

Transport, Assembly,
Commissioning and Maintenance
of Central Air Handling Units

Series AT 4

General Instructions

The units should be assembled properly and used precisely in accordance with our instructions. If assembly is carried out contrary to our attached instructions and if the resulting defect/damage is due to improper modification, treatment or handling, then any claims for compensation or against the guarantee are excluded.

The customer would then have to provide evidence that the improper assembly did not cause the defect in question.

It is essential to comply with the general installation, assembly, commissioning and maintenance instructions as supplied with each unit series AT 4 as manufactured by AL-KO THERM GMBH.

Assembly, commissioning and maintenance work should only be carried out by qualified skilled personnel.

1. Transport	2
1.1 Handling units by forklift truck	3
1.2 Handling units by crane	3
2. Assembly	4
2.1 Assembly of flameproof units	4
2.2 Internal unit connection for split casing units	5
2.3 AT 4-unit connection where these are arranged above and alongside each other	5
2.4 Outdoor assembly	7
3. Additional assembly and maintenance instructions for hygiene units	9
3.1 Assembly	9
3.2 Commissioning and maintenance	9
4. Commissioning and maintenance	10
4.1 Fans	10
4.1.1 AIR-vent fan component	11
4.1.2 Tightening torques for screw connections on fan section	12
4.2 Heat exchangers	13
4.3 Heat recovery	15
4.4 Filters	17
4.4.1 Bag filters	17
4.4.2 Activated carbon filters	18
4.4.3 Grease trap filter	18
4.4.4 Particulate filter	18
4.5 Louvre flaps	19
4.6 Noise attenuators	19
4.7 Moisture eliminators	19
4.8 Air humidifier	20
4.8.1 Spray humidifier	20
4.8.2 Steam humidifier	21
4.9 Drive elements	22
4.9.1 Electric motor	22
4.9.2 Belt drive	23
4.9.3 Rotary three phase a.c. motor connections	24
4.9.4 Circuit with frequency converter	28

The regulations below must be observed when installing, commissioning and maintaining units:
Local/national regulations should also be complied with.

DIN EN 292 Parts 1 and 2	Safety of machines
DIN EN 294	Safety of machines: units and systems
DIN EN 349	Safety of machines: minimum clearances
DIN EN 60204-1	Safety of machines: Electrical design of machines, general requirements
DIN VDE 0100	Installation of electrical power systems up to 1000 V
DIN VDE 0113	Electrical equipment for machines: general requirements
VDMA 24167	Fans, safety requirements
VDMA 24168	Ventilation systems: programme of maintenance work
VDI 2079	Ventilation systems: acceptance test
VDI 3801	Operating ventilation systems
VDI 3803	Ventilation systems: structural and technical requirements
VDI 6022	Hygiene requirements for ventilation systems, offices and meeting rooms
UVV VBG 1	Accident prevention regulations: general instructions
UVV VBG 7	Accident prevention regulations: fans
UVV VBG 9	Accident prevention regulations: cranes
UVV VBG 9a	Accident prevention regulations: operating lifting gear
89/392/EEC	Machinery directive

1. Transport

Irrespective of their size, AT 4 series air handling units are either supplied assembled complete or as components bolted on to square transport timbers, according to delivery section arrangements. The unit drawing shows how the delivery is sectioned (JL: = delivery division).

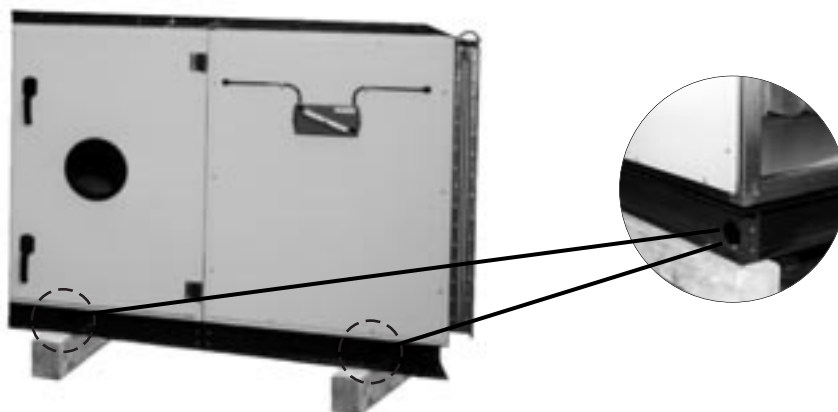


Fig. 1 Unit components ready for transport

All AT 4 units are equipped as standard with a base frame with lifting apertures for crane transport. When the units are delivered, the lifting apertures are capped.

