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POLAND

STATIONARY AIR HANDLING UNIT (AHU)
CSK, CSN, CM

Before starting operation please read the user's manual.

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I. CONTACTS

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JUWENT

II. ORIGINAL USER'S MANUAL

STATIONARY AIR HANDLING UNIT
CSK size 05÷160
CSN size 20÷125
CM size 200÷300

The units were made in accordance with the European Standards EN 1886 and EN 13053.

TABLE OF CONTENTS

1. INTRODUCTION

Please read carefully this document, install and operate AHUs in accordance with the descriptions contained herein and observe all safety instructions to ensure that the device operates correctly and safely.
Only qualified persons or personnel working under supervision of authorized persons may unload the pallets containing AHU components, handle the pallets and unit components and connect and maintain AHUs.
“Qualified personnel” means persons authorized to perform related work and avoid possible risks due to their training, experience and awareness of relevant standards, documents and codes pertaining to safety and equipment operating environment.
This technical and operating manual does not contain details of all possible unit configurations or examples of assembly, installation, startup, operation, repair or maintenance. If you use your units for the designated purpose, this document and other documents attached to the units contain instructions sufficient for qualified personnel.

Assemble each unit, connect related systems, and commission, operate and maintain the equipment in accordance with your local codes and regulations.

We recommend using JUWENT Authorized Service Organizations (ASO) to install, commission, repair, inspect and maintain the equipment.

Ensure that relevant documentation is readily available near the equipment.

2. INTENDED PURPOSE AND DESIGN

Range CSK consisting of 14 sizes is intended for treating 850 to 72,000 m^3/h air flows. It includes floor units of up to CSK-75 size and maximum 33,750 m^3/h capacity.
Range CSN consisting of 8 sizes is intended for treating 3,400 to 56,250 m^3/h air flows.
Range CM consisting of 3 sizes is designed for treating 34,000 to 135,000 m^3/h air flows. The CM units are intended for the ground floor only.
JUWENT AHUs are designed for installation in ventilation networks furnished with safeguards preventing access to rotary components of the unit (fan rotor) on the inlet and outlet sides. A “ventilation network” is taken to mean ventilation ducts and, for outdoor equipment, intakes and ejectors. Each JUWENT AHU consists of one or more multi-functional sections. All air treatment features of the unit are identified with icons placed on guard panels on the servicing side.
The units do not emit non-ionizing radiation due to their design and materials.

2.1. SYMBOLS AND IDENTIFICATION

2.1.1. AHU Identification

... – ... – ... – ... – ... / ... – ... / ... – ... / ... / ...

UNIT TYPE

CSK, CSN, CM

UNIT SIZE

CSK-05, 10, 15, 20, 30, 40, 50, 60, 75, 90, 105, 120, 140, 160
CSN-20, 25, 35, 50, 70, 80 110, 125
CM-200, 240, 300

DESIGN

S - Standard; H - Hygienic; B - Swimming pool, E - Special

HOUSING TYPE

W - Indoor; D - Roof

SERVICING SIDE

P - Right;L- Left

AIR SUPPLY INLET TYPES

1, 2, 3, 4, 5

AIR SUPPLY OUTLET TYPES

2, 3, 4, 5, 6

AIR EXHAUST INLET TYPES

1, 2, 3, 4, 5

AIR EXHAUST OUTLET TYPES

2, 3, 4, 5, 6

HEAT RECOVERY

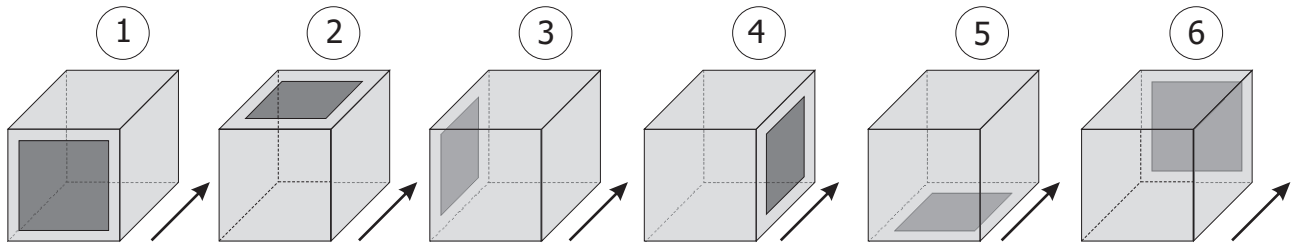
M - Recirculation; K - Cross-flow; O - Rotary; G - Glycol; R - Hot pipe

LAYOUT

V - Vertical; H - Horizontal, S - Serial

Most configurations are available in “left” and “right” designs. Whether the design is “left” or “right” depends on the air flow direction relative to the servicing side (inspection panels, unit connector pipes, etc.). For supply-and-exhaust units the side depends on the air flow direction in the supply side.

2.1.2. Inlet and Outlet Marking



The arrow represents the air flow direction.
If the unit mixes air or separates air streams, the inlet or outlet symbol is the combination of the foregoing digits.
For instance, “12” identifies an air inlet with the straight ahead and from the top air flow direction.

2.1.3. Function Labels

FILTERS


- Coarse

- Coarse, Ex


- Fine

SUPPRESSORS

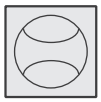
- Short

- Medium

- Long

OTHERS


- Moisture separator


- Cooling circuit


- Lifting point labels

HUMIDIFIERS

- Water

- Vapour

HEATERS

- Water

- Steam

- Electric

- Gas

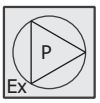
COOLERS

- Water

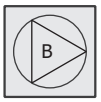
- Freon

FANS

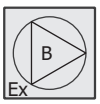
-Belt



- Belt, Ex



- Direct



- Direct, Ex

HEAT RECOVERY


- Recirculation


- Glycol


- Hot pipe


- Cross-flow


- Rotary

2.2. DESIGNS

2.2.1. Standard

The AHU components are made of the following materials:

· inner housing panel plates: coated galvanized steel;
· outer side and top panel plates: coated galvanized steel; floor panel plate: galvanized steel;
· all housing joints sealed with silicone;
· door panel seals: EPDM;
· rails and guides for drawers, filter frames, heat exchanger housings, fan compartment walls: galvanized steel;
· drip tubs under coolers and heat exchangers: stainless steel;
· fluid drains with gradient towards the outlet;
· condensate drains with traps for backflow prevention;
· AHU base plate: galvanized steel.

2.2.2.Hygienic

This design is based on the standard one, modified as required. The modifications include the following:

· inner side and top panel plates: coated galvanized steel; floor panel plate: stainless steel;
· inner panel plates in AHUs intended for surgical wards, operating rooms, isolation wards and laboratories: stainless steel;
· outer side and top panel plates: coated galvanized steel; floor panel plate: galvanized steel;
· all housing joints sealed with certified antibacterial silicone;
· door panel seals: material resistant to cleaning and disinfecting agents;
· floor surface in each unit section: smooth, even and leak-proof;
· rails and guides for drawers, filter frames, heat exchanger housings, fan compartment walls, cleaner/disinfectant drains and drip tubs under coolers and heat exchangers: stainless steel;
· fluid drains with gradient towards the outlet;
· condensate drains with traps for backflow prevention;
· filter, fan and cooler sections with eyeholes and illumination;
· vapour-only humidifiers in the terminal sections of the unit;
· epoxy-coated fans and heat exchangers;
· moisture separator downstream the cooler removable as a separate component;
· sufficient distances between exchangers for access from both sides;
· wear-resistant slotted levers of noise suppressors;
· coarse filters class: at least F5 (EU5);
· directly driven fans.
· at Customer's request, the hygienic design can be modified further, as follows:
· inner side, top and bottom panel plates: stainless steel;
· eyeholes and illumination in additional AHU sections;
· gauges for monitoring pressure loss on filters in real time;
· belt-driven fan;
· UV lights for the filtration section;
· if required (except for units for surgical wards, operating rooms, isolation wards and laboratories), fans and heat exchangers without epoxy coatings.

2.2.3. Swimming Pool

This design is based on the standard one, modified as required. The modifications include the following:

· inner panel plates: epoxy-coated galvanized steel;
· outer side and top panel plates: coated galvanized steel; floor panel plate: galvanized steel;
· all housing joints sealed with certified antibacterial silicone;
· door panel seals: material resistant to cleaning and disinfecting agents;
· rails and guides for drawers: stainless steel or epoxy-coated galvanized steel;
· drip tubs under coolers and heat exchangers: stainless steel;
· filter frames, heat exchanger housings, fan compartment walls: epoxy-coated galvanized steel;
· fluid drains with gradient towards the outlet;
· condensate drains with traps for backflow prevention;
· epoxy-coated fans and heat exchangers;
· wear-resistant slotted levers of noise suppressors.

2.2.4.Special

As specified in the catalogue plus the following customized solutions (as agreed with a design engineer), at request:

· additional components (items not listed in the catalogue);
· custom dimensions;
· custom materials (e.g., stainless steel housings);
· custom air specifications with possible heat recovery from processes.

Each custom design has to be agreed on in writing. Custom designs are not included in the AHU Selector application. Please contact the JUWENT Design Office in Łódź (Poland).

3. HANDLING AND STORAGE

Our AHUs are delivered either fully assembled or in parts, loaded on pallets.

This document does not contain assembly instructions.

We recommend using a JUWENT ASO to assemble and install your unit.

The delivery will become the property of the Customer once the Customer signs the bill of lading.

Check the condition of packages and delivery completeness on the basis of specifications and the bill of lading attached immediately after the delivery.

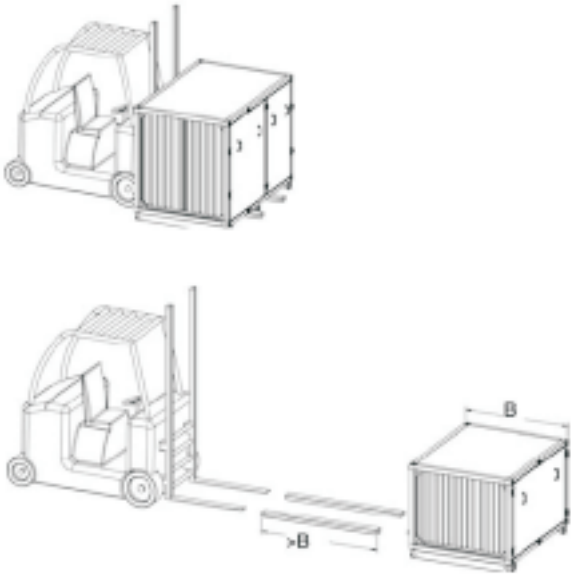
Use suitable equipment and qualified personnel to unload the shipment and move components to the assembly/installation site.

Store the components under a roof, on hard dry surface, i.e. level, flat and hard surface unaffected by weather.

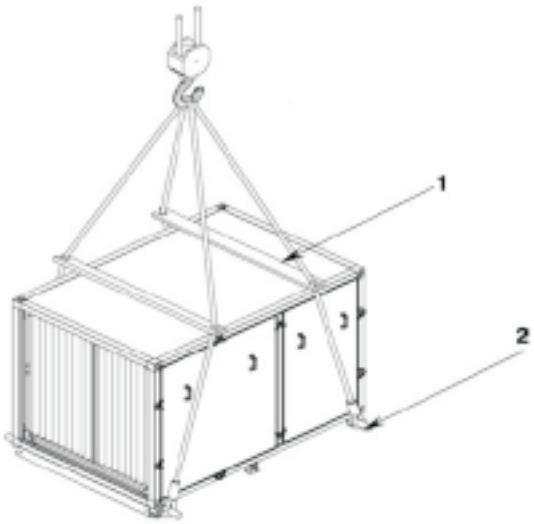
Keep the components safe from damage from vehicles/machines, impacts, moisture, corrosive chemicals, dust, sand, etc.

