Future® S air handling unit

Operation and maintenance instructions

15 December 2020 version

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CONTENTS

1 General

For efficient and economical ventilation system, the operation of the equipment must be monitored on a regular basis, and the operation and maintenance instructions must be followed. The ventilation system must be designed and implemented in accordance with the statutes and regulations in force.

The documentation of the ventilation system contain the operating principles of the plant and its subsystems, operating programs, connection and control diagrams, location and layout drawings, and adjustment values and operation and maintenance instructions for the equipment.

1.1 Operating conditions

The standard unit is designed for indoor installation. Ambient temperature must be over 0 °C. The air to be handled must not be corrosive or poisonous, warmer than 40 °C or contain significant amounts of water vapour or large particles.

CAUTION	**The permitted operating conditions and any limitations must be checked from the section-specific instructions.**

1.2 CEN standard classification

Future® air handling unit complies with the CEN standard EN 1886 classification as follows:

- L2 leakage class for casing
- T3 heat transfer coefficient for casing.

1.3 Sound level

For the unit's sound data, please refer to the design calculations supplied with the acknowledgment of order.

1.4 General safety instructions

WARNING	**The ventilation unit includes sharp parts and hot surfaces.**

WARNING	**Observe general and section-specific safety instructions**

 **WARNING**	**The component manufacturer's installation and operating instructions must be followed. In case of a discrepancy between these instructions, follow the component manufacturer's instructions. For detailed component manufacturer's operating and maintenance instructions, please refer to our website at** **http://www.koja.fi/fi/rakennukset/tukimateriaalit/ilmankaesittelykoneet**

 **WARNING**	**Before switching on the fan, make sure that the inlet and outlet of the fan section have been connected to the ductwork or that the access to the rotating fan parts, such as the impeller, through an inlet, outlet or access door has been prevented with protective screens or by other appropriate manner. The service switch of the air handling unit must be installed and in service when the unit is switched on. The damper section of the unit must open before the fan starts.**

 **WARNING**	**Do not keep extra objects on top of or inside the unit. Do not climb or walk on top of the unit.**

 **WARNING**	**The earthing continuity of the frame of the ventilation unit must be assured, and the frame must be connected to the building's earthing system before operation.**

 **WARNING**	**The supply cables of the ventilation unit must be equipped with a correctly dimensioned safety switch that can be used to stop the unit before starting any maintenance work. Upon starting the unit, the safety switch of the unit must be installed and operating and the access doors closed.**

 **WARNING**	**The electric motors are serviced according to the manufacturer's instructions. The components must be de-energised and the impeller stopped for the duration of the maintenance. Once opened, the rotors and stators of the EC motors may cause interference in electrical devices, such as mobile phones and payment cards. Being in close proximity to opened permanent magnet motors constitutes a danger to people with pacemakers.**

 **WARNING**	**Electrical connections must be made by a qualified and authorised electrician only. The condition of the cables connected to the unit must be inspected visually before making any electrical connections and starting the unit. Before starting any installation and maintenance work on the electrical device, make absolutely sure that the device is de-energised. After switching off the power, wait at least five minutes to allow dangerous voltages to discharge from the devices. Electrical devices should be inspected every six months. Any deficiencies and faults must be rectified immediately.**
 **WARNING**	**Due to functional reasons, fans/motors may start and stop automatically without warning. This may happen, for example, after a power outage or malfunction.**
 **WARNING**	**Do not use components other than those specified or approved by the equipment manufacturer in the ventilation unit.**
 **CAUTION**	**The unit must be installed in a space accessible only to qualified personnel. If the unit is installed in a place where it is accessible to persons other than service personnel, the handles of the access doors must be removed and locked in a safe place. Ensure during installation, commissioning and maintenance that only qualified maintenance personnel have access to the danger area.**
 **CAUTION**	**The ventilation system and its maintenance routes must be designed and constructed so that the ventilation unit can be serviced and repaired easily and safely. The National Building Code of Finland 1009/2017, Section 24 of the Ministry of the Environment Decree on the indoor climate and ventilation of buildings**
 **CAUTION**	**The filters' pressure difference values must under no circumstances exceed the dimensioning pressure drop in the filters by more than two times. If the pressure difference is exceeded, the components or structure of the unit may become damaged. The warranty does not cover damages due to negligence in replacing the filters**
 **CAUTION**	**If the unit is equipped with drainages for washing water, these must be plugged. If the drainages are sewered, they must be equipped with a water trap.**

CAUTION	**The fan models are not designed to be disassembled.**

CAUTION	**If the fan has to be replaced, the faulty fan is to be returned with a length of the wire attached to the motor.**

CAUTION	**If the units have been in storage for an extended time, make sure that there is no moisture in the link boxes of the motors.**

1.4.1 CE marking

Future® S ventilation units are CE marked. The CE mark is attached to the machine plate on the switchboard door. The manufacturer's declaration of conformity and other documents relating to the safety of the unit sections are supplied with the unit.

The ventilation system's supplier and person responsible for taking the system into use must ensure that the essential requirements relating to the safety of the unit are complied with and that the equipment manufacturer's instructions are followed. Electrical installations and their installation inspections and measurements must be performed in accordance with standards SFS-EN 60204-1 and SFS 6000-6, and the person responsible for taking the unit into use must compile the testing and installation documents.

1.4.2 Fire

In case of fire in the unit, do not use water, but a powder extinguisher or such. The materials used in the unit do not produce harmful amounts of any hazardous gases when burning.

1.5 Declaration of conformity

DECLARATION OF CONFORMITY

Manufacturer	Koja Ltd
Address	Lentokentänkatu 7 FI-33900 Tampere Finland
	Hereby declares that
Products	**FUTURE® S air handling unit series**

a) conforms with the essential requirements of the directives listed below, provided that the said products are installed in accordance with the instructions supplied with the unit.

Machinery Directive 2006/42/EC
EMC Directive 2014/30/EC
Low Voltage Directive 2014/35/EC
Commission Regulation 1253/2014 implementing Directive 2009/125/EC with regard to ecodesign requirements for ventilation units

The declaration only applies to the ventilation unit within the scope during the time of delivery. If any changes are made to the products, this declaration will no longer be in effect. A risk analysis according to the Machinery Directive requirements has been conducted on the product.

b) has been manufactured according to the following harmonised standards: SFS-EN ISO 12100, SFS-EN ISO 13857, SFS-EN 60204-1, EN 61000-6-1, EN 61000-6-3, EN 61000-6-4, SFS 6000-6, SFS-EN 13053

Technical file compiled by: Taneli Timlin
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Date	**07 December 2020**
	
Signature	Joonas Lius
Position	Business Director

1.6 Recycling and disposal instructions

 **WARNING**	**Observe general and section-specific safety instructions**

 **WARNING**	**Before starting any disassembly work on the device, make absolutely sure that the device is de-energised. After switching off the power, wait at least five minutes to allow dangerous voltages to discharge from the devices.**

- Disconnect the device from other systems (ducts, heating network, cooling network, automation, electrics).
- If the device consists of modules, remove the module fasteners
- Remove access doors
- Unwire components and disconnect cables
- Remove components
- Disassemble modules into parts if possible
- Sort and recycle loose parts and components according to the material recycling instructions.

The device consists of the following materials:

- Modules: Hot-dip galvanised steel plate, mineral wool, small amounts of plastic, rubber and adhesive mass (corner brackets, handles, hinges and gaskets).
- Shut-off dampers: Hot-dip galvanised steel plate, polyurethane foam, small amounts of silicone (gaskets).
- Filters: Hot-dip galvanised steel plate, fibreglass and plastic.
- Heat exchangers: Hot-dip galvanised steel plate, aluminium and copper.
- Fans: Hot-dip galvanised steel plate, composite, small amounts of rubber, electric components.
- Switchboard: Painted steel plate
- Electric components (field devices, wiring, central components)
- Small amounts of plastic (e.g. pressure hoses, water traps)

1.7 Future® S series equipment and product code key

The equipment relating to Future® S series devices is selected unit-specifically during device dimensioning. Device dimensioning forms a product code of the device, and this code defines the equipment included in the device. Standard equipment in the device series include:

- EC fans
- Heat recovery (counterflow or rotating)
- Supply air filter ePM1 60% F7L
- Exhaust air filter ePM10 60% M5L
- Post-heating coil (water)
- Water drains and water traps
- Lifting brackets
- Adjustable base
- Electric automation centre with the following field devices installed and wired to terminal blocks:
    - Air temperature sensors (5 pcs)
    - Anti-freezing sensor for the heating coil
    - HR damper actuators (counterflow HR) or HR control centre (rotating HR)
    - HR defrost pressure-difference transmitters
    - Filters' pressure-difference transmitters
    - Safety switch wired separately

The following accessories are available for the series:

- FxVent controller
- Fresh and exhaust air dampers
- Spare filters
- Heating coil pump group
- Air flow measurement
- Constant pressure control
- Fresh and exhaust air damper actuators
- Preheater
- Cooling coil

