: **Function Relay:** [3] Drive ready/remote

6-25: **Terminal 54 High Reference:** Max. Hz from order papers

14-03: **Over modulation:** [1] Active

14-20: **Reset Mode:** [2] Automatic reset x 2

0-50: **LCP Copy:** [1] All to LCP (Copy of Systemair factory settings to panel)

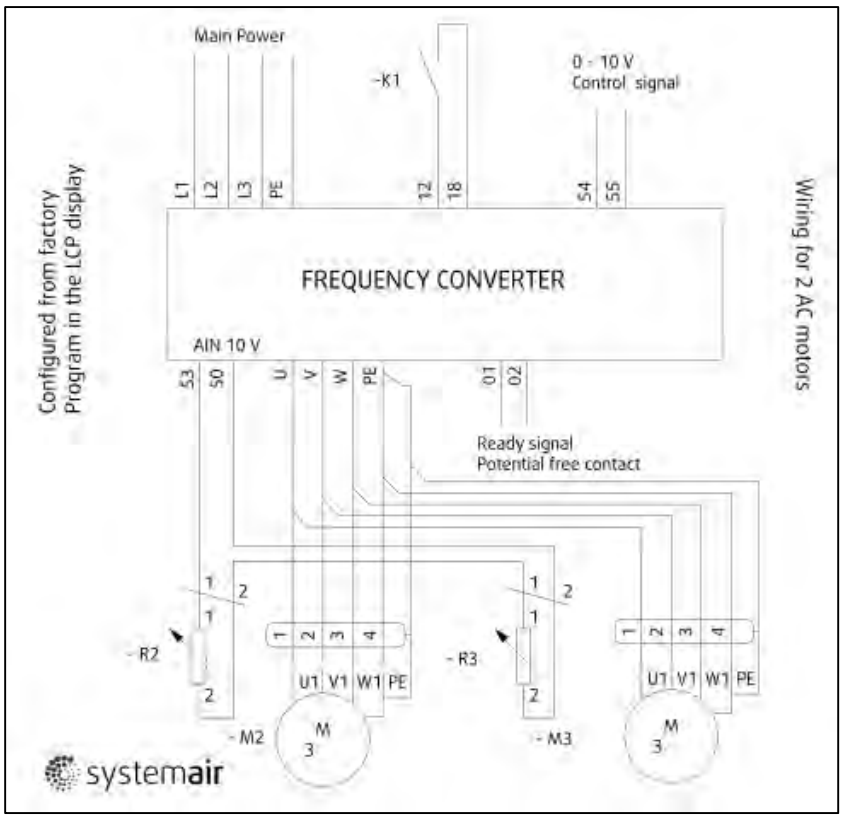
Connections:

