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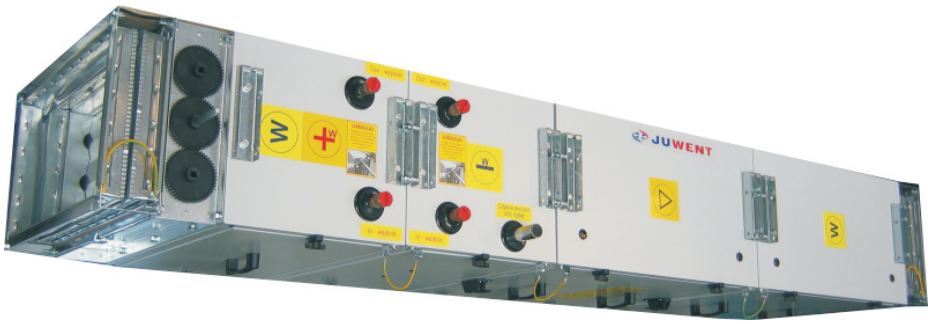
POLAND

SUSPENDED AIR HANDLING UNIT
CP



Before starting operation please read the user's manual.

RYKI 2017
1st EDITION PL

I. CONTACTS

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JUWENT

II. ORIGINAL USER'S MANUAL

SUSPENDED AIR HANDLING UNIT
CP size 1÷3

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

TABLE OF CONTENTS

1. INTRODUCTION

To ensure correct and safe operation of the device thoroughly learn the contents of the herein documentation, install and use the units in accordance with the descriptions herein and respect all safety conditions.

Works related to unloading of pallets with components of the unit, handling of pallets, elements and unit blocks, connecting the systems within the unit, as well as maintenance must be performed by qualified personnel or supervised by authorized personnel.

The qualified personnel is referred to personnel who in respect of the completed training, working experience and knowledge of essential standards, documents and regulations on occupational safety and working conditions, are authorized to perform necessary works and are able to recognize and avoid potential hazards.

The below operating and maintenance manual does not include detailed information on any possible configurations of the units, examples of their mounting and installation, and commissioning, use, repair and maintenance. If air handling units are used as intended, this documentation and other documents delivered with the units include instructions essential to the qualified personnel.

Assembly of air handling unit, connection of the related systems, commissioning, use and maintenance must be conducted in accordance with relevant directives and regulations valid in country of the device installation.

It is recommended to use services of JUWENT Authorised Service Points when installing, commissioning, performing post-warranty repairs, inspections and maintenance of the devices.

Make sure that the documentation is always available nearby the device and is easily accessible to the Service personnel.

2. INTENDED USE AND DESIGN

The CP series includes 3 sizes and is intended for air processing within the capacity from 500m^3/h up to 4500m^3/h.
The JUWENT air handling units are intended to be installed in ventilation system – disabling access to the device's rotating elements (fan rotor) from both the overpressure and the vacuum side of the device. The ventilation system is referred to ventilating ducts, and in the case of devices installed inside, also parts such as air intake vents and exhaust terminals. The JUWENT air handling units comprise one or more multi-functional sections. All air processing functions performed by the unit are marked with graphic symbols attached on protection plates from the service side.
Due to their design and materials used, air handling units do not emit non-ionising radiation.

2.1. SYMBOLS AND DESIGNATIONS

2.1.1. Designations of air handling units

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

UNIT TYPE
CP

UNIT SIZE
CP-1, 2, 3

UNIT VERSION
S - Standard, H - Hygienic, B - Pool, E - Special

CASING TYPE
W - Indoor

SERVICE SIDE
P-Right, L-Left

SUPPLY INLET TYPE
1, 2, 3, 4, 5

SUPPLY OUTLET TYPE
2, 3, 4, 5, 6

EXHAUST INLET TYPE
1, 2, 3, 4, 5

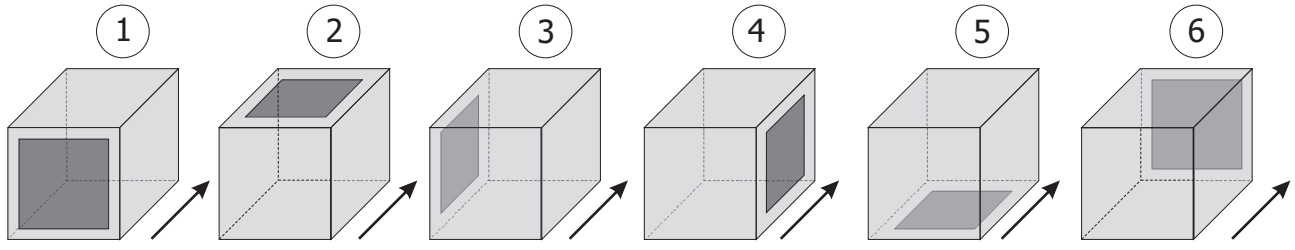
EXHAUST OUTLET TYPE
2, 3, 4, 5, 6

HEAT RECOVERY
M - Recirculation, K - plate heat exchanger, G - Glycol exchanger

SPATIAL CONFIGURATION
H - Parallel, S - In-line

Most configurations are available in left- and right-sided versions. The version sides are determined depending on the direction of air flow in relation to the side of maintenance (inspection panels, terminals of heat exchangers etc.) In case of the supply and exhaust units, the version side is determined by the direction of air flow in the supply part.

2.1.2. Designations of inlets and outlets



Arrow marks the air flow direction.
In case of mixing or division of air stream, the symbol of inlet and outlet is the combination of the above digits.
For example air inlet located straight ahead and from the top is marked with 12.

2.1.3. Designation of functions

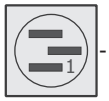
FILTERS


- INITIAL

- INITIAL Ex


- FINE

SILENCERS



- MEDIUM

- LONG

FANS

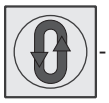
-DIRECT DRIVEN

HUMIDIFIERS

- STEAM

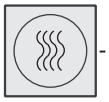
HEAT RECOVERY


- RECIRCULATION


- GLYCOL


- PLATE HEAT EXCHANGER

OTHER


- DROPLET ELIMINATOR

HEATING COILS

- WATER

- STEAM

- ELECTRIC

COOLING COILS

- WATER

- FREON

2.2. UNIT VERSIONS

2.2.1.Standard

Individual elements of air handling units are made of the following materials:

- internal sheet metal of casing panels is made of galvanised steel sheet;
- external sheet metal of casing panels is made of Aluzinc type sheet;
- all the slots between casing elements are filled with silicone;
- door panels seals are made of EPDM;
- rails and guides cooperating with sliding components, filter frames, heat exchanger casings, fan partitions are made of galvanised steel sheet;
- drip trays located under cooling coils and heat exchangers for heat recovery are made of stainless steel;
- parts removing liquids with decline towards drainage;
- drainage of condensate protected against drawback with siphons;
- bases of the units are made of galvanised sheet metal (for installation version in position F - see 4.1.2.)

2.2.2. Hygienic

- The construction of the hygienic units is based on accordingly modified solutions used in standard versions of air handling units. These modifications in each case include the following constructional components:
- internal sheet metal of side and top panel is made of Aluzinc type sheet, and of floor panel – of stainless steel sheet;
- internal sheet metal of all panels in units intended for operation theatres, treatment rooms, infectious diseases wards and laboratories is made of stainless steel sheet;
- external sheet metal of all panels is made of Aluzinc type sheet;
- all the slots between casing elements are filled with certified silicon with antibacterial addition;
- door panels seals are made of material resistant to cleaning agents and disinfectants;
- rails and guides cooperating with sliding components, filter frames, heat exchanger casings, fan partitions, troughs removing cleaning agents and disinfectants from the interior of the unit and drip trays located under cooling coils and heat exchangers for heat recovery are made of stainless steel;
- parts removing liquids with decline towards drainage;
- drainage of condensate protected against drawback with siphons;
- steam humidifiers only, located at ends of units;
- fans and heat exchangers are epoxy coated;
- distances between heat exchangers allowing an access to them from both sides;
- surfaces of silencer baffles are resistant to abrasion;
- initial filters, class at least F5 (EU5);

Upon the customer's request, hygienic versions can additionally include the following modifications:

- internal sheet metal of side, top and floor panels is made from stainless steel sheet;
- indicators of continuous measurement of pressure drop on filters;
- UV lamps for radiation of filtration section;
- in substantiated cases, excluding operation theatres, treatment rooms, infectious diseases wards and laboratories, fans and heat exchangers are not epoxy coated.

2.2.3. Pool

The construction of pool units is based on accordingly modified solutions used in standard versions of air handling units. These modifications in each case include the following constructional components:

- internal panel sheets made from galvanized, epoxy coated sheets;
- external sheet metal of casing panels is made of Aluzinc type sheet;
- all the slots between casing elements are filled with certified silicon with antibacterial addition;
- door panels seals are made of material resistant to cleaning agents and disinfectants;
- rails and slide ways working with withdrawable elements, drip tubes under the cooling coils and heat recovery exchangers made from stainless steel
- drip trays located under cooling coils and heat exchangers for heat recovery are made from stainless steel sheet;
- filters frames, heat exchangers casings, fans partitions are made from galvanized, epoxy coated sheets;
- parts removing liquids with decline towards drainage;
- drainage of condensate protected against drawback with siphons;
- fans and heat exchangers are epoxy coated;
- surfaces of silencer baffles are resistant to abrasion;

2.2.4. Special

Except for versions of units with parameters and characteristics given in the catalogue data, our company in consultation with a designer is able to deliver individual units or their components which differ from the standard solutions in the following range:

- use of components not included in the catalogue,
- dimensions of the units by creating custom heights or widths based on standard dimensions of the units and other sizes of the same series of types,
- material solutions (for example: casing from the stainless steel sheets),
- non-standard parameters for air conditioning processes including the possibility of heat recovery from technological processes.