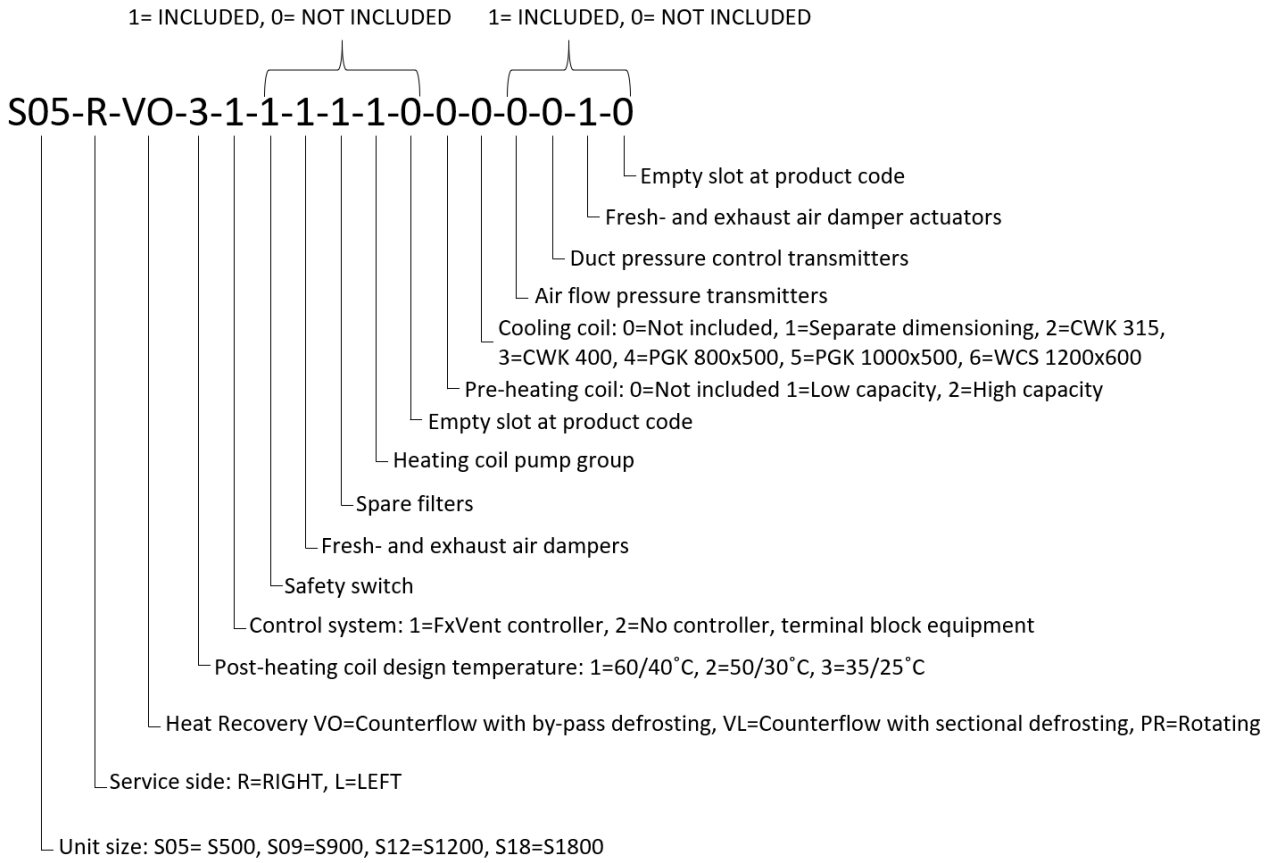


Figure 1.1: Future® S code key

The product code of the unit is available in the technical printout included in the unit delivery.

2 Installing the unit

Future® S ventilation unit is installed according to separate transport, storage, and installation instructions.

2.1 Space reserved for the unit

The space to be reserved for the unit depends on the selected model. Check the space required by the unit from its dimensional drawing.

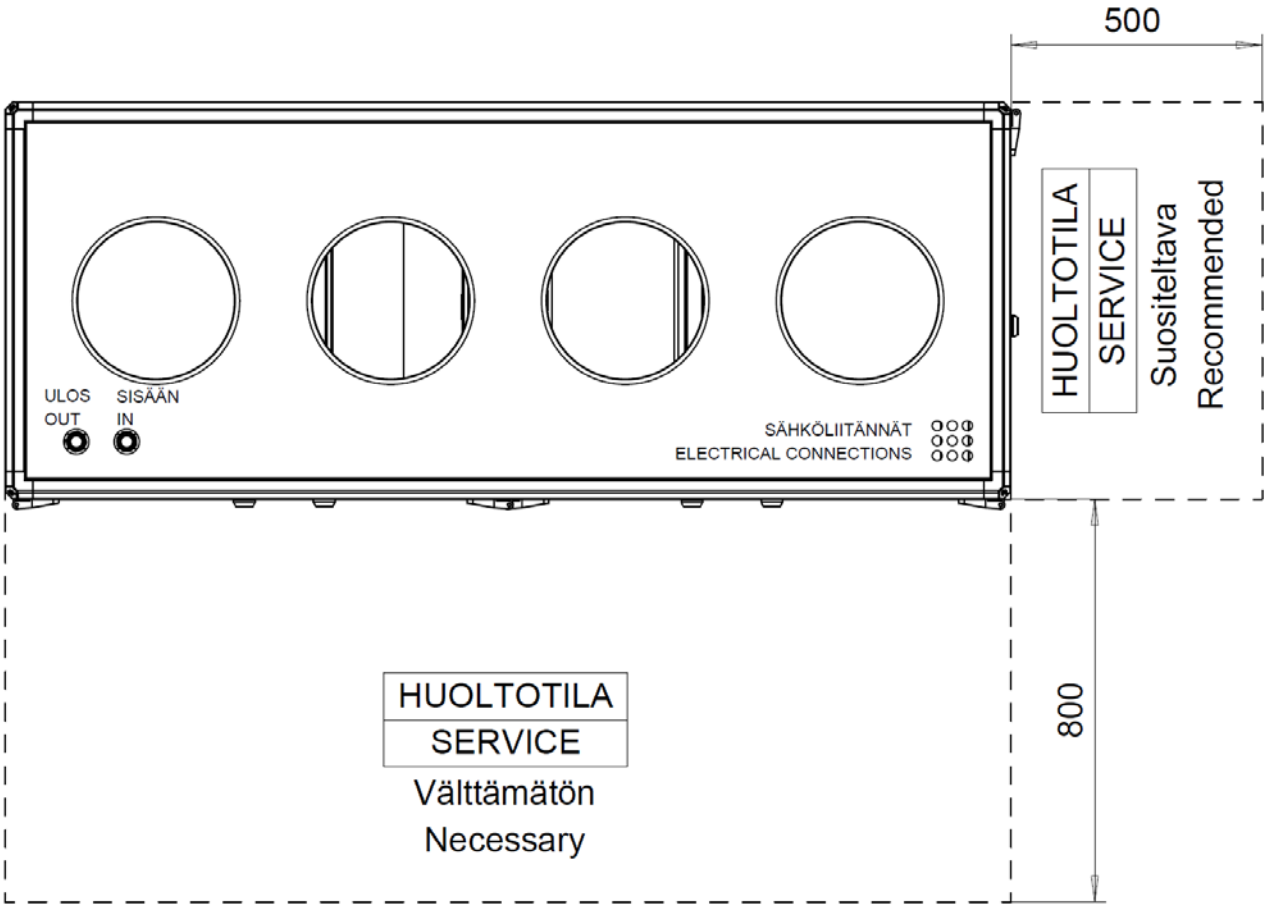


Figure 2.1: Example of the space to be reserved for the unit

NOTE! The locations of connections vary according to the unit's handedness and model. Check the positions of integrates from the unit's dimensional drawing.

2.2 Unit components in general

The figure below describes the unit components on a general level.

