



39 HQ Air Handling Units AiroVision

Assembly/Installation,
Commissioning, Maintenance
Manual



1. SAFETY PRECAUTIONS	7
1.1. General	7
1.2. Applications	7
1.3. Cautions	7
2. TRANSPORT & LIFTING	8
2.1. General	8
2.2. Transport & Storage	8
2.3. Roof Edge Protection during Transport	10
2.4. Offloading or Hoisting	10
2.5. Horizontal Transport	11
3. PREPARATION FOR ASSEMBLY	11
4. LIFTING INSTRUCTIONS	11
4.1. General	11
4.2. Lifting Bar Certification	11
4.3. Fastening of Lifting Bars	11
5. ASSEMBLY	12
5.1. Air Handling Unit Assembly	12
5.2. Connection of Modules having Equal Width and Height	13
5.3. Air Handling Unit with Control Assembly	15
6. STACKED CELL SECTIONS	16
6.1. Unit without Intermediate Base Frame	16
6.2. Unit with Intermediate Base Frame	18
6.3. Units with Different Widths	20
6.4. Connection of Double Deck Mixing Box	22
7. FRESH AIR INLET HOOD	22
8. ROOF COVER	22
9. START-UP CHECK-LIST	24
9.1. Start-Up Inspection Items Check-list	24
9.2. Start-up Inspection Items	24
10. START-UP INSTRUCTIONS	26
10.1. Casing	26
10.2. Casing panels	26
10.3. Doors and Access / Guard Covers	26
10.4. Flexible Connections	26
10.5. Earthing	26
10.6. Air Handling Unit Installation and Connections	26
10.7. Siphon	26
10.8. Dampers	28
10.9. Air Filters	28

10.10. Heaters	29
10.11. Coolers	29
10.12. Heat Recovery Wheel	30
10.13. Plate Heat Exchanger	30
10.14. Steam Humidifier	30
10.15. Electric Steam Humidifier	30
10.16. Water spray humidifier	31
10.17. Fan	31
10.18. Sound attenuator	31
10.19. Lighting	31
11. MAINTENANCE CHECK-LIST	32
11.1. Inspection Items Check-list and Maintenance Intervals	32
12. MAINTENANCE & OPERATING INSTRUCTIONS	34
12.1. General	34
12.2. Casing panels	34
12.3. Doors and Access Covers	34
12.4. Flexible Connections	34
12.5. Earthing	34
12.6. Dampers	34
12.7. Outdoor Air Intake	34
12.8. Air Filters	34
12.9. Heaters	34
12.10. Coolers	35
12.11. Heat Recovery Wheel	35
12.12. Plate Heat Exchanger	35
12.13. Steam Humidifier	35
12.14. Water spray humidifier	36
12.15. Fan	36
12.16. Sound attenuator	37
12.17. Instructions for Hygienic Air Handling Units	37
12.18. Disposal of Unit	41
APPENDIX-1 Cell Info and Connection Order	42
APPENDIX-2 Front and Side Withdrawal Filter Detail	43
APPENDIX-3/1 Side Withdrawal Filter	48
APPENDIX-3/2 Front Withdrawal Filter	49
APPENDIX-3/3 Pleated Filter	50
ANNEX-4 Quantities of Section Joining Part	51
ANNEX-5 Frequency Inverter Control	53
ANNEX-6 UV Light Wiring Diagram	57



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1. SAFETY PRECAUTIONS

1.1. General

The 39HQ air handling units (AHUs) has been designed and manufactured in accordance CE directive EN292. In order to guarantee safe operation and use of the unit, please carefully read and observe the instructions in this document and pay special attention to the warnings that apply to this unit. Any modifications in the design and/or installation of the AHU that are carried out without discussion with Alarko Carrier and without advance written agreement will result in the loss of the right to any warranty claims and any claim for injury to personnel as a result of these modifications.

Maintenance procedures may only be carried out by qualified personnel. Heating and cooling elements are manufactured and supplied in accordance with guidelines of the Pressure Equipment Directive (PED).

CE declarations of AHU's can be found at www.alarko-carrier.com.tr website.

1.2. Applications

AHUs are designed for the movement and conditioning of air, unless otherwise agreed during the design stage.

1.3. Cautions

The following warning pictogram and labels are used on the unit.

Lifting Point



This label shows where the AHU can be lifted with support beams. Support beams shall be used with cranes. If forklifts are used for lifting, support beams cannot be used.

Transporting from Side Base

İşaretle yerlerden taşıma mümkün değilse bu yönde taşıma sadece forklift ile yapılabilir. Vinç ile taşıma yapılamaz.

If it is not possible to lift at the points marked ↴ transporting can only be done by forklift. Crane cannot be used.

It is not allowed to place lifting devices for transport and storage under profiles not having lifting points (side profiles).

Earthing



This pictogram indicates where the AHU must be earthed and is on one of the support beams beneath the casing in the fan section.

- The electrical components in the AHU must be earthed, except for components with double insulation and/or components with a supply voltage below 50 V.
- The electrical components must be installed in accordance with national and local regulations.



Rotating Parts

This pictogram indicates that there are rotating parts behind this access cover, door or panel which may cause injury. The components that include rotating parts are the fan and heat recovery wheel. If there are special customer-specific components behind doors, access covers or panels that include rotating parts and pose a potential risk, this is also indicated by this pictogram.



Hot Surfaces

This pictogram indicates that there are components behind this access / guard cover, door or panel that can cause serious burns when touched.

The components that may have hot surfaces are the steam humidifier, steam heater and the electric heater. If there are special customer-specific components behind doors, access / guard covers or panels that have hot surfaces and pose a potential risk, this is also indicated by this pictogram.



Electric Voltage



This pictogram indicates that there are electrical components behind this access cover, door or panel that may be dangerous for the user/installer. Only personnel qualified in accordance with local standards permitted to carry out work on these components. The pictogram is attached to the access cover for the electric heater control box.

Z Profiles

This pictogram is located at the bottom of the fan section and indicates that the z profiles must be removed during commissioning before the fan is started up.



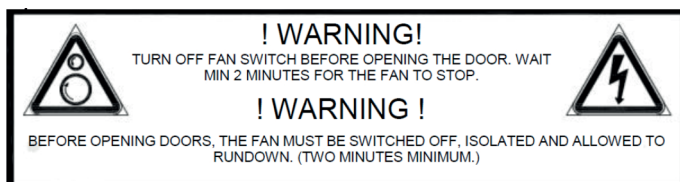
Capacity Label

AIR HANDLING UNIT	
Type	39HQ 10.10
Order No/ Serial No	MH00770
Place of Use	Surgery Room
Air Volume (m ³ /s)/Tot.Sta.Pres.(Pa)	23.000 / 1.197
Production Date	2016
ALARKO GÖSS-Gelbze Organize Sanayi Bldem Şahabettin Bılgıno Cad. 41480 Gebze Tel: (0262) 648 60 00 PBX Fax: (0262) 648 61 01 - 648 60 78  	
ALARKO CARRIER SANAYİ VE TİCARET A.Ş. Made in TURKEY	

This label contains the data for the AHU, such as order number, type of AHU, etc. The label is normally located on the door of the fan cell or on the access cover.

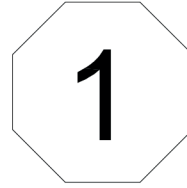
Opening the Fan Cell

This pictogram is positioned on the outside of the door or access/guard cover of the fan assembly. This pictogram warns that the fan must have been switched off and de-energised for a minimum of two minutes before the door or access / guard cover is opened.



Caution: All doors and access / guard covers must be closed before starting up the AHU.

Cell Matching Label



This label shows that matching surfaces of AHU units for assembly. It is located at bottom right and left corner of the units. Sample label is above.

Lifting and Transport

An instruction is attached to the AHU describing the procedures that must be followed for lifting and transport. For further details on this subject, see Chapter 2.

Packing materials must be disposed of in a responsible manner end in accordance with local regulations.

2. TRANSPORT & LIFTING INSTRUCTIONS


2.1. General

Transport and lifting of 39HQ AHUs must always be in accordance with the instructions below. If these instructions are not observed, irreparable damage may occur to the unit, and people in the immediate vicinity of the unit are also endangered. Alarko Carrier Sanayi ve Ticaret AS does not accept any responsibility if these instructions are not observed.

Transport and lifting must be carried out by qualified personnel. The AHU must only be lifted with lifting bars supplied by Alarko Carrier Sanayi ve Ticaret AS.

Lifting must be carried out in accordance with local regulations and with the help of certified lifting aids.

2.2. Transport & Storage

Lifting of the AHU is only permitted under the designated lifting methods. For transporting marked points shall be used. If it is not possible to use marked points due to the loading conditions, transporting can only be done by forklift  (cranes cannot be used) from under the side base frame profiles. This applies to transport as well as storage, and is indicated on the base frame profiles by warning label.

AHUs are delivered as side by sections. Moving the plastic cover will let the dirt and particulates enter to the unit from openings.

Take appropriate precautions on site and do not move the protection cover unless you complete the installation of the unit.

If filters of AHUs stored outside for a long time are exposed to direct sunshine, filters can deteriorate. Therefore, filters should be kept at shadows.

Short Term Storage

Indoor Units: In any case, indoor units should not be stored at outside.

Outdoor Units: Unit should be stored with shipping covers. After periodical inspection during storage, covers should be closed properly.

Short-term storage is considered as 6 months or less after transportation. Maintenance of the unit should be as follows during this time.

- Fans should be rotated every one or two months to prevent bearings from moisture after arrival.
- If the units are stored before installation, the unit should be prevented from rain, snow and animals.
- The ground on which the unit is placed should be flat and strong. The unit should be prevented from water accumulation.

Not: To prevent anti-microbial growth, the unit should be protected from rain and all kinds of moisture entry.

- And the unit should be protected from vehicles and people.

Long Term Storage

Long term storage is considered more than 6 months after transportation. If long term storage is expected, contact sales representative that the unit(s) will be stored for long term to take required precautions.

Preventive Maintenance Prior to Long Term Storage

For long term storage following precautions should be taken:

- Bearings of fan and motor are greased according to manufacturer's specification
- Belts, pulleys and motor should be protected from humidity and moisture. For protection,
 - 1- Anti-rust protection spray is applied.
 - 2- Belts are removed from pulleys. Motors are wrapped with stretch film. And agent is used to absorb moisture.

- Fan drain plug is removed to prevent moisture accumulation.

Preodical Fan Control

Each month fan and motor should be rotated manually to replenish bearings.

Fan impellers should be stopped at 180 degree of previous month to prevent taking a set position.

It is customer responsibility to record monthly based of conditions of unit(s). Report(s) should include conditions of unit(s) and discomformities.

Report(s) of the units should be sent to Alarko Carrier.

2.3. Roof edge protection during transport (outside installation)

During transport by truck the units are attached to the loading surface with tie ropes, pulled across the unit towards the side edges of the truck.

On external units, to protect the roof edge from distortion by the tie ropes protection plates are added.

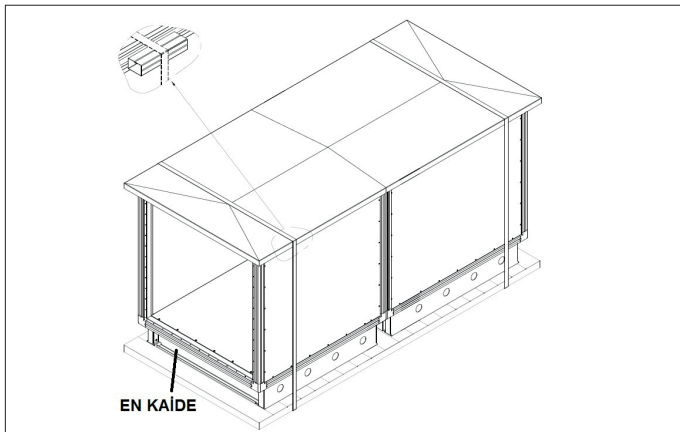
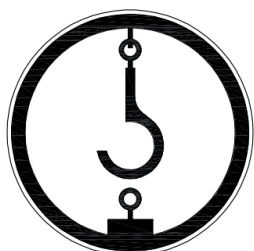


Fig. 1. Before lifting, place support profiler as shown in Fig. 1.

2.4. Offloading or Hoisting

Depending on the dimensions of the AHU and the situation on site, the AHUs are supplied in previously agreed transport sections. Before proceeding with the transport and installation of the cell sections, always consult the documents that give the dimensions and weights of the sections, as well as the installation sequence. For ease of installation, follow dimensional drawings indicating cell dimensions and weight.

The weight of each transport section is given on the unit (See Appendix -1). The points that will be used for transport are marked by the label shown below on base frame.

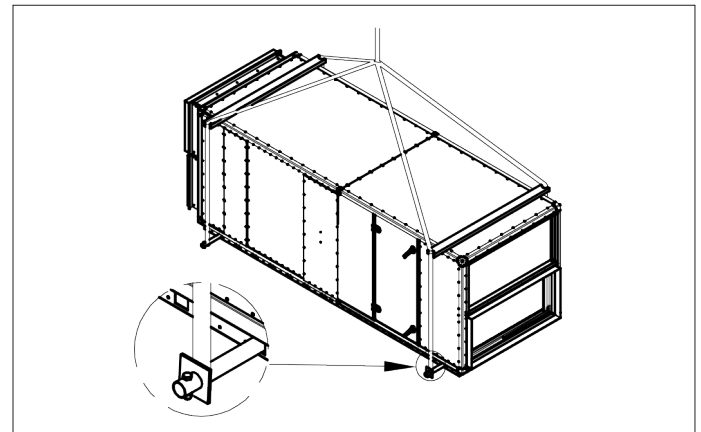


For lifting and moving AHUs, the following methods are recommended:

Method 1

Attach hoisting ropes to lifting bars. Evenly positioned spacers that will not slip off between the ropes should be used between the lifting ropes to prevent damage to the top of the unit and ensure that no excess pressure is applied to the side panels. Spacers used should be durable to the force applied by the ropes (in terms of dimension and material).

Fig. 2. Vertical transport using pallet truck



Method 2

Attach hoisting ropes connected to lifting bars to lifting beams. To do this (in terms of strength), use a proper beam.

Note: For lifting, make sure load is distributed evenly.

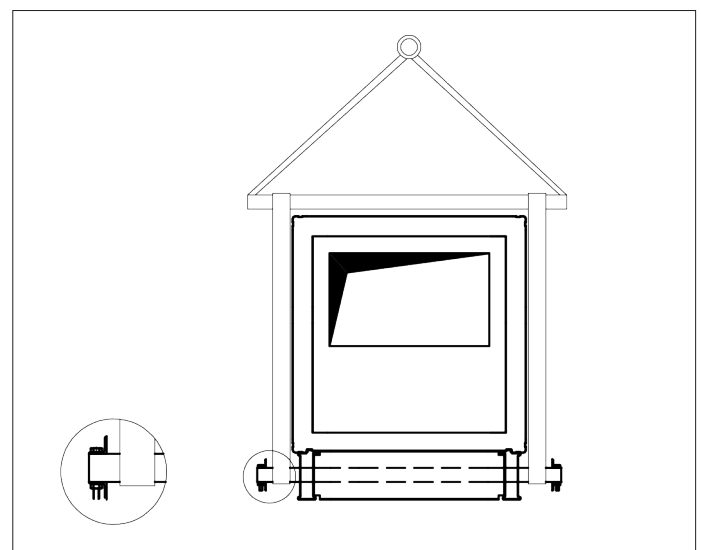


Fig. 3. Vertical transport by lifting beams

Note: For lifting, make sure load is distributed evenly.

2.5. Horizontal Transport

For horizontal transport, pallet lifters or transport skids can be placed under unit frame or under the lifting bars. Lifters used should be placed properly to support the lifting points. During lifting and transport process, never use transversal side base frame profiles shown in Fig. 1. FOR HORIZONTAL TRANSPORT, ALWAYS PROVIDE SUPPORT UNDER THE LIFTING POINTS. The use of bars as rollers can result in damage to the unit frame.

For lifting and moving AHUs, the following methods are recommended:

Method 1

Attach hoisting ropes to lifting bars. Evenly positioned spacers that will not slip off between the ropes should be used between the lifting ropes to prevent damage to the top of the unit and ensure that no excess pressure is applied to the side panels. Spacers used should be durable to the force applied by the ropes (in terms of dimension and material).

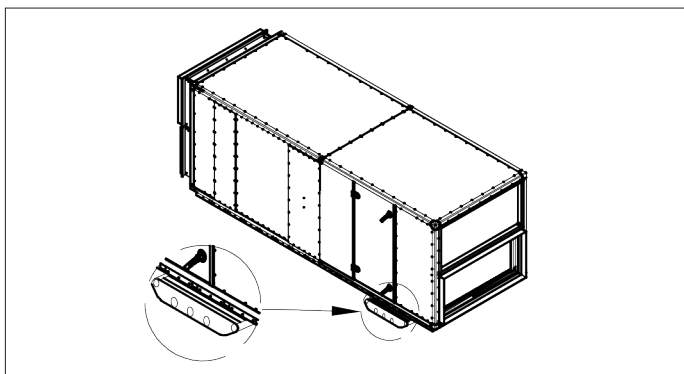


Fig. 4. Horizontal transport with pallet truck

3. PRE-ASSEMBLY PREPARATIONS

The following material is supplied with the unit as standard by Alarko Carrier Sanayi ve Ticaret AS:

- Installation, Maintenance and Operating Instructions
- Connection equipment

The following material is supplied with the unit as optional by Alarko Carrier Sanayi ve Ticaret AS.

- Anti-vibration pads
- Outdoor air suction grille
- Heat recovery rotary control
- Steam humidifier and its accessories

Measure and inspect the installation site. Surface of installation site should be smooth and level, having no height differences that could lead to problems during interconnection of modules. Make sure a base frame is constructed to provide sufficient height for the siphon. See Chapter 10.7 for siphon height calculation.

Determine correct assembly sequence of AHU sections. Use the most logical sequence, taking the installation site into account.

Each cell composing AHU has a label showing order number, module number and its weight, and a number system indicating adjacent modules is applied. Connect the modules considering these labels (See Appendix -1).

4. LIFTING INSTRUCTIONS

4.1. General

See Transport and Lifting chapter.

4.2. Lifting Bar Certification

Lifting bars supplied are certified in accordance with Machinery Directive 2006/42/EC and they are for single use.

4.3. Fastening of Lifting Bars

1. Remove the bolt and the locking plate on one side of the lifting bar.

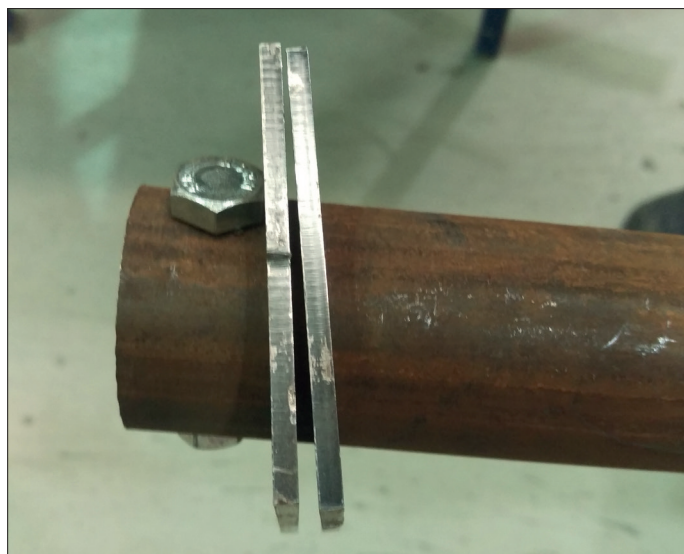


Fig. 5. Fastening of lifting bars - 1

2. Slide the lifting bar into the hole on the base frame intended for that purpose.



Fig. 6. Fastening of Lifting Bars - 2

3. After inserting the lifting bar, re-insert the bolt and locking plate in the correct position.

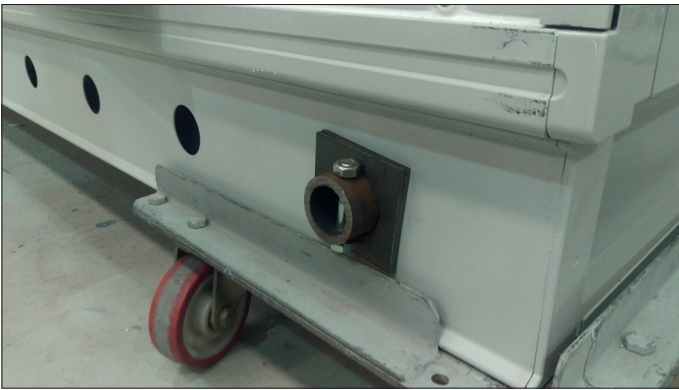


Fig. 7. Fastening of Lifting Bars - 3

4. Position the lifting ropes on lifting bars. Evenly positioned spacers that will not slip off between the ropes should be used between the lifting ropes to prevent damage to the top of the unit and ensure that no excess pressure is applied to the side panels. Spacers used should be durable to the force applied by the ropes (in terms of dimension and material).

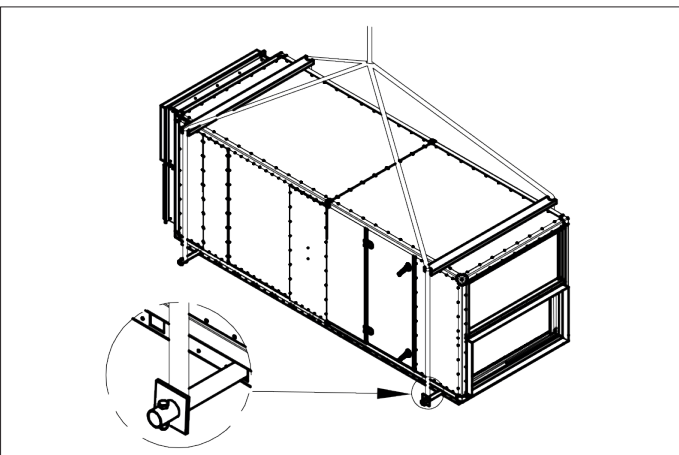


Fig. 8. Vertical transport with bars

5. Before proceeding lifting, make sure load is distributed evenly and check if the steps above are performed (Lifting bars cannot be removed if there is not enough space between the unit and the wall)

As shown in the example below, it is not possible to remove 6th section of the AHU from the right side because it is so close to the wall. Bar can be removed from the left side if 3rd section of the AHU is not placed. When 6th section is placed, remove bolts and plates on the right side to remove the lifting bars.