Use a forklift truck or lift to unload the pallets and move them to the assembly/installation site. Assemble the cross-flow exchanger sections of parallel AHUs CSK-140 and CSK-160 at the target installation site.
Once assembled, each unit must be transported in its working orientation. Do not store AHUs in stacks.
If a unit is to be stored, make holes in its film wrapping.

JUWENT disclaims any responsibility for any damage resulting from incorrect unloading, handling or storing the AHU or its components.



1.Securing struts
2.Handling pipes – pull through the holes in the carrier frames



Store the units and their components in the following conditions:
- RH: <80% at t= 20°C
- ambient temperature: -40°C to +60°C
- no dust, no corrosive chemicals

4. FOUNDATION, ASSEMBLY AND CONNECTIONS

4.1. FOUNDATION

Place the unit on one of the following foundation types:

- · poured concrete pad;
- · steel foundation frame concreted in the floor
- · dedicated rigid steel structure.

The foundation must be strong enough, flat and level (no deterioration in time).
The height of the foundation must allow for installing a non-return valve (trap) on the condensate drainage line. If the height of the trap (H) for drip trays installed in the bottom AHU sections exceeds the value of

- · 170 mm for unit width up to 1,100 mm;
- · 190 mm for unit width from 1,400 to 2,050 mm;
- · 230 mm for unit width above 2,050 mm;

provide for an extra foundation height or a recess in the foundation directly under the trap.

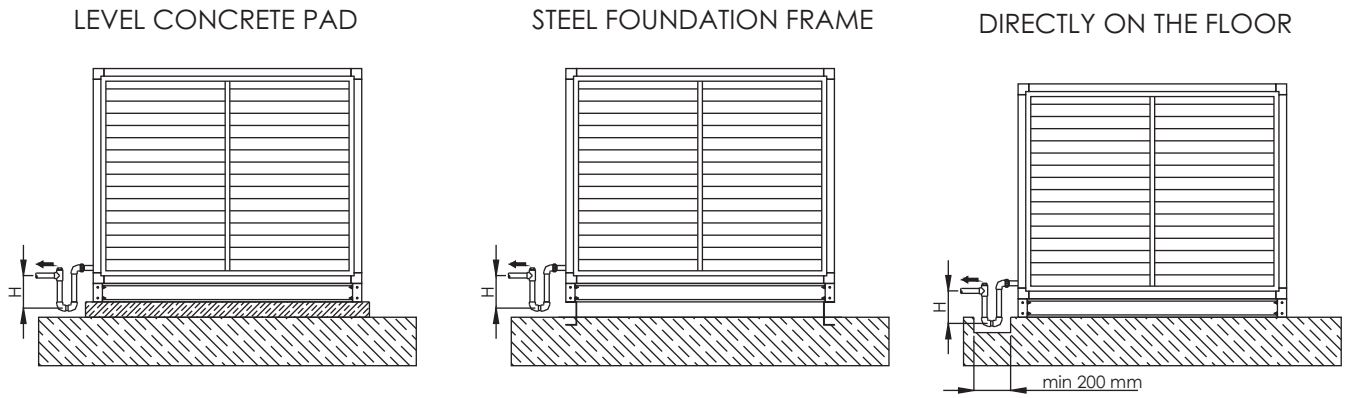
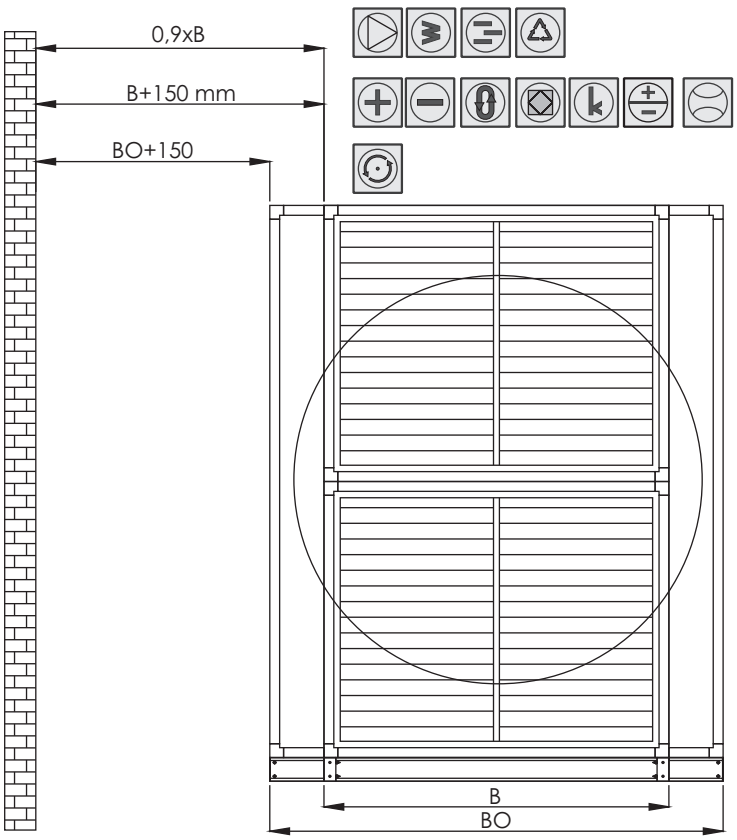


Fig. AHU foundation examples

4.2. INSTALLATION SITE

The unit's input/output lines (ventilation ducts, pipelines, cable trays, etc.) should not block the inspection panels.
Provide sufficient installation, operation and maintenance clearances between the servicing side and the existing fixed structures (such as walls, supports or pipelines).
The servicing space may contain pipelines, supports or other structures only insofar as such items do not obstruct servicing and repairing the unit.
Place the unit on rubber vibration isolating pads, such as “Mafund”. If your unit consists of more than one section, match the pads' footprints to the weight of each module to ensure that the sag of all the pads is even.



4.3. CONNECTING AHU BLOCKS

Level the blocks of adjacent units to ensure that their vertical and horizontal surfaces are in close contact. Before anchoring the units, bolt their blocks together in sequence shown on the dimensional drawing contained in the documentation. Wrap the adhesive tape supplied with the units around the contacting block frames before bolting them together. In blocks, the cartridges of which (exchangers, suppressing pads, etc.) obstruct access to the block connectors, remove such cartridges and store them safely until replacement.

4.4. CONNECTING VENTILATION DUCTS

Use flexible couplings to isolate the unit from vibration and correct slight outlet-duct misalignments. The flexible couplings have flanged ends. Bolt the unit connector and ventilation duct flange corners together with M8 bolts. For larger coupling sizes place additional clamps on the flanges (not included in the delivery).

A flexible coupling performs bests if its bellows is stretched to approx. 110 mm.

Ducts connected to the unit must be supported or hanged on dedicated structures. The ducts and fittings should be routed for minimum noise. If your unit uses an enclosed radial fan, the orientation of the ventilation elbows installed on the ducts near the outlet of the unit should conform to the fan's rotation direction.

If the fan has no housing, you can install straight elbows, T-pipes or noise suppressors directly next to the fan's outlet.

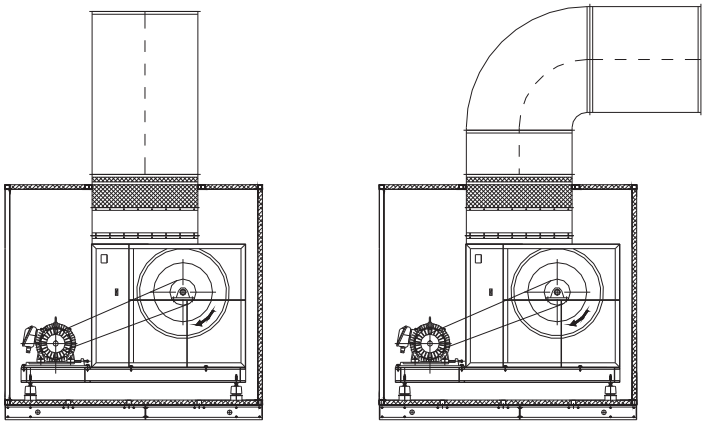


Fig. Correct ventilation duct connection: elbow orientation consistent with the rotor's rotation direction

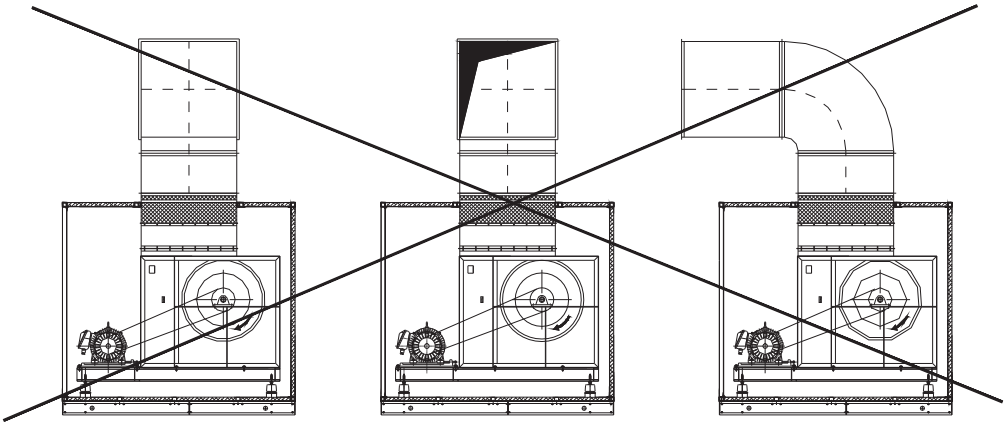


Fig. Incorrect ventilation duct connection: elbow orientation opposite to the rotor's rotation direction

4.5. CONNECTING HEATERS AND COOLERS

Ensure that the heat exchanger connections are free from stresses that could produce damage or leaks. The weight of the pipeline and thermal stresses must not be transferred to the exchanger's connector pipes. Install expansion joints on the supply and return pipelines as required. While tightening a threaded pipe to the exchanger, secure the exchanger's connector pipe with an additional wrench.

Ensure that the supply line does not obscure other sections of the AHU. The exchanger-to-supply line connection system should enable easy removal of the pipeline and then the exchanger for maintenance or repair.

While connecting lines to the supply and return connector pipes of the exchangers ensure that the directions of the two air streams are opposite. If they are the same, the mean temperature difference, and the performance of the exchanger will be lower.

See the following figure for supply and return pipelines connection examples depending on the unit installation side.

