





Instructions for Assembly, Operation and Maintenance of Air Handling Units

ENG



SOKO[®]
INŽINJERING

CERTIFICATES

	<p>CE MARK Declaration of conformity of air handling units with European directives:</p> <ul style="list-style-type: none">• Machine Safety Directive "Machinery Directive 98/37/EC"• Electrical Equipment Safety Directive "Low Voltage Directive 2006/95/EC"
	<p>GOST R certificates of conformity of air handling units with the standards and technical regulations of Russia:</p> <ul style="list-style-type: none">• Certificate of conformity with Safety Regulations▪ Certificate of conformity for Hygienic design▪ Certificate of conformity for Ex design
	<p>EAC Declaration of the Customs Union of Russia for air handling units</p>
	<p>Evidence of conformity of air handling units with the requirements of DIN 1946-4 standard</p> <ul style="list-style-type: none">• Air conditioning in health care facilities• VAC systems in buildings and rooms used in the health care sector"

www.sokoing.rs

Druga industrijska 1/1/1, 22314 Krnješevci, Srbija

Factory

022/215-07-19

proizvodnja@sokoing.rs

Service

022/215-07-41

servis@sokoing.rs

CONTENTS

1. <u>GENERAL INFORMATION</u>	2
2. <u>STANDARDS AND PROVISIONS</u>	2
3. <u>SAFETY INSTRUCTIONS</u>	3
3.1. Legal regulations for the user	4
3.2. Safety symbols	5
4. <u>CONSTRUCTION, LABELING AND SIDES OF SERVICING</u>	5
4.1. Construction	5
4.2. Labeling air handling units before delivery	6
4.3. Sides of servicing	7
5. <u>DELIVERY, TRANSPORT, STORAGE</u>	8
5.1. Delivery	9
5.2. Transport	9
5.3. Storage	10
6. <u>PLACING AIR HANDLING UNITS</u>	11
7. <u>ASSEMBLY</u>	18
8. <u>CONNECTING AIR HANDLING UNITS</u>	21
8.1. Connecting Air Handling Units to the Air Ducts	21
8.2. Heat exchangers – installation in Air Handling Units	21
8.3. Siphon – installation	23
8.4. Connecting exchangers - protection against freezing	24
9. <u>ELECTRICAL INSTALLATIONS</u>	25
9.1. Connecting electric motors	26
9.1.1. Installation and connection of frequency regulators	29
9.1.2. Connecting EC motors	33
9.2. Connecting electric heaters	36
9.3. Connecting rotary recuperators	37
9.4. Potential equalization, grounding	38
9.5. Connecting humidifiers	38
10. <u>PUTTING INTO OPERATIONAL MODE</u>	39
10.1. Preparations for operational mode	39
10.2. Putting into operational mode	42
11. <u>MAINTENANCE</u>	44
11.1. Table for the type of inspections and necessary activities for maintenance of the air conditioning chamber according to VDI6022	46
11.2. Atex Air Handling Units	49
11.3. Switch off Air Handling Units for a longer period	50
11.4. Control measurements of operating parameters	50
12. <u>AIR HANDLING UNITS LABELING</u>	51
12.1. Symbol overview	51
12.2. Air Handling Units labeling system	52
12.3. Example labels with technical characteristics of functional units	53

1. GENERAL INFORMATION

- Instructions for installation, operation and maintenance are delivered with the supplied air handling units, stored in a safe place and must be available at all times to the person in charge of maintenance.
- These instructions should be read and studied by all persons responsible for the installation, commissioning and maintenance of the air handling units, which are the products of SOKO INŽINJERING, before the start of operation.
- Only qualified and trained personnel may install, commission and maintain. If some parts of the supplied air handling units or embedded assemblies are not covered by this instruction, individual instructions are submitted for them.
- The Air Handling Unit supplied by SOKO INŽINJERING is intended exclusively for central air conditioning in air conditioning and ventilation systems. It provides the required purity, temperature and humidity of the air through the basic functions; filtration, ventilation, heating, cooling, humidification, dehumidification, recovery and regeneration. Any other use is explicitly prohibited.
- This instruction is applicable to the following series of SOKO air handling units:
 - Standard modular air handling units series „K“
 - Standard modular air handling units series „S“
 - Hygienic air handling units „Hg“
 - Swimming pool air handling units „B“
 - „ATEX“ air handling units
 - Air handling units with integrated cooling systems
 - Compact recuperative air handling units „KR“

2. STANDARDS AND REGULATIONS (Directives) applicable to the SOKO series of air handling units to which this guide applies:

- Machinery Directive “**Machinery Directive 98/37/EC**”
- **EN ISO 12100** – machine safety, design guidelines
- **EN ISO 13857** – safety of machines, safety distances
- Low Voltage Directive **2006/95/EC “Low Voltage Directive”, EN 60204-1:1997**
- **EN 1886** – Ventilation of buildings - central air conditioning unit
- **EN 13053** - Ventilation of buildings - central air conditioning unit
- **EN 60335-1** – Security of electrical devices
- **EN 50347** – Standard for three-phase motors
- **ISO 1940** – Mechanical vibration, balancing
- **ISO 16890** – Standard for filters
- **EN 1751** – Standard for testing methods for clappers and dampers
- **DIN 1946-4** – Ventilation and air handling units in health care areas
- **VDI 6022** – Hygienic requirements for ventilation and Air Handling Unit systems, special requirements for systems used in people's occupations (air quality)
- **VDI 2089** – Regulations for swimming pools
- **ATEX 95** – Directives for equipment and systems intended for use in potentially explosive atmospheres
- **DIN VDE 0701-0702** –Standards for installations, periodic inspection of electrical appliances - General requirements for electrical safety.

3. SAFETY INSTRUCTIONS

- SOKO air handling units comply with all safety standards and are subject to constant control. In case of inadequate handling or use for any other purpose, in relation to the foreseen, there is a risk of serious or fatal injury to a person, as well as the risk of damage to the unit or other property.
- The manufacturer is not responsible for any damages arising out of use that do not correspond to the intended purpose.
- Standard versions of air handling units can be used for temperature ranges from -30°C to + 40°C.
- When handling, assembling, cabling, commissioning, repairs or servicing units, it is necessary to comply with the applicable safety rules and standards.
- All work related to the assembly, installation and commissioning of the unit must be carried out by specially trained, licensed technical persons, in accordance with applicable regulations.
- Only competent and qualified electricians are allowed to work on electrical installations of the air handling units. All electrical works must comply with the requirements of the VDE and local energy company regulations.
- Prior to all work on the the air handling units, check that the power is off and protected against unauthorized switching (the main switch must be in the OFF position) in order to avoid the risk of electric shock.
- Any changes or modifications of certain components that may affect their safety and correctness shall be prohibited.
- Use only original spare parts to replace damaged or defective components.
- air handling units are designed for transport and air treatment without solid, sticky, aggressive, corrosive and flammable substances and other hazardous substances that endanger the health and safety of people.
- Air handling units form part of the air conditioning system and can be put into operation only after the installation of the entire system, which must be carried out according to the project.
- Never use a unit if it is not in full operation.
- Air handling units can only operate with fully closed audit doors and panelsa.
- The device must always work within the scope of the operating parameters stipulated in the technical documentation provided by SOKO INŽINJERING, and which are foreseen by the project.
- In case of fire, air handling units should be automatically excluded from work, by the fire protection system.
- In addition to the maintenance and installation instructions, the labels on the equipment in the air handling units provide important information, and the compliance with them is mandatory.
- Upon receipt of incoming goods, the buyer should check all units and components, in order to record possible damage if it occurred in the transport. He / she must make a record in relation to that, which should be signed by the carrier and immediately inform SOKO INŽINJERING about the new circumstances.
- Working on air handling units requires personal protective equipment.
- If there is a problem in the work, the buyer must prove that he/she has done everything according to the instructions, and only then the guarantee would be valid.

3.1. Legal regulations for the user

The user of the Air Handling Unit has the obligation and responsibility to ensure compliance with all legal regulations in this field related to assembly, commissioning, operation, maintenance and environmental protection. The following standards are included:

- **VDI 3803** – Requirements for the performance of central HVAC systems and requirements for the areas in which they are located (provide enough space for safe operation and maintenance)
- **DIN VDE 0701-0702** – Standards for installations, periodic inspection of electrical appliances - General requirements for electrical safety
- **VDI 6022** – Hygienic requirements for ventilation and Air Handling Unit systems, special requirements for systems used in people's occupations (air quality)
- **DIN EN 378** – Cooling systems and heat pumps- Environmental safety requirements. The obligation of the system owner is to keep a **record of the system** that must contain the following items:
 - Details of complete maintenance and repairs,
 - Type and amount of refrigerant charge,
 - Quantity of discharged refrigerant,
 - Origin of repaired refrigeration,
 - Modifications of units, replacement of components,
 - Results of all checks, tests and all significant events (eg standby time).
- **EU Regulation 2037/2000** refers to substances that destroy the ozone layer - The obligation of the owner of the Air Handling Unit is to provide regular inspections and maintenance by a specialized technical person, as well as a leak test minimum once a year.
- **Local hygiene plan**– If air handling units are used in medical institutions, regulations on cleaning intervals specified in the local hygiene plan, as well as permissible cleaning and disinfection agents must be respected.
- **National regulations for water protection** – Compliance with regulations for disposal, and in relation to clean water.
- **Waste management** – Disposal of dirty filters must be done according to the relevant waste management regulations
- **Regulations for the use of personal protective equipment**– Compliance with these Regulations
- **Regulation on industrial safety and human health**– Compliance with these Regulation

3.2. Safety symbols

The security symbols in this document are sorted according to the type of danger and damage that may occur. Protection of personnel and material goods, proper use of the device as well as the contribution to the technical safety of work, obliges to strictly observe the following warnings and safety labels.



WARNING: This symbol signifies security activities that must be absolutely respected in order to avoid personal injuries that may be fatal.



CAUTION: This symbol signifies security activities that must be absolutely respected in order to avoid material damage.



NOTE: Additional information, specific guidelines for easier understanding and handling.



RISK OF ELECTRIC SHOCK:: This symbol signifies security activities that must be absolutely respected and refer to electrical components in order to avoid health risks or deadly injuries.

4. CONSTRUCTION, LABELING AND SERVICE SIDES

4.1. Construction

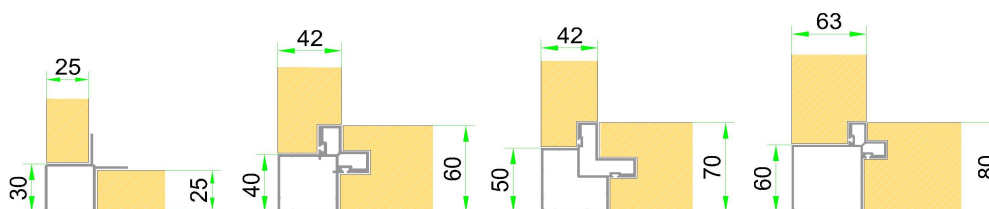
The Air Handling Unit consists of one or more sections which are interconnected on an object in a single unit. Each section, except double-height unit, is attached to a base made of galvanized bent profiles of sufficient stiffness with or without adjustable legs. Due to the reduced transmission of vibrations to the construction, if the adjustable legs (composed of rubber) are not installed, the rubber ribbed shock absorbers are placed beneath the base.



The casting of the Air Handling Unit is made of extruded aluminum profiles and coils, with cladding (sandwich panels with fillings made of insulating material). The insulation materials can be: a polyurethane density of 44 kg / m³ or a stone mineral wool with a density of 90 kg / m³ with transversely oriented fibers between the sheets.

Thickness of the cladding depends on the size of the Al profile.

The following diagrams show the thicknesses of vertical and horizontal claddings for different sizes of Al profiles



The test results according to the EN 1886 standard are an indication of the extraordinary casing strength, excellent sealing, excellent thermal and acoustic insulation, and maximum filter extrusion. The casing with its smooth surfaces guarantees quick and easy cleaning of units.

The components of the Air Handling Unit are maximally adapted for the same purpose, with highly efficient fans and minimal vibration.

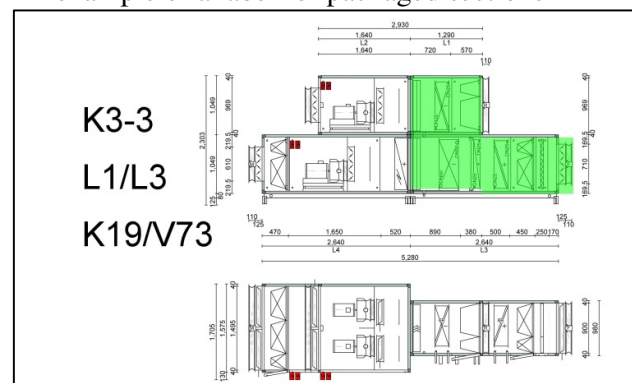
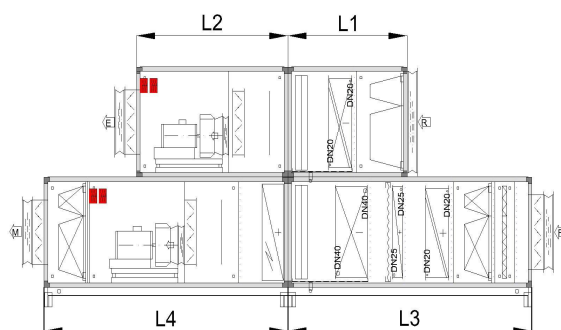
The suction and discharge units of the air handling unit are equipped with elastic connections for connection to the duct network.

Air handling units for outdoor installation are equipped with a protective roof, and the suction ports for the fresh air and ejection of the waste are protected by hoods with a protective net.

4.2. Labeling air handling units before delivery

Each section of the Air Handling Unit is equipped with a label with a drawing of the complete Air Handling Unit, on which the corresponding section is marked separately, so that the position of the same assembly is visible. These labels are placed on a nylon film in which the finished section is packaged.

An example of a label for packaged sections



The drawing of the complete Air Handling Unit indicates the type and size of the Air Handling Unit, as well as the designation of the system from the project (eg K19 / V73) for the facility to which the Air Handling Unit is delivered.

Sections individually within a single set are marked with the letter L + number, as the drawings indicate the lengths of those same sections (see the sketch).

During delivery each system receives a complete label with a serial number.

One label symbol is placed for each functional unit of the Air Handling Unit (fans, filters, coolers, heaters, heat pumps, humidifiers, dampers ...), and another label with technical characteristics.

Each label on the device and components must be legible and undamaged.

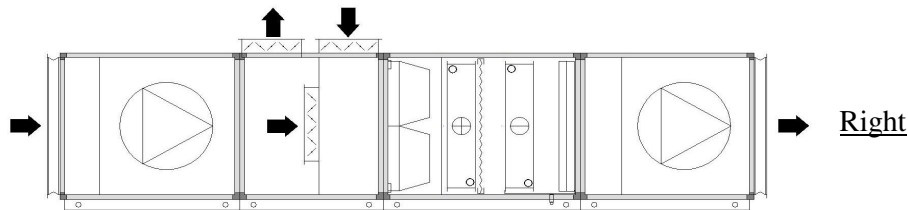


NOTE: An overview of the symbol - labels for the functional units is provided at the end of the manual.

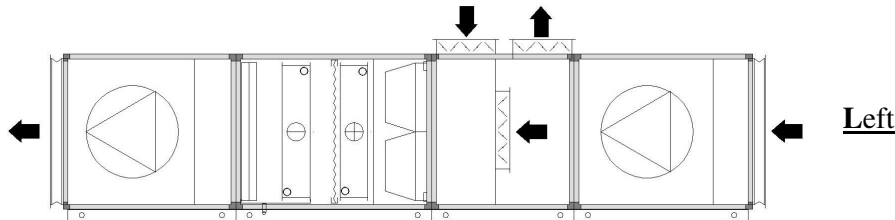
4.3.SERVICE SIDE

The Air Handling Unit are manufactured to the right or left side of the service, which is determined by the direction of air flow through the device and by the position of service doors, pipe connections and drainage of condensate.

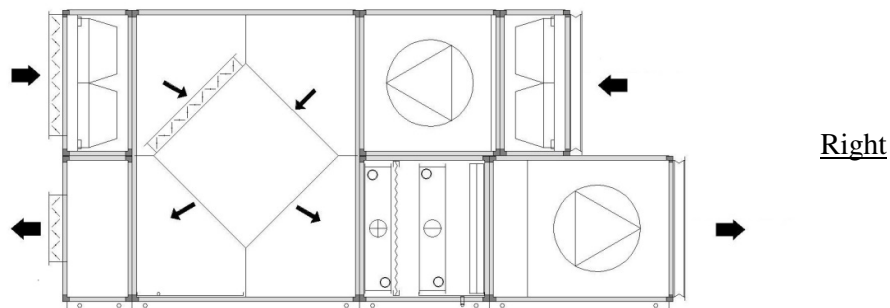
- ✓ The **RIGHT** side of the service is when we are facing the service door in front of the device (on this side are also the penetration of the pipes from the exchanger and the condensate drain pipe) and the direction of flow of air through the device is **from left to right**.



- ✓ The **LEFT** side of the service is when, for the same conditions, we have a flow of air through the device **from right to left**.



- ✓ In the double-height units and parallel air handling units, the service side is determined according to the direction of flow of air on the insertion.



NOTE: The drawing of the Air Handling Unit is always done as a look at the service side.

5. DELIVERY, TRANSPORT, STORAGE

5.1.Delivery

The Air Handling Unit is supplied, depending on the size, either in its fully assembled form or in sections. In exceptional cases, at a special request, they can be delivered in a disassembled form. (In such cases, we insist that the assembly of the section is performed by our trained workers on the spot).