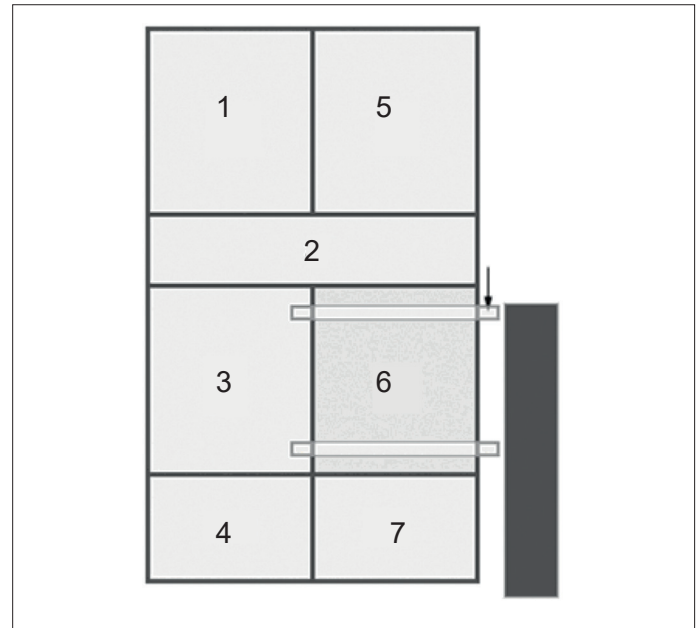


Fig. 9. Placement diagram (Upper view)

5. ASSEMBLY

5.1. Air Handling Unit Assembly

- Place the anti-vibration rubber pads (optional) to the location where the first AHU section will be positioned.
- Place the first module on the anti-vibration rubber pads and then remove the lifting bars.



- Then place the anti-vibration rubber pads to the location where the next cell will be positioned and then place this section on rubber pads.
- Before placing the each cell adjacent to another, fix the insulation tape supplied between the sections. This should be done in four sides, and the sealing tape should overlap at the corners (See Fig. 15 and 19).
- Details of anti-vibration pads (location, dimension, quantity,...) are given in customer drawings.

The labels showing the matching surfaces are for easily matching the unit surfaces correctly during assembly of AHU. Same numbers should be side by side.

Note: Attach the insulation tape supplied to only one of the two assembled sections.

- Place the sections together as close as possible. Ensure that both sections can still be moved. Insert a lifting bar into both sections, so that they can be pulled closer towards each other.

Two methods can be used for pulling the sections towards each other:

Method 1

Pull the sections against each other, using the pull ropes attached to the lifting bars. Pull evenly on both sides of the AHU.

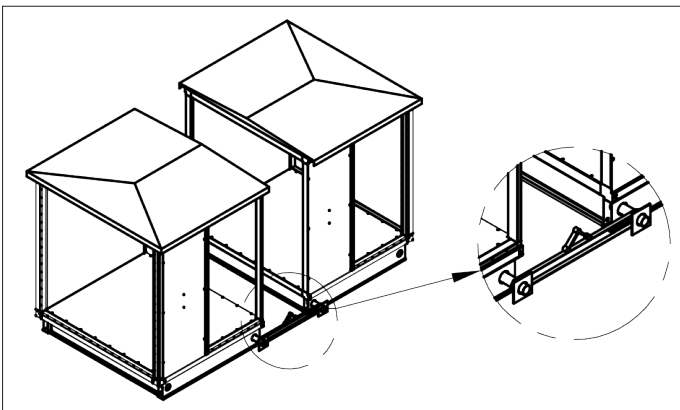


Fig. 11. Connecting sections using pull ropes

Method 2

Insert a bar with threaded ends through both lifting bar holes. Screw a nut onto the threaded ends of the bar and tighten it. Pull evenly on both sides of the AHU.

Note: Before connecting the sections, they should be horizontally and vertically aligned.



Fig. 12. Connecting the sections using threaded bars

5.2. Connection of Modules having Equal Width and Height

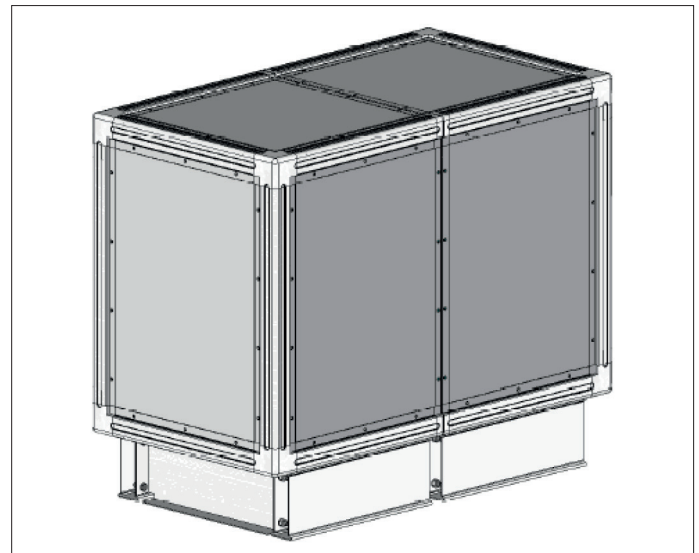


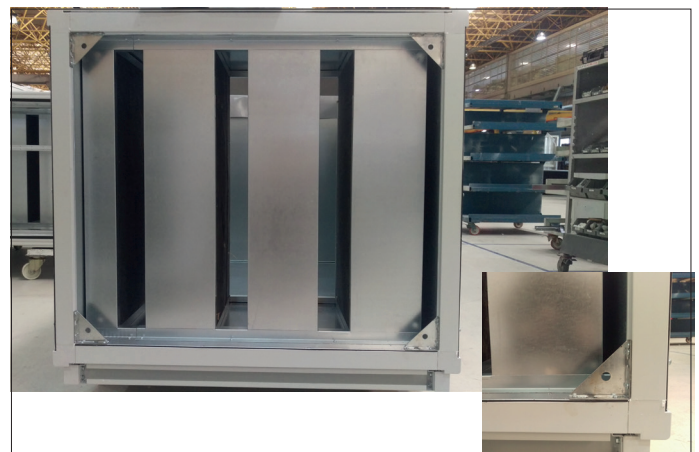
Fig. 13. Unit having equal width and height

To connect the AHU sections, use one of the following methods according to AHU construction.

Method 1

This method applies for sections ending with cell connection profiles.

Check that the four corner flags are attached.



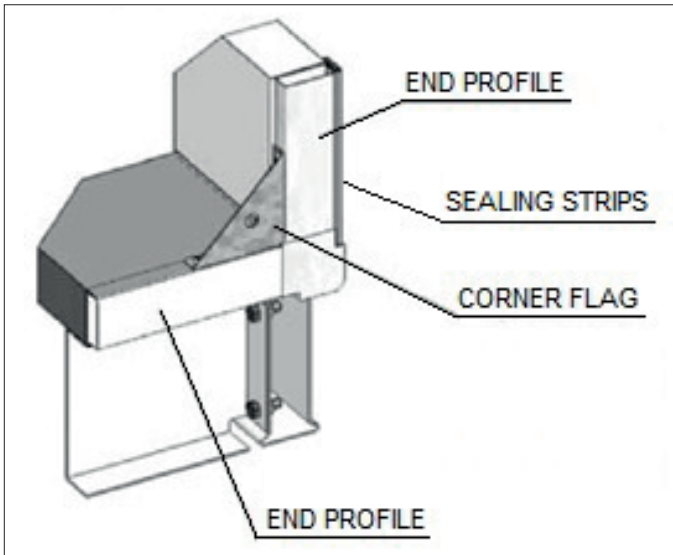


Fig. 14. Connection bars with corner connection parts (flags)

Before moving the sections against each other, make sure that the insulation tape supplied is fixed to one of the two sections.



Fig. 15. Bonding insulation tape on cell joint

Using pre-mounted corner flags, perform final positioning of the sections and secure the corners with a bolt. After assembly, both sections must be fully aligned.

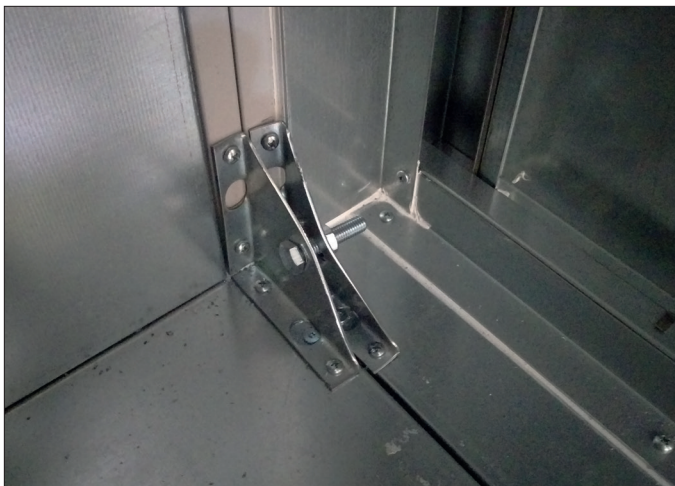


Fig. 16. Corner connection

Section joining shall be made from inside whenever possible, if it is not possible it will be made from outside. Outside joining shall not be chosen, if joining from inside is possible.

Section joining shall be made with parts shown at Figure 17. Distance between the parts shall be equal, Figure 18-19. See for quantities Annex-4. Corner flags, shown at Figure 14, shall not be disassembled after section joining.

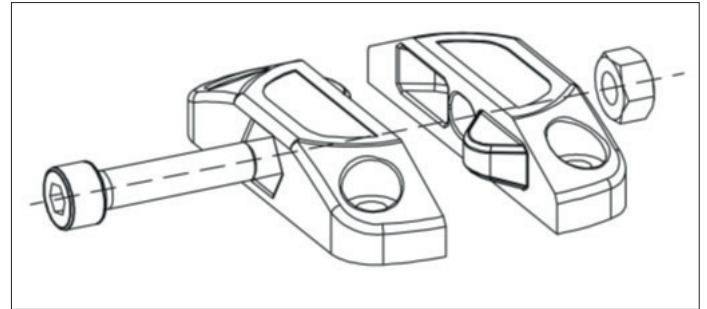


Fig. 17. Section Joining Parts

If a unit have to be connected from outside and ends with 20x55 profiles (Figure-14), then section joining parts have to be on sealing strips. In that case, assembly points of section joining parts are marked on sealing strips and drilled with Ø5 bore. Only sealing strips should be drilled, not panels.

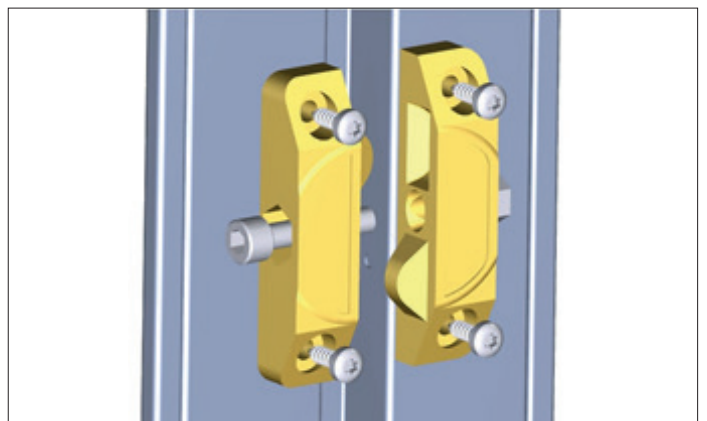
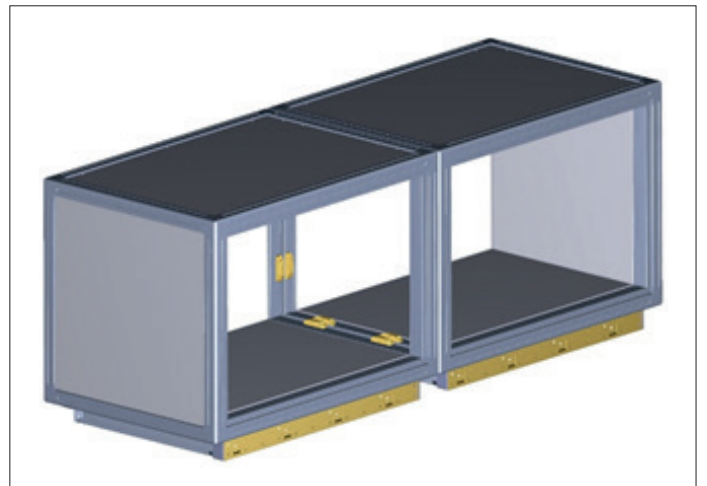


Fig. 18. Perspective view and assembly detail

Check for insulation tape before section joining. Insulation tape shall be applied on one of the section, Figure 20.

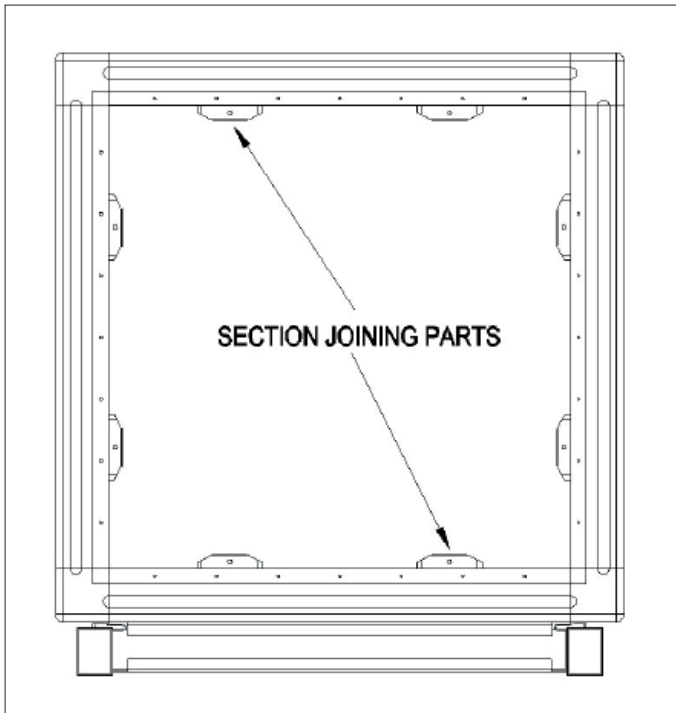


Fig. 19. Side view



Fig. 20. Insulation tape application

- If AHU has more than two sections, repeat this procedure. For an outdoor installation of the AHU, all external joints of the sections should be sealed.

For outdoor installation of the AHU, roof should be applied as described in Chapter 8.

5.3 Air Handling Unit with Control Assembly

Units produced with the control option are plug & play and do not require extra commissioning. After the module combinations and power supply are done, units will operate according to the scenario that previously determined. The units produced with the control option will be delivered to the field in modules, and the mounting and fixing operations of these units can be made easily on the field by connecting the connectors.



Fig 21. Connector connection

In the internal wiring of air handling unit, the signal and power cables will be executed with different cable conduits and will be combined with the other cell through different connectors.



Fig 22. Power and signal cable conduits

6. STACKED CELL SECTIONS

6.1. Unit without Intermediate Base Frame (Equal Width)

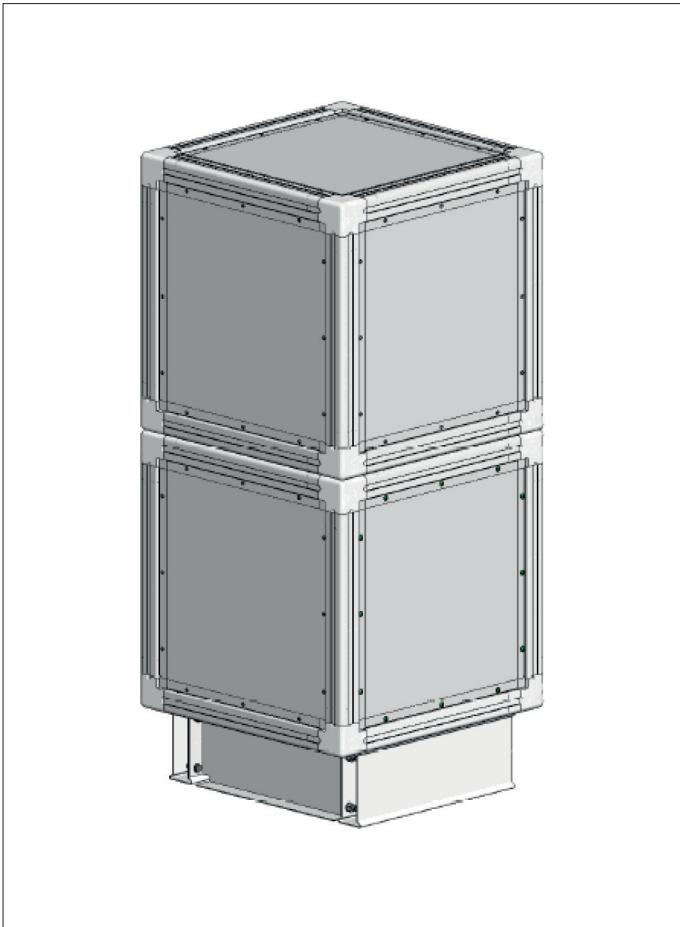


Fig. 23. Unit without intermediate base frame

Indoor Installation

- Position the sections on top of one another so that the corners are in the same plane.
- Mount the profiles supplied with AHU as described below. For sections having equal length, these profiles should be mounted all round the unit.
- For AHUs having shorter or longer upper sections, no further works are required.

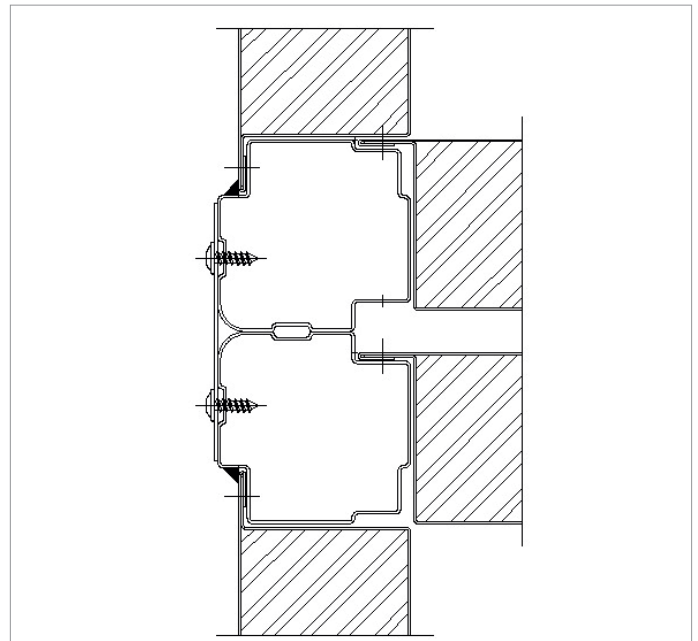


Fig. 24. Profile installation, indoor installation, unit without main base frame at intermediate section

Outdoor Installation

- Position the casing sections on top of one another so that the corner profiles are in the same plane.
- Mount the profiles supplied with AHU as described below. For sections having equal length, these profiles should be mounted all round the unit.

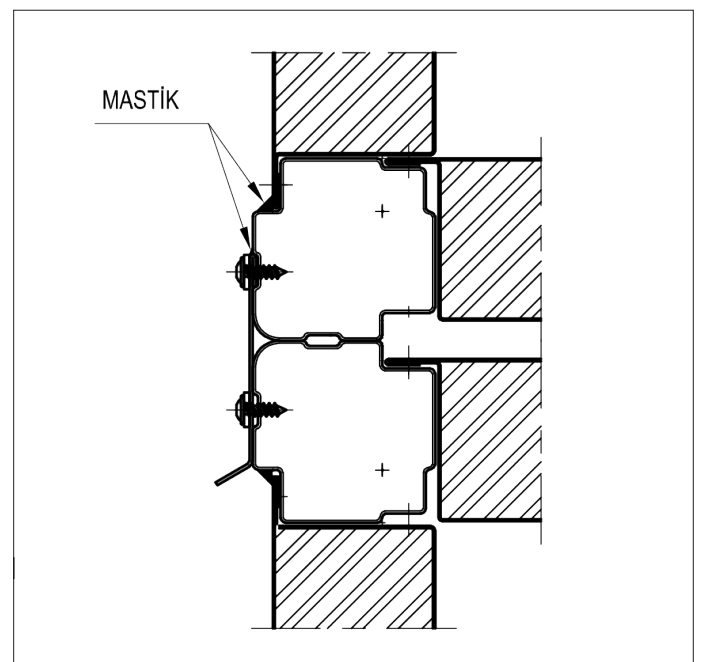
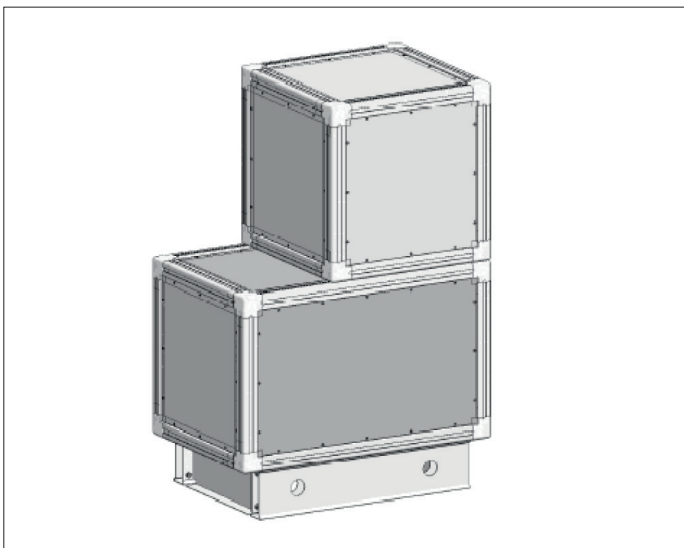


Fig. 25. Profile installation, outdoor installation, unit without main base frame at intermediate section

- If the top section is shorter than the bottom section, the ends should be finished as described below.



