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Abbreviations

  AHU - Air handling unit
  PED - Pressure Equipment Directive
  SUP - Supply air
  ETA - Extract air
  BMS - Building management system
  HMI - Human machine interface
  ODA - Outdoor air
  EHA - Exhaust air
  rh - Relative humidity
1 - SAFETY CONSIDERATIONS

1.1 - General

Air Handling unit (AHU) is a device used to regulate and circulate air as part of a heating, ventilating, and air-conditioning (HVAC) system. So it can not be used for different purposes. The 39SQ air handling units (AHUs) has been designed and manufactured in accordance with the CE machine directive. 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 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.

All work must be carried out by sufficiently trained personnel.

All applicable personal safety devices must be used to ensure safe working conditions. Safety gloves, glasses and shoes must be worn for all maintenance operations. A respiratory protection mask must be worn when changing the filters. This pictogram shows the safety requirements for all maintenance operations.

The technical staff should be use the most suitable lightning for maintenance and startup. The unit should be lighted according to EN12100.

The A weighted equivalent continuous sound pressure level is between 70 and 85 dB(A), depending on the motor size, fan size and fan speed. This means that ear defenders must be worn, when the fan is running.

All doors and hatches must have at least one lock that can only be opened with a special device.

Heating and cooling coils are manufactured and supplied in accordance with guidelines of the Pressure Equipment Directive (PED).

Do not walk on the roof panels of units installed inside or outside.

Technical staff who is responsible for startup and maintenance, has to take occupational health and safety trainings according to the relevant national laws and obligations. Only technical staff who fits this definition is allowed to work on (electrical) components. All power supplies to the unit must be disconnected, before any work can be carried out.

Switch off the supply voltage using the main disconnect switch /emergency stop switch.

**CAUTION: Electric heaters have a separate supply and must be switched off separately.**
Central data
This label contains the data for the AHU, such as order number, position number etc. If present, the label is normally located on the access cover or the door of the fan assembly.

*If the AHU consists of several parts, each part must have a label with the required data.*

<table>
<thead>
<tr>
<th>AIR HANDLING UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td><strong>Order No / Sera: Nc</strong></td>
</tr>
<tr>
<td><strong>Location</strong></td>
</tr>
<tr>
<td><strong>Air Volume (m³/s)/Tot.Stra./Pres.(Pa)</strong></td>
</tr>
<tr>
<td><strong>Production Date</strong></td>
</tr>
</tbody>
</table>

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.

**Central data**
This label contains the data for the AHU, such as order number, position number etc. If present, the label is normally located on the access cover or the door of the fan assembly.

*If the AHU consists of several parts, each part must have a label with the required data.*

<table>
<thead>
<tr>
<th>AIR HANDLING UNIT</th>
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</thead>
<tbody>
<tr>
<td><strong>Type</strong></td>
</tr>
<tr>
<td><strong>Order No / Sera: Nc</strong></td>
</tr>
<tr>
<td><strong>Location</strong></td>
</tr>
<tr>
<td><strong>Air Volume (m³/s)/Tot.Stra./Pres.(Pa)</strong></td>
</tr>
<tr>
<td><strong>Production Date</strong></td>
</tr>
</tbody>
</table>

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

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

Electrical 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 qualified electrician is permitted to carry out work on these components. Do not work on electrical components including control panels, switches, VFD until you are sure ALL POWER IS OFF and no residual voltage can leak from capacitors or solid state components. Lock open and tag electrical circuits during servicing (see annex1 for lock out tag out instructions).

If the operation is interrupted, confirm that all circuits are deenergized before the operation is resumed. For this work the regulations of the applicable international (a.o. IEC 61557, EN 50110 and ES 59009) and national (e.g. BS 7671) standards must be observed. The pictogram is attached to the access cover for the electric heater control box.
Opening the fan door
This pictogram is positioned on the outside of the door or access cover of the fan assembly. This pictogram warns that the fan must have been switched off and deenergised for a minimum of two minutes before the door or access cover is opened. This pictogram also indicates that transport brackets must be removed before the fan is started up. This warning is also important for safety. Because of the positive pressure, fan doors can hit the technical personnel who opens the doors.

CAUTION: All doors and access covers must be closed before starting up the AHU.

Lifting and transport
An instruction is attached to the AHU that describes the procedures that must be followed for lifting and transport. The following chapter contains further details.

1.4 - Disposal of parts/materials
- The packaging material must be disposed of in a responsible manner and in accordance with local regulations.
- Components that are replaced, must be disposed of as described above.

2 - TRANSPORT AND LIFTING INSTRUCTIONS

2.1 - General
Transport and lifting of the AHU must always be in accordance with the instructions below. If these instructions are not observed, the unit may be irreparably damaged, and people in the immediate vicinity of the unit are endangered. Carrier 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 Carrier (box profile 30 x 30 x 4 mm). Lifting must be carried out in accordance with local regulations and with the help of certified lifting aids.

Only one set of lifting bars is supplied per order/position number per unit width (if ordered). These lifting bars are suitable for single use and only for the parts of this order/position number. The lifting bars are certified by an authorised person using a type test.
For offloading as well as hoisting lifting cables can be attached to the lifting bars. Evenly positioned spacer bars should be used between the lifting cables to prevent damage to the top of the unit and ensure that no excess pressure is applied to the side panels. For hoisting please ensure that the weight is evenly distributed. And please use CE marked hooks.

The AHU should not be lifted or moved under the cross beams.

2.4 - Horizontal transport

For horizontal movement pallet lifters or transport skids can be placed under the installation frame or under the lifting bars. It is important that these support the lifting points. At no time should the cross beams at the ends of the unit sections be used for jacking or tracking the AHU. FOR HORIZONTAL TRANSPORT ALWAYS PROVIDE SUPPORT UNDER THE LIFTING POINTS. The use of bars as rollers can result in damage to the installation frame.

2.5 - Storage

The packaging in which the AHU is supplied can cause condensation to be formed between the packaging and the AHU, if the unit is stored in an unconditioned place. Storage temperature will be between –25 to 55 oC according to EN 60204-1. If the AHU is not immediately used it is recommended to store it in a conditioned location on-site. If the AHU is kept outside for a short period direct sun radiation must be avoided.

If the fans are shut down for a longer period (longer than three months) bearing damage can occur. To prevent this it is recommended to loosen the belt tension or to temporarily remove the fan belts. When the fans are re-started the belt tension must be reset to the specified tension. Controlled rotation of the fan impeller can also prevent this type of damage. This is also recommended for direct-drive fans.

2.6 - Placement

The unit have to be placed on a dry floor surface which can handle the weight and do not give permission to slide or vibrate. Anti vibration pads can be used if needed.

2.7 - Schematic diagram of an air handling unit

The two versions of the 39SQ with heat recovery shown here in schematic diagrams with a short description. The drawings in this document are for information only and show the various versions. They do not include possible external sensors or control devices. The air flow direction shown is from LEFT to RIGHT.

The dimensions given in the drawings (H and W) refer to the outside dimensions of the AHU casing (excl. connections and additional components). Dimension W1min is the required service clearance in front of the AHU. W1rec is the recommended service clearance in front of the AHU to replace components.
39SQR with high-efficiency heat recovery wheel
Sizes 0606, 0707, 0808, 0909, 1010, 1111, 1212, 1412 and 1416

Dimensions

<table>
<thead>
<tr>
<th>39SQR</th>
<th>Dimensions in mm</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>H</td>
</tr>
<tr>
<td>0606</td>
<td>1120</td>
</tr>
<tr>
<td>0707</td>
<td>1280</td>
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<tr>
<td>0808</td>
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<tr>
<td>0909</td>
<td>1600</td>
</tr>
<tr>
<td>1010</td>
<td>1760</td>
</tr>
<tr>
<td>1111</td>
<td>1920</td>
</tr>
<tr>
<td>1212</td>
<td>2080</td>
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<tr>
<td>1412</td>
<td>2080</td>
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<tr>
<td>1416</td>
<td>2720</td>
</tr>
</tbody>
</table>

W1 min = minimum service distance
W1 rec = recommended service distance,
Recommended service distance on top of the unit is 1.5 meter.
If the customer doesn’t leave sufficient service distance,
Alarko Carrier does not accept any responsibility about commissioning
or service problems.