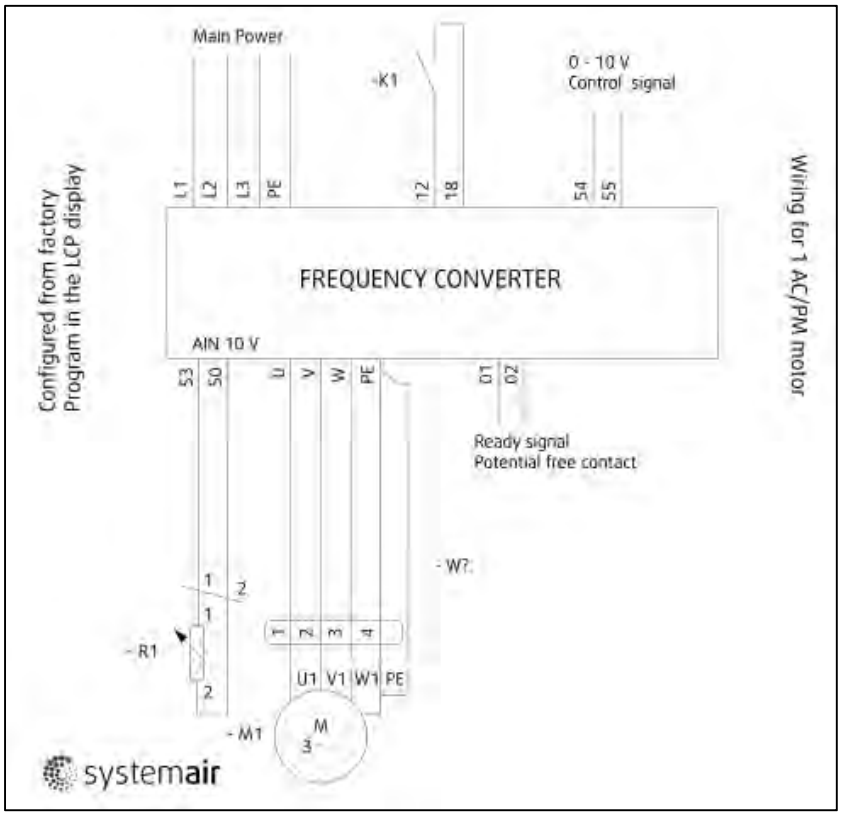
0-10V: terminal 54-55

Start: terminal 12-18

Thermistor: terminal 50-53

Drive ready: terminal 1-2


Main Power
-K1
0 - 10 V
Control signal
L1 L2 L3 PE 12 18 54 55
FREQUENCY CONVERTER
AIN 10 V
53 50 U V W PE 01 02
Ready signal
Potential free contact
Configured from factory
Program in the LCP display
Wiring for 2 AC motors
- R2
- R3
- M2
- M3
U1 V1 W1 PE
systemair


Main Power
-K1
0 - 10 V
Control signal
L1 L2 L3 PE 12 18 54 55
FREQUENCY CONVERTER
AIN 10 V
53 50 U V W PE 01 02
Ready signal
Potential free contact
Configured from factory
Program in the LCP display
Wiring for 1 AC/PM motor
- W?
- R1
- M1
U1 V1 W1 PE
systemair

12.3 AC-fan operation without thermistor for Danfoss FC101

Systemair factory set-up is based on Danfoss initialization.

14-22: **Operation mode:**	[2] Initialisation (Danfoss Initialisation)
	Turn power off and on.

Systemair factory set-up:

0-01: Language selection:	
1-03: **Torque characteristic:**	[3] Auto-Energy optim.
1-20: **Motor power:**	According to motor plate
1-24: **Motor Current:**	According to motor plate
1-25: **Motor Nominal Speed:**	According to motor plate
1-29: **Automatic motor adption (AMA):**	[1] Kompl.motor adaption to (Turn power off and on.)
1-42: **Motor Cable Length:**	Order specific
1-50: **Motor Magnetisation at zero speed.:**	0 %
1-52: **Min. Speed Normal Magnetisation:**	10 Hz
1-73: **Flying start:**	[0] Deaktivated
5-40.0: Function Relay:	[3] Drive ready/remote
14-03: Over modulation:	[1] Active
14-20: Reset Mode:	[2] Automatic reset x 2
0-50: LCP Copy:	[1] All to LCP (Copy of Systemair factory settings to panel)

Connections:

0-10V:	terminal 54-55
Start:	terminal 12-18
Drive ready:	terminal 1-2
Jumper	terminal 12-27

12.4 Set-up Danfoss FC101 for DV-units with PM motors

SETUP IS DONE IN FACTORY BEFORE DELIVERY

To reload Systemair factory settings from the control panel:

0-50: **LCP Copy:** [2]

Systemair factory set-up is based on Danfoss initialization.

14-22: **Operation mode:** [2] Initialisation (Danfoss Initialisation)