Such projects have to be agreed in writing by both parties. Such cases are not considered in JUWENT units selection computer software and require a direct consultation by customer with the JUWENT constructional office in Juwent division located in Lodz.

3. TRANSPORT AND STORAGE

Units are delivered complete, placed on pallets. The delivered units become a Customer's property once the packing list has been signed by the Customer's representative.

Immediately after the reception of the devices, check the condition of the packaging and whether the delivery is complete on the basis of the attached specifications and packing lists.

Unloading of the units, handling them onto the assembly site and handling of the unit parts to the site of setting must be performed using specialized equipment and by properly qualified personnel.

The units in the facility must be stored on a hardened, dry area under a roof. A hardened area should be considered flat, horizontal, hard surface the properties of which shall remain unchanged under the weather conditions.

Units and unit elements should be stored away from areas where machine traffic (vehicles, lifts and other construction machinery) is present, in a place where they are not exposed to mechanical damages, moisture, aggressive chemical agents, dusts, sands and other external factors which may affect the condition of the units and elements stored.

Before lifting of the device make sure that doors and access plates are closed. Units should be transported only in position P or F (see 4.1.) and must not be stacked when stored.

The unit should be stored in rooms, where:

- relative humidity $\varphi < 80$ % at $t = 20^{o}C$
- ambient temperature $-40^{o}C < t < +60^{o}C$
- prevent the devices against exposure to dusts, caustic gases and vapours, and other chemical agents causing corrosion to the equipment and structural elements of the device.

During the storage period the foil must be unsealed.

Any damages resulting from improper handling of units or their components in the facility, unloading and storage are not covered by the warranty, and any claims in this respect shall not be considered by JUWENT.

4. SETTING, ASSEMBLY, CONNECTION OF RELATED SYSTEMS

4.1. SETTING

The basic position for the CP operation is suspension from the top, horizontally (position P). It is also possible to install the unit flat in a horizontal position based on a solid foundation (position F), and also in a vertical position adjacent to the wall (position V).

However, it is not allowed to install the unit in a position in which side of the unit is located parallel to the ceiling, floor or wall.

Regardless of the installation position, remember to provide access to the unit operation in a selected position.

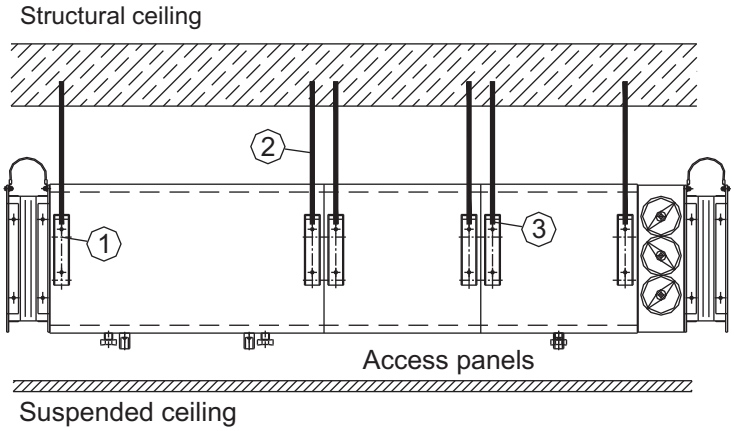
4.1.1. Installation in position "P"

Diagram for the unit installation in position "P" is shown in the figure below. The units are suspended in the ceiling cavity using mounting bars M8. In order to limit the transmission of vibrations and noise, rubber dampers are used between bars of the suspension and factory holders located on side walls of the units.

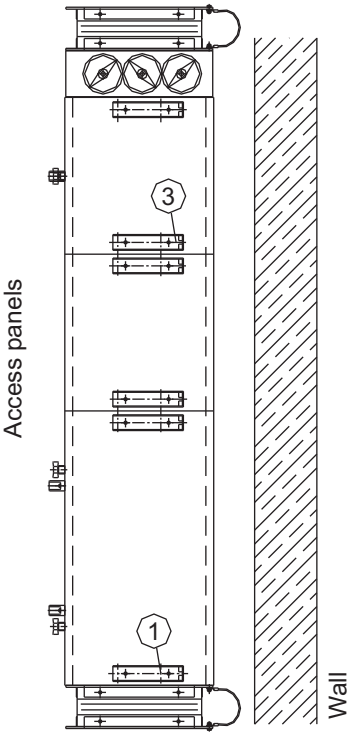
4.1.2. Installation in position "F" and "V"

Installation in position "F" (on a solid foundation, e.g. underneath a raised floor or in a separate room) or in position "V" (on a vertical wall) is a custom solution, but is allowed on condition the installation designer and installer applies adequate constructional solutions using mounting points in factory holders. Setting diagram is presented below.
For position "F", e.g. commonly available vibration dampers provided with bolts M8 of adequate length can be used. As an option, on Investor's request, Juwent can deliver a 40mm high base.
For position "V" the applied mounting solution on each occasion must be designed and installed including local construction conditions and use factory holders on the units.

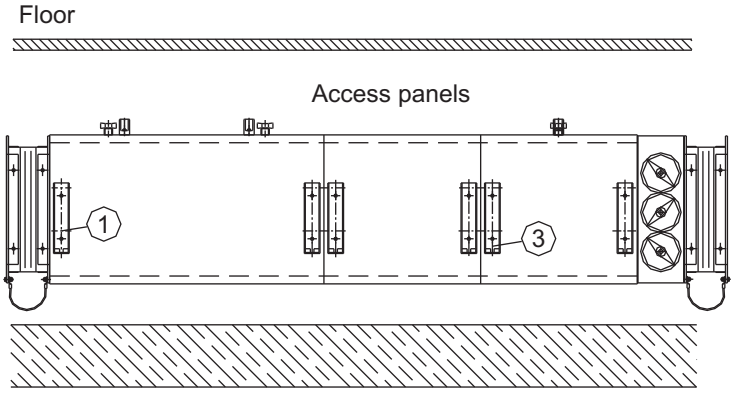
POSITION P



POSITION V



POSITION F



4.2. SETTING LOCATION

The unit should be set so as connections of the related systems (ventilating ducts, pipeworks, cable routing) create no collision with inspection panels. In order to have an efficient assembly, use and service of the units, keep a minimum distance equalling at least to the unit height +200mm between the service panel and the structural components (walls, supports, pipeworks, etc.) existing in the assembly site however no less than 100cm. These values are not applicable to installation above a suspended ceiling allowing a free access to the unit after its removal.
Within the operational space it is permitted to install systems, pipeworks, support structures only if their disassembly and assembly can be done problem-free for the time when service and repair works are performed.

4.3. CONNECTING SECTIONS

Coupling of individual sections delivered separately can be done using factory delivered mounting holders and bolts M8.

4.4. CONNECTING VENTILATION DUCTS

Ventilation ducts should be connected to the unit using flexible connections preventing transmission of vibrations and eliminating slight alignment deviations between a duct and the unit exhaust. Ducts connected to the unit must be supported or suspended on own support elements. Method of routing the ducts with fittings should eliminate the possibility of increase in noise levels within the ventilation system.
All connections between the unit sections and to an external frame of flexible connectors are provided with earthing conductors connecting the unit casing ground to external ventilation ducts ground.

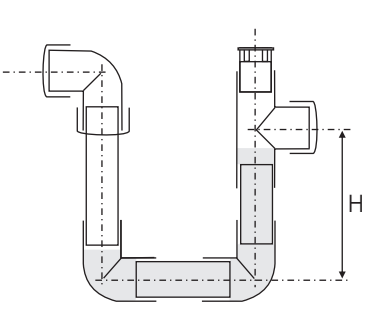
4.5. CONNECTING HEATING AND COOLING COILS

Connecting heat exchangers should be completed so as to protect them against possible stresses which could cause mechanical damages or leaks. Connections on heat exchanger should not be affected by weight of the pipework or thermal stresses. Depending on local conditions use compensation in pipework system on supply and return in order to reduce length-wise expansion of pipeworks. During installation of the supply system to heat exchangers with threaded connection, heat exchanger connection should be locked using an additional wrench.
The supply system should be arranged so that it creates no interference in access to other sections of the unit. The applied method of connecting the exchangers to the supply system should allow an easy removal of pipeworks to remove the exchanger from the unit without any collision during maintenance and repair works.
Supply and return connections on heat exchangers should be connected so as the heat exchanger operates in counter-flow system. Operation in counter-flow system reduces average difference in temperature which determines the heat exchanger efficiency.
Connection of freon cooling coil to the supply system with refrigerating unit should be carried out by a qualified cooling system technician in accordance with valid rules for freon condensation equipment.