Legend
1. Actuator, outdoor air damper
2. Pressure sensor, extract air fan
3. Frequency converter, extract air fan
4. Actuator, recirculation air damper
5. Frequency converter, supply air fan
6. Pressure sensor, supply air fan
7. Actuator, extract and supply air damper (2 x)
8. Main disconnect switch (supply), electric heater
9. Electrical heater switching components
10. Fuses, electric heater
11. Pressure switch, supply air filter
12. Controller, heat recovery wheel
13. Main supply connection, control panel
14. Main disconnect switch / emergency stop switch (excl. electric heater)
15. Connection terminals
16. Pro-Dialog control
17. Reset button
18. Temperature sensor, air intake
19. Temperature sensor, extract air
20. Pressure switch, extract air filter
21. Relay
22. Frost protection thermostat, heating coil
23. Temperature sensor, DX coil inlet
24. Temperature sensor, supply air
39SQP with cross-flow plate heat exchanger
Sizes 0405, 0506, 0606, 0707, 0808, 0909 and 1010

<table>
<thead>
<tr>
<th>39SQP</th>
<th>Dimensions in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>H</td>
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<tr>
<td>0405</td>
<td>960</td>
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<td>0909</td>
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<tr>
<td>1010</td>
<td>1760</td>
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</tbody>
</table>

W1 min = minimum service distance
W1 rec = recommended service distance,
Recommended service distance on top of the unit is 1.5 meter.
If the customer doesn’t leave sufficient service distance,
Alarko Carrier does not accept any responsibility about commissioning
or service problems.

Legend
A. Outdoor air intake damper
B. Extract air damper
C. Electric pre-heater (hot water)
D. Supply air filter
E. Extract air filter
F. Recirculation damper, plate heat exchanger
G. Plate heat exchanger, incl. face/bypass damper
H. Control panel
I. Supply air fan
J. Extract air fan
K. Electric re heater (hot water)
L. Cooling coil with changeover
M. Supply air damper
N. Exhaust air damper

Legend
1. Actuator, outdoor air, extract air damper (2 x)
2. Actuator, face/bypass and/or recirculation air damper, plate heat
exchanger
3. Frequency converter, extract/supply air fan (2 x)
4. Pressure sensor supply/extract/supply air fan (2 x)
5. Actuator, supply/exhaust air damper (2 x)
6. Main disconnect switch (supply), electric heater
7. Electrical heater switching components
8. Fuses, electric heater
9. Pressure switch, supply air filter
10. Pressure switch, extract air filter
11. Temperature sensor, air intake
12. Temperature sensor, extract air
13. Relay
14. Pro-Dialog control
15. Main supply connection, control panel
16. Main disconnect switch, / emergency stop switch
AHU (excl. electric heater)
17. Connection terminals
18. Reset button
19. Frost protection thermostat, heating coil
20. Temperature sensor, DX coil inlet
21. Temperature sensor, supply air
Before commissioning the unit, all functions below and the associated components must be checked, using the check list below. 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. The unit should be lighted according to EN12100 during maintenance operation.

**CAUTION:** “Technical staff who is responsible from startup and maintenance, has to take occupational health and safety trainings according to the relevant national laws and obligations.” Do not work on electrical components including control panels, switches, VFD until you are sure ALL POWER IS OFF and no residual voltage can leak from capacitors or solid state components. Lock open and tag electrical circuits during servicing. If work is interrupted, confirm that all circuits are deenergized before resuming work. 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 covers must be closed and the AHU must be earthed.

### Start-up check points

<table>
<thead>
<tr>
<th>Function</th>
<th>Components</th>
<th>Check points</th>
<th>Start-up</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>All functions</td>
<td>Remove obstacles and loose debris from compartment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>All functions</td>
<td>Check for possible condensate and if necessary dry the parts</td>
<td></td>
</tr>
<tr>
<td>Indoor installation/outdoor installation</td>
<td>Internal and external panels</td>
<td>Damage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Internal and external panels</td>
<td>Damage</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Joints</td>
<td>Cracks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Doors/access covers</td>
<td>Must be closed and locked before start-up</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flexible connections</td>
<td>Correct installation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Earthing</td>
<td>Correct earthing in accordance with regulations</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Roof covering (outdoor installation)</td>
<td>Check if roof is completely watertight</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Dampers</td>
<td>Correct operation</td>
<td>Blades fully closed and at zero position</td>
</tr>
<tr>
<td></td>
<td>Actuators</td>
<td>Correct operation</td>
<td>Actuator end position same as damper end position</td>
</tr>
<tr>
<td></td>
<td>Filters</td>
<td>Correct filter type</td>
<td>Are the filters correctly installed</td>
</tr>
<tr>
<td></td>
<td>Pressure differential gauge</td>
<td>Correct operation</td>
<td></td>
</tr>
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<td></td>
<td>Pressure differential switch</td>
<td>Correct operation/set-up</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heaters</td>
<td>Hot-water coil</td>
<td>Correct connections</td>
</tr>
<tr>
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<td></td>
<td>Frost protection thermostat connected</td>
<td></td>
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<tr>
<td></td>
<td>Electric heater</td>
<td>Check heater earth</td>
<td></td>
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<td>Check hatch earth</td>
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<td></td>
<td></td>
<td>Correct fuse size</td>
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<td>Check wiring diagram</td>
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<td></td>
<td>Coolers</td>
<td>Chilled-water coil</td>
<td>Correct connections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check for possible condensate and if necessary dry the heater</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heaters</td>
<td>Hot-water coil</td>
<td>Correct connections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Frost protection thermostat connected</td>
<td></td>
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<tr>
<td></td>
<td>Coolers</td>
<td>Chilled-water coil</td>
<td>Correct connections</td>
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<tr>
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<td></td>
<td>Check for possible condensate and if necessary dry the heater</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Drift eliminators</td>
<td>Correct alignment</td>
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<td></td>
<td>Drain trap</td>
<td>Correct connection</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Heat recovery wheel</td>
<td>Rotor</td>
<td>Check rotation direction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Seal</td>
<td>Correct seal towards wheel</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Drive</td>
<td>Check connection voltage</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Drive</td>
<td>Correct connection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Drive</td>
<td>Check current in all phases</td>
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<tr>
<td></td>
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<td>Drive belt</td>
<td>Check tension</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rotation monitor</td>
<td>Correct connection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Controller</td>
<td>Correct connection</td>
</tr>
<tr>
<td></td>
<td>Plate heat exchanger</td>
<td>Damper (if used)</td>
<td>Correct operation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Actuator (if used)</td>
<td>Correct operation</td>
</tr>
<tr>
<td></td>
<td>Fan</td>
<td>Transport protection brackets</td>
<td>Remove</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fan housing and fan compartment</td>
<td>Remove obstacles and loose debris from the fan and fan compartment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Fan compartment, fan, motor, frequency converter</td>
<td>Check for possible condensate and if necessary dry the parts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Impeller</td>
<td></td>
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<td>Motor</td>
<td>Check connection voltage</td>
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<td></td>
<td></td>
<td>Correct connection</td>
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<td></td>
<td></td>
<td>Check current in all phases</td>
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<td></td>
<td>Drive belt</td>
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<td></td>
<td>Flexible connections</td>
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<td></td>
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<td></td>
<td>Operating switch</td>
</tr>
<tr>
<td></td>
<td>Frequency converter</td>
<td>Connections</td>
<td>Correct connection/complies with EMC</td>
</tr>
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<td>Frequency converter</td>
<td>Check for possible condensate and if necessary dry the converter</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Voltage</td>
<td>Check connection voltage</td>
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<tr>
<td></td>
<td></td>
<td>Settings</td>
<td>Check correct settings</td>
</tr>
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<td></td>
<td></td>
<td>Phases</td>
<td>Check voltage in all phases</td>
</tr>
<tr>
<td></td>
<td>Lighting</td>
<td>Lamp</td>
<td>Check connection voltage</td>
</tr>
<tr>
<td></td>
<td>Control panel</td>
<td>Components</td>
<td>Check for possible condensate and if necessary dry the components</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Power supply</td>
<td>Check power supply voltage</td>
</tr>
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<td></td>
<td>Check neutral</td>
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<td></td>
<td></td>
<td>Correct earthing in accordance with regulations</td>
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<td></td>
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<td></td>
<td>Power supply with correctly sized fuses</td>
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<td></td>
<td></td>
<td>External sensors/control devices</td>
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<td></td>
<td></td>
<td></td>
<td>Alarms</td>
</tr>
<tr>
<td></td>
<td>Controller</td>
<td>Parameters</td>
<td>Set all specific project parameters</td>
</tr>
</tbody>
</table>
4 - START-UP INSTRUCTIONS

4.1 - Casing

The unit data, such as order number, position number etc. is given on the nameplate.