AT 4 units may be transported to the place of installation by crane or forklift truck.

1.1 Transporting the units by forklift truck

Warning:

Use forks of correct length in order to avoid damage to the base of the unit. Basically, look out for projections (e.g. base drainage). Service doors must always be locked during transport.

1.2 Transporting the units by crane

Note:

All current VBG 9 and VBG 9a and any local or national safety regulations must be observed for transport by crane. For weatherproof AT 4 units, the projecting weather skirts must be given additional protection (e.g. cross-members or spacing timber) when transporting by crane. Service doors must always be locked during transport.

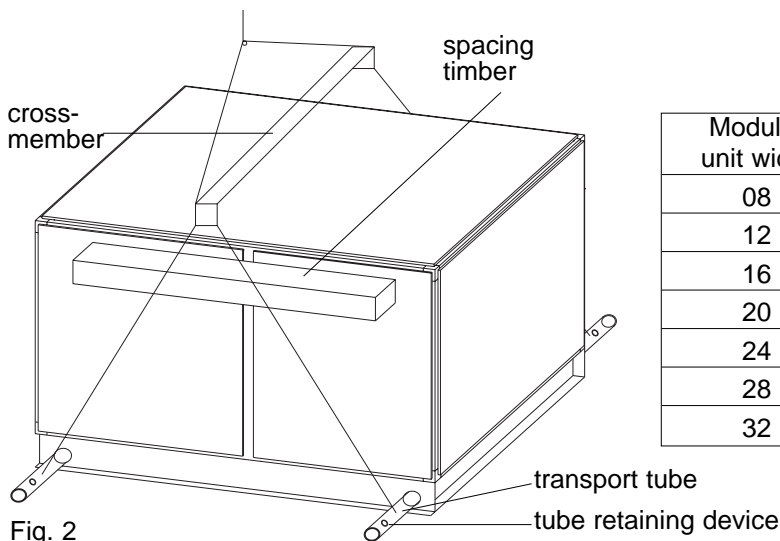


Fig. 2

Modular unit width	Unit width in mm	Length (transport tube)
08	688 mm	1100 mm
12	994 mm	1400 mm
16	1300 mm	1700 mm
20	1606 mm	2000 mm
24	1912 mm	2300 mm
28	2218 mm	2600 mm
32	2524 mm	2900 mm

Table 1

- Remove covers.
- Push transport tubes (special optional accessory: 1 1/2" tube to DIN 2440) through the transport openings in the base frame and secure with tube retaining device.
- Secure the lifting tackle (ropes, chains, lifting slings) to the transport tubes protruding from the side (min. protrusion 200 mm on both sides).

2. Assembly

General:

A level foundation is needed to assemble the equipment. The foundation may be either a solid foundation or a continuous footing. For continuous footings, and where the units are more than 2 m wide, additional cross-members must be provided to give support at the front of the unit, the back of the unit and at the points where component sections join.

Note:

At the time of delivery, the accessories can be found packed in the fan chamber.

Recommendation:

- In order to cushion vibrations, suitable anti-vibration strips (not supplied) may be placed underneath the AT 4 units. Take note of the insulation strip manufacturer's instructions.
- Generally, AL-KO THERM recommends that anti-vibration strips be placed underneath the front ends of the units, the points where the components join and in a longitudinal direction where components are approx. 1200 mm long or more.
- In order to prevent structure-borne noise from being transmitted, AL-KO THERM recommends the use of flexible connections between the unit and air ducts.

Warning:

The order in which the individual components are assembled can be determined from the contract drawing and must be complied with.

- Assembly of the AT 4 units begins with the component which incorporates the air outlet (duct connection).
- Stick the sealing strips supplied to the front faces of the unit components flush with the outer edge of the unit.
- Position subsequent unit components as closely as possible and connect using the self-centring unit bracket or, for larger and heavier unit components, pull together with appropriate aids (belts) and connect.

Warning:

Units must be level in order to guarantee correct operation.
Do not walk on top of unit unless it is protected against damage (scaffolding or supports).
Carefully cover units between assembly and commissioning in order to prevent damage and soiling.

2.1. Assembly of flameproof units

For some components, the cover plates have to be removed in order to assemble the unit. There are holes provided in these covers. Once the components have been connected, the holes must be sealed using the blind rivets supplied.

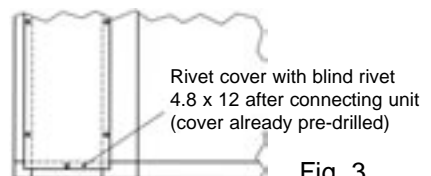


Fig. 3

2.2 Internal unit connection for split casing

- Stick on enclosed sealing tape flush with the outer edge of the unit.
- Insert hexagonal bolts into corner plates and assembly brackets as necessary then fix with a shim and hexagonal nut.