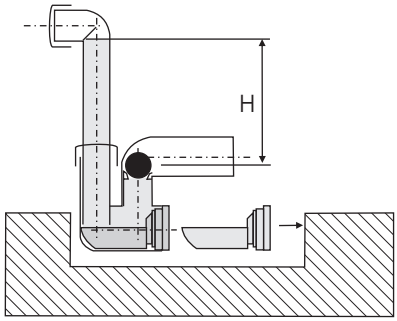
4.6. CONDENSATE DRAINAGE

In drip trays in cooling and cross-flow heat exchanger sections, condensate drainage ports are installed, and they are routed to the outside of the unit casing.
Drainage ports should be connected to siphons intended to drain water dropping out of heat exchangers at various pressure values in the section and in the ambient.
Siphon functional height “H” depends on the difference in pressures between pressure in the unit section from where the condensate is being drained during operation, and ambient pressure. The “H” dimension counted in mm must be greater than the difference in pressures expressed in mm H^2O.

No	Fan overall 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



Discharge siphon



Suction ball siphon

Due to different pressures in sections when operating the unit, it is allowed to connect few condensate draining connections to a single siphon

Siphons of different sections can be connected by a single outflow drain on condition the drain has contact with the ambient air (vent). Before starting the unit fill the siphons with water. In cool environment insulate the water drain and if needed use an adequate anti-freeze system.

4.7. ELECTRICAL CONNECTIONS

Electrical connections of elements of the unit equipment should be carried out by properly qualified and authorized personnel in accordance with standards and regulations valid in a country of the device installation. Sections and types of power supply cables (e.g. screened cables) should be selected according to current rating and conditions specific for the unit location (e.g. ambient temperature, method of cable installation, distances from the power cubicle).
Before connecting the power supply make sure the voltage and frequency values of the mains are compatible with the data given on data plates of the devices. Admissible tolerances in values of the supply voltage and its frequency in relation to the values given on the data plate are ±5%. If any incompatibilities are found, do not connect the devices.

4.7.1. Electric heater

Connection of the heater should be carried out so as it is protected against possibility of activating the heater if the fan is not on. Apart from that if the fan operation is interrupted, the heater's power supply must be disconnected.
Depending on the automation system used, the heater power can be adjusted step-less or in steps. To adjust the heater in steps, it is required to group heating elements. Heating elements from each group are arranged symmetrically in the heater window. The heater's heating coils will be damaged if supply voltage is fed with no air flow.
As a standard, thermostat protecting against excessive increase in air temperature inside the heater caused by loss or drop in airflow, is used.

The thermostat must be incorporated into the heater's control system.

Operation of the thermostat is based on the properties of a bimetallic element causing opening of contacts in the heater's supply control circuit with the air temperature around the thermostat of 65°C. After an automatic emergency stop of the heater the air temperature is reduced by 20°C. After a scheduled or an emergency (caused by overheating) supply voltage cut-off, the supply air fan must operate for an adequate time (0.5-5 mins) to cool down the electric heater's heating coils.

4.7.2. Fan motor

Fan motors with protection class IP54 and insulation class F are suitable to cooperate with frequency converter (minimum recommended frequency set-point is 30Hz). No additional means to provide protection of the motors against conditions in the fan section of the air handling unit are required. Optionally motor windings have internal protection against overheating as PTC sensors, and these should be connected to electronic measuring relay to monitor temperature, e.g. frequency converter.
Motors used as standard in air handling units, have their own cooling with a fan incorporated on the shaft. Route power cables from the fan motor through rubber bushings located in the unit casing panel.
When openings for guiding power cables in the motor terminal boxes are blanked with a thin layer of cast iron, remove it carefully

Do not route supply cables through inspection panels.

<u>Fan indirect drive</u>
Fan motors with belt drive are powered by 3x400V/50Hz. As standard, single-speed motors are installed. On a request, two-speed motors or 3x400V/50Hz inverter-controlled motors can be installed. The connection should be done by applying overload and short-circuit protection suitable for rated current of the motor type used.
<u>Fan direct drive</u>
Fan motors with direct drive as standard are supplied from frequency converter with 3-phase voltage. 3x400V/50Hz motor windings should be connected to corresponding terminals of the frequency converter. Electrical connection should be done through short-circuit protection for rated current of the motor type used. Overload protection should be implemented on the frequency converter by activating specified rated parameters of the motor in accordance with instruction manual delivered with the frequency converter.
When supplying the motor from the frequency converter, currents of high frequencies or harmonic components of voltages in motor powering cables may cause electromagnetic interferences. Connection between the frequency converter and the motor should be carried out using screened cables, in accordance with the guidelines as given in the frequency converter's Operation and Maintenance Manual (DTR).
Before commissioning and after a long storage or idle period, make sure to measure the insulation resistance between the casing and the windings, by applying direct current. Minimum insulation resistance for a new, cleaned or repaired winding should be 10MΩ in relation to the earth.

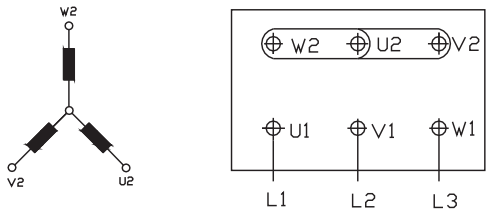
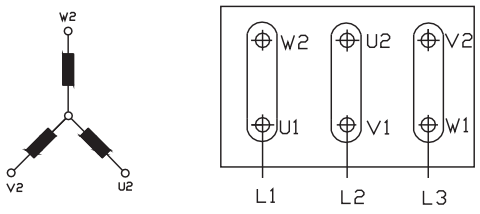
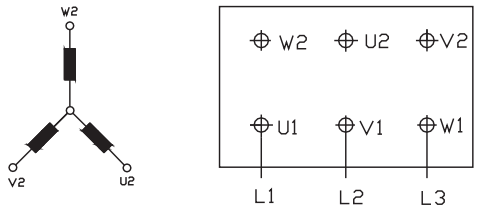
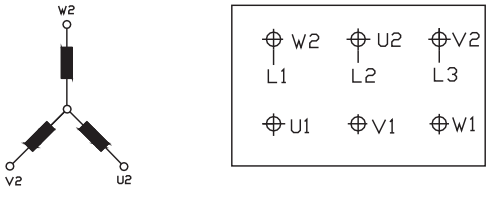
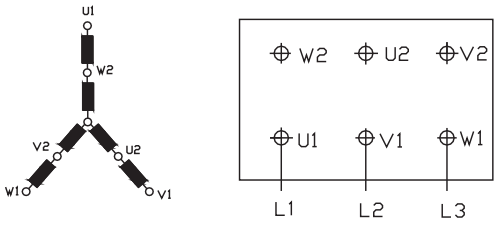
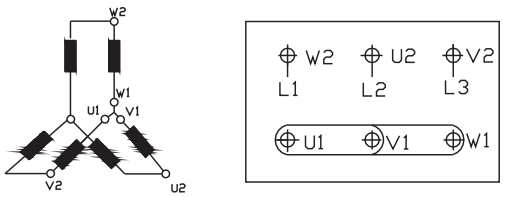
Do not start motors if they are not provided with short circuit and overload and voltage drop protection according to PN-89/E-05012.

In order to ensure safe operation of the device make sure to install a service switch outside the fan section to cut off the power supply to the fan motor during service works. Service switch should be placed nearby inspection panel of the fan section. As standard, air handling units have service switches, with factory-installed wiring from the motor to the service switch, connection to the switch terminals to be carried out by installer. For single-speed motors 3-pole switches (WS-3) are used, and for two-speed motors 6-pole switches (WS-6) are used.

Disconnection of the power supply circuit with the service switch must take place with the de-energized device. Do not install the service switch on inspection panels.

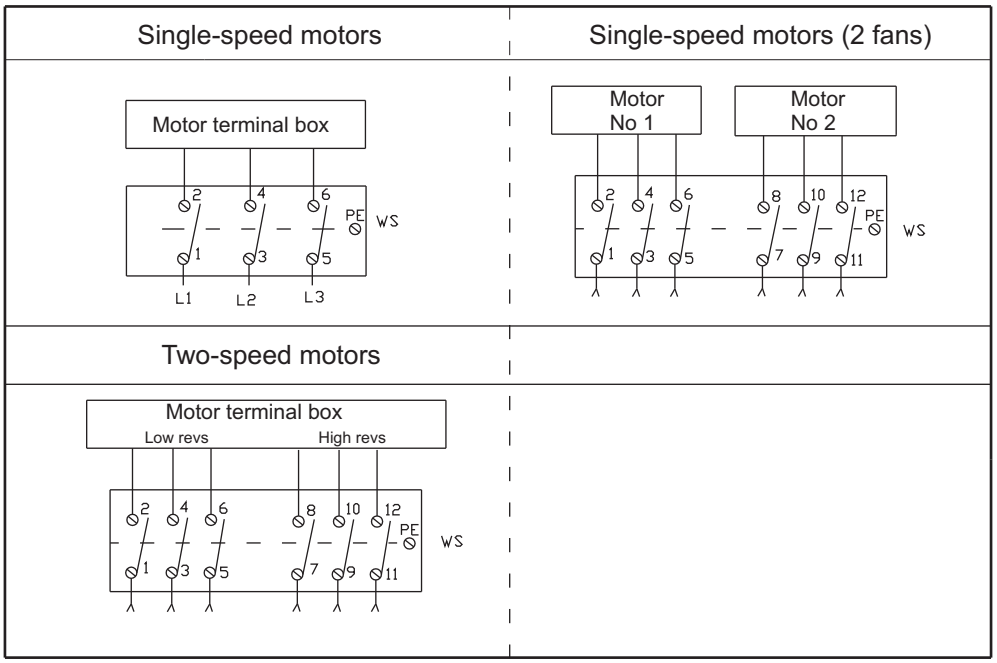
Never start and operate a motor without natural or protective grounding.