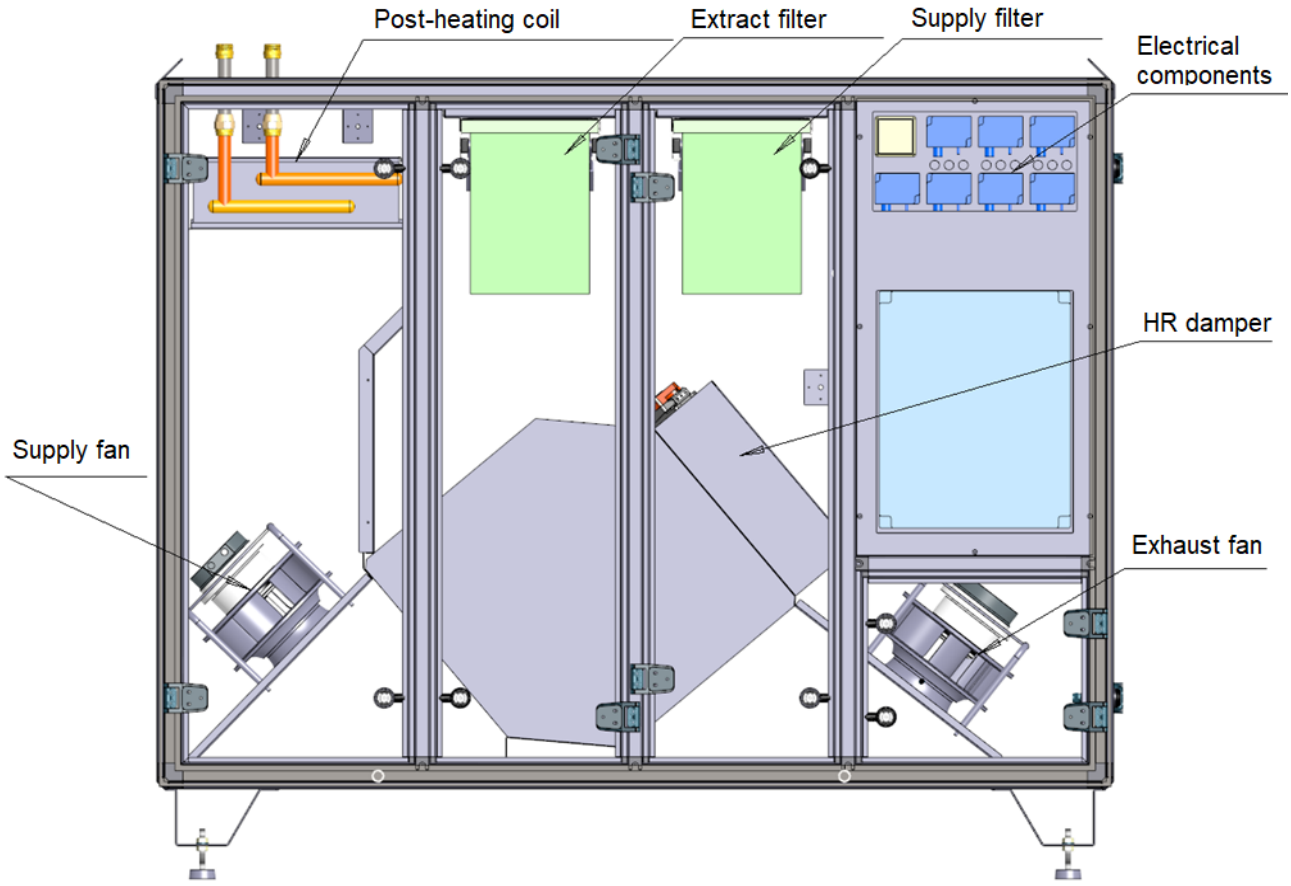


Figure 2.2: Unit components in general

The components included in the unit vary according to the selected model.

2.3 Location of duct outlets and handedness of equipment

The following is a general description of the handedness of the device series.

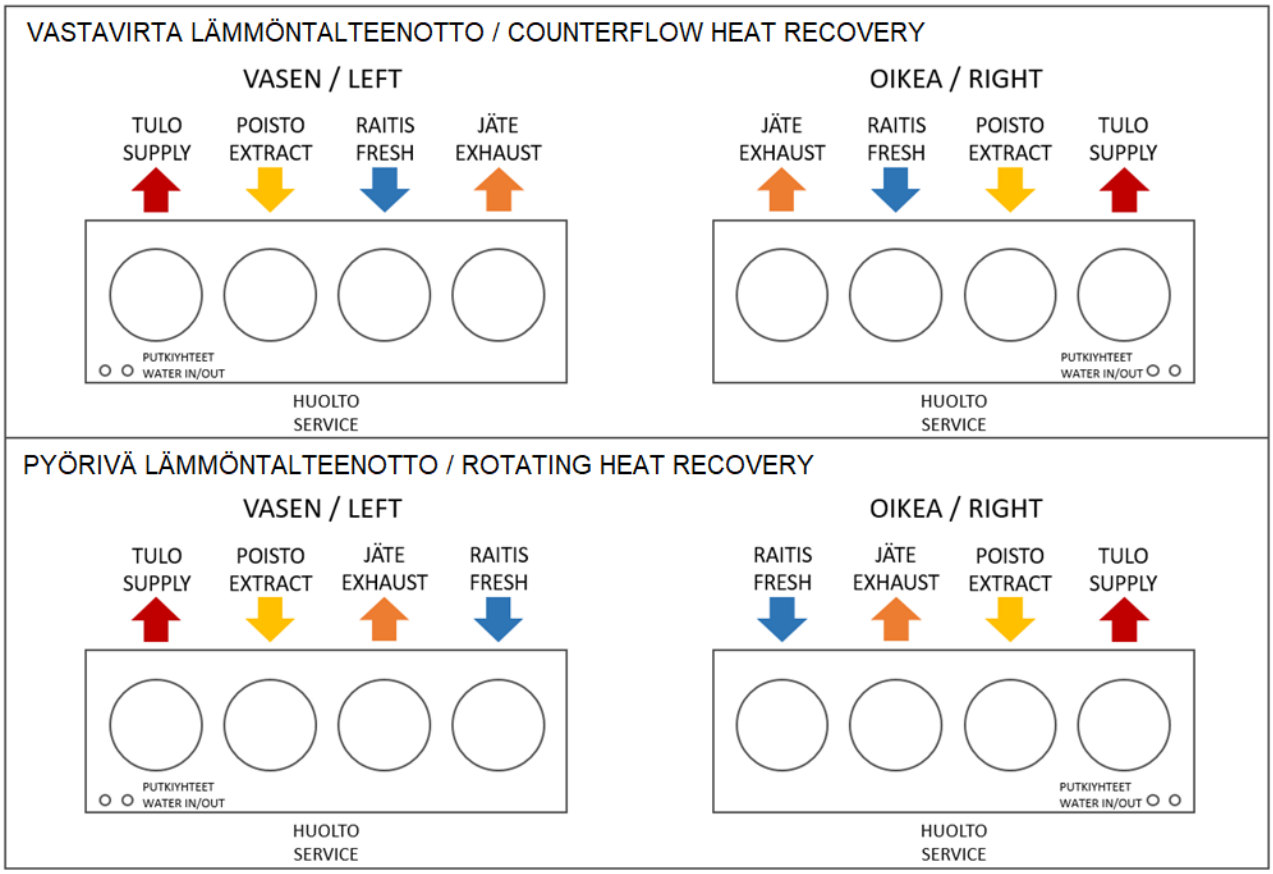
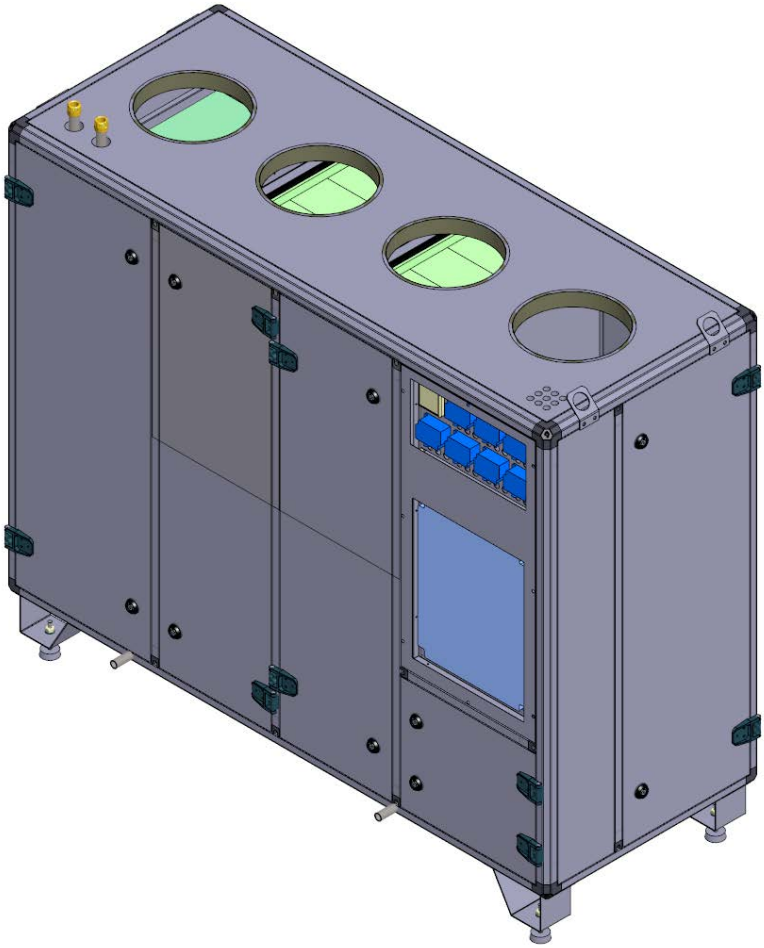


Figure 2.3: Handedness in general

Duct outlet locations are the same for all sizes of Future® S series units. Only the size and distance between the ducts varies. Check the handedness of the unit from the unit's dimensional drawing.