Each section is packed in a protective film (marked as previously explained) and placed on wooden beams with a height of 100mm (50x100) at the ends of the base, and if it is longer, it is placed in the middle.

On the sections there are two pairs of holes within the base (and on long and heavy sections up to four pairs) \varnothing 50mm, so that the **steel pipe** 1½ "can be pulled through for the eventual need to lift the Air Handling Unit with a crane.

Base with outlet pipe for the siphon and holes \varnothing 50mm



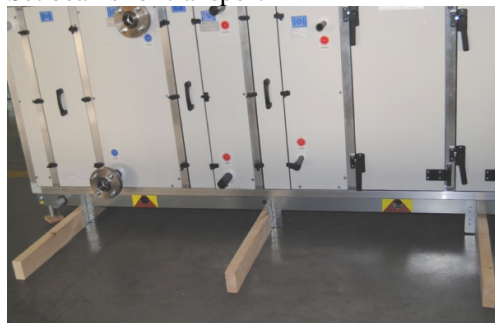
In each section of the Air Handling Unit, sealing strips are placed on the casting frames, in the places of interconnection of sections.

Often, when delivering the double-height units, the lower section and the upper section are connected into one unit (exactly as they should be mounted on the drawing of the assembly), packed and transported.

Example of transport with connected sections



Set beams for transport



A box with mounting elements is supplied with each Air Handling Unit.

The rule is that this box is placed in a pressure fan section. Standard in the box are: screws for interconnecting sections, set screws or rubber ribbed shock absorbers, siphon elements (if they are the subject of delivery)....





NOTES:

- Along with the Air Handling Unit, a drawing of technical characteristics, instructions for assembly, handling and maintenance, delivery notes and warranty card are supplied.
- The transport of the Air Handling Unit can only be carried out by trained, qualified and reliable personnel.
- Delivery must be checked when receiving completeness and damage. Possible lack of parts, documentation or damage to units during transport, must record it in writing by the receiver, signed by the carrier and delivered to SOKO INŽINJERING.

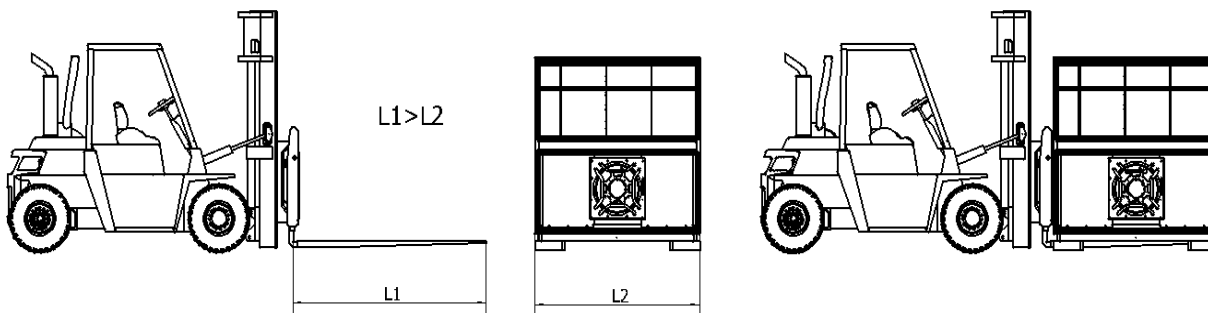
5.2.Transport

Lifting, loading and unloading sections can be done by a forklift truck or a crane.



WARNINGS:

- **When lifting the device, provide space below the device and in the immediate vicinity of the presence of people.**
- Forklift trucks or cranes drivers must be able to manage the same and possess appropriate permissions.
- All safety regulations in accordance with UVV BGV DG and BGR 500-Section 2.8 must be complied with for the crane operation.
- Equipment for lifting loads of sufficient capacity must be used.
- Cables, ropes, chains, pipes, clamps must be checked before use
- Devices may only be transported in the mounting position, well fastened, in order to avoid tilting and moving in the transport.
- Devices must not be stacked one another for lifting or storing.



CAUTION:

- During lifting, the device should be lifted over its frame of the base, which means that it is completely supported on the forks and the center of gravity is between two forks.
- In case the forks are short and can not accept the entire frame of the base, in order not to damage the sections, it is necessary to use extensions of the appropriate length.
- Section units without a base (double-height units sections) are placed on pallets, for easier acceptance of forklift truck, and protection against damage.
- When the forks are pulled out, it is necessary to do this carefully, without any sudden jerks, so as not to damage the profile of the base.
- Climbing or walking by sections is not allowed. If in some situations it is necessary, use the weight distribution panels.

- ✓ **Transport by a crane** should be carried out by steel ropes over the conveyor pipe.

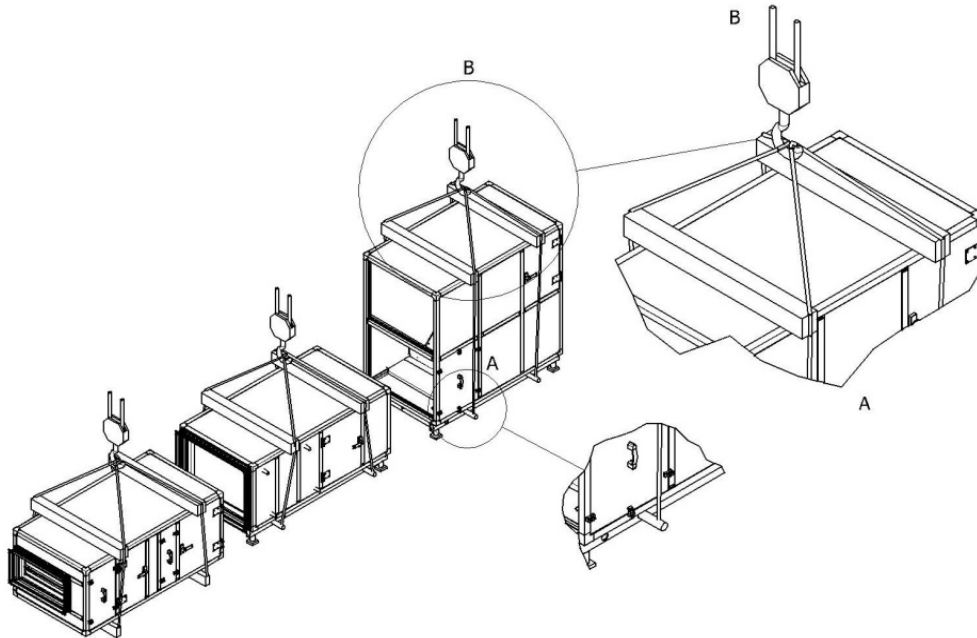
As a conveyor pipe, a steel tube of 1½ "diameter is used, which is pulled through the holes on the base for that purpose. The conveyor pipe should pass on both sides of the section at least 200mm.

At the ends of the pipe, the pipe clamps are laid for which the steel ropes are fixed. The sections on the roof must be provided with spacers (supporters) so that the ropes do not damage the section itself. Ropes must be of equal length.



WARNING:

- Pay attention to the lifting speed (see safety instructions for the transport equipment).
- Dropping of cargo, high risk of injury or damage to property.



5.3.Storage

It is recommended that the units are stored indoors and installation and commissioning as soon as possible. Only outdoor devices can be stored in an open space, with mandatory covering with a leak-proof roof, with the provision of natural ventilation under the roof.



CAUTION:

- Packaged units must not be placed one to another.
- The supplied Air Handling Unit should be stored in rooms that meet the following conditions: air humidity not exceeding 80% for a temperature of 20 °C; the ambient temperature ranges from -20 °C to + 40 °C.
- Water, dust, aggressive gases, various chemicals must never come into contact with the Air Handling Unit sections.
- In case of prolonged storage, it is necessary to remove the foil in which the units are packed in order to prevent condensation. Every month, it is necessary, because of the bearings, to start rotating parts (fans, motors, rotary recuperators ...) and remove belt straps.
- **All damage caused by transport, unloading or inadequate storage is not covered by the manufacturer's warranty.**

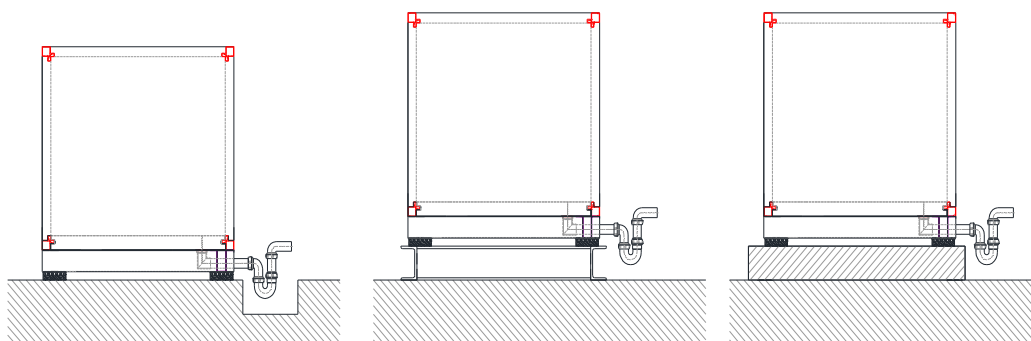
6. PLACING AIR HANDLING UNITS

The Air Handling Unit should be replaced on a completely flat, **leveled** concrete substrate, or on a specially prepared, **leveled** steel structure. The suspension of the sections must be the whole width of its base, together with rubber shock absorbers or counting feet.



CAUTION:

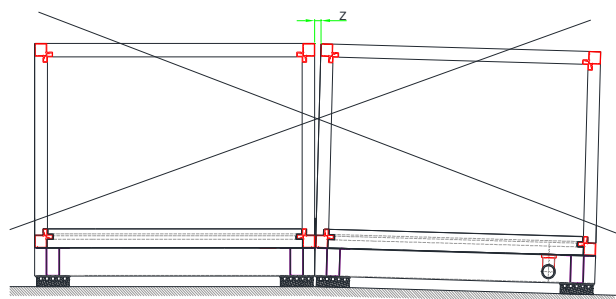
- The place of installation must be statically adapted to the load from the complete Air Handling Unit, must have an adequate drainage of water. The frequency of the resonance of the supporting structure must be different from the frequency of the rotating parts (fans, motors, compressors).
- A waterproof base for air handling units with humidification or cooling is recommended, if mounted above sensitive areas.
- The height of the foundation, together with the base of the device, must guarantee the correct installation of the siphon, and can be solved by burial in the substrate.
- The following drawings provide three examples of the possible installation of the device for the proper execution of the siphon: burial in the substrate, lifting to the steel structure or the fundamental plate.



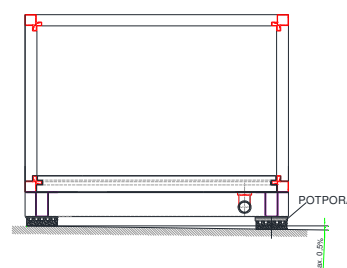
- Any irregularities in the fabrication of the substrate or the steel structure directly affect the quality of the installation of the Air Handling Unit, ie they lead to the unparallelism of the frame sections of the interconnected sections.
- Small floor unevenness can cause malfunctions and door locking.
- Small floor unevenness must be corrected by adequate support or adjusting the legs (if the chambers are with adjustable feet).

The maximum permissible slope of the substrate is 0.5%.

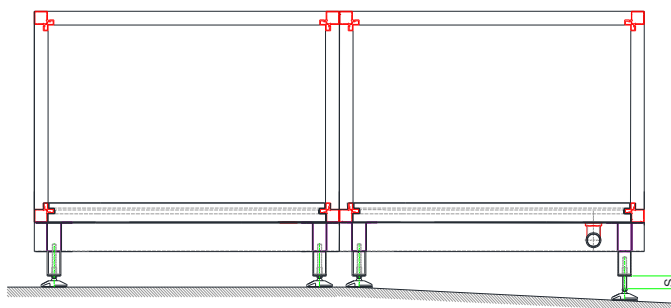
Non-parallel frame sections due to small floor unevenness



Aligning by deflating the support



Aligning the units with adjustable legs



✓ The sequence of activities in setting up the Air Handling Unit on site



CAUTION:

The drawing of the Air Handling Unit is the basis from which it begins and with which the assembly is completed.

- Mark the space on which the air conditioner is installed
- Packaged sections are supplied by a forklift truck, one by one, in the order as provided in the drawing.
- Nylon film in which the sections are packed is removed, screws securing the wooden beams for transport are removed.
- Sections are again slightly raised by a forklift truck, so that the beams with their profiles for the connection with the base.
- If the sections are adjustable feet, there is a waterproof plywood 80 x 80 x 20 attached to them, which makes sliding sections for fine position adjustment.



CAUTION:

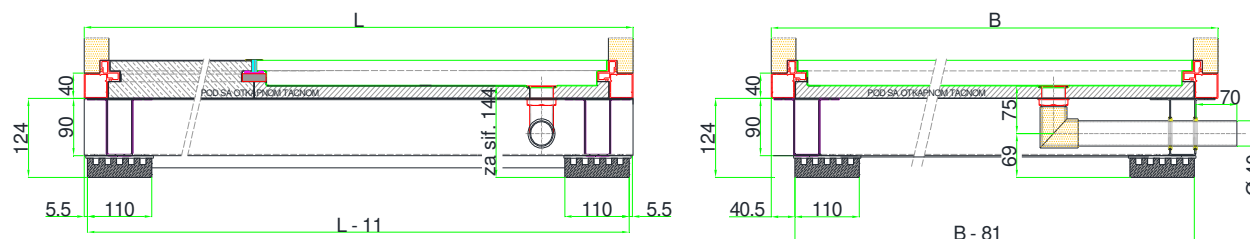
- Moving the sections to the appropriate position is always done **exclusively over the frame** of the base, and certainly not through the panel or through the collector exchanger.
- Do not attempt to move sections using hammer or other heavy tools (by bangs).
- To move, use the battens that act on the frame of the base.
- In order to prevent the spread of vibrations, **the Air Handling Unit casting is never screwed on the base or support structure**, and under the sections at the support points, rubber ribbed shock absorbers are placed or they are adjustable feet with rubber feet.
- ✓ **Bases with adjustable legs** – setting the legs with the tire, adjusting the height of the legs due to leveling.



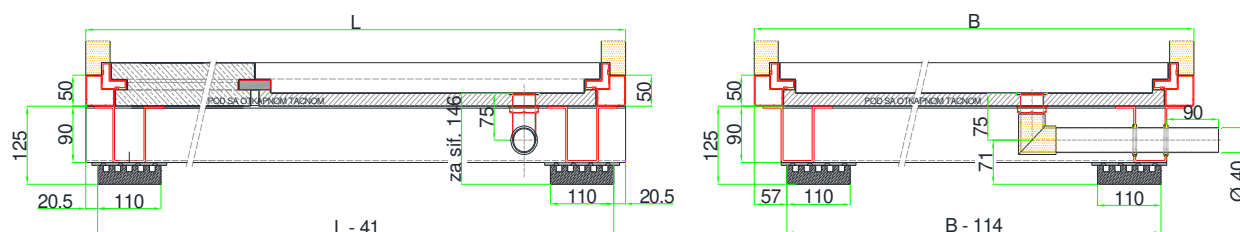
- When the section is located exactly in its place it is again lightly raised by a forklift truck, then the supports from the waterproof plywood are removed and the rubber stops that belong to the adjustable feet are set, then the section drops and pulls the forklift truck.
- After that, the leveling (alignment) of the Air Handling Unit sections follows by fine adjusting the height through the adjustable legs.

- ✓ **Bases without adjustable feet, with rubber ribbed shock absorbers** – the positions of the supports as well as the height of the siphons for all three sizes of Al profile;

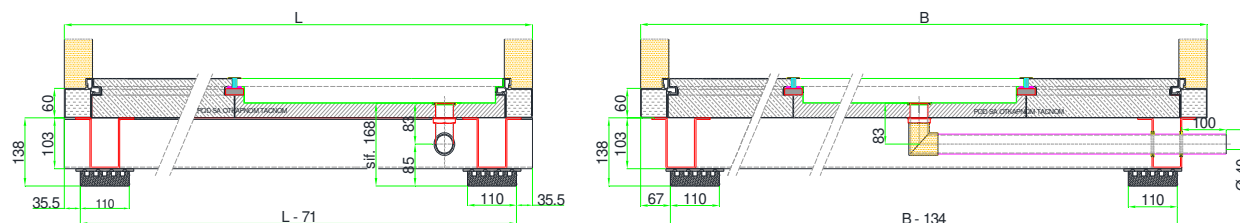
Profil **40mm**



Profil **50mm**



Profil **60mm**



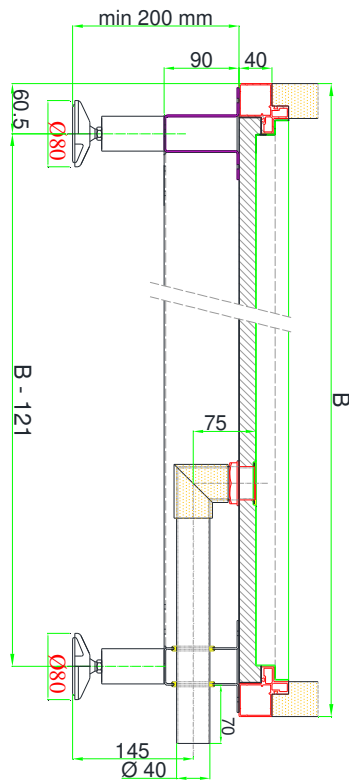
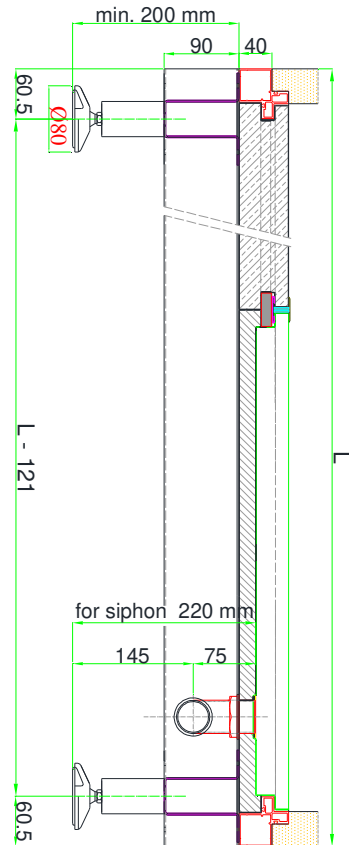
- Bases without adjustable legs are prepared with steel plates for supporting rubber ribbed shock absorbers and by which slip sections are made for the final adjustment of the position.
- After that the sections are slightly raised by a forklift truck and rubber ribbed shock absorbers are placed underneath the plates.