Note: For outdoor installation, seal all ends of the profiles. Repeat this procedure for all corner and butt joints.

Fig. 26. Unit without intermediate base frame having a shorter top section

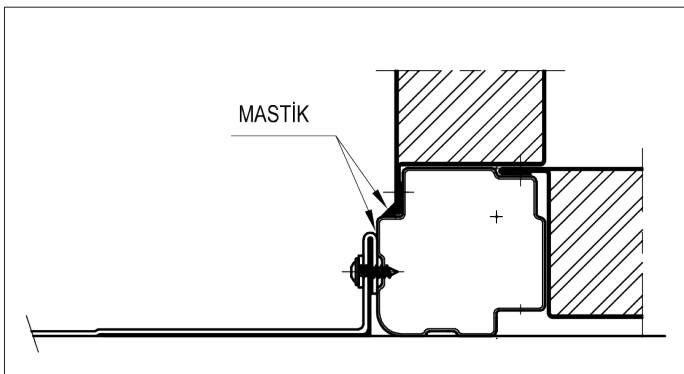


Fig. 27. Unit without intermediate base frame having a shorter top section, roof installation

- A longer top section needs no further finish at the ends.

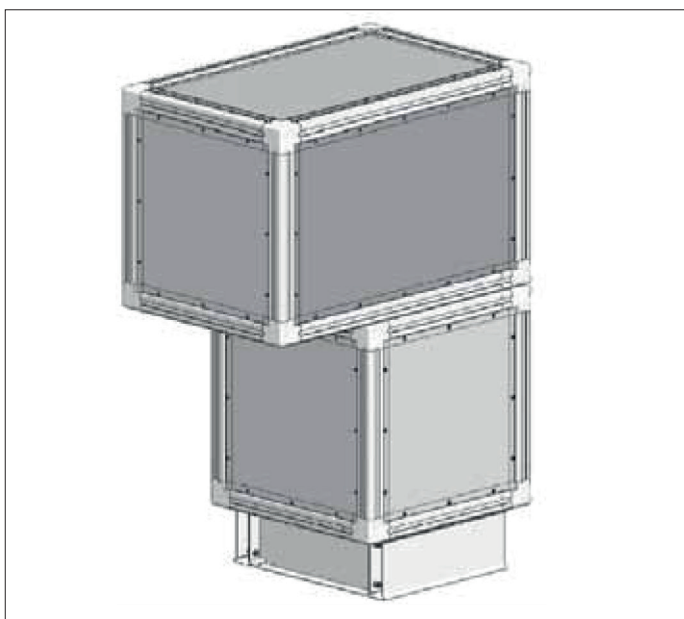


Fig. 28. Unit without intermediate base frame having a longer top section

6.2. Unit with Intermediate Base Frame (Equal Width)

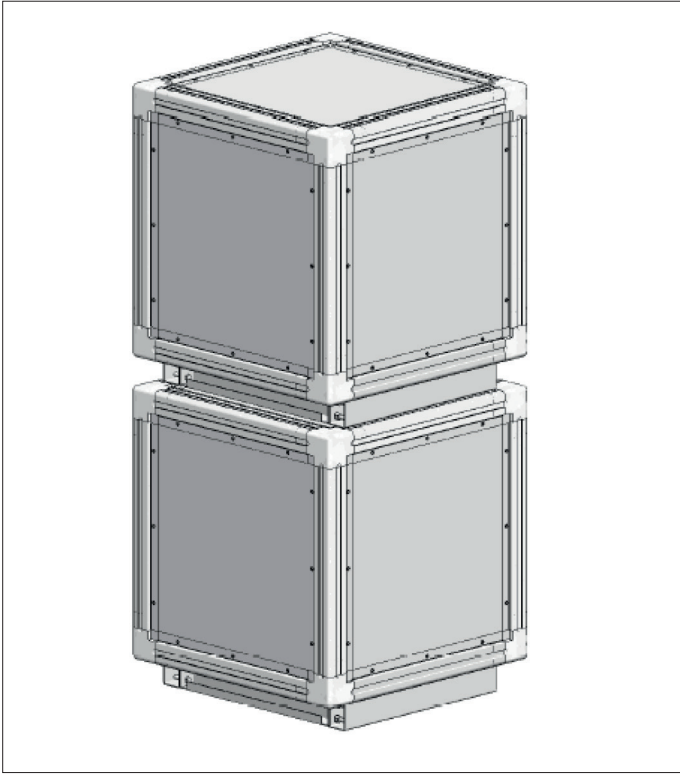


Fig. 29. Unit with intermediate base frame

Indoor Installation

For indoor installation, connection profiles of 240 mm length are supplied with the AHU.

- Position the casing sections on top of one another so that the corner profiles are in the same plane. The base frame of the top section should be slightly back compared to the bottom casing section.

If stacking units in an indoor installation the connection profiles should be placed between the different unit sections. Use the following assembly method for connection:

- Install a connection profile to the end of the casing section, stopping at the module line (panel level) (A).
- Install a connection profile at the joint (B).
- Install a connection profile against the adjacent section (C).
- Install connection profiles supplied with the unit between A, B and C joints on service side and rear side, maintaining minimum 960 mm distance in between.

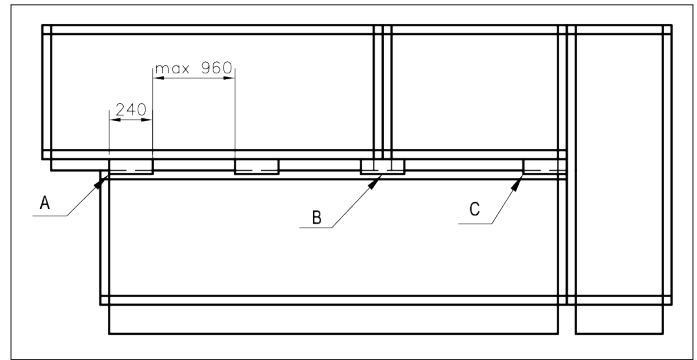


Fig. 30-1. Connection of unit profiles with intermediate base frame

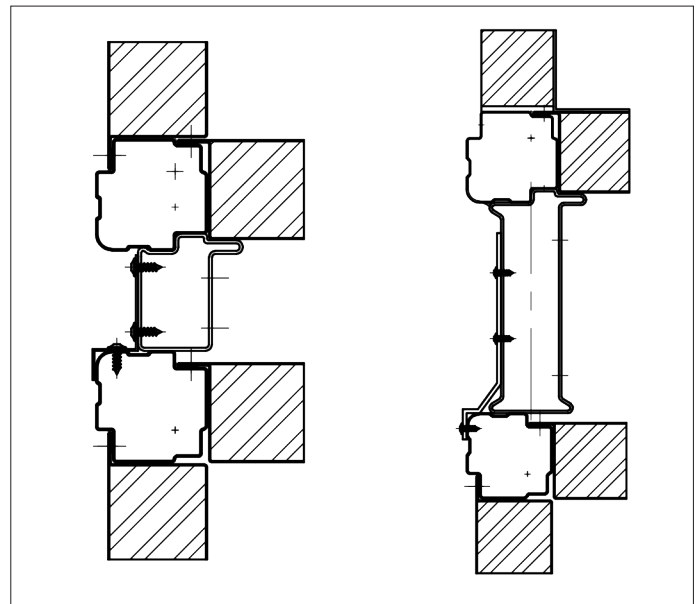


Fig. 30-2. Connection of units with intermediate base frame

At the end of the unit (width side) there is no need for a profile connection.

Outdoor Installation

For outdoor installation, connection profiles supplied need to be cut to the correct length. These profiles should be mounted over the entire unit length and width.

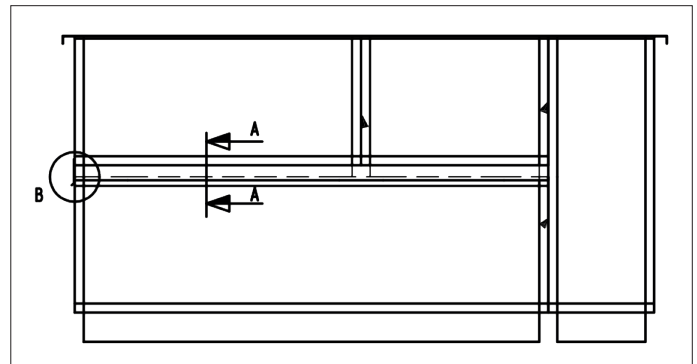


Fig. 31. Stacking, outdoor installation

Different connection profiles are used for the length and width directions of sections.

- Length direction: Cut the connection profiles supplied to the correct length and mount it as described below.

Cross section view in length direction (A - A)

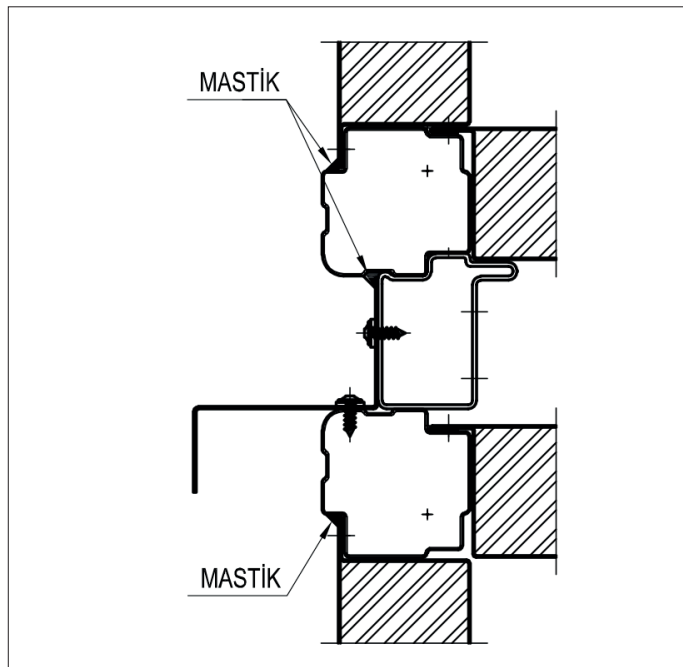


Fig. 32. Connection profile, at length direction, unit with intermediate base frame

- Width direction: Cut the connection profiles to the correct length and mount it as described below.

Cross section view in width direction, equal base frame length (B)

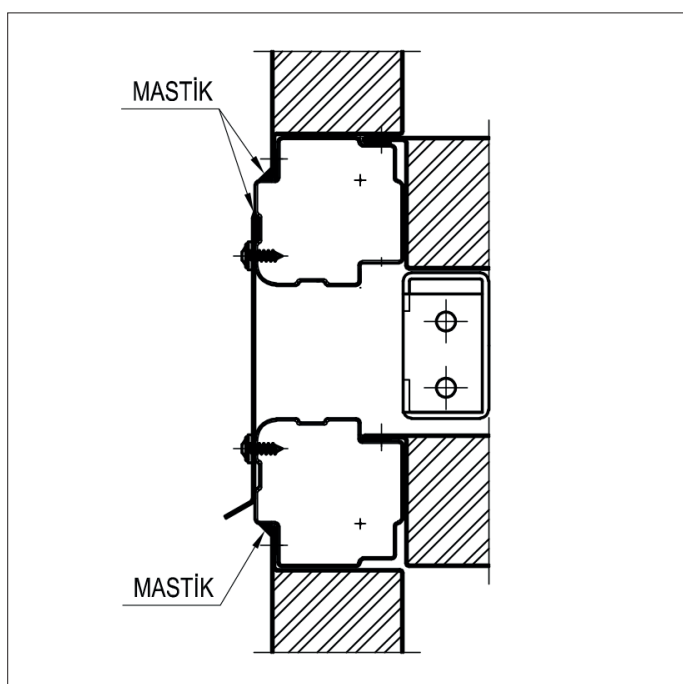


Fig. 33. Connection profile, at width direction, unit with intermediate base frame

- If the top section is shorter than the bottom section, the unit ends should be finished as described below.

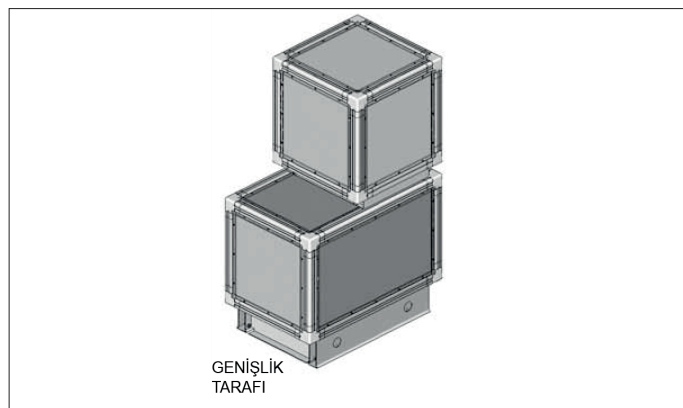


Fig. 34. Unit with intermediate base frame having a shorter top section

- Cut the connection profiles to the correct length and mount it as shown below.

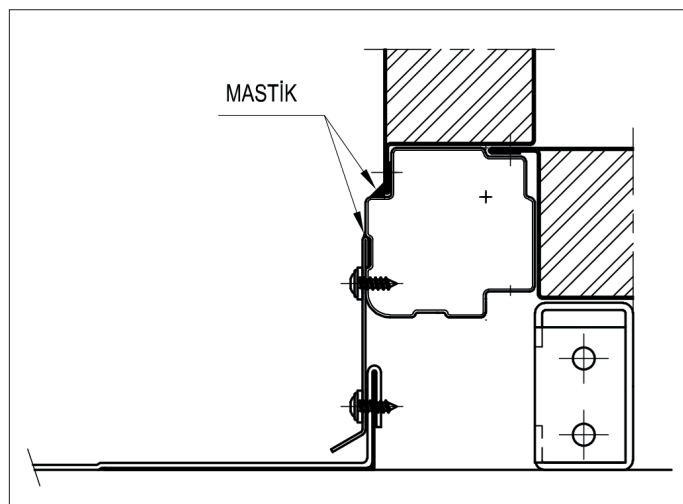


Fig. 35. Width cross section view of unit having shorter top section, unit roof detail

A longer top section needs no further process at the ends.

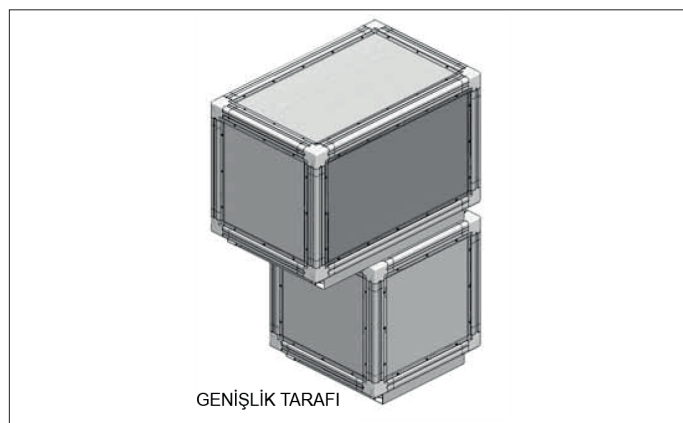


Fig. 36. Unit with intermediate base frame having a longer top section

Note: For outdoor installation, seal all ends of the profiles. Repeat this procedure for all corner and butt joints.

6.3. Units with Different Widths

For units with different widths, there are 4 different situations. For an indoor installation the method described below applies to all situations.

Indoor Installation

The top cell includes a projecting cross beam that is effectively as wide as the bottom cell.

- Check that the cover strip at the ends of the bottom cell is installed in the correct place.
- Position the top section as indicated in drawing.
- Screw the projecting base frame profiles of the top section to the corner posts of the bottom section.

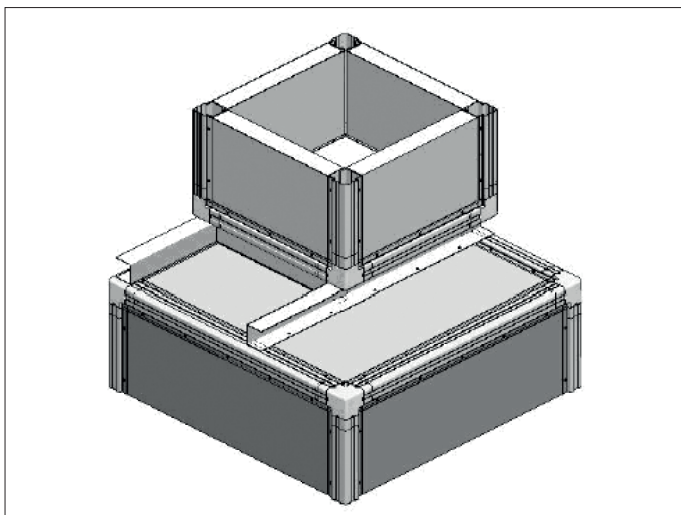


Fig. 37. View in width direction, unit with unequal widths

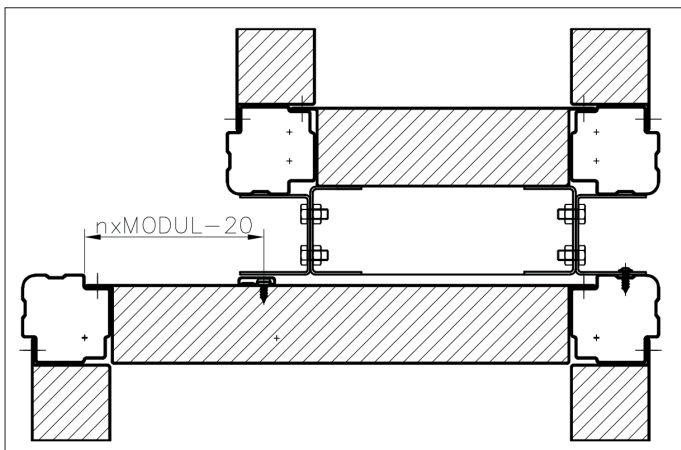


Fig. 38. View in length direction, unit with unequal widths

Outdoor Installation

The top cell includes a projecting cross beam that is effectively as wide as the bottom cell. For outdoor installation, connection profiles need to be cut to the proper length. These profiles should be mounted over the entire unit length and width.

- Position the top section as indicated in the dimensional drawing. The position of the top section can be as described in one of the four situations be-

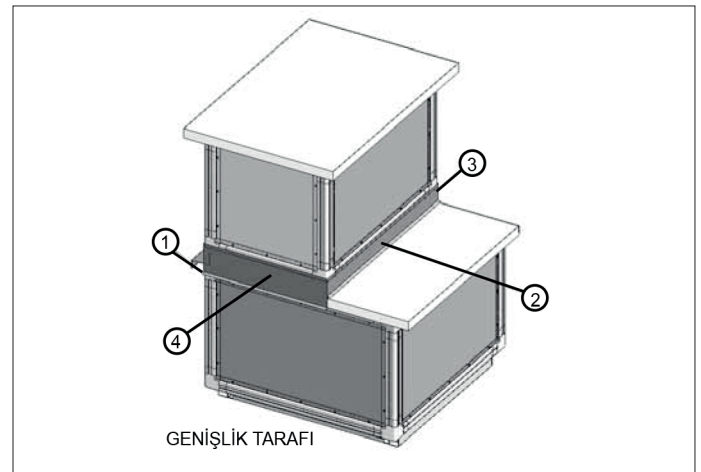


Fig. 39. Unit with unequal widths - situation A

low:

- Direction 1: Cut the connection profile to the correct length and mount it on the correct side (See Fig. 39).

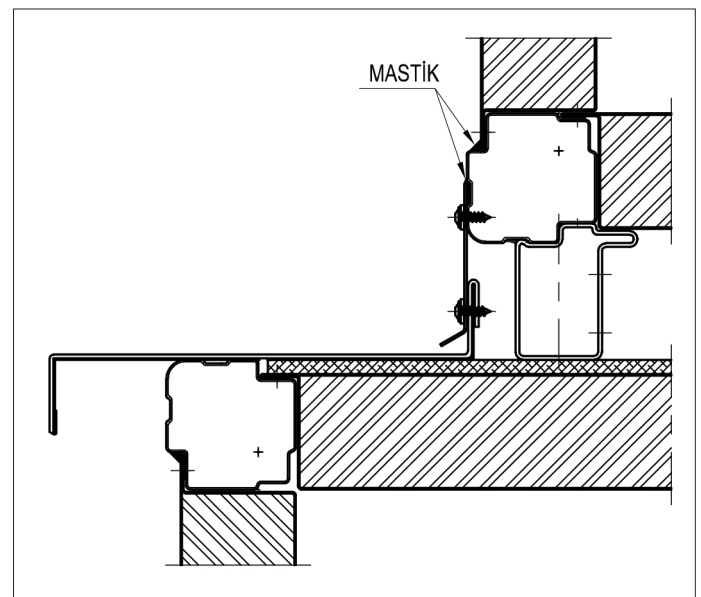


Fig. 40. Roof finish, situation A, side 2

- Direction 2: Cut the connection profile to the correct length and mount it on the correct side as described below.

