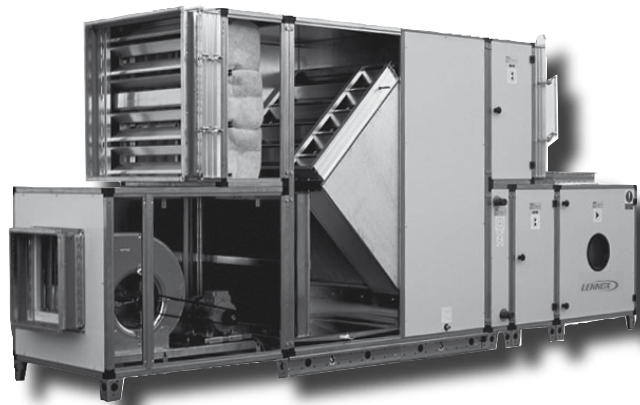


Installation, operating and maintenance **SENATOR 25**



- Providing indoor climate comfort



KLM and KLMC Units PKP 12 7449

Instructions for Use, Assembly and Operation Rules

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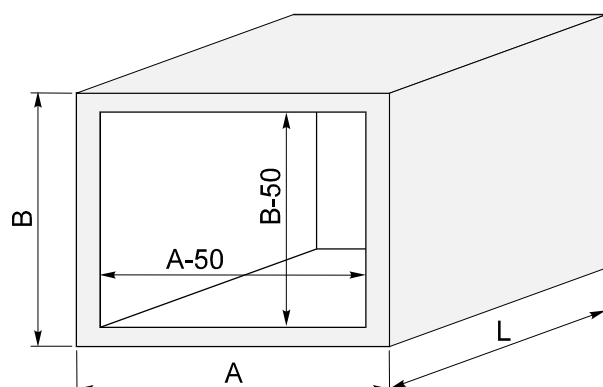
1 INTRODUCTION

- Instructions for use are designed for all air-conditioning units operators as per PK 12 7449 type KLM (Indoor design) and KLMC (Outdoor design). These Instructions contain technical data, instructions for labour safety, instructions for acceptance, transport, assembly, and installation of products, operation information, instructions for maintenance staff, repairs, storage, list of parts subject to wear and tear, information on liquidation and guarantees. Observance of the appropriate data preconditions safe, reliable, and economical operation of the given product.
- Product users are obliged to train product operation and maintenance staff (hereafter referred to as operators), and present to them the instructions as well as all standards and regulations concerning the product operation, namely safety rules.
- It is of vital importance to follow namely safety warnings and notices the negligence of which might cause human injury, destruction of products or their surroundings.
- Operation, cleaning, maintenance, and repairs of the product can only be performed by properly instructed and trained staff based on a responsible employee's instructions.
- Data concerning the appropriate air-conditioning device, regulation set, and electric installation must be contained in the given implementation project.

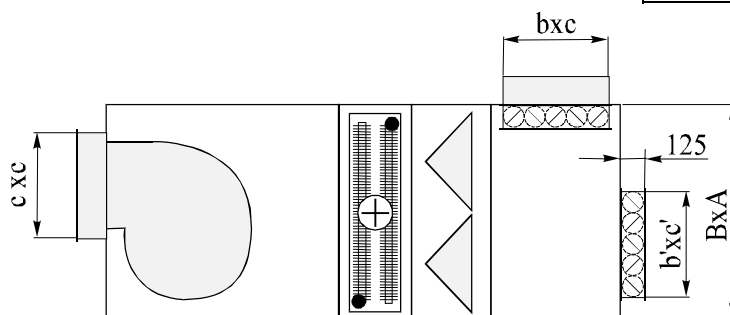
2 USAGE

- Instructions for use, assembly, and operating rules for air-conditioning units as per PKP 12 7449 apply for indoor, outdoor and hygienic design.
- Air-conditioning units are designed for transport and processing of air in low- and high-pressure aeration, heating, and air-conditioning systems without any danger of explosion, off direct influence of atmosphere, within the temperature range around the unit being -20°C to $+40^{\circ}\text{C}$, upon air relative humidity of up to 80%.
- Air flowing through fans must contain no mechanic dirt, fiber dust or mixtures that might settle in the rotating wheel and spiral box, or cause excessive corrosion of steel, aluminum or zinc.
- Outdoor Units are equipped with roof with hydroinsulation sheet against impact of rain and snow. Roofing has service life 20 years and does not need any maintenance during this period. It has high resistance against aggressive impact of atmosphere and industrial air pollution's. The roofing surface has good solar radiation heat reflection and minimal solar radiation heat absorbivity and is resistant against radiation heat up to 80°C .
- At the inlet or outlet rain-protective cover with safety net against birds or rain protective louver could be.

3 TECHNICAL DATA



KLM	A x B
2,5	550 x 550
4	650 x 650
6	800 x 800
10	1000 x 1000
16	1250 x 1250
25	1600 x 1600
40	2250 x 1700
63	2400 x 2250
80	2600 x 2250



Dimensions in (mm)

Unit size	connection						damper		
	External dimensions	to fan chamber	to damper chamber to empty chamber to mixing chamber	to full surface damper	for side damper	for full surface connection	H, S, D design	full surface damper	side damper (placed outside the chamber)
KLM	A x B	c x c	b x c	b x c	b x c	b x c	b' x c'	b' x c'	b' x c'
2,5	550 x 550	250	363 x 208	498 x 408	348 x 408	490 x 400	341 x 210	476 x 410	326 x 410
4	650 x 650	315	458 x 208	598 x 508	348 x 508	590 x 500	436 x 210	576 x 510	326 x 510
6	800 x 800	400	638 x 208	748 x 708	348 x 708	740 x 700	616 x 210	726 x 710	326 x 710
10	1000 x 1000	500	808 x 308	948 x 908	448 x 908	940 x 900	786 x 310	926 x 910	426 x 910
16	1250 x 1250	630	1008 x 408	1198 x 1108	548 x 1108	1190 x 1100	986 x 410	1176 x 1110	526 x 1110
25	1600 x 1600	800	1408 x 408	1548 x 1508	548 x 1508	1540 x 1500	1386 x 410	1526 x 1510	526 x 1510
40	2250 x 1700	1000	2006 x 500	-	646 x 1500	2190 x 1500	1986 x 510	-	626 x 1510
63	2400 x 2250	1250	2126 x 700	-	846 x 2100	-	2106 x 710	-	826 x 2110
80	2600 x 2250	1400	2256 x 900	-	1046 x 2100	-	2236 x 910	-	1026 x 2110

4 SAFETY

- Upon assembly, electric connection, bringing into operation, repairs and units maintenance it is vital to observe the applicable safety regulations and generally accepted technical rules (see Appendix).
- Assembly of units including connection of electric installation, bringing the unit into operation, repairs, maintenance, and operation can only be performed by staff with professional qualifications as per relevant valid standards.
- Upon checking, cleaning, repairs etc. the appropriate unit must be switched off from electric voltage.
- Active liquid access to exchangers must be sealed off. Works on water heaters can only be started after the temperature drops to +40°C.
- Upon assembly, at least at one point chambers must be joint in a conductive manner, e.g. as per Fig. 3 or 4.
- Exchangers can be used only for those work conditions for which they were supplied. Upon fan operation stoppage active liquid intake to heaters must be stopped simultaneously.
- Fans are deposited in chambers on flexible shaking dampers. Electric connectors and grounding conductors cannot prevent free movement of fans. Conductors must be terminated e.g. by loops.
- Fans can be run only with built-in protective covers. On fan chambers doors safety signs are placed reading: "Take off protective cover only when the device is idle." Data signs and safety signs must be kept intact and clean.
- When releasing active liquids from exchangers, their temperature must be below +40°C.
- Air-conditioning units cannot be used for other operating conditions but those for which they were supplied. The manufacturer is not responsible for any potential damage caused by improper use, while the entire risk is borne by the user.
- Upon transport and removal separate chambers or the entire unit must be transported only using high-lifting carts or conveyor belts, while valid standards must be followed. Active liquid must be taken out of exchangers.
- Any changes or modifications to air-conditioning units that might influence their safety can only be performed on the basis of the manufacturer's approval.
- When using air-conditioning units all instructions stated herein must be followed.
- Air-conditioning units put out of operation or units with only the cooling chamber for summer cooling must be prevented from freezing by releasing water and/or condensate from all parts of such a unit. In order to release water, piping close to connection necks must be fitted with air and discharge valves so that no other fitting be between exchangers and valves. Residual water must be removed by pressurized air flow. Anti-freezing protection must also be installed in units that are not constantly operated, e.g. back-up units. Recommended protection of heaters against freezing under operation is given in "Anti-Freezing Protection" Chapter.