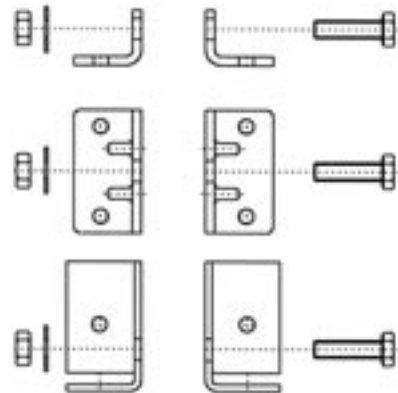


Fig. 4 Unit connection

2.3 AT 4 unit connection where units are arranged above or alongside each other

2.3.1 Units arranged one above another

- Place top unit component on the lower unit using a crane.
- Bolt unit base frame to lower casing using hexagonal bolts.

In the mixing chamber area (airside connection) between the top and bottom unit, the unit base frame must also be sealed all round with a liquid sealant (e.g. SIKA S221).

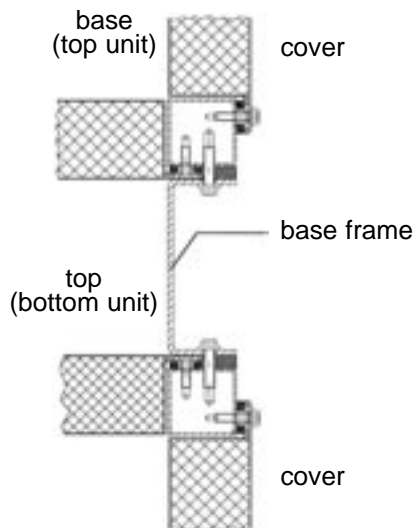


Fig. 5 Units arranged one above another

Warning:

Where the top and bottom unit components are of different lengths, the base frame cross-section must be bolted to the facing cover. For weatherproof AT 4 units, the base frame cross-section must also be properly sealed with liquid sealant (e.g. SIKA S221)

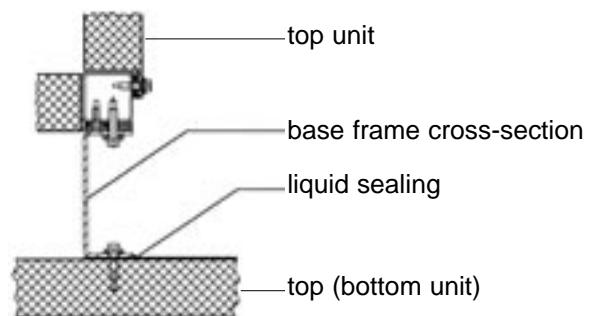


Fig. 6 Units arranged one above another where lengths differ

2.3.2 Units arranged alongside each other

- Slacken hexagonal bolts on the factory-fitted spacer bar.
- Place unit component alongside by forklift truck or crane.
- Fix spacer bar using hexagonal bolts.

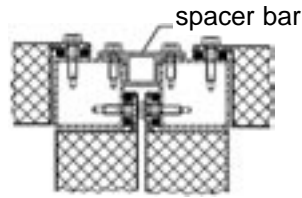


Fig. 7 Units arranged alongside each other

In the mixing chamber area (airside connection) a 25 mm wide sealing strip must be stuck on all round, in addition to the spacer bar. After fitting, this sealing strip must be checked for tightness.

Warning:

Where the left and right unit components are of different length, the facing angle must be bolted to the facing cover.
For weatherproof AT 4 units, the facing angle must also be sealed with liquid sealant.

For weatherproof AT 4 units, the hexagonal bolts supplied must also be fitted with an EPDM sealing washer.

Warning:

If a humidifier is installed, offset foundations will be required to compensate for the difference in height between the humidifier trough and base frames of the adjacent unit components.