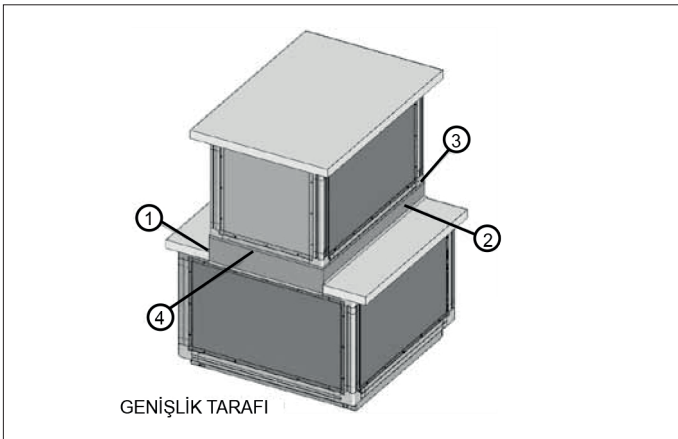


Fig. 41. Units with unequal widths - situation B

- Directions 3 and 4: Cut the connection profiles to the correct length and mount them on the correct sides.
- Directions 1 and 2: Cut the connection profiles to the correct length and mount them on the correct sides (See Fig. 43).

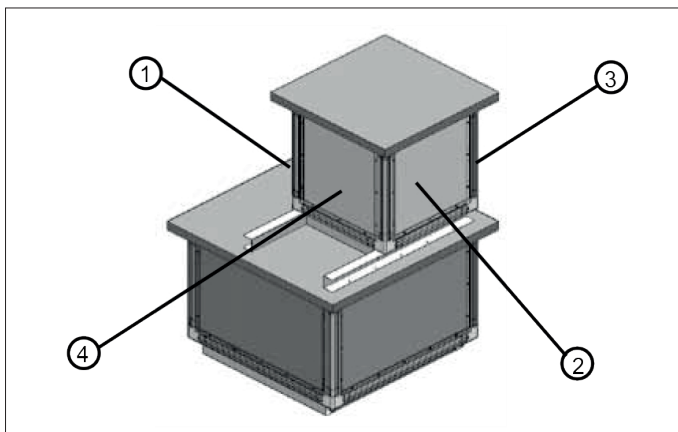


Fig. 42. Units with unequal widths - situation C

- Directions 3 and 4: Cut the connection profiles to the correct length and mount them on the correct sides.
- Direction 1: Cut the connection profiles to the correct length and mount them on the correct sides (See Fig. 31).
- Direction 2: Cut the connection profiles to the correct length and mount them on the correct sides (See Fig. 39).
- Direction 3: Cut the connection profiles to the correct length and mount them on the correct sides (See Fig. 32).
- Direction 4: Cut the connection profile to the correct length and mount it on the correct side as described below.

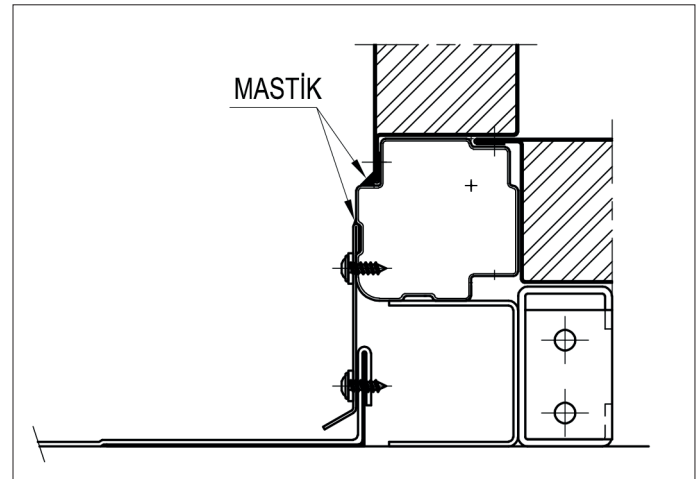
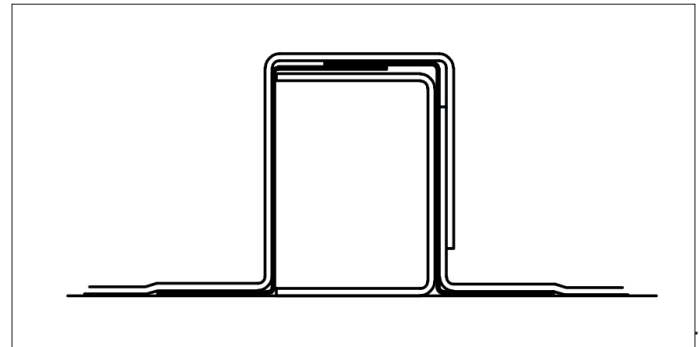


Fig. 43. Roof finish, situation C, side 4

- Mount Z-profiles over the projecting cross beam of the top section as described below. Roof membrane of the bottom casing section can be applied over these profiles.



profiles over width profile

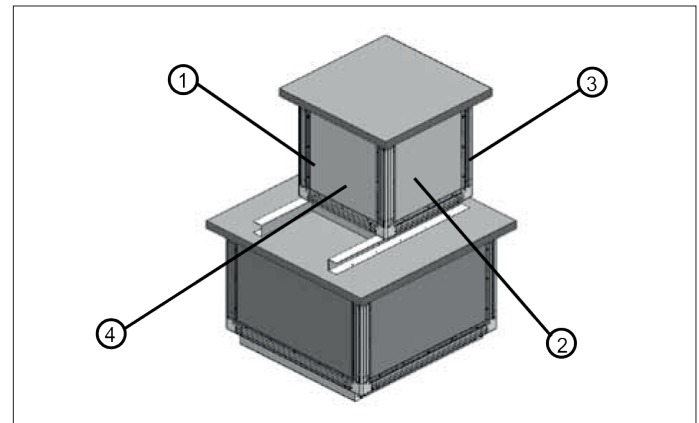


Fig. 44. Unit with unequal widths - situation D

- Directions 1 and 2: Cut the connection profiles to the correct length and mount them on the correct sides (See Fig. 39).
- Direction 3: Cut the connection profiles to the correct length and mount them on the correct sides (See Fig. 32).
- Direction 4: Cut the connection profiles to the correct length and mount them on the correct sides (See Fig. 44).

- Install Z-profiles over the longer base frame profile of top section as shown in Fig. 43 in this chapter. Apply roof foil over Z-profiles.

6.4 Connection of Double Deck Mixing Box

First remove the flanges over top section. Then, pull flexible connection of lower section upwards. Finally, connect the flexible connection as shown in Fig. 45.

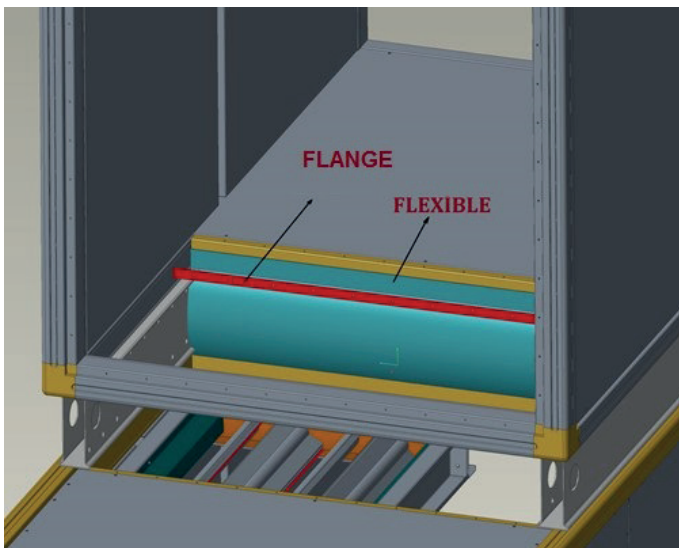
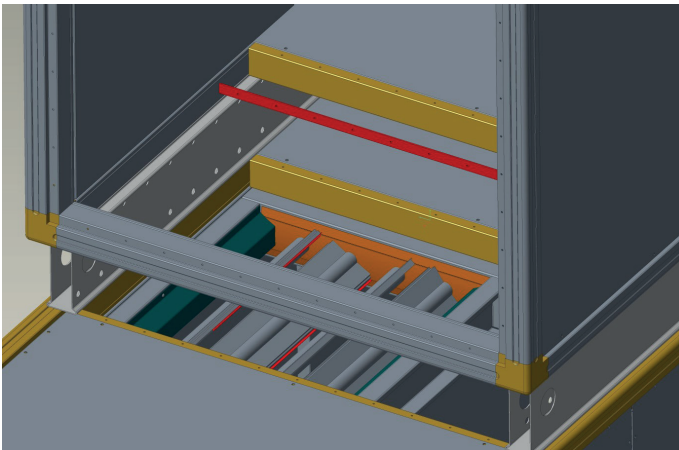
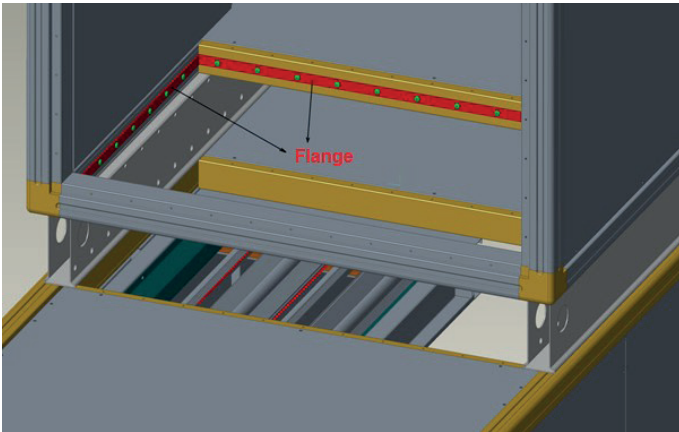


Fig. 45. Flexible connection of double deck section

7. FRESH AIR INLET HOOD

The fresh air inlet hood may be supplied loose with the AHU.

In this case the rain hood must be attached in the correct position as follows:

- Install the inlet hood with the screws supplied in the correct location.
- The bottom wire grille should then be attached to the corner post.



Fig. 46. Fresh air inlet hood

Note: The connection between the outdoor air suction grille and the corner post should be sealed.

8. ROOF COVER

For multi-section air handling units to be installed outdoors, after the assembly, connection area should be covered with special roof cover material supplied from Alarko Carrier. If the casing section has a flat top use one of the following two methods.

Method 1

- Shorten the roof cover the correct length. Ensure that the strip projects enough to attach it to the side of the roof edge with a blow dryer.
- Ensure that the roof cover already attached to the two casing sections to be connected is clean and dust-free.
- Attach the roof cover strip with a blow dryer over the entire length of the joint up to the roof edge.
- Remove any excess roof membrane up to the underside of the roof edge.



Fig. 47. Roof installation, method 1

Method 2

- Fix sealing tape to the connection profiles. Drill 160 mm holes with a 10 mm diameter through the connection profiles. Be sure to remove the drill boring after drilling.
- Attach the sections to each other using stainless steel bolts and nuts.
- Seal the seam on the top of the connection profiles.
- Install the cord after sealing.

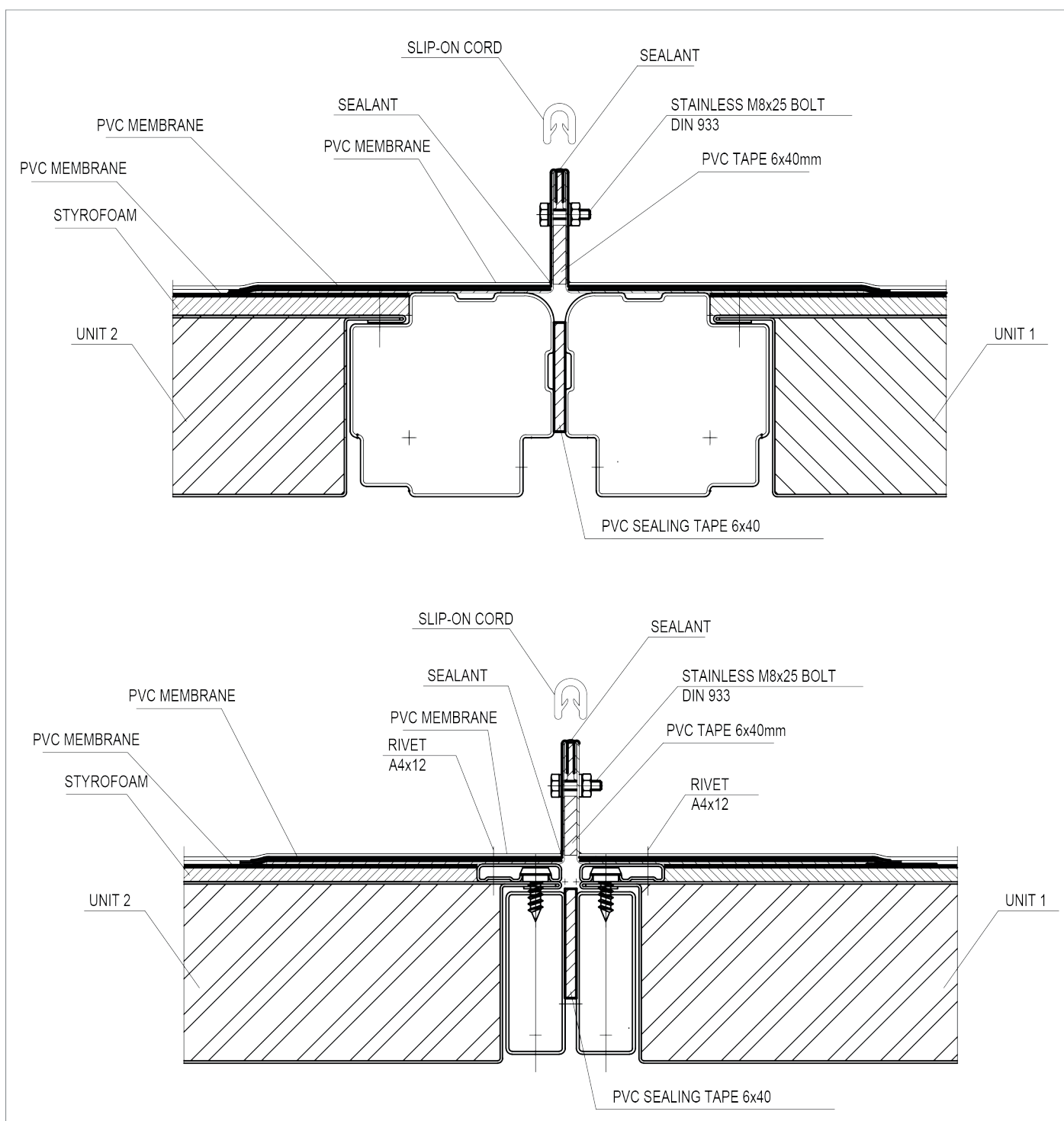


Fig. 48. Roof installation, method 2

9. START-UP CHECK-LIST

9.1. Start-Up Inspection Items Check-list

The table below shows a general overview of the planning required to facilitate the installation of the AHU. The following pages give a more detailed description of the individual components.

CAUTION!

Before starting up the AHU ensure that the components have the correct connection voltage and connect them in accordance with the regulations. The doors and access / guard covers must be closed and the AHU must be earthed.

9.2. Start-up Inspection Items

FUNCTION	COMPONENTS	CHECK POINTS	STATUS
General			
Inside installation (indoor unit)	Indoor and outdoor panels	Damage	
Outside installation (outdoor unit)	Indoor and outdoor panels	Damage	
	Joints	Cracks	
	Doors / access / guard covers	Should be closed before operation	
	Flexible connections	Correct connection	
	Earthing	Earthing according to regulations	
Dampers		Correct operation	
	Damper motor	Correct operation	
Filters		Correct filter type	
		Are filters installed correctly?	
	Pressure differential gauge	Correct operation	
	Pressure differential switch	Correct operation / installation	
Heaters	Hot water coil	Correct connection	
		Leakage	
		Frost thermostat operation	
	Electric heater	Correct connection / safety devices	
	Steam coil	Correct connection / safety devices	
		Leakage	
Coolers	Cool water coil	Correct connections	
		Leakage	
	Eliminator	Correct positioning	
	Syphon	Correct connection	
Heat Recovery Wheel	Rotor	Direction of rotation	
	Seals	Correct mounting	
	Drive	Motor / belt / rpm check	
	Controller	Correct installation	

FUNCTION	COMPONENTS	CHECK POINTS	STATUS	
Plate heat exchanger	Damper (if present)	Correct operation		
	Damper motor	Correct operation		
	Syphon	Correct operation		
	Eliminator	Correct positioning		
Steam humidifier	Connection and fixations	Leakage		
Electric steam humidifier	Connection and fixations	Correct connection / correct operation check		
	Electrical parts	Connection voltage check		
		Correct connection / correct operation check		
Water humidifier	Spray humidifier	See document supplied		
	Core (Cell) type	See document supplied		
Fan	Z Profiles	Remove.		
	Fan housing and section	Z profiles should be removed. Check whether ant objects - particulates are present in fan housing, helix and fan cell, and whether fan can rotate freely manually		
	Motor	Check motor nameplate corresponds to mains voltage		
		Check connections		
		Check all phases		
		Check whether terminal connection is on the pulley side		
		Drive belts	Check their tension	
		Flexible connections	Correct mounting	
		Maintenance switch	Check connections	
		Maintenance switch	Make sure is is closed when performing checks.	
	Pressure switch	Operation operation status check		
Attenuator		Check attenuators for damage		
Lighting	Light	Connection voltage check		
	Switch	Connection check		

10. START-UP INSTRUCTIONS

10.1. Casing

The label indicating unit data, such as order number, unit type etc. is usually located on the access cover or door of the fan compartment.

AIR HANDLING UNIT	
Type	39HQ 10.10
Sip. No/ Serial No	MH00770
Place of Use	Surgery Room
Air Volume (m ³ /s)/Tot.Sta.Pres.(Pa)	8,5 / 1.197
Production Date	2016
ALARKO GOSU Gebze Organize Sanayi Bölgesi Sahabettin Dilgusu Cad. 41480 Gebze Tel: (0262) 648 60 00 PBX Fax: (0262) 648 61 01 - 648 60 78 Carrier ALARKO CARRIER SANAYİ VE TİCARET A.Ş. Made in TURKEY CE	

10.2. Casing panels

Check the AHU panels for any damage. Any dirt or stains must be removed from the surface to prevent possible long-term damage. Building debris left on the roof must be removed. Dirt can be removed with water and a mild house-hold soap solution. Damage can be repaired by thoroughly cleaning the affected surface, then treat and paint as necessary. If applicable check the sealing joints and repair if required.

10.3. Doors and Access / Guard Covers

Check the operation of door handles, locks and movement of the hinges.

10.4. Flexible Connections

Check that all flexible connections are attached to the AHU and if necessary, tighten loose screws.

10.5. Earthing

Ensure that the AHU has been earthed correctly and in accordance with local regulations. A label on the base frame indicates where the unit should be earthed.

10.6. Air Handling Unit Installation and Connections

The floor in the room where the AHU is installed must be water-tight and water-drainable to prevent connection problems. Before the units are placed against or on top of each other, the sealing tape supplied must be attached between the casing sections.

Caution: Before assembling the sections side-by-side or stacked, insulation band supplied should be applied over section connection areas.

Place the section as close as possible together before assembly.

Assembly the sections towards each other by the aid of lifting bars and pulling ropes.

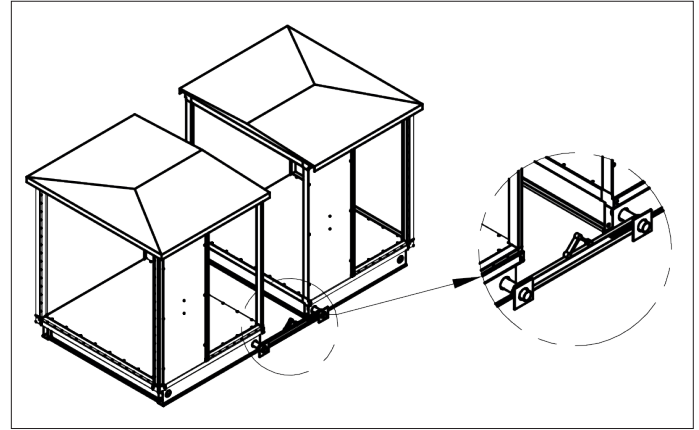


Fig. 49. Roof installation, method 2

The sections are connected to each other with section connection strips and aluminium metal sheets supplied.

Sections pulled together are connected with stud bolts over cell connection strips located opposing to each other.

Then, remove section connection strips one by one and screw aluminium bars instead. (Warning: Never leave cell connection strips on the unit.)

If the AHU is installed outdoors, the roof connecting plate provided must be installed on the roof and when required properly sealed.

10.7 Siphon

It is advised to use siphon to have a constant water drain at all the outlets of the cooling coil, humidifier and other wet areas of the Air Handling Units.

Siphon application is very important not to cause air leakage from outlets and also water drainage without overflowing inside unit.

Siphon height should be arranged according to static pressure of siphon location.

The factory can provide only negative siphon type (Figure 50).

Positive siphons should be made with U-bent pipes (Figure 51)

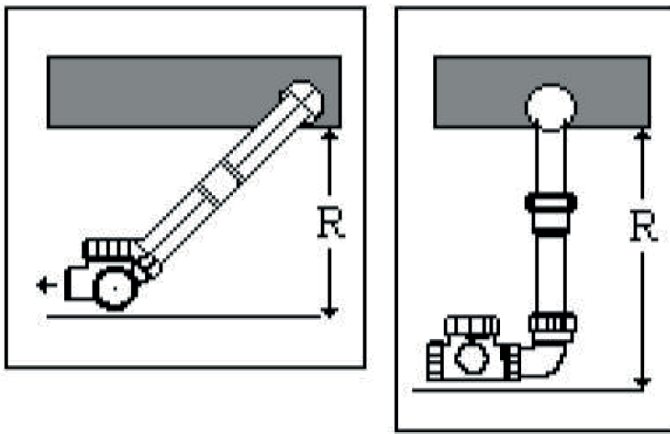


Fig. 50. Negative pressure siphon

$$R = \frac{P}{10} + 50$$

P [Pa]: Negative pressures in the unit. Calculation should be done without using (-) sign.