5 SUPPLIES, TRANSPORT, TAKING-OVER AND STORAGE

5.1 Supplies

- Each supply includes a complete product as ordered including original technical documentation.
- Accompanying technical documentation includes:
 - certificate of quality – protocol on tests
 - instructions for use and operation – PKP 12 7449 and technical sheet of transmissions
 - proof of identity
 - transfer specifications
 - assembly and operation rules concerning electric air heaters – see par 7.7
 - technical information – assembly instructions concerning gas burners – see par 7.8
 - list of parts supplied

5.2 Transport

- Air-conditioning units are supplied by separate chambers on frames with prepared roof or partly assembled. Air-conditioning are supplied packaged.
- Electric engines with axis high 200 mm and more are transported separately on pallets.
- **Fan chambers from size KLM and KLMC 25 are equipped with transport holding fixture which is protecting flexible mounting of fan against damage during the transport.**
- **Before starting fan for the first time: Remove the shipping clamps fitted to the anti-vibration mounts!**
- Upon transport and removal separate chambers or the entire unit must be transported only using high-lifting carts or conveyor belts.

5.3 Taking-over

- Upon taking-over it is vital to check whether or not the product was supplied in the agreed design and extent including original technical documentation and whether or not it was damaged during transport.
- Taking-over and transport methods or other regulations are agreed in the appropriate purchase contract.

5.4 Storage

- Air-conditioning units must be stored in dry and dust-free areas where the temperature of surrounding area does not drop under +5°C and must be protected against mechanic damage, contamination or corrosion.
- During storage at the buyer it is necessary to manually rotate the fan and electric engine shaft at least once each fortnight to lubricate the bearings and protect them against corrosion.

6 ASSEMBLY AND INSTALLATION

6.1 Launching assembly

- Air-conditioning unit assembly can only be performed by a professional natural or legal entity with an appropriate valid authorization.
- Connection and grounding of engine electric device as well as the entire electric installations must comply namely with valid standards, applicable rules, given environment and with regard to safe operation all works can be performed only by professionally qualified staff as per valid standards.
- Prior to launching assembly it is necessary to check whether or not the air-conditioning unit was stored as per the terms pursuant to par 5.4.
- Upon manipulation with the air-conditioning unit protective gloves should be worn.
- Upon manipulation and lifting separate chambers or the entire unit can be transported only using high-lifting carts or conveyor belts, while the regulations of valid standards must be followed.

Warning: The air-conditioning unit cannot be transported above humans.

- Suspension eye on the electric engine is designed only for lifting of the electric engine upon assembly and disassembly.

6.2 Minimum Mounting Clearance

- Minimum Mounting Clearance must be keep according to fig. 1

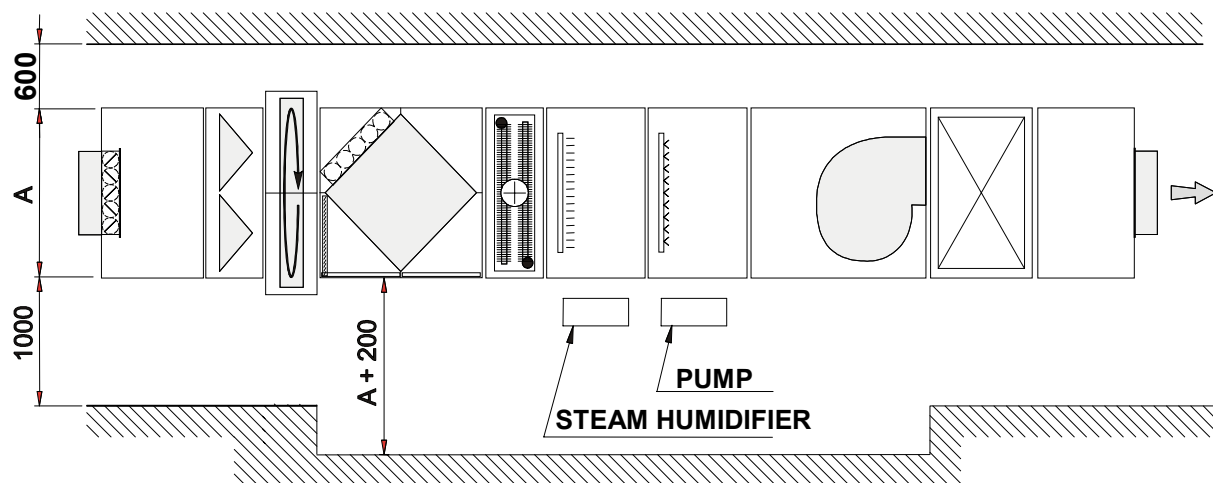


Fig. 1 - Minimum Mounting Clearance (top view, right hand maintenance side)

6.3 Assembly procedure

- Prior to assembly all parts of the air-conditioning unit and chambers must be checked for their status and completeness. Any defects must be removed prior to assembly. As regards air-conditioning chambers, electric engine and fan bearings light operation is checked as well as the status of insulators shaking, status of paint and conductive connection of the fan with the chamber body.
- Status and tightness of V-belts must be checked according to Technical sheet of transmission. In sheet are given minimum a maximum deflection forces at installation a retensioning and belt deflection (cca 24 operating hours). to Technical sheet of transmission is put in plastic folder in fan chamber (together with Operating instructions).

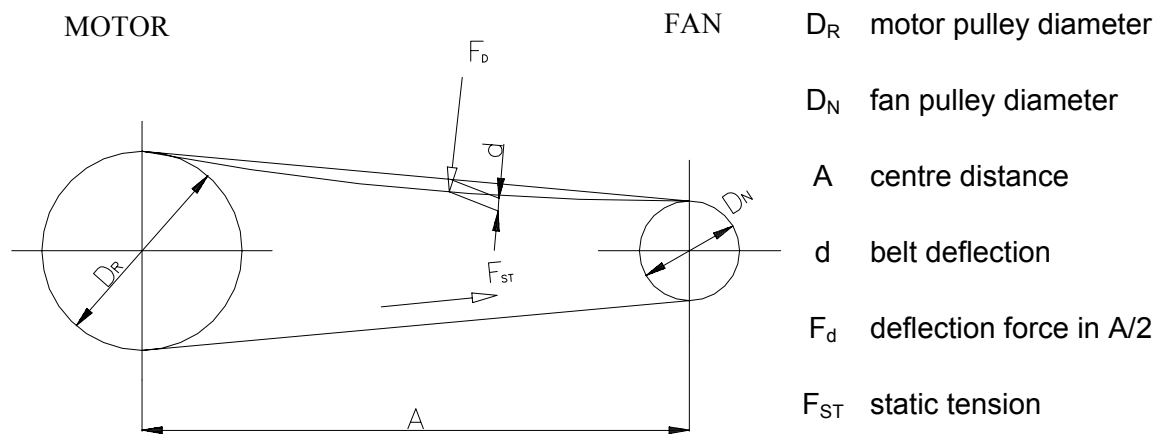
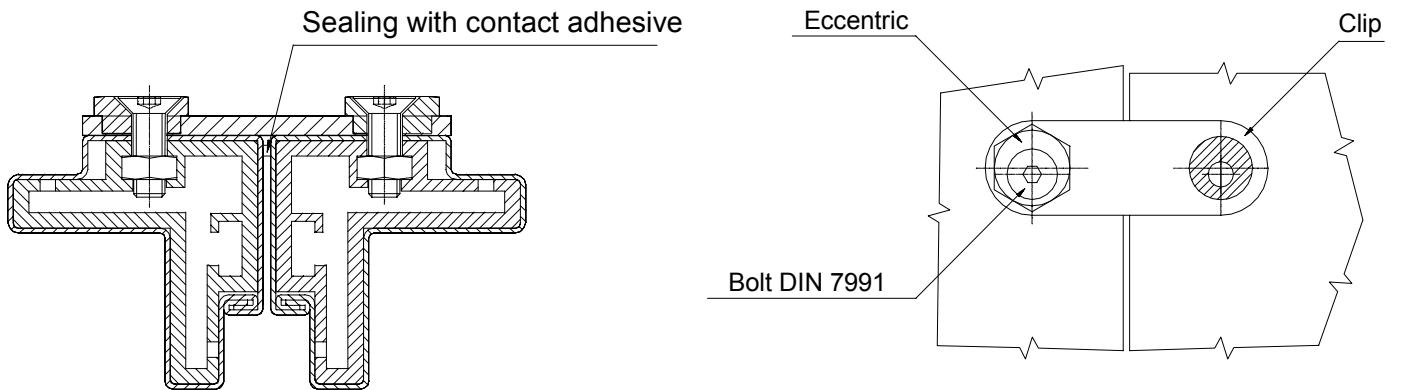


Fig. 2 - V-belts tightness

- Unit must be put on the basement. Basement must be enough solid for unit weight, smooth and horizontal.
- As for an air-conditioning units set that includes a water moisturising chamber, all the other chambers of such a set must be fitted with feet of the height of 450 mm. Feet of the height of 450 mm including bolts and nuts to be fitted onto the existing feet of the height of 150 mm are included in the given supply and are supplied disassembled.
- Water moisturising chamber pumps are assembled as per the instructions of their manufacturer stated in pump operation instruction manual which is included in the given unit supply.
- As regards units of rack design, top unit chambers feet are disassembled prior to assembly.
- Arrows on filtration, damper and mixing chambers show the direction of air flow.
- Self-adhesive sealing must be applied on contacting surfaces in one of chamber front openings.
- As regards rack design sets and separate sets (intake or outlet), chambers are connected as per Fig. 3a. Conductive connection of chambers must be secured as per par 3 and 4 at the place of chambers angle iron. In case insufficient conductive connection (e.g. when unit has painted profiles), chambers must be connected according to Fig. 4. All elements necessary for chambers connection are included in the appropriate supply.
- For unit sets placed above each other it is recommended to stick between up and down section self-adhesive sealing VITOLEN 3 x 6 mm before assembling.
- Units in outdoor design are equipped with tin roofs. Roofs are supply with unit and are mounted after chamber assemblage. Roof must be fasten in unit by rivets or screws (max. spacing 400 mm). Rivet or screw heads must be sealed (e.g. silicon sealant). Roof joining must be covert by tin fillet. Assembly material (rivets, screws) is not part of our delivery.