**AIR HANDLING UNIT**

<table>
<thead>
<tr>
<th>Type</th>
<th>30HQ 10.10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Order No / Serial No</td>
<td>MH00770</td>
</tr>
<tr>
<td>Location</td>
<td>Ametystine</td>
</tr>
<tr>
<td>Air Volume (m³/s)/Tot. Sta. Pres. (Pa)</td>
<td>23,000 / 1,197</td>
</tr>
<tr>
<td>Production Date</td>
<td>2015</td>
</tr>
</tbody>
</table>

Note: Making a hole or mounting different components on panel while start up, can affect the air handling unit mechanical classes

4.1.1 - 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. 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.

4.1.2 - Doors and access covers

Check the operation of door handles, locks and movement of the hinges. Check if the door closure (on the inside of the door) is tightly fitted, so that there are no excessive air leaks at the doors. For outside installation of the AHU check the storm cord.

**CAUTION:** Doors and access covers must always be closed before starting the unit.

4.1.3 - Flexible connections

- Check that all flexible connections are attached to the AHU. If necessary, tighten loose screws.
- The stretched length of a single-skin flexible connection is 170 mm, but a flexible connection must NOT be installed stretched between the AHU and the duct. Once installed the operating length of the flexible connection must be 100 mm.

4.1.4 - Earthing

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

4.1.5 - Connected ducts

- Inlet and outlet sections could be full face opening or full face damper with flanges. For all fan types (forward, backward or plug) duct have to be fixed from flanges.
- It is recommended to use Europrofile connections (type E30) at the corner frame as well as at the duct to be connected.
- The Europrofile connections are available in fixed lengths and can be cut to the required length with a saw. These profiles can easily be placed over the corner frame. Allow for a maximum profile height of 30 mm, so that ducts that are positioned one above the other can be installed correctly.
- The four corners between the profiles can be completed with a corner piece (type H30).
- The profile at the corner frame can be attached to the profile on the duct using a drive slip (type SR).
- Attaching self-adhesive tape between the two profiles ensures an air-tight seal, as shown in the drawing below.
To be able to make two openings one above the other the corner frames of the two openings have a different length so that there is always enough space to place and attach the profiles. Using the drive slip means that there is no need to use screws in the limited space between the two ducts that are one above the other, as shown in the drawing below.

The corner frame has a length of 32 or 72 mm and extends 22 or 62 mm beyond the external AHU dimension, as shown in the drawing below.

The flexible connection, including the installed corner frame, extend 170 mm beyond the external AHU dimension, and a damper set 132/172 or 207/247 mm, as shown in the drawing below.

The combination of flexible connections and dampers, including the installed corner frame, extends 302/337 or 342/417 mm beyond the external AHU dimension, as shown in the drawing below.

4.1.6 - Outdoor air intake

Ensure that the air intake duct is correctly connected. High air velocities must be avoided and no rain drops should get into the duct. This can be prevented by installing rain protection air intake grilles (Caution: The maximum air velocity for the grille is as given by the supplier). The rear air intake duct must be sized to avoid higher than allowable air velocities in the grille. High air velocities in the openings can also be caused by wind attacks at one of the openings.

If these can be expected for the installation or geographical location, try to minimise them with partitions. If there is any possibility that rain water can be drawn in, droplet eliminators must be added behind the air intake grille. A pre-heater for the filters can be installed to prevent that mist causes the filters to become too wet. The pre-heater will reduce the relative humidity of the air.

Connection of the outdoor air intake duct

If condensation can be expected in or on the ducts, these must be insulated on the outside.

To connect the outdoor air intake duct to a unit that is installed inside we recommend the following procedure:

- Connect a 500 mm long adapter piece to the corner frame of the air handling unit.
- Insulate the inside of the complete adapter piece up to the unit panel.
- Insulate the outside of the adapter piece so that there is a 250 mm overlap between inside and outside insulation.
- The remainder of the adapter piece needs to be insulated on the outside, as shown in the drawing below.
4.1.7 - Assembly and placement of the air handling unit

Ensure that the floor in the room where the unit is installed is even and waterproof. The joints between the parts must be covered with the sealing tape provided. The sections can then be placed in the correct order. Place the sections as close as possible together and ensure that they can be moved. Using a support, pull the sections towards each other with a pull-rope. Check if all parts are water-tight and if necessary slide spacers under the support where required (see also chapter 2). Then attach the profiles supplied to the joint. The roof of units installed outside must be sealed so that no water can leak to the inside. Always attach a unit installed outside to the floor of the support frame, to ensure that the unit cannot move or fall. (take the force of the wind into account). For units installed inside please make sure that the unit cannot move from its support points. If necessary, the unit must be attached to the support.

4.1.8 - Air contamination

If the exhaust and outdoor air intake openings are close to each other there is a risk of air contamination. To reduce contamination the air must be rarefied. To do this correctly, the air volume, the horizontal and vertical distance to the two openings and the position of the two openings in relation to each other must be taken into consideration. It may be necessary to position the two openings further apart, using an extra piece of duct at the outdoor air intake opening. If the units are installed outside, this piece of duct should be placed between the air handling unit and the pre-installed suction cap (if used). The piece of ducting must always be supported in an appropriate way.

4.1.9 - Condensation in or on the AHU

Condensation can form on the inside and outside the AHU. This depends on the installation location (indoor or outdoor), temperature and relative humidity inside and outside the AHU and the thermal bridge factor (the TB value) of the AHU. Always select an AHU with a thermal bridge factor that will not lead to condensation at the indoor and outdoor conditions. For units installed inside the following points must be considered:

- Open water collection tanks (e.g. vapour/condensate collection tank). These must always be unpressurised and covered so that the relative humidity in the plant room is minimised.
- Sufficiently insulate the cold water and condensate lines up to the AHU.
- Sufficiently insulate air ducts with a possible air temperature below the dew point of the air in the plant room, as described earlier.

For units that are installed outside the following points must be considered:

- Always insulate air ducts with a possible air condition (temperature and relative humidity) with a dew point above the expected outdoor air condition, to prevent condensate formation in the duct. It is recommended to insulate all ducts from and to the building to minimise heat transfer and to ensure good control.
- After connecting the ducts to the building immediately connect the unit to the power supply, switch it on and start it up. If this is not done moisture will move from the building ducts to the AHU, causing an increase of the relative humidity in the AHU. At low outdoor temperatures (if the AHU is not operating) this can lead to condensation in the AHU and the control panel. This must always be prevented.

4.1.10 - AHU support

The AHU incorporates a 62-mm high self-supporting base. If the AHU is placed on a base or an external frame, the following dimensions of the support under the AHU must be taken into consideration.

Unit width: (Dimensions in mm)

4.2 - Dampers

- Check if the actuator motor is installed in accordance with the supplier’s instructions.
- Check if the correct angle has been set.
- Check if the dampers close properly.
- Check if the damper can open to the required angle.
- Check operation after the power has been restored following a power cut. Some dampers must be open, others must be closed.
• Ensure that the end position of the damper is the same as the end position of the actuator so that the drive lever of the damper is unloaded in the end position.