2.4 Commissioning general instructions

(Figure shows – S500 Counterflow unit, Handedness – Left)



Before commissioning the ventilation unit, make sure that the unit has been installed and cleaned according to the instructions, that the components and safety devices essential for the safe operation of the unit have been installed properly, and that the flow rates have been adjusted.

The commissioning of the ventilation unit and the training of the operating personnel are usually carried out by the supplier of the air-conditioning plant in question.

2.5 Maintenance general instructions

WARNING	**Observe general and section-specific safety instructions**

Before starting any maintenance and/or repair work, make sure that the work will not cause an unnecessary disturbance to other activities in the building. Stop the unit and turn the safety switch to the zero position. Make absolutely sure that the unit will not be started accidentally during maintenance.

After completing the maintenance and/or repair work, start the unit and make sure that all shut-off and control devices as well as instruments are functioning.

The stated maintenance intervals are only guidelines. The intervals are determined by the utilisation rate of the air-conditioning plant and the ambient conditions. The given intervals apply when the plant is used 8 hours a day in city air environment. The maintenance intervals are longer in cleaner environments (like the countryside) and shorter in dirtier environments (like industrial areas).

It is advisable to have the unit serviced at the beginning (autumn) and at the end (spring) of the heating season. Maintenance activities that can be performed by the plant's own service personnel are cleaning, the replacement of filters, belts and pulleys, and the lubrication of joints and bearings.

Repairs on unit sections and all installation and adjustment operations related to electricity or automation require special expertise. Clean the unit with an ordinary detergent. Solvents must not be used in cleaning sections that include aluminium parts (heat exchangers).

Spare parts mentioned in these instructions are available at Koja or the manufacturer in question. (Koja Ltd reserves the right to changes without prior notice.)

3 Fans

3.1 Operating conditions

The maximum permissible air temperature upstream of the fan is + 40 °C.

3.2 Safety

 **WARNING**	**Observe general and section-specific safety instructions**

 **WARNING**	**An EC motor rotating freely generates voltage to the internal motor connections. These voltages can be dangerously high. After the motor has stopped, wait at least five minutes to allow dangerous voltages to discharge.**

3.3 Commissioning

The fans' EC motors are equipped with an integrated control unit. EMC requirements do not apply to the EC motor power cabling. Nevertheless, it is advisable to use screened cable control wires. The bus conductors must be screened and of the twisted pair type. Any control cable screens are connected on the EC motor end only. The equipment must be protected against short circuits and the installations against overloading with, for example, fuses.

- Make sure that the inside of the fan section and the fan are free from any loose parts, debris, etc. that could get into the fan impeller.
- Check that the electrical cables are intact and routed to the motor flexibly and that the type of the cable is correct.
- Check that the drive and fan operate freely by turning the impeller a couple of turns by hand.
- Make sure that the fan's direction of rotation is correct.
- All filters, louvres, valves and other parts of the air-conditioning plant must be installed and pre-set before long-term operation. The fan must not be started with the inlet and outlet dampers closed.
- If necessary, clean the fan casing and impeller with a brush, vacuum cleaner or damp cloth.
- Check the condition of the motor visually.
- Make sure that the access door gaskets are in place and intact. Close the access door and make sure that every latch tightens properly.
- If the unit is installed in a place where it is accessible to persons other than service personnel, the handles of the access doors must be removed and locked in a safe place.

3.4 Maintenance

- The recommended maintenance interval is 6 months.

- Make sure that the inside of the fan section and the fan are free from any loose parts, debris, etc. that could get into the fan impeller.
- Check that the electrical cables are intact and routed to the motor flexibly and that the type of the cable is correct.
- Check that the drive and fan operate freely by turning the impeller a couple of turns by hand.
- All filters, louvres, valves and other parts of the air-conditioning plant must be installed and pre-set before long-term operation. The fan must not be started with the inlet and outlet dampers closed.
- If necessary, clean the fan casing and impeller with a brush, vacuum cleaner or damp cloth.
- Make sure that the fan's direction of rotation is correct.
- Make sure that the access door gaskets are in place and intact. Replace, if necessary. Close the access door and make sure that every latch tightens properly.
- Check that the fan is not making any extra noise.
- If the unit is installed in a place where it is accessible to persons other than service personnel, the handles of the access doors must be removed and locked in a safe place.

Regular maintenance can be scheduled for the beginning and end of the heating season. It is advisable to monitor the operation of the fan and, in particular, the drive between regular maintenances. During commissioning of the air-conditioning plant, check the unit weekly to detect any possible need for repair.

4 Filters

4.1 Operating conditions

- The operating temperature range is -40 °C ... +40 °C.

4.2 Safety

WARNING	**Observe general and section-specific safety instructions**

4.3 Installation and commissioning

The filters must be installed before test-running the unit. The filters are placed in the mounting grooves and clamped with a clamping mechanism against the gasket.

• Check that the filters are intact and of the correct type.

• Check that the filters are tight against the frame gasket and that there are no leaks.

• Check that the filters are clamped in place.

• Check that the differential pressure gauge is intact and reset.

• Check that the differential pressure hoses of the filter section are intact and in their places.

At the installation stage, the pressure difference limits for the filter indicators must be set according to the Future® dimensioning program documentation. The filter pressure difference values must under no circumstances exceed the dimensioning pressure drop in the filter by more than two times. If the pressure difference is exceeded, the components or structure of the unit may become damaged. The warranty does not cover damages due to negligence in replacing the filters.

4.4 Maintenance

The filter section is to be serviced and cleaned twice a year, normally in the autumn and spring.

To measure the pressure drop, a filter indicator indicating the pressure difference across the filter has been installed on the filter section. When the pressure difference across the filter exceeds the set limit, the filter must be replaced. Refer to the unit design documentation for the recommended filter-specific final pressure drop with design air flow.

The filter pressure difference values must under no circumstances exceed the dimensioning pressure drop in the filter by more than two times. If the pressure difference is exceeded, the components or structure of the unit may become damaged. The warranty does not cover damages due to negligence in replacing the filters.

Replace the filters if the pressure difference limit in the filters has been exceeded, or if the filters are dirty or damaged Replace filters at least once a year to prevent microbial growth.

• Check that the filters are intact and of the correct type.

• Check that the filters are tight against the frame gasket and that there are no leaks.

• Check that the filters are clamped in place.

• Check that the differential pressure gauge is intact and reset.

• Check that the differential pressure hoses of the filter section are intact and in their places.

• Check that the differential pressure transmitter operates properly and has been calibrated according to the manufacturer's instructions. Check also that a pressure difference limit, which must not exceed the dimensioning pressure drop by more than two times, has been set in accordance with the Future® dimensioning program documentation.

4.5 Replacement of filters

1. Open the access door and the clamping mechanism. Pull the filter (filters) out of the casing.

2. Clean the casing, if necessary.

3. Check the condition of the gaskets. Replace worn and damaged gaskets. **NOTE! Gaskets are not needed between filters that are mounted parallel to each other.**

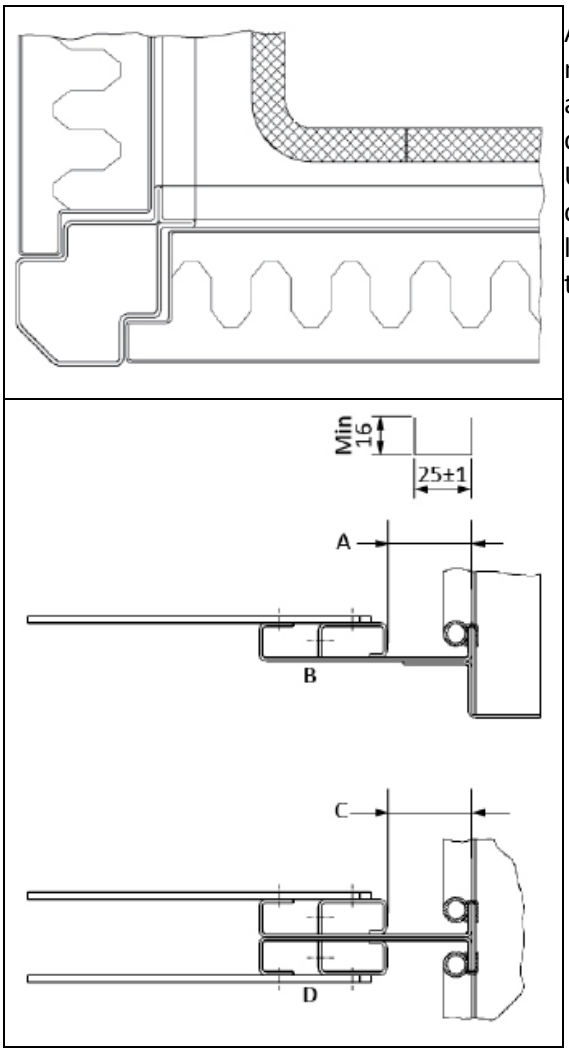
4. Place new filters in the mounting grooves and clamp the filters against the gasket. Note! Ensure correct filter type. The filter type is displayed on the technical printout of the unit.