WIRING DIAGRAMS FOR COILS AND TERMINALS OF THREE-PHASE MOTORS

	LOW REVS	HIGH REVS
Single-speed motors		
Two-speed motors, two separate windings		
Two-speed Dahlander motors		

With delta-star connection start-up or with control using contactors, no bridges are provided.
All 6 terminals are included in the service switch.

WIRING DIAGRAMS FOR SERVICE SWITCH WS WITH THREE-PHASE MOTOR



4.8. AUTOMATICS

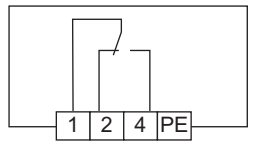
Complete automatics which should be an integral part of any air conditioning system enables unobstructed operation of the device, and in many cases is considered an essential component which if missing, may cause problems related to use and serious failures of the device. This documentation does not contain information on connection, start-up and use of the system, and only installation of components of the automatic equipment.
Additional information can be found in separate documents delivered by JUWENT with automation set. In other cases any related information and documents should be provided by the automation system supplier.

AUTOMATIC EQUIPMENT COMPONENTS

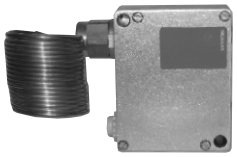
ANTI-FREEZE THERMOSTAT

Protects the heating coil against freezing. Mounted on the unit side wall, and the capillary is laid on the heat exchanger's surface.
Setting a limit temperature (recommended from 4 up to 5°C) is possible thanks to a union on the thermostat.

Measurement	-5...+15°C
Factory set-point	5°C
Contact type	switching
Capillary length	3 or 6m
Protection level	IP54



1-2 Alarm freezing
1-4 Normal operation mode



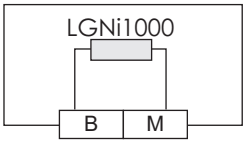
THERMOSTAT PROTECTING AGAINST OVERHEATING

In units with electric heaters, two-state temperature thermostats, designed for the heater protection, are used. The thermostat must be included in the electric heater control circuit. As standard, thermostat protecting against overheating is mounted on each electric heater.

DUCT TEMPERATURE SENSOR

The duct sensor is used for measurement of the supply and outlet air temperature and as a limiting sensor (e.g. for the minimum limit of supply air) in ventilation ducts or directly outside of the unit. When adjusting the supply air temperature, the sensor is mounted downstream of the fan, however, when adjusting the exhaust air temperature, it is always installed upstream of the fan on the inlet.

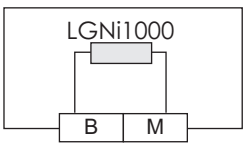
Measurement range	-50...+80°C
Measurement component	LG-Ni 1000
Measurement probe length	0,4m
Protection level	IP42



ROOM TEMPERATURE SENSOR

The room sensor is used for measurement of the temperature in the room in heating, ventilation and air handling systems, when the high comfort level is required.
The sensor should not be installed in recesses, shelves, opposite or nearby sources of heat and cannot be exposed to direct sunlight.

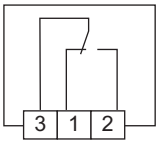
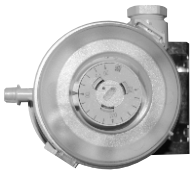
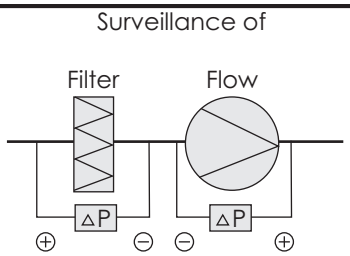
Measurement range	0...+50°C
Measurement component	LG-Ni 1000
Protection level	IP42



DIFFERENTIAL PRESSURE SWITCHES

Pressure switch is a device intended to:

- indicate contamination of air filters
- control fan V-belts

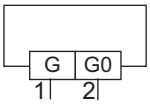
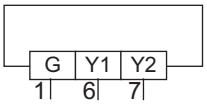
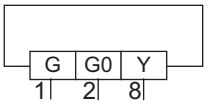
Measurement range	20...1000Pa	 3-1 Closed contact at pressure drop 3-2 Closed contact at pressure increase		
Contact type	switching			
Protection level	IP54			

When ordering a complete automation set with the unit, pressure switches are mounted outside the unit as standard

AIR DAMPER ACTUATORS

To control air dampers actuators are used, and they are intended to set an air damper in a desired position. Depending on control method for dampers within the units, actuators of the following types are used:

- open/close (on/off) with return spring.
- open/close (on/off) without return spring.
- continuous operation with return spring.

Actuator type	on/off	Continuous signal	On/off with spring	On/off without spring	Continuous signal	
Supply voltage	24V AC	24V AC	 1 - Potential 2 - Ground	 6 - Control signal, open 7 - Control signal, close	 8 - Control signal 0..10V	
Close / open time	150 s	150 s				
Protection level	IP 54	IP 54				

When ordering a complete automation set with the unit, actuators are mounted outside the unit as standard.

VALVES

In air conditioning units valves are commonly used in a broad scope of application at air flow rate control:

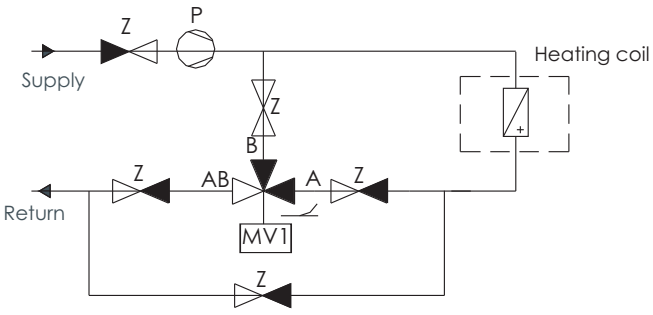
- heating medium (water or steam) through the heating coil;
- cooling medium (water, glycol) through the cooling coil;
- chilled water medium through the cooling coil.

Three-way valves applied within the system are intended to mix, and therefore should be installed on the return due to lower temperatures of return ducts within the heating system.

DN	k_{vs}, m^3/h continuous signal	t[°C]	PN
20	4	1..110	16
25	6,3		
25	10		
32	16		
40	25		
50	31		

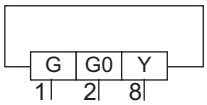
FITTINGS:

Z: cut-off valve: manual
P: Circulation pump
MV: actuator-controlled three-way valve
Permissible flow direction: A->AB i B->AB



VALVE ACTUATORS

For direct installation on the valves electric power actuators are used, and they provide a step-less valve control.
The actuator is mounted on the valve using a connecting nut, and during the installation the actuator must be set in 0 position. It is recommended to install the valve in such position so that the actuator is above the valve in an accessible location.

Actuator type	0...10V continuous signal	 1- Potential 2- Ground 8 - Control signal 0..10V	
Supply voltage	24V AC		
Close / open time	150 sec.		
Protection level	IP40		

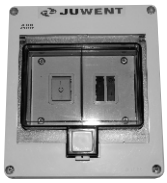
CARBON MONOXIDE DETECTOR

Microprocessor controlled DTW Carbon Monoxide Detector is intended for continuous monitoring of carbon monoxide concentration in rooms potentially exposed to carbon monoxide emissions. The detector is delivered with an additional connection and installation manual.

Supply voltage	230V AC	
Detected gases	carbon monoxide 25 to 1000ppm	
Control signals	Alarm1, Alarm2	
Protection level	IP40	

REMOTE CONTROL BOX

Thanks to the remote control box the unit can be switched on/off from any selected room, additionally, the remote control box signals condition of system operation or failure. The box is provided with a plastic casing.

Dimensions width x height x depth	175x160x90mm	
Protection level	IP55	

SERVICE SWITCH

Intended to switch the fan motor off so servicing can be carried out. Use of the WS switch prevents an unexpected start of the motor, which could pose a danger when servicing.

Type	WS-3	WS-6	
Main circuit: poles	3-pole	6-pole	
Power circuit switch	current 1- and 3-phase	current 3-phase	
Rated continuous current	25A	25A	
Protection level	IP 65	IP 65	

5. PREPARING FOR START-UP

The unit start-up when commissioning the ventilation system must be carried out by properly qualified and skilled personnel only. Before the start-up thoroughly clean the equipment and ducting inside. Check if:

- during assembly works there have been no damages to equipment and system parts, and automatic equipment and automatic equipment components,
- all ventilation devices are mechanically installed and connected to the ventilation system,
- earthing conductors connecting the unit to ventilation ducts are mounted,
- hydraulic and freon system is completely installed and prepared for operation, and heating or cooling medium is available during the start-up,
- electric power receivers are wired and ready for operation,
- siphons and drain system for condensate from drip trays are installed,
- all automation elements are installed and wired.

5.1. WIRING SYSTEM

Before electric power receivers junction boxes are closed, check:

- on the basis of available wiring diagrams, compatibility of wiring connections and terminal connections,
- whether the applied protections of all electric power receivers work properly,
- whether all bolts are tightened, and support elements and electric connections (also unused auxiliary terminals, if present) are properly mounted,
- wires and cables for compliance with all protection requirements,
- arrangement, section, etc.,
- whether earthing and protecting connections are correct,
- whether inside junction boxes there are no wire scraps,
- condition of gaskets and sealing surfaces.