BOLT M6x20 – KLM 2,5 to 25

BOLT M8x25 – KLM 40 to 80

Fig. 3a - Chambers connection (vertical arrangement)

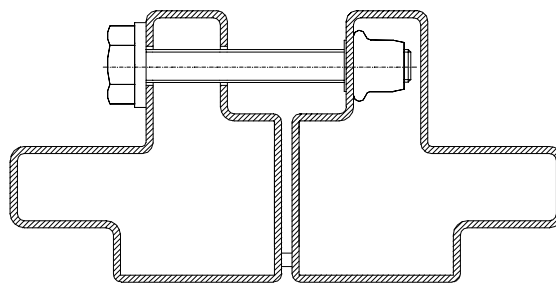


Fig. 3b - Chambers connection (rotary heat exchangers and horizontal arrangement)

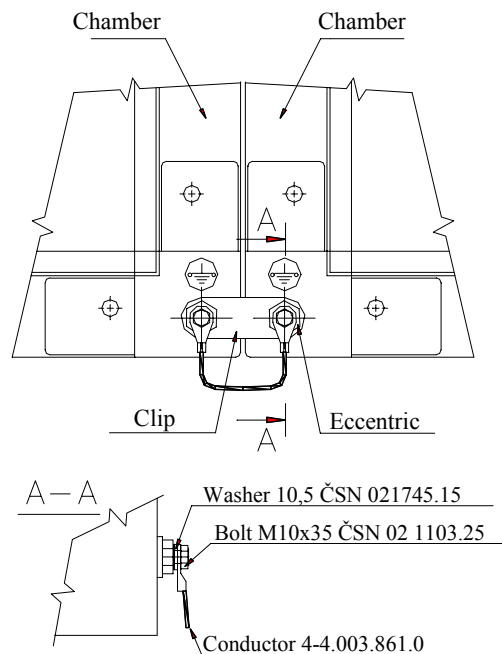


Fig. 4 – Conductive chambers connection

- Heating and cooling chambers are equipped with signs showing the manner of exchangers connection in reverse current – see Fig. 5.

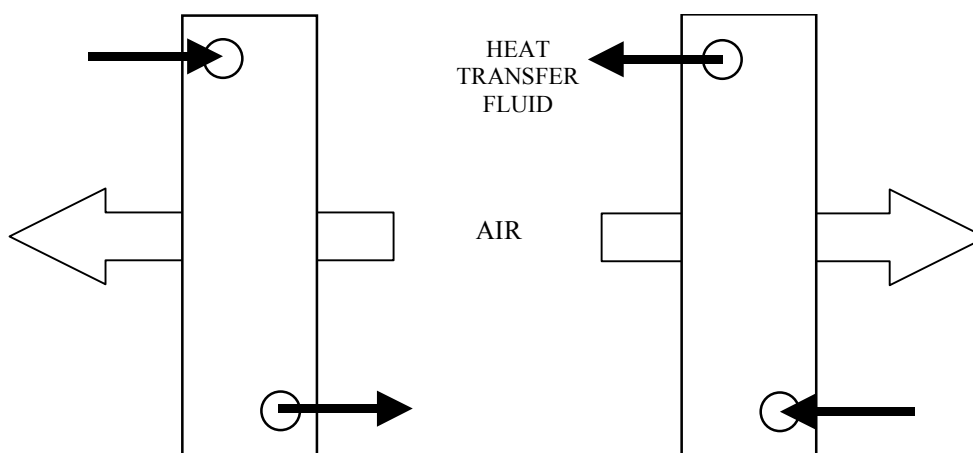


Fig. 5 – Exchangers connection

- Piping of active liquids is not allowed to influence the chamber by its weight and dilatation forces. Air-conditioning piping connected to the chambers must be suspended separately to avoid any influence on chambers dampening inserts by its weight.
- All connections including electric ones and connection of automatic regulation set parts must not prevent operation and maintenance of the given air-conditioning unit. Electric power connections are fitted on fan chambers to electric engine terminal block by a flexible cable via seal inlets. Installation of temperature sensors and sensing units is recommended near chamber profiles. Each such an opening in profile must be properly sealed. Capillary sensing unit of anti-freezing protection is suitable to be placed on metal-sheet parts of exchanger outlet side.

6.4 Water closures

- All outlets to cooling chambers sewage, ZTZ, water and steam moisturising must be connected because of faultless operation via odour-preventing water closures as per Fig. 6. Separate closures are used for each chamber separately. Odour-preventing water closures are included in the given chambers supply. Odour-preventing water closures are constructed for the maximum chamber under-pressure of 700 Pa. Upon a higher under-pressure it is necessary to use an odour-preventing closure determined as per the following formula:

in unit under-pressure section: $h_1 \text{ min} = -\Delta p/10+10 \text{ (mm)}$ $\varnothing D = +\Delta p/10+5 \text{ (mm)}$

in unit over-pressure section: $h_2 \text{ min} = +\Delta p/10+10 \text{ (mm)}$;

where $\Delta p = p - p_{\text{bar}}$ (Pa) is the highest possible pressure difference at the given place of the unit compared to atmospheric pressure. For the purpose of determining Δp pressure difference, filters choking up to a double value of pressure loss compared to clean filters is considered.

Warning:

In the period of use, odour-preventing water closures must be flooded with water, in the period of no operation odour-preventing water closures must be blinded.

Visual tests are sufficient to find if an odour-preventing water closure is suitable for the given unit. When the device is working, water must not be sucked in the chamber after flooding odour-preventing water closure.

The maximum length of extension piping after odour-preventing water closure (siphon) can be 10 cm, while condensate piping must then be mouthed into free atmosphere.