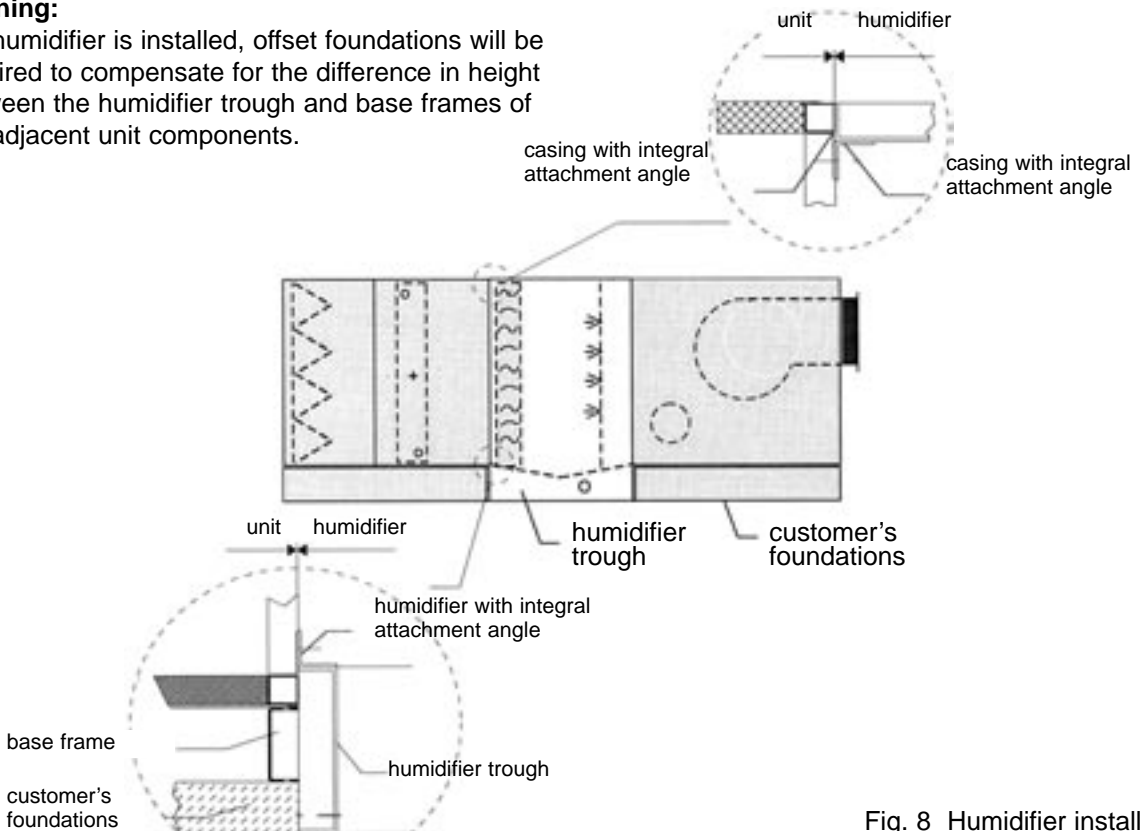


Fig. 8 Humidifier installation

2.4 Outdoor assembly

Roof frame

1. Roof frame pre-assembled by the customer (see Fig. 9)

- Position roof frame on foundation and bolt together
- Seal transport openings in roof frame with covers
- Apply sealing compound to the roof frame
- Position units by crane on roof frame and bolt down to roof frame (also bolt on attachment angles for cover plate)
- Seal transport openings in base frame with covers
- Attach customer's roof cover to roof frame to make seal and bond underneath the weather skirt.
- Suspend cover plate from weather skirt and rivet to attachment angle.

2. Factory fitted base frame or roof frame (see Fig. 10)

- Seal transport openings in base frame / roof frame with covers
- Attach customer's roof cover to base frame / roof frame to make seal and bond underneath the weather skirt.

3. Where units are delivered in sections, place individual unit components as close together as possible, draw together using the unit connections (corner plate and attachment angle) and bolt together. Where unit components are large and heavy, suitable aids (e.g. straps) must be used to draw the components together.

4. Seal where units join (see Fig. 11).

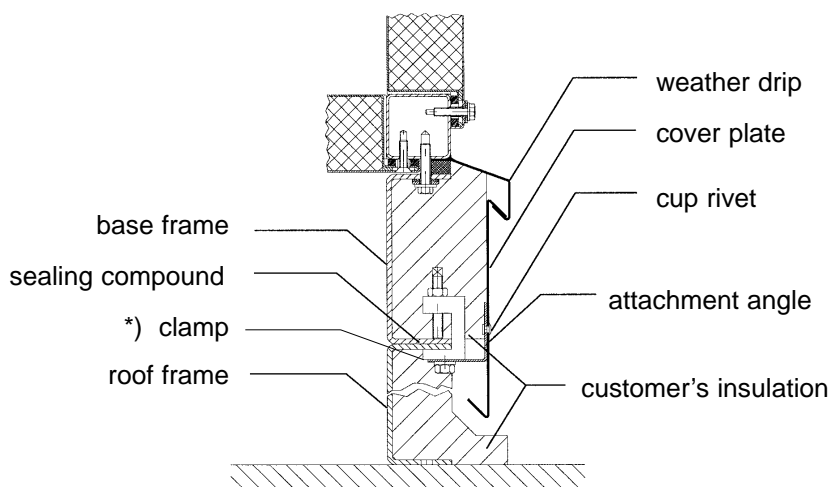


Fig. 9 Customer pre-assembled roof-frame

- *) Number of clamps per component: at least 2
but with a max. distance between clamps of 700 mm.