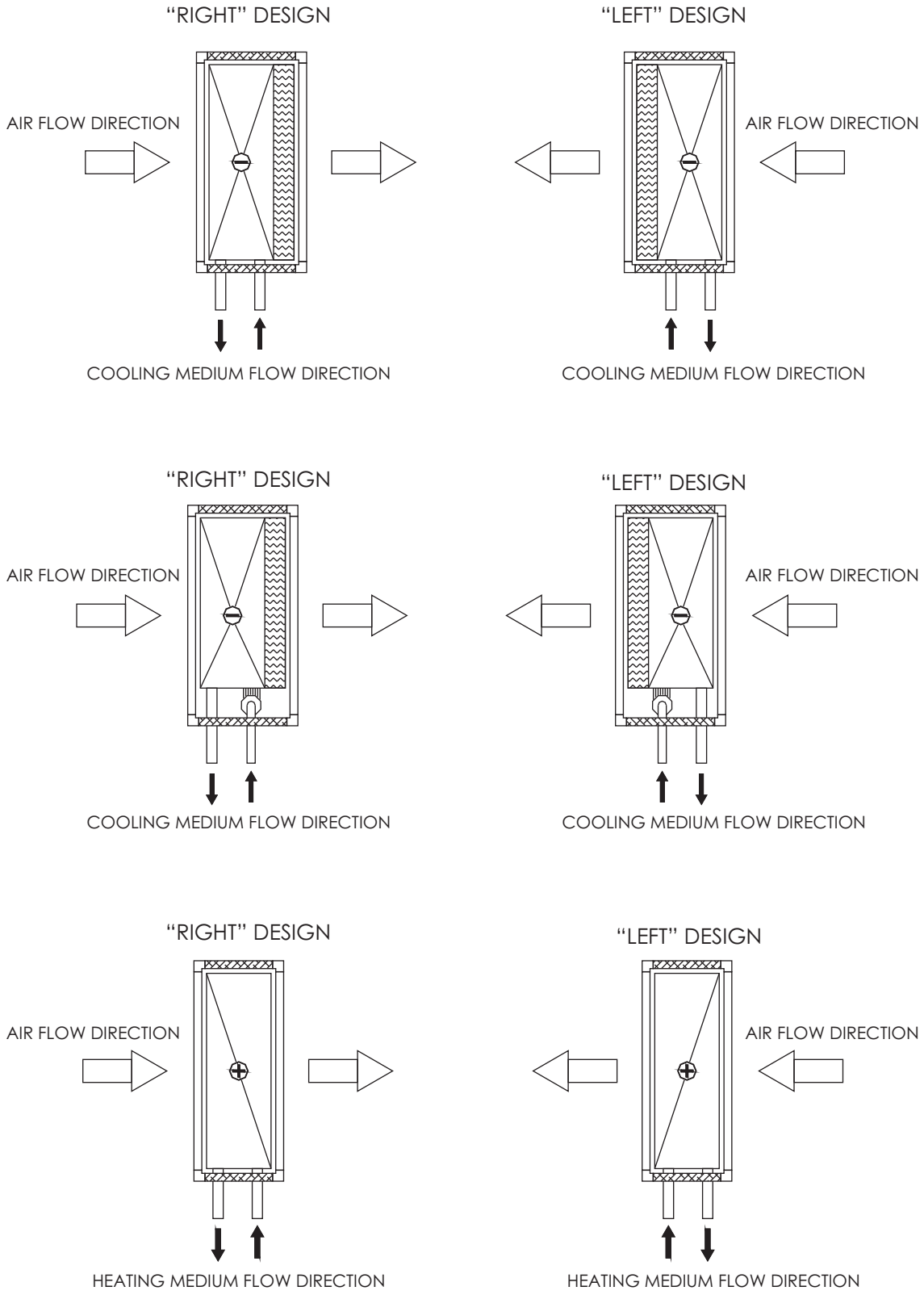


Fig. Water cooler, freon cooler and water heater installation sides

A qualified cooling systems engineer should connect the freon cooler to the refrigerating unit in accordance with rules applicable to cooling equipment using freon.

4.6. HUMIDIFICATION

The humidifier is a separate, non-removable unit section containing a tub in its base. Check that this section is not damaged before installing the unit. Do not allow the ambient temperature to drop below +5°C and follow the humidifier manufacturer's instructions attached to this section.

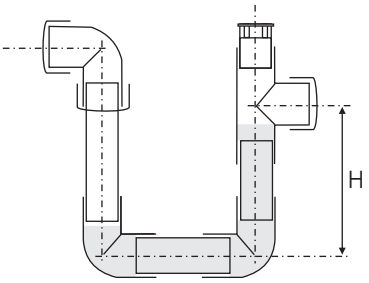
4.7. CONDENSATE DRAINAGE

The condensate drainage connector pipes of the drip trays are output from the cooling section of the cross-flow exchanger to the outside of the unit's housing.

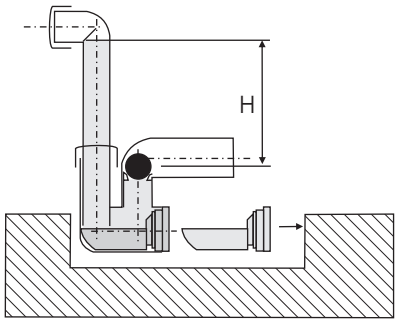
Connect one-way valves (traps) to these connector pipes to prevent condensate from the exchangers from flowing back in certain section and ambient pressure conditions.

The working height (H) of the traps depends on the difference of pressures inside the exchanger and the atmosphere. This height (mm) must be larger than the pressure differential (mm H2O).

No	Total fan pressure [Pa]	Dimension H [mm]
1	<600	60
2	600-1000	100
3	1000-1400	140
4	1400-1800	180
5	1800-2200	220
6.	2200-2600	240



Trap on the pumping side



Trap on the suction side (ball valve)

Sharing one by more than one condensate drainage connector pipe is not allowed due to pressure difference between the exchanger sections during the unit operation

On the other hand, traps can share a single collecting discharge pipe, provided that the pipe is vented. Prime the traps with water before commissioning the AHU. If the ambient temperature is freezing, insulate the discharge pipe and install trace heating, if required.

4.8. GAS EXCHANGER

This document does not contain instructions concerning assembling, connecting, commissioning and operating the gas exchanger, burner and the flue gas and condensate discharge system.

See separate documents provided by JUWENT.

4.9. COOLING SYSTEM

4.9.1. Design

The cooling systems for CSK AHUs are suitable for AHU sizes 05 to 160.

All components of the refrigerating unit are fully cabled and connected inside the housing. The cooling system is integrated with the housing of the AHU and the unit contains a separate section for compressors.

The coils of the cooler and the refrigerating unit's condenser are made of copper pipes with profiled aluminium lamellas fitted on the surface. The housing of the exchangers is made from galvanized steel plate.

The cooling systems are complete with integrated automatics and internal cabling.

Depending on the size of the AHU, the cooling system contains 2 or 3 spiral compressors and unit sizes from 120 to 160 are equipped with 2 separate cooling circuits, each containing 2 compressors.

The cooling systems have an evaporator (cooler) for direct cooling medium evaporation on the air supply side and a condenser on the exhaust side of the AHU.

The cooling circuits contain environmentally friendly medium: R407C fluid. This medium is safe for the ozone layer and accepted for use without any limitation.

4.9.2. Operating Principle

Gaseous cooling medium is compressed by compressors S1 and S2 and fed to the SKT condenser, where it is cooled down by the stream of exhausted air. As the result of cooling, gas condenses and flows to the fluid container.

Liquid coolant collected in the container is expanded by thermostatic expansion valve to the pressure of the evaporator (cooler). The pressure and temperature of liquid coolant drop while the fluid flows through the expansion valve TZR. The coolant flows then from the expansion valve through a distributor to the evaporator PAR (cooler) where it reaches its boiling point, evaporates and, thus, cools down air flowing around the cooler. From the PAR evaporator, evaporated (gaseous) coolant is sucked to the compressor through a fixed pressure valve with a suction filter. Then the gas is compressed and the next cycle begins.

The cooling capacity of the device is controlled by turning on one or both compressors:

first compressor S1 and then, if the cooling capacity is insufficient, compressor S2. The performance of each compressor is adjusted based on a preset and control signal from a temperature sensor.

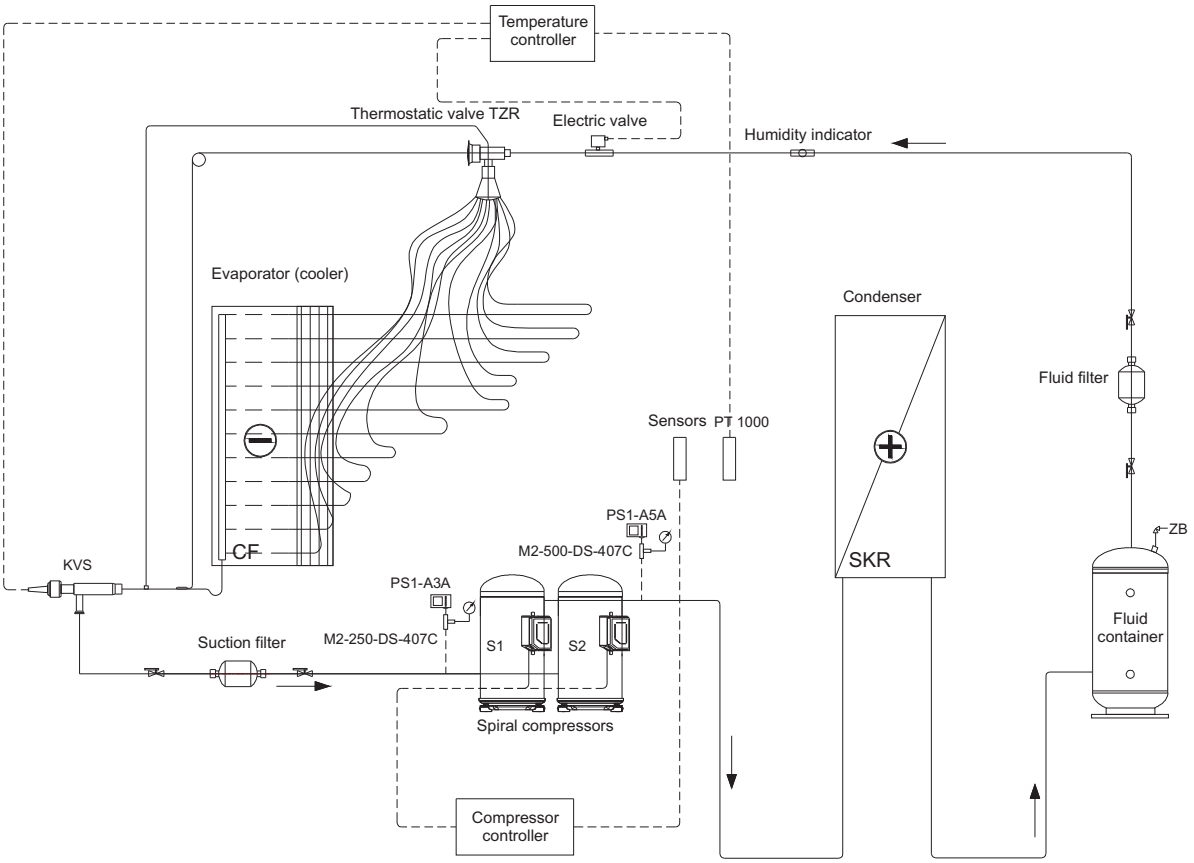


Fig. Cooling system diagram

There is a “neutral zone” surrounding the preset, within which subsequent compressors will not be turned on or off. If the temperature value is beyond this zone, reaching one of the dashed areas (+Zone or -Zone), the controller will turn on or off additional compressor(s). If the temperature returns to the neutral zone, output will not be changed. If the temperature moves to the ++Zone or --Zone, subsequent stages will be turned on or off faster. The compressors are load-balanced in time (the compressor turned off last will also be turned on last).