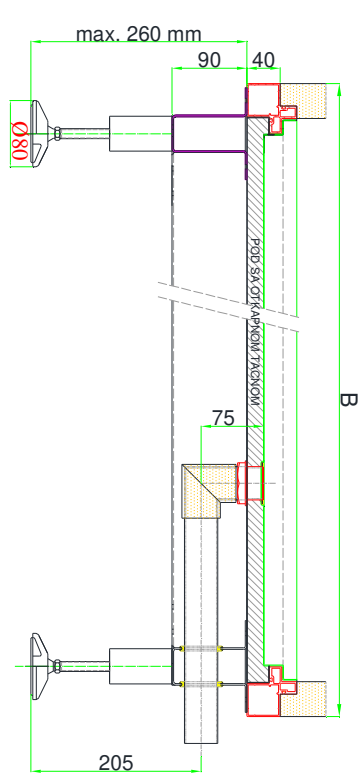
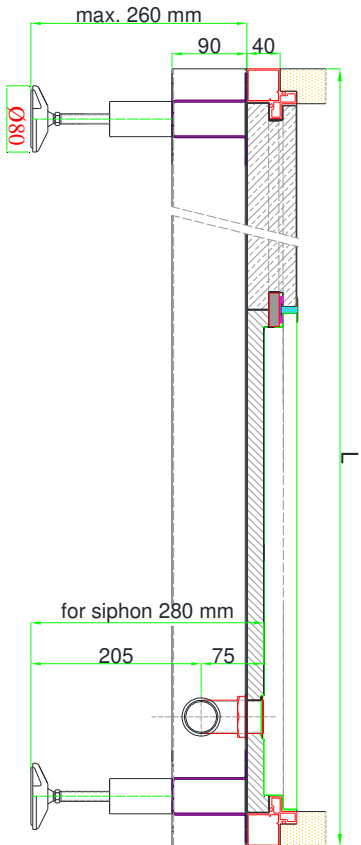
NOTES:

- If the sections differ substantially by weight, in order for the frames to be aligned prior to joining, additional supporters are needed for the heavy section or the end of the section in which a heavier element is placed (for example, a fan). These supports are placed between the steel plates of the base and rubber ribbed shock absorbers, and there can be one or more steel plates (option and additional tire).
- ✓ **In the following drawings**, for all sizes of the Air Handling Unit (ie all three sizes of Al profiles), the minimum and maximum height of the base with the corresponding adjustable feet, the positions of the supports, and the minimum and maximum height for the siphon.

Stand with adjustable legs at **minimum** height for the **40 mm** profile
- support position, siphon size

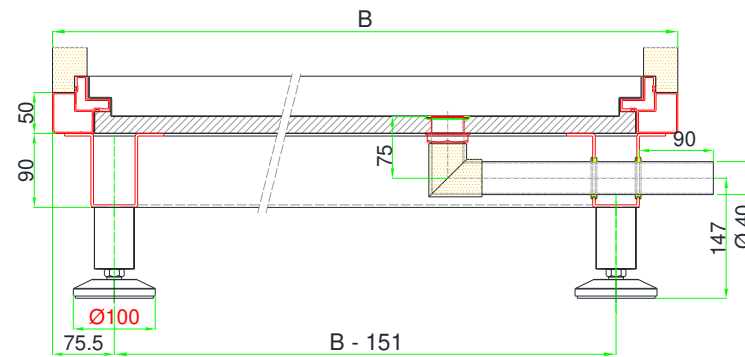
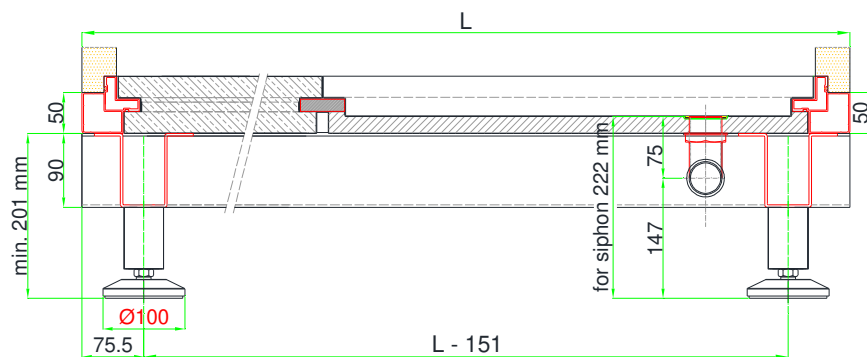


Stand with adjustable legs at **maximum** height for the **40 mm** profile
- support position, siphon size



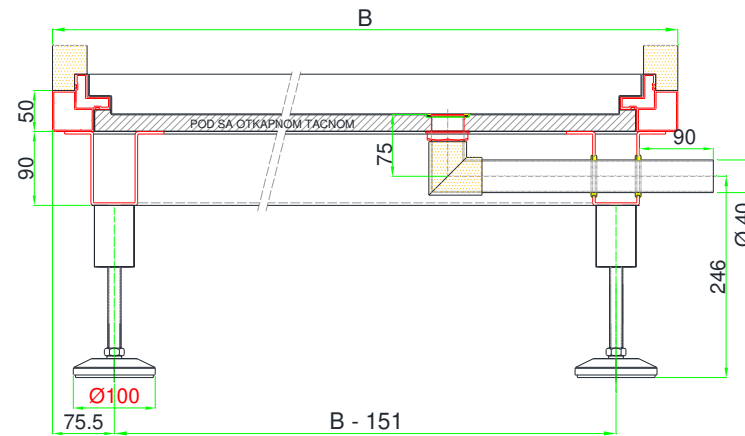
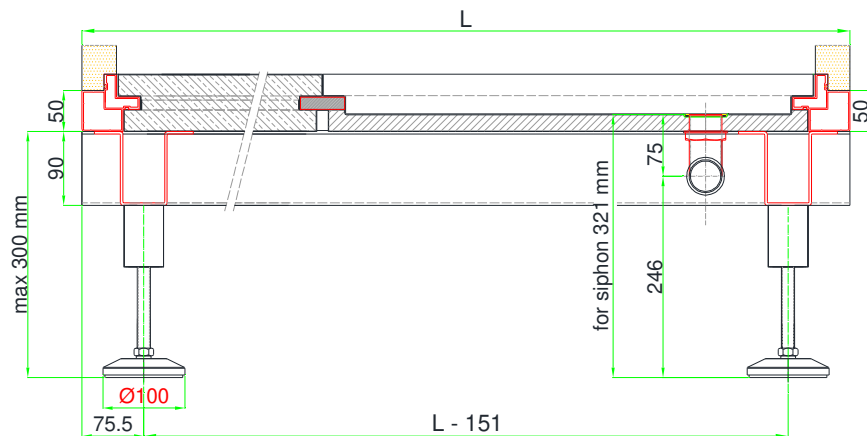
Stand with adjustable legs at **minimum** height for the **50 mm** profile

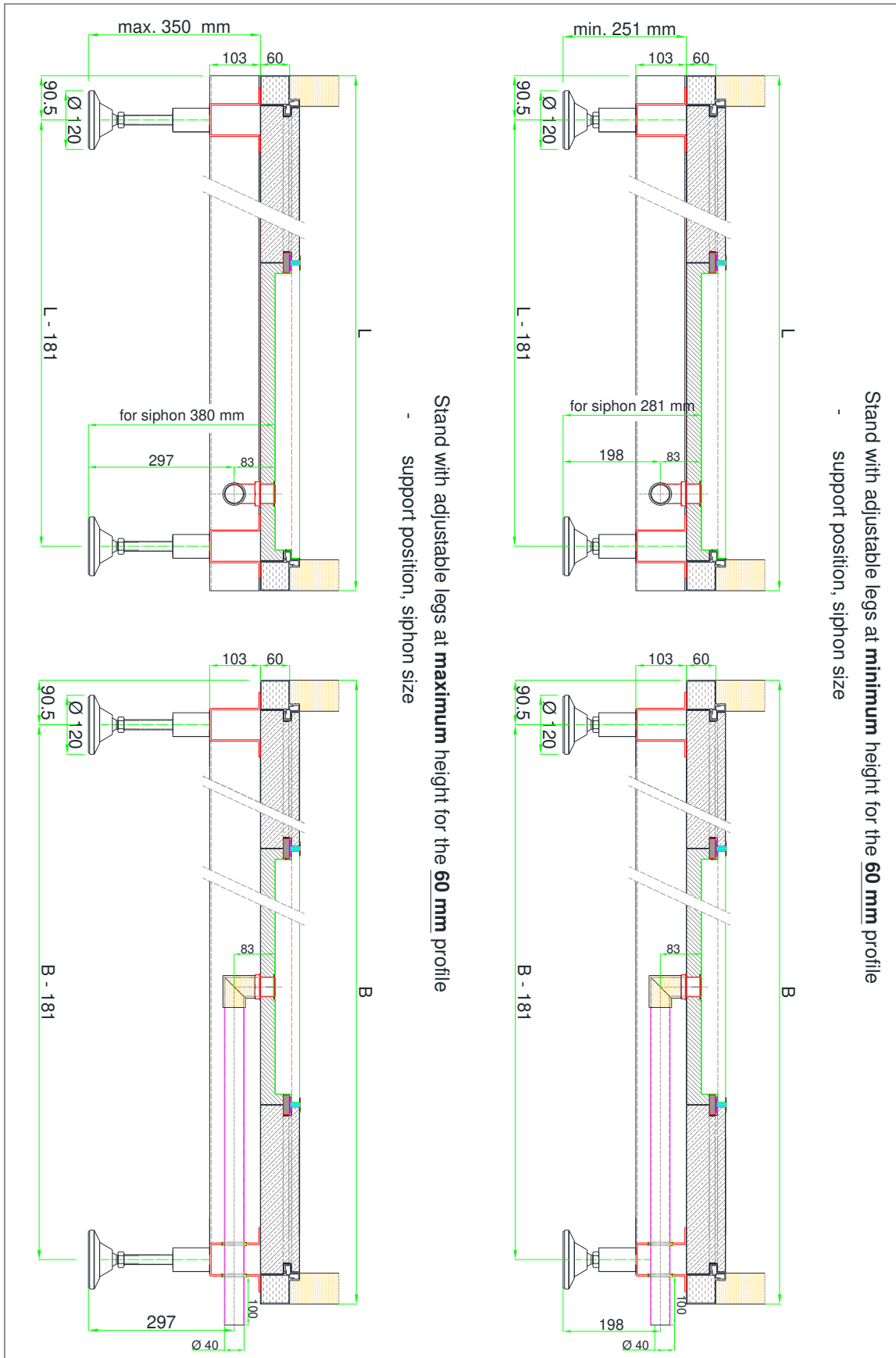
- support position, siphon size



Stand with adjustable legs at **maximum** height for the **50 mm** profile

- support position, siphon size



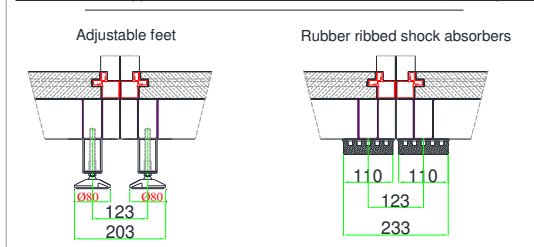




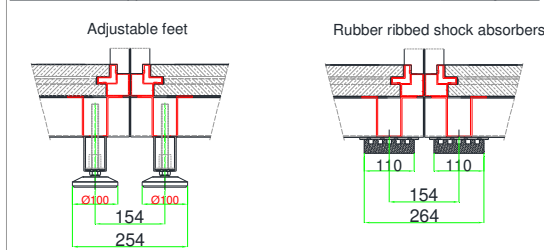
NOTES:

- If steel structures to carry the Air Handling Unit are made, in this case, due to the layout of the carrier, the positions of the supports on the connections of the two sections are very important, which is shown in the following drawings.
- The drawings show schedules of the bonds section in the case of reliance on adjustable feet in the case of relying on rubber ribbed shock absorbers for all three sizes of aluminum profiles (all three types of enclosures).

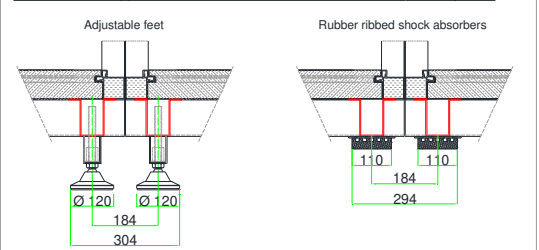
Position of the support on the connections of the two sections - 40 mm profile



Position of the support on the connections of the two sections - 50 mm profile



Position of the support on the connections of the two sections - 60 mm profile

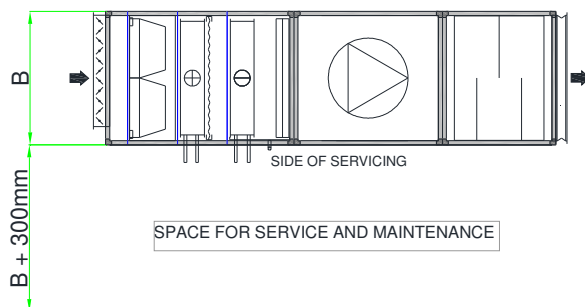


✓ Position of the Air Handling Unit



NOTES:

- The Air Handling Unit should be installed so that connection to the ventilation duct system is the simplest, as well as the distribution of hot or cold water.
- When mounting, the service side must provide free space for replacing, maintaining and servicing all built-in components.
- In accordance with VDI 6022, sufficient space must be left (width of the Air Handling Unit plus 300mm) so that heat exchangers can be extracted, eliminators of drops, and for ventilators 0.8 B it would be enough.



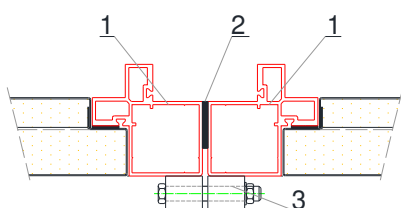
- For parallel air handling units, space must be provided for service and maintenance on both sides of the appliance.
- The pipeline and associated equipment are mainly operated on the side of the Air Handling Unit, but it must be ensured that all doors and service pieces can be opened smoothly.
- The staff installing the units must wear protective equipment (protective gloves, protective shoes...).

7. PARTS ASSEMBLY



CAUTION:

- All work related to the assembly of the unit must be carried out by specially trained, technical persons, in accordance with applicable regulations.
- Before starting the assembly of the sections of each air handling units, check the following:
 - Check the position of the Air Handling Units and the order of the sections according to the drawing.
 - Check that all items that were used for the transport, unloading and positioning of the device, as well as the protection of parts of the device during transport are removed from the sections.
 - Check that the damaged tapes that are factory-fitted to the frame sections and are used for sealing between sections.
 - Check the positions of adjustable feet or rubber ribbed shock absorbers (if they are correctly supported on the bearing surface).
 - Check the outlet pipes for draining water from the sections (if any) to possible damage.
 - Check all dampers and elastic connections (if they are removed, install them).
 - **With a level**, check the vertical and parallelism (compatibility) of the frame sections in all directions.



External connection

- 1- housing frames
- 2- self-adhesive sealing tape
- 3- connection profile with a screw and a nut

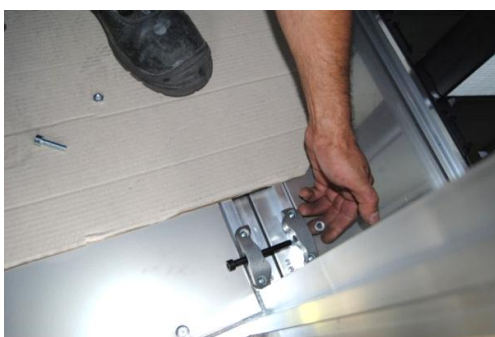
- The sequence of joining sections must be absolutely observed. First, it starts with the unit that contains the air outlet (connection to the channel).

The profiles for indoor and outdoor connection are factory-fitted on sections, and screws and nuts are in a box with other mounting material located in the pressure fan section.