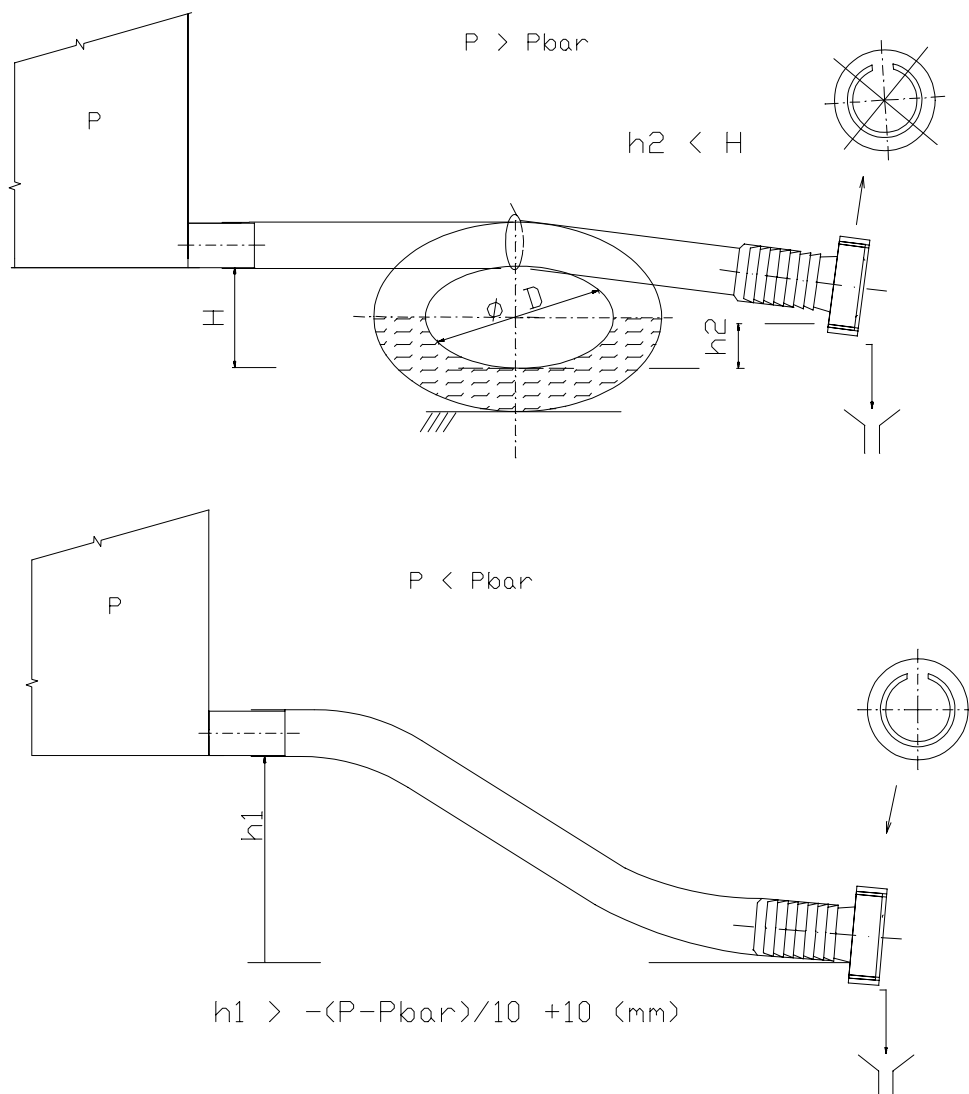


Fig. 6 – Odour-preventing water closures

7 OPERATION

7.1 Bringing into operation

- Air-conditioning unit can be brought into operation only by a duly trained and instructed person observing all related safety rules and standards.
- Upon the temperature of outside air under +5°C, prior to running a fan, active liquid intake to heater must be opened. Heated air temperature cannot exceed +40°C.
- Check carefully according to name plate correct assemblage of unit chambers (must be the same like in project).

LENNOX®				
TYPE	KLM/VN.VT 6 S/P			
SERIAL No.	965	Weight	82	kg
Standard CE		Certificate No.		
Order ID	AHU 0090/01	Manufacturing date	2001	
Max. Operating Pressure	-	Pa		
Max. Operating Temperature	-	°C		
Customer No.	AHU 7			

7.2 Fans

- Prior to bringing in operation, electric engines with axis height 200 mm and higher (including pulleys) are fitted into chambers and connected by a conductive cable to chamber body.
- Single-revolution electric engines connection schemes are given on electric engines terminal blocks caps, double-revolution electric engines connection schemes are given in the Appendix.
- **Fan chambers from size KLM and KLMC 25 are equipped with transport holding fixture which is protecting flexible mounting of fan against damage during the transport.**
- **Before starting fan for the first time: Remove the shipping clamps fitted to the anti-vibration mounts!**
- Before starting a fan for the first time, it is necessary to measure electric engine insulation resistance as per valid standards, to prevent any potential damage of the engine. Upon a test run a protective cover must be fitted in the given chamber with open doors, while the proper direction of fan rotating wheel rotation is checked according to an arrow on the spiral box.
- Fans can be run after connecting the given unit to an appropriate piping network and chambers must be fitted on all panels. Upon the first run of a unit electric engine intake must be measured.
- Electric engines must be protected against short circuit and overload. Electric engines must be protected by over current relay against thermal overload by over current. If such a relay is not included in the engine, it must be installed in the electric engine intake electric circuit.
- When fan operation is stopped or electric power supply interrupted, active liquid intake in heaters must be limited so that fan and electric engine surrounding temperature cannot exceed + 40°C.
- When replacing V-belts a whole set is replaced at once. When tightening V-belts, regulations and valid standards must be followed.
- During the first two days of operation, bearings must be paid close attention to. Bearings temperature cannot exceed + 80°C. As soon as this temperature is reached, the appropriate fan must be stopped and run again after the bearings cool down. Increased temperature might be caused by an over-lubricated or insufficiently lubricated bearing, defective lubricant, defective bearing, or over-tightened belts.
- In order to make assembly easier upon connecting electric cable to electric engine terminal block it is recommended to incline the electric engine in the bottom position. When connection is finished, V-belts must be tightened again as per par 6.2.

7.3 Filters

7.3.1 Fabric filter chambers

- Filtration inserts and pressure-meter are transported separately. These are fitted after the unit is assembled and the entire air-conditioning unit cleaned. Each filtration insert must have self-adhesive sealing applied on one vertical side of the frame (sealing included in chamber supply). Prior to bringing the chamber into operation, pressure-meter tank is filled with a non-freezing liquid. The pressure-meter tank is placed on the unit panel.
- During operation, filtration inserts are gradually choked and their pressure loss is increasing. Pressure loss is measured by pressure-meter. Should the pressure loss be increased to a double of the pressure loss with clean filters, filtration inserts must be changed. Both values should therefore be marked on the pressure-meter. Regeneration (cleaning) of inserts is not performed. Each new filtration insert must be equipped with self-adhesive sealing, see previous paragraph.

7.3.2 Activated carbon filter chambers

- Filtration cartridges with activated carbon are transported separately. They are fitted in chambers upon final assembly after cleaning the entire air-conditioning device.
- During operation, filtration inserts activated coal surface is getting clogged and gradually lose their absorption abilities. Activated coal saturation level is determined according to the increase in absorption filling weight. Filling replacement is recommended upon reaching the maximum of 1.5 multiple of clean activated carbon weight.
- Servicing and replacing absorption inserts is recommended to be performed by a professional company equipped with special desorption devices and performing activated carbon regeneration. Air-conditioning units manufacturer does not provide this service.

7.3.3 Metal filter chambers

- Metal filters are transported in air-conditioning unit chamber. Upon operation, filters are gradually clogged with dust and therefore must be cleaned, most preferably upon fabric filters replacement. Cleaning is performed by beating-out larger deposited granules and the first rinse with a detergent liquid in warm water and sufficient rinsing of the filter in clean water.

7.4 Exchangers

- Before bringing into operation, connection of active liquids to exchangers is checked, as well as filling odour-preventing water closures with water, function of closure valves and dewatering of chamber. Upon launching operation, exchangers must be deaerated.
- Water for water exchangers cannot contain any impurities that cause clogging, namely steel and alloy parts corrosion products. In order to prevent an origination of such impurities it is necessary to use chemically treated water of the following parameters:
 - hydrogen exponent pH 7 – 9
 - water hardness 1,0 mval.l⁻¹
 - chlorine contents max. 30 mg.l⁻¹
 - phosphate contents converted to P₂O₅, min. 15 mg.l⁻¹
- Exchanger ribs are cleaned in the direction opposite to the direction of air flow by means of pressurised air blow.

Warning:

In winter periods upon stopping the unit operation, e.g. upon electric power supply failure, it is necessary to bear in mind the danger of exchanger freezing.

7.5 ZTZ chambers with plate exchanger

- These chambers have no special requirements for operation and maintenance apart from exchanger plate fins blowing with pressurised air from time to time. Damper conditions must also be checked, see "Damper chambers" section.

7.6 ZTZ chambers with rotating exchanger

- These are supplied already assembled only with one-piece exchanger including supporting feet.
- For unit sets placed above each other, chambers are supplied partly covered with metal sheet in front and fitted with M8 riveting nuts for connecting to air-conditioning chambers.
- Power supply of driving electric motor is 3 x 400 V but, if required by customer, the rotary heat exchanger can be equipped with a frequency changer powered from 1 x 230 V and with the control signal within the voltage scope of 0-10 V.

Assembly procedure:

Unit chambers are placed with a sealing on the front surface of a rotating exchanger and are connected by M8 x 35 hexagonal head bolts.

- As for sets placed next to each other, rotating exchanger chambers are connected to units via connecting free chambers the height of which equals the height of rotating exchanger chamber, while their width equals the width of separate air-conditioning units chambers. Assembly procedure is the same as in the previous case. Both units sets (outlet and intake) are placed close next to each other without any space between.
- A frequency changer of revolutions is supplied if exchanger rotor revolutions are required to be regulated in a stepless manner. Instructions for assembly and operation of frequency changer are included in the supply.
- Cleaning is performed by pressurised air blow or by steam – WAP.

7.7 Electric heater chamber

- Data on electric heater is given in assembly and operating instructions of electric air heaters including electric connection. These instructions are supplied with each electric heater. Work with electric heater can only be performed by a properly qualified staff as per the valid standards.
- **Electric heater must not be switched on before bringing unit into operation.** It is therefore necessary upon electric installation to secure a possibility of switching electric heater only after running the appropriate fan. After switching off electric heater, the unit is run for at least 3 minutes to cool down heating bodies.
- Electric heater must not be used in explosive ambient, near electric heater must not be stored easy combustible and explosive matters.
- If is in front of electric heater put filter chamber with bag filters, is necessary carefully check before starting fan for the first time whether filter are not tear and if filter do not touch heating rods!