For manual operation the damper blades can open via hexagon-socket-screw key which is mounted on the actuators.

AHU with control
The unit is supplied as standard with actuator(s).
• Open/closed
• Spring return

4.3 - Air filters

• Check if the correct filters have been installed.
• Check if the filters have been installed correctly.
• Set pressure switches or filter indicators, if used.
• Close the inspection door.

AHU with control
The supply and extract air filters are equipped with a pressure switch that is configured in series and normally closed.

4.4 - Heaters

4.4.1 - Hot water coil

• Check the connections on the dimensional drawing.
• Ensure that the coil has been fully purged.
• Check connections for leakage.
• Ensure that the frost protection thermostat has been correctly connected and set up.
• It is possible that the coil is the last or second last component in the AHU. The frost protection thermostat must be made accessible by providing a field-installed inspection hatch in the supply air duct.
• Ensure that the heater can supply heat to prevent frost formation when the fan is started.
• City water can be used for water coils without any conditioning.

CAUTION: When the coils are drained, no water must remain in the circuits to prevent freezing at temperatures below zero.

AHU with control
The first hot water coil without glycol in air flow direction is equipped with a frost protection thermostat. This is set to a cut-out temperature of 5°C.

4.4.1.1 - Coils containing glycol

If coils are filled with a water/glycol mixture, this requires extra attention.
• Glycol can react violently with strong oxidation solutions.
• When working on the coil, always check which medium is used. Before adding anything to the heat exchange medium, always check with the installer.
• Always wear safety glasses, gloves and shoes.
• Do not smoke or use an open flame.
• When sizing the expansion tank take the higher heat transfer coefficient into account, (± 25% larger).
• Watertight seals are not always tight for water/glycol mixtures. It is therefore better to use weld/solder connections.
• Water/glycol causes increased sludge formation.
• Always observe the instructions of the right glycol manufacturer.
• Check the mixture to ensure that the glycol concentration (by weight) is correct.

4.4.2 - Electric heater

• Check and/or connect the heater in accordance with local regulations and the data from the manufacturer.
• Ensure that the terminal strip earth and the inspection hatch earth have been connected.
• Check for possible condensate/moisture. Condensate may form in the period before the first start-up of the AHU as a result of weather change and/or humid air from the building. Remove all condensate from the construction components and dry the electrical components using warm (dry) air (e.g. with a hair drier).
• Check the connection voltage.
• Check the existing amperage on all phases. The values must agree with the data on the heater name plate.
• To ensure safe operation of the heater, it is equipped with a thermostat with auto reset (70 °C) and a high limit thermostat with manual reset (110 °C).

ATTENTION:
• Do not enter the AHU if the electric heater is on.
• The instructions must clearly specify that the fan must be operating, before the electric heater is switched on. After the heater has been switched off, the fan must continue to run for at least five minutes.
• As not all electric heater stages have variable control, always ensure that the minimum speed across the heater is 2 m/s. If all stages have variable control the air velocity over the element can go down to 1.5 m/s.

• The warning label for electrical voltage is attached to the inspection hatch.
• The earth warning label is attached to the inside of the heater and the inspection hatch.

AHU with control
Do not work on electrical components including control panels, switches, VFD until you are sure ALL POWER IS OFF and no residual voltage can leak from capacitors or solid state components. Lock open and tag electrical circuits during servicing. If work is interrupted, confirm that all circuits are deenergized before resuming work. If an AHU with control includes an electric heater, this must have a separate power supply (400 V ± 10%, 3 phase, 50Hz +-%2) the electric heater supply must be protected by a correctly sized fuse. The control ensures the correct control signal and the minimum air flow across the heater.

The electric heater includes:
• A main disconnect switch
• Internal fuses (fast acting)
• Circuit control devices and switching elements that ensure modulating control.

The product complies with residential EMC standards EN 61000-4-2, EN 61000-4-3, EN 61000-3-2, EN 61000-3-3, EN 61000-3-11, EN 61000-3-12, EN 61000-6-2, EN 61000-6-4, EN 55016-2-1, EN 55016-2-3, EN 55014-1 with the following restrictions, related to the flicker effect.

<table>
<thead>
<tr>
<th>Heating capacity (kW)</th>
<th>Current/phase (A)</th>
<th>Maximum Impedance Z</th>
<th>Declaration of the connection condition to comply with</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5</td>
<td>11 A</td>
<td>0.309</td>
<td>Minimum power supply capability at the building connection point to the public network &gt; 100 A per phase</td>
</tr>
<tr>
<td>9</td>
<td>13 A</td>
<td>0.257</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>16 A</td>
<td>0.210</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>22 A</td>
<td>0.154</td>
<td>Maximum allowable power supply network impedance &lt; 0.15 Ohm</td>
</tr>
<tr>
<td>18</td>
<td>26 A</td>
<td>0.128</td>
<td>Maximum allowable power supply network impedance &lt; 0.13 Ohm</td>
</tr>
<tr>
<td>19</td>
<td>27 A</td>
<td>0.122</td>
<td>Maximum allowable power supply network impedance &lt; 0.12 Ohm</td>
</tr>
<tr>
<td>24</td>
<td>35 A</td>
<td>0.096</td>
<td>Maximum allowable power supply network impedance &lt; 0.10 Ohm</td>
</tr>
<tr>
<td>27</td>
<td>39 A</td>
<td>0.086</td>
<td>Maximum allowable power supply network impedance &lt; 0.09 Ohm</td>
</tr>
<tr>
<td>35</td>
<td>51 A</td>
<td>0.066</td>
<td>Maximum allowable power supply network impedance &lt; 0.07 Ohm</td>
</tr>
<tr>
<td>40</td>
<td>58 A</td>
<td>0.058</td>
<td>Maximum allowable power supply network impedance &lt; 0.06 Ohm</td>
</tr>
</tbody>
</table>

* Maximum value at the point of common coupling (PCC) of the machine and other electrical devices sensitive to the flicker effect

The values in the table above are calculated based on the following assumptions
• Power supply 400 V
• Safety margin 10%
• A voltage change as defined by the standard corresponds to a cycle ON – OFF – ON
• For an interval period of 50 seconds

4.4.3 - Electric heater in combination with changeover coil
For an AHU with control an electric heater combined with a changeover coil can be used. The changeover coil provides primary heating and cooling. The electric heater is used as a back-up heater in case there is no hot water available for the changeover coil at a demand for heating. The electric heater must NOT be used if the changeover coil is operating and the required entering temperature is not achieved.

4.5 - Coolers
• Check the connections in accordance with the dimensional drawing.
• Ensure that the coil has been fully purged.
• Control the connections for leaks.
• If a changeover coil is supplied by a heat pump, the installation must be designed to compensate for the required heat during the system heat pump defrost cycle and the heat cannot be drawn from the supply air. Otherwise the supply air temperature cannot be achieved. During the heat pump defrost cycle it must be possible to add so much heat into the system that the desired entering temperature (heater design capacity) as well as the required heat for heat pump defrosting can be guaranteed.
• Ensure that the AHU is installed high enough to enable the siphon trap to work correctly.
• Check that the siphon trap (option) has been correctly installed.

• Check if siphon cover and ball have been correctly installed.
• Check that the (negative or positive) pressure corresponds to the siphon type installed.
• The outlet of the siphon trap connected to the drain must not be under pressure.

4.6 - DX-coils
• The DX-coils are supplied without refrigerant.
• The coils must never be pressurised with water. They must be sealed and pressurised with a gaseous medium to prevent pollution of the coil.
• A qualified person should charge the coil and the rest of the system with a sufficient amount of the refrigerant specified in the technical specifications.
• When connecting the DX-coil to the compressor/condensing unit always follow the supplier specifications and the instructions of the qualified personnel.
• It is not recommended to connect several DX-coils to one compressor/condensing unit.
• It is best to use an infinitely variable controller for the compressor/condensing unit. If the condensing unit has infinitely variable control, one of the temperature controls in the controller can be selected.
• If the condensing unit does not have infinitely variable control, set the AHU control for supply air temperature control, and connect the DX entering temperature sensor instead of the supply air sensor. The desired (room) temperature must then be controlled by a separate controller at the condensing unit.