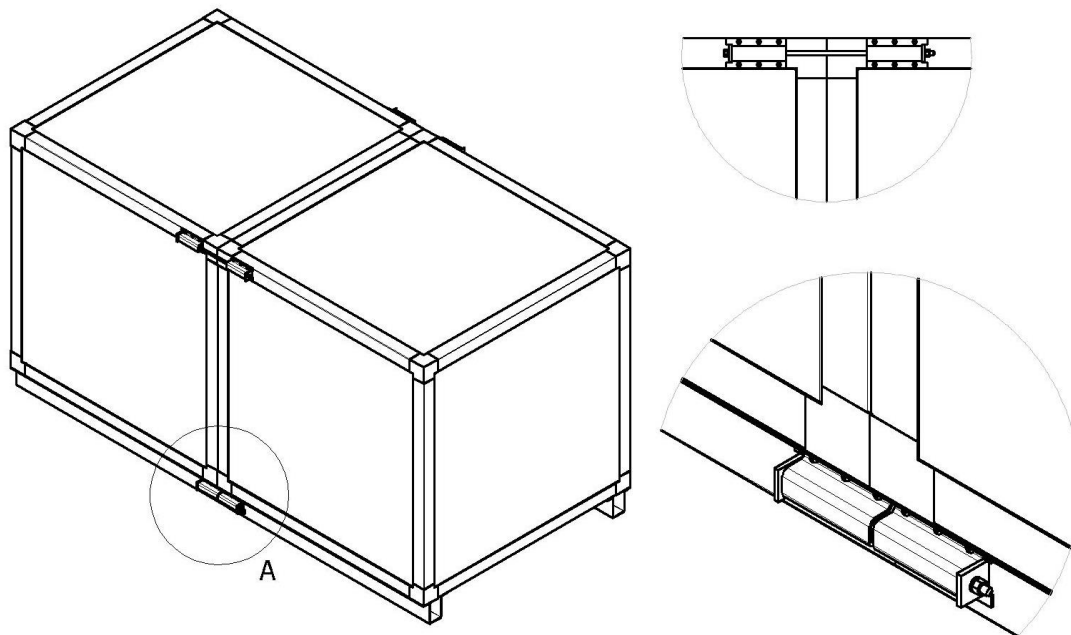
- External joining of sections



- Internal joining of sections



- When it comes to large Air Handling Units, besides this connection of the frame frames, an additional interconnecting frame between the base and the roof is carried out, as shown in the picture below. (Screws, nuts and tiles are in the box of prefabricated material).



- After interconnecting all sections and tightening of all screws, it is followed by **checking the closing of all built-in doors**. If a door is not closed, the hinge adjustment should be done correctly.
- **Adjusting on the hinge**

- The first step is to release the tie-in with the 2.5-inch hexagonal key by means of which the hinge is fixed to avoid displacement.



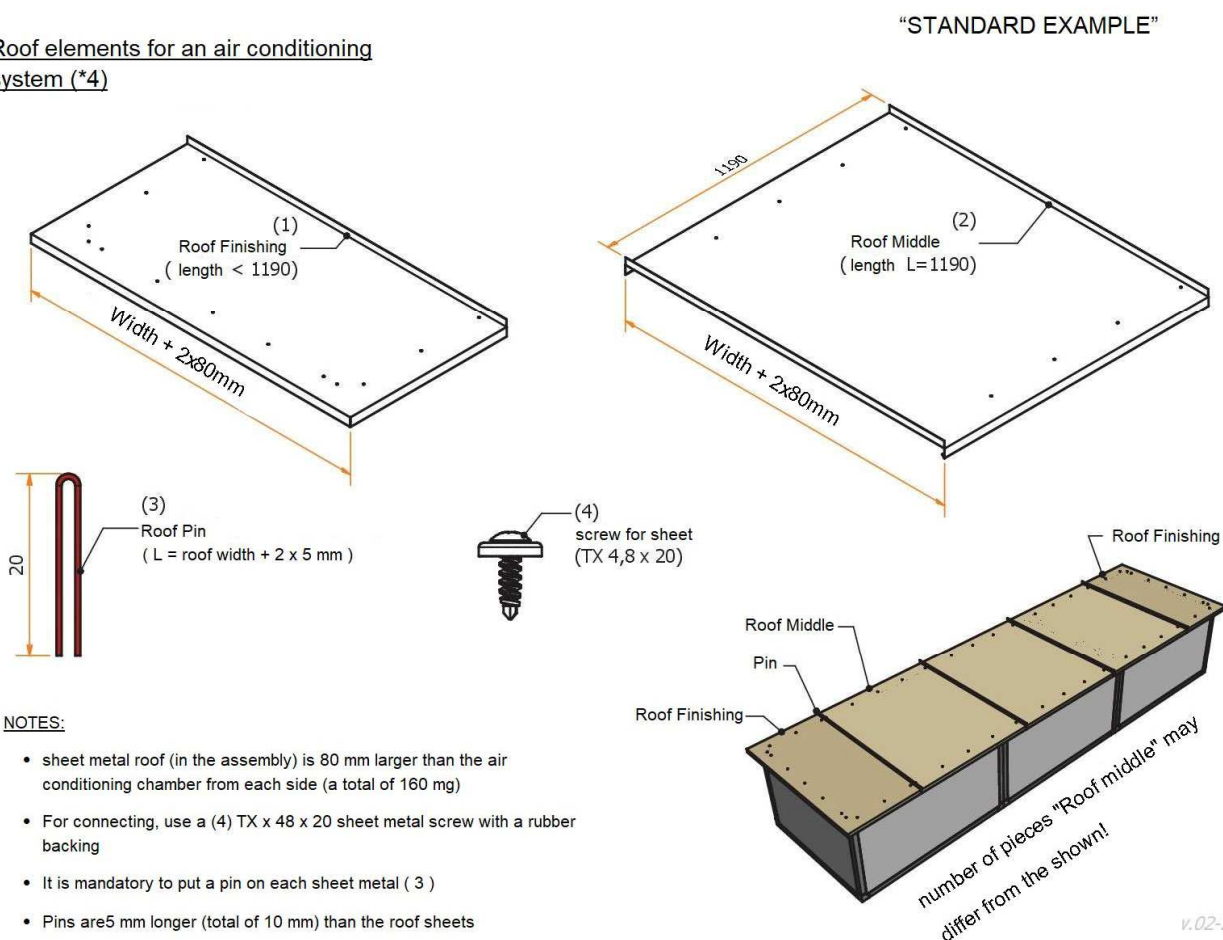
- The second step is to adjust the door according to the hexagonal key 5 (as shown in the second figure).
- The third step is to re-tighten the tensioner to fix the hinge.



✓ Installing the roof with external Air Handling Unit

- Air Handling Units for outdoor installation are equipped with a protective roof, and the suction ports for the fresh air and ejection of the waste are protected by hoods with a protective net.
- The protective roof for small air handling units can be made of one piece, and for larger airconditioning chambers it is made of several pieces (sheets), which are connected with conjuncts on the building. The sheets and conjuncts are packed with the air handling units and mounted after the assembly is completed (as shown in the drawing).

Roof elements for an air conditioning system (*4)



NOTES:

- sheet metal roof (in the assembly) is 80 mm larger than the air conditioning chamber from each side (a total of 160 mm)
- For connecting, use a (4) TX x 48 x 20 sheet metal screw with a rubber backing
- It is mandatory to put a pin on each sheet metal (3)
- Pins are 5 mm longer (total of 10 mm) than the roof sheets



NOTES:

- Factory-made holes for the passage of the screw connections for the Air Handling Unit are built in all the sheets.
- The screws are **TX 4,8 x 20** with a rubber pad and are packaged in a box with mounting material.

8. CONNECTING AIR HANDLING UNITS

8.1. Connecting Air Handling Units to the channel air distribution

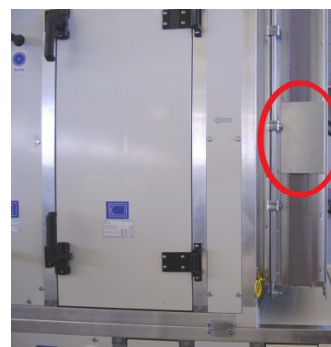
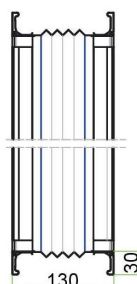
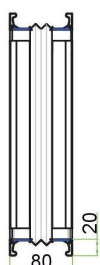
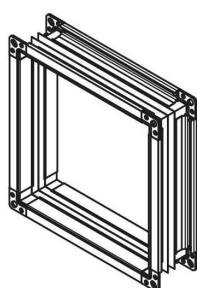
In order to avoid the transmission of vibrations from the Air Handling Units to the air ducts, they are interconnected by elastic couplings, which are supplied as part of the Air Handling Units.



CAUTION:

- The connection of air ducts with elastic couplings to the air conditioner chamber must be achieved through the flange of the elastic connection, necessarily with the screws on the corners, and additional tightening with the pads along the sides.
- When connecting, care must be taken of the parallelism of the elastic coupling flange. The compounds must be such that they do not leak air.
- The length of the elastic connection must not be used up to the maximum.

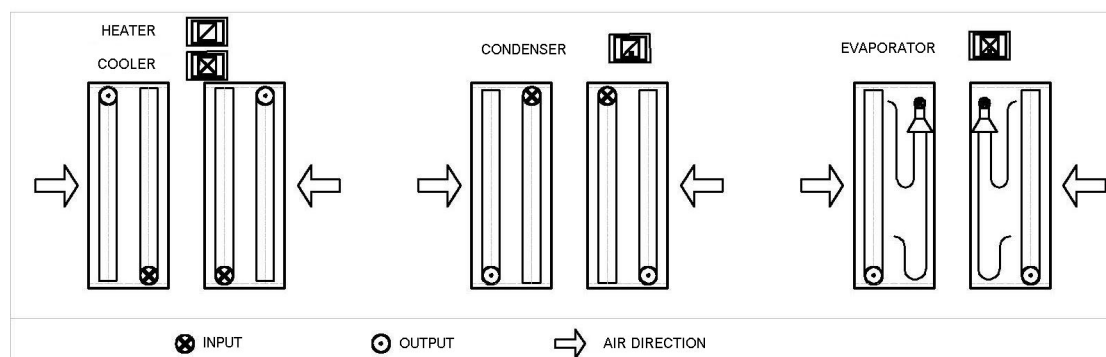
The drawings below show the widths of the elastic bends with flanges of 20mm or 30mm MEZ flanges and associated angles, which are used in Air Handling Units, depending on the size of the holes.



- When transporting the Air Handling Units, the elastic connections are fixed as shown in the figure, to avoid damage.
- When the Air Handling Units are installed, these fixers must be removed before connecting to the air ducts.

8.2. Heat exchangers – installation in air handling units

- The heat exchangers within the Air Handling Units are most often delivered with inlet-out-of-pipe collectors carried out outside the cross-section of the Air Handling Units through the fixed lateral formwork, and almost always on the service side.
- The type of exchanger (whether heater, cooler, Dx cooler or recuperator) are labeled with different labels, and for each of them labels are marked both inlet and outlet (glycol).
- Exchangers are countercurrent (coolant moves in the opposite direction from the air flow).



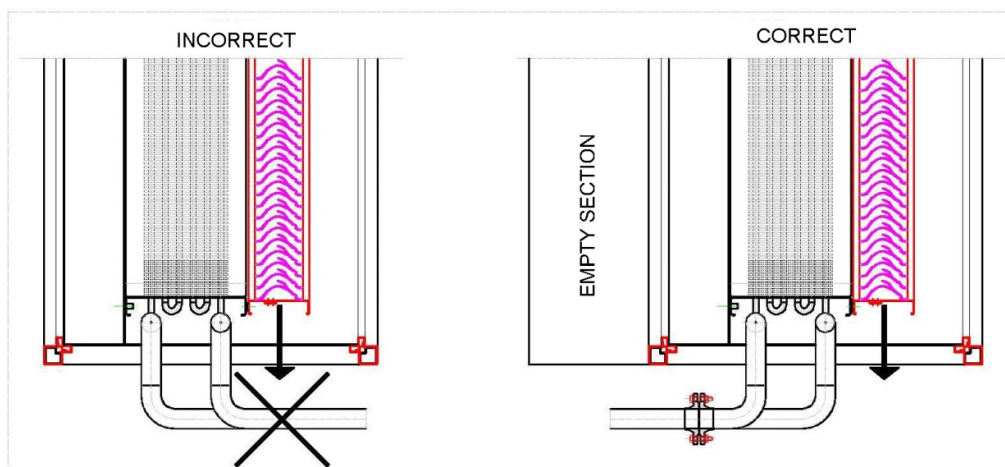
- For steam generators the steam supply is always at the top, a larger pipe diameter, and the condensate outlet is at the bottom, a smaller pipe diameter.

- Exchangers are equipped with liquid drain connections (at the lowest point) and vent connections (at the highest point).

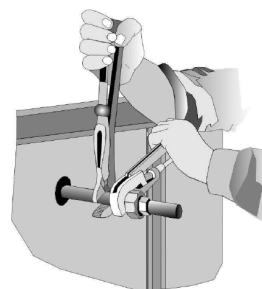


CAUTION:

- Exchangers must be connected so as not to transfer any mechanical loads or vibrations from the pipeline to the exchangers (to ensure line piping dilatations).
- The pipeline must never interfere with access to other elements of the Air Handling Unit.
- When installing the pipes, ensure unhindered extraction of the droplet eliminator (with coolers and evaporators) or unhindered access to the cold thermostat (with heaters).



When tightening the hose coupling, the connection pipe (collector collector) must be additionally accepted with the appropriate key or pliers, in order not to damage the connection of the collector to the pipes of the exchanger.



NOTES:

- Behind every heat source heater is necessary to install a thermostat for protection against freezing. The carrier for this frost thermostat is factory built in the Air Handling Units.
- The heat exchanger system of the lamellar recovery device is filled with a mixture of water-ethylene glycol at a concentration as indicated by the project.

- The refrigerators and evaporators are located in the condensate collecting vessels, which are taken out of plastic tubes through the base, outside the chamber (as shown in the drawings in the section "Installing the Air Handling Units"). A **siphon** is connected to this plastic tube.



Drain the condensate when the cooler is up



8.3.Siphon – installation

- SIPHONS are an upgrade to all sections, where cooling, humidification and recuperation processes take place and serve as an undisturbed drainage of water generated by these processes.
- The height of the siphon depends on the value of the overpressure or suppression in the section from which the water is drawn out and is determined according to the following terms:

In the zone of **overpressure**

$$H1 = 35 \text{ mm}$$

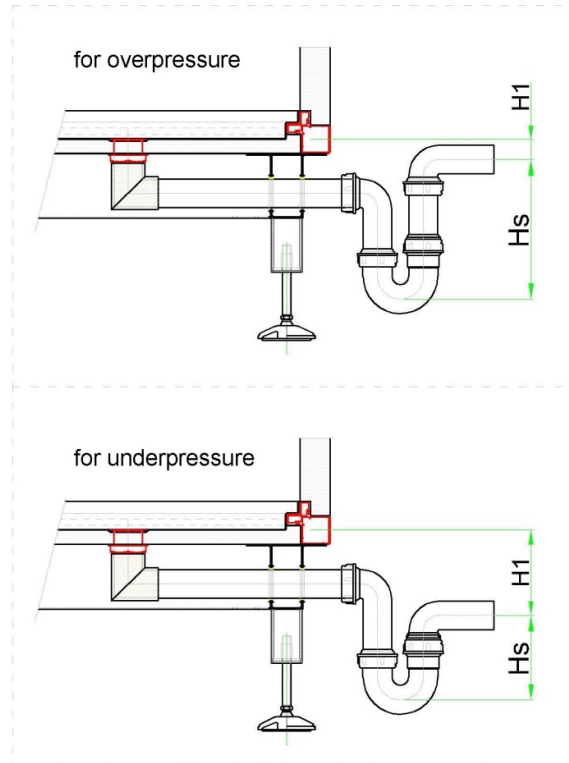
$$Hs = p + 35 \text{ mm}$$

In the zone of **underpressure**

$$H1 = p + 35 \text{ mm}$$

$$Hs = p \times 0,6 \text{ mm}$$

Wherein; p = pressure at the mounting site,
expressed in mmVS- 1mmVS = 10 Pa



- The siphons are upgraded to a plastic tube **ø40 mm**, which extends through the base of the mentioned sections.
- PVC pipes and rubber seals are most commonly used for the siphons.

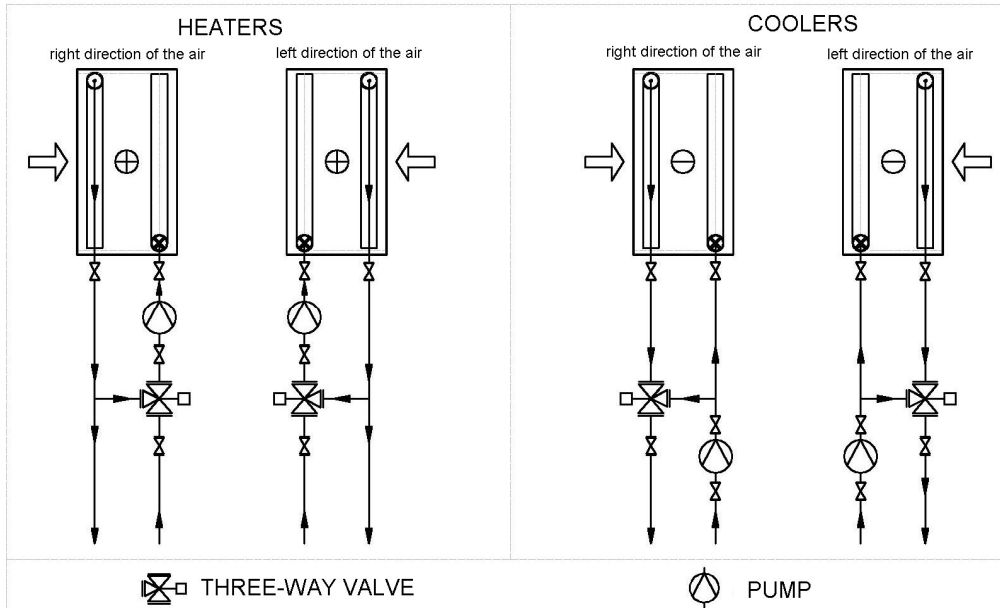


CAUTION:

- o Never connect drainage of water from the overpressure zone to drains of water from the underpressure zone.