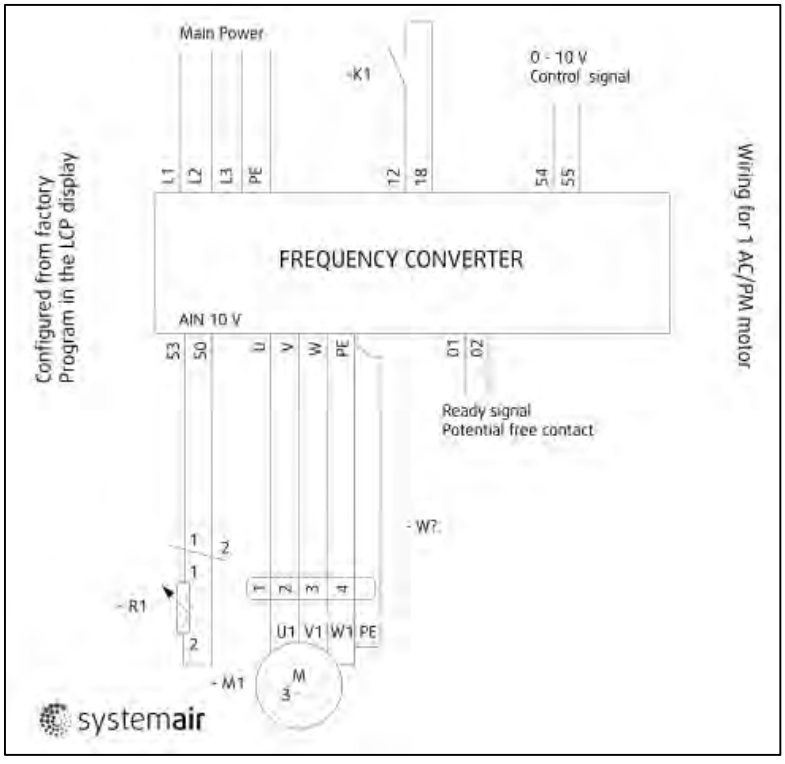
Turn power off and on.

Systemair factory set-up:

0-01: Language selection:
1-06: Clockwise Direction: [1] Inverse
1-10: Motor Construction: [1] PM, non-salient SPM
1-24: Motor Current: According to motor plate / Schedule
1-25: Motor Nominal Speed: According to motor plate / Schedule
1-26: Motor Cont. Rated torque: According to motor plate / Schedule
1-30: Stator Resistance (Rs): According to motor plate / Schedule
1-37: d-axis inductance (Ld): According to motor plate / Schedule
1-39: Motor Poles: According to motor plate / Schedule
1-40: Back EMF at 1000 RPM: According to motor plate / Schedule
1-42: Motor Cable Length: 3m
1-90: Motor Thermal Protection: [2] Thermistor trip
3-15: Reference 1 Source: [2] Analog input AI54
1-93: Thermistor Source: [1] Analog input AI53
3-03: Maximum Reference: According to motor plate / Schedule
3-16 + 3-17: Reference 2- and 3 Source: [0] No function
3-41 + 3-42: Ramp 1 Up and down: 30 sec.
4-19: Max. Output Frequency: According to motor plate / Schedule
4-14: Motor Speed High Limit: According to motor plate / Schedule
4-18: Current limit: 115 %
5-12: Terminal 27 Digital input: [0] No operation
5-40.0: Function Relay: [3] Drive ready/remote
5-40.1: Function Relay: [3] Drive ready/remote
6-25: Terminal 54 High Reference: According to motor plate / Schedule
14-03: Over modulation: [1] Active
14-20: Reset Mode: [2] Automatic reset x 2
0-50: LCP Copy: [1] All to LCP (Copy of Systemair factory settings to panel)
Connections:
0-10V: terminal 54-55
Start: terminal 12-18
Thermistor: terminal 50-53
Drive ready: terminal 1-2