If a changeover coil is supplied by a heat pump, the installation must be designed to compensate for the required heat during the system heat pump defrost cycle and the heat cannot be drawn from the supply air. Otherwise the supply air temperature cannot be achieved. During the heat pump defrost cycle it must be possible to add so much heat into the system that the desired entering temperature (heat design capacity) as well as the required heat for heat pump defrosting can be guaranteed.

WARNING:
AVOID SPILLING liquid refrigerant on skin or getting it into the eyes.

USE SAFETY GOGGLES. Wash any spills from the skin with soap and water. If liquid refrigerant enters the eyes, IMMEDIATELY FLUSH EYES with water and consult a physician.

AHU with control
To ensure that the correct control strategy for an AHU with DX-coil can be selected, there is a temperature sensor on the intake side of the DX-coil. If a heater is placed directly before the DX-coil, this sensor is only accessible, if an inspection section is installed between the two coils.

4.7 - Heat recovery wheel
• Ensure that the heat exchanger face area is not damaged.
• Check that the wheel is rotating in the correct direction. This is indicated by an arrow on the casing.
• Check if the wheel seals are fitting correctly.
• Check if belt tension is correct.
• Check if the motor and the rotation monitor have been correctly connected (5 mm play between sensor and detection point on the wheel).
• Ensure that the rotor speed has been correctly set. The 39SQ condensation rotor must have a maximum speed of 10 min⁻¹; a sorption rotor must have a maximum speed of 20 min⁻¹. Refer to the user manual for the heat recovery wheel controller.
• If the air intake temperature is below -15 °C, a preheater is recommended for the heat recovery wheel to prevent freezing.
4.8 - Plate heat exchanger

- Ensure that the face area of the heat exchanger is not damaged.
- If dampers are installed, also check if the actuator motor has been installed in accordance with the instructions of the supplier.
- Check if the correct angle has been set.
- Check if the dampers close correctly.
- Check if the dampers can reach the fully open position.
- If the air intake temperature at the is below -10 °C in a cross-flow plate heat exchanger, a pre-heater is recommended for the plate heat exchanger to prevent freezing.

**AHU with control**
The plate heat exchanger is supplied with a modulating actuator (24 V).

4.9 - Recirculation damper

- Before operating this damper refer to chapter 4.2
- The damper must always be closed at a power failure or when the unit is shut down.
- If a recirculation damper is used a damper must be included for both the outdoor entering and exhaust air opening.
- The recirculation damper used is designed for an open/closed application.
- The AHU with recirculation damper is therefore NOT suitable for modulating operation of the recirculation damper. This is due to the non-guaranteed damper authority and the fan position in the AHU relative to the recirculation damper.

**AHU with control**
The recirculation damper is supplied with an open/closed actuator with spring return (24 V). The control used for the recirculation damper is an open/closed control.

4.10 - Fan

![Fan with control](image)

**AHU with control**
The recirculation damper is supplied with an open/closed actuator with spring return (24 V). The control used for the recirculation damper is an open/closed control.

---

![Warning](image)

**Warning**

Remove the transportation brackets (Z or U profiles) before running.
CAUTION: The air flow may cause stationary parts to move (even a fan that is switched off).

- Remove the transport brackets. This is indicated by a label on the door.
- Check if the fan can move freely without obstructing the frame, flexible connection or wiring.
- Check for possible condensate/moisture. Condensate may form in the period before the first start-up of the AHU as a result of weather change and/or humid air from the building. Remove all condensate from the construction components and dry the electrical components using warm (dry) air (e.g. with a hair drier). This applies to both motor and frequency converter.
- Check the connection voltage.
- Check and/or connect the motor in accordance with local instructions and the data of the supplier.
- Check the direction of rotation of the impeller. The direction is indicated on the fan by an arrow.
- Separately measure the current draw of the electric motor for all phases. The current draw of all phases must be approximately the same and agree with the data on the name plate. Set the motor protection device to the nominal value.
- The motor data shown is for an altitude above sea level of up to 1000 m and an ambient temperature of 40 °C maximum.
- The data for belt type, belt tension, number of belts, size and type of pulley is given on a sticker on the fan housing.
- If the fans are shut down for longer periods (longer than three months), the bearings may be damaged. To prevent this it is recommended, to reduce the fan belt tension or to remove the fan belts temporarily. When the fans are restarted the belt tension has to be reset to the specified value. This type of damage can also be prevented by controlled rotation of the fan impeller. This is recommended for direct-drive fans.
- Check if the flexible connection is correctly installed.
- If used check the pressure switch and set the correct pressure.
- Check the operation of the main switch / emergency stop switch.

CAUTION: While working on the fan the switch has to be locked open.

- This warning also important for safety. Because of the positive pressure, fan doors can hit the technical personnel who is opening the doors.
- Before opening the doors, the fan must be switched off, isolated and allowed to rundown (2 minutes minimum)
- The warning pictograms on rotating parts, electrical voltage and opening doors are attached to the door.

If the machine has stopped due to an unexpected power supply failure, sudden re-starting of the machine must be avoided. The control system must include an appropriate protection device.

General data, fan motor

<table>
<thead>
<tr>
<th>Insulation class motor</th>
<th>PTC trip temperature</th>
<th>Connection voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>155 °C</td>
<td>3 x 230V+-%10/50 Hz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3 x 400 V +-%10</td>
</tr>
</tbody>
</table>

The fan motor must have a power supply of 230V+-%10, 3 ph, 50Hz+-%2 or 400 V +-%10, 3 ph, 50Hz+-%2. The connection must be made with short circuit protection (fuses) and a thermal motor safety switch, matched to the nominal current of the motor. The motor can also be protected against overheating by three series-connected PTC thermistor fuses, installed in the windings. If a frequency converter is used the thermistors must be connected to the converter.

Before connecting the power supply please check the diagrams on the next page to ensure that they agree with the data on the motor name plate and the data in the technical documentation.

The disconnect switch is located on or near the fan section. When working on the unit the switch must be turned off and secured with a padlock. Switching off the disconnect switch must be done when the unit is not energised. If work is interrupted, confirm that all circuits are deenergized before resuming work.

Risk of injury or death by electrocution. High voltage is present on motor leads even though the motor is not running when a VFD is used. Open the power supply disconnect before touching motor leads or terminals.

Before opening the door or inspection hatch of the fan section (failure, maintenance, service) all power supply circuits must be switched off.

**CAUTION:** Motors with a power output of up to 2.2 kW (230V+-%10 / 400V +-%10) have across-the-line starting. Motors with a power output of 3 kW (400 V+-%10) should be started with the star/delta switch.
4.10.1 - Plug fans

Plug fans are fans without a scroll that are directly driven by the motor. To get the correct operating point for this type of fan a frequency converter is required. The maximum frequency at which the plug fan can rotate depends on the motor/impeller assembly and should normally be higher than 50 Hz. The maximum frequency is given on the fan name plate.

Plug fans are equipped with a pressure measurement point in the intake cone of the fan. By measuring the pressure drop between the pressure for the fan and the pressure in the intake cone the actual air flow can be calculated using the following formula: 

\[ V = k \cdot \sqrt{\Delta p_{e}} \]

Where 
- \( V \) = actual air flow rate in m³/h 
- \( k \) = specific fan coefficient 
- \( \Delta p_{e} \) = pressure differential cone/air intake section in Pa
The k-value depends on the fan size used. This value can be found in the table below.