R [mm]: Distance from lower point of the condensation tray outlet pipe to ground.

R value can be set higher than the value found by calculation, but not less.

Negative siphon provided by Factory can only be used in negative sections

In Figure 51, parts and assembly order of negative siphon are given. If it is not necessary, Part-6 may not be used.

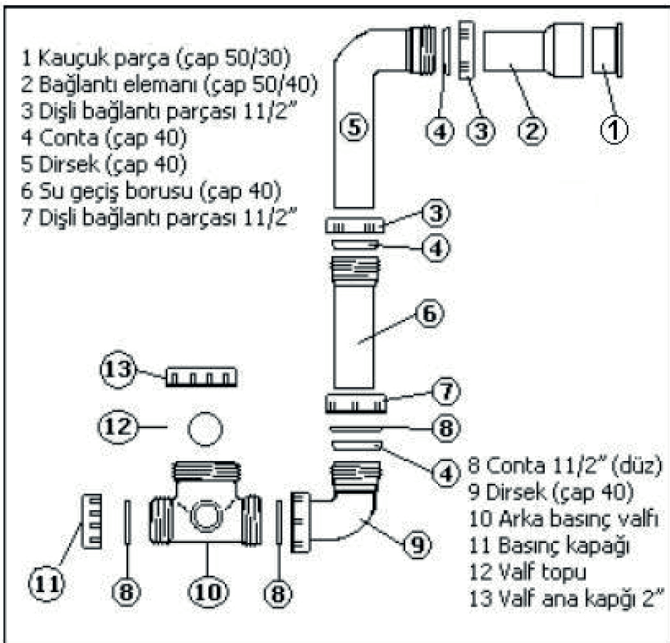


Fig. 51. Negative pressure siphon installation

The ball inside the negative pressure siphon provides drained water fill the siphon by preventing air suction.

This ball also blocks suction discharges that may be produced during pressure shocks.

Water drain direction marked with an arrow on the negative pressure siphon.

U-BENT SIPHONS

Positive Pressure Siphons

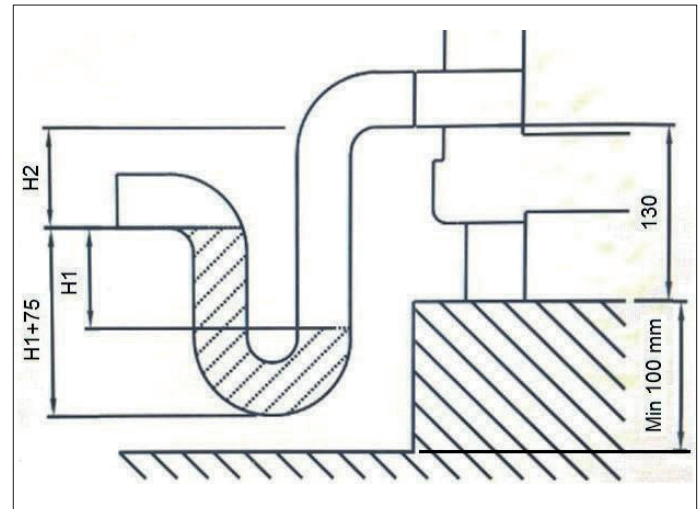


Fig. 52. Positive pressure siphon

$H1 = (\text{max positive pressure at cooling coil, Pa}) / 10 + 50 \text{ mm}$

$H2 \geq 1/2 \times H1$

Negative Pressure Siphon

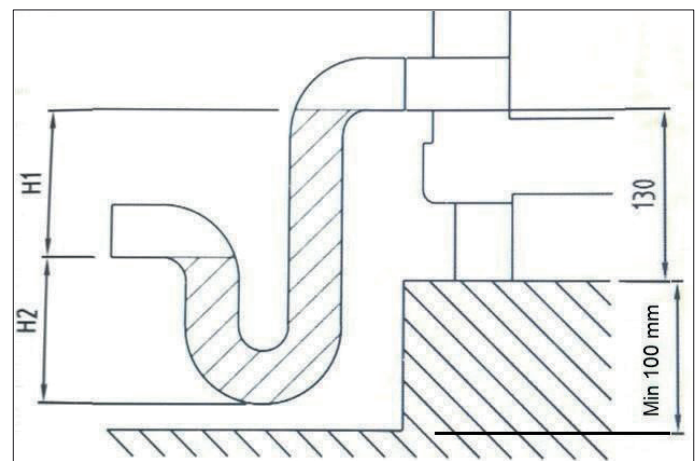


Fig. 53. U-bent negative pressure siphon

$H1 \geq (\text{max negative pressure at cooling coil, Pa}) / 10 + 50 \text{ mm}$

$H2: 50 \text{ mm}$

Negative u-bent siphons which are not provided by factory should be made according to Figure 53.

All U-bent siphon types should be filled with water before usage.

Application types according to the pressure and siphon types are shown in Fig. 54.

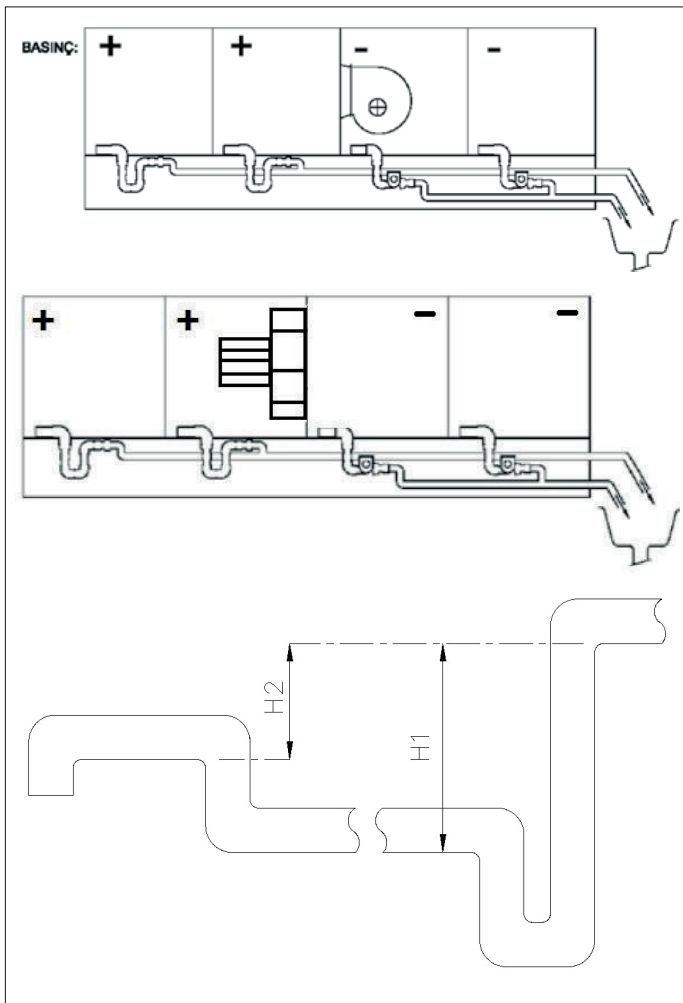


Fig. 54. Multi-siphon installation

Siphon outlets should not be raised over along drain line or at the end of the line. If it is necessary due to an obstacle on the ground, H2 in siphon calculation should be considered, see Fig. 54.

If drain outlet is away from, for every 5 m pipe extension 1cm should be added to H1 height. It is necessary due to pipe friction loss.

For U-bent siphon types, it is better to arrange H1 and H2 bigger than calculated values.

For 62 mm. base frames that requires siphon application, a base frame shown in Figure 52 and Figure 53 is necessary under the air handling unit. The constructed base frame should be levelled and balanced.

For AHU with NPU profile concrete base frame requirement and height must be checked and AHU installation area must be prepared according to the explanations above.

10.8. Dampers

- If not installed in the factory, check whether damper motor has been installed in accordance with the instructions of the supplier.

Check whether correct angle is set.

Check whether dampers close correctly.

Check whether damper is opening at correct angle.

For servo-motor controlled dampers, following to frost thermostat warning or after a power failure, check the operation after power is restored.

Some dampers should be open while some other are closed.

10.9. Air Filters

Check if the correct filters have been installed.

Check if filters are installed correctly.

HEPA filters are supplied separately to prevent fouling during transport and start-up. Insert HEPA filters

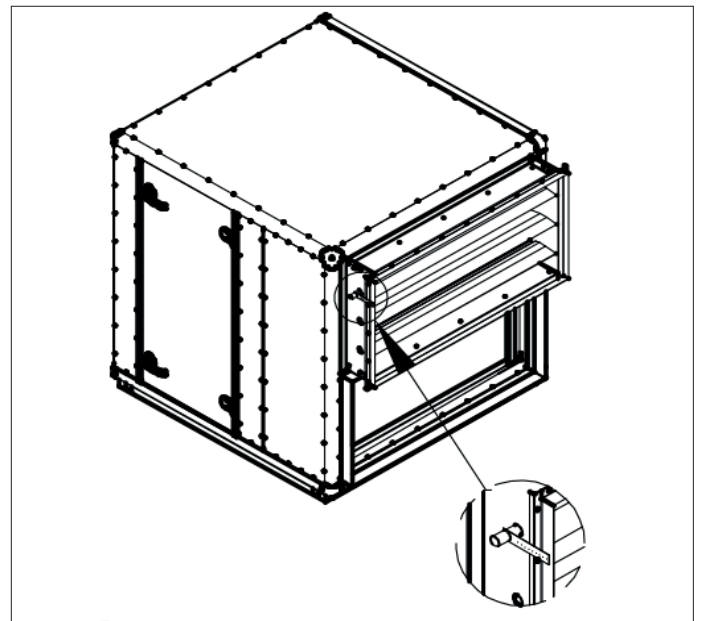


Fig. 55. Manual start-up

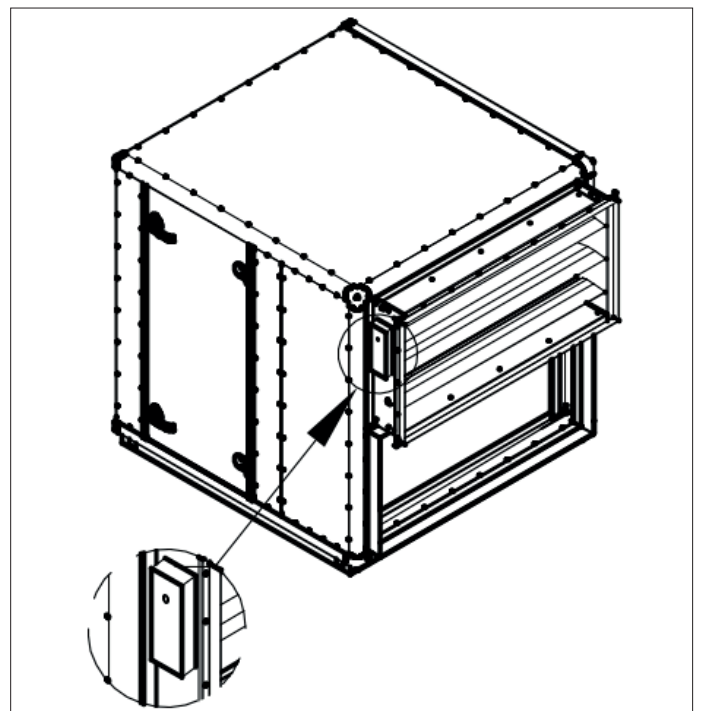


Fig. 56. Start-up with damper motor

only after cleaning the unit.

Set dirty filter pressure switch or filter indicators, if available.

Close the door of filter cell.

For further details about filter installation, see Appendix-2.

For number of filters used or to be replaced, see Appendix-3.

10.10. Heaters

10.10.1. General

- Check the connections in accordance with the dimensional drawing.
- Check the connections for leakage and sealing.
- Make sure heater can supply enough heat to prevent frost formation once fan is started.

Caution: For coils which water is used as heating or cooling medium (refrigerant), coils must be drained completely for preventing any possible damages on the coils when the temperature drops below 0°C.

10.10.2. Electric Heaters

- Make sure heater has been connected in accordance with supplier instructions. Wiring diagram is located inside the electric connection box.
- Check the current of electric heater.
- Check whether safety devices shown in wiring diagram are installed.
- Check whether heater is earthed in accordance with local instructions.
- Electric heater may only be switched on if specified minimum air flow is provided.
- Electric heater should be switched off at least 5 minutes before air handling unit is turned off.
- Make sure no foreign objects are left in electric heater section.
- The following warnings are attached to the panel: electric voltage and hot surface.

10.10.3. Steam Coil

Steam coil surface temperature exceeds 100°C. Steam supply should be checked by authorized personnel.

- Steam coil may only be switched on if specified minimum air flow is provided.



- Make sure no foreign objects are left in steam coil section.
- Steam coil should be closed at least 5 minutes before air handling unit is turned off.
- The following warning is attached to the panel: hot surface



10.11. Coolers

- Check the connections in accordance with the dimensional drawing.
- Check the connections for leaks.
- Check drain siphon. If Alarko Carrier standard discharge siphon is used, check whether has been correctly installed. Check whether siphon cap and ball are installed correctly.
- Comb the coil fins which were bended during transport
- Check whether droplet eliminator pack after the cooler has been correctly installed.
- Material to block water flow should not be placed inside the ceiling.

- After a period of time, check whether condensate is being drained and plastic siphon is operating. If required, clean the siphon.

Check Annex-6 for UV-light connection diagram.

10.12. Heat Recovery Wheel

- Check that the wheel is rotating in the correct direction. This is indicated by an arrow on the casing.
- Check whether rotary seals are fitted correctly.
- Check whether belt tension is sufficient.
- Check whether motor and control panel, if present, is correctly connected.
- If present, check whether Check if the controller has been correctly connected and set in accordance with the instructions of the supplier.
- Check whether rotor speed has been set correctly.
- The following warning is attached to the panel: rotating parts



- When making rotary inverter connection, use the cable supplied by the factory, see Fig. 56.



Fig. 57.

10.13. Plate Heat Exchanger

For plate heat exchangers with bypass dampers:

- Check whether damper motor has been installed in accordance with the instructions of the supplier.
- Check whether the correct angle has been set.
- Check whether dampers close correctly.

- Check whether damper is opening at correct position.
- Check operation after the power has been restored following a power cut. Some dampers should be open while others are closed.
- Straighten the fins if they are bent during transport.
- Check whether siphon has been correctly installed and check whether siphon cap and ball have been properly placed.

10.14. Steam Humidifier

- Check fixing of steam pipe.
- Check steam supply and condensate drain pipes.
- For longer pipes install an extra drain pan in accordance with the instructions of the supplier.
- Check whether the dirt trap has been installed.
- Humidifier duct should left without pressure in accordance with the manufacturer's instructions. Refer to supplier instructions.
- If humidifier cell has negative pressure, install a special siphon to humidifier cell.
- Before starting up the steam humidifier, steam must be introduced slowly into the system to provide correct operation temperature of the humidifier. Once the condensate pipe reaches to operation temperature, start the actuator motor electrically or pneumatically and set the desired humidity level. Observe supplier instructions for all of these processes.
- A few days after starting up the unit, clean the strainer of dirt trap and check the status of humidification duct. For casings with negative pressure, operation of the negative pressure system should be controlled with a check valve.
- Steam humidifier should be closed at least 2 minutes before air handling unit is turned off.
- The following warning is attached to the panel: hot surface

10.15. Electric Steam Humidifier



- Check general fixing status of steam generator.
- Check steam supply and drain pipes.
- If humidification sections have negative pressure, install a siphon at humidifier cell.
- Steam humidifier device should be closed at least 2 minutes before air handling unit is turned off.
- Check the voltage and measure the circuit current.
- Connect the humidifier according to supplier recommendations.
- The following warning is attached to the panel: hot surface.



10.16. Water spray humidifier

Check supplier instructions.

10.17. Fan

- Remove Z-profiles. Location of Z-profiles are shown on the label attached to the door. (Fig. 57)
- For hygienic air handling units, when starting-up the fans, reinstall the screws removed from Z-profiles after Z-profiles are dismantled.
- For fan motor couplings using Al profile, remove the square nut after Z-profile is dismantled.
- Check whether terminal connection is on the pulley side. If required, turn terminal connection before connecting the wires.

Check whether fan can move freely without touching the frame, flexible connection or wiring. Check mains voltage of electric motor. Check and/or connect the motor in accordance to local regulations and supplier instructions.

Check the rotation direction of the fan. The direction is indicated on housing by an arrow. Measure current draw for all phases of electric motor. Current draw for all phases should be nearly the same and corresponding to data on unit nameplate. Set motor protection mechanism to its nominal value. Type of the belt used, belt tension and number of belts and their dimensions are indicated on the label attached to fan

housing together with information on pulley the belt is connected on.

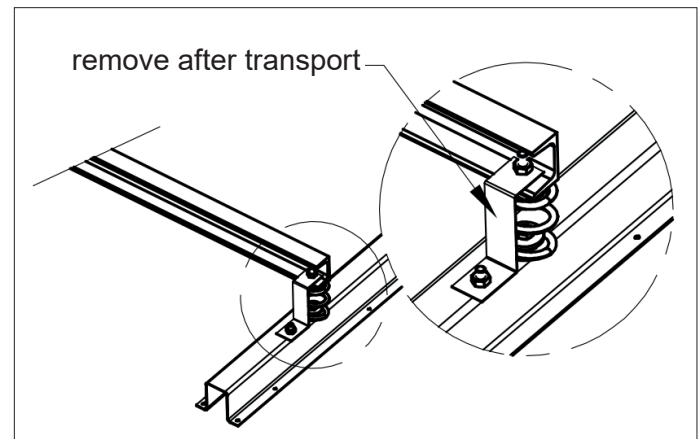
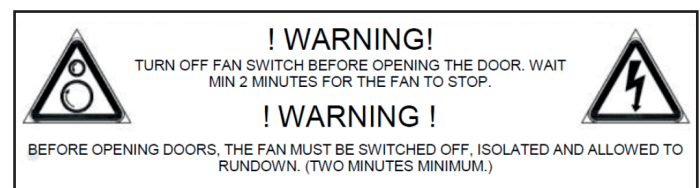


Fig. 58. Fan Z-fixing

Caution: Air flow can lead moving of stationary parts (even if fan is switched off).

Check whether flexible connections are correctly installed. To have control over belt ruptures, check pressure switch, if available and adjust to correct pressure. Check the operation main switch. Warning: While working on the fan make sure power is off. Warning regarding rotating parts, electric voltage and open doors are attached to the door. Label for removing Z-profiles is attached to floor of fan section.



Check Annex-5 for Frequency Invertor Control.

10.18. Sound attenuator

- Check attenuators for damage.

10.19. Lighting

- Check connection voltage.
- Check whether switch is operating. Switch should be installed in accordance to local regulations.

11. MAINTENANCE CHECK-LIST

11.1. Inspection Items Check-list and Maintenance Intervals

The table below shows a general overview of the planning required for inspection and maintenances of the AHU. On the following pages there are more detailed descriptions for individual components.

CAUTION!

Remember to de-energise all components and make sure fan has stopped rotating before opening the doors and access / guard covers to perform inspections and maintenance.

FUNCTION	COMPONENTS	CHECK POINTS	Every Month	Every 3 Months	Every 6 Months	Every Year	Depending on dealer and contamination degree
Chassis general							
Inside installation (Indoor unit)	Indoor and outdoor panels	Pollution and damage					
Outside installation (Outdoor unit)	Indoor panels						
	Outdoor panels						
		Joints					
Doors and Access / Guard Covers	Hinges	Operation of hinges and locks					
	Locks						
	Door gasket	Cracks					
	Flexible connections	Cracks					
Dampers	Damper blades	Leak tightness					
		Connections					
	Damper checks	Damper motor					
Outdoor air intake	Grill / hood	Blockage check					
	Floor, under filter condensation tray (if present)	Pollution status					
	Eliminator cassette (if present)						
Filters	Cassette filter	Filter general status check, filter pressure drop and leak tightness					
	Pouch filter						
	Carbon filter						
	Electrostatic filter						
	Differential pressure gauge	Operation status					
	Differential pressure switch						
Heaters	Cooler coil	Pollution					
		Leakage					
	Thermostat	Operation					
	Electric heater	Connections					
	Steam Coil	Pollution					
		Leakage					
Coolers	Cool water coil	Pollution					
	Condensation tray	Leakage					
	Eliminator cassette	Pollution, operation					
	Syphon						
Heat recovery wheel	Rotor	Pollution					
	Seals						
	Drive: motor	Operation					
	Belt	Wear / Voltage					
	Electrical parts	Operation					
Plate heat exchanger	Fins	Pollution					
	Damper (if present)	Leak tightness					
		Bearings					
		Servo					

FUNCTION	COMPONENTS	CHECK POINTS	Every Month	Every 3 Months	Every 6 Months	Every Year	Depending on dealer and contamination degree
	Condensation tray	Pollution					
	Eliminator cassette						
Steam humidifier	Connection and fixations	Leak / operation					
	Servo	Operation					
Electric steam humidifier	Connection and fixations	Leak / operation					
	Electrical parts	Operation					
	Boiler	Burring on electrodes					
Spray humidifier							
Fan	Bearings (large type)	Lubrication / wear					
	Fan housing	Pollution					
	Motor (large type)	Lubrication					
	Belt	Voltage / wear					
	Anti-vibration pads	Fixations					
	Flexible connections	Cracks					
	Pressure switch	Operation					
	Pulleys	Lubrication					

12. MAINTENANCE AND OPERATING INSTRUCTIONS

12.1. General

The smooth inside and outside finish of the panels makes maintenance very simple.

For dry sections, check inside and outside of AHU casing thoroughly once a year. For wet sections (cooler and humidifiers), please see relevant chapters.

12.2. Casing panels

12.2.1. Inside Installation (Indoors)

a) Inspection of panel and all dry sections from inside.