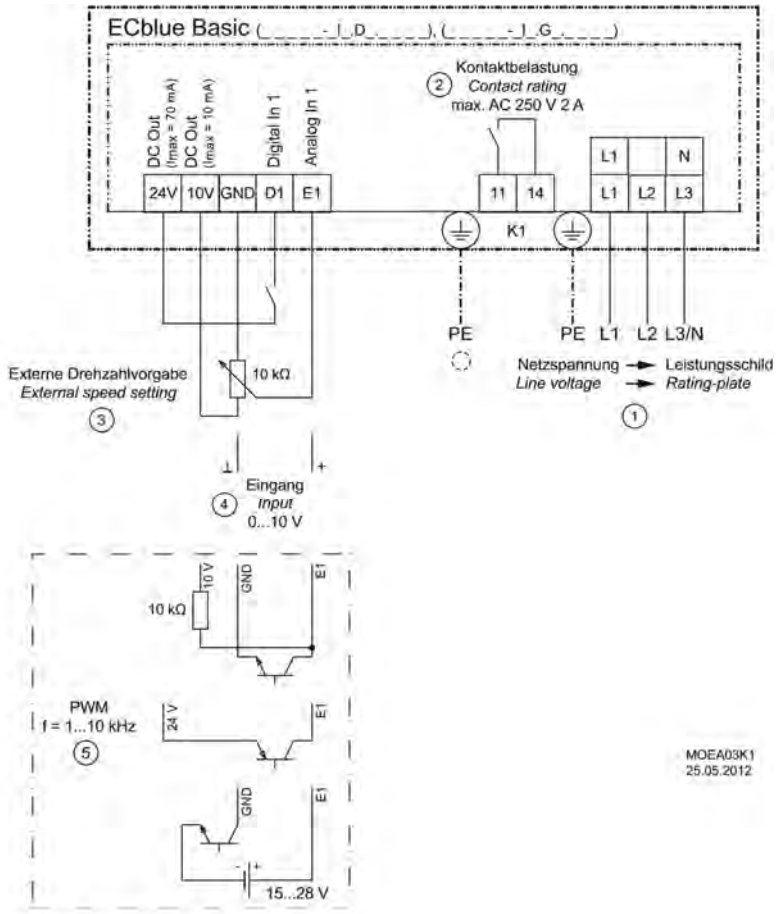
Schedule for PM motor parameters

Parameter:	124	125	126	130	137	139	140	341	342	303	625	414	419
Motor Type Number	Amp Name plate	Motor RPM rated	Nm Name plate	Ohm [Rf-f]	mH [Lf-f]	Poles	Bemf @ 1000	Ramp up	Ramp Down	Max Hz		Max motor Hz	
HPS 71 3800 18	1,8	3800	2	7,80	23,50	6	255	30	30	215	215	219	219
HPS 71 3700 28	2,8	3700	3,6	3,16	12,20	6	291	30	30	191	191	204	204
HPS 71 3300 18	1,8	3300	2,6	11,50	41,00	6	280	30	30	170	170	182	182
HPS 71 3200 30	3	3200	4,2	3,70	14,50	6	268	30	30	161	161	176	176
HPS 71 2900 21	2,1	2900	3,3	9,10	30,80	6	276	30	30	143	143	160	160
HPS 71 2800 40	4	2800	6,1	3,35	13,50	6	267	30	30	144	144	154	154
HPS 71 2500 29	2,9	2500	5	6,00	22,00	6	262	30	30	129	129	138	138
HPS 71 2350 38	3,8	2350	7,3	4,60	18,70	6	271	30	30	120	120	129	129
HPS 90 2650 64	6,4	2650	9,6	2,50	21,50	8	230	30	30	182	182	194	194
HPS 90 2350 76	7,6	2350	13	1,60	20,00	8	241	30	30	159	159	172	172
HPS 90 2100 63	6,3	2100	10,5	3,00	29,50	8	212	30	30	142	142	154	154
HPS 90 2050 100	10	2050	19	1,40	17,50	8	236	30	30	140	140	150	150
HPS 90 1850 84	8,4	1850	16	2,10	23,00	8	203	30	30	127	127	136	136
HPS 90 1900 136	13,6	1900	26	1,15	14,50	8	209	30	30	127	127	139	139
HPS 90 1700 106	11	1700	22	1,15	14,50	8	199	30	30	116	116	125	125
HPS 112 1550 108	10,9	1550	32	1,50	17,50	6	276	30	30	80	80	85	85
HPS 112 1700 145	14,5	1700	39	0,93	10,90	6	276	30	30	88	88	94	94
HPS 112 1350 135	13,5	1350	44	0,98	12,90	6	266	30	30	69	69	74	74
HPS 112 1500 187	18,7	1500	54	0,70	10,00	6	262	30	30	76	76	83	83
HPS 112 1000 140	14	1000	51	1,04	15,50	6	242	30	30	54	54	55	55
HPS 132 1250 199	19,9	1250	69	0,64	15,20	6	262	30	30	65	65	69	69
HPS 132 1000 202	20,2	1000	77	0,75	18,50	6	230	30	30	51	51	65	65
HPS 132 1150 300	30	1150	104	0,47	16,00	6	265	30	30	58	58	65	65
HPS 132 930 273	27,3	930	118	0,56	19,50	6	243	30	30	46	46	65	65



12.5 Installation ECblue

12.5.1 Connection



1 *Line voltage ☞ rating plate*
2 *Contact rating max. AC 250 V 2 A*
3 *External speed setting*
4 *Input 0...10 V*
5 *PWM input, f = 1...10 kHz*

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 (☞ EN 50 178, Art. 5.2).