<table>
<thead>
<tr>
<th>k-values</th>
<th>Plug fan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan size</td>
<td></td>
</tr>
<tr>
<td>225</td>
<td>47</td>
</tr>
<tr>
<td>250</td>
<td>60</td>
</tr>
<tr>
<td>280</td>
<td>75</td>
</tr>
<tr>
<td>315</td>
<td>95</td>
</tr>
<tr>
<td>355</td>
<td>121</td>
</tr>
<tr>
<td>400</td>
<td>154</td>
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<tr>
<td>450</td>
<td>197</td>
</tr>
<tr>
<td>500</td>
<td>252</td>
</tr>
<tr>
<td>560</td>
<td>308</td>
</tr>
<tr>
<td>630</td>
<td>381</td>
</tr>
<tr>
<td>710</td>
<td>490</td>
</tr>
</tbody>
</table>

4.10.2 - Frequency converters

It is recommended to install a frequency converter with an integrated operating switch. If a separate operating switch is installed on the unit and near the frequency converter, this can be located in the supply voltage for the frequency converter. If the frequency converter is not installed near the unit/operating switch, the operating switch can be placed in the control power circuit, that switches the supply voltage to the frequency converter via a relay. To connect the frequency converter, please refer to the wiring diagram for the converter installed. Ensure that the EMC directives are observed and pay attention to the shielded cables. The frequency converter must always be correctly set to suit the motor and type installed. Observe the instructions of the supplier of the frequency converter. Special attention should be given to the following parameters:

- Correct application of the general motor data
  - Pay special attention to the motor frequency.
  - For subsynchronous operation (lower than the network frequency) it must be set in accordance with the motor nameplate.
  - For supersynchronous operation (higher than the network frequency) it must be set for the maximum admissible frequency of the motor/impeller assembly (this applies above all to plug fans.)
- Operating type, square variable connection
- It is recommended to cut out so-called overmodulation
- Setting of the normal start-up/shut-down times.
- Check for possible condensate/moisture. Condensate may form in the period before the first start-up of the AHU as a result of weather change and/or humid air from the building. Remove all condensate from the construction components and dry the electrical components using warm (dry) air (e.g. with a hair drier).
- Do not work on electrical components including control panels, switches, VFD until you are sure ALL POWER IS OFF and no residual voltage can leak from capacitors or solid state components. Lock open and tag electrical circuits during servicing. If work is interrupted, confirm that all circuits are deenergized before resuming work. Risk of injury or death by electro shock. High voltage is present on motor leads even though the motor is not running when a VFD is used. Open the power supply disconnect before touching motor leads or terminals.

4.11 - Silencers

The silencers for the 39SQ are supplied separately on a pallet as duct silencers. For this use the connection profiles recommended and use the method described in chapter in 4.1.5 - “Duct connections”. The connection to the rest of the duct system can also be made in this way, as show in the drawing below.

Please ensure that the duct silencers are always correctly supported on the floor or suspended from the ceiling. Make sure that the following weights are taken into consideration:

<table>
<thead>
<tr>
<th>Duct silencers</th>
<th>Weight, kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit type</td>
<td></td>
</tr>
<tr>
<td>0005</td>
<td>30</td>
</tr>
<tr>
<td>0006</td>
<td>35</td>
</tr>
<tr>
<td>0007</td>
<td>45</td>
</tr>
<tr>
<td>0008</td>
<td>50</td>
</tr>
<tr>
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<td>1416</td>
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<tr>
<td>1417</td>
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</table>

The duct silencer can also be used for units installed outside. After installation they must always be insulated on the outside to ensure that they are water- and steam- light. The pre-installed air intake and discharge hood (if used) must be removed first. Install the corner frame, supplied separately, at the opening og the silencer, before installing the silencer. Finally replace the air intake and discharge hood at the opening of the silencer. Here too the duct silencer must be sufficiently supported, as show in the drawing below.

4.12 - Lighting

- Check the connection voltage.
- Check the operation of the switch. The switch must be connected in accordance with local regulations.
Connect the supply voltage to the control panel in accordance with the wiring diagram supplied. The general data for the control panel is given in the table below.

<table>
<thead>
<tr>
<th>Model39</th>
<th>0402 SQR</th>
<th>0506 SQR</th>
<th>0606 SQR</th>
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</table>

20
• Check for possible condensate/moisture. Condensate may form in the period before the first start-up of the AHU as a result of weather change and/or humid air from the building. Remove all condensate from the construction components and dry the electrical components using warm (dry) air (e.g. with a hair dryer).
• Check the supply
• The unit supply must be protected by a correctly sized fuse.
• Connect all external sensors, control devices and external controls to the terminal board as shown in the wiring diagram supplied.
• If required include alarms, release signals and similar elements in the BMS or on the external panel.
• Set the controller for the specific project parameters, such as operating times, holidays etc. Follow the instructions given in the operating instructions for the “Pro Dialog AHU control”.
• The control panel is ventilated using exhaust air. To ensure the air flow there is a grille in the control panel hatch. This must not be covered.
• The control panel hatch must be locked when the AHU is started.

CAUTION: If the AHU includes an electric heater, the heater needs to have a separate power supply.

4.14 - Installation of external sensors included

Outdoor air temperature sensor
The passive PT1000 sensor must be installed outside on a wall with north exposure. Ensure that the gland is at the bottom. This sensor (if required) is supplied separately and must be connected to the control panel after the unit has been installed. In the control diagram this sensor is shown as 23TT22 (TT6).

Room temperature sensor
The passive PT1000 sensor includes room temperature correction with regard to the required setpoint. The sensor must be positioned in the representative room and not be exposed to direct sunlight and not be near a local heat source. This sensor (if required) is supplied separately and must be connected to the control panel after the unit has been installed. In the control diagram this sensor is shown as 24TT4 (TT5).

Duct pressure sensor
The active sensor (24 V) has a maximum measurement range of up to 3000 Pa.

This sensor (if required) is supplied separately and must be connected to the control panel after the unit has been installed. In the control diagram this sensor is shown as 25PDT13 (PT3). The sensor cannot be placed in the outdoor air.

The “+” pressure measurement point must be in a representative and stable position in the supply air of the duct system (not directly after a damper, bend, branch or similar). The “−” pressure measurement point can measure atmospheric pressure in the room.

CO₂ sensor
The active sensor (24 V) must be placed in the correct room in a location that is representative of the CO₂ concentration in the room. Connect terminal 7 - 8 in the CO₂ sensor to the correct terminal at the terminal strip in the control panel.

This sensor (if required) is supplied separately and must be connected to the control panel after the unit has been installed. In the control diagram this sensor is shown as 25QT22(QT).
Thermostat, cooling coil with changeover function

The chilled-water coil can be set by the controller to operate as a cooling coil, or a heating coil, if warm water is available for this coil. The controller needs to know if warm or chilled water is available. The passive thermostat supplied for this purpose must be installed on a supply water pipe after this coil. Position the thermostat in a place in the piping system where continuous flow and a temperature for the medium can be guaranteed that is independent of the control damper position. If the sensor is installed in the wrong position in the water piping, the system will not work.

The followings standard settings are required.

- **Cooling mode detection**: if the measured water temperature is lower than the value set at the top dial, set this to 20°C. If the control demands cooling, the control damper will open, if the water temperature measured is below 20°C.
- **Heating mode detection**: if the measured water temperature is higher than the sum of the setting values at the bottom and top dials, set the value at the bottom dial to 10 K. If the control demands heating, the control damper will open, if the water temperature is 20 + 10 = 30°C.
- If the temperature is between the values above, the last mode detected applies.

Ensure that the gland is at the bottom. This sensor (if required) is supplied separately and must be connected to the control panel after the unit has been installed. In the control diagram this sensor is shown as 26TA22(TS1)

### 4.15 - Sensor replacement

- If sensors are replaced, ensure that the new sensor is the same type as the installed sensor and of a Carrier authorised replacement type.
- Before connecting the ducts and completing the other installation procedures ensure that all sensors are still accessible for maintenance in their final location. This can be achieved by installing inspection hatches in the ducts to be connected.
## 5 - MAINTENANCE CHECKLIST

### 5.1 - Checklist of check points and maintenance intervals

The checklist contains a general overview of the planning that facilitates the inspections and maintenance of the AHU. On the following pages there is a more detailed description of the individual components.

**WARNING:** Remember to deenergise all components and to ensure that the fan has stopped rotating, before the doors and access covers are opened before inspections and maintenance take place.