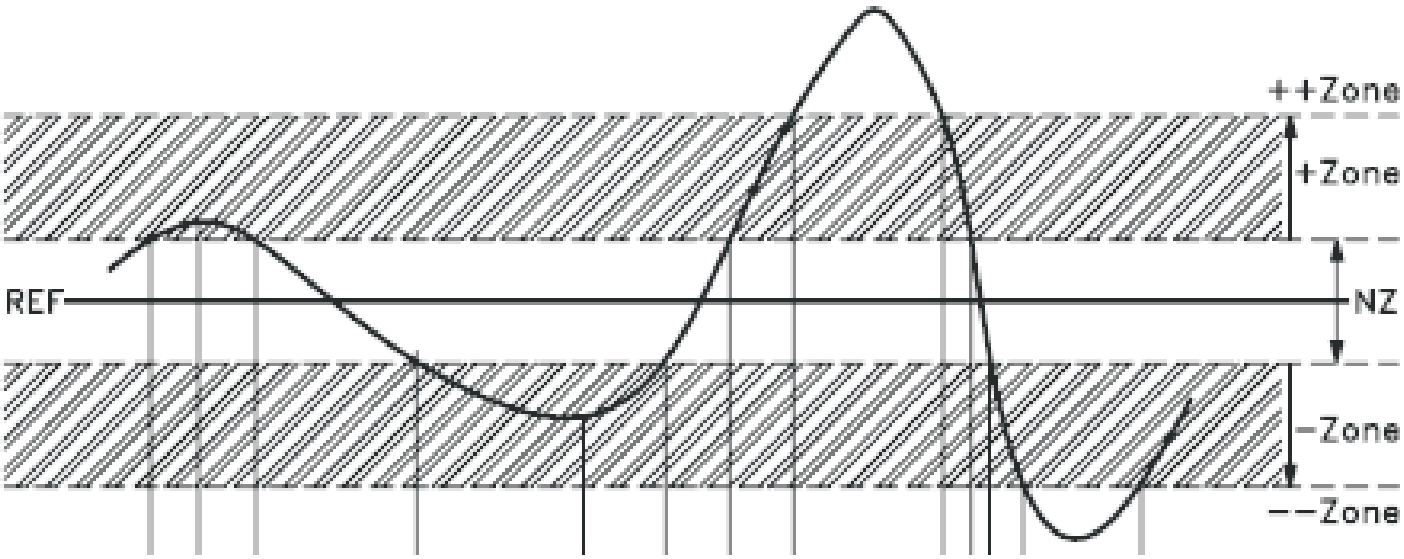


Fig. Cooling system performance control using compressors

4.9.3. Safety Requirements

The safety switch is installed on the inspection side of the unit. It must not be used for regular turning on and off the cooling device. To ensure that the cooling device is off, turn off the AHU or press briefly the refrigerating unit's power switch on the control panel of the AHU. Then you can isolate the cooling system from the mains using the main switch.

Always disconnect the AHU from the mains with the safety switch before servicing the AHU. (Unless a relevant instruction provides otherwise.)

Check that the AHU is isolated from the mains before servicing the AHU.

The interior of the AHU's housing containing the cooling system components is the place where the cooling medium can leak.

The cooling medium circuit must not be opened by unauthorized personnel. The circuit contains gas and liquid under high pressure.

The door panel with the compressor section lock must not be opened while the AHU's fan is on. The vacuum can cause injuries and damage the panel.

Only qualified and licensed electrical engineers may connect leads within the device. Only qualified refrigeration engineers may access the cooling medium circuit.

4.10. ELECTRICAL CONNECTIONS

Only qualified and licensed electrical engineers may connect AHU components. Always follow the applicable local codes and regulations. Cross-sections and types of leads (e.g., shielded cables) should be selected to match the rated current and environment of the AHU (e.g., ambient temperature, conductor routing, distances from the power supply cabinet).
Before connecting [any device] to the mains ensure that the mains voltage and frequency match the values specified in the rating plate(s). The voltage and frequency tolerance from the rated values is ±5%. If this tolerance limit is exceeded, do not connect the device.

4.10.1. Water humidifier

Water pump and illumination are the electrical components of the water humidifier. The pump's motor placed outside the rinsing chamber tub is powered with 3x400V/50 Hz current. Connect the motor by following the instructions provided on the motor's rating plate. Provide the motor with appropriate short circuit and overload protections. The motor (and the pump) should rotate in the direction of the arrow on the pump's housing.

4.10.2. Rotary exchanger

The rotary exchanger is driven by a gear motor (cage motor with worm gear) with a frequency converter. The control system uses the standard 0-10 V signal. The frequency converter is powered with 1x230V/50 Hz current. Connect the rotary speed setting signal (0-10 V) using a two-wire shielded control cable. All electrical connections and configurations of the rotary exchanger's drive should conform to the “Rotary Exchanger Drive Operating Manual”.

4.10.3. Electric heater

Ensure that the electrical connection of the heater prevents the heater from running if the fan is off. Depending on the automation system, the heater's power control can be stepless or incremental. In the latter case, connect component heaters in clusters. The individual heaters of each cluster are arranged symmetrically in the heating unit's window. The heating coils of the heater will be damaged if the heater is energized without air flow.

The heater's control system must contain a thermostat.

The bimetallic thermostat opens the contacts of the heater's power supply control circuit once the ambient air temperature around the thermostat rises to 65°C. The heater will be turned on again once the temperature drops to 45°C. The cooling fan will operate for some time (0.5-5 minutes) after intentional or emergency (on overheating) disconnection of power supply to cool down the heating coils of the electric heater.

4.10.4. Fan motor

Fan motors are designed for operation in dusty and humid environments (IP54) and their isolation (class F) is compatible with frequency converters. No additional measures are required to proof the motors for operation in the environment of the AHU's fan section.

Motors installed in AHUs contain integrated cooling fans installed on their shafts.

Fan motor power supply leads must be passed through the rubber glands of the AHU's housing panel.

If the power supply cable penetrations in the terminal boxes of the motor are blanked with thin layers of cast iron, gently remove the blanks.

Do not pass power supply cables through the inspection panels.

Fan's indirect drive

Belt-driven fan motors are powered with 3x400V/50 Hz current. Install overload and short circuit protections rated for the motor's current in the power supply circuit.

The motor windings have optional internal thermal protections (PTC sensors).

The sensors are connected in series and terminated in the terminal box. Connect them to an electronic measuring relay controlling temperature.

Fan's direct drive

Directly driven fan motors are powered from three-phase frequency converters. The 3x400V/50 Hz motor winding should be connected to appropriate terminals of the frequency converter.

Optionally, motors of up to 2.2 kW power can be powered with 1x230 V/50 Hz current.

Install a short circuit protection rated for the motor's current in the power supply circuit. The overload protection should be provided in the frequency converter by enabling specific settings and entering rated motor settings in accordance with the instruction attached to the frequency converter.

If the motor is supplied from the frequency converter, high frequency currents or harmonic components in the motor's power supply leads can produce electromagnetic interference. Use shielded leads to connect the motor to the frequency converter in accordance with the converter's operation and maintenance manual.

Measure the resistance of insulation between the housing and windings before first commissioning and after each longer period of storage or inactivity. The minimum resistance of a new, cleaned or repaired winding should be 10 MΩ relative to earth.

A service cut-out isolating the fan's motor from the mains must be provided outside the fan section to ensure safe servicing. The service cut-out should be installed near the inspection panels of the fan section.

The service cut-out must be voltage-free. Do not install the service cut-out on inspection panels.

4.11. AUTOMATICS

Complete automatics that should be an integral part of any air handling system enables stepless operation of the device and in many cases it is an essential component, the unavailability of which can lead to operating problems and serious device damage. This document does not contain instructions for assembling, connecting, commissioning and operating components of the automatics.

See separate documents provided by JUWENT with the set of automatics.

In other cases, the supplier of the automatics system is required to provide related information and documents.

5. PREPARATION FOR STARTUP

Only qualified and properly trained personnel may start up the AHU during the commissioning of the ventilation system.

Before starting up AHU, clean thoroughly the interiors of devices and ducts. Check if:

- components of devices, systems, automatics or equipment of automatics have not been damaged during assembly;
- all ventilation devices are installed mechanically and connected to the ventilation network;
- grounding wires connecting the AHU with ventilation ducts are installed;
- the hydraulic and freon system is fully installed and ready for operation and the heating or cooling medium is available during the startup;
- electric loads are cabled and ready for operation;
- traps and system for the removal of condensate from drip trays are installed;
- all components of automatics are installed and cabled.

5.1. ELECTRICAL SYSTEM

Before closing the terminal boxes of electric loads, check that:

- leads and connections between terminals are connected correctly based on wiring diagrams;
- all electric loads are furnished with correct protections;
- all bolts are tight and supports and electrical connections (including unused auxiliary terminals, if any) are assembled correctly;
- leads and cables meet all protection requirements;
- routes, cross-sections, etc. are correct;
- grounding and protective connections are correct;
- terminal boxes are free from lead stubs and other foreign objects;
- seals and sealing surfaces are intact.

5.2. FILTERS

Air filters used in AHUs prevent the ingress of dust to the ventilated premises.

In addition, they efficiently protect other functional components of AHUs, including specifically heat exchangers, from contamination.

Each AHU must be operated with its filters in place at all times.

Do the following before closing the filtering section:

- · remove the film protecting the filters;
- · insert the filters in the guides so that the pockets are in vertical positions;
- · check the filters and make sure they are seated tight in the guides;
- · check differential barostat settings (if present) that define the static pressure difference qualifying the filter for replacement.

Filter type	Filter class	Admissible pressure differential acc. to EN 13053
Metal	G2	150 Pa
Pleated	G4	150 Pa
Pleated	F5	250 Pa
Pocket	G4	150 Pa
Pocket	F5	250 Pa
Pocket	F7	250 Pa
Pocket	F9	350 Pa

Table - Admissible filter pressure differential acc. to EN 13053

5.3. WATER AND GLYCOL HEATERS

Check the following:

- · heater lamella status;
- · input and output pipelines for connection correctness;
- · antifreeze thermostat's capillary for permanent fixation to the heater's housing;
- · antifreeze thermostat setting (default: +5°C);
- · heater's control valve for installation correctness (marks on the housing).

5.4. ELECTRIC HEATERS

Check if:

- · the electrical connections conform to the heater wiring diagram;
- · the protective thermostat is connected correctly;
- · the heaters do not touch any components within the heating section;
- · the individual heaters are not damaged.

5.5. GLYCOL AND FREON COOLERS

As with water heaters, check the following:

- · cooler lamella status;
- · input and output pipelines for connection correctness;
- · moisture separator's orientation vs. the air flow direction;
- · trap installation for connections (prime the trap with water before starting up the AHU);
- · condensate drainage line patency.

5.6. NOZZLE HUMIDIFIER (RINSING CHAMBER)

The humidifier is thoroughly cleaned and tested by its manufacturer before shipment. However, it should be cleaned again, as it can get contaminated during handling or assembly.

Do the following:

- · check that the water filter upstream the pump is clean and installed correctly;
- · check that the rinsing nozzles are installed correctly;
- · fill the trap with water;
- · fill the water tank (under the humidifier) to approx. 2 cm below the trap's overflow point;
- · adjust the float valve;
- · check the rotation direction of the pump.

Do not run the pump while it is dry as the pump's shaft can get damaged.

5.7. CROSS-FLOW EXCHANGER

Check the following:

· exchanger's lamella status (contamination, physical damage);
· operation of the throttle installed on the exchanger (the part of the throttle redirecting the flow to the exchanger's bypass should be closed before starting up the AHU);
· moisture separator and its orientation vs. the air flow direction;
· if your AHU contains a moisture separator, check the trap for size and installation correctness and condensate drain line patency; prime the trap with water before starting up AHU.