Remove impurities by water and mild soap solution. If finish paint is damaged, remove the rust formation and touch up with good quality anti-corrosive primer and paint.

Outdoor air intake sections can show signs of corrosion as they contain wet parts and are affected by mist, rain and air pollutants.

b) Inspection of coating from outside

If paint is damaged, remove rust formation and touch up with good quality anti-corrosive primer and paint.

12.2.2. Outside Installation (Outdoors)

Check the sealed joints of AHUs installed outside and if required seal again with a UV-resistant material that paint can be applied. Treat damage as for inside installation.

12.3. Doors and Access Covers

Check locks and hinges of all doors and access covers.

12.4. Flexible Connections

Check flexible connections for damage.

12.5. Earthing

Make sure unit is earthed and installed in the properly.

12.6. Dampers

All damper hinges are equipped with plastic bearing bushings. Therefore, no lubrication is required. Remove excess impurities by cleaning it with air jet. Clean aluminium parts with water and mild soap solution.

Check screws and anchorages, re-tighten if required. Make sure damper blades run free of the casing

and do not touch the flexible connection and duct connections.

12.7. Outdoor Air Intake

Especially outdoor air intake gets contaminated by impurities taken in with the air. Maintenance intervals should be observed. Accumulated impurities can lead irreparable damages on the panels. Clean the outside air intake thoroughly and repair damages observes as described in "Inside Installation (Indoors)" chapter.

12.8. Air Filters

The filters must be inspected once a month for excess pollution, pressure loss, damage and seating of the slide-in filters or built-in frames. With slide-in filters ensure that the filters have been correctly positioned and have been pushed well against each other from below. When replacing built-in filters you must ensure that the filter has been pushed well against the sealant and that the clips have been correctly installed. Filters must be replaced at required intervals. The timing of the replacement depends on the type of filter, quality and the degree of contamination of the air. The pressure drop across the contaminated filter can be measured with a pressure differential gauge. Maintenance instructions of special filters are available on request.

12.9. Heaters

12.9.1. Water, Glycol and Steam Coils

Check air intake once a year for contamination and clean with air jet, if required, against the direction of the air flow or clean air intake with a vacuum cleaner.

Perform leakage check. Check the operation of frost protection thermostat and check the correct control sequence when thermostat trips.

Glycol-charged heating and cooling exchangers must be checked annually for the actual percentage of glycol in the water.

The following warning is located on the panel of steam heat exchanger: hot surface.

12.9.2. Electric Heaters

Check for contamination once a year and if necessary



clean with air jet. Check the connections in the control box. Check operation of thermostat. The following warning pictograms are attached to the panel: electric voltage and hot surface.

12.10. Coolers

Check for contamination once a year and if necessary



clean with air jet against the direction of the air flow or clean with a vacuum cleaner.

The eliminator assembly mounted after the cooler can be removed. Perform leakage check. Check fins of eliminator. Clean siphon and check its operation.

Check the condensation pan for contamination and clean if necessary.

12.11. Heat Recovery Wheel

Check rotor for contamination once a year and clean with air jet, if required. Check rotor speed and compare it with design data.

Check the operation of the rotation monitor. Depending on roto-run material, rotary can absorb moisture. When stationary rotary will absorb moist on one side and thus become heavier.

For rotary speed adjustment, see manufacturer operating manual.

Rotor bearings are lubricated for complete life cycle and maintenance free. Drive motor is accessible via an inspection cover.

V-belt is automatically tensioned by a spring-loaded rocking base on which motor is installed. New belts expand excessively the beginning. Therefore, when new belts are installed, check whether belt still has enough tension after two days.

After this inspection, belt tension should be checked weekly during the first month and then once a month.

If heat recovery wheel is controlled by a control panel, see supplier documents for further information about operation and maintenance details.

The following warning pictogram is attached to the panel: rotating parts.

12.12. Plate Heat Exchanger

Check plate heat exchanger for contamination once a year and if necessary, clean with air jet against



the direction of air flow. If dampers are used, strictly follow the instructions in "Dampers" section.

Check the condensation pan for contamination and clean if necessary.

12.13. Steam Humidifier

Clean the filter in steam supply line once a year.

If a filter is installed, also clean condensation drain valve and inside of condensation tray.

Check control valve, condensation drain and distribution box twice a year.

With steam distribution pipes in negative pressure systems (installed at air side) there may be excess water present, as the condensation may not drain from the steam distribution pipe.

For some brands a special siphon with a check valve is supplied. Check the operation of this valve once a year.

During periodical checks of the steam humidifier, casing sections after the humidifier should facilitate inspection and controlling of humidification level.

When viewed in the direction of the air flow rate, there should not be any steam accumulated at the end of the steam humidification section.

Electric humidifier capacity is strongly affected by contamination of steam boiler and electrodes. This is indicated by the LED. If required, replace steam boiler or the electrodes.

For further information regarding the operation and maintenance of steam humidifier, see supplier documents.

The following warning is attached to the panel: hot surface

12.14. Water spray humidifier

For maintenance of water humidifier, see supplier documents.



12.15. Fan

12.15.1. General

- Warning: Air flow can lead moving of stationary parts (even if fan is switched off).
- Warning: While working on the fan make sure power is off.
- Type of the belt used, belt tension and number of belts and their dimensions are indicated on the label attached to fan housing and ventilator cell door together with information on pulley the belt is connected on.
- Take care to insulation of terminal box when making motor cable connections. No humidity should enter into the box.

12.15.2. Bearings

Bearings of smaller fans are closed type and do not require greasing. If larger fans that require greasing is used, grease them every six months. For higher temperatures and increased contamination greasing intervals should be adjusted as required. For the type of grease, observe fan manufacturer recommendations. For higher temperatures and a higher degree of humidity use a lubricant recommended by the supplier.

Electric motors are equipped with roller bearings, depending on the motor size the bearings are lubricated for complete life cycle or are equipped with a grease nipple. The lubrication interval and type of lubricant are as above.

12.15.3. Power transmission

After starting up the unit or after replacing the belts, belt tension has to be checked within one week for

the first time and then after two weeks, and tension should be re-adjusted, if required. After that, check belt tension and inspect the condition of the belts every three months.

CORRECT BELT TENSION depends on:

- type of belt,
- power to be transmitted,
- belt speed.

Belt tension is calculated for each transmission. If belt tension is too high this can result in premature wear at bearings and vibration. If it is too low this can result in belt slippage and belt wear.

Sequence for installation of new belts:

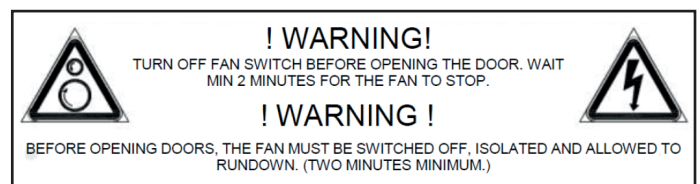
- Make sure that the pulleys are correctly aligned. If necessary, re-align.
- Position all belts loosely on the pulleys, do not pull tensioned belts over pulleys.
- Tension belt, check their tension.
- Re-check alignment.

If fan speed changes or if a motor with different power specifications and/or speed is installed, the manufacturer must be informed and no further work should be performed.

Alrako Carrier will calculate the load to be carried by the fan and also bearing loads. Failure to perform this step may lead irreparable damages at fan.

Alrako Carrier accepts no liability for any modifications done without approval. See chapter related with safety.

- Warning pictograms are attached to the door indicating rotating parts, electric voltage and open doors.



12.16. Sound attenuator

Under normal conditions, attenuators are maintenance free. Nevertheless it is recommended to check attenuators once a year for possible damage and loose fibre elements, in order to prevent further contamination of the system.

12.17 INSTRUCTIONS FOR HYGIENIC AHU's

The information in this application pages is provided as a guideline for the cleaning and maintenance technicians. Please also refer to other parts of the mounting, installation operation and maintenance instructions.

Storage

Hygienic air handling units must be stored and installed indoors, never outdoors.

Hygienic air handling units must be stored indoors, never outdoors.

Dust-free, clean and dry conditions must be ensured during storage (on boards, if necessary, with the components being covered by water-resistant covering).

Prior to installation, components shall be checked for coarse contamination and any such contamination found shall be removed.

Do not unwrap the hygienic air handling units outdoors or in a dirty environment.

General

Only competent personnel under a qualified supervisor must carry out maintenance, repairs cleaning or modifications.

The elements of the air handling unit are accessible upstream and downstream for cleaning purpose, but it is recommended to have them easily and safely removable; this shall be taken into account when making modifications on the fittings for pipes and ducts.

Do not open any access panels or touch electrical components while voltage is applied unless it is necessary for measurements, tests or adjustments. Only a qualified electrician equipped with the proper tools, and wearing appropriate body protection against electrical hazards should carry out such work. Before removing any panels from the enclosure, or dismantling any part of the unit, isolate from the main electrical power supply. Lock the isolator in the 'OFF' position and remove the fuses. Attach a label to

the isolator switch carrying the warning 'WORKING PROGRESS – DO NOT APPLY VOLTAGE'. Do not switch on electrical power or attempt to start the unit if a warning label is attached.

When handling, operating or carrying out maintenance on the unit, personnel must use safe engineering practices and observe all relevant local health and safety requirements and regulations.

When air handling unit (AHU) products are installed over doorways or within the ceiling framework, most maintenance or repair work will be carried out at heights in excess of 2 metres. Suitable precautions should be taken to ensure that any access equipment used, ladders, towers, etc., are isolated from passing human traffic by the use of an appropriate barrier/notice system. Any barriers used should be positioned at a suitable distance to remove risk of injury to passing personnel from dropped tools/components.

All equipment used to gain access to work at height must be properly secured, and manned by sufficient support staff to meet National/Local safety regulations.

Attention should be paid to the weight of units or individual components, particularly when being removed from the original installed location. Suitable lifting equipment, including slings, straps, hooks, etc, should be used as appropriate.

Cleaning

The elements of the air handling unit are accessible upstream and downstream for cleaning purpose but if the internal AHU functions have to be taken out for cleaning or maintenance purposes, where access is gained via removable panels, each enclosure panel can simply be removed from the outside to ensure complete and easy access to components, however, care should be taken to ensure the panel can be adequately supported when removed, particularly when working at height.

Doors must be opened only by authorized persons. Prior to the commencement of any cleaning work, the HVAC system cleaning technicians shall perform a visual inspection of the AHU to determine if there are any extra ordinary foreign objects that disturb AHU components and try to find the reasons. If damaged system components are found during the inspection they shall be documented and brought to the attention of the manufacturer. If replacement parts are needed, use only genuine Carrier spare parts.

Replace missing or damaged fasteners and gaskets as required (sized to suit).

Air-Volume Control Devices (dampers and any air-directional mechanical devices) of the AHU must have their position marked prior to cleaning, so that, upon completion, they can be restored to their marked position.

Mechanical Cleaning

AHU shall be cleaned using source removal mechanical cleaning methods designed to extract contaminants from within the HVAC system and safely remove contaminants from the facility. No cleaning method, or combination of methods, shall be used which could potentially damage components of the AHU or negatively alter the integrity of the system.

Mechanical cleaning may employ;

- vacuum units
- mechanical and hand brushes
- pressurized air sources
- pressurized water sources
- steam
- other tools

to dislodge attached particulate and debris and convey it to a collection device in a controlled manner.

Cleaning the heating and cooling functions first, is advised since you can use pressurised air or water for cleaning the coils. Do not use pressurized air for cleaning of foreign objects from other functions (other than heating and cooling coils) since the air may take the foreign objects to other parts of the air handling unit. Instead, use a vacuum cleaner to clean the unit of foreign objects.

All methods used shall incorporate the use of vacuum collection devices that are operated continuously during cleaning. The vacuum collection device must be of sufficient power to render all areas being cleaned under negative pressure, such that containment of debris and the protection of the indoor environment is assured.

All vacuum devices exhausting air inside the building shall be equipped with HEPA filters (minimum efficiency), including hand-held vacuums and wet-vacuums.

All vacuum devices exhausting air outside the facility shall be equipped with Particulate Collection including adequate filtration to contain Debris removed from the HVAC system. Such devices shall exhaust in a manner that will not allow contaminants to re-enter the facility. Release of debris outdoors must not violate any outdoor environmental standards, codes or regulations.

Clean all internal surfaces and components. Remove visible surface contaminants and deposits from within the AHU.

You can also wash the internal parts of the air handling unit (excluding filters, electrical components).

Washing operation clean condensate collectors and drains. Assure that a suitable operative drainage system is in place prior to beginning wash down operations. A direct connection of the hygienic ahu water drains to the sewage system is not permitted. The water in the syphon should not freeze at any condition. A non-return mechanism should be installed to ensure that during all operating cycles as well as

during stoppage no contaminants of any kind can be transferred from the condensate drain to the inlet air flow.

Do not use any flammable liquid to clean any part of the unit. If chlorinated hydrocarbon non-flammable fluids are used for cleaning, safety precautions must be taken against any toxic vapours that may be released.

External panels and grilles where fitted, should be cleaned with hot soapy water and a soft cloth from both inner and outer sides. As the paint finish is to be maintained, avoid the use of abrasives or strong detergents.

You can do a preliminary wipe down using a 10:1 solution of deionized water and isopropyl alcohol. Do not use this solution on plastic.

Door seals should be inspected and replaced if necessary.

If, because of any reason, the sealing materials used in AHU have to be changed, they shall be closed-pored; they shall not absorb any humidity or release any odours and, in particular, must not provide a nutrient substrate for microorganisms.

Plastic materials used in air-handling areas where high values of relative humidity, or large quantities of water, are inherent in the intended use, must not provide a nutrient substrate for microorganisms (proof to be established in accordance with EN 846).

Wiring:

Check the unit for loose connections or frayed wiring. Clean and tighten all connections and repair or renew all frayed or damaged wires and cables. Take care not to damage the wiring when working on the unit. When refitting wires and cables make sure they will not be damaged in service by chafing or by contact

with a hot surface. Always refer to the appropriate wiring diagram when refitting any components previously removed or renewed.

Don't spill cleaning materials over the motor and wiring.

Dampers:

Automatic close-down of dampers even, if the auxiliary power is cut off, is required.

Heating Coil:

High operating temperatures are attained by electric heating elements or hot water coils during normal operation. Ensure all electric heating elements or hot water coils have cooled sufficiently to allow safe handling for cleaning purposes.

Clean all coils and related components, including fins.

Particular care should be taken to avoid damaging the heating elements/coil fins. Cleaning methods shall not cause any appreciable damage to, displacement of, inhibit heat transfer, or erosion of the coil surface or fins.

Coils shall be thoroughly rinsed with clean water to remove any latent residues.

Verification of Coil Cleaning:

Cleaning must restore the coil pressure drop to within 10 percent of the pressure drop measured when the coil was first installed. If the original pressure drop is not known, the coil may be considered clean only if the coil is free of foreign matter and chemical residue, based on a thorough visual inspection.

Cooling Coil:

Clean all coils and related components, including evaporator fins including drain tubes and drip pans. Particular care should be taken to avoid damaging the cooling elements/coil fins. Cleaning methods shall not cause any appreciable damage to, displacement of, inhibit heat transfer, or erosion of the coil surface or fins. Coils shall be thoroughly rinsed with clean water to remove any latent residues.

The water in the syphon should not freeze at any condition.

A non-return mechanism should be installed to ensure that during all operating cycles as well as during stoppage no contaminants of any kind can be transferred from the condensate drain to the inlet air flow.

Verification of Coil Cleaning : Cleaning must restore

the coil pressure drop to within 10 percent of the pressure drop measured when the coil was first installed. If the original pressure drop is not known, the coil may be considered clean only if the coil is free of foreign matter and chemical residue, based on a thorough visual inspection.

Filters:

Check filters on a regular basis. Don't leave dirty filters in units without replacement. (Prolonged operation with restricted airflow through dirty filters can have a detrimental effect on the heating and cooling outputs, as well as putting unnecessary strain on the motor or motors resulting in reduced component life). Filters shall be changed only by the filters properties of which are in accordance with the filter stickers on the doors of the filter functions.

Filters of the hygienic AHUs are 'throwaway' type and are not to be cleaned by washing. Light dust deposits on the filter frames can be removed by the careful use of a soft brush and vacuum cleaner. Then filter frame can be washed or may be cleaned with hot soapy water and a soft cloth.

Humidifiers:

The upper limit value for non-pathogenic bacteria for humidifier water is 10000 cfu x ml⁻¹. However, from a bacteria content of 1 000 cfu x ml⁻¹ (cfu:colony forming unit) onwards in the humidifier water, the plant should be checked and cleaned. National authorities can specify additional requirements to these default values. A person responsible for the maintenance and inspection of the humidification plants should be appointed. All measures taken shall be recorded. Steam should not contain any substances representing a health hazard. For that reason, the steam humidifiers may only be operated with water of at least drinking water quality and that any flow-back to the drinking water must be excluded.

During operation no condensate shall develop in the fresh air volume flow behind the air humidifier. This requirement must also be met in the event of an AHU failure or when there is no or only insufficient supply air volume flow.

Disinfectants can be used during cleaning after all the accumulated dirt has been removed, however, disinfectants shall not get into the room air through the humidification process.

Steam humidification is recommended, however if evaporative humidifier is used, sufficient overflow shall be arranged. Ultraviolet treatment and regular flushing are recommended.

Fans:

Fans and blowers shall be thoroughly cleaned. Areas to be cleaned include blowers, fan housings, plenums (except ceiling supply and return plenums), scrolls, blades, or vanes, shafts, baffles, dampers and drive assemblies. All visible surface contamination deposits shall be removed.

Fans, motors, electrical components, and internal casing should be cleaned with the use of a soft brush, e.g. paintbrush, and vacuum cleaner. Brush out dirt and dust etc. from the motor, fan impeller, fan casing and shafts.

Use a vacuum cleaner and brush to remove dust from the motor ventilation holes to ensure that motor cooling is maintained at maximum efficiency. Don't use cleaning materials over the motor and wiring.

Belts should be checked for wear and tension and should be adjusted or replaced if necessary.

Air Diffusers:

Air diffusers may be cleaned with hot soapy water and a soft cloth.

Attenuators:

If there is any evidence of damage, deterioration, delamination, friable material, mold or fungus growth, or moisture such that fibrous glass materials cannot be restored by cleaning or resurfacing with an acceptable insulation repair coating, they shall be identified for replacement.

If you need to take one of the attenuators

- a. Pull out the striping on the panel-profile cross section part.
- b. Take the panel out.
- c. Take the screws on the profiles which are fixing the attenuators out
- d. Take the attenuators out

Cleanliness Verification:

Following cleaning, a visual inspection of interior surfaces, shall be performed to verify the surfaces are visibly clean and free from non-adhered substances and debris.

Verification of cleanliness will be determined after mechanical cleaning and before the application of any treatment or introduction of any treatment-related substance to the AHU, including biocidal agents and coatings.

Visual Inspection: The AHU shall be inspected visually to ensure that no visible contaminants are left.

1. If no contaminants are evident through visual inspection, AHU shall be considered clean; however, cleanliness of the AHU can be verified through gravimetric or wipe testing analysis etc.
2. If visible contaminants are evident through visual inspection, those portions of the AHU where contaminants are visible shall be re-cleaned and subjected to re-inspection for cleanliness.

Biocidal Agents and Coatings

1. Biocides can only be used if, under no circumstances, they are detrimental to the health of the occupants in the areas served by the air handling unit.
2. Biocidal agents shall only be applied if active fungal growth is reasonably suspected, or where unacceptable levels of fungal contamination have been verified through testing.
3. Application of any biocidal agents used to control the growth of fungal or bacteriological contaminants shall be performed after the removal of surface deposits and debris.
4. Biocidal agents shall be applied in strict accordance with manufacturer's instructions.
5. Biocidal coating products for both porous and non-porous surfaces shall be water soluble solutions with supporting efficiency data and MSDS records.
6. Biocidal coatings shall be applied according to manufacturer's instructions. Coatings shall be sprayed directly onto interior surfaces, rather than "fogged" downstream onto surfaces. A continuous film must be achieved on the surface to be treated by the coating application. Application of any biocidal coatings shall be in strict accordance with manufacturer's minimum millage surface application rate standards for effectiveness.

Upon cleaning completion, all components must be returned to those settings recorded just prior to cleaning operations.

Air-Volume Control Devices (dampers and any air-directional mechanical devices) of the AHU, upon completion, must be restored to their marked position prior to cleaning.

12.18 Disposal of Unit

Switching the Unit Off:

Turn off power supply of the unit. Wait until unit is discharged mechanically and electrically.

Dismantling the Unit:

Dismantling works should be done by competent persons.

Use original lifting equipment and proper lifting points.

Components should be classified according to their material types and recycled or disposed according to local regulations.

Recyclable Materials:

Galvanized Metal Plates, Stainless Steel, Copper, Aluminium, Plastic, Fibreglass, Rockwool Parts, Electrical components.