<table>
<thead>
<tr>
<th>Function</th>
<th>Components</th>
<th>Check points</th>
<th>1 month</th>
<th>3 months</th>
<th>6 months</th>
<th>12 months</th>
<th>depends on supplier and degree of contamination</th>
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<td>Contamination/corrosion and damage</td>
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<td>Zero calibration</td>
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6.1 - General

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

For dry sections: twice a year thoroughly check the inside and outside of the AHU casing. For maintenance of wet sections (coolers) please refer to the air handling section concerned.

All work must be carried out by sufficiently trained personnel.

All applicable personal safety devices must be used to ensure safe working conditions. Safety gloves, glasses and shoes must be worn for all maintenance operations. A respiratory protection mask must be worn when changing the filters.

No holes must be drilled into the AHU, to prevent leakage from the AHU, cooling coils and heating coils and damage to the wiring.

6.2 - Casing panels

6.2.1 - Inside installation

a) Internal inspection of the casing of double-skin panels and of all dry parts.

Remove contamination with water and a mild household soap solution. Where damage of the paint finish has occurred, if necessary remove rust and touch up with good quality anti-corrosive primer and paint. The outside air intake sections can show signs of corrosion as they contain wet parts and are affected by mist, rain and air pollutants.

b) Outside inspection of the coating.

If damage to the paint treatment has occurred, remove the rust (if necessary), and touch up with good quality anti-corrosive primer and paint.

6.2.2 - Outside installation

Check the sealed joints of AHUs installed outside and if required seal again with a UV-resistant and paintable kit. Repair damage as described for inside installation. Check the roof for leaks and if necessary, repair them.

6.3 - Doors and access covers

Check locks and hinges of all doors and access covers. Check that the bolt of the internal roller is still correctly tightened.

6.4 - Flexible connections

Check the flexible connections for damage.

6.5 - Earthing

Ensure that the unit is earthed and installed in the correct manner.

6.6 - Dampers

Lubrication of the dampers is not required. Remove excess contamination by cleaning with compressed air and possible cleaning with water and a mild household soap solution. Ensure that the damper blades run free in the casing.

6.7 - Outside air intake

The outdoor air intake is contaminated by pollution taken in with the air. The maintenance interval must be observed, as irreparable damage of the panels might otherwise occur. Clean the outdoor air intake well and repair damage as described in point 6.2.1. Ensure that no moisture (droplets) is taken in. If there is still moisture, ensure that this is corrected by changing the outdoor air intake duct.

6.8 - 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 the required intervals. The timing of the replacement depends on the type of filter, quality and the degree of contamination of the air. The pressure loss across the contaminated filter can be measured with a pressure differential gauge.

A respiratory protection mask, type P2 and safety gloves must be worn when changing the filters. Open flames are forbidden while changing the filters to prevent setting fire to the filter medium. This is indicated by a sticker on the door or hatch.

6.9 - Heaters

6.9.1 - Hot-water coil

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

Checking the heaters: Check the operation of the frost protection thermostat and check the correct control sequence when the thermostat trips.

For coils filled with glycol please check if the mixture has the correct glycol concentration (by weight).
While working on the heaters gloves must be worn that offer protection against temperatures of 70 °C. The piping outside the air handling unit must be insulated. The water temperature in the pipes can be 120 °C maximum.

The following sticker is shown to warn that there is a hot surface.

City water can be used for water coils without any conditioning.

6.9.2 - Electric heater

Once a year check the air inlet and air outlet for contamination. If they are polluted, clean them with a vacuum cleaner.

Safety gloves, glasses and shoes must be worn while working on the heater. The coil surface temperature can reach 600 °C. If contact is possible, a safety screen must protect the operator against direct contact.

**CAUTION:** The fan must always be running, before the electric heater is switched on to prevent overheating inside the casing.

After the heater has been switched off, the fan must continue to run for at least five minutes to cool down the heater coils.

- The following label is attached to indicate a hot surface.

- The warning label for electrical voltage is attached to the inspection hatch.

- The earth warning label is attached to the inside of the heater and the inspection hatch.

6.10 - Coolers

Check once a year for contamination, and if necessary clean with compressed air against the direction of the air flow or clean with a vacuum cleaner. Check the coil and the connections for leaks. For coils filled with glycol please check if the mixture has the correct glycol concentration (by weight).

Check the fins of the droplet eliminator after the coil. Clean the siphon and check it for correct operation. Check the condensate pan for contamination and clean if necessary.

City water can be used for water coils without any conditioning.

6.11 - Heat recovery wheel

Check the rotor once a year for contamination, and if necessary clean with compressed air. Check the rotor speed and compare it with the design data.

Check the operation of the rotation monitor. Depending on the rotor material the wheel can absorb moisture. When stationary the wheel will become moist on one side and therefore heavier. The rotor speed can be set to intermittent in the controller so that the wheel will rotate “x” times per time unit.

The rotor bearings are lubricated for life and do not require maintenance. The drive motor is accessible via an inspection cover.

The V-belt is automatically tensioned by a spring-loaded rocking base on which the motor is installed. New belts expand a lot in the beginning. Check after two days if the belt still has enough tension. After this check the belt tension weekly during the first month and then check it once a month.

For further operation and maintenance details on the heat recovery wheel/controller refer to the documentation provided by the supplier.
The following warning pictogram is located on the panel:

Rotating parts

6.12 - Plate heat exchanger

Check the plate heat exchanger once a year for contamination and if necessary clean with compressed air against the direction of the air flow. If dampers are used, follow the instructions in section 6.6.

Check condensate pan for contamination and clean if necessary.

Check the droplet eliminator fins in the condensate pan (if installed).

6.13 - Recirculation damper

For maintenance of this damper refer to chapter 6.6.

6.14 - Fan

6.14.1 - General

- **CAUTION: The air flow may cause stationary parts to move (even a fan that is switched off)!**
- **CAUTION: While working on the fan, the switch has to be locked open.**

Before switching off the fan always check if an electric heater is installed. If this is the case, the electric heater must always be switched off first. The fan must continue to run for at least five minutes to cool down the heater coils.

- The data for belt type, belt tension, number of belts, size and type of pulley is indicated on the fan housing.

6.14.2 - Bearings

The bearings of the smaller fan types cannot be lubricated. If the larger fans are of the re-lubricated type, they should be lubricated every six months. For higher temperatures and increased contamination the lubrication interval should be adjusted as required. For higher temperatures and a higher degree of humidity use a lubricant recommended by the supplier.

The electric motors are equipped with roller bearings. Depending on the motor size the bearings are lubricated for life or equipped with a grease nipple. The lubrication interval and type of lubricant are as above.

It is recommended to check the motor and fan bearings for excessive vibration. This can be a sign of bearing wear, but also of incorrect operation of the transmission or an unbalanced system.

The following points require extra attention:
- Check for vibration.
- Check the rotation direction.
- Avoid unnecessary stops and rapid start-ups of the fan.

6.14.3 - Transmission

After starting up the unit and after replacing the belts, the belt tension must be checked within one week and then after two weeks, and further tensioned if required. After that check the belt tension and inspect the condition of the belts every three months.

The **CORRECT BELT TENSION** depends on:
- the belt type
- number of belts
- smallest pulley diameter
- power to be transmitted
- belt velocity.

The belt tension is calculated for each transmission. If the belt tension is too high this can result in bearing wear and vibration, if it is too low this can result in belt slippage and pulley and belt wear.

Sequence for installation of new belts:
- Ensure that the pulleys are correctly aligned. If necessary re-align.
- Position all belts loosely on the pulleys, do not pull tensioned belts over the pulleys.
- Tension the belts and check the tension with a Sonic Tension Meter.
- Re-check the alignment.

If the fan speed changes or if a motor with different power specifications and/or speed is installed, this must be discussed in advance with the manufacturer. The supplier must re-calculate the bearing load as well as the impeller load. If this is not done, irreparable damage to the fan may incur. The supplier does not accept any responsibility for modifications that have not been approved. See chapter 1.1.

**CAUTION: While working on the fan the switch has to be locked open.**

The warning pictograms indicating rotating parts, electrical voltage and opening of doors are attached to the door.