5. Replace the maintenance hatch.

6. Check the operation of the filter indicator once the fan has been restarted.

4.6 Replacement of gasket

Dimensions of the mounting groove and filter cassette frame



A new gasket is mounted, starting from the middle of the frame bottom. Press the gasket against the edge of the plate by hand or carefully with a hammer or some other tool. Use, for example, a 20-mm pipe to bend the corners appropriately. Cut the gasket to a length of about 5mm too long. Force the ends together and apply sealant between them.

A. With the clamp closed: 35 ± 1.0

B. Lower frame

C. With the clamp closed: 35 ± 1.0

D. Middle frame

5 Post-heating coil

5.1 Operating conditions

• The maximum operating temperature is +150 °C.

• The maximum operating pressure is 1.0 MPa.

5.2 Safety

 **WARNING**	**Observe general and section-specific safety instructions**

 **CAUTION**	**Due to its structure, the heat exchanger will never drain completely. If the cooling medium used is water, the heat exchanger may freeze up and become damaged at temperatures below 0 °C.**

 **CAUTION**	**Pipe connections must be carried out by qualified persons only.**

5.3 Installing

 **CAUTION**	**The coils are always connected so that the fluid flow runs against the direction of the air flow.**

5.4 Commissioning

- Make sure that the heat transfer surfaces of the coil are clean and intact.
- Open the line control valves to fill the coil with fluid.
- Bleed the coil.
- Make sure that the water side connections of the coil do not leak.
- Check the rotation direction of the circulating pump (do not run the pump dry).
- If necessary, check the operation of the anti-freezing thermostat.
- Make sure that the control valve functions, and adjust the line control valves, according to the plan. Refer to the manufacturer's manual for further adjustment instructions.

5.5 Maintenance

- The recommended inspection interval is 6 months.
- Make sure that the water side connections of the coil do not leak.
- Make sure that the heat transfer surfaces of the coil are clean and intact.
- Clean the coil gently with a brush, compressed air or a vacuum cleaner.
- Bleed the coil and check the operation of the anti-freezing thermostat at the beginning of each heating season.
- A damaged coil must be repaired in place, sent to the manufacturer to be repaired or replaced.

 **CAUTION**	**If the coil is not used during the heating season, water must be drained from it or it has to be filled with a water-glycol mixture to avoid freezing. The coil does not drain fully through the drain screw; 20 to 30% of the total water volume remains in the coil. To drain water from the coil, you can, for example, blow compressed air through the bleed screw, observing the maximum permissible operating pressure.**

6 Heat recovery section, plate

6.1 Operating conditions

- The operating temperature range is -40 °C ... +40 °C.
- The maximum permissible pressure difference between supply and exhaust air is 800 Pa.

6.2 Safety

WARNING	**Observe general and section-specific safety instructions**

6.3 Installing

CAUTION	**To prevent the risk of freezing, we recommend the use of fresh-air preheating in connection with a plate heat recovery especially in sites where the exhaust air is humid.**

6.4 Commissioning and maintenance

The maintenance interval is 6 months. It is advisable to have the unit serviced at the beginning (autumn) and at the end (spring) of the heating season.

- Make sure that the heat transfer surfaces are clean and intact.
- Check the operation of the dampers. If necessary, lubricate with a silicone-based lubricant.
- Check the turning direction of the actuator. If necessary, change the direction by turning the switch on top of the actuator with a flathead screwdriver of suitable size.
- Clean the heat recovery cube gently with a brush, compressed air or a vacuum cleaner.
- Check and, if necessary, clean the condensation water discharge system, i.e., drip tray, piping and water trap.
- Flush the piping.
- Make sure that there are no loose components, debris etc., that could get into the fan impeller.
- Make sure that the electrical cables are intact.
- Make sure that the access door gaskets and plate heat exchanger are in place and intact. Close the access door and make sure that every latch tightens properly.

7 Heat recovery section, rotating

7.1 Operating conditions

- The operating temperature range is -40 °C ... +40 °C.
- The maximum permitted pressure drop is 250 Pa.
- The pressure differences between supply and exhaust air must be designed to be as small as possible. Large pressure differences lead to larger leaks.

7.2 Safety

WARNING	**Observe general and section-specific safety instructions**

7.3 Commissioning

- The units should not be started during the construction phase. If this cannot be avoided, the fan must not be used without the heat exchanger in operation. Make sure that the filters are in place.
- Make sure that the supply or exhaust ducts are free from foreign objects that could damage the faces of the heat exchanger.
- Use a spirit level on the face of the heat exchanger to ensure that the rotor is upright.
- Make sure that the rotor rotates freely.
- Make sure that the rotor belt is suitably tight and running freely in its proper place.
- Make sure that the brush seals on the circumference touch the surface of the arch plate. Also check that the brush seals on the lower surface of the rotor mid-beams touch the surface of the exchanger.
- Make sure that the access door gaskets are in place and intact. Close the access door and make sure that each latch tightens properly.
- Go through the section-specific instructions, check that the access doors are shut, and then start the unit.
- Check the functioning of the rotor after two weeks of use.

7.4 Maintenance

The maintenance interval is 6 months. It is advisable to have the unit serviced at the beginning (autumn) and at the end (spring) of the heating season.

- Check and, if necessary, clean the heat transfer surfaces according to a separate instruction (Section 7.4.1).
- Check that the rotor is in a vertical position and in the middle of the frame. If necessary, adjust the vertical and horizontal position according to a separate instruction (Section 7.4.2).
- Make sure that the brush seals on the circumference lightly touch the surface of the arch plate. Also check that the brush seals on the lower surface of the rotor mid-beams touch the surface of the exchanger. Replace damaged brush seals.
- Check that the belt is suitably tight. If the belt slips during start-up or stop, it must be tightened or possibly replaced according to a separate instruction.
- Check that the speed control operates properly.
- Check the bearing noise and vibration. Under normal conditions, there is no need to add lubrication, as the lubrication in the unit is designed to last throughout its life cycle.

7.4.1 Cleaning

Check the surface of the rotor regularly.

The following cleaning instructions are recommended as part of the annual inspection:

- Vacuum cleaning with a soft nozzle. Wiping with a dry brush.
- Compressed air (4–6 bar) can be used for heavier dirt that is not sticky.

CAUTION	**If you use a brush, make sure not to damage the heat exchanger lamellas.**

CAUTION	**If you use compressed air, point the nozzle perpendicular to the lamellas, and blow toward the dirty side from the clean side.**

CAUTION	**Loose dirt must be removed from the casing after cleaning.**

7.4.2 Adjusting rotor position

Figure 1 Loosen the hex head screw.

Figure 2 Carefully tilt the rotor. Ensure that the disc lamellas are not damaged.

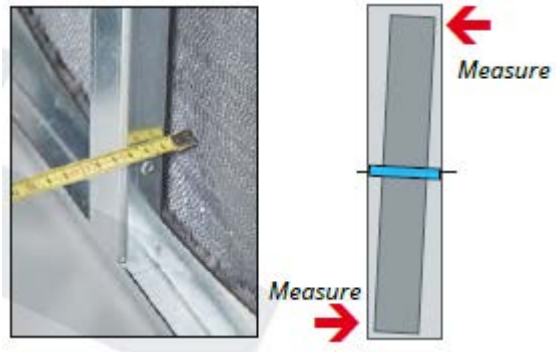


Figure 3 Check the inclination by measuring opposite sides.

Figure 4 When the rotor is positioned at a suitable angle, tighten the hex head screw to the correct torque.

Figure 5 Check the horizontal centre of the rotor for measuring points.

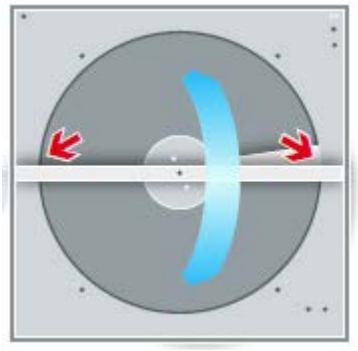


Figure 6 The arrows indicate the measuring points. The blue line indicates the inclination.

7.4.3 First actions in case of an alarm when the rotor motor has stopped

- Switch off the main voltage supply upstream of the control unit, wait 10 seconds and switch the voltage on again. If the motor starts, the motor guard of the control unit had tripped. Make sure that the exchanger rotates freely.
- Check the fuse upstream of the control unit.
- Check the fuse of the control unit.
- If the motor still does not work, leave further troubleshooting to an expert.

7.4.4 Replacement of drive belt

The rotor is belt driven. The belts loosen during their service life and wear in use. For this reason, we recommend regular maintenance intervals. If the belt is loose, shorten it by removing a suitable length of the belt.

If the belt needs to be replaced, we recommend that you contact service. This will ensure the use of the correct belt and specific installation instructions.


Figure 7.4.4.1: The belt direction is marked on the belt with an arrow.