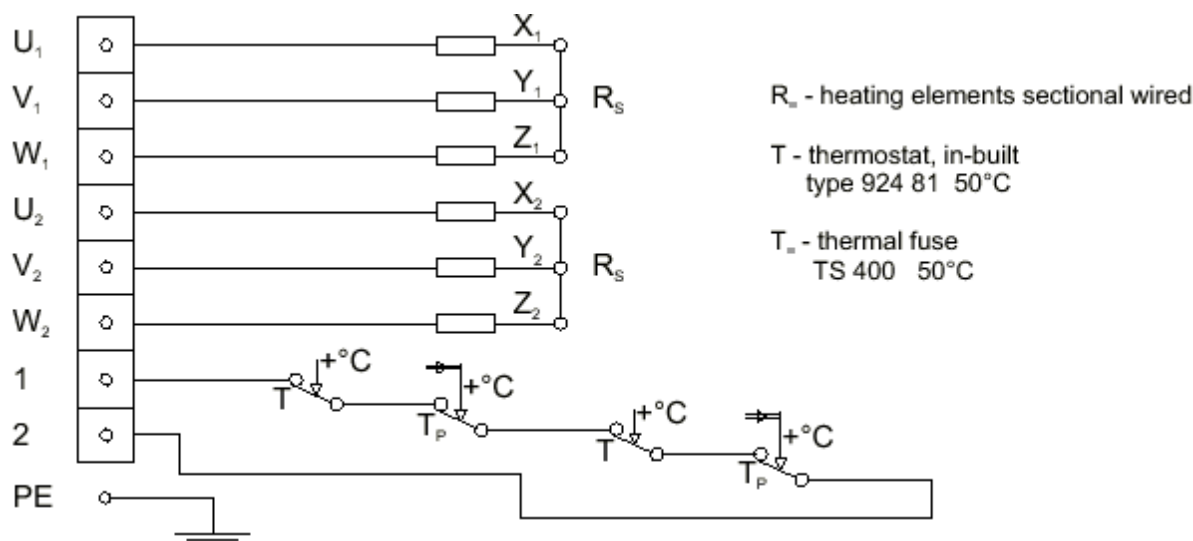


Fig. 7 – Example of wiring diagram of electric heating (see operating instructions of electric air heaters!)

7.8 Gas heater chamber

- Data for gas burners used in gas heaters chamber is given in "Technical Information – Assembly Instructions" supplied together with gas heater.
- Connection to gas distribution can only be performed by a natural or legal entity with the applicable authorisation.
- **Gas burner must not be switched on before bringing unit into operation.** It is therefore necessary upon electric installation to secure a possibility of switching gas heater only after running the appropriate fan. After switching off electric heater, the unit is run for at least 10 minutes to cool down heating exchanger.

7.9 Dampers and Damper chambers

- Prior to assembling chambers into the given air-conditioning unit and bringing into operation, assembly of dampening inserts placed on the bottom side of chambers is performed. Upon transport, these dampening inserts are placed inside the chamber because of protection against damage.
- If a surface-wide damper (transported separately with dampening insert) is in an air-conditioning unit set, it is fixed onto the appropriate chamber using M8x20 and M6x20 hexagonal head bolts, and M8 and M6 riveting nuts. Bolts and nuts are supplied together with the damper.

Assembly procedure:

Damper is set onto chamber, according to the openings in damper flange holes are marked and drilled on air-conditioning unit chamber for riveting nuts in the upper and bottom profile of the diameter of 11,2 mm and in vertical profiles holes of the diameter of 9,2 mm are drilled. Riveting nuts are then riveted to the openings. On such an air-conditioning flange sealing is applied and damper fitted to chamber using bolts.

- Dampers for KLM 10 and higher have two operating rods that are connected with a connecting rod before connecting a power unit (connecting rod included in damper supply).

- Dampers controlled by power unit are supplied with operating shaft free end (diameter of 12 x 12 mm) to fit on a power unit. Power units to be used: BELIMO, JOHNSON CONTROLS, LANDIS & STAFA etc.
- Prior to bringing a damper into operation it is recommended to test power unit at idling and set damper end positions. Potential damage of the power unit is thus prevented.
- Regular visual checking of dampers upon unit idling – damper light operation, fastening power unit – together with chambers cleaning are recommended to be performed once a quarter.

7.10 Mixing chambers

- Prior to assembling chambers in an air-conditioning unit and bringing into operation, assembly of inserts placed on the bottom side of chambers is performed. Upon transport, these dampening inserts are placed inside the chamber in order to prevent their damage.
- Filtration inserts and pressure-meter are transported separately. These are fitted after assembly of the air-conditioning unit and cleaning the whole air-conditioning device. Before bringing chamber into operation, pressure-meter tank is filled with non-freezing liquid (pressure-meter tank is placed on the air-conditioning unit panel).
- During operation, filtration inserts are gradually clogged and their pressure loss is increasing. Pressure loss is checked by pressure-meter. Should the appropriate pressure loss grow to approximately a double of the pressure loss with clean filters, filtration inserts must be replaced. Therefore it is recommended to mark both of these values on the pressure-meter. Regeneration (cleaning) of inserts is not performed.

7.11 Silencer chambers

- These chambers have no special requirements for operation and maintenance apart from chamber walls and dampening curtains cleaning by vacuum-cleaner from time to time. It is performed after taking off upper panels and taking out inserts from the chamber.

7.12 Empty chambers

- These chambers have no special requirements for operation and maintenance apart from cleaning from time to time which is performed upon chamber panel being taken off.
- Before assembling chambers in air-conditioning unit and bringing into operation dampening inserts are fitted on the bottom side of chambers. Upon transport, these dampening inserts are fixed inside chambers to prevent their damage.

7.13 Steam moisturising chambers

- Upon assembly and operation of steam moisturiser it is necessary to follow the appropriate manufacturer's instructions. Steam moisturiser pipes are upon assembly inserted through the appropriate opening at the chamber side. Required size of opening in metal sheet cover is cut upon assembly.

7.14 Water moisturising chambers

- Data on water moisturising chamber is given in assembly and operating instructions issued by the supplier. These instructions are supplied together with each chamber.
- Chambers can be operated only upon air-conditioning unit fan switched on to have air flowing through the chamber. Otherwise the eliminators cannot fulfil their function and water drops penetrate to neighbouring chambers. Time switching must secure fan operation approximately 20 seconds before switching on and switching off the circulation pump.

Water moisturising chambers cleaning using disinfecting preparations!

- At least once a week it is necessary to perform disinfecting of chamber inside using a disinfecting liquid, e.g.:

chlordetal	2%
alcon 12	0.5%
alcon 14	0.5%
orthosan	0.5% (use only exceptionally)

Using other preparations must be consulted with the local authorised hygienic station!

- disinfection is performed with the pump and fan switched off
- prior to discharging water from chamber, mechanic slime from tub walls must be removed
- disinfection preparation should be poured in water, pump should be run and left running for about 30 minutes
- discharge water from the chamber, fill it with clean water, switch on pump for a while and then discharge the contents of the chamber. Repeat the procedure until only clean water without foam is running out
- fill the chamber with clean water and bring the entire air-conditioning device into operation
- apply SAGEN according to the instructions on package
- At least once every two days water tank should be discharged and sprinkled with pressurised water, namely at the water level, as well as corners and bottom. Upon cleaning, no brushes can be used, hose ends cannot touch the inside of the chamber. Then fill the chamber with clean water and bring the entire air-conditioning device into operation. Apply SAGEN according to the instructions on package.

Moisturising water chambers cleaning using UV radiators

- This new method secures perfect bacteriological purity of water in the shower chamber water circuit. It requires no disinfection preparations and it produces no health or environment harmless substances. It causes no corrosion of materials either.
- Desinfection unit with UV radiator is placed directly in the circulation water circuit. Upon lower water flow it is recommended to create a separate water circuit where water circulates only between the UV radiator and shower chamber tank. Bacteria originating during operation inside the chamber is washed away by circulation water to the UV radiator area where it is eliminated instantly. Device operation can be fully automatic, water exchange can be performed approximately once a month. UV radiators can be ordered from air-conditioning units manufacturer.
- Regularly, approximately once in two weeks it is necessary to check water sprinkling in jets. If the jets are choked it is necessary to clean them or replace them, e.g. during water exchange.

Note:

Manufacturer recommends shower chambers to be installed in machine rooms with water-tight insulation on floors, inclination and sewage connection.

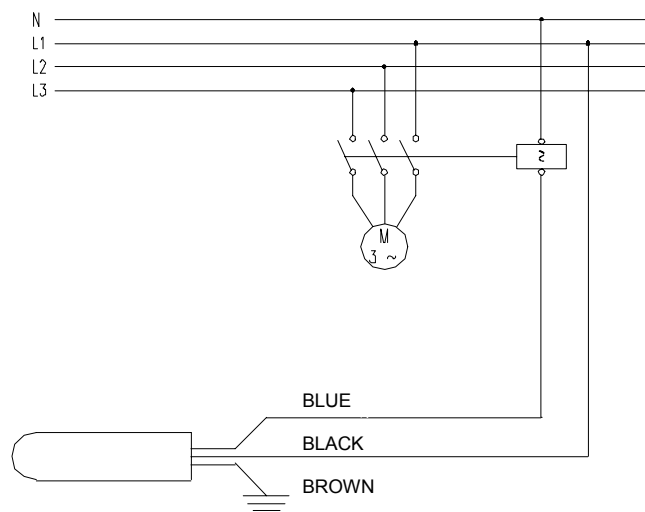


Fig. 8 - Connection of water flow switch

7.15 Checking under operation

- Under operation, function and operation of all air-conditioning unit chambers are monitored, as well as tightness of joints and fixing of panels, temperature of active liquids and transported air, and pressure loss of air filters.