8.4. Connecting exchangers - protection against freezing

- It is recommended to connect the heat exchanger to the installation using **three-way valves**, to protect against freezing. Three-way valve allows the mixing of the incoming and return current of the transmission medium.



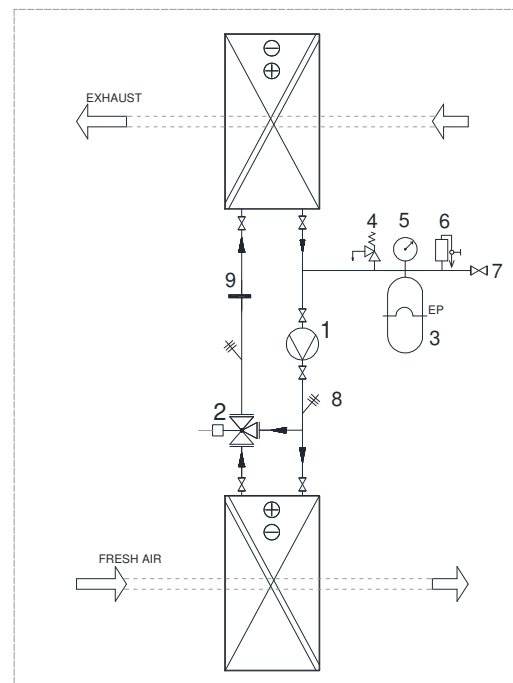
NOTES:

- The method of linking to an object may be different from the one shown in the drawing, so the specific project or customer's requirement should always be respected.

• Connection of the lamellar recuperator

A system with **two lamellar exchangers in a closed circle** with a pump, three-way valve and other supporting armature, with the transfer medium of the water-glycol mixture, is coupled according to the following principle scheme:

1. Circulation pump
2. Three-way valve
3. Expansion dish
4. Safety valve
5. Manometer
6. Ventilation valve
7. Charging valve
8. Thermometer
9. Connector for temperature probe

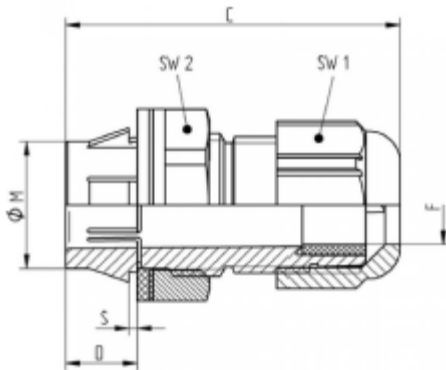


9. ELECTRICAL INSTALLATIONS



CAUTION:

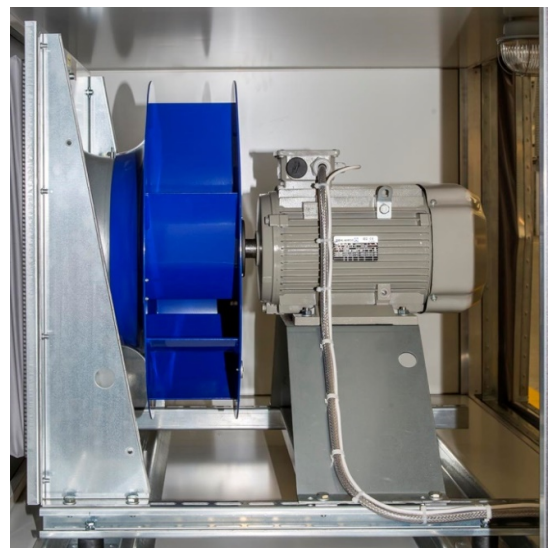
- Only skilled and qualified electricians can operate electrical installations on Air Handling Units in accordance with the regulations and requirements of VDE and legal regulations.
- Before operating the installations, check that the voltage, frequency and phase number correspond to the data in the technical characteristics attached to the device.
- In case of any deviation, do not start the installation work.
- It must be possible to disconnect the power supply cable of the motor using the main switch in the electric motor and the service switch.
- For the passage of cables through the panels, the holes are drilled and the glands are installed that must not leak air. The table below shows the size of the glands, the holes drilled in the panels as well as the outer diameter of the connecting cables.



The appearance of a metric gland type SKINTOP® CLICK

No.	Size	Clamping range ØF	M (hole)	SW1/SW2	Total length C	Length of thread D	Wall thickness S
		mm	mm	mm	mm	mm	mm
53112692	CLICK 12	4.5-7.0	12.3(-0.2)	15.0/18.0	40.0	8	1.0-4.0
53112686	CLICK 16	5.0-9.0	16.3(-0.2)	19.0/22.0	42.0	8	1.0-4.0
53112687	CLICK 20	7.0-13	20.3(-0.2)	25.0/27.0	45.0	8	1.0-4.0
53112688	CLICK 25	9.0-17	25.3(-0.2)	30.0/32.0	48.0	8	1.0-4.0
53112694	CLICK 32	11.0-20.0	32.3(-0.2)	36.0/40.0	56.0	8	1.0-4.0

- The cables inside the device must be sufficiently distanced from the moving parts in the device, secured by clamps to allow unhindered servicing.
- Ensure sufficient cable lengths to allow access to all parts that need to be moved for some reason (belt tension) or pulled out from the device.



9.1. Connecting electric motors

Electric motors that are installed in the Air Handling Unit are three-phase asynchronous motors (directly coupled with a fan or connected to the fan via the belt transmission), as well as three-phase or single-phase EC motors.

Three-phase asynchronous motors

Types of protection of three-phase asynchronous motors that must be applied:

- short circuit protection,
 - overload protection,
 - protection against falling and voltage failure,
 - protection against the failure of some of the phases
- Fuses and motor protection switches are used for motor protection against short circuits. If friction fuses are used, the soldering inserts should be $(2 \div 3) \times I_n$ for low power motors, or approximately $1.3 \times I_n$ for high power motors (I_n -nominal motor stays). If motor protection switches are used, which are also protection of the motor from overload, the setting of the motor protection switch must be at $I_n \times 1.05$.
 - To protect the motor from falling and voltage failure, as well as from the failure of some of the phases, the appropriate protection relays are used. Response of these relays should interrupt the command line which supplies the pump-type contactor to switch on the motor.
 - Electric motors have built-in bimetal or PTC protection in the coils as an additional measure of overload protection. The bimetallic protection must be connected to the line with the power supply cord plug for switching on the electric motor. PTC sensors must be connected to the appropriate protection relays for motor overheating, which will, in case of overheating of the motor, switch off the voltage of the cordless contactor for switching on the electric motor. If frequency controllers are used to control the electromotor, the bimetallic or PTC protection is preferably connected to the corresponding digital or analog input of the frequency regulator.



WARNING!

- **If the recommended motor protection measures are not applied, there may be damage that are not covered by the warranty! Before each commissioning of the motor it is necessary to check the recommended way of connecting the coils for given voltage and network frequency which is written on the nameplate of the motor.**
- Electric motors with rated power up to 5.5 kW are put into operation directly while high power motors are put into operation by a star / triangle starter (Y-D) or soft starter.
- Motors can be driven and operated by frequency regulators.
- For motors that are commissioned directly, through a soft starter or frequency regulator, three-pole service switches are provided.
- For motors running through the star – triangle starter, six-pole service switches are provided
- Service switches of the electric motor of the fan are mounted on the external fixed fan section. Service switches have built-in auxiliary contacts so the switch-on or switch-off of the service switch can be signaled by a lamp on the control box of the Air Handling Unit, at the digital input of the PLC that operates the operation of the Air Handling Unit or at the digital input of the frequency regulator.





WARNING!

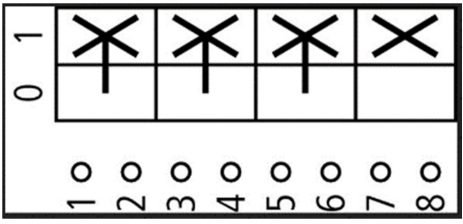
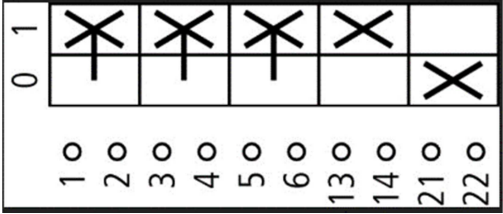
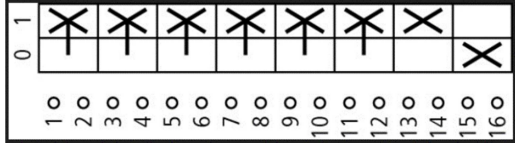
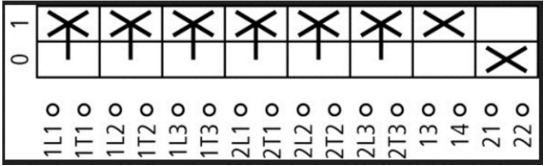
- When operating in any Air Handling Unit, the device must be disconnected from the power by turning off the main switch in the control circuit board and by turning off the motor service switch.
- During work, the device must be protected against unauthorized restart. Doors on the fan sections can only be opened when the fans are off and completely stopped.
- The fan impellers must not be stopped by hand or mechanical obstacles.

Motor power	Motor start	Appropriate service switch
0.55kW	Direct start or via frequency regulator	T0-2-15679/I1/SVB, 3P
0.75kW		T0-2-15679/I1/SVB, 3P
1.1kW		T0-2-15679/I1/SVB, 3P
1.5kW		T0-2-15679/I1/SVB, 3P
2.2kW		T0-2-15679/I1/SVB, 3P
3kW		T0-2-15679/I1/SVB, 3P
4kW		T0-2-15679/I1/SVB, 3P
5.5kW		T0-2-15679/I1/SVB, 3P
7.5kW		P1-25/I2/SVB/HI11, 3P
11kW		P1-25/I2/SVB/HI11, 3P
15kW		P1-32/I2/SVB/HI11, 3P
18.5kW		P3-63/I4/SVB/HI11, 3P
22kW		P3-63/I4/SVB/HI11, 3P
30kW		P3-63/I4/SVB/HI11, 3P
37kW		P3-100/I5/SVB/HI11, 3P
45kW		P3-100/I5/SVB/HI11, 3P

Table for selection of service switches for direct start of the motor, via soft starter or via frequency regulator

Motor power	Motor start	Appropriate service switch
7.5kW	Starter Y-D	T3-4-15682/I2/SVB
11kW		T3-4-15682/I2/SVB
15kW		T5B-4-15682/I4/SVB
18.5kW		T5B-4-15682/I4/SVB
22kW		T5B-4-15682/I4/SVB
30kW		T5-4-15682/I5/SVB
37kW		T6-160-6/I45/SVB/HI11
45kW		T6-160-6/I45/SVB/HI11

Table for selection of service switches for starting the motor through the starter Y-D

	<p>The order of contacts for T0-2-15679/I1/SVB</p>
	<p>The order of contacts for P1-25/I2/SVB/HI11, P1-32/I2/SVB/HI11, P3-63/I4/SVB/HI11 and P3-100/I5/SVB/HI11</p>
	<p>The order of contacts for T3-4-15682/I2/SVB, T5B-4-15682/I4/SVB and T5-4-15682/I5/SVB</p>
	<p>The order of contacts for T6-160-6/I45/SVB/HI11</p>

Contactor schedule table for service switches

9.1.1. Installation and connection of frequency regulators

When using frequency regulators for the motor speed control, the following must be considered:

1. The motor must be designed for frequency control,
2. The motor must have overheat protection in the coils such as the PTC sensor,
3. The cable for connecting the motor and frequency regulators must be braided as well as the cable connecting the PTC sensor to the frequency regulator,
4. The maximum permissible fan speed may not be exceeded in any case,
5. Installation must be carried out in accordance with EMC recommendations.

If the frequency regulators are placed in the Air Handling Units, the formworks on the fan sections are prepared for their simple installation.

The method of assembling frequency regulators on the formwork of the air conditioner:



1. Remove the upper screws (figure 1) and the lower two unscrews for about 5-6 mm.
2. Take the appropriate frequency converter (the mark is on the aluminum profile) and set the lower two screws (figure 2).
3. Lean the converter onto the panel, return the two upper screws and then all four screws firmly tighten.



NOTES:

Frequency converters are mounted in the factory on the formwork in order to parameterize the basic parameters of the motor and they are removed so that they do not get damaged during transport.

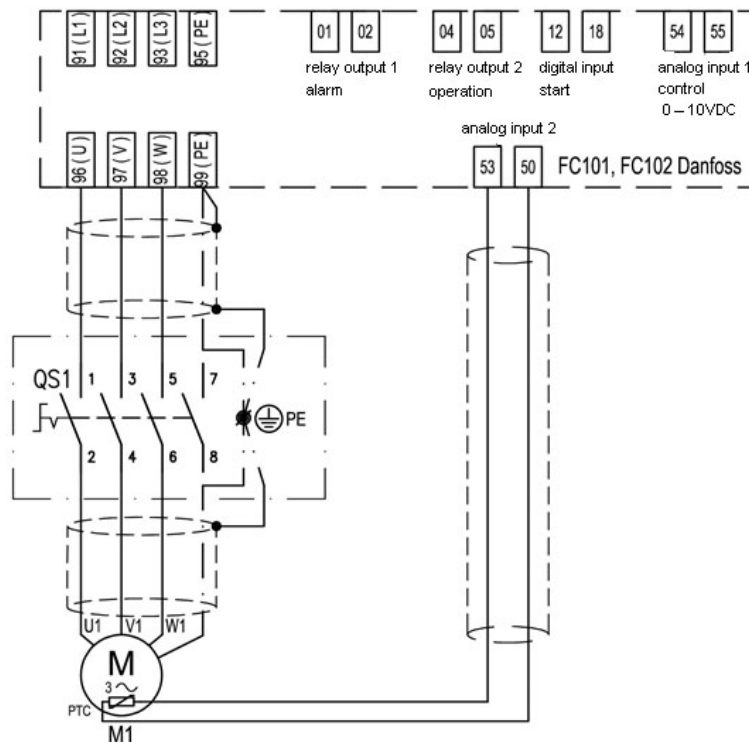
Transport of frequency converters to the facility is done on pallets and in their factory packaging.



- If the Air Handling Units are designed for outdoor installation, the frequency regulators are mounted and transported within the fan sections.
- In this case, the display of the frequency regulators is installed on the front formwork via the remote mounting kit, so that they are available for adjusting and reading the parameters.

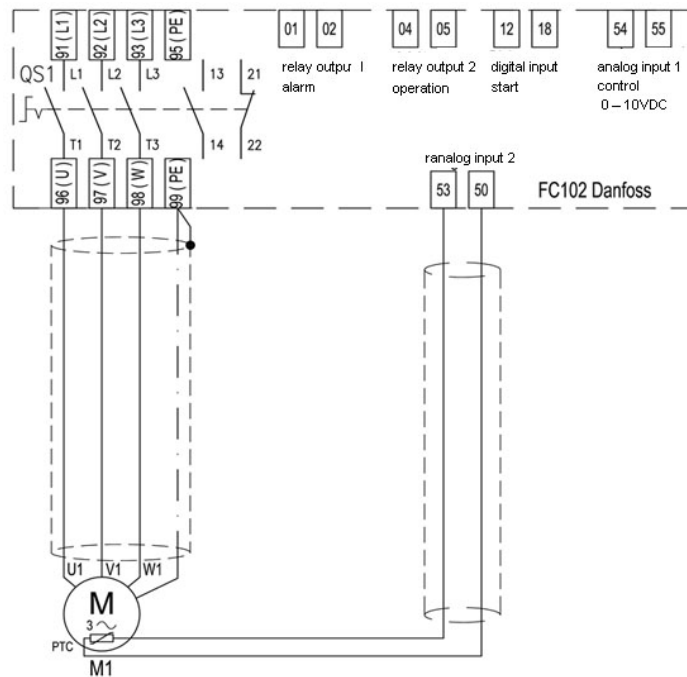


- The service switch is connected to interrupt the power supply in the output circuit of the frequency converter.



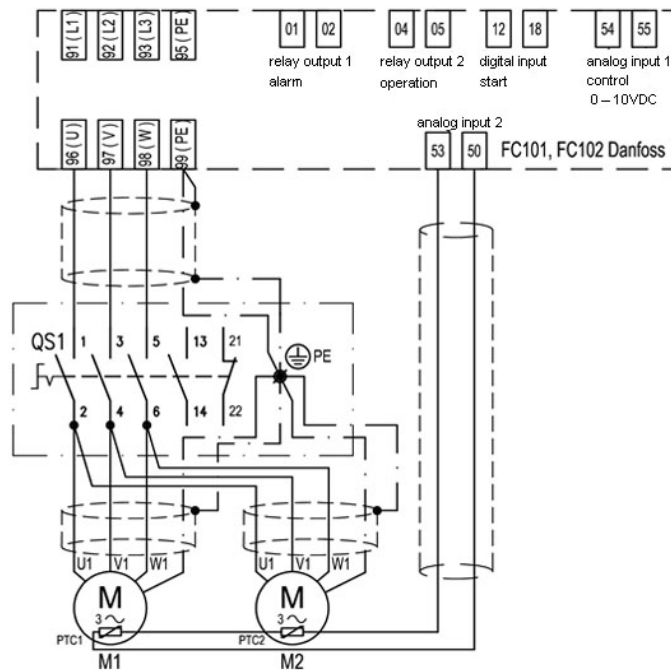
Example of connection of a frequency converter and a motor with a service switch in the output circuit of the frequency converter

- There are also variants of frequency converters (FC102) that have a built-in service switch on. In this case, the power supply in the supply circuit of the frequency converter is interrupted.