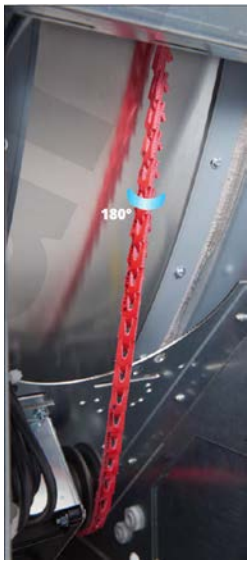


Figure 7.4.4.2: Ensure that the belt rotates around the motor pulley and rotor as shown. After installation, the belt rotates 180 degrees as the rotor rotates.

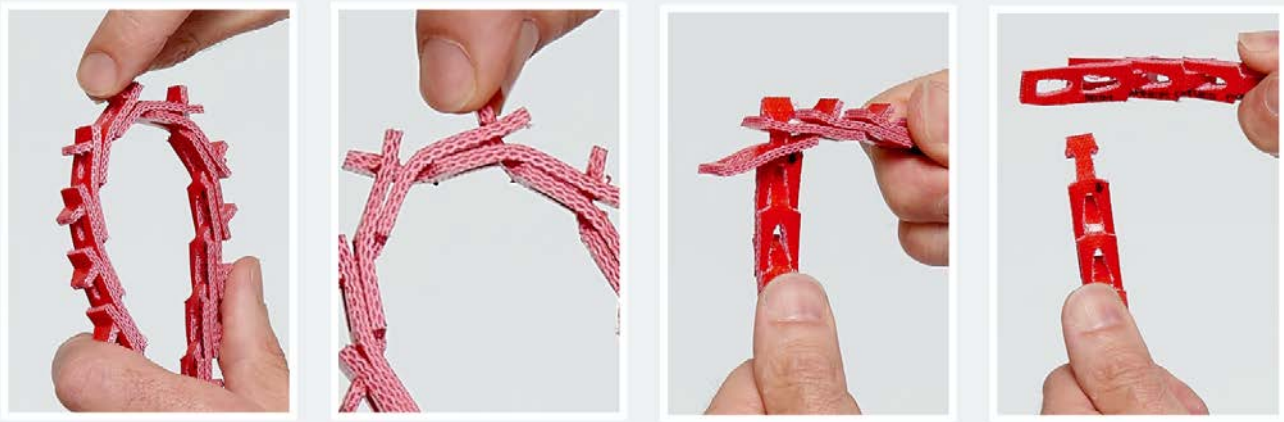


Figure 7.4.4.3: Removing the belt connection for shortening the belt.

7.4.5 Rotor removal

WARNING	**Removing the rotor requires disconnecting the electrical cables. Electrical installations must be carried out by a qualified and authorised electrician only and general and section-specific safety instructions must be observed throughout the procedure.**

The rotor package is designed in such a way that it can be removed from unit casing, for example, for the duration of maintenance. The rotor package is attached (depending on the model) with screws.

Removal instructions:

- Remove the rotor mounting screws, 3 pcs on the top and 3 pcs on the bottom per side
- Disconnect the power from the rotor control unit. The connections are located on the side of the access door, at the bottom.
- Carefully pull the rotor out of the casing, taking care not to damage the rotor.
- Carefully push the rotor back to its place and attach it with screws.
- Ensure the rotor's tightness on the air supply and extract sides, as well as on the back.
- Connect the power in accordance with the connection diagrams of the unit.
- Close the access door.

8 Electric automation

The unit's electric automation equipment is selected during the dimensioning of the device. Check the equipment included in the unit with the product code key. The product code is available in the technical printout delivered with the unit documentation and the code key can be found in Section 1.7 "Future® S series equipment and product code key" of this manual.

8.1 Safety

WARNING	**Observe general and section-specific safety instructions**

WARNING	**Electrical connections must be made by a qualified and authorised electrician only. The condition of the cables connected to the unit must be inspected visually before making any electrical connections and starting the unit. Before starting any installation and maintenance work on the electrical device, make absolutely sure that the device is de-energised. After switching off the power, wait at least five minutes to allow dangerous voltages to discharge from the devices. Electrical devices should be inspected every six months. Any deficiencies and faults must be fixed immediately.**

CAUTION	**The protective devices for the electric components must be dimensioned correctly in order to guarantee safe use of the unit.**

8.2 Commissioning and maintenance

Before unit commissioning, the power supply and the possible building automation control cable must be connected to the unit. The S1800 model is supplied in modules and the electrical and control cables between the modules are connected with the marked quick couplers included in the equipment delivery. After installation, field check must be carried out to ensure that the connections have been correctly made. Marked pressure hose connections between the modules are also made on site.

The unit's ~400 V (L1, L2, L3, N and PE, max cable diameter 6mm2) power supply cable and possible building automation control cable are connected to the switchboard through the Ø30 mm penetrations on the upper part of the machine as shown in Figure 8.2.2 through the switchboard casing's multi flange to the switchboard's X1:L1, L2, L3, N and PE terminal blocks (refer to Koja's separate electric diagram).

Note! If the unit is supplied with an optional safety switch, the distribution board's power supply is connected directly to the safety switch terminals. More specific electrical data on the unit is available on Koja's technical printout.

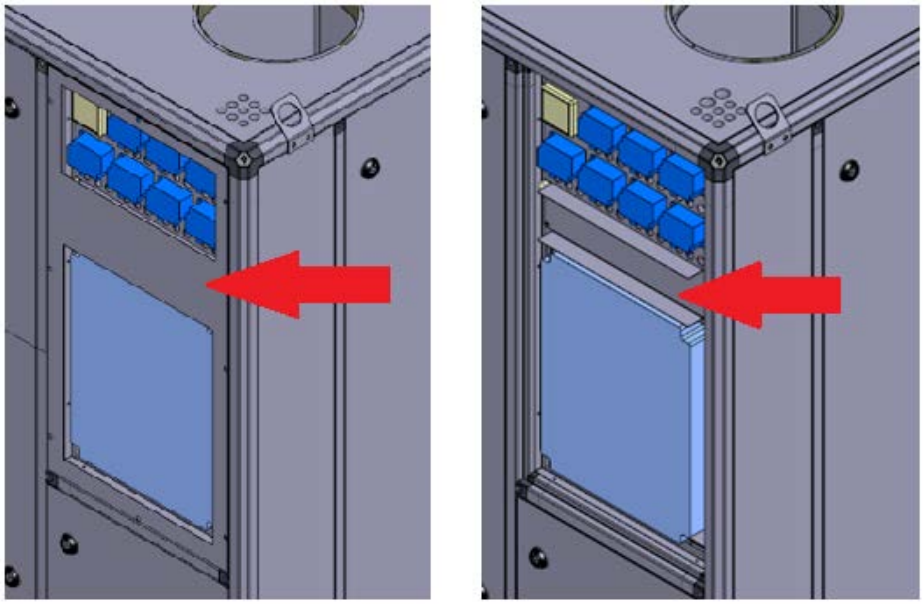


Figure 8.2.1: Cabling cover plates

The easiest way to pass the cables through the switchboard is by removing the cover plates indicated with the red arrow in Figure 8.2.1.

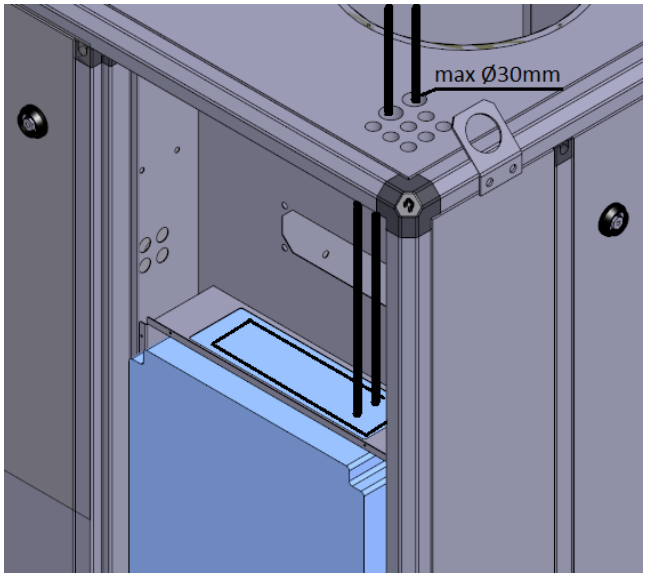


Figure 8.2.2: Installation route of the supply cable and the building automation control cable

When the cover door is closed and the cable penetration flange is correctly used, the switchboard complies with the IP65 classification. During normal operation, the switchboard cover must always be kept closed for personal and component protection.

When the FxVent controller is included in the unit delivery, the controller's operating panel is located outside the switchboard casing. The pressure sensors and airflow transmitters are similarly located on a mounting plate above the switchboard for easy operation and readability.

The switchboard must only be opened by a qualified electrician. With normal ventilation operation, opening the switchboard casing's cover door is not necessary. If maintenance, connection or repair work is carried out on the switchboard or other components included in the unit delivery, power supply for the entire unit must be switched off and it must be ensured that it cannot be switched on during work.