Recyclable Fluids:

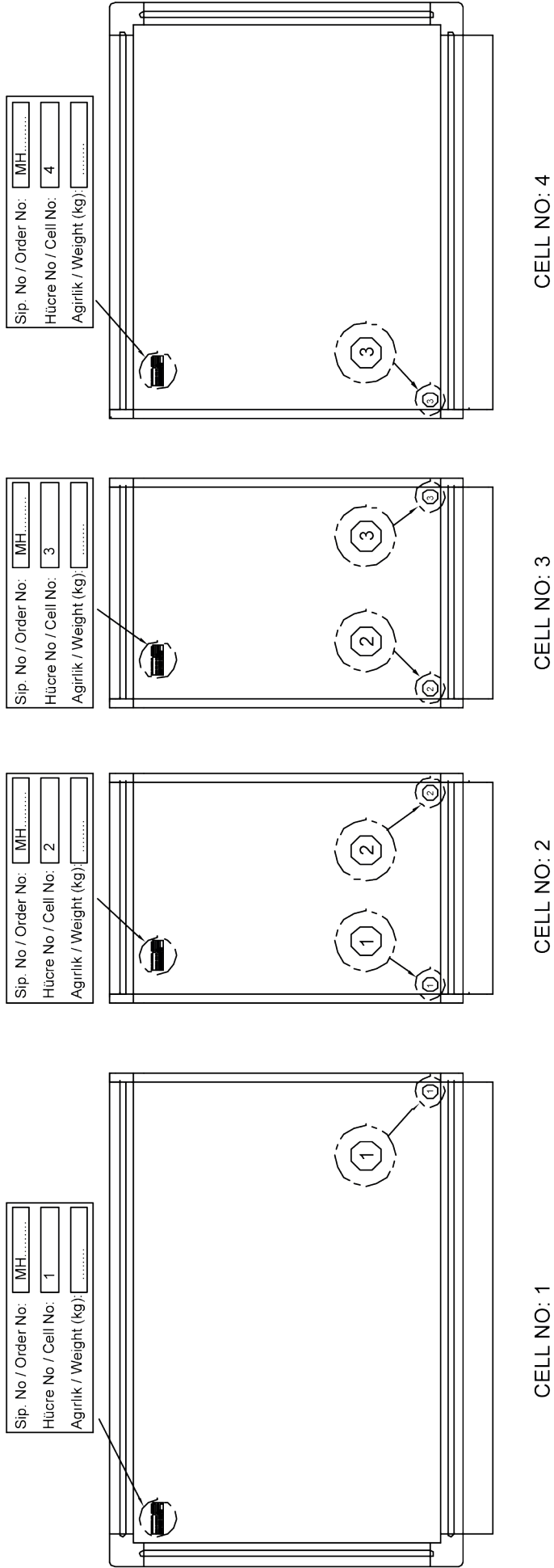
Basic fluids, refrigerants, compressor oil.

Recycling of fluids should be done according to local regulations.

Disposal of Electrical and Electronic Equipment

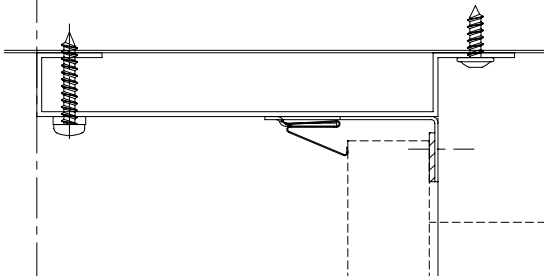
Electronic components should be dismantled by competent persons and recycled according to local regulations.

APPENDIX-1 CELL INFO AND CONNECTION ORDER

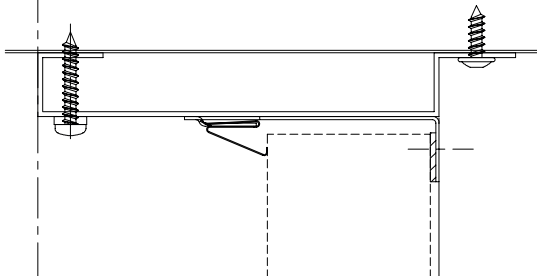


APPENDIX-2 FRONT WITHDRAWAL FILTER DETAIL

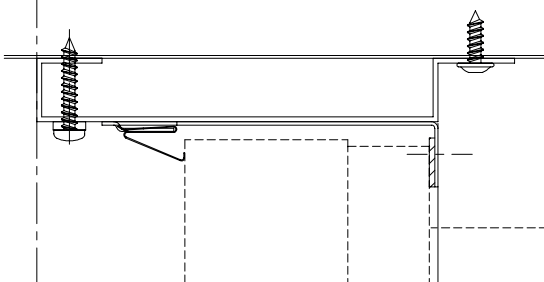
BAG FILTER



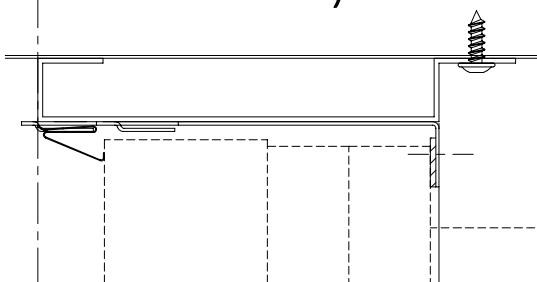
CASSETTE FILTER B=48mm



BAG + CASSETTE FILTER

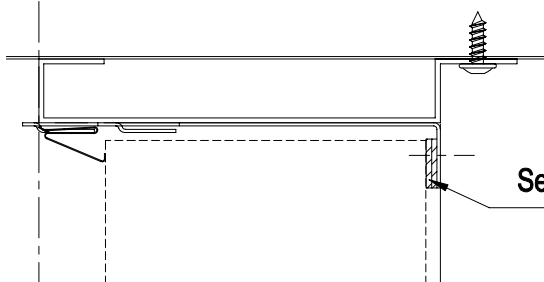


BAG + CASSETTE FILTER (WHEN FILTER PRESSURE DIFFERENTIAL IS MEASURED)



25 *

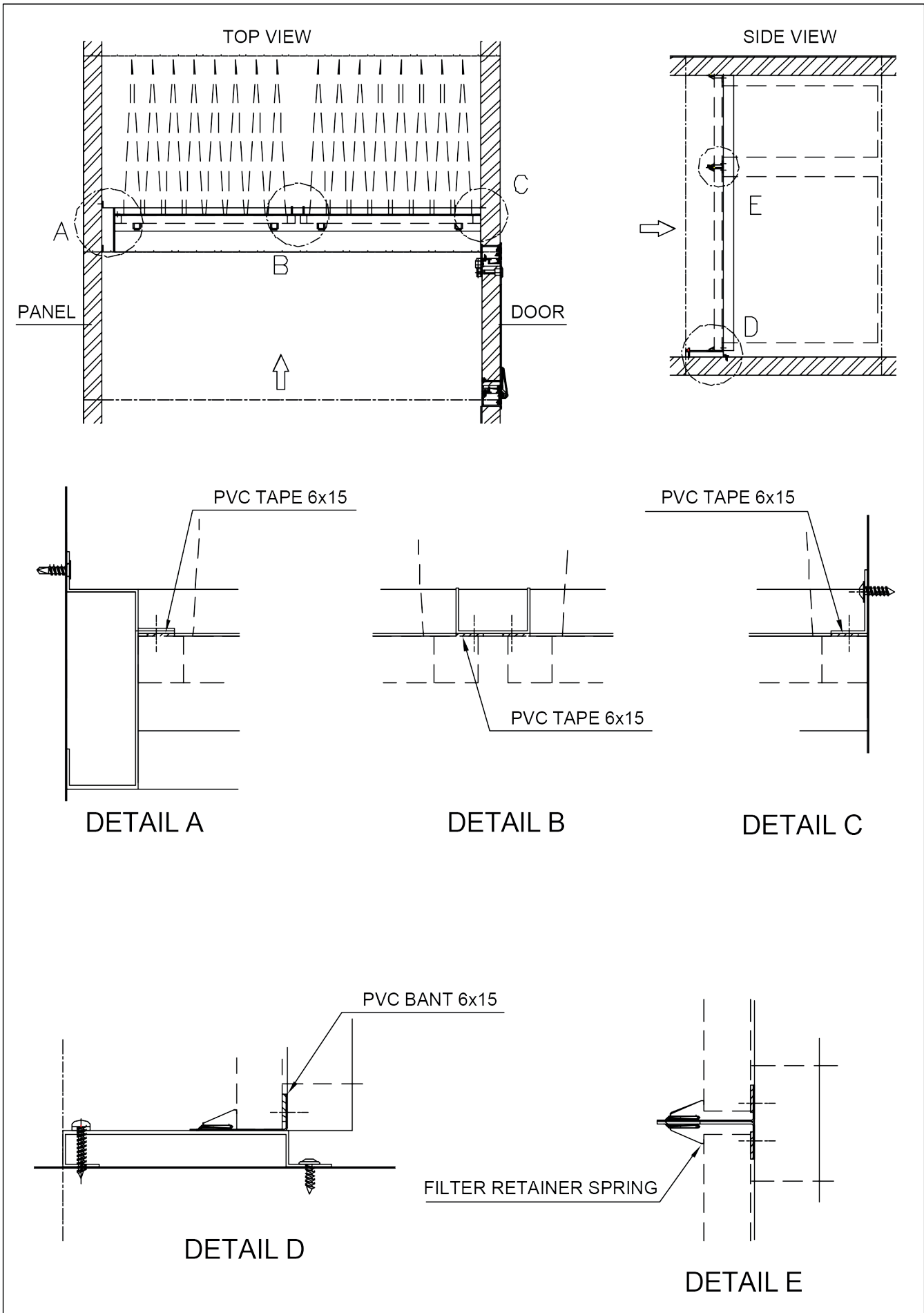
CASSETTE FILTER B=95mm



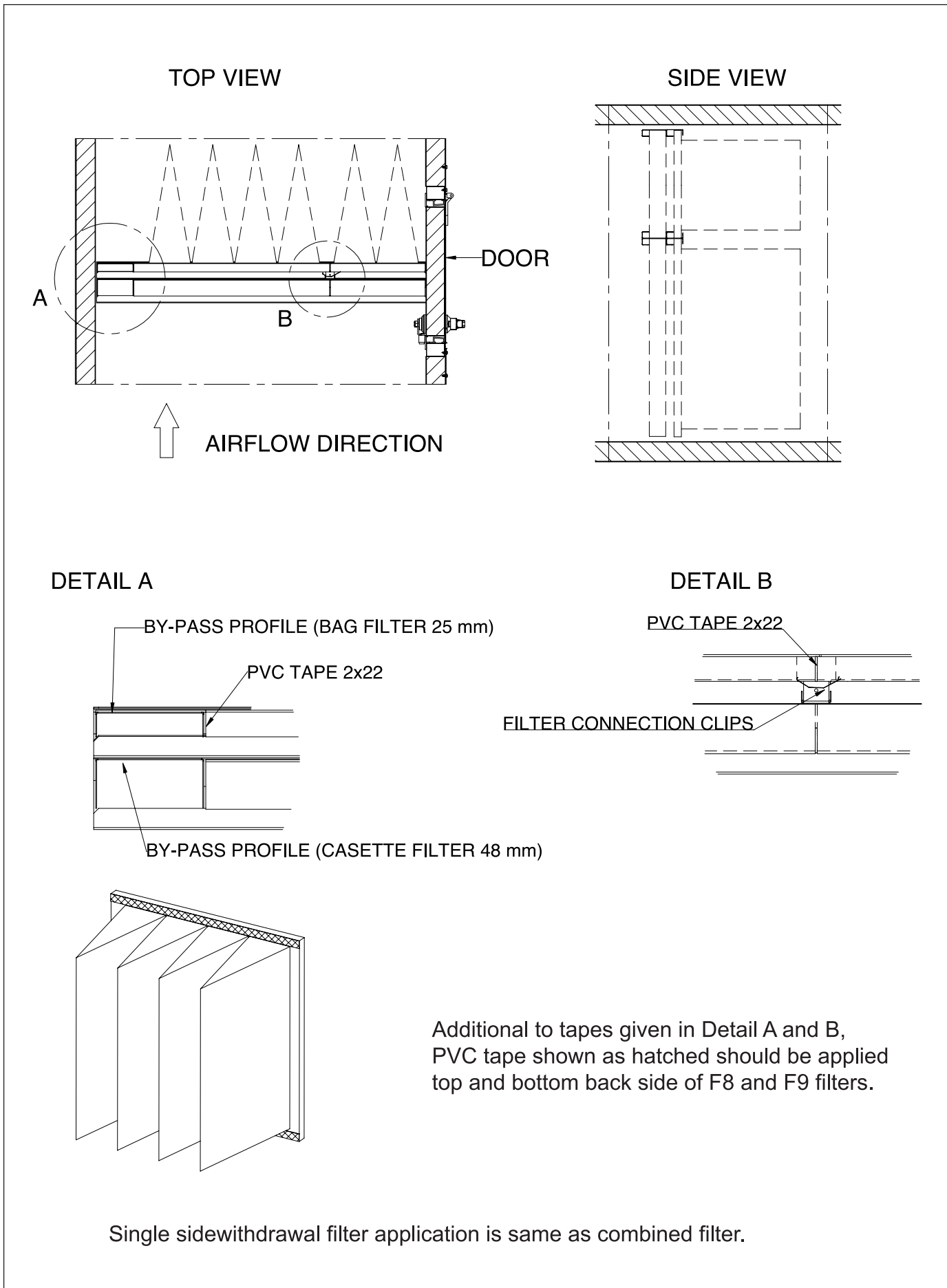
Sealant Tape 6x20 (2)

Note: Leave space at places shown with (*) and for distance measurement point.

APPENDIX-2 FRONT WITHDRAWAL BAG FILTER INSTALLATION



APPENDIX-2 SIDE WITHDRAWAL COMBINED FILTER INSTALLATION



APPENDIX-3/3 Pleated Filter

RIGID FILTER DIMENSIONS AND QUANTITY

Unit	W	H	287x592	490x592	592x592	W	H	287x592	490x592	592x592	W	H	287x592	490x592	592x592
39HQ	4	2	1	-	-	13	10	3	-	6	20	8	-	-	10
39HQ	4	4	-	-	1	13	12	-	-	9	20	10	5	-	10
39HQ	4	6	1	-	1	13	14	3	-	9	20	12	-	-	15
39HQ	5	2	1	-	-	13	16	-	-	12	20	14	5	-	15
39HQ	5	4	-	-	1	14	6	4	-	3	20	16	-	-	20
39HQ	5	6	1	-	1	14	8	2	-	6	20	18	5	-	20
39HQ	5	8	-	-	2	14	10	5	-	6	20	20	-	-	25
39HQ	6	2	1	-	-	14	12	3	-	9	21	8	2	-	10
39HQ	6	4	1	-	1	14	14	6	-	9	21	10	7	-	10
39HQ	6	6	2	-	1	14	16	4	-	12	21	12	3	-	15
39HQ	6	8	2	-	2	15	6	3	1	3	21	14	8	-	15
39HQ	7	4	1	-	1	15	8	-	2	6	21	16	4	-	20
39HQ	7	6	2	-	1	15	10	3	2	6	21	18	9	-	20
39HQ	7	8	2	-	2	15	12	-	3	9	21	20	5	-	25
39HQ	8	4	-	-	2	15	14	3	3	9	22	8	2	-	10
39HQ	8	6	2	-	2	15	16	-	4	12	22	10	7	-	10
39HQ	8	8	-	-	4	16	6	4	-	4	22	12	3	-	15
39HQ	8	10	2	-	4	16	8	-	-	8	22	14	8	-	15
39HQ	9	4	-	-	2	16	10	4	-	8	22	16	4	-	20
39HQ	9	6	2	-	2	16	12	-	-	12	22	18	9	-	20
39HQ	9	8	-	-	4	16	14	4	-	12	22	20	5	-	25
39HQ	9	10	2	-	4	16	16	-	-	16	23	8	-	-	12
39HQ	9	12	-	-	6	17	6	4	-	4	23	10	6	-	12
39HQ	10	4	1	-	2	17	8	-	-	8	23	12	-	-	18
39HQ	10	6	3	-	2	17	10	4	-	8	23	14	6	-	18
39HQ	10	8	2	-	4	17	12	-	-	12	23	16	-	-	24
39HQ	10	10	4	-	4	17	14	4	-	12	23	18	6	-	24
39HQ	10	12	3	-	6	17	16	-	-	16	23	20	-	-	30
39HQ	11	4	-	1	2	18	6	5	-	4	24	8	-	-	12
39HQ	11	6	2	1	2	18	8	2	-	8	24	10	6	-	12
39HQ	11	8	-	2	4	18	10	6	-	8	24	12	-	-	18
39HQ	11	10	2	2	4	18	12	3	-	12	24	14	6	-	18
39HQ	11	12	-	3	6	18	14	7	-	12	24	16	-	-	24
39HQ	12	4	-	-	3	18	16	4	-	16	24	18	6	-	24
39HQ	12	6	3	-	3	18	18	8	-	16	24	20	-	-	30
39HQ	12	8	-	-	6	19	8	-	2	8	25	10	8	-	12
39HQ	12	10	3	-	6	19	10	4	2	8	25	12	3	-	18
39HQ	12	12	-	-	9	19	12	-	3	12	25	14	9	-	18
39HQ	12	14	3	-	9	19	14	4	3	12	25	16	4	-	24
39HQ	13	6	3	-	3	19	16	-	4	16	25	18	10	-	24
39HQ	13	8	-	-	6	19	18	4	4	16	25	20	5	-	30

ANNEX-4 Quantities of Section Joining Part

Quantities are per section. If no need for section joining part, it is denoted as "0".

W (MODULE)	H (MODULE)	PART QUAN. IN W MODULE	PART QUAN. IN H MODULE
4	2	2	0
4	3	2	0
4	4	2	0
4	5	2	0
4	6	2	0
5	2	2	0
5	3	2	0
5	4	2	0
5	5	2	0
5	6	2	0
5	8	0	2
6	2	2	0
6	3	2	0
6	4	2	0
6	5	2	0
6	6	2	0
6	8	0	2
7	4	2	0
7	5	2	0
7	6	2	0
7	8	0	2
8	4	2	0
8	5	2	0
8	6	2	0
8	8	2	2
8	10	2	2
9	4	2	0
9	5	2	0
9	6	2	0
9	8	2	2
9	10	2	2
9	12	2	2
10	4	2	0
10	5	2	0
10	6	2	0
10	8	2	2
10	10	2	2
10	12	2	2

W (MODULE)	H (MODULE)	PART QUAN. IN W MODULE	PART QUAN. IN H MODULE
11	4	2	0
11	5	2	0
11	6	2	0
11	8	2	2
11	10	2	2
11	12	2	2
12	4	2	0
12	5	2	0
12	6	2	0
12	8	2	2
12	10	2	2
12	12	2	2
12	14	2	2
13	6	2	0
13	8	2	2
13	10	2	2
13	12	2	2
13	14	2	2
13	16	2	4
14	6	2	0
14	8	2	2
14	10	2	2
14	12	2	2
14	14	2	2
14	16	2	4
15	6	2	0
15	8	2	2
15	10	2	2
15	12	2	2
15	14	2	2
15	16	2	4
16	6	4	0
16	8	4	2
16	10	4	2
16	12	4	2
16	14	4	2
16	16	4	4

W (MODULE)	H (MODULE)	PART QUAN. IN W MODULE	PART QUAN. IN H MODULE
17	6	4	0
17	8	4	2
17	10	4	2
17	12	4	2
17	14	4	2
17	16	4	4
18	6	4	0
18	8	4	2
18	10	4	2
18	12	4	2
18	14	4	2
18	16	4	4
18	18	4	4
19	8	4	2
19	10	4	2
19	12	4	2
19	14	4	2
19	16	4	4
19	18	4	4
20	8	4	2
20	10	4	2
20	12	4	2
20	14	4	2
20	16	4	4
20	18	4	4
20	20	4	4
21	8	4	2
21	10	4	2
21	12	4	2
21	14	4	2
21	16	4	4
21	18	4	4
21	20	4	4
22	8	4	2
22	10	4	2
22	12	4	2
22	14	4	2
22	16	4	4
22	18	4	4
22	20	4	4

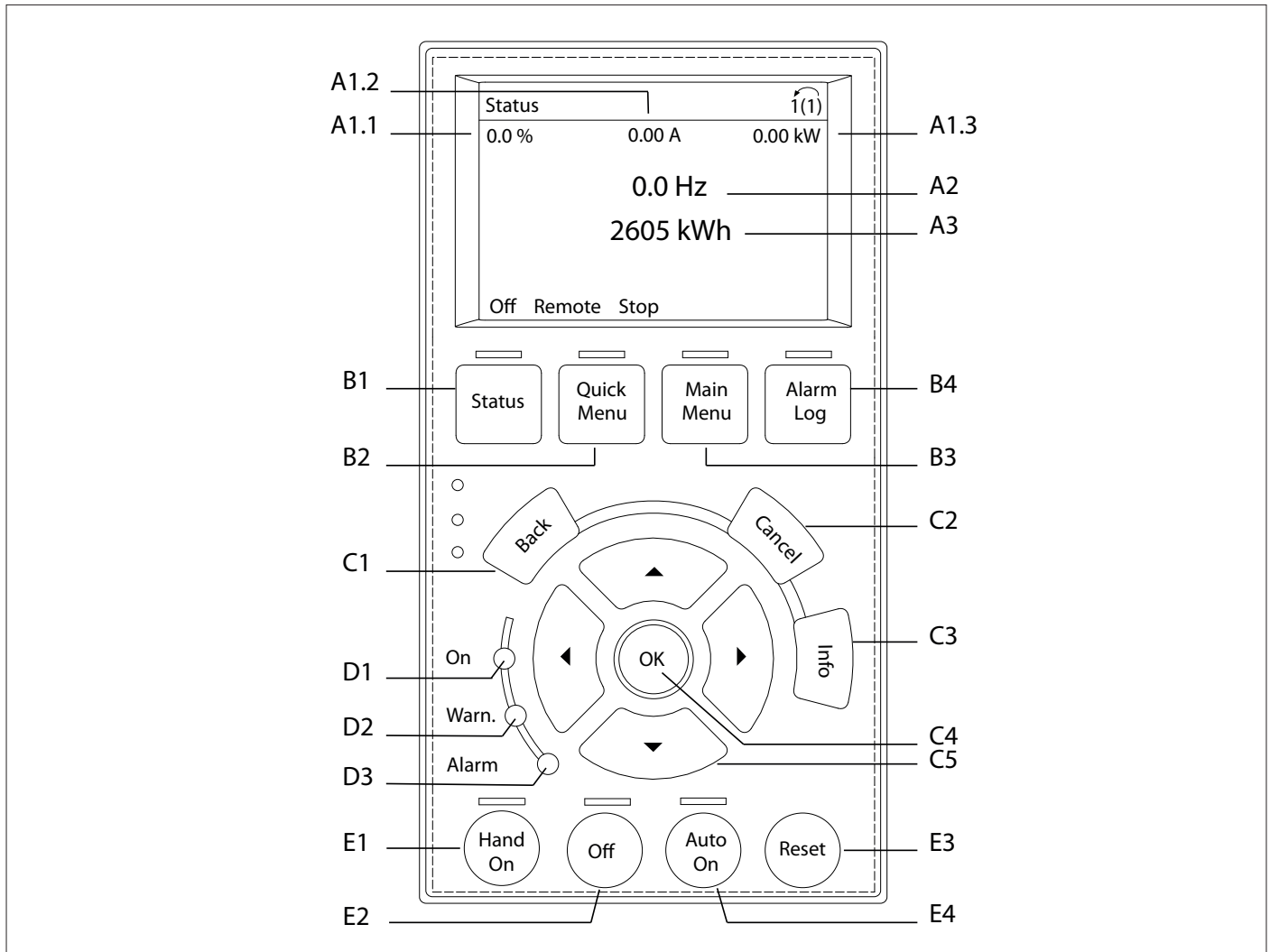
W (MODULE)	H (MODULE)	PART QUAN. IN W MODULE	PART QUAN. IN H MODULE
23	8	4	2
23	10	4	2
23	12	4	2
23	14	4	2
23	16	4	4
23	18	4	4
23	20	4	4
24	8	6	2
24	10	6	2
24	12	6	2
24	14	6	2
24	16	6	4
24	18	6	4
24	20	6	4
25	10	6	2
25	12	6	2
25	14	6	2
25	16	6	4
25	18	6	4
25	20	6	4
26	10	6	2
26	12	6	2
26	14	6	2
26	16	6	4
27	10	6	2
27	12	6	2
27	14	6	2
27	16	6	4
28	10	6	2
28	12	6	2
28	14	6	2
28	16	6	4
29	10	6	2
29	12	6	2
29	14	6	2
29	16	6	4
30	10	6	2
30	12	6	2
30	14	6	2
0	16	6	4

ANNEX -5 Frequency Inverter Control

Driver: It is a speed control device that can adjust the speed of the alternating current motor from zero to the desired value and in a desired time with a high starting torque. Depending on the capacity needs of the fans, it may be desired to drive the fans at values other than 50Hz, which is the network frequency. These controls can be provided with external signals such as 4-20mA and 0-10V. EC fans can be controlled with the help of the on-board driver, without the need for an additional driver.