5.2. FILTERS

Air filters in air conditioning units prevent penetration of dust and dirt into a ventilated room. Apart from that they provide an effective protection against soiling of other functional elements of the unit, and heat exchangers in particular.

When using thee unit filters must always be fitted.

Before closing filtration section, make sure to:

- remove the filter protective foil,
- mount filters in guides so that bags are in vertical position,
- check condition of filters and tightness of their fitting in the guides,
- check set-points of differential pressure switches (if any) indicating the accepted difference in static pressure exceeding of which indicates the need to replace the filter.

Filter type	Filter class	Maximum difference in pressure in accordance with EN 13053
Metal	G2	150 Pa
Pleated	G4	150 Pa
Pleated	F5	250 Pa
Bag	G4	150 Pa
Bag	F5	250 Pa
Bag	F7	250 Pa
Bag	F9	350 Pa

Tab. Maximum differences in pressure on filters in accordance with EN 13053

5.3. WATER AND GLYCOL HEATING COILS

Check

- condition of heating coil panels,
- supply and exhaust pipework for correct connection,
- whether capillary of anti-freeze thermostat is fixed to the heater's casing,
- set-point of anti-freeze thermostat (factory set-point +5°C),
- whether control valve on heating coils is installed in accordance with markings on its casing.

5.4. ELECTRIC HEATERS

Check:

- electric wirings for correct connection in accordance with wiring diagram for heating elements,
- safety thermostat for correct connection,
- whether heating elements are not in contact with any parts inside the heating section,
- whether heating elements of the heater are not damaged.

5.5. WATER, GLYCOL AND FREON COOLING COILS

As in the case of water heating coils, check

- condition of cooling coils panels,
- supply and exhaust pipework for correct connection,
- setting of droplet eliminator in relation to air flow direction,
- siphon for correct mounting – before starting the unit fill the siphon with water,
- serviceability of condensate drain system.

5.6. PLATE HEAT EXCHANGER

Check:

- condition of the exchanger panels (soiling, mechanical damages),
- operation of damper installed on cross-flow heat exchanger (before starting the unit, part of the damper which operates the exchanger by-pass should be closed)l
- check mounting of droplet eliminator and its setting in relation to airflow direction;
- in air handling units with droplet eliminator check whether the size of siphon is right and properly mounted and condensate drain system is serviceable;
- before starting the unit fill the siphon with water.

5.6. FAN ASSEMBLY

Check if:

- around the fan there are no objects which could be sucked into rotor once started,
- fan rotor rotates freely, without rubbing any parts of the casing,
- motor is properly set and whether the system and operating conditions are compatible with parameters on the data plate (supply voltage, current, frequency, winding connections),
- motor rotor rotates freely, without rubbing the stator,
- air for motor cooling can be freely supplied and exhausted from the motor housing,
- earthing and protecting connections are correct,
- the designed fan rotary speed would not be exceeded (see specifications of the unit),
- all bolts, support elements and electric connections are tightened firmly,
- supply cables inside the fan section are away from all movable drive parts and fixed with adequate holders to electric wires,
- all dampers on ventilation duct system are arranged as designed,
- direction of rotor rotation is compatible with the arrow on fan housing (impulse-activate the fan). In case of reverse rotation direction replace any two phases in the motor terminal box or change rotation direction on the frequency converter,
- tensioning of V-belts and setting of belt gear pulleys meets the requirements.

Do not operate the device if any inspection panel is opened.

6. START-UP AND ADJUSTMENT

Start-up is intended to assess whether the unit conforms with the design and is suitable for use. The start-up procedure and adjustments of ventilation and air conditioning systems can only be performed by a qualified crew of personnel competent in start-up, and equipped with a set of basic measuring instruments.

Once the procedure described in chapter 5 is completed, approach the first start-up. In air handling units with secondary filtration section, it is recommended to perform start-up without secondary filter cartridges.

The fan should be started at a reduced load and run to reach parameters as near the assumed operating point as possible. The reduced load can be achieved by closing control damper on the unit inlet, and additionally, in case of motor supply by frequency converter through rotary speed reduction.

While increasing the load, pay attention to constantly control level of the current drawn by the motor.

Make sure that for the design air parameters, the fan motor supplying current is within its rating.

Failure to follow the recommendations for the first start-up may lead to the fan motor overload and its serious damage.

Once started check whether:

- there are no alarming noises and unnatural mechanical sounds,
-
- there are no vibrations of the unit that can be considered to be excessive.

Let the unit operate for about 30 min. Then turn it on and inspect individual sections.
Pay particular attention to:

- filter (for damage),
- efficiency of condensate drainage,
- fan assembly (belt tensioning, temperature of fan bearings and motor).

It is recommended, in the automatic equipment system, to ensure that dampers are pre-opened on the unit inlet before the fan is started. This has an effect on damper durability and operation, and eliminates operation of pressure switch indicating no static pressure condition.

Once the start-up is complete, replace or clean primary filters. To achieve the presumed effects of air handling or air conditioning units, among others make sure to carry out adjustments and control measurements.

6.1. MEASURING AIR QUANTITY AND ADJUSTING EFFICIENCY OF THE UNITS

Measuring air quantity is essential when:

- starting and commissioning of the unit,
- the assembly fails to function as designed,
- performing periodic inspection of the unit's operation,
- replacing components of fan assembly.

Before any measurements and adjustments are performed make sure to:

- check if dampers at all grilles or diffusers are positioned as designed,
- set fresh and recirculation air dampers (if provided) in one of end positions, i.e. either 100% of fresh air or maximum recirculation,
- measure the current drawn by the motor. If necessary, throttle the airflow using main damper or reduce the fan rotational speed.

Determining volumetric airflow is based on measuring an average air velocity in the gauging section of ventilation duct. One of the basic methods for determining an average air velocity is probing in the gauging section of the duct using Prandtl tube and measuring an average dynamic pressure corresponding to this velocity.
Important factors having effect on measurement accuracy are as follows:

- location of gauging section in relation to components,
- number and location of measurement points in the gauging section,
- considerably stabilized and the least disturbed possible airflow.

In particular, it is not recommended that the gauging section is located directly downstream:

- elements of the network causing disturbances in the velocity field (elbows, reducers, T-pieces,dampers, etc.),
- fan, where velocities opposite in sign are likely to occur in the gauging section.

The measurement should be carried out over a section of the duct with parallel walls, with straight lengths of at least 6 times the diameter or equivalent diameters before the measurement point, and no less than 3 diameters behind. In the actual ventilation system it can be difficult to find such long and straight section of the duct. Then, the best method is to mark out the gauging section in an area where the least disturbances are expected, and to concentrate the measurement point grid. Location of the gauging section should be determined already when designing the system. Comprehensive recommendations on airflow measurements and location of measurement points are defined in ISO 5221.
The measured efficiency shall be assessed as appropriate if it departs from the assumed by no more than ±10%. In case of greater discrepancies, an efficiency similar to the value assumed in the project can be achieved by:

- adjusting the network of ventilation ducts,
- changing settings of the main damper,
- changing the fan rotational speed.

When adjusting the fan rotational speed to higher, control the motor power consumption and do not let the rated current to be exceeded.

Also, due to strength reasons and maximum parameters, it is important not to let the maximum rotor rpm rate to be exceeded. In justified cases when it is necessary to increase the air efficiency in relation to the measured value, increasing the rotational speed may require a bigger fan motor.
In systems with dampers automatically changing proportions of fresh, recirculation and removed air or proportions of airflow through by-pass, measurements of the efficiency and adjustment of the main damper should be carried out in one of the end positions. Then, it is required to check proportions of the air and its overall efficiency in the other end position, and if necessary carry out a corresponding adjustment so as to achieve adequate proportions while keeping a constant overall efficiency.

6.2. ADJUSTING WATER HEATING COIL EFFICIENCY

Water heating coil efficiency adjustments are carried out after having determined the adequate air capacity flowing through units. Water heating coil adjustment involves checking the effect of its operation from the air side through air temperature measurements in front and behind the heating coil, with supply and return temperatures, and quantity of the heating medium flow as designed.

The heating coil efficiency is adjusted by the change in water supply temperature. This is achieved by mixing the supply water at high temperature with water at lower temperature returning from the heating coil, in a 3-way valve. Once mixed the heating coil supplying water reaches an adequate temperature depending on the degree of mixing.

External conditions close to measuring conditions occur in a year-cycle within a relatively short time. In most cases, this involves adjustments to be carried out in intermediate conditions, for which adequate conversion rate to design parameters should be used.

Checking function of anti-freeze thermostat is possible only if the temperature of air supplied on the exchanger is lower than the set-point on the thermostat (factory set-point +5°C). The safest way is to take this step, if supply air temperature is by 1-2 degrees above zero. Then with the unit operating, close off the heating medium supply and observe the thermostat function. Do this before commissioning the unit to be normally used.

6.3. ADJUSTING ELECTRIC HEATER

Adjusting power of electric heater in most cases can be carried out by turning off particular groups of heating elements. By connecting particular heating elements to one another, a multi-step adjustment is possible.

It is necessary to carry out a simulation of a reduced power demand by decreasing the set-point value for the set temperature so that all power supply levels (contactors) are off. Next increase the set-point significantly and check whether all power supply levels are being switched on in the order as described. Restore the original set-point for temperature.