5.8. ROTARY EXCHANGER

Check the following before starting up the exchanger:

· whether the rotor rotates smoothly after V-belt removal;
· rotor-to-housing clearance (adjust the sealing brushes, if required);
· electrical connections;
· after installing the driving belt and starting up the exchanger ensure that the rotor rotation direction proceeds from ducts with exhausted air, through a cleaning gate, to ducts with supply air.

5.9. FAN UNIT

Check if:

· there are no foreign objects around the fan that could be picked up by the fan once it is started;
· the fan's rotor rotates freely, without brushing against housing components;
· the motor is correctly set and the operating conditions comply with the information provided on the rating plate (supply voltage, current, frequency, winding connections);
· the fan's rotor rotates freely, without brushing against the stator;
· cooling air can flow into, and leave the motor's housing without obstruction;
· grounding and protective connections are correct;
· the design RPM of the fan is not exceeded (see AHU specifications);
· all bolts, retainers and electrical connections are tight;
· supply leads inside the fan section are clear from all moving components of the drive and fixed with correct holders to electric leads;
· all throttles in the ventilation ducts are set as specified in the design;
· the rotor rotates in the direction of the arrow placed on the fan's housing
· (turn on the fan for an instant; if the direction is incorrect, switch any two leads in the motor's terminal box or change the rotation direction in the frequency converter);
· the V-belt is tight and belt transmission wheel positions are correct.

Once done, close all the inspection panels.

Do not operate the AHU with any inspection panel open.

5.10. COOLING SYSTEM

5.10.1. Preparations for priming and starting up the cooling device

Once the cooling device is assembled and before it is filled with the cooling medium, test the device for pressure withstand and tightness. The test pressure depends on the working pressure of the medium. Before running the test disconnect all pressure-sensitive control/protective components and safety valves.
Use only dry nitrogen (air or commercial nitrogen would introduce too much moisture to the system).
Feed nitrogen from the cylinder's reducing valve, setting the pressure based on the reducer's gauge indication.
Perform the leak test very carefully. If the ventilation system develops any problem with maintaining vacuum at a later time, repeat the pressure test. After successful verification of cooling device tightness you can dry the system and evacuate foreign gases with high vacuum . Before filling, adjust and set all cut-outs and controllers and test the core components of the system. For this purpose, check the following:

· voltages;
· switching pressure settings in high and low pressure barostats;
· setting of compressors' overcurrent contactors (maximum working current);
· compressor motor rotation directions;
· cut-outs and motors' protective circuit breakers (should be on).

The cooling systems of AHUs of all sizes have controls of the sequence of connection of phases. If the connection of phases is incorrect, the control system will prevent the compressors in the cooling system from running. An alert will be displayed on the AHU control panel.

5.10.2. Correcting improper connection of phases

Only a qualified electrical engineer may perform the following work.

Check with a meter that the AHU compressors are de-energized.

· turn off the cooling device by setting the switch in the “0” position.
· turn the safety switch to “Off”.
· cut off the compressors.
· switch any two phase leads to reverse the rotation direction.
· energize the unit.
· turn the safety switch to “On”.
· turn on the cooling device.

The cooling device is filled with the cooling medium before commissioning

6. STARTUP AND ADJUSTMENT

The purpose of starting up the AHU is to ensure that the AHU conforms to the design and is serviceable. Only qualified personnel equipped with a set of basic measuring instruments can perform the startup and initial adjustment of the ventilation and air handling system.
You can start up the AHU only after completing all work described in section 5. For AHUs with fine filtering sections it is recommended that the AHU is run without the fine filter cartridges.
Start fans under small initial load and then increase the low gradually to the design value. You can do that by partly closing the control throttle on the AHU's inlet and, in addition, if the motor is powered by the frequency converter, by reducing the motor's speed.
Monitor the current drawn by the motor while increasing the load.

The current of the fan's motor must not exceed the rated value for the design air parameters.

Unless you follow the foregoing instructions, the fan's motor can get overloaded and damaged.
After starting up the AHU, ensure that:
· there is no unusual noise,
· there is no excessive vibration.

Leave the AHU on for approx. 30 minutes. Then turn it off and check each section.
Observe the following:
· filters (for any damage);
· condensate removal performance;
· fan set (belt tensioning, fan and motor bearing temperature).

It is recommended that throttles on the AHU inlet are initially opened in the automatics system before the fan is started. This will extend the lifetime, improve the performance of throttles and prevent the tripping of the barostat (no compression).

Once done, replace or clean the coarse filters. Perform adjustments and measurements until the AHU reaches its target performance.

6.1. MEASURING AIR VOLUME AND ADJUSTING AHU OUTPUT

Air volume measurement is the basic measurement for:
· starting up and commissioning the AHU;
· correction of system deviations from the design;
· regular AHU operation checks;
· replacement of the fan unit components.

Do the following before carrying out measurements and adjustments:
· check that the throttles in all grates or anemostats are set to the design positions;
· set fresh and recirculation air throttles (if any) in one of the extreme positions (100% fresh air or 100% recirculation);
· measure the fan motor's current; If necessary, choke the flow with the main throttle or reduce the speed of the fan.

The determination of the air flow volume is based on the measurement of the mean air velocity in the measuring orifice of the ventilation duct. Sampling the cross-section of the duct using a Prandtl tube and measuring the mean dynamic pressure corresponding to this velocity is one of the basic methods for determining the mean velocity.”
The following are the important factors affecting measurement accuracy:
· measuring orifice orientation vs. components;
· number and location of measuring points in the measuring orifice;
· relatively stabilized and minimally turbulent air flow.

Locating an orifice directly behind the following items is particularly undesirable:
· network components producing velocity field distortions (elbows, reducers, T-pipes, throttles, etc.);
· fan (due to possible back flows).

The measurement should be performed in a duct section with parallel walls, of length representing at least 6 duct diameters (or equivalent diameters) before and not less than 3 diameters behind the measuring point.
Finding a straight duct section of such length can be difficult. If so, install the measuring orifice at the point of expected smallest turbulence and use a larger number of measuring points. The locations of measuring orifices should be selected at the system design stage. See ISO 5221 for the bulk of recommendations concerning flow measurement and measuring point locations.
The measured capacity is considered correct if it is within ±10% tolerance of the expected one. For a larger deviation, a capacity approaching the design one can be obtained by:

- re-engineering the ventilation duct network;
- changing the main throttle setting;
- changing the speed of the fan.

If the fan speed is increased, it is necessary to monitor the motor's current to avoid exceeding the rated value.

Furthermore, do not exceed the maximum rotor speed. If necessary, replace the fan's motor with a larger one. For systems containing throttles for automatic adjustment of fresh, recirculation and exhausted air proportions or the bypass flow rate, measurements of capacity and adjustment of the main throttle should be performed with the throttle set in one of the extreme positions. Then check the proportions of air and the total capacity in the opposite extreme position and, if necessary, perform adjustment to obtain correct proportions while maintaining constant total capacity.

6.2. ADJUSTING HEAT OUTPUT OF THE WATER HEATER

Set the air flow through AHU first.
Adjusting the output of the heater consists in verifying its effect on the air by measuring air temperatures before and behind the heater at the design supply and return temperatures and the design heating medium flow rate.
The heat output of the heater depends on feed water temperature. The target temperature is obtained by mixing hot feed water with colder water returning from the heater, using a 3-way valve.
The ambient environment similar to the design conditions exists for relatively short period of time during the year.
In most cases the AHU needs to be adjusted for interim environments based on design variables.
The antifreeze thermostat can be checked setting: +5°C). It is safest to perform the check when the feed air temperature is 1-2 °C.
Then, with the AHU working, cut off the heating medium for a while and see whether the thermostat responds. This check should be performed before commissioning the AHU.

6.3. ADJUSTING THE ELECTRIC HEATER

The adjustment consists in turning on or off clusters of individual heaters.
Stepped adjustment is obtained by grouping the individual heaters.
Simulate reduced demand for power by lowering the target temperature preset so that all electric stages (contactors) are off. Then increase the setting to a high value and check whether all stages are turned on in the sequence conforming with the description. Return the original temperature set point.
Check also the response of the temperature rise protection in case of null air flow. For this purpose, reduce the air flow through the heater by partly closing the inlet throttle or reducing the fan speed.

Normally, the air flow rate through the heater should not be slower than 1.5 m/s.

Note that the risk of overheating increases with decrease of the air flow rate. The shutdown of the AHU must be delayed by 0.5-5 minutes: the time required for cooling down the electric heater.

6.4. ADJUSTING THE OUTPUT OF THE COOLER

Adjust the cooler in conditions similar to the design ones. As with the heater, consider the cooler's effect on the air side by measuring temperatures and relative humidities before and behind the cooler.
Check the medium temperature. If the cooler's performance is insufficient, adjust it, by changing:

- cooling medium volume (water coolers);
- air flow through the AHU (water coolers with direct medium evaporation);
- evaporation temperature (in systems with direct evaporation).

Typically, coolers are used in complex air handling systems with automatic control.
Automatic controllers should be checked not only in the extreme computational conditions but also during periods of partial loading of the cooler.

6.5. ADJUSTING THE NOZZLE HUMIDIFICATION CHAMBER

This adjustment consists in the setting of a rinsing ratio using the B=W/G formula, where:

- W = quantity of water fed to the nozzles (kg/h);
- G = quantity of air flowing through the chamber (kg/h).

Depending on air treatment process, B=0.3 ÷ 1.5 kg of water per 1 kg of air. The quantity of air is set by adjusting the air flow rate through the whole system. If the rinsing factor is different than the design one, adjust it by changing the rinsing water flow rate using the bleed valve.

While adjusting the rinsing factor monitor the air downstream the rinsing chamber. Where possible, perform measurements in multiple points as air can form different temperature air strata.

6.6. ADJUSTING THE COOLING SYSTEM

After filling the device with the cooling medium and starting it up, monitor the core parameters of the device carrying out the following:

- check the suction and condensation pressures after reaching the steady state;
- measure air temperatures downstream the cooler and condenser;
- check the overheating ratio in the thermostatic expansion valve and make adjustments, if required;
- check the oil levels in the compressors.

The cooling medium circuit must not be opened by unauthorized personnel. The circuit contains gas and liquid under high pressure. The fluid tank has a relief valve. Always wear protective clothes covering full body and gloves while working with the cooling medium. The fluid is harmful to the skin and eyes. Wash contaminated skin with soap and water. Seek medical advice in case of unusual symptoms.

7. OPERATION AND MAINTENANCE

AHU operation and maintenance personnel should read this document before proceeding with any work with the AHU. If you do not have qualified personnel, use the services of a JUWENT ASO.

Any damage to AHU resulting from your failure to follow these instructions is excluded from the warranty.

The Technical Specifications Sheet attached to each AHU contains the basic technical details of the AHU such as types and dimensions of the core components (filters, heat exchangers, fans, motors).

Shut your AHU down before service. A service cut-out isolating the fan's motor from the mains must be provided outside the fan section to ensure safe servicing. The service cut-out must be voltage-free. The service cut-out should be installed near the inspection panels of the fan section.

Careful and regular maintenance and checks of the AHU and related equipment are essential for early diagnosing of problems and resolving them before they aggravate.

This document contains only general recommendations concerning inspection intervals depending on the operating regime and environment. The intervals need to be adjusted to the actual situation (contamination, number of start/stop cycles, loads, etc.).

The operators should keep an AHU operation log using the Inspection and Maintenance Schedule provided in the Warranty Card. A carefully maintained log is the only reliable proof of AHU fitness, schedule of current inspections and a record of problems, if any.