An example of a motor and frequency converter scheme with a built-in service switch

- If there is a coupled connection between two fans in the ventilation section, they can be connected so that each has its own frequency converter or both can be connected to one frequency converter.

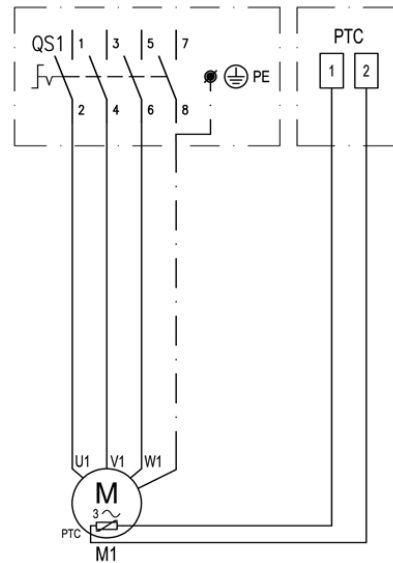


An example of a scheme for connecting two electric motors to one frequency regulator

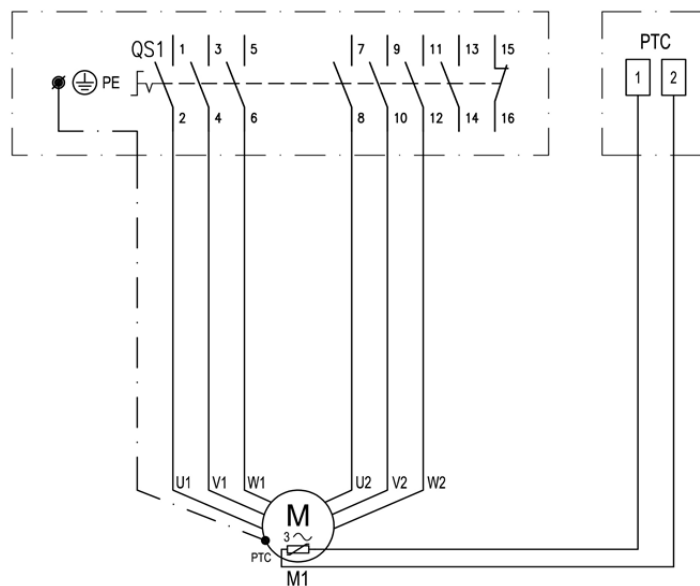


WARNING!

- The maximum output frequency of the frequency converter must not exceed the recommended maximum fan frequency!



Engine connection diagram and service switch for direct start



Motor connection diagram and service switch for the starter Y-D

The ends of the PTC sensor are pulled into a smaller terminal box that is mounted on the formwork next to the service switch.

After starting the motor it is necessary to check the parameters of the motor - to measure the current by the phases,, the interconnected voltage, the direction of rotation of the engine. If the direction of rotation is not good, replace the two phases in the power supply cable. If frequency converters are used to regulate the speed of the motor, all engine parameters can be easily read on it.

9.1.2. Connecting EC motors

Ensure that there is sufficient distance between power and control cables to avoid interference. Command cables must not exceed 30m.

- For distances greater than 20m, control cables must be braided. When using braided cables, the braided cable must be ground only on one side, ie, only on the side of the device with protective grounding (use as short as possible cables and with as little as possible inductance).

Power supply:

- Single-phase – lead power supply to L, N and PE. It must be strictly observed that the supply voltage meets the defined tolerances - check the nameplate of the motor.

Alternatively, DC power supply is permitted - check the motor nameplate. The polarity of the voltage on the L and N inputs is irrelevant.

- Three-phase: lead power supply to L1, L2, L3, N and PE. It must be strictly observed that the supply voltage meets the defined tolerances - check the nameplate of the engine. Alternatively, DC power supply is permitted - check the motor nameplate. The polarity of the voltage to L1, L2, and L3 is irrelevant.



Risk of electric shock!

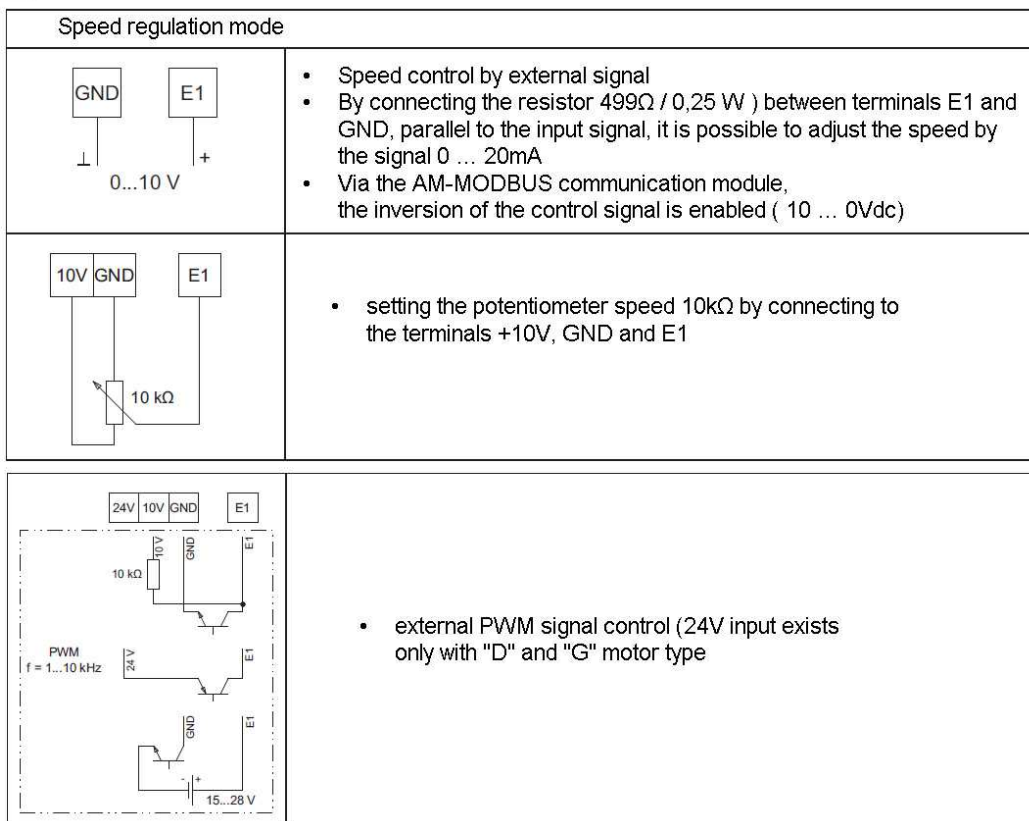
- The motor has built-in overload protection so that no additional overload protection measures are required.

Analog input

The motor has an analog input 0-10V for speed control. Connect the control signal to the inputs "E1" and "GND". Take care of the polarity! Alternatively, speed control with PWM signal is possible.



Do not supply the power supply to the analog input! Take into account the polarity of the control signal.



Voltage output +10V

It is used for speed control with an external potentiometer. Connection is on "DC Out" - "GND" (Imax 10 mA). It is not allowed to interconnect outputs from multiple devices.

Power supply for external devices, only for "D", "G" motor size (+24 V, GND)

Integrated power supply for external devices. The terminal is "+ 24 V". It is not allowed to interconnect outputs from multiple devices. During overload or short circuit (24 V - GND), the control voltage (and therefore the device) is switched off. Restart automatically after removing the cause of the error.

Digital input for ON / OFF (Digital input In 1= D1)

Electronic ON / OFF control for overvoltage contact "D1" - "+24V" / "+10V"

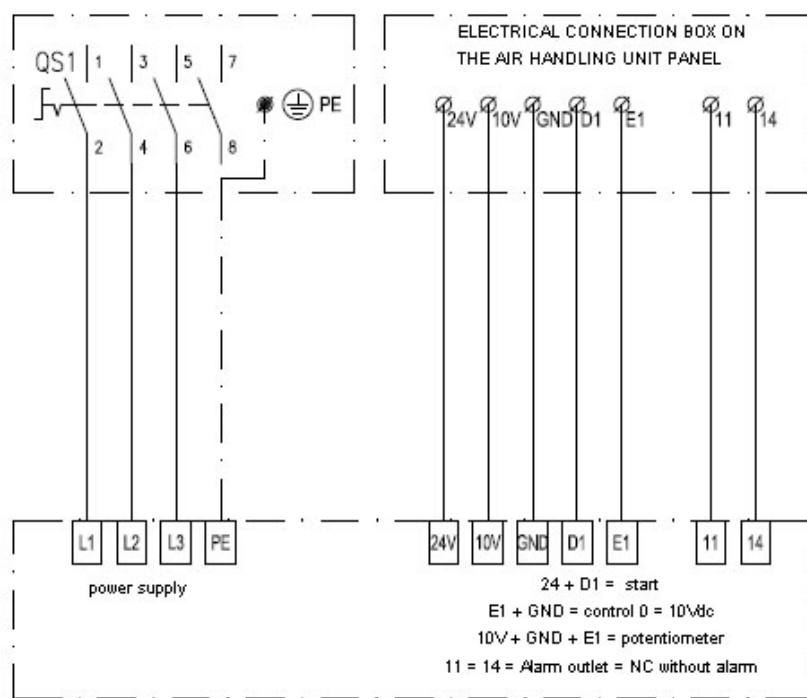
- The device is "ON" when the contact is closed
- The device is "OFF" when the contact is open

The relay output remains triggered, the contact 11-14 is short-circuited.

Relay output K1

An external error indicator is available via a non-volatile contact of the built-in relay. In case of operation, the relay is triggered; between 11 and 14 is a short connection. The relay remains triggered even when the device stops via the digital input.

In the event of an error, the relay is triggered.



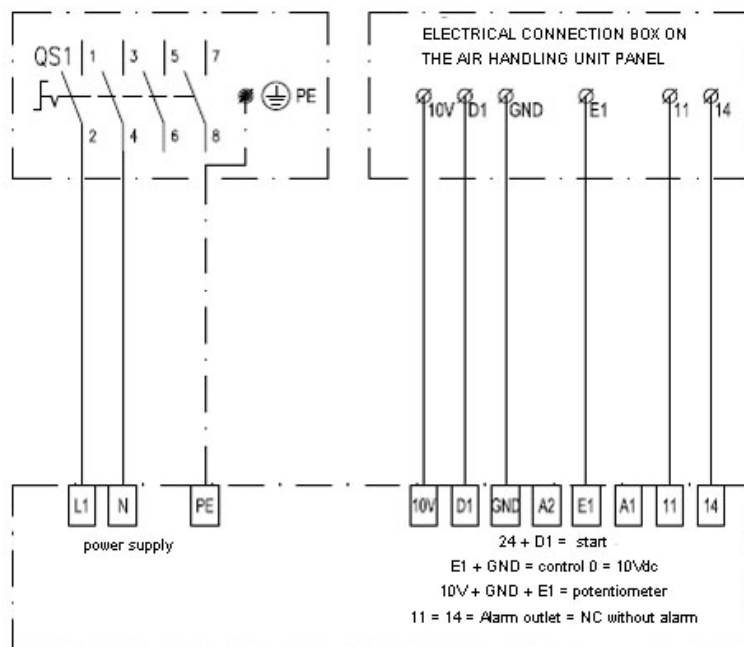
Connection scheme for "D" and "G" motors size

(type: _____ - I . D _____), (type: F _____ - I . G _____)



Fan box for "D" and "G" motors size

1. Housing cover,
2. Cable glands and rubber seal for two cables (use if necessary)
 - for "D" size motors: 3 x M16 + 1 x seal with two 5 mm openings in diameter,
 - for "G" size motors: 3 x M20 + 1 x seal with two 6 mm openings in diameter,
3. Inlet for cables for plastic plugs,
4. Terminals for the power cable,
5. Terminals for the alarm relay,
6. Terminals for control,
7. Slot for the additional module,



Connection scheme for "B" motors size

(type: _____ I . **B** _____)

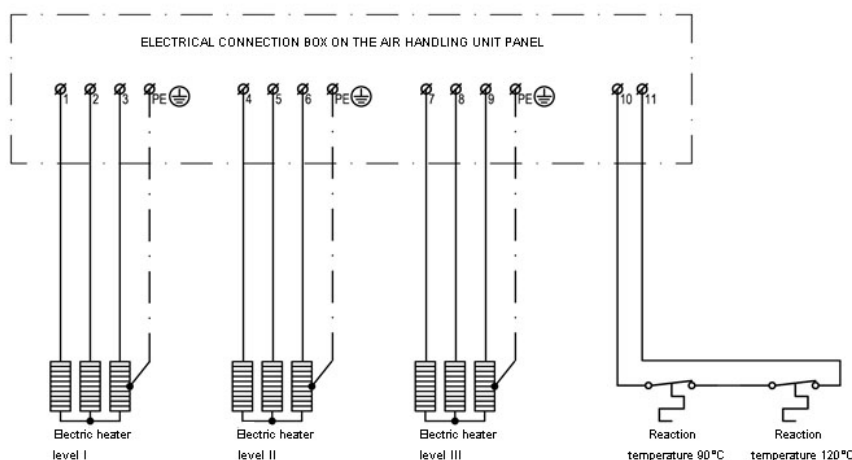
9.2. Connecting electric heaters

- Electric heating batteries are formed by stacking and connecting rod-shaped heater in the required number to form the required power of the electric heater defined by the technical statement of the Air Handling Units
- Switching on electric heaters can be stepwise (ON / OFF) or via thyristor.
- The heating and cooling thermostats connected to the red - clicks are installed on the heating batteries, as an additional measure of protection of the heating batteries from overheating. The ends of regularly connected protective thermostats should be connected as to interrupt the power supply contactor degree of electrical heaters or command line thyristor.
- The ends of the heaters and the protective thermostats are drawn into the connection box that is mounted on the heating section panel from the outside.

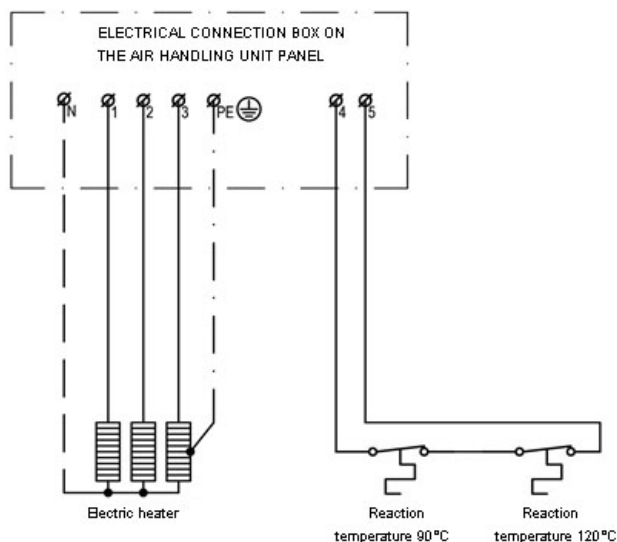


CAUTION!

The operation of the electric heater must be conditioned by the operation of the electric motor of the Air Handling Unit fan. After switching off the Air Handling Unit, if the heaters were in operation before, delay the tripping of the fan motor for a period of at least 3min!