Residual-current-operated protective devices

Terminal	Function / connection
L1, N, PE	Mains connection for 1 ~ types (observe the line voltage indicated rating plate).
L1, L2, L3, PE	Mains connection for 3 ~ types (observe the line voltage indicated rating plate).
11, 14	Relay output “K1” for fault indication.* • For operation the relay is energized, and “14” are bridged. For fault the relay connections “11” is de-energized (Diagnostics / faults). • When switching off via enable (D1 = Digital In 1), the relay remains energized.
E1, GND	Analog input for setting speed via 0 - 10 V or PWM signal*
10V	Voltage supply for speed setting by 10 kΩ potentiometer.
24V	Voltage supply for external devices.
D1, +24V	Digital input for enable.* • Device “ON” for closed contact. • Controller “OFF” with opened contact.

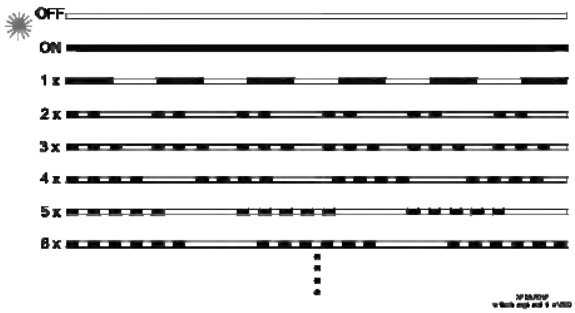
*Function for standard factory setting, different presetting possible.

UL: Input (Line)

- Cu connection leads with the following specifications must be employed:
  - Minimum insulation temperature of 80 °C
  - Terminal tightening torque for field block (L1, N, and/or L1, L2, L3) of 5 - 7 Lb In. (Exception: spring-cage terminal for motor size "G" @ line voltage 3 ~ 200...240 V) – Terminal tightening torque of 4.5 Lb In for field block (K1).
  - Terminal tightening torque of 4.5 Lb In for all other field blocks.
  - Terminal tightening torque of 2.2 Lb In for add-on modules.

12.5.2 Diagnostic/faults

Status Out with flash code



LED Code	Relays K1*	Cause
OFF	de-energized, 11 - 14 interrupted	**No line voltage**
ON	energized, 11 - 14 bridged	**Normal operation without fault**
1 x	energized, 11 - 14 bridged	**No enable = OFF**
2 x	energized, 11 - 14 bridged	**Temperature management active**
3 x	de-energized, 11 - 14 interrupted	**HALL-IC error**
4 x	de-energized, 11 - 14 interrupted	**Line failure** (only for 3 ~ types)
5 x	de-energized, 11 - 14 interrupted	**Motor blocked**
6 x	de-energized, 11 - 14 interrupted	**IGBT Fault**
7 x	de-energized, 11 - 14 interrupted	**Intermediate circuit undervoltage**
8 x	de-energized, 11 - 14 interrupted	**Intermediate circuit overvoltage**
9 x	energized, 11 - 14 bridged	**IGBT cooling down period**
11 x	de-energized, 11 - 14 interrupted	**Error motor start**
12 x	de-energized, 11 - 14 interrupted	**Line voltage too low**
13 x	de-energized, 11 - 14 interrupted	**Line voltage too high**
14 x	de-energized, 11 - 14 interrupted	**Error Peak current**
17 x	de-energized, 11 - 14 interrupted	**Temperature alarm**

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

Annex 13. Commissioning

See separate cover with annexes 1, 2, 3 and 13

Part number 90925371

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