When in use, the velocity of air flowing through the heater cannot be lower than 1.5m/s.

Please note that reduction of the air stream increases the risk of overheating. Stopping the air handling unit operation must be delayed (0.5-5min), so as to cool down heating elements of the electric heater.

6.4. ADJUSTING COOLING COIL EFFICIENCY

The cooling coil efficiency adjustment should be carried out in conditions similar to design conditions. As in the case of the heater, the effect from the air side is considered, by measuring the temperature and relative humidity values in front of and behind the cooling coil.

While also temperatures of cooling medium are controlled. If the effect of the cooling coil is insufficient, an adequate adjustment is necessary. Among others, this can be achieved by:

- adjusting quantity of cooling medium (water cooling coils),
- adjusting quantity of air flowing through air handling unit (water cooling coils and with direct evaporation of the medium),
- adjusting by changing evaporation temperature (in systems with direct evaporation).

Usually the cooling coils operate in complex air conditioning systems with automatic adjustment. The automatic adjustment devices should be inspected not only in extreme design conditions but also in operating periods at partial load of the cooling coil.

7. USE AND MAINTENANCE

Personnel responsible for operation of the unit should be familiarized with this documentation before performing any use and maintenance works. If no personnel of adequate technical skills is available, the on-going inspection of air handling units should be ordered at the JUWENT Authorised Service Point.

Any damages to air handling unit or its part due to failure to follow guidelines included in documentation, will not be subject to warranty repairs.

Basic technical data for air handling unit, such as version, type and dimensions of essential components (filters, heat exchangers, fans, electric motors) can be found in Technical Data Chart delivered with each device.

Air handling unit should be serviced only when the device is not running. In order to ensure safe operation of the device make sure to install a service switch outside the fan section to cut off the power supply to the fan motor during service works. Disconnection of the power supply circuit must take place with the de-energized device. Service switch should be placed nearby inspection panel of the fan section.

Careful, regular maintenance and inspection of technical condition of air handling unit and its equipment is necessary to find defects early enough, before major damages occur.

This documentation includes only general instructions on inspection intervals to ensure faultless operation of air handling unit due to various external conditions of their operation and servicing. Thus inspection intervals must be adjusted to present conditions (pollution, number of start-ups, load, etc.).
Personnel in charge of air handling unit servicing from the moment of its start-up should run records in the “Inspection and Maintenance Table” provided in the Warranty Card, where it is required to note works resulting from normal, routine servicing of the device. Carefully run register shall be the only reliable document to confirm operating condition of the device, date of on-going inspections, any potential malfunctions found. If it is necessary to contact a JUWENT representative, please give the device's serial numbers provided both on the casing and in documents delivered with air handling unit. Duration of intervals is defined assuming the air handling unit “non-stop” operation and as part of a system with low dusting and no other conditions disturbing normal function of the device. In environments with high dusting on supply and/or exhaust, inspections should be more frequent.
Spare parts and accessories for air handling units can be ordered at a local JUWENT Authorised Service Point. When ordering please give type and serial number of your device. These can be found on the data plate located on the fan section.

7.1. DAMPERS

If a damper is found to be excessively contaminated or operate defectively, clean it by using one of the below methods:

- with use of industrial vacuum cleaner with soft suction cup,
- blow with compressed air,
- wash with pressurized water with cleaning agents not causing the corrosion of aluminium.

Pay particular attention whether the damper is tight after closing, above all from the external air side, as otherwise water cooling coil can be frozen.

7.2. FILTERS

With standard conditions of air handling unit operation, make sure to replace filters approximately once a half year. Filters must be replaced (apart from visual inspection of their function) if pressure drop exceeds values given in Table 1.
The units can be fitted with the following filters:

- initial, pleated class G4, F5 with length of 48mm;
- initial, bag class G4, F5, F7 with length of 360mm;
- secondary, bag class F5 - F9 with length of 600mm.

Filtration rates are different for particular filter types, therefore it is particularly important that filters are replaced with ones of identical filtration rate.

If the final pressure difference on the filter is higher than the filter presumed value, replace it immediately. Pleated and bag filters are intended for single use only. When replacing the filter also clean the filtration section by removing dust from its surface or rubbing it with a damp cloth. When ordering a new set of filters at a JUWENT Authorised Service Point, please give filter type, filtration rate and size of the unit, optionally size and number of filters in accordance with Table 2.
Air handling units must operate with installed air filters as otherwise the power consumption by fans may exceed the assumed values, what in turn may cause burning of the motor windings.

Unit size	**1**	**2**	**3**
300x580x48 [mm]	1	1	2
300x950x48 [mm]	-	1	-
287x592x360 [mm]	1	1	2
287x287x360 [mm]	-	1	-
287x592x600 [mm]	1	1	2
287x287x600 [mm]	-	1	-

Tab. Filter cartridges for CP units.

7.3. HEAT EXCHANGERS

7.3.1. Water or glycol heating coil

Water heating coils when used should be equipped with a system protecting against freezing. As an alternative, in the winter period, the heating coil can be filled with a non-freezing medium (e.g. glycol solution). When supply of the heating medium is cut off or the unit is shut down, and the air temperature is likely to drop below + 5°C, the heating coil should be emptied.
Thus:

- close valves on heating medium supply and drain (shut off the heating coil from the heating system),
- move access panel towards shut off valves,
- from collectors, remove drain and vent plugs,
- in the place of drain plug connect a drain tube so that the water from the exchanger being emptied is removed outside the unit,
- blow the heating coil with compressed air supplied to the vent plug.
- perform blowing a few times in short intervals until only air is removed from the drain tube, without any visible water droplets,
- put drain and vent plugs back on again,

•At least every 6 months inspect whether heating coil panels are not contaminated. Collection of dust on the heating coil surface causes reduction in heating power of the heating coil and an increase in pressure drop at the air side. Even if the unit has filters, with time from the air supply side, dust collects on the heating coil panels. If excessive contamination is found, cleaning can be carried out using the following methods:

- with use of a vacuum cleaner with soft suction cup from the air inlet side,
- blowing with pressurized air jet in direction opposite to normal airflow, by directing the stream parallel to the panel arrangement,
- washing with warm water with cleaning agents not causing the corrosion of aluminium and copper.

Before cleaning make sure to protect adjacent sections of the unit against released contaminations.
In order to achieve full heating capacity, the heating coil must be well deaerated. For this use vent plugs located in the heating coil collectors.
•During the standstill of the device make sure to reduce flow of heating medium to minimum so that the temperature inside the device is no greater than +60°C. Increase in temperature above this value may damage some of the elements or sub-assemblies (motor, bearings, plastic parts, etc.) mounted in sections adjacent to the heating coil.

7.3.2. Electric heater

Battery of electric heater comprises unprotected heating coils. When the unit is running in periods when the heater is in standstill, dust may collect on heating coils. As the heater is used again, due to strong contamination a burnt dust smell, and even a risk of fire may occur. In regular intervals (every 6 months), and before heating season in particular, make sure to check electrical connections, technical condition of heating elements whether they are not deformed or excessively soiled. Remove any potential contaminations with a vacuum cleaner with a soft suction cup, soft brush or compressed air.

Do not clean electric heaters with damp or wet cloths.

Also check function of protection against temperature increase in case the airflow is lost. Air velocity should not be lower than 1.5m/s.

7.3.3. Water or glycol cooling coil

Inspect whether the cooling coil is clean once every 6 months. If necessary the cooling coil can be cleaned using methods specified for water heating coils.
Before cleaning make sure to protect adjacent sections of the unit.
When inspecting whether the cooling coil is clean, also check if droplet eliminator is not contaminated and serviceability of drip tray and water siphon. Before starting the unit fill the siphon with water.
If contamination is found, rinse the droplet eliminator with warm water with cleaning agents.
For glycol cooling coil additionally check the contents and concentration of glycol in the circuit. In order to achieve full heating capacity, the cooling coil must be well deaerated. For this use vent plugs located in the cooling coil collectors.

7.3.4. Freon cooling coil

Servicing freon cooling coil includes the same procedure as for the water heating and cooling coil.
When washing the freon cooling coil with warm water, empty the cooling system by evacuating freon to a tank. Otherwise high risk of uncontrolled increase in freon pressure and damage of cooling system may be present.

7.3.5. Plate heat exchanger

Servicing of the exchanger only involves an inspection of its technical condition and soiling of aluminium panels to be carried out every six months. Dirt deposits in cross-flow heat exchangers is often limited to the first 50mm in the exchanger. Before cleaning protect the adjacent sections.

Necessary cleaning should be carried out using one of the following methods:

- dusting with use of a soft nozzle,
- blowing ducts with air jet in the direction opposite to the normal air flow,
- washing the entire length of air ducts with water with cleaning agents causing no corrosion to aluminium,
- more contaminated exchangers can be cleaned by rinsing them with a jet of high-pressurized water.

When cleaning using mechanical means for dirt removal, be particularly cautious and pay attention so that exchanger plates are not deformed or damaged.

When using the heat exchanger at temperatures below zero, before restarting the unit dry the exchanger completely.

Apart from that check:

- damper operation,
- condition of droplet eliminator,
- condition of drip tray,
- serviceability of condensate drain system,
- before starting the unit fill the siphon with water,
- anti-frost system for proper mounting (if mounted),
- whether by-pass damper is closed tightly, when de-frosting is not required.