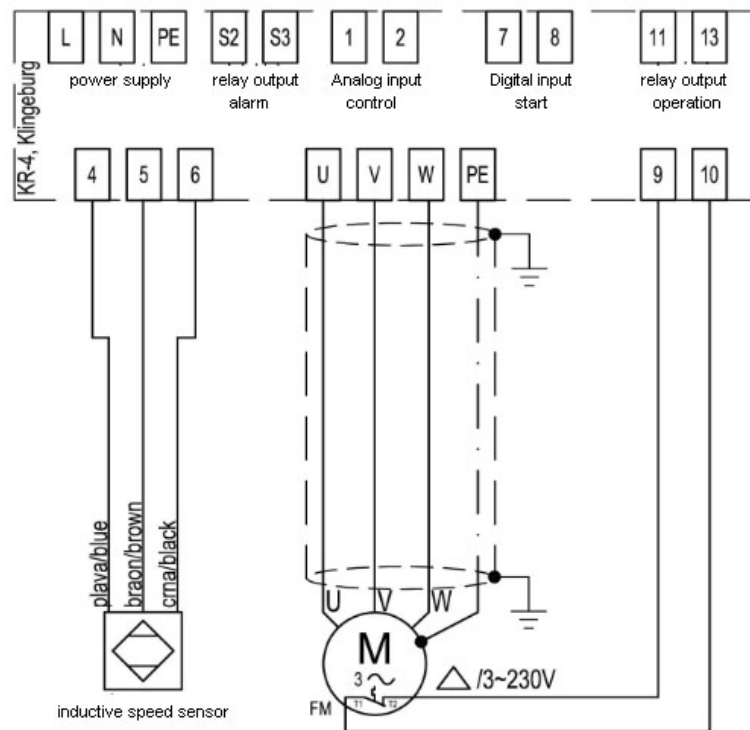


An example of schemes of electrical heaters for 3 stepwise activation

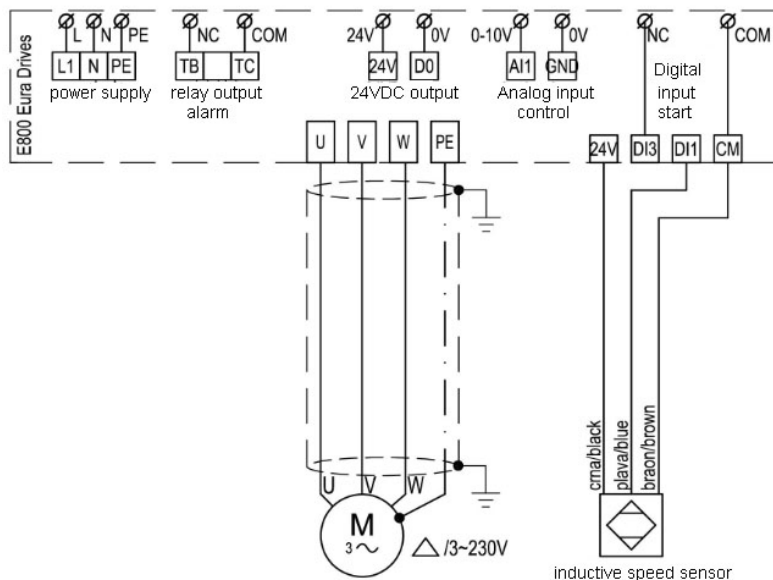


An example scheme of electrical heaters for power control through thyristors

9.3. Connecting rotary recuperators



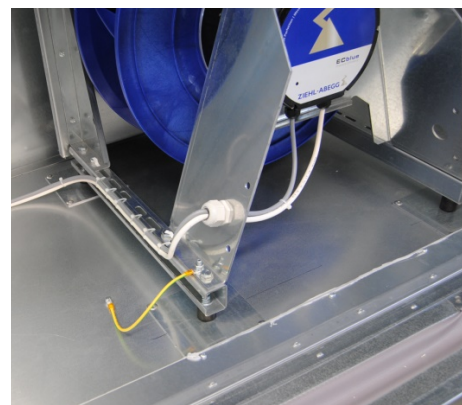
Connection scheme of the KR4 rotary recuperator of the Klingeburg manufacturer - factory connection



Connection scheme of the E800 Eura Drives rotary recuperator of the ERI Corporation – factory connection

9.4. Potential equalization, grounding

- ✓ To prevent sources of ignition caused by electrostatic discharge, all non-conductive coupling points must be equipped with equipotential bonding connections (between two sections, Air Handling Units with ducts, fan-motor with housing). The entire casing must be grounded.



9.5. Connecting humidifiers

- Humidification of air in our Air Handling Units can be done with the following three types of humidifier;
 - **Steam humidifiers** with autonomous steam generator or with central steam preparation. The steam generator needs to be installed on the building, connect it electrically, connect it with hoses to a vapor distributor already installed in the Air Handling Unit, connect the water supply, and connect condensate drains. The maximum absolute vapor pressure can be 1.5 bar.

All of the above should be done exactly as instructed by the manufacturer of the humidifier.

- **Adiabatic contact humidifier** (honeycomb humidifiers) which with all its elements embedded in a Air Handling Unit at the factory. It is necessary to properly connect the pump, float valve, discharge valve, all this according to the original instructions from the manufacturer of the humidifier.
- **Adiabatic high-pressure humidifier**

High pressure water is sprayed through the nozzle in the air stream. This humidifying system consists of a pump station with a controller for control of operation, a nozzle assembly and a droplet eliminator. The pump station provides water pressure of $4 \div 15$ bars or $25 \div 75$ bar, depending on the type of humidifier. The hose is connected to the nozzle assembly in the Air Handling Unit.

All connections should be done according to the instructions provided by the manufacturer of the humidifier.



CAUTION: It is necessary to provide connection to the installation with prepared water. The characteristics of the prepared water must be in accordance with the recommendations of the manufacturer of the humidifier (see the instructions of the manufacturer of the humidifier).

10. PUTTING INTO OPERATION



CAUTION:

- **The Air Handling Unit forms part of the air conditioning system and can be put into operation only after the installation of the entire system, which must be carried out according to the project.**
- **The commissioning of the Air Handling Unit can only be performed by qualified and trained persons, respecting all standards and regulations.**
- **Persons who commission the system should first study the installation instructions, commissioning and maintenance of the SOKO Air Handling Unit.**
- They must always have drawings of the **Air Handling Unit with technical characteristics** that they should satisfy, as well as all necessary **electrical and hydraulic schemes**.
- System operators must be obliged to obtain instructions for all those system elements that are not covered by the standard instructions of the SOKO airconditioner (eg humidifiers).

10.1. Preparations for putting into operation

Before commissioning the system, the following control actions must be performed (checks):

- Check that the Air Handling Unit is grounded and connected to the duct air distribution.
 - Open the Air Handling Unit and check that all parts of the device (fans, exchangers, filters, recuperators, humidifiers ...) are factory-installed, undamaged after transport and assembly.
 - Check that you have removed all blockades and foil needed for transport.
 - Check that the Air Handling Unit is cleaned from the inside.
 - Make sure that all panels and service doors are secured and sealed.
- ✓ **Checking the electrical installation**
- Check that all electrical parts are connected.
 - Check that the cables are enough away from the moving parts.
 - Check that the supply of electrical equipment has been carried out in accordance with the supplied circuit diagrams and in accordance with the standards.
 - Check the system start switch function (set on the control circuit board), as well as the function of the service switch on the Air Handling Unit.
- ✓ **Checking the filter**
- Check the attachment of the filter to the supporting frame as well as the seals.
 - Check the condition of the filter bags or cartridges.
 - Check the installation method, function, and set pressure parameters and pressure gauges to measure the dirt of the filters.
 - Check if the filters can be pulled out of the unit due to replacement.



NOTES:

- When starting the system for the first time, with fine filters or absolute filters installed, it is preferable not to use them. Instead, insert some pressure drop simulators, and these filters return to their place after the first commissioning and thorough cleaning of the space.
- ✓ **Inspection of lamellar heat exchangers - heaters, coolers, Dx coolers, recuperators**
- Check that the exchangers are properly connected (counter-current).
 - Check heat exchangers for mechanical damage and dirt.
 - Check that the pipe network (for water or water-glycol installations) together with the pump and the control and protection elements are carried out according to the hydraulic scheme from the project.
 - Check that the circulation pump is properly connected.
 - Check that the three-way control valve is well-installed.

- Check that the installation is filled with the appropriate media (for heating or cooling).
- Check that the Dx coolers are connected to the Freon system and ready to operate.
- Check the siphons; whether they are installed on all necessary places, whether they are good altitudes, whether they are connected to drains and whether they are filled with water.
- Check whether the freezer thermostat is installed correctly behind the heater.
- Check whether the drop-off eliminators are correctly installed behind the radiator and can freely be removed.



NOTES:

- All work, checks, adjustments, refills on refrigeration installations with Dx coolers, compressors, condensers should be carried out by authorized refrigeration service providers (freon installations).

✓ **Inspection of plate recuperator**

- Check mechanical damage and dirt.
- Check the bypass dempper function (if installed).
- Check the drop separator (if fitted).
- Check the siphon according to the same principle as for the lamellar exchangers.



NOTES:

- Before commissioning the drive bypass damper should be closed.

✓ **Checking the rotary recuperator**

- Check that the wheel freely rotates when the belt is removed, and check the gaps.
- Check whether the electrical connection is done according to the scheme, whether the sensors are built in.
- Check the belt.

✓ **Checking electrical heaters**

- Check that the electric heater battery is connected according to the enclosed connection scheme and is properly grounded.
- Check that the working and protective thermostat is properly connected and adjusted.
- Check connections for damage, as well as connection box.

✓ **Checking steam humidifiers**

- When autonomously humidifying, check that the steam generator is properly installed, whether the electrical installation and water supply have been well done (according to the instructions).
- Check that the steam supply hose, as well as the steam distributor, are properly replaced.
- Check whether water quality is good (according to the project).
- Check condensate drainage pipes - if they are properly mounted.
- For central vapor preparation, check whether the valve with electric drive, the separator and steam distributors are well-adjusted..
- Check the siphon according to the previous principles.

✓ **Checking the adiabatic contact of humidification and adiabatic high pressure humidifier**

- All these checks perform according to the original manufacturer's instructions.

✓ **Checking the dumpers**

- Check that the dampers are properly secured and are sealed well.
- Check whether the blade shaft is swiveling freely
- Check whether the electric drive is fastened and connected.

- Check whether the dipper heaters are set and connected (if they are foreseen by the project)

✓ **Checking fan units - belt transmission**

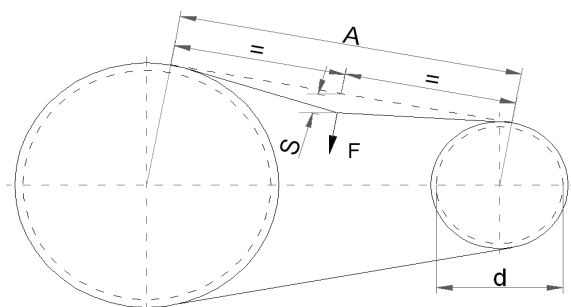
- Check whether that the transport struts are removed, if they are not removed.
- Check whether the fan wheel freely rotates and whether it is balanced.
- Check the direction of rotation of the fan and whether it is aligned with the arrow on the housing.
- Check whether the axle of the electric motor freely rotates.
- Check the parallel and tension of the wedge belt.
- Check whether the elastic connections are properly attached and equalized.
- Check the tightness of all screws.
- Check the bearings and lubricate them if necessary.
- Check the anti-vibration support function.
- Check whether the ground is properly implemented.

• **Regulation of the tensile force of V-belt according to DIN 7753**

Tension of V-belt should be measured and adjusted in accordance to certain technical requirements, using adequate measuring instruments.

- Measure the distance A of the fan and motor pulleys axes (in meters)
- Deviation of the belt strap S (mm) = A (m) x 16 (mm)
- Apply sufficient force F on the V-belt in the middle of the distance A in order to obtain deviation S
- Measure the applied force F
- Compare deformation force of F with the tabular values.

Use higher values in the stage of commencing the operation of new V-belt. After a few hours of continuous operation, test again the deformation force F and adjust it if necessary.



CAUTION:

- Incorrectly tensioning the V-belts can lead to damage to the bearing of the fan and the electric motor, and for this reason, if the unit is standing for more than three months, the relays must be loose or removed, and the tension adjustment should be carried out immediately before commissioning.

The force F (N) after the deflection S = 16 mm per 1 m of the distance A

TYPE OF PULLEY	DIAMETER OF SMALLER PULLEY "d" (mm)			DEFORMATION FORCE F (N)		
SPZ	67	up to	95	10	up to	15
	100	up to	140	15	up to	20
SPA	100	up to	132	20	up to	27
	140	up to	200	28	up to	35
SPB	160	up to	224	35	up to	50
	236	up to	315	50	up to	65
SPC	224	up to	355	60	up to	90
	375	up to	560	90	up to	120

- ✓ **Checking the fan units - freely rotating (Plug-in)**
 - Check whether the bracings for transport are removed, if they are not, remove them.
 - Check whether the fan is damaged.
 - Check the motor connection and supply voltage.
 - Check the rotation of the rotor (the rotor must not touch the suction nozzle).
 - Check the direction of rotation of the fan and whether it is aligned with the arrow on the housing (briefly turn on). If the direction of rotation is wrong, replace the two phases in the power supply cable of the motor.
 - Check the tightness of all screws.
 - Check the anti-vibration support function.
 - Check whether the ground is properly implemented.
 - Check whether the differential pressure switch is properly installed and connected.



NOTE:

All service doors must be closed immediately after all these checks performed.

10.2. Putting into operational mode

Functional control and measurement of the parameters must be recorded in the official document (Putting into operational mode Record).

- ✓ The Air Handling Unit is started up by turning the main switch on the control circuit cabinet to the on position.

Fans



CAUTION:

- Before starting the Air Handling Unit fan, the fire doors must be opened (if any in the system) and the control dump must be opened too to some extent in order to protect the electromotor from overload.
- During commissioning, any level of resonance frequencies should be detected and eliminated.
- The fan should not be used if unusual frequencies and noise appear.
- Fans that do not have frequency converters, with power exceeding 5.5kW, are put into operational mode by a star / triangle starter or via a soft starter.
- With the plug of the fan, a differential pressure sensor whose differential difference is directly converted to the air flow velocity.
- Check whether the automatic control opens the dampers to the working position when the fan reaches the working speed.
- After starting the device, it is necessary to measure the value of the rated current drawn by the fan motor, as well as the noise and vibration levels.
- The measured value of the current must not exceed the nominal value (indicated on the electric motor plate).
- Turn off the device immediately if there is an overrun.
- If there are different phase currents, check the motor connection.
- It is not allowed to exceed the maximum fan speed (indicated on the plate).
- If the fan pulls the power within the limits of the permissible and has the number of revolutions within the limits of the permissible, it is necessary to measure the total pressure drop on the fan, as well as the amount of air it gives and compare with the required quantity that is on the sticker. If it fails, it is necessary to intervene.
- It is necessary to balance the flow of air through the suction and pressure holes.

Heaters, Coolers

- System charging must be handled carefully to reach the highest point of the system. An irregularly ventilated exchanger may form air pockets that reduce the efficiency.
- When filling the system, all stop valves and control elements must be fully open, as well as all vent elements.
- The system should be slowly charging from its lowest point.
- Gradually closing the vent valves at different heights.
- Turn on the pumps and check their direction of rotation.
- Check the system for leaks.
- Check the percentage of glycol in the loaded installation (if provided).
- Measure the volume flow of the medium and compare it with the required flow rate written on the label of this section. If it is deviating, it should be indicated as a problem.
- Perform measurements of temperature and humidity in front of and behind each exchanger.

○ Protection against freezing

If the temperature in the environment of the Air Handling Unit can fall below 3 °C, the heat exchanger must have protection against freezing over the protective thermostat, which must be adjusted depending on the percentage of glycol in the medium.

Percentage of glycols	Temperature of freezing for ethylene glycol	Temperature of freezing for propylene glycol
20 %	- 11 °C	-7°C
30 %	-18°C	-12°C
40 %	-25°C	-19°C



NOTE:

- Damage resulting from frost is not covered by the warranty.

Dx- coolers

- The cooling installation was previously tested with nitrogen at the appropriate pressure (depending on the type of freon), vacuumed and filled with freon.
- Commissioning and maintenance of cooling installations covered by separate instruction and operated by specially trained people.

Rotary recuperators

- Check whether the turning direction of the circuit is good (indicated on the housing).
- Check the prescribed rotational speed.
- Check the sealing tape (position), as well as the uniform rotation of the circuit around its axis..
- Check motor operation and belt tension.

Electric motor drive dumpers

- When the dumpers are coupled, check the synchronized movement of the blades, the proper functioning of the gear, the 90 ° angle of rotation and the closing of the blades at the end position of the demper.

Electric heaters

- The operating and protection thermostats must be installed directly in the air stream behind the electric heater and adjusted: working at 60 °C; protective at 80°C.



CAUTION:

- The electric heater can only be operated if the air flow control is ensured.
- Otherwise, due to insufficient cooling (overheating), damage to both the heater and the housing may occur.
- After switching off the Air Handling Unit, if the heaters were in operation before, delay the switch off of the fan motor for at least 3 minutes.

11. MAINTENANCE

- Maintenance and service is the basis for the warranty.
- The Air Handling Unit user is obliged to provide regular maintenance
- Inspection, maintenance and repair procedures can only be carried out by qualified and trained personnel.



WARNING!

- During any operation in the Air Handling Unit, be sure to turn off the power by turning off the main switch in the control panel and switching off the engine service switch.
- During work, the device must be protected against unauthorized restart. Doors on the fan sections can only be opened when the fans are off and completely stopped.
- The impellers of the fan must not be stopped by hand or mechanical obstacles..
- The main power supply must not be connected before the device is grounded and connected to the safety system.



CAUTION:

- The service station must be equipped with the necessary protective equipment (fire extinguisher, first aid cabinet ...) as well as mandatory emergency exit.
- The personnel handling the Air Handling Units and operating on the same must have protective equipment: protective clothing and footwear, protective gloves, goggles, protective masks, breathing apparatus...
- All inspections, all works done in the Air Handling Units, as well as the results of the performed measurements, must be recorded in the official document - Maintenance Book.

✓ **Basic safety risks in handling and maintenance of the Air Handling Units**



WARNING!

- Risk of injuries from the sudden opening of the door (formwork) in the Air Handling Unit when operating. (The door can be opened only when the fan is off)
- Risk of injuries from the fan blades. Risk that the fan sucks up clothes or hair. (The ventilator should only be operated when it is switched off at the service switch and completely stopped. Tie long hair and not wear wide outfit).
- Risk of electric shock due to short circuit (If the cables are not connected properly, there is damage to the insulation, the presence of moisture...).
- Risk of electric shock due to electrostatic discharge (If the units are not grounded).
- Due to the risk of electric shock, wait for at least 2 minutes after switching off the device before starting to work around the electrical component.
- Risks arising from heaters and coolers are: the risk of burns caused by hot steam under pressure or hot water. (Before any work on the exchangers, close the valves on the inlet and drain lines and let it cool down); Frost risk when touching cold pipes (wear protective gloves).
- Risk of burns caused by steam from steam humidifiers. (Keep your hands away from the humidifier, handle only when all the elements are connected and checked for leaks).
- Risk of poisoning caused by inhalation of dust from the filter or precipitated dust in the sections. (When replacing the filter and suction sections, wear a protective mask).