If you need to contact us, use the product/serial numbers provided on device housings and in related documents.

The time intervals between specific action were set based on the assumption of continuous operation, low dust, and no other disrupting factors. If dust loads in the supply and/or exhaust air are large, perform inspections more often.

You can order spares and accessories for your AHU from your local ASO. Specify the type and serial number of the target device while placing orders. You will find this information on the rating plate placed on the fan section.7.1. THROTTLES

Clean contaminated throttles using:

- a heavy-duty vacuum cleaner with a soft suction nozzle;
- compressed air;
- water jet with an aluminium-safe detergent.

Ensure that each throttle, including specifically the one on the ambient air side, provides reliable sealing when fully closed or, otherwise, the water heater can freeze.

7.2. FILTERS

Given typical operating environment, filters should be replaced every 6 months. Increasing pressure loss (see the following table) provides relevant indication in addition to visual signs of filter wear.

An AHU can be equipped with the following filter types:

- · coarse, pleated, class G4/F5, length 48 mm;
- · coarse, pocket, class G4/F5-F7, length 360 mm;
- · fine, pocket, class F5-F7, length 600 mm.

Filtration performance depends on filter type, so each filter must be replaced with an identical one.

If the final pressure drop on a filter is larger than the limit, replace the filter.

Pleated and pocket filters are for single use. While replacing a filter, clean its surroundings (use vacuum cleaner or moist cloth). While ordering a new filter set, specify the filter types, classes and AHU size or use the following table.

The air filters must be installed at all times or, otherwise, the fans can draw excessive power and their motors can get damaged.

CSK AHU filters														
AHU size	**05**	**10**	**15**	**20**	**30**	**40**	**50**	**60**	**75**	**90**	**105**	**120**	**140**	**160**
592x592x48 [mm]	-	1	1	1	2	4	4	4	6	9	9	9	12	16
287x592x48 [mm]	-	-	1	2	2	-	2	4	3	-	3	6	4	-
402x592x48 [mm]	1	-	-	-	-	-	-	-	-	-	-	-	-	-
592x592x360 [mm]	-	1	1	1	2	4	4	4	6	9	9	9	12	16
287x592x360 [mm]	-	-	1	2	2	-	2	4	3	-	3	6	4	-
402x592x360 [mm]	1	-	-	-	-	-	-	-	-	-	-	-	-	-
592x592x600 [mm]	-	1	1	1	2	4	4	4	6	9	9	9	12	16
287x592x600 [mm]	-	-	1	2	2	-	2	4	3	-	3	6	4	-
402x592x600 [mm]	1	-	-	-	-	-	-	-	-	-	-	-	-	-

Table. CSK AHU filters

CSNAHU filters								
AHU size	**20**	**25**	**35**	**50**	**70**	**80**	**110**	**125**
592x592x48 [mm]	2	2	2	3	6	8	8	10
287x592x48 [mm]	-	1	3	4	2	-	6	5
592x592x360 [mm]	2	2	2	3	6	8	8	10
287x592x360 [mm]	-	1	3	4	2	-	6	5
592x592x600 [mm]	2	2	2	3	6	8	8	10
287x592x600 [mm]	-	1	3	4	2	-	6	5

Table. CSN AHU filters

CM AHU filters			
AHU size	**200**	**240**	**300**
592x592x48 [mm]	20	24	30
592x592x360 [mm]	20	24	30
592x592x600 [mm]	20	24	30

Table. CM AHU filters

7.3. HEAT EXCHANGERS

7.3.1. Water or glycol heater

Water heaters should be protected against freezing.
Alternatively, a heater can be supplied with non-freezing medium (such as glycol) in winter.
If the temperature in the heater can drop below 5°C (e.g. no heating medium supply or AHU idle), evacuate the medium from the heater.
Proceed as follows:

- close the heating medium inlet and outlet valves (cut off the heater from the heating system).
- move the inspection panel towards the cut-off valves.
- screw off the bleed and vent caps from the collector pipes.
- connect a drain hose in place of the bleed cap to evacuate water from the exchanger.
- purge the heater with compressed air fed to the venting port.
- repeat the purging in short intervals until the outflowing air is free from visible water droplets.
- screw in the bleed and vent caps.

Check the heater's lamella for contamination every 6 months as the minimum. Deposits on the heater reduce its performance and increase the pressure drop on the air side.
In time, dust sets on the lamella on the air supply side even if your AHU has filters. You can clean the lamella using:

- a vacuum cleaner with a soft suction nozzle (on the air inlet side);
- compressed air applied in the direction opposite to the normal flow, parallel to the lamellas;
- warm water with an aluminium and copper-safe detergent.

Cover the adjacent AHU sections before starting the cleaning.
Remove air pockets from the heater to ensure its optimal performance. Use the venting caps in the collector pipes.
While the AHU is idle, the heating medium flow should be minimal and the temperature inside the heater should not exceed 60°C. Higher temperature can damage certain components (motor, bearings, plastic items, etc.) adjacent to the heater.

7.3.2. Electric heater

The electric heater's battery consists of bare heating coils. These cover with dust while the AHU is on and the heater is off. Once the heater is turned on, the deposit can smoulder or even ignite. Check and clean, if required, electrical connections and heating elements in equal intervals (particularly before each heating season). Remove dust with a vacuum cleaner with a soft suction nozzle, soft brush or compressed air.
Never wipe electric heaters with moist cloth!
Check also the response of the temperature rise protection in case of null air flow. Normally, the air flow rate through the heater should not be slower than 1.5 m/s.

7.3.3. Water or glycol cooler

Check the cooler for contamination every 6 months. If necessary, clean using the same methods as in case of water heaters.
Cover the adjacent AHU sections before starting the cleaning.
Check also the moisture separator for contamination and the condensate drain line and water trap for patency. Prime the trap with water before starting up the AHU.
Wash the moisture separator with warm water with a detergent.
For glycol cooler, check the level and density of glycol. Remove air pockets from the cooler to ensure its optimal performance. Use the venting caps in the collector pipes.

7.3.4. Freon cooler

The maintenance procedures are identical as for the water heater or cooler.
Before purging the freon cooler with water, evacuate freon to a vessel or,
otherwise, the pressure of freon can increase and can damage the cooling system.

7.3.5. Cross-flow exchanger

Check the exchanger for its condition and contamination. The accumulation of dust in the exchanger is often limited to the initial 50 mm section. Cover the adjacent AHU sections before starting cleaning.
Use one of the following cleaning methods:

- vacuum cleaner with a soft suction nozzle;
- compressed air applied in the direction opposite to the normal flow;
- water with an aluminium-safe detergent ;
- water jet (for strong contamination).

Clean the exchanger carefully to avoid bending or damaging the plates.
If the exchanger operates in freezing temperatures, dry it thoroughly.
In addition, check the following:

- throttle performance;
- moisture separator condition;
- drip tray condition;
- condensate drainage line patency;
- prime the trap with water before starting up the AHU;
- anti-frost system (if present);
- bypass throttle tightness where defrosting is not necessary.

7.3.6. Rotary exchanger

Check the exchanger for its condition and contamination.

Check if:

· the rotor rotates freely. If you feel resistance, the sealing brushes may be too tight (rubbing against the rotor rim). If so, adjust the brushes. Replace the brush sealing, if worn. If a sealing is to be re-used, ensure that its orientation vs. the rotor's direction remains the same. Run the exchanger for 30 minutes after replacing or adjusting the brushes to allow the brushes to adapt to the rotor. Then measure the motor's current and compare it to the rated value (to avoid overloading).

· the driving belt is intact, clean and fits snugly to the rotor's cylinder. If the belt is slack at the maximum tension position, trim or replace the belt.

· air inlet holes are not covered with dust or blocked otherwise. Clean the rotor using the methods described for the exchangers.

The rolling bearings of the rotor and motor are lubricated automatically. The quantity of grease applied to the bearings on assembly suffices for a long time (no need for routine replenishment). Clean the motor and transmission from time to time to prevent dust buildup and related drive temperature growth.

7.4. DAMPING SECTION

The damping section contains curtains packed with noise-suppressing inflammable mineral wool.

The maintenance consists of cleaning the damping inserts.

Use a vacuum cleaner or moist cloth on all surfaces (or nylon brushes for stronger contamination).

7.5. FAN UNIT

Before proceeding with any work with your AHU (repair, maintenance, or check), and particularly before opening an inspection panel of the fan section or removing an electrical cover, ensure that:

· the AHU has been isolated from the mains (this applies to both main and auxiliary circuits);

· the rotor is still;

· the fan is cool enough;

· the fan has been secured against inadvertent starting.

7.5.1 Fans

Fans are designed for pumping dust-free or slightly dusted air (not corrosive gases, vapours or air loaded with dust). Hostile environment can damage the bearings, cause corrosion and/or unbalance the rotor (vibration).

The fan and its motor are sized for the design AHU specifications. The fan speed is selected to ensure that the air flow and pressure buildup on the fan are matched to the ventilation system requirements. Insufficient air flow rate will affect the AHU and unbalance the whole ventilation system. A drop in the flow rate may result from the following:

· driving belt slip;

· dust deposits on rotor's vanes;

· wrong rotation direction (reverse rotation of a radial fan results in a major drop in performance).

· In case of drop in the air flow check if:

  · the rotor rotates freely;

  · the rotor is well balanced and rotates without run-out;

  · the rotor is secure on the shaft;

  · the rotor is well aligned with the inlet funnel;

  · the vibration insulators are installed and intact;

  · the flexible coupling (if present) are intact;

  · all fan unit's bolts are tight.

The loss of rotor's balance can result from the following:

· dust deposits on rotor's vanes;

· loss of balancing weights;

· rotor vane damage.

Check the housing interior, rotor and motor and clean, if required:

· housing interior with a vacuum cleaner;

· rotor with a vacuum cleaner or moist cloth with a mild detergent.

The fan's life expectancy depends on regular checking the fan and cleaning its bearings. Check the bearings while performing other maintenance work.

Listen to the bearings by manually turning the rotor. If you hear:

· slight regular noise, the bearing is OK;

· squeaky sound, the lubrication is insufficient;

· sharp, often irregular, brushing, metallic, frequent noise - the bearing is damaged. Replace the bearing.

Check the bearing temperature with a thermometer or by touching its housing. If the temperature is too high or changes rapidly, the bearing does not work properly, which may be a result of:

· not enough or too much grease;

· contamination, overloading or damaged balls;

· compression;

· excessive friction from seals;

· heat transmission from the outside.

Higher temperature is normal within the 1 or 2 days after greasing.

Fan bearings are maintenance-free during normal AHU operation.
The bearings of belt-driven houseless fans contain grease nipples. In this case apply solid bearing grease to the bearings in intervals depending on AHU loading and current state of the bearings.
Greasing the bearings once a year is recommended, assuming 8 hours per day operation of the AHU (twice for longer daily regimes). The quantity of grease depends on the fan size and bearing type. An excess of grease in a bearing housing will cause heat buildup, especially at high speeds. After replenishing grease a couple of times, open the bearing housing and remove old grease before adding fresh one.

Manufacturer	Type	Base	Operating temperature range
Fina	Marson HTL3	Lithium	-30/+120°C
Shell	Alvania Fett 3	Lithium	-20/+130°C
Esso	Beacon 3	Lithium	-20/+130°C
Mobil	Mobilux EP3	Lithium	-30/+130°C
SKF	LGMT 2/S	Lithium	-30/+110°C

Table. Fan bearing greases

Depending on type, size and shaft power, fans used in AHUs are provided with different bearing types. The quantity of replenishment grease and lubricating interval depends on bearing type and operating speed.
When all checks and maintenance are carried out, check the fan speed. If the rotation direction is incorrect, air will flow in the right direction but the flow rate will be much smaller. The rotation direction can change as a result of a modification in the power system, so it has to be checked from time to time.