7.4. SILENCING SECTION

Silencing section is fitted with baffles filled with non-flammable mineral wool absorbing acoustic energy. In this case, maintenance works involve inspection whether cartridges on silencing systems are not soiled.

Cleaning should be carried out using a vacuum cleaner or by wet wiping of all surfaces. For any major soiling, nylon brushes can be used.

7.5. FAN ASSEMBLY

Before any works (fault, maintenance, servicing) on the unit, and particularly before opening inspection panels of the fan section and removing guards from live parts, make sure that:

- the device is properly disconnected from the power supply. This applies to both main and auxiliary circuits,
- rotor is in standstill,
- fan is cooled down, and the temperature on its surface presents no risk of burns,
- fan is protected against an accidental start.

7.5.1. Fans

Fans are intended to transfer dust-free or slightly dusted air. They are not intended for use with aggressive gases, vapours or highly-dusted air. Fan operation in non-compatible environment may lead to damaging bearings, corrosion, unbalance of rotor and vibrations.

Fan and drive unit in the assembly are selected for the unit operation design parameters. The fan rotational speed is selected so that the air stream and overall static pressure are best suited to the cooperating ventilation system. Smaller stream of the transferred air means disruptions in correct operation and causes imbalance of the whole ventilation system. This may result from:

- slippage of the drive belt,
- dust deposits on fan rotor blades,
- incorrect rotational direction of the fan. If the radial fan rotates in a wrong direction, the airflow takes place at a significantly reduced efficiency.

For fan servicing check whether:

- rotor rotates freely,
- is balanced and shows no run-out,
- rotor is securely mounted on the axle,
- rotor is not shifted against entry funnel,
- vibro-insulators are firmly mounted and show no damage,
- flexible connection (if present) is not damaged,
- all bolts securing the fan unit components are tightened.

Loss of rotor balance may be caused by:

- dust deposits on rotor blades,
- loss of additional balance weights,
- damage to rotor blades.

Inspect for contaminations inside the casing, rotor and motor once every 6 months, and if needed clean:

- the casing inside with vacuum-cleaner,
- rotor with vacuum-cleaner or using wet cleaning with a mild detergent.

In order to achieve the presumed life of the fan it is necessary to inspect and clean bearing on regular basis. Fan bearings should be inspected, e.g. when servicing.

Rotate the fan rotor manually to check whether there appear any strange noises on bearings. If there appear:

- not too loud noises when rotating as silent, soft, regular whisper – bearing works correctly,
- rasp – lubrication is insufficient,
- hard, often irregular sounds, rubbing or metallic, frequently repeated sound – damaged bearing. Replace the bearing.

Check the bearing temperature with a thermometer. If the temperature is too high or changes rapidly, this means the bearing is not working correctly, and reason for that can be:

- no or excess grease,
- contamination, overload or damage of bearing balls,
- bearing compression,
- too much friction on seals,
- external heating

Increase in temperature is normal within the first 1–2 days after lubrication.

When used as intended the unit fan bearings require no lubrication.
Bearings on fans without casing, with belt drive have grease nipples. In such case on bearings, apply a solid grease for bearings in intervals according to the unit operation intensity and current technical condition of bearing.
It is recommended to grease bearings once a year if the unit is operated up to 8 hours a day, twice a year, if operated longer during a day. The amount of grease for bearings depends on the fan size and bearings used. Excessive grease in the bearing housing causes the bearing temperature to increase, especially at the fan high rpm rate. After the bearing has been greased several times, open the bearing housing and before applying new grease remove the old one.

Manufacturer	Type	Base	Work range min/max
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

Tab. Grease for fan bearings

Depending on type, size and power on the shaft, fans installed in the units have bearings of various types. The amount of grease used for greasing, as well as greasing intervals depend on the bearing type and its rotational speed.
Once inspection and maintenance works are done, check the fan revolutions. If direction of the fan revolutions is incorrect, the air flow direction will be wrong causing drop in the device's efficiency. Direction of fan revolutions may change, e.g. due to modifications in the wiring system, thus the direction of revolutions must be controlled.

7.5.2. Motors

Careful, regular maintenance and control of motor condition is necessary to find any incompatibilities before major damages occur.
Before any works related to the motor or other motor equipment, and particularly before removing guards provided for protection against contact with movable or live parts, make sure that the motor is correctly disconnected from the power supply. Moreover, also disconnect additional and auxiliary circuits.
Follow the below safety rules:

- disconnect the power supply,
- use protection against accidental activation,
- check functionality of safe isolation of power supply,
- use guards on adjacent live parts.

All the above precautions should be kept until all maintenance works are not completed and the motor is not fully assembled and ready to start.
For fan motor servicing check:

- whether defined specifications are met (power consumption, temperature of windings, bearings),
- whether there are no grease leaks,
- whether the motor operates properly and noises coming from the motor and bearings do not get louder,
- all mechanical and electrical connections for proper fixing,
- resistance of insulation of the windings,
- whether wires and insulations are in good condition and there are no discolourations.

All changes and incompatibilities should be removed immediately.
Also:

- inspect bearings following the procedure described for fan bearings inspection,
- inspect whether the motor is properly mounted and mounting bolts are tightened,
- check whether the motor housing is not contaminated.

Excess contamination hampers the motor cooling, what in consequence may lead to overheating of the motor windings and its damage. The motor can be dry cleaned with a brush or blown with dry compressed air.

7.5.3. Belt gear

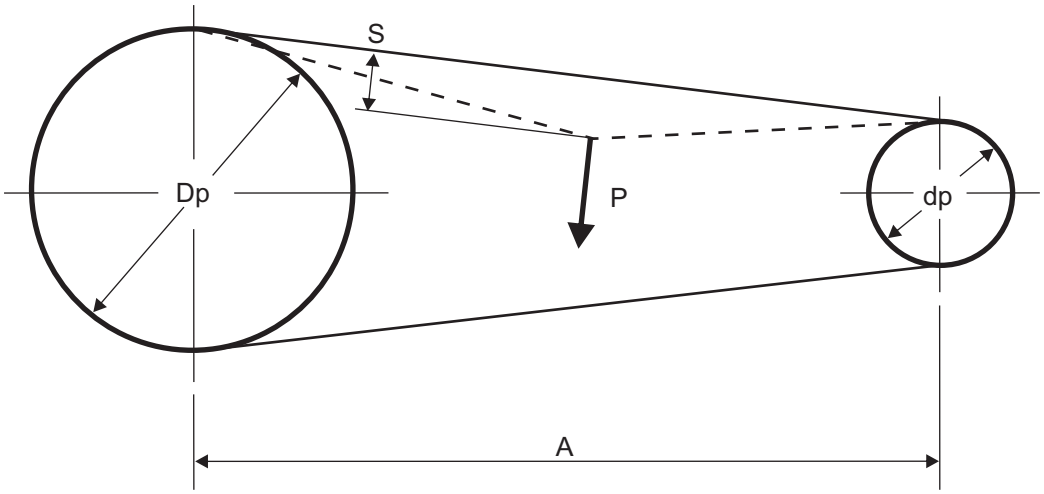
When servicing the fan assembly it is essential to check the tension of V-belts and pulleys for parallel alignment. Check the factory set belt tensioning after the first 50 hours of the assembly operation and then adjust once every 6 months.

If the belt is too loose, it may fall from the pulley or cause slippage and its fast wearing, and too much belt tension may cause heating and damage of bearings or overloading of the motor.

To check whether the belt is tensioned correctly, do as follows:

- measure the distance between wheel axles (dimension A),
- measure force P required to deflect the belt by S=16mm for each running metre of the distance between wheel axles, approximately in the middle of that distance,
- increase the belt tension, if the force is smaller or decrease, if greater than the value given in the table,
- recommended deflection of the belt is 0.8 x Pmax.

If belts are tensioned incorrectly, tension them by moving the motor with tension screw on the motor plate, and compare the tensioning values with data in the table.



	SPZ		SPA		SPB	
Smaller pulley diameter dp[mm]	67-95	100-140	100-140	>140	160-236	>236
Deflection force P*[N]	10-15	15-20	20-27	28-35	35-50	50-65
Deflection 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

Tab. Deflection value P depending on type and diameter dp of smaller pulley

* - force required to deflect the belt by s=16 mm with the distance between the axles A=1000 mm

To avoid unnecessary calculations below is the chart of belt deflection values “S” with various distances between the pulley axles.

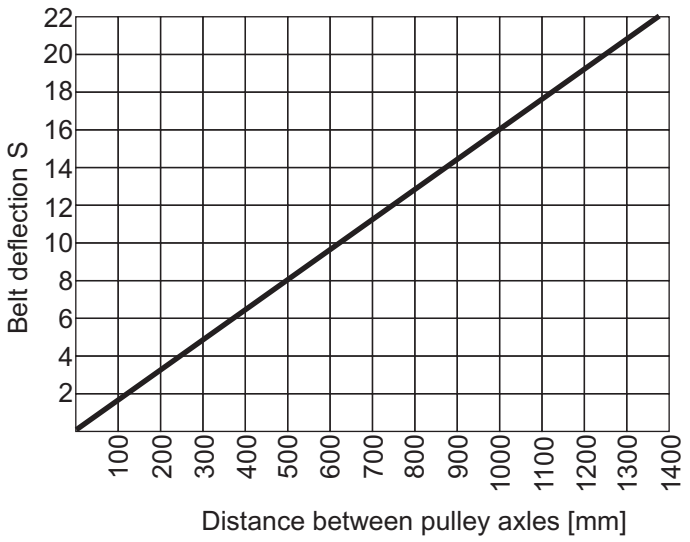


Fig. V-belt deflection depending on distance between pulley axles.