- Risk of chemical poisoning, from the occurrence of allergic reactions and chemical burns, all due to the use of glycol, leakage of freon installations, inhalation of toxic fumes ... (Wear protective gloves, use a face mask and eye protection).
 - Risk of eye damage and skin burns from stone removing agents. (Always wear protective goggles and protective gloves)
 - Use standard washing and disinfection agents in normal concentrations. They must not be aggressive or poisonous.
 - When cleaning the Air Handling Unit, do not breathe vapor and ensure good ventilation of the room.
 - Use quality cloths and accessories that do not damage the surface and do not leave hair on the surface.
 - If some parts have been previously disassembled, taken out of the Air Handling Unit and cleaned, carefully restored and reattached them.
- ✓ **The prescribed servicing and maintenance** intervals must be respected to ensure the smooth operation of the Air Handling Unit.
 - ✓ These recommendations refer to standard systems under normal operating conditions.
 - ✓ Most often, preventive examinations and necessary activities are performed twice a year - before winter and before the summer.
 - ✓ The intervals are twice as short for the hygiene Air Handling Unit and for more severe working conditions.

11.1. Table for the type of inspections and necessary activities for maintenance of the Air Handling Unit according to VDI6022

	Type of review	Necessary activity	Interv. months	Option ally
1. Housing				
1.1	Check all sections for contamination and corrosion	Cleaning	6	
1.2	Check the sealing of connection to the duct and all elastic connections	Repair	6	
1.3	Check the sealing of the formwork and door, checking hinges and locks	Repair	6	✓
1.4	Check if there are water in the sections	Cleaning	6	
1.5	Check for mechanical damage	Repair	6	
2. Fans				
2.1	Check the fan for damage and dirt	Cleaning and Repair	6	
2.2	Check the electric motor (damage, corrosion, heating, direction of rotation, noise and motor bearings)	Repair	3	✓
2.3	Check the impeller blades		6	

2.4	Check impeller bearings	Lubricate at prescribed intervals and with the means as instructed by the manufacturer. Replace damaged bearings	3	✓
2.5	Check the anti-vibration support function	Repair	6	
2.6	Check the tightness of all screws	Tightening	6	
2.7	Check the parallel and tension of the V-belt	Adjust	3	✓
2.8	Check the voltage, the current drawn by the fan and phase symmetry		6	
2.9	Check elastic connections to damage and permeability	Repair	6	
3. Filters				
3.1	Check the filters for contamination, odor and damage	Eventual replacement	3	✓
3.2	Check the filter frames for leak tightness and filter sealing	Repair	6	
3.3	Measure differential pressure drop on filters The recommended extreme pressure drops for certain filter categories are: - G1-G4 150Pa - M5-F7 200Pa - F8-F9 300Pa	Filters change when the final pressure drop exceeds. ➤ When replacing the filter, a protective breathing mask should be worn	3	✓
3.4	Check the storage of the filters that are in stock and check their shelf life	Filters must be stored in a dry, dust-free environment and must not be used after the expiration date	6	
3.5	Checking special filters (Absolute filters, activated carbon filters)	Special filters are serviced according to the instructions provided by the manufacturer	3	
4. Exchangers				
4.1	Check the cleanliness of the lamellas and pipes	Cleaning – Use low pressure water only if the floor can be collected and discharged from the Unit. When cleaning with compressed air, blowing is done in the direction of air flow. The surfaces can be cleaned with a soft brush and a vacuum cleaner. In more difficult situations, the exchanger can be removed from the Unit for cleaning.	6	

4.2	Check for damage to the blades and pipes	Repair (Cleaning of lamellas)	6	
4.3	Check the exchanger for possible leaks	Repair		
4.4	Check inlets and drains for leaks	Repair	6	
4.5	Check the function of freezing protection	Measure the percentage of glycol in the installation. The protective frost thermostat is placed on a frame that is easily pulled out of the Unit due to a check.	6	
4.6	Check the drip tray and the condensate drain	Clean	6	
4.7	Check the siphon function	Clean and refill	3	
4.8	Check drop eliminators (damage and dirtiness)	Repair and clean	3	
4.9	➤ The exchanger must be completely discharged if it does not work for a long time, especially when there is a risk of freezing.	Emptying is done by opening the bleed valve and then opening the drain plug located at the lowest point of the exchanger. Afterwards, the exchanger is compressed with compressed air.		✓
5. Electric heaters				
5.1	Check for cleanliness and damage	Do not touch the heating elements, wait until the heater cools to prevent the possibility of burns Clean and repair	6	
5.2	Check the function of the operating and protection thermostat	Adjust	3	
5.3	Check the strength of the joints	Repair	6	✓
5.4	Check the operation of air flow control via heaters (differential pressure switch, wing switch)	Adjust if disrupted	6	✓
6. Rotary recuperators				
6.1	Check for damage and cleanness	Clean the rotor by compressed air.	6	
6.2	Checking the transmission system with belts	Adjust	6	
7. Plate recuperators				
7.1	Checking the cleanliness and damage	Cleaning and Repair	6	
7.2	Checking the water in the drip tray	Cleaning	3	
7.3	Checking the siphon function	Cleaning and a siphon fill up	3	
7.4	Check the bypass damper function	Adjust	6	
8. Dumpers				

8.1	Check for cleanliness and damage	Cleaning and Repair	6	
8.2	Checking the sealing	Repair	6	✓
8.3	Checking the function of the electric drive	Repair		
9. Steam humidifiers				
6.1	Check for cleanliness and damage	Cleaning and Repair	3	
6.2	Checking the steam distribution system (hoses and distributors), checking the permeability		3	✓
6.3	Check the siphon function	Cleaning and rinsing	3	
6.4	Checking the water in the drip tray	Cleaning, rinsing and disinfection	3	
10. Dampers				
6.1	Check for cleanliness and damage	Cleaning	6	



11.2 Atex Air Handling Units

- **ATEX** Air Handling Units, whether located in the Ex atmosphere or processing explosive air are subject to special requirements and procedures.
- The user or designer are obliged to classify dangerous spaces by type of explosive medium (explosive group) and by temperature class, according to the ATEX 94/9 / EC Directive, then delivered to constructors and manufacturers.
- **SOKO ATEX** Air Handling Units are operated according to the ATEX 95 directive and have anti-explosion safety by choosing appropriate materials for housings, selection of parts and components (electric motors, fans, filters, switches, lamps ...) in the appropriate EX version and assembled by qualified installer workers. After that, at the factory, each section is checked individually and in the end it is followed by a check and supervision from the competent institute, who gives approval.
- The proper grounding of all electrically conductive parts is guaranteed.
- **ATEX** Air Handling Units manufactured in Soko Inženjering can be used for the next EX zone:
 - for gas **G**
 - for the category of equipment **2G** or **3G**
 - for the **II** product group
 - for temperature classes **T3** (max. temperature + 200 ° C) and **T4** (maximum temperature + 135 ° C)

An example of marking;

EX II 3G; IIB T4



WARNING!

- ✓ **ATEX units must not be used nearby:**
 - High frequency sources (eg transmitting stations)
 - High-power light source (for example, laser light)
 - Ionizing radioactive sources (eg X-ray machines)
 - Ultrasonic sources
- ✓ ATEX units for external installation must be equipped with appropriate lightning protection systems, and all other metal parts of the structure (ladders, work platforms ...) must be grounded.
- ✓ The Air Handling Units can only operate under the conditions indicated on the "EX" plate (zone and temperature class).
- ✓ **Risk of explosion:**
 - Use only a tool that complies with EN 1127-1 to avoid sparks
 - The appearance of static electricity (due to cleaning with dry cloth)
 - The sparks produced by the fan if they work at a speed higher than the working range. This should never be allowed.
 - Hot surfaces
 - Thunderstorm
 - Electrostatic discharge of personnel - service personnel must carry conductive shoes.
 - Substances that are prone to self-ignition must not be near the present.
 - ✓ **If the ATEX unit is installed in the machine room, permanent and adequate ventilation must be provided.**
 - ✓ **All surfaces of the ATEX device must be cleaned only with a wet cloth.**
 - ✓ **Only use original ATEX certified parts for service.**
 - ✓ **Regular ATEX checks are every month.**

11.3 Switch off Air Handling Units for a longer period

If the Air Handling Unit is to be disconnected from use for a long period of time, the following should be done:

- Turn off the main switch for power supply
- Physically separate all other power sources (hot water, cold water, steam)
- Drain the water from the heat exchanger and blow it out with air under pressure
- Drain the water from the swabs
- Remove dirty filters
- Dry the interior of the Air Handling Unit
- Close all doors and formwork
- Every month it is necessary to start rotating parts due to bearings (fans, motors, rotary recuperators ...)
- Remove belt straps

When re-starting the Air Handling Unit, the procedure set out in this manual "Preparation for commissioning" must be completed".

11.4 Control measurements of operating parameters

As when commissioning, as well as maintenance and regular inspections, measurement and control of the following operating parameters of the Air Handling Unit are needed:

- Measurement of the total pressure drop on fans
- Measurement of the rated current for fans
- Measurement of air volume on the pressure of the air conditioner
- Measurement of the air volume on the suction of the air conditioner, as well as the mixing ratio of fresh and recirculating air
- Checking the fan speed
- Checking the pressure drop on filters
- Measurement of the temperature and humidity of the air at the entrance and at the exit of the air conditioner
- Measurement of temperature and humidity before and after heater
- Measurement of temperature and humidity before and after the refrigerator
- Measurement of the temperature of the refrigerant before and after the refrigerator
- Measuring the temperature of the heating medium before and after the heater
- Measurement of the cooling medium flow through the refrigerator
- Measurement of the cooling medium flow through the heater
- Measurement of temperature and humidity before and after the recuperator
- Measurement of the rated current for all other electric consumers
- Measurement of the noise level

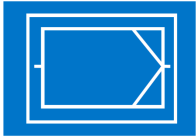
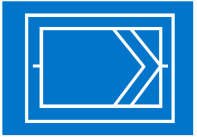
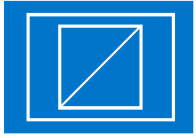


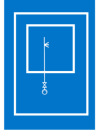






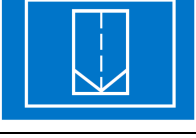





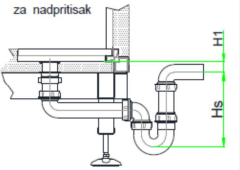
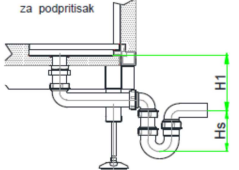


NOTE:

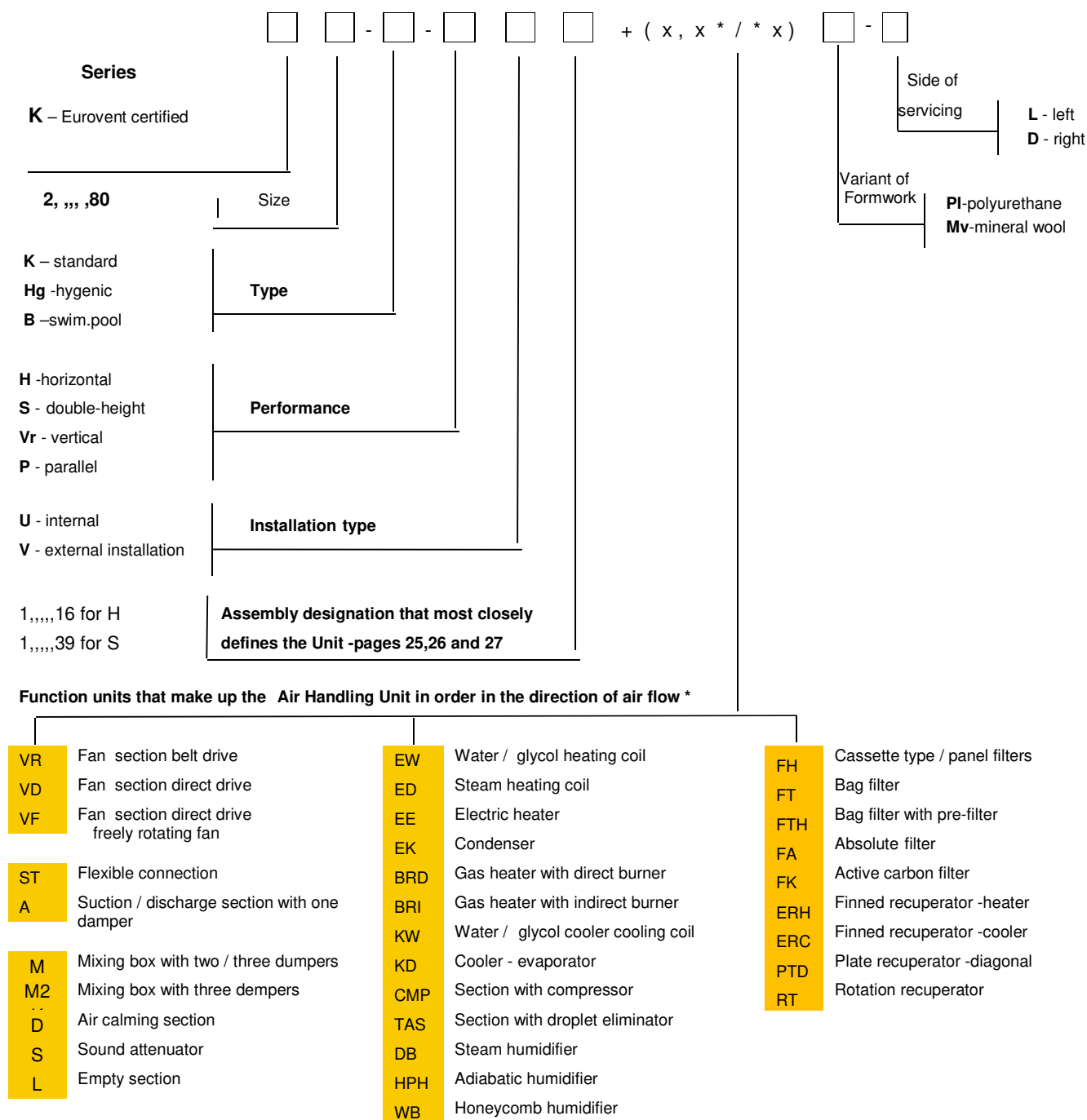
All these measurements must be recorded in an official document (in accordance with legal requirements and regulations), ie, in the Maintenance Book

12. AIR HANDLING UNITS LABELING

12.1. Symbol overview

	Filter		Filter with pre-filter
	Heater		Cooler
	Evaporator		Humidifier
	Plate recuperator		Rotary recuperator
	Recuperator heater		Recuperator cooler
	Fan		Silencer
	Droplet eliminator		Frost thermostat
	Heater input		Heater output
	Cooler input		Cooler output
Siphon for overpressure		Siphon for underpressure	
<p>Za nadpritisak $H1 = 35 \text{ mm}$ $Hs = p + 35 \text{ mm}$ Gde je ; $p = \text{pritisak na mestu ugradnje (mmVS)}$ $1 \text{ mmVS} = 10 \text{ Pa}$</p>		<p>Za podpritisak $H1 = p + 35 \text{ mm}$ $Hs = p \times 0,6 \text{ mm}$ Gde je ; $p = \text{pritisak na mestu ugradnje (mmVS)}$ $1 \text{ mmVS} = 10 \text{ Pa}$</p>	
			

12.2. Air Handling Units labeling system



* Only those functional units that do not contain the selected assembly are registered in the label (odsis / potis).

Example marking:

K12-K-S-U16 + (S; FH; / FT; EW; S; FT) – PI – L ;



12.3. Example labels with technical characteristics of functional units

Fan with direct drive -potis	K2
Air flow [m ³ /h]	1.000
Fan	ER25C-6ID.BD.CR
External pressure drop [Pa]	150
Speed [1/m]	2.605
Efficiency [%]	
Motor	
Power [kW]	0,50
RPM+-2% [1/m]	3.080

Filter	K2
Class F7	
Bag length [mm]	600
Air flow [m ³ /h]	1.000
	592. x 592. x 1 kom
Pressure drop of a dirty filter dP [Pa]	400

Heater	K2
Performance [kW]	24,23
Medium:	Water
Media Input/Output Temp[°C]	70,00 / 50,00
Media Flow [l/s]	0,3030
Drop of media pressure [kPa]	10,62

Cooler	K2
Performance [kW]	9,33
Medium :	Ethylen Glycol 35%
Media Input/Output Temp[°C]	7,00 / 12,00
Media Flow [l/s]	0,4650
Drop of media pressure [kPa]	20,33

Sound attenuator	K2
Type of coulisse:	K-200T-606x628x900-2
Air flow[m ³ /h]	1.000
Frq [Hz]	250
Prig [dB]	20



www.sokoing.rs

Main office

Bulevar A. Čarnojevića 125 ☐☐11070☐ New Belgrade Serbia

Phone.:011 / 635-19-20

☐ office@sokoing.rs

Factory

Druga industrijska 1/1/1 ☐☐22314 Krnješevci, Stara Pazova, Serbia

Phone.:022 / 215-07-19

☐ proizvodnja@sokoing.rs

Servis

Druga industrijska 1/1/1 ☐☐22314 Krnješevci, Stara Pazova, Serbia

Phone.:022 / 215-07-41

☐ servis@sokoing.rs