7.5.2. Motors
Careful and regular maintenance and checks of the motor are essential for early diagnosing problems and resolving them before they aggravate.
Isolate the motor from the mains supply before starting any work with the motor or related equipment, specifically before removing protective panels covering moving or energized parts. In addition, disconnect all additional and auxiliary circuits.
Follow the following safety rules:
- · cut off power supply.
- · use safeguards against inadvertent energizing components;
- · check isolation effectiveness;
- · cover adjacent energized parts.

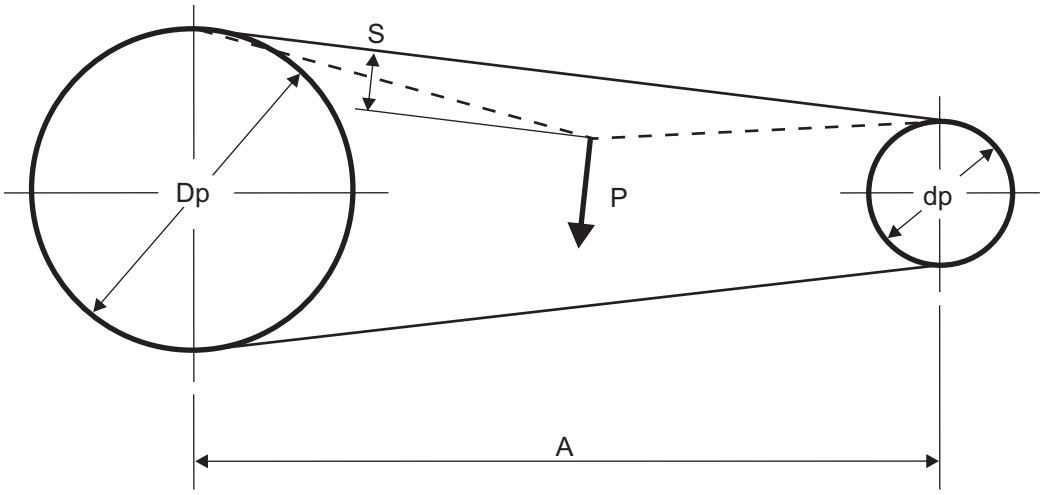
Maintain the foregoing safety measures until your maintenance work has been completed and the motor is fully assembled and ready for operation.
For the fan's motor, check if:
- · the state of the motor is correct (power input, winding temperature, bearings);
- · there are no grease leaks;
- · the motor operates correctly without any unusual noise from the motor or bearings;
- · all mechanical and electrical connections are secure;
- · the winding insulation resistance is correct;
- · leads and insulation are intact, without stains.

Correct each problem without delay.
In addition:
- · check the bearings as described in the fan bearings section;
- · check if the motor is fixed and its bolts are tight;
- · check the motor housing for contamination.

Excessive contamination reduces cooling efficiency: the motor can overheat and the heat buildup can cause damage. Clean the motor with a dry brush or dry compressed air.

7.5.3. Belt Transmission
Check the V-belt tensioning and pulley alignment as part of the fan unit maintenance. The factory-set tensioning should be checked after the initial 50 hours of operation and then checked/adjusted every 6 months.
A slack belt can fall from the belt or slip (excessive wear) and if it is too tight it can heat up and cause bearing damage or motor overloading.
Check the belt tensioning as follows:
- · measure the distance between wheel axles (dimension A);
- · measure force P required to depress the belt by S=16mm per each belt length meter, approximately at the midpoint between the axles.
- · slacken or tighten the belt (see the following table).
- · 0.8 x Pmax is recommended.

Adjust the belt by moving the motor with the tensioning bolt on the motor's base plate.



	SPZ		SPA		SPB	
Smaller pulley diameter dp[mm]	67-95	100-140	100-140	>140	160-236	>236
Deflecting force P*[N]	10-15	15-20	20-27	28-35	35-50	50-65
Deflecting force P*[kg]	1,0-1,5	1,5-2,0	2,0-2,7	2,8-3,6	3,6-5,1	5,1-6,6

Table. Deflecting force (P) depending on smaller pulley type and diameter (dp)
* - force required to deflect the belt by s=16 mm at pulley span A=1,000 mm

The following belt deflection vs. pulley span diagram will help you avoid converting the values.

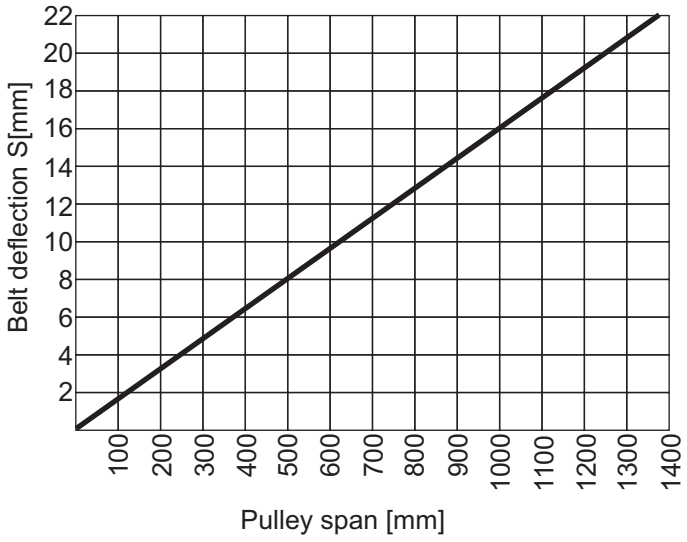


Fig. V-belt deflection depending on pulley span

Check that the belt is not frayed, broken or damaged in any other way. Replace the belt if it is damaged. For a multi-track drive, replace all the belts at the same time, ensuring that they match the grooves. Unless you replace all the belts, the new ones will wear faster as they are a bit shorter than the old ones. To replace the belts loosen the tensioning bolt on the motor's base plate. Never fit belts on the pulleys by stretching them with any tool. Check the pulley grooves for wear. Tension the new belts as described above and check that the pulleys are aligned (see the following figure). Ten rotate the drive without load to lodge the belts in their grooves. Re-tension new belts after approx. 50 hours of drive operation.

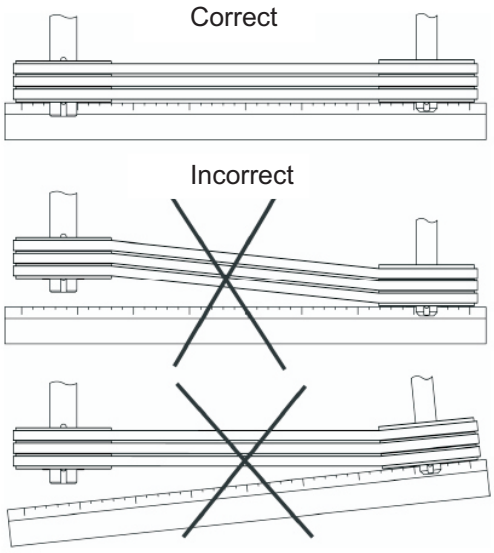


Fig. Pulley alignment

Align the motor and fan shafts by adjusting the position of the motor on the tensioning plate.
If the grooves are misaligned, move one of the pulleys (fan's or motor's) along the shaft. Pulleys have taper-lock bushings to facilitate this operation.

To adjust or replace a pulley with a taper-lock bushing:

- · remove Allen screws from holes “A” (Fig. 31 or 32).
- · insert the screws in holes “B”. Drive the screws in until the pulley and the shaft's bushing become loose.
- · move the bushing on the fan's or motor's shaft pivot (to replace the pulley, remove the bushing with the pulley and insert a new pulley/bushing set).
- · re-insert the screws in holes “A” and drive them in until you feel resistance.
- · align the pulley (Fig. 29).
- · tighten the screws alternately, to clamp the bushing with the pulley on the shaft's pin.

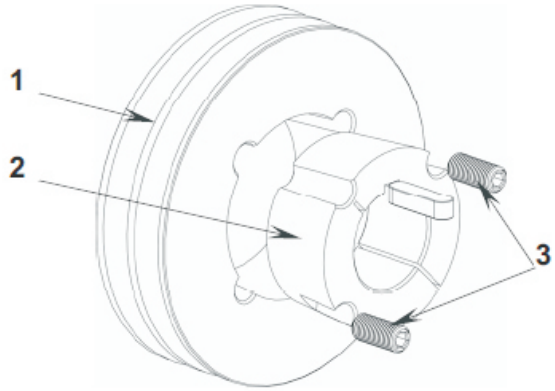


Fig. Pulley with taper-lock bushing 1 – Pulley, 2 – Bushing, 3 – Allen screws

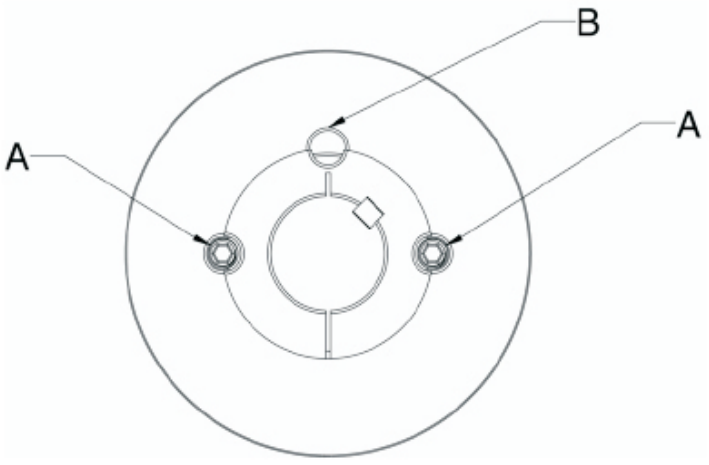


Fig. Pulley with bushings N° 1008 to 3030

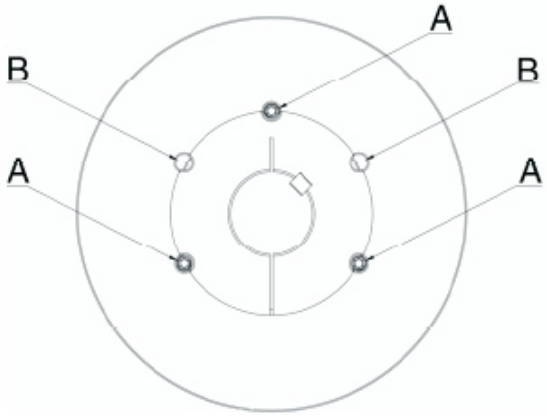


Fig. Pulley with bushings N° 3535 to 5050.

7.6. VALIDATION MEASUREMENTS
Check and adjust your AHU by following instructions from section 6 after completing each inspection or maintenance work.
Noise specifications are provided for each AHU on case-to-case basis in the Technical Quotation.
Document all inspections and validation measurements in the Inspection and Maintenance Schedule.

7.7. COOLING SYSTEM
Service the cooling system of your AHU on regular basis. Only qualified personnel should service the AHU. Service the AHU at least once every 6 months. Only qualified personnel may repair the cooling system, subject to JUWENT's consent.