7.16 Checking at idling

- conditions and tightness of V-belts are checked according to valid standards
- cleanliness of fan interior, namely rotating wheel
- filters choking checking
- dampers light operation
- power units fixing

8 MAINTENANCE

- Maintenance and operation of electric devices can only be performed by staff with professional qualifications as per valid standards
- Electric engines, pumps and power units are maintained as per their manufacturers instructions.
- Throughout their life it is necessary to maintain all signs clean and intact.

8.1 Disassembly

8.1.1 Fan disassembly

- Fan rotating wheel disassembly requires a remover. No other special tools are necessary. Remover is not included in the supply.

Bearings tightening procedure

After putting a bearing on shaft, holding-down nut is manually screwed tight. The nut is then tightened by a wrench by further 90°.

8.1.2 Electric engines disassembly – up to KLM 16 size

- Release transmission belts by setting tipper tightening bolt nut to lifting so that belts can be taken off via belt pulleys. After taking off belts the electric engine is disassembled by releasing bolts which hold it to the tipper. Then the electric engine is pushed out through the chamber service side.

8.1.3 Electric engines disassembly – up to KLM 25 size

- Release transmission belts by releasing slide rails tightening bolts and releasing bolts that hold the electric engine on slide rails. Then the electric engine is pushed out through the chamber service side.

8.1.4 Disassembly of exchangers from heating and cooling chamber

- Exchanger can be pushed out after taking off the side panel.

8.1.5 Belt pulleys disassembly

PULLEY REMOVAL (system Taper-Lock®):

- Remove the 2 screws and put one of them in the extraction threaded screw. Screw in fully. The hub and the pulley will separate from each other. Remove the hub and the pulley by hand without damaging the machine.

PULLEY INSTALLATION (system Taper-Lock®):

- Clean and de-grease the shaft, hub and conical bore of the pulley. Lubricate the screws and install the hub and pulley. Position the screws without turning them. Place the assembly on the shaft and screw in the screws alternatively and evenly. Using a mallet or a hammer with a wooden wedge, tap on the face of the hub to keep the assembly in place. Torque the screws. Take the pulley in both hands and shake it vigorously to make sure everything is in place. Fill the holes with grease for protection. NOTE: During installation, the key should never protrude out of its groove. After 50 operating hours, check that the screws are still in place.

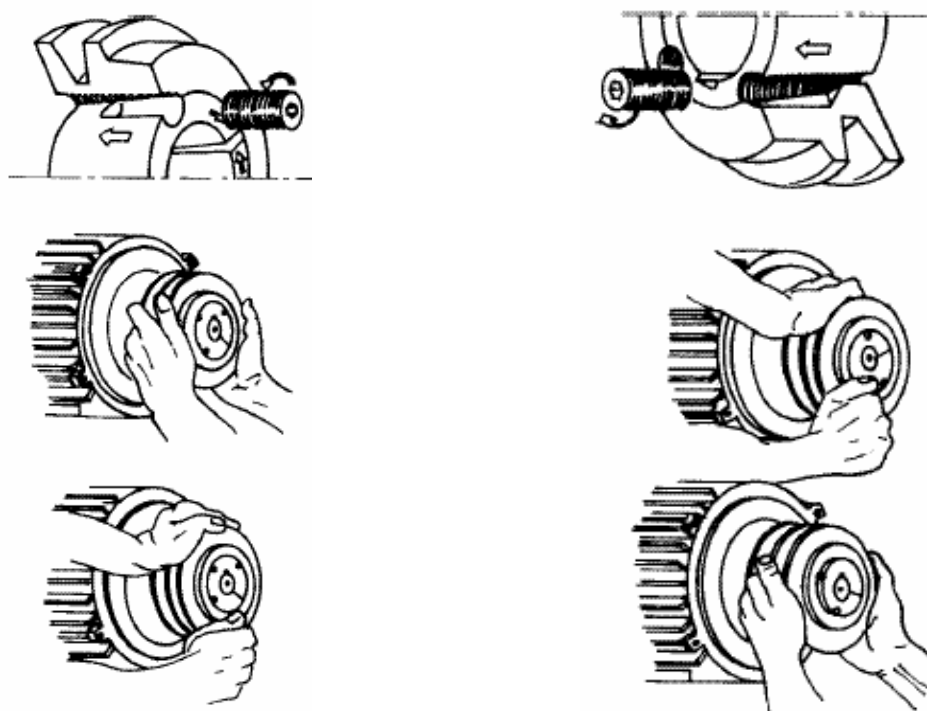


Fig. 9 - Pulley installation and removal

Bush Taper-Lock®	Tightening torque of screw (Nm)	Number of tightening screw (pcs)	Screws with internal hexagon (")	Spanner (mm)
1108	5,6	2	1/4"	3
1210	20	2	3/8"	5
1610	20	2	3/8"	5
1615	20	2	3/8"	5
2012	30	2	7/16"	6
2517	50	2	1/2"	6
3020	90	2	5/8"	8
3535	115	3	1/2"	10
4030	170	3	5/8"	12

Table. 1 - Bush Taper-Lock® used in air handling units Janka

8.2 Back-assembly

- A reverse assembly procedure is applied.

9 REVISIONS AND REPAIRS

Product revisions are performed once a quarter. The following is checked primarily:

- interior surface cleanliness, namely the rotating wheel
- bearing conditions verification
- electric engine and bearings light run
- paint conditions
- main bodies functionality
- sealing conditions
- Defects found and removed are recorded in the "Book of repairs and revisions" that must be kept by the product user.
- For the purpose of fast removal of defects, table 2 gives potential causes of defects as well as hints for their removal.

Table 2 – Defects and Repairs

Defects	Possible causes	Repairs
Air-conditioning unit fails to reach the prescribed output	closed slide valve or damper in air ducts or on unit	open closing parts
	choked or clogged air ducts, rotating wheel etc.	clean air ducts, rotating wheel etc.
	pressed and choked air ducts	repair and straighten air ducts
	choked filter	replace filter
	wrong rotating wheel rotation direction	change phase poles on electric engine
	air-conditioning values do not correspond with the expected values	according to air-conditioning device designer or unit manufacturer
Excessive shaking of fan	unbalanced rotating wheel, clogged wheel, sediments on wheel	balance the wheel or replace with a balanced one, clean wheel
Electric engine bearing is heated excessively	defective bearing	replace bearing
	bearing damaged upon assembly	
	higher temperatures around bearing	decrease surrounding temperatures
Loud bearing	defective bearing	replace bearing
Water fails to drain from cooling chamber	siphon not connected	connect siphon
	discharge pipe clogged	clean discharge pipe
	siphon outlet is connected to a too long pipe, or closing elements	shorten pipe, or remove all closing elements
Non-functional dampers	small power unit	change power unit
	defective power unit	replace power unit

9.1 Spare parts

- Spare parts can be ordered for potential repairs. Spare electric engine, helical springs, combined springs, V-belts, and bearings are ordered by users at the manufacturer.

9.2 Fan chambers

- One chamber is considered to require one set of bearings, one set of V-belts, and one set of sealing. Electric engine type, V-belt type, and belt pulley type are given in transmission specification supplied with each fan. An overview of bearings used is given in the Appendix.
- The expected life of fan bearings and V-belts upon maximum 16-hours operation is approximately 2 years.

9.3 Filtration chambers

- Filtration inserts dimensions comply with the European standard. Composition of filtration inserts for separate sizes of chambers is given in the Appendix. Filtration inserts replacement interval depends on operating conditions. Spare filtration inserts can be ordered from the manufacturer.

9.4 Exchanger chambers

- No spare parts are required. If an exchanger is damaged, it can be ordered from the manufacturer. Such an order must contain the following:
 - unit size, exchanger type – water or Freon, number of rows, with water exchangers – water channels number, fins pitch, with Freon exchangers – cooling circuits number
 - original exchanger marking (given on exchanger manufacture sign)

Other chambers require no spare parts.

9.5 Supposed service life of AHU parts

Table 3 - Supposed service life of AHU parts

AHU part		Service life	
		hours	years
Unit chambers, tin parts	in front of cooler or air washer		30
	behind front of cooler or air washer		10
Rubber sealing of doors and revolution parts			max. 10
Fan and motors bearings		max. 40 000	
Belts		12 000	
Motors			10
Fans	in front of cooler or air washer		30
	behind front of cooler or air washer		10
Coils	water heaters		15
	water and direct coolers		max. 10
Filters		according to load and pressure drop	
Dampers	low dustiness area		10
	height dustiness area		5
Heat recovery	plate desk exchangers		15
	rotary heat exchangers - belt		10
Silencers	in front of cooler or air washer		30
	behind front of cooler or air washer		10

10 LIQUIDATION

- Expected air-conditioning unit life upon observing operation and maintenance terms is given in Table 3. After product life is expired and the product is liquidated, it is necessary to follow the Act No. 125/97 of the Coll.
- Iron and non-iron metal must be liquidated in a scrap-yard.
- Fabric filters can be liquidated by combustion under higher temperature in pyrolysis combustion plants. Activated carbon filters are liquidated by Janka Radotín.
- PUR foam waste liquidation is based on local conditions approved by the appropriate body of local administration.
- Electric engines and power units are liquidated as per their manufacturers' instructions.