8.3 Fans

Supply and exhaust fans are equipped with EC motors. The fans are controlled with a DI start signal and 0…10 V control signal. The fan also has a K1 relay that provides status or alarm data, depending on the relay programming. In factory delivery, the power supply to the fans is ready-connected to the unit switchboard and the control points are either ready-connected to the FxVent controller or to the unit switchboard's terminal blocks, depending on the delivery content. Electrical and automation connection diagrams are presented in further detail in Koja's connection diagrams and the fans' K values are presented in the technical printout.

8.4 Temperature sensors

In standard delivery, the unit includes 5 pcs NTC10 air temperature sensors and NTC10 anti-freeze sensor for the heating coil. The temperature sensors are installed and wired at the factory.

The anti-freeze sensor of the post-heating coil is a fast time constant NTC10k rod sensor, measuring the temperature of the liquid returning from the coil. The sensor has its own installation fitting near the coil return water inlet. The FxVent controller monitors the measurement and reacts to the freezing risk by opening the coil's control valve as the first step and stopping the ventilation unit as the second step, thereby creating a class A freezing hazard alarm. The freezing hazard alarm is always acknowledged by the user. The limit value of the freezing hazard can be set as desired with the controller.

If the unit is delivered without the Koja controller, the control automation must always monitor the measurement of the anti-freeze sensor and act in such a way that in the event of a freezing hazard, coil freezing is prevented by taking the necessary measures.

8.5 Pressure transmitters

In standard delivery, the unit includes pressure difference transmitter for fresh and exhaust air filters and a pressure difference transmitter for heat recovery exhaust air. Scalable pressure limits are set for the measurement of pressure difference according to the operating level of the fans.

Fan air flow measurement and constant pressure controller are available as accessories. Air flow measurement includes air volume transmitters for monitoring the supply and exhaust air flow. The constant pressure controller includes pressure transmitters for monitoring the supply and exhaust duct pressure.

All pressure transmitters are installed, wired to the unit's switchboard and hosed to the pressure measuring points at the factory. Pressure transmitters require 24 Vac or 24 Vdc supply voltage to operate. When commissioning transmitters, check the pressure measuring range:

- In pressure difference transmitters, ensure the pressure measuring range set for the transmitter with jumpers, according to which the transmitter scales the output 0…10 V voltage signal.

The air volume transmitters of supply and extract fans must have the following settings:

- Manufacturer -> Common probe
- Formula unit m^3/h
- K value (check the correct K value of the fan in the Koja technical printout)
- Flow output scaling to 0...10 V to match the automation settings. (Koja S500 and 900 0…1000 l/s and S1200 and S1800 0…2000 l/s)

The air volume transmitter sends either a pressure or air volume signal Vout or Pout according to automation needs. As a Koja factory standard, Vout is set as flow signals and in l/s. In connection of commissioning, it must be ensured that the flow unit and output scaling used by the transmitter correspond to the automation settings.

8.6 FxVent controller (accessory)

If the delivery includes a Koja FxVent controller, it can be used to extensively control and monitor all the necessary functions of the unit, depending on the equipment level. The unit is delivered with the controller and field devices ready-connected. Basic parameters have been pre-set for the controller, after which the final operating parameters, such as supply air temperature or fan control setpoints, must be set during commissioning. Separate operating instructions are provided for the operation and more detailed functions of the controller.

8.7 HR damper actuators (accessory)

Fresh- and exhaust-air damper actuators require 24 Vac or 24 Vdc supply voltage. Actuators are spring-return with ON/OFF control so that the damper is opened by switching on the actuator supply.

HR damper actuators require 24 Vac or 24 Vdc supply voltage and 0–10 Vdc control signal to operate. Depending on the equipment level of the unit delivery, the actuators are delivered ready-connected to the terminal blocks or directly connected to the FxVent controller. The connections are shown in more detail in separate electrical diagrams. If necessary, the actuator's direction can be changed using the rotation switch on top of the actuator casing.

8.8 Safety switch (accessory)

The protective devices for the electric components must be dimensioned correctly in order to guarantee safe use of the unit.

Future® S units can be equipped with an optional safety switch that switches off the entire unit's 400 V power supply. The safety switch can be used to ensure that the equipment is de-energised, for example, for the duration of maintenance work. When the safety switch is included in the unit delivery, the mains can be connected directly to the safety switch connectors.

8.9 Heating coil pump group pump (pump group accessory)

The heating coil has an EC controlled pump with a 230 V power supply. The pump running may be enabled with an external start signal. The pump can be adjusted for example by AUTOADAP, FLOWADAPT, relative pressure, standard pressure or standard curve adjustment methods. In addition, the pump relays provide alarm, status or standby status indication.

As a factory setting, Koja connects the pump supply cable to the circuit breaker and the pump control cable to the switchboard terminal blocks or to the FxVent controller, depending on the delivery content. The connections are shown in more detail in separate electrical diagrams. If the pump group is delivered separately, the supply and control cables must be connected on site.

8.10 Heating coil pump group control valve (pump group accessory)

The control valve actuator supplied as the pump group control valve requires 24 Vac or 24 Vdc supply and (0) 2–10 Vdc control signal to operate. In addition, the actuator provides position feedback via a 2–10 Vdc signal. The actuator supply and control cables are ready-connected to the switchboard terminal blocks or to the FxVent controller, depending on the delivery content. If the pump group is delivered separately, the cables must be connected to the actuator on site.

9 Other accessories

Future® S series accessories are selected unit-specifically during unit dimensioning. Check the equipment included in the unit with the product code key. The product code is available in the technical printout delivered with the unit documentation and the code key can be found in Section 1.7 “Future® S series equipment and product code key” of this manual.

9.1 Safety

WARNING	**Observe general and section-specific safety instructions**

9.2 Water trap

If the device has water drains (counterflow HR), water traps are also included in the unit delivery. **NOTE! All water drains must be sewered and equipped with water traps. The S1800 model also has water drains at the back of the unit.** NOTE! When adjusting the height of the unit, the vertical space required by the water trap must be taken into account.

The supplied water trap is installed according to the instructions supplied with the water trap in the position shown in Figure 9.2.1 below. Adjust the overall height of the water trap by shortening the pipe and measuring L.

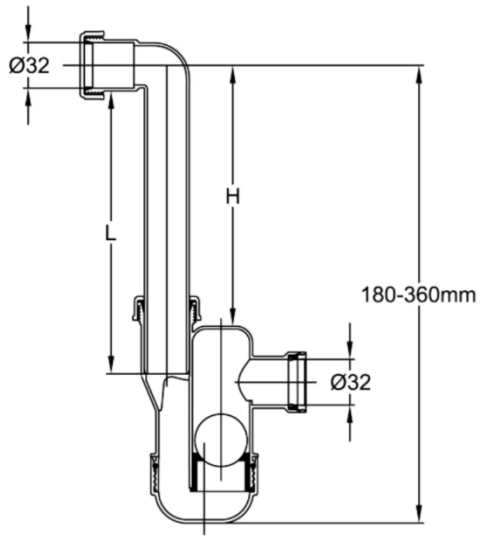


Figure 9.2.1: Water trap

9.3 Fresh and exhaust air dampers (accessory)

Future® S units can be equipped with optional fresh and exhaust air dampers to prevent uncontrolled air flow when the unit is not running. The dampers are ready-insulated and selected according to the unit’s duct size. The dampers are supplied together with the unit in a separate box.

9.4 Spare filters (accessory)

Future® S units can be equipped with an optional spare filter kit. The kit includes one set of filters suitable for the unit and the spare filters are supplied together with the unit in a separate box.

9.5 Heating coil pump group (accessory)

A heating coil pump group, as shown in Figure 9.5.1, is available as an accessory for the unit series. The pump group is always the same regardless of the handedness or size of the ventilation unit. In addition to the components shown in the figure, the pump group delivery includes a 2-way control valve suited according to dimensioning, control valve actuator and reducers if the control valve is smaller in size than DN25. The pump group's glue joints have been tested for pressure at the factory. In addition to the glued joints, the pump group has level gasket joints components that can be replaced, such as the circulator (1) and check valve (4).