After changing the motor, transmission or frequency converter settings:
- Check the fan rotation direction.
- Check the power input.

**CAUTION: While working on the fan the switch has to be locked open.**
WARNING: Remember to deenergise all components and to ensure that the fan has stopped rotating, before the doors and access covers are opened before inspections and maintenance take place.

6.15 - Silencers
It is recommended to check the splitters of the silencers periodically for possible damage and loosening of the fibres, to prevent dirt deposits in the system.

6.16 - Control
The control must be checked daily for fault messages and alarms. These must be corrected immediately. After correcting the cause for a fault message or alarm, the AHU can be restarted with the reset button on the control panel. Once a year check if the position of the control device agrees with the specified controller setting.
**39SQ Air Handling Unit**

**LOCKOUT / TAGOUT**

### Important

- Wear personnel protective equipment when performing this maintenance.
- If you do not take occupational health and safety trainings according to the relevant national laws and obligations please do not touch the unit.
- Perform LOTO and do not work on electrical components including control panels, switches, VFD until you are sure all power is off (all LEDs which position on VFD, SSRs and main controller must be off) and no residual voltage can leak from capacitors or solid state components.
- If the operation is interrupted, confirm that all circuits are de-energized before operation is resumed.

### Open

1. **Open the main heater water valve**
2. **Unlock the electrical heater main electric switch**
   - Open the electrical heater main switch, switch will be set from 0 to 1 position
3. **Unlock the main electric power switch**
   - Open the main electric power switch, switch will be set from 0 to 1 position
4. **Find the main control panel where the AHU's power supply**
5. **Find the switch which belongs to AHU's power supply**
6. **Open the switch**

**Note:**
- At the 3 stages switches; 2: automation, 1: manuel control, 0: means close
- If there is an electrical heater on the unit, please take two different lock
- If there is an electrical heater on the unit, there is one more main switch on the electrical heater

**Note:**
- Wear personal protective equipment when performing this maintenance.
- If you do not take occupational health and safety trainings according to the relevant national laws and obligations please do not touch the unit.
- Perform LOTO and do not work on electrical components including control panels, switches, VFD until you are sure all power is off (all LEDs which position on VFD, SSRs and main controller must be off) and no residual voltage can leak from capacitors or solid state components.
- If the operation is interrupted, confirm that all circuits are de-energized before operation is resumed.
39SQ Air Handling Unit
LOCKOUT / TAGOUT

IMPORTANT

- WEAR PERSONEL PROTECTIVE EQUIPMENT WHEN PERFORMING THIS MAINTENANCE.
- IF YOU DO NOT TAKE OCCUPATIONAL HEALTH AND SAFETY TRAININGS ACCORDING TO THE RELEVANT NATIONAL LAWS AND OBLIGATIONS PLEASE DO NOT TOUCH THE UNIT.
- PERFORM LOTO AND DO NOT WORK ON ELECTRICAL COMPONENTS INCLUDING CONTROL PANELS, SWITCHES, VFD UNTIL YOU ARE SURE ALL POWER IS OFF (ALL LEDS WHICH POSITION ON VFD, SSRS AND MAIN CONTROLLER MUST BE OFF) AND NO RESIDUAL VOLTAGE CAN LEAK FROM CAPACITORS OR SOLID STATE COMPONENTS.
- IF THE OPERATION IS INTERRUPTED, CONFIRM THAT ALL CIRCUITS ARE DEENERGIZED BEFORE OPERATION IS RESUMED.

AREA NO. | CLOSE | AREA NO. | CLOSE
--- | --- | --- | ---
1 | 1- FIND THE MAIN CONTROL PANEL WHERE THE AHU’S POWER SUPPLY 2- FIND THE SWITCH WHICH BELONGS TO AHU’S POWER SUPPLY 3- CLOSE THE SWITCH | 4- CLOSE THE ELECTRICAL HEATER MAIN SWITCH, SWITCH WILL BE SET FROM 1 TO 0 POSITION 5- LOCK THE ELECTRICAL HEATER MAIN ELECTRIC SWITCH |
2 | NOTE: AT THE 3 STAGES SWITCHES; 2: AUTOMATION, 1:MANUEL CONTROL, 0: MEANS CLOSE | NOTE: IF THERE IS AN ELECTRICAL HEATER ON THE UNIT, THERE IS ONE MORE MAIN SWITCH ON THE ELECTRICAL HEATER |
3 | 3- CLOSE THE MAIN ELECTRIC POWER SWITCH, SWITCH WILL BE SET FROM 1 TO 0 POSITION 4- LOCK THE MAIN ELECTRIC POWER SWITCH | 5- CLOSE THE MAIN HEATER WATER VALVE 6- CLOSE THE MAIN COLD WATER VALVE |
NOTE: PLEASE BE AWARE OF THAT HOT WATER PIPE SURFACE CAN BE TOO HOT SO PLEASE DO NOT TOUCH THE PIPES.

PINBOARD

AREA NO. | CLOSE
--- | ---
4 | 4- CLOSE THE ELECTRICAL HEATER MAIN SWITCH, SWITCH WILL BE SET FROM 1 TO 0 POSITION 5- LOCK THE ELECTRICAL HEATER MAIN ELECTRIC SWITCH |
5 | NOTE: IF THERE IS AN ELECTRICAL HEATER ON THE UNIT, THERE IS ONE MORE MAIN SWITCH ON THE ELECTRICAL HEATER |

AREA NO. | CLOSE
--- | ---
5 | 5- CLOSE THE MAIN HEATER WATER VALVE 6- CLOSE THE MAIN COLD WATER VALVE |

IMPORTANT

- WEAR PERSONEL PROTECTIVE EQUIPMENT WHEN PERFORMING THIS MAINTENANCE.
- IF YOU DO NOT TAKE OCCUPATIONAL HEALTH AND SAFETY TRAININGS ACCORDING TO THE RELEVANT NATIONAL LAWS AND OBLIGATIONS PLEASE DO NOT TOUCH THE UNIT.
- PERFORM LOTO AND DO NOT WORK ON ELECTRICAL COMPONENTS INCLUDING CONTROL PANELS, SWITCHES, VFD UNTIL YOU ARE SURE ALL POWER IS OFF (ALL LEDS WHICH POSITION ON VFD, SSRS AND MAIN CONTROLLER MUST BE OFF) AND NO RESIDUAL VOLTAGE CAN LEAK FROM CAPACITORS OR SOLID STATE COMPONENTS.
- IF THE OPERATION IS INTERRUPTED, CONFIRM THAT ALL CIRCUITS ARE DEENERGIZED BEFORE OPERATION IS RESUMED.

AREA NO. | CLOSE | AREA NO. | CLOSE
--- | --- | --- | ---
1 | 1- FIND THE MAIN CONTROL PANEL WHERE THE AHU’S POWER SUPPLY 2- FIND THE SWITCH WHICH BELONGS TO AHU’S POWER SUPPLY 3- CLOSE THE SWITCH | 4- CLOSE THE ELECTRICAL HEATER MAIN SWITCH, SWITCH WILL BE SET FROM 1 TO 0 POSITION 5- LOCK THE ELECTRICAL HEATER MAIN ELECTRIC SWITCH |
2 | NOTE: AT THE 3 STAGES SWITCHES; 2: AUTOMATION, 1:MANUEL CONTROL, 0: MEANS CLOSE | NOTE: IF THERE IS AN ELECTRICAL HEATER ON THE UNIT, THERE IS ONE MORE MAIN SWITCH ON THE ELECTRICAL HEATER |
3 | 3- CLOSE THE MAIN ELECTRIC POWER SWITCH, SWITCH WILL BE SET FROM 1 TO 0 POSITION 4- LOCK THE MAIN ELECTRIC POWER SWITCH | 5- CLOSE THE MAIN HEATER WATER VALVE 6- CLOSE THE MAIN COLD WATER VALVE |
NOTE: PLEASE BE AWARE OF THAT HOT WATER PIPE SURFACE CAN BE TOO HOT SO PLEASE DO NOT TOUCH THE PIPES.