DRIVER PARTS

Local Control Panel (LCP):

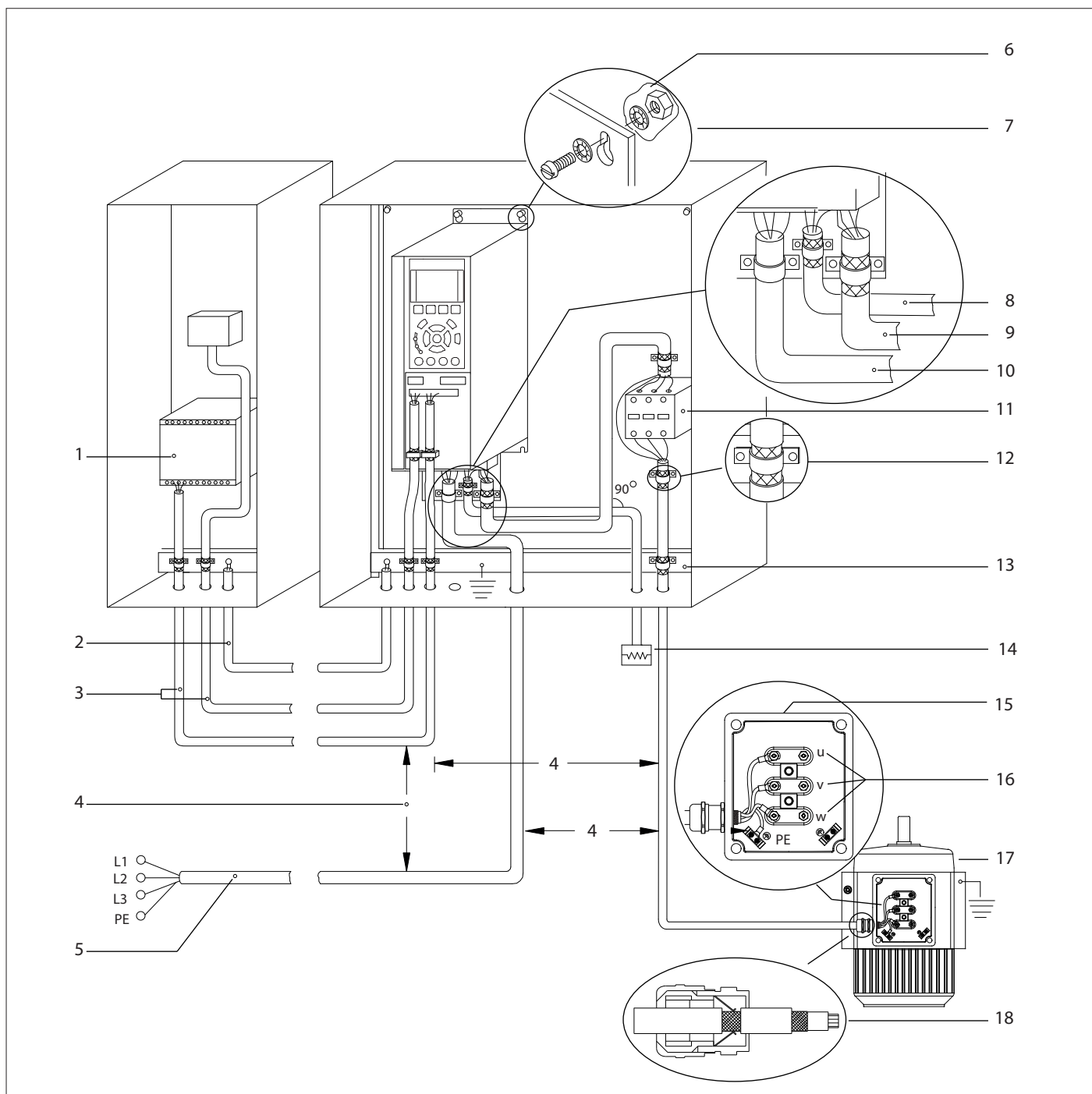


The local control panel (LCP) is the display and keypad combination on the front of the driver.

LCP is used for:

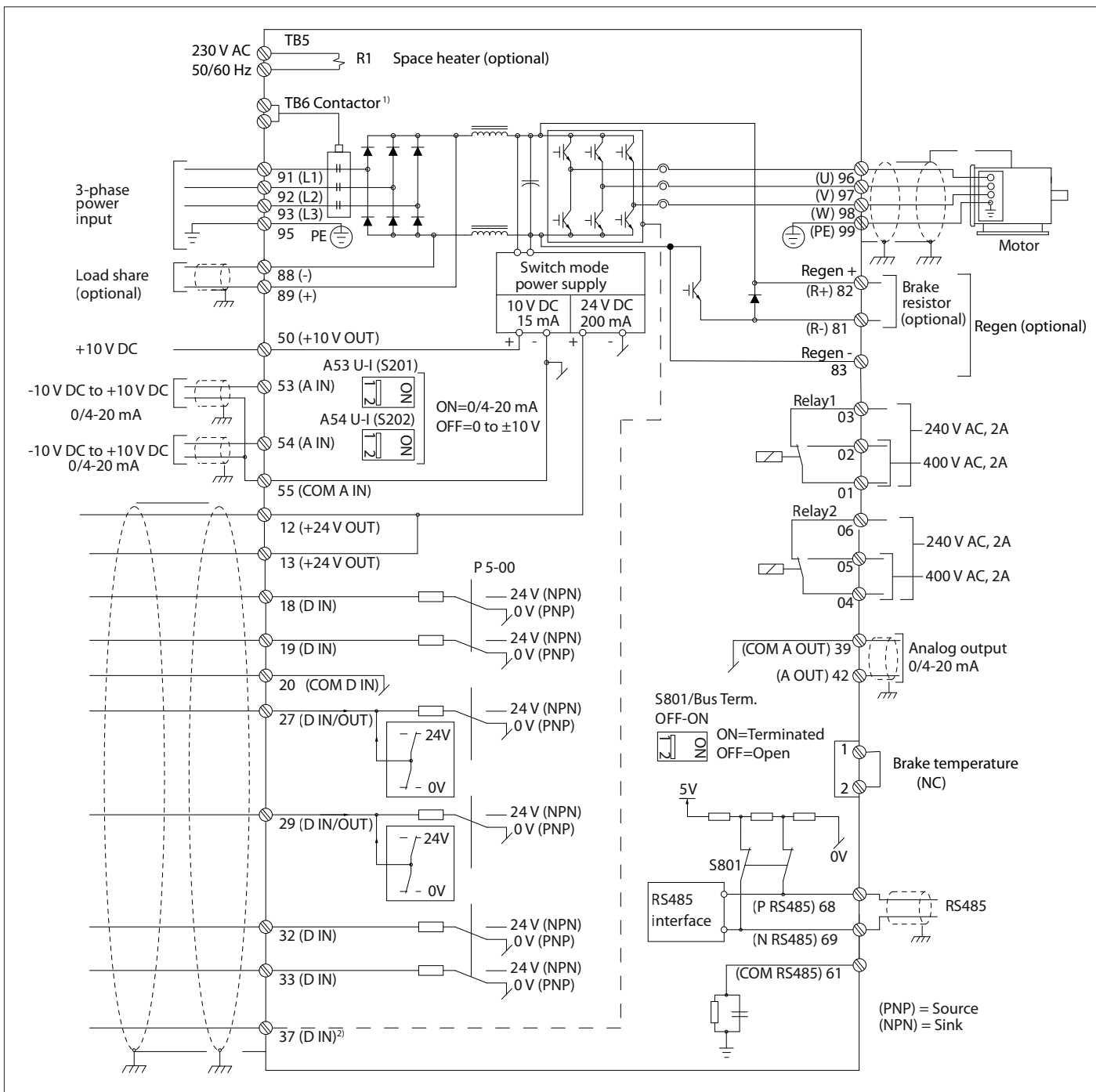
- Controlling the drive and motor.
- Accessing drive parameters and programming the drive.
- View operating data, drive status and warning phrases.

The numerical local control panel (NLCP) is available as an option. NLCP works similarly to LCP, but there are differences between them.

Electrical Connections:

1	PLC	6	Shielded cable
2	Frequency converter	7	Motor, 3-phase and PE
3	Output contactor	S	Mains, 3-phase and reinforced PE
4	Grounding rail (PE)	9	Control wiring
5	Cable insulation (stripped)	10	Equalising min. 16 mm ² (0.025 in)

Cable Connections:



A=Analog, D=Dijital

1) Terminal 37 is for: Safe Torque Off.

Motor Connection Details:

INDUCED VOLTAGE

Induced voltage from the output motor cable run together can charge hardware capacitors even when the equipment is turned off or locked out. Failure to run output motor cables separately Failure to use shielded cables may result in death or serious injury.

- Follow local and national regulations regarding cable sizes.
- Follow the motor manufacturer's wiring requirements. Follow the motor manufacturer's wiring requirements.
- The protruding parts of the motor cables or access panels are provided in the feet of the IP21 / IP54 (Type 1 / Type 12) units.
- Do not connect a starting or pole-changing device (eg. Dahlander motor or slip ring induction motor) between the drive and the motor.

PROCEDURE

1. Strip a section of the outer cable insulation.
2. Position the stripped wire under the cable clamp to establish mechanical fixation and electrical contact between cable shield and ground.
3. Connect ground wire to the nearest grounding terminal in accordance with grounding instructions.
4. Connect the 3-phase motor wiring to terminals 96 (U), 97 (V), and 98 (W).
5. Tighten terminals in accordance with the information provided in 8.7 Connection Tightening Torques.

AC MAINS CONNECTION

- Size wiring based upon the input current of the frequency converter.
- Comply with local and national electrical codes for cable sizes.

PROCEDURE

1. Connect 3-phase AC input power wiring to terminals L1, L2, and L3 (see Illustration 4.9).
2. Depending on the configuration of the equipment, input power will be connected to the mains input terminals or the input disconnect.
3. Ground the cable in accordance with grounding instructions provided in 4.3 Grounding.
4. When supplied from an isolated mains source (IT

mains or floating delta) or TT/TN-S mains with a grounded leg (grounded delta), ensure that 14-50 RFI Filter is set to OFF to avoid damage to the intermediate circuit and to reduce earth capacity currents in accordance with IEC 61800-3.



CAUTION

POTENTIAL HAZARD IN THE EVENT OF INTERNAL FAILURE!

Risk of personal injury when the frequency converter is not properly closed. Before applying power ensure all safety covers are in place and securely fastened.

NOTICE

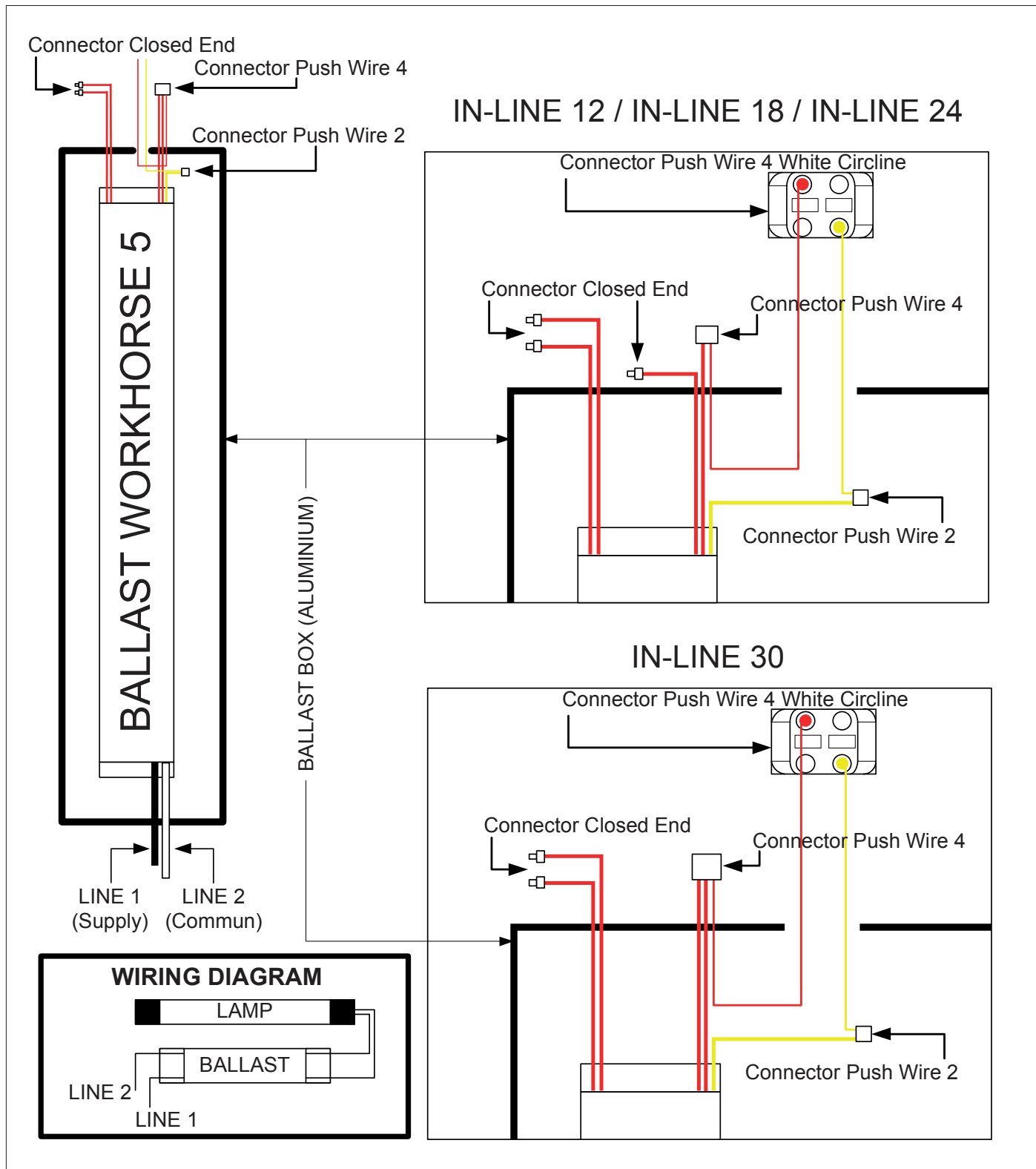
EMC INTERFERENCE!

Use separated shielded cables for input power, motor wiring and control wiring, or run cables in 3 separate metallic conduits. Failure to isolate power, motor and control wiring can result in unintended behaviour or reduced performance. Minimum 200 mm (7.9 in) clearance between control cables, motor and mains.

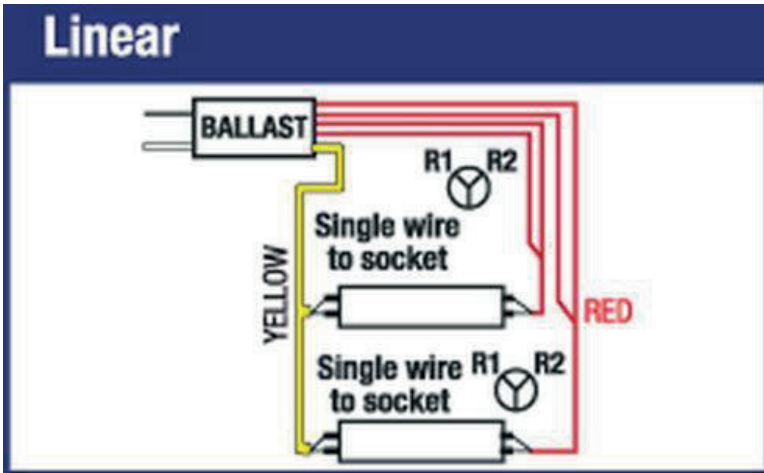
For more information, please review the FC 102 series Danfoss Frequency Converter document.

ANNEX -6 UV Light Wiring Diagram

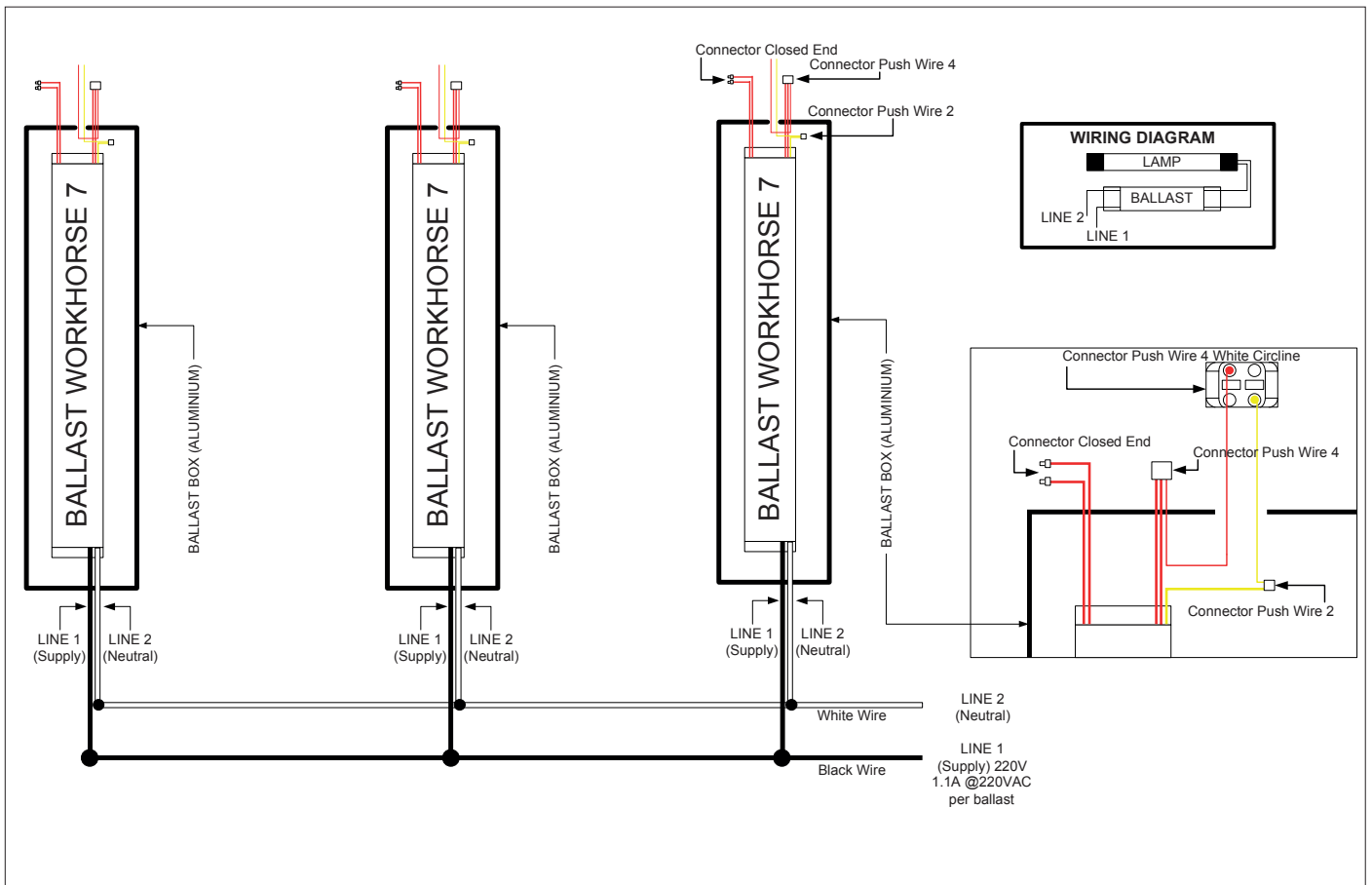
Single Lamp Diagram



Multiple Connection to Ballast



Multiple Lamp Diagram





ALARKO



ALARKO CARRIER
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