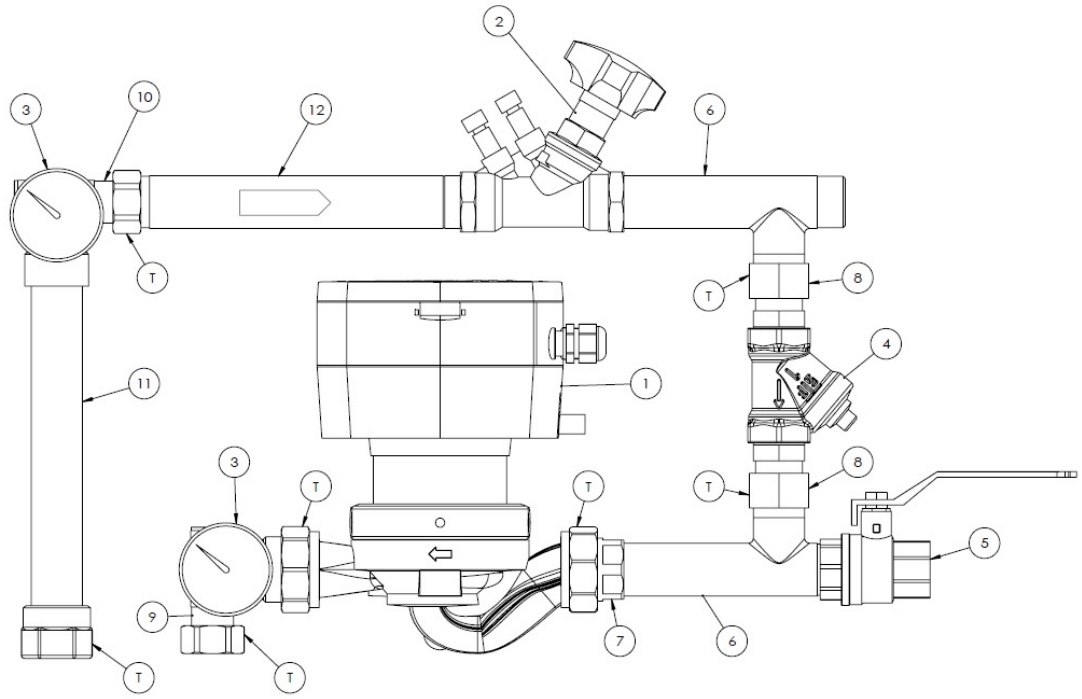


Figure 9.5.1: Heating coil pump group

Table 9.5.1: Component list for the heating coil pump group

N:o	Component name	Pcs
1	Grundfos Magna3 25-40 pump	1
2	IMI TA STAD DN25 line control valve	1
3	Thermometer 60	2
4	Check valve 1"	1
5	Ball valve DN25	1
6	T fitting 1" x 1" x 1"-3/4"	2
7	Pump connector 1" x 1 1/2"	1
8	Gasket connector 1" UK x 1" SK rotating	2
9	Angle gauge 3x1/2"-1"-1 1/2" for pump	1
10	Angle gauge 3x1/2-1"-1" for slide connector	1
11	Slide connector 1" UK/ 1" SK L= 245	1
12	Distance pipe L=234mm	1
T	Gasket joints (blue mark on nut)	7

9.5.1 Pump group installation

CAUTION	**Pipe connections must be carried out by qualified persons only.**

The pump group is install on top of the unit and connected to the inlet and outlet fittings of the heating coil.

- Check the ventilator unit's handedness and loosen the pump connectors to rotate the circulator display to the service side of the ventilator. When the pump is in the correct position, tighten the pump connectors.
- If the ventilation unit's handedness is right/R, also turn the thermometers (Figure 8.5.1 (3)) to the other side of the angle gauges (Figure 8.5.1 (9 and 10)) so that they are visible on the service side of the ventilation unit.
- Check the model of the supplied control valve by comparing the valve to the unit's technical printout, attach the control valve to the pump group and ensure the tightness of the connection.
- Check the joints' inlet and outlet connections from the unit's dimensional drawing and join the pipe connections with gaskets.
- Ensure sufficient support of the pump group with appropriate HVAC brackets.
- Connect the pump group to the heating network. Flush, fill and bleed the network and ensure the pump group's tightness.
- Connect the pump supply and control cable and the control valve control cable in accordance with the unit's connection diagrams. Also refer to Sections 7.9 and 7.10 of this manual.

9.5.2 Pump group commissioning and maintenance

- Ensure that the shut-off valves and line control valves are open.
- When the pump and valve are connected to the power supply and automation, set the pump adjustment method (e.g. FLOWADAPT) on the pump display and the flow rate according to the unit's dimensioning run.
- Ensure correct fluid flow by measuring on the line control valve.
- Ensure that the line control valve does not restrict the flow rate.
- Check for leaks and ensure the operation/direction of control valve.
- Check the operation of the pump group and any leaks every 6 months.
- Bleed and fill the system if necessary.

9.6 Preheating coil for the duct (accessory)

 **WARNING**	**Electrical connections must be made by a qualified and authorised electrician only. The condition of the cables connected to the unit must be inspected visually before making any electrical connections and starting the unit. Before starting any installation and maintenance work on the electrical device, make absolutely sure that the device is de-energised. After switching off the power, wait at least five minutes to allow dangerous voltages to discharge from the devices. Electrical devices should be inspected every six months. Any deficiencies and faults must be rectified immediately.**

 **CAUTION**	**The protective devices for the electric components must be dimensioned correctly in order to guarantee safe use of the unit.**

Future® S units equipped with plate heat recovery system can be fitted with an optional electric fresh air preheating coil installed in the duct. The preheating coil is dimensioned with the Future® S dimensioning program and its technical specifications are available in the ventilation unit's technical printout.

The preheating coil has an independent temperature controller and overheating protector and it is supplied with a temperature sensor installed in the duct. The preheating coil heats the fresh air entering the ventilation unit to the temperature set on the heater controller (e.g. -15 ˚C) according to its own temperature measurement. The controller's temperature range is -20 -> +10 ˚C.

The preheating coil must be equipped with its own supply cable and a correctly dimensioned safety switch. The preheating coil is installed, connected and serviced according to the heater manufacturer's instructions. The heater's safety distance requirements must be taken into account in design.

When using an electric preheating coil, it must be ensured that the heater does not receive a start signal if the air speed in the heater is less than 1.5 m/s. In addition, in connection of switching off the ventilation unit, the preheater's start signal must be removed at least 3 minutes before switching off the fans to ensure adequate after-ventilation. The preheater includes an access point for start signal control and overheating protector indication.

The FxVent controller has a built-in preheater start signal control and after-ventilation and an outdoor temperature limit above which the preheating enable is out of use. In order to ensure optimal operation, the outside temperature limit must be set two degrees higher than the target temperature set in the preheater controller. If the Future® S unit does not have an FxVent controller, start signal control, after-ventilation and outdoor temperature limit must be implemented with a building automation system.

9.6.1 Preheating coil installing, commissioning and maintenance

The preheating coil is installed, commissioned and serviced according to the heater manufacturer's instructions. Instructions are included in the equipment delivery. In addition to the heater manufacturer's instructions:

- Check that the heater is visually intact.
- Make sure that the heat transfer surfaces are clean and intact.
- Ensure there is no material or moisture inside the heater that does not belong there.
- The heater's safety and locking functions must be tested carefully before commissioning.
- Cleaning can be done with a vacuum cleaner, for example. NOTE! Do not use water for cleaning.
- If the overheating protector is activated, the cause of the activation must be determined before the overheating protector is acknowledged.

9.7 Cooling coil for the duct (accessory)

Future® S units can be equipped with an optional fluid circulation cooling coil installed in the horizontal duct. The cooling coil is dimensioned with the Future® S dimensioning program and its technical specifications are available in the ventilation unit's technical printout. The cooling coil is installed and serviced according to the cooling coil manufacturer's instructions. **NOTE! The cooling coil must be installed in a horizontal duct. In connection of installation, ensure that condensed water is discharged from the condensation tray to the condensation drain. Condensation drains must be sewered and equipped with a water trap.**

The FxVent controller has a built-in cooling coil control valve's 0–10 V adjustment. The control valve and actuator are not included in the equipment delivery. If cooling is selected for the unit, the supply air duct temperature sensor (TE10) is wired at the factory and looped on top of the unit. The site's automation contractor installs the temperature sensor in the ductwork after the cooling coil and connects the cooling valve actuator into the automation system controlling the unit.

If necessary, the cooling coil can be dimensioned separately (separate dimensioning) if the site uses, for example, different cooling network temperatures. In this case, the supply air duct's temperature sensor is wired at the factory and looped on top of the unit.

9.7.1 Cooling coil installing, commissioning and maintenance

CAUTION	**Pipe connections must be made by qualified persons only.**

The cooling coil is installed, commissioned and serviced according to the cooling coil manufacturer's instructions. Instructions are included in the equipment delivery. In addition to the manufacturer's instructions:

- Check that the cooling coil is visually intact.
- Make sure that the heat transfer surfaces are clean and intact.
- Ensure there is no material or moisture inside the cooling coil that does not belong there.
- Ensure that the cooling coil is installed in a duct with horizontal air flow.
- Ensure that condensed water is discharged through the condensation drain without obstruction. Condensation drain must be sewered and equipped with a water trap.
- Check the connections' inlet and outlet connections and the direction of air flow from the cooling coil's installation instructions.
- Ensure sufficient support of the cooling coil with appropriate HVAC brackets.
- Connect the cooling coil to the cooling network. Flush, fill and bleed the network and ensure the tightness of connections.
- Check the operation of cooling and any leaks every 6 months.
- Bleed and fill the system if necessary.
- Heat transfer surfaces can be cleaned with a vacuum cleaner, for example.