8. OCCUPATIONAL HEALTH AND SAFETY REQUIREMENTS

· Only qualified personnel should connect and start up AHUs in accordance with the applicable codes/regulations, including specifically those pertaining to electric equipment.
· Do not energize the AHU before connecting it to a protective grounding system.
· Isolate the AHU from the mains before proceeding with any repair or maintenance work.
· The AHU must not be operated with any inspection panel removed.
· The operators and repair/maintenance personnel must have appropriate qualifications in accordance with your local codes/regulations.
· The AHU installation site must contain necessary OHS and fire protection equipment as required by local codes/regulations.

Your AHU will not emit any harmful radiation.
Although it was designed and manufactured in accordance with the standards applicable on the commissioning date, the risk of injury related to operation of the AHU cannot be fully eliminated. This risk is related to the frequency of access to the system during operation, cleaning, repair or maintenance, presence of personnel in affected areas, and the level of consistency in following these manual.
The types of possible injuries or health impairment depend on many factors that could be accounted for only partially in the design of the AHU and descriptions/warnings provided herein.
Therefore, there is a residual risk if the operators fail to comply with these recommendations and instructions.

9. DISPOSAL

Have a licensed operator dispose the AHU.

10. CONTACT INFORMATION

Regular inspections performed by qualified technical services or Authorized Service Organizations of JUWENT will ensure reliable and longer operation of your AHU. Our service engineers remain in standby to assist you with your startups, maintenance tasks and emergencies at any time.
JUWENT ASOs offer spares and consumables for AHUs.
While placing an order, please specify the type, size and serial number of your AHU. Visit www.juwent.com.pl for more information about our service network.

III. SAMPLE EC DECLARATION OF CONFORMITY
NR: 01/12

JUWENT

Szymański, Nowakowski Sp. j.
ul. Lubelska 31, 08-500 Ryki, POLSKA
tel. +48 81 883 56 00, fax +48 81 883 56 09
www.juwent.com.pl info@juwent.com.pl

Authorized representative

Person authorized to prepare technical documentation

Konrad Błachnio, ul. Lubelska 31, 08-500 Ryki, Polska

We hereby declare that the device:

Stationary air handling unit

Type: ..... - .....-.....

serial number: .....

to which this declaration applies, conforms with the following directives:

Directive number	Symbol	Directive title
2006/42/EC	MAD	Machinery Directive
97/23/EC	PED	Pressure Equipment Directive
with components complying with requirements of the following directives:		
2006/95/EC	LVD	Low Voltage Directive
2004/108/EC	EMC	Electromagnetic Compatibility

and the following standards:

Standard number	Issue date
PN-EN ISO 12100-1+Ap1+A1	2005/2006/2009
PN-EN ISO 12100-2+A1	2005/2009
PN-EN ISO 14121-1	2008
PN-EN 60204+A1	2006/2009
PN-EN 1886	2008
and with the exchanger production technology acknowledged by the following documents:	
Acknowledgement record in accordance with PN-EN 13134:2004	BPAR Nr IS/ZT/113; -114; 115/05 of 10 October 2005
Qualification records in accordance with PN-EN ISO 15613:2005(U) PN-EN ISO 15614-8:2005	WPQR No IS/ZT/105 ÷ 112; -122; -123/05 of 14 November 2005, issued by the Welding Institute in Gliwice, Identification No. 1405

This EC Declaration of Conformity is no longer valid in case the stationary air handling units are changed or rebuilt without our consent.

Marking year CE : 2012

Ryki

.....
/issue date/

Manager of the Air handling Unit Department

.....

IV. WARRANTY CONDITIONS

1. JUWENT Szymański, Nowakowski Spółka jawna in Ryki, hereinafter referred to as the Warrantor, hereby grants warranty for the air handling unit produced by the Warrantor, provided that the system is used in accordance with the conditions stated in the user's manual, and under the following conditions.
2. The warranty services shall be provided exclusively by the Warrantor or Authorized Service Organization (hereinafter referred to as "Obligor").
3. The warranty is granted under the alternative conditions:
   a) standard warranty – 24 months from the date of purchase, in the event of starting up the device without the Obligor's assistance
   b) prolonged warranty - 36 months from the purchase date, provided that the Buyer concludes a service agreement with the Warrantor, the subject of which are in particular:
      - starting up the devices performed by the Obligor (against payment),
      - training a person responsible for supervising the unit (against payment),
      - periodical inspections and service (against payment).
4. Regardless of the warranty period for a given unit, the warranty for heating elements of the electrical heaters shall be 12 months.
5. As far as units with a gas heat exchanger are concerned , the warranty conditions for the element are specified by the warranty card of the element's manufacturer.
6. Devices working with the unit but not being its integral components (e.g. refrigerating units, steam generators etc.) shall be subject only to the warranty provided by manufacturers of these devices.
7. The unit shall be subject to the warranty provided that the following conditions are met:
   a) the Buyer submits a valid Unit Startup Report with a Service Request Form,
   b) the Buyer performs or commissions performing routine and periodic inspections in accordance with the user's manual, confirming this fact in the Inspection and Maintenance Sheet.
8. During the prolonged warranty period (36 months) the Obligor shall have the exclusive right to perform periodic inspections. The works performed do not prolong the warranty period for the unit or its components.
9. Physical defects, including the lack of clear specification of the unit properties provided by the Warrantor, discovered during the warranty period, shall be removed (repaired) free of charge on the site of the unit's installation, no later than 14 calendar days from the day the defect is reported, unless there is an immediate need for importing parts, which shall prolong the above –mentioned period by the time necessary to obtain the part. In case the repair cannot be performed or is not cost-effective, the Obligor shall replace the unit or its part with a new one.
10. The Warrantor shall choose the method of defect removal.
11. The ownership of the parts replaced during repair shall be transferred to the Warrantor.
12. The Warrantor shall be excluded from liability for any damage and/or malfunctioning of the device arising in particular from:
    a) mechanical damage resulting from improper installation, especially the improper setup of the power supply, transportation performed not by than the Warrantor or Obligor,
    b) improper storage, misuse of the unit, arbitrary modifications or repair attempts,
    c) part replacement without the consent of the Obligor, continued use of faulty unit, with a defect discovered by the Buyer
    d) random incidents, force majeure, including atmospheric conditions,
    e) improper handling, improper maintenance or lack thereof, regulation or use disregarding the guidelines included in the manual,
    f) using spurious spares and components (e.g. motors, fans, filters etc.) without the consent of the Warrantor,
    g) failing to perform the periodic inspections every 6 months and lack of routine maintenance between these inspections,
    h) operating the unit in a chemically aggressive environment on a level exceeding the capabilities of the unit, or in a dusty environment requiring the use of dust removal devices,
    i) using supply water and/or boiler water with parameters other than those specified in the standard PN-85/C-04601.
13. The warranty shall not cover:
    a) third party installations (systems) on the basis of which the unit operates,
    b) parts subject to normal wear, consumables (filters, seals, bulbs, fan belts, fuses etc.),
    c) action undertaken in accordance with the guidelines in the system manual as a part of standard maintenance and inspections,
    d) the travel costs of the Obligor or Warrantor
    e) compensation of the Buyer's losses or additional expenses arising from the unit being idle while awaiting the warranty repair.
14. In the case of unjustified calling for the service all expenses shall be born by the Buyer.
15. Keeping the dates and the scope of works required by the unit maintenance shall be confirmed by a qualified person's note in the Inspection and maintenance sheet.
16. The Warrantor shall be liable for physical defects of the system within the limits of the standard value of the defective components, understood as their value according to the Warrantor's prices being in force as of the date of performing the warranty repair.
17. The Warrantor shall not be liable for the damage suffered by the Buyer or any third parties due to moving the unit, in particular this arising from not complying with the conditions specified in section 12.
18. In the case of replacement of a part or component, the warranty period for the system shall be prolonged by the time the Buyer is unable to use the system.
19. The Buyer shall provide the Obligor with free access to rooms where the units are held. In the case of units mounted on considerable heights, the Buyers shall provide, at his own expense, appropriate scaffolds and vertical transportation devices. The Buyer shall be obliged to perform the hydraulic disassembly of the exchangers.
20. The complaints shall be submitted to the nearest Home Representative in written form, on a service request form by fax or e-mail, with a copy of Startup Report enclosed.
21. The Obligor shall be able to decline the performance of the warranty-covered activities (the periodic inspection or repair) if the remuneration to the Warrantor or Obligor for the unit or a previous service has not been paid.

PURCHASE DATE **STAMP AND SIGNATURE**

Special Warranty Conditions:

Prolonging the warranty period to ……. months.

STAMP AND SIGNATURE

V. AHU STARTUP REPORT*

DEVICE USER:	
INSTALLATION SITE:	
DEVICE TYPE:	
SERIAL NUMBER:	

INSTALLATION AND STARTUP

Task	**Contractor's name and address** (seal, signature, name, phone number)	**Date and signature**	**Remarks**
Physical installation			
Hydraulic connections			
Electrical connections			
Startup			
Measurements			

PERFORMANCE MEASUREMENTS

Air supply			**Air exhaust**		
Air capacity			Air capacity		
Design [m3/h]		Actual [m3/h]	Design [m3/h]		Actual [m3/h]
Motor			Motor		
Rated current [A]		Rated current [A]	Rated current [A]		Rated current [A]
1st gear			1st gear		
2nd gear			2nd gear		

*** Follow the applicable section of the instruction manual.**

JUWENT

VI. INSPECTION AND MAINTENANCE SHEET*

DEVICE TYPE:	
SERIAL NUMBER:	

Inspection date	Inspection performed by	Works performed	Throttles	Filters	Air heater	Air cooler	Fan unit	Heat recovery	Noise suppressor	Automatics	Cooling system	Condenser	Comments
1		Testing											
		Cleaning											
		Replacement											
2		Testing											
		Cleaning											
		Replacement											
3		Testing											
		Cleaning											
		Replacement											
4		Testing											
		Cleaning											
		Replacement											
5		Testing											
		Cleaning											
		Replacement											
6		Testing											
		Cleaning											
		Replacement											
7		Testing											
		Cleaning											
		Replacement											
8		Testing											
		Cleaning											
		Replacement											
9		Testing											
		Cleaning											
		Replacement											
10		Testing											
		Cleaning											
		Replacement											
11		Testing											
		Cleaning											
		Replacement											
12		Testing											
		Cleaning											
		Replacement											

***Follow the applicable section in the user's manual.**

JUWENT

Date:

VII. SERVICE REQUEST FORM

☐ WARRANTY ☐ NON-WARRANTY ☐ AGAINST PAYMENT

Device user (name)	
Contact person	
User address	
Phone number, fax number and e-mail	
Device type	
Factory number	
Year of production	
Startup performed by	

Defect description:

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NOTE: AFTER COPYING AND FILLING IN SEND THE FORM BY FAX OR E-MAIL WITH A COPY OF THE STARTUP REPORT ENCLOSED

JUWENT accepts only complete and legible forms.

Should an unjustified complaint be submitted, the person submitting shall be charged with the service costs.

Warranty issue date

.....

Order number

.....

(stamp with the company's name)

VIII. ADDITIONAL DOCUMENTS

Your AHU can be provided with the following additional documents, depending on configuration:

- Technical Specifications Sheet
Contains all information concerning the design and computational values of air and selected components.

- Declaration of Conformity

- List of AHU Components
Specification of components installed in your AHU on the supply and exhaust sides.

- Automatics Specification
List of controls installed in your AHU and a drawing of their locations. If the AHU contains no controls from JUWENT, this document will not be supplied.

- List of Attachments
This list is enclosed only when components not installed directly on or in the AHU are supplied (e.g., where the AHU is assembled at the Customer's site). The list specifies components such as adhesives, gaskets, bolts, etc