11 GUARANTEES

- Upon observing the terms given in the instructions hereof the manufacturer provides a guarantee of 12 months for chambers, 12 months for rotating parts.

12 ANTI-FREEZING PROTECTION OF HEATERS

12.1 Project design principles

- Heaters must be designed without unnecessary output reserves. Overdimensioning increases the danger of their freezing.
- Secure connection of all appliances including measuring and regulation circuits of anti-freezing protection to a back-up electric power source.
- Upon mixing outside and circulation air before heater it is necessary to take in cold air at the top, as distant from the heater as possible.
- The first water heater contacting outside air must have a dedicated circulation pump, i.e. regulation by changing temperature upon constant water flow through the heater. Constant nominal flow of heating water prevents freezing upon a short-term decrease in temperature of heating water compared to project values or upon different pressure losses of separate water channels in the heater. Distribution of temperatures on the heater surface is also more even.
- It is necessary to detect temperature of water leaving the heater as well as the temperature of outside air.
- It is necessary to properly set regulation devices and heating water circulation pump.

12.2 Anti-freezing protection function

12.2.1 water heaters

a) Outside temperature sensor:

Should outside temperature drop to $+1^{\circ}\text{C}$ a circulation pump of the first heater must be switched on regardless of whether or not the air-conditioning device is operating. The main pump is expected to be operating already.

b) Water temperature sensor:

Upon heating water temperature after the heater to $+12$ to 15°C the regulating valve opens heating water intake to heater to the maximum. As soon as heating water after heater reaches the temperature of approximately $+40^{\circ}\text{C}$, the regulating valve returns to the initial position.

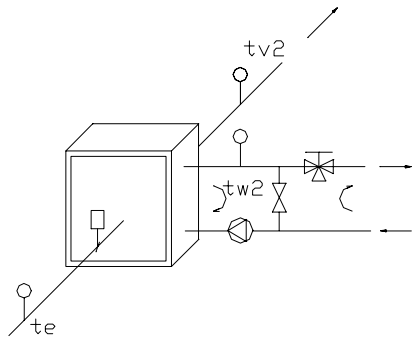
c) Sensor of air temperature after heater:

When using a capillary temperature sensor, it must be placed in the entire exchanger cross-section. Stem temperature sensor is placed in the bottom part of the unit or on the piping. As soon as temperature of air after heater drops to $+5^{\circ}\text{C}$, air intake damper to heater is automatically closed and the cause of air temperature decrease must be removed. Upon a further decrease in air temperature after heater to $+2^{\circ}\text{C}$, the air-conditioning device is laid out of operation. Main pump of heating water is still operating. The device can be repeatedly run manually after air temperature decrease causes are detected and removed.

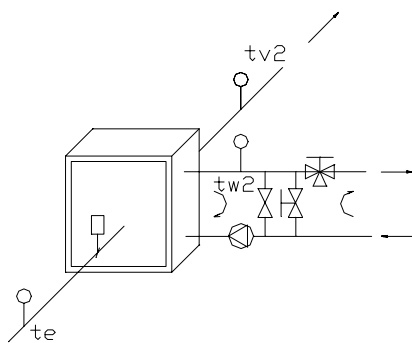
With the device not operating only the functions stated in a) and b) are working at full extent.

water heater

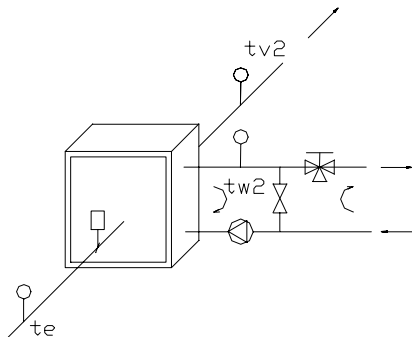
connection 1



connection 2



connection 3



Explanatory notes:







-  Air input damper
-  Circulation pump
-  Throttle valve
-  Three-way regulating valve
-  Regulating throttle valve
-  Thermometer

Fig. 10 – Recommended methods of heaters anti-freezing protection

- Connection 1 and 2 secures constant flow of heating water in the heater and intake circuit upon all operation conditions. These are applied upon higher water flow rates.
- Connection 3 secures constants flow of heating water in heater upon all operating conditions, however, changing flow rate in the intake circuit. It is applied upon low water flow rates.

13 APPENDIX

13.1 Fan Chambers Bearings and Sealing

Table 4 - Fan Chambers Bearings and Sealing (Janka fans)

KLM	6	10	16	25	40	63	80
Fan	250	315	400	500	630	800	1000
2 bearings set	6304 ZZ P 636	6305 ZZ P 636	6306 ZZ P 636	2308 K	2310 K	2312 K	2315 K
4 pcs of sealing ČSN 02 9401.0				GP 35x56x12	GP 45x72x12	GP 55x80x13	
ČSN 02 3655							6,5x8x235

Table 5 - Fan Chambers Bearings (Comefri fans)

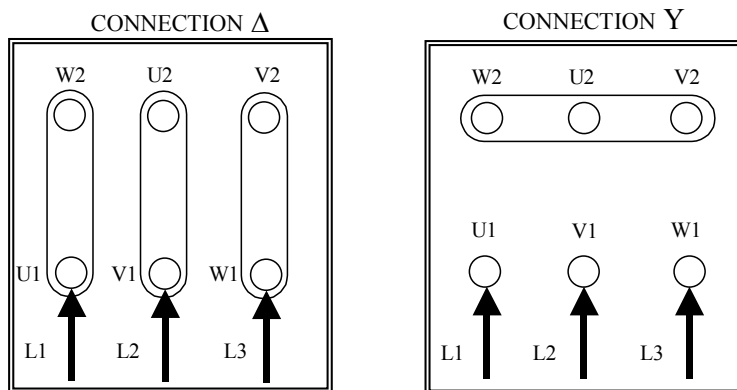
KLM	2,5	4	6	10	16	25	40	63	80
Fan	160/180	225	280	355	450	560	710	900	900
2 bearings set V _N chamber	SKF YET 204	SKF YET 204	SKF YET 205	SKF YET 206	SKF YET 207	SKF YET 208	SKF YET 210	INA GRAE 60 NPPB	INA GRAE 60 NPPB
2 bearings set V _V chamber	SKF YET 204	SKF YET 204	SKF YET 205	SKF YET 206	SKF YET 207	SKF 1311 EK	SKF 1313 EK	SKF 2313 EK	SKF 2313 EK

13.2 Methods of Electric engines connection with poles switching to network

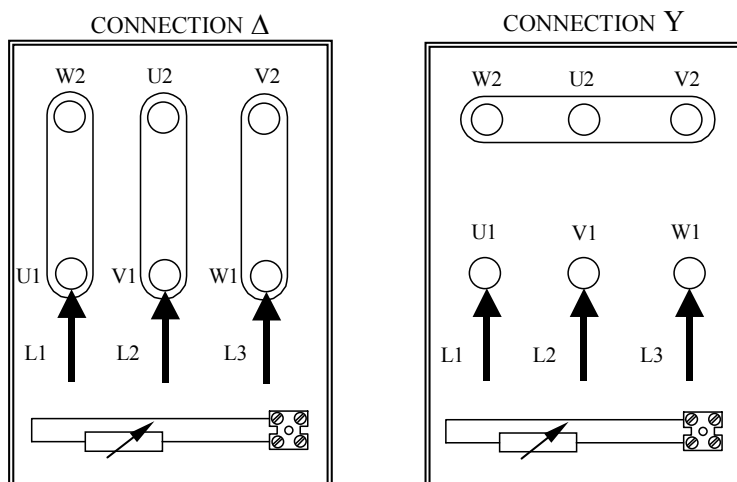
- Terminal block for single and double revolutions has six terminal connectors. With regard to the given number of connecting bolts it is possible to run electric engines only by connecting directly to the network.
- When using electric engines with poles switching in an environment with a temperature exceeding +40°C, or at the height above the sea level higher than 1000 m it is necessary to regulate electric engine output pursuant to valid standards.
- Electric engines with 4/2 and 8/4 poles switching are designed with one winding and Dahlander D/YY connection.
- Electric engines with 6/4 poles switching have two separate windings in Y/Y connection.
- As for electric engines with thermal protection it is necessary to connect also thermal protection contact placed on the electric engine terminal block.