Also check whether the V-belt is not worn, broken or otherwise damaged. Make sure to replace a damaged V-belt immediately. For multi-belt drive, if even one belt is worn, make sure to replace all belts, paying attention that all of them are equal in length and type and match the pulley teeth. Failure to replace all belts at once will cause new belts to transfer greater loads, as they are slightly shorter than old ones. When replacing belts loose the tension screw on the motor plate to such extent that belts can be removed and installed on pulleys manually, without applying too much force. Never try to install belts by forcing them to be placed on pulleys using a screwdriver or any other such tool. When replacing the belt check whether contact areas of pulleys are not worn. Tension new belts so the required deflection force P is as close to value P given in table 4. Once new belts are installed, check settings of pulleys, using a gauge to see if pulleys are parallel and their teeth are at the same plane (Fig. below). After the pulleys are correctly adjusted, move the drive forward without a load, so that belts engage on the teeth. Remember to tension the new belts after 50 hours of operation.

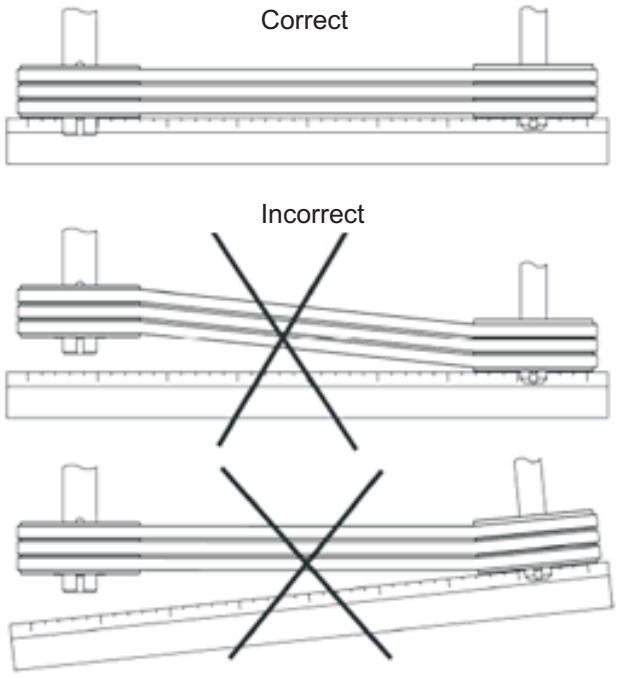


Fig. Setting pulleys.

In order to adjust the alignment of motor shafts and the fan, correctly position the motor on tension plate. If the pulley teeth are not at the same plane, move one of the pulleys (on fan or motor) along the shaft to correct this discrepancy. This operation enables mounting the “Taper-Lock” bushing on the pulley.

To move pulleys for adjustment or replacement of the pulley with “Taper-Lock” bushing, proceed as follows:

- from hole “A” (Fig. 31 or 32) remove hexagon socket screws
- then screw the same screws in hole “B” . Screw them until the pulley and the bushing are loosened on the shaft
- move the bushing on shaft pin on the motor or the fan (for replacement remove the bushing with pulley and mount a new set)
- screw the screws again in holes “A” until an initial resistance is felt
- set pulleys (Fig. 29) correctly
- firmly tighten the screws alternately until the bushing with pulley is tightened on the shaft pin

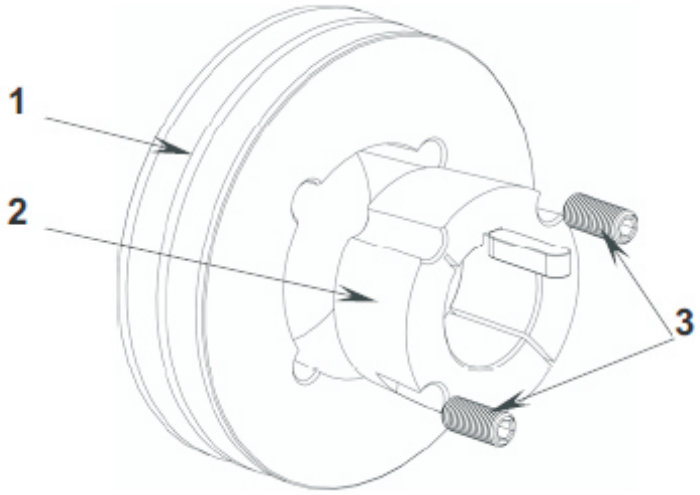


Fig. Pulley and “Taper-Lock” bushing. 1 – Pulley, 2 – Bushing, 3 – Hexagon socket screws.

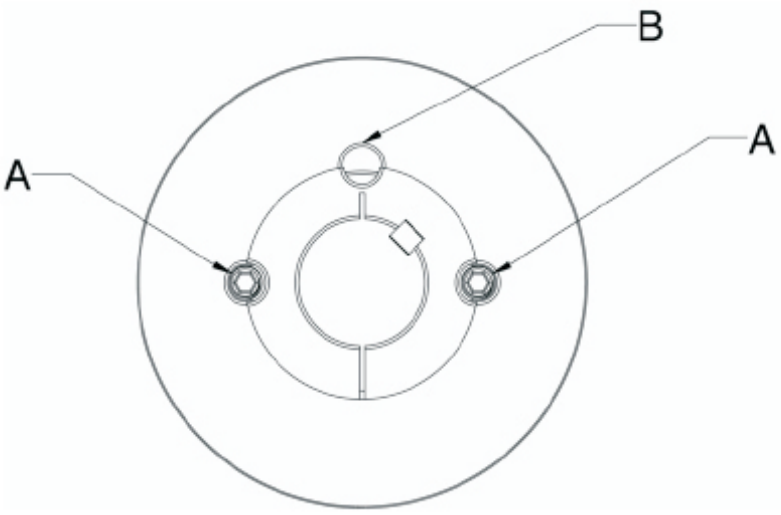


Fig. Pulley with bushings no. 1008 to 3030

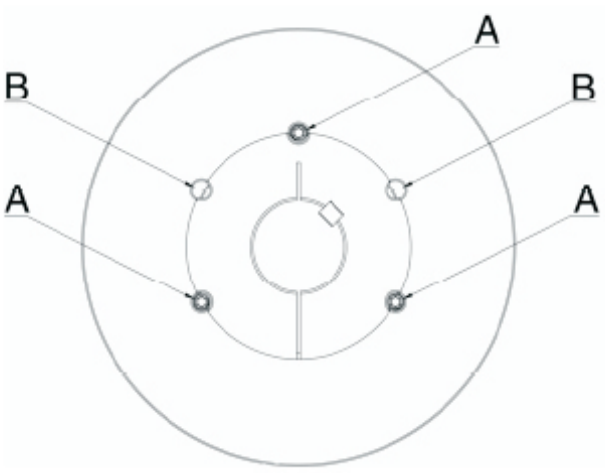


Fig. Pulley with bushings no. 3535 to 5050.

7.6. CONTROL MEASUREMENTS

After having completed maintenance works and inspections, check and adjust functional parameters of the device in accordance with recommendations in item 6. Parameters for noise emission are given individually for each device in Quotation.

Any conducted maintenance and control measurements must be recorded in Inspection and Maintenance Chart.

8. OHS INSTRUCTIONS

- Connection and start-up of the units should be carried out by qualified personnel in conditions compliant with valid regulations, particularly in use of electrical equipment.
- Do not power the system before connecting the unit to protective system.
- Do not carry out any repairs and maintenance without having previously turned off the unit power supply.
- Do not operate the unit with removed inspection panel from any unit section.
- Person in charge of operation, repair or maintenance must be properly qualified and authorised in accordance with regulations valid in a country of the device installation.
- Location of the unit installation must be equipped with the required protective equipment providing safe operation and necessary fire protection equipment in accordance with local provisions.

Due to its design, the device does not emit any hazardous radiation.

Despite the fact that the device has been designed and manufactured in accordance with the standards valid as for the moment of the manufacture start, likeliness of injury and damage to health when using the device is unavoidable. This likeliness is related to frequency of using, cleaning and repairing the device, presence of persons within the danger area, and not respecting the safety rules as set out in the instruction.

Severity of the bodily injury and deterioration of health is dependant on numerous conditions which can be foreseen partially only by considering them when designing the device and by providing descriptions and warnings in the instruction manual.

Therefore residual risk is present if recommendations and instructions are not respected by the operator.

9. DISPOSAL

The device should be disposed of by a company specialized in dismantling and disposal of such devices.

10. INFORMATION

Regular inspections carried out by qualified technical service or by JUWENT Authorised Service Points shall ensure a reliable and problem-free operation for many years. At any time our service technicians can be called up to conduct start-ups of the devices and maintenance works on them, and are at your disposal in emergency situations.
At any JUWENT Authorised Service Point you can order spare parts and consumables for your unit.
When ordering the parts, always give the device type and size, and its serial number. For more information on service points go to our website www.juwent.com.pl.

III. SAMPLE EC DECLARATION OF CONFORMITY
NR: 01/13

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:

Suspended air handling unit

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

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	2012
PN-EN 60204-1+AC	2010/2011
PN-EN 1886	2001
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 air handling units are changed or rebuilt without our consent.

Marking year CE: 2013

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	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