13.2.1 Three-phase one speed motors 1LA7 SIEMENS

- Basic connection



- Connection with thermistors



- Connection with thermocontacts

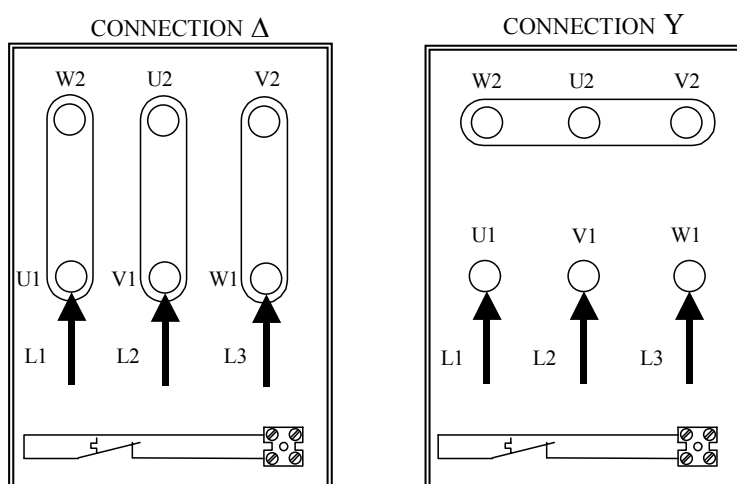
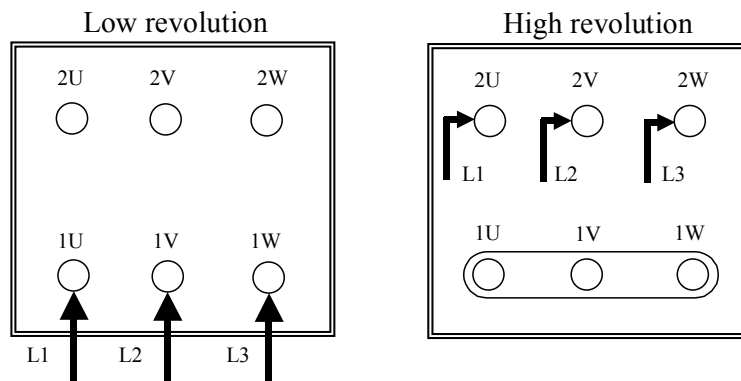


Fig. 11 – Connection of one speed motors

13.2.2 Three-phase two speed motors 1LA7 SIEMENS

- Connection Dahlander 4/2 (21); 8/4 8/4 (23)



- Connection two separate windings 4/6 (25)

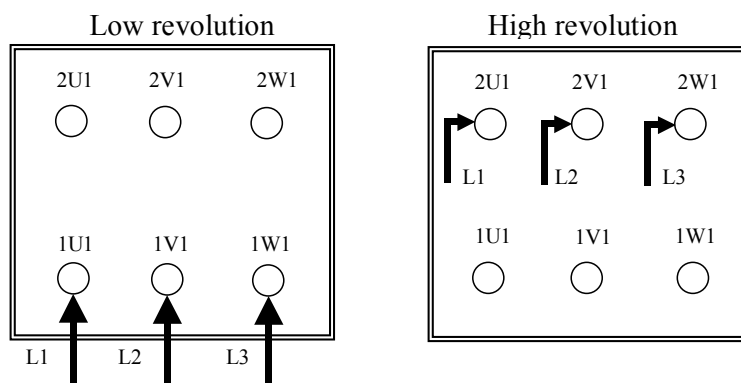


Fig. 12 – Connection of two speed motors

13.3 Composition of filtration inserts for separate chamber sizes

13.3.1 Carbon filters

number of filtration cartridges for separate sizes

KLM 2,5 – 8 pcs

KLM 4 – 12 pcs

KLM 6 – 20 pcs

KLM 10 – 30 pcs

KLM 16 – 48 pcs

KLM 25 – 78 pcs

KLM 40 – 118 pcs

KLM 63 – 172 pcs

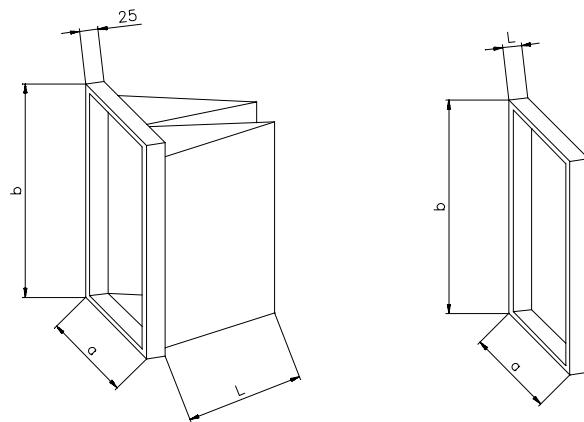
KLM 80 – 174 pcs

13.3.2 Pocket, cassette and metal filters

chamber size	arrangement of filters in chamber
2.5	Z
4	A
6	B F
10	C C C
16	A A D D
25	B B I D D B D D B
40	B B B I D D D B D D D B

chamber size	arrangement of filters in chamber
63	B B B E D D D A D D D A D D D A
80	B B B B D D D D D D D D D D D D

Filtration inserts dimensions



a x b (mm)

- A 490 x 592 x L
- B 287 x 592 x L
- C 897 x 287 x L
- D 592 x 592 x L
- E 490 x 287 x L
- F 402 x 592 x L
- I 287 x 287 x L
- Z 402 x 490 x L

- L = 360 for EU 3,4 filters
- L = 25 for metal filters
- L = 500 for EU 5 filters
- L = 96 for cassette filters
- L = 590 for EU 6-8 filters

lengths of dilatation inserts by separate manufacturers can vary slightly

14 Certificates



CERTIFICATE

The TÜV CERT Certification Body
of RWTÜV Anlagentechnik GmbH

hereby certifies in accordance with TÜV CERT
procedure that

JANKA Radotín a.s.
Vrážská 143
153 00 Praha 5
Česká republika

has established and applies a quality system for

**Development and manufacturing of ventilation
and air-conditioning equipment and industrial cooling**

An audit was performed, Report No. 623325

Proof has been furnished that the requirements according to
ISO 9001 : 1994 / EN ISO 9001 : 1994

are fulfilled. The certificate is valid until **14.12.2003**

Certificate Registration No. 041008170

The company has been certified since **1998**



Essen, 25.10.2001

TÜV CERT Certification Body
of RWTÜV Anlagentechnik GmbH

EN ISO 9001

JANKA
KLIMATIZACE - VZDUCHOTECHNIKA

KLM

Vrážská 143, 153 00 Praha 5, Czech Republic, tel.: +420-2-579 12 488

test results of Elastopor VPH 222/001

LENNOX

CERTIFICATE

25 mm panel

By developing and testing the KLM air handling units the following values of specific density, heat conductivity, adhesive strength and fire behavior were determined.

* Elastopor VPH 222/001

Elastogran GmbH, Geschäftsbereich Hartschaumsysteme,
Schipkauer Strasse 6, D-01987 Schwarzheld

specific density	50,4	kg/m ³	DIN 53 420
heat conductivity	0,0237	W/mK	DIN 52 616
adhesive strength	0,38	MPa	DIN 53 292
fire behavior	separately	B2	class
	in panel	B1	class
			DIN 4102
			DIN 4102

Dipl.Ing. Pavel Červinka
head of development

JANKA
JANKA Radotin a.s.
153 01 PRAHA 6 - Radotin, Wládká 143
12

Dipl.Ing. Jaroslav Karel
laboratory master

comparison with 50 mm mineral wool panel

	heating resistance			
	25 mm panel		50 mm panel	
Elastopor VPH 222/001	1,05	m ² K/W	2,11	m ² K/W
mineral wool	0,52	m ² K/W	1,04	m ² K/W

Tel.: +420-2-579 10 400 - director
+420-2-579 11 594 - CZ sale
+420-2-579 11 729 - export

Fax: +420-2-579 10 393 - director
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Account number:
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19 -15 63 88 02 37 / 0100

Applicable Standards and Regulations:

ČSN 02 3109	Driving V-belts of classic cross-sections
ČSN 02 4640	Single-row ball bearings with cover
ČSN 02 4650	Double-row ball swivel bearings
ČSN 02 9401	Shaft sealing rings. Dimensions
ČSN 27 0144	Lifting devices. Means of load binding, suspending and dripping
ČSN 33 2000-4-41	Electric devices. Part 4: Safety. Chapter 41: Protection against electric current injury
ČSN 33 2000-5-51	Electric devices. Part 5: Safety. Chapter 51: Selection and construction of electric devices. Chapter 51: General regulations
ČSN 33 2000-5-54	Electric devices. Part 5: Safety. Chapter 54: Selection and construction of electric devices. Chapter 54: Grounding and protective conductors
ČSN 33 2190	Connection of electric machines and drives with electric engines
ČSN 34 3205	Service and usage of rotating electric engines
ČSN 35 0010	Rotating electric machines. Tests
PK 12 7449	KLM units

decree of ČÚBP and ČBÚ No. 50/78 of the Coll.



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Improper installation, adjustment, alteration, service or maintenance can cause property damage or personal injury.

Installation and service must be performed by a qualified installer and servicing agency.



SENATOR25-IOM-0205-E