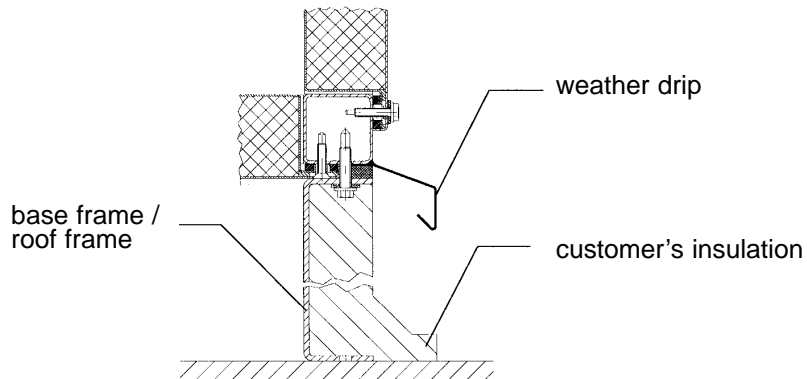


Fig. 10 Factory-assembled base or roof frame

Warning:

When working downwards (breaking through the roof), clarify all details beforehand with the factory.

Sealing the unit joins:

1. Check that unit joins are correctly sealed
2. Clean top of unit where the units join
3. Slide connecting piece at unit join over the weather skirt, then rivet
4. Seal joints with seam sealant
5. Fold back overlapping roof cover
6. Apply solvent bonding agent with brush
7. Fold over film cover again
8. Seal joints with seam sealant

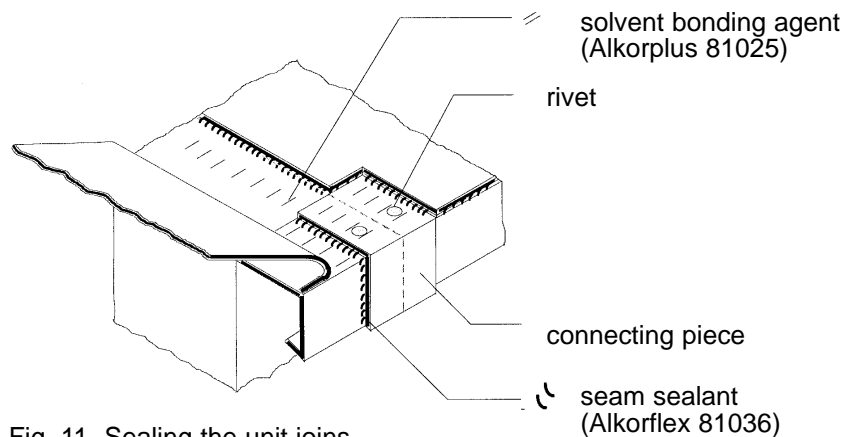


Fig. 11 Sealing the unit joins

Warning:

Seam sealant and solvent bonding agent can only be used where the outside temperature is > 10°C. Where the outside temperature is lower than this, pre-heat areas in question with a hot air blower.

Carefully check casing seal.

Seam sealant and solvent bonding agent are highly flammable – keep away from sources of ignition.

Observe the safety instructions on the containers.

For further information, refer to the current EC safety data sheets (we can supply these on request).

3. Additional assembly and maintenance instructions for hygiene units

3.1 Assembly

Warning:

Following assembly and connection of the individual components, the unit joins are sealed internally with liquid, disinfectant-resistant sealing material.

3.2 Commissioning and maintenance

Before commissioning the ventilation system, all installed filters, in particular the fine-dust filters, must be checked to see that they are sealed tightly.

Warning:

AL-KO THERM generally recommends that all filters be replaced after the ventilation system has been operating for a short time, in order to remove contamination which has entered the filter during the building phase and commissioning.

All fitted components must be either freely accessible for cleaning or be removed or dismantled from the unit once the facing cover has been removed.

Warning:

If the facing cover is dismantled for maintenance purposes, then the inside of the casing in this area must be resealed with liquid, disinfectant-resistant sealing material on completion of maintenance.

AL-KO THERM recommends that maintenance of the ventilation systems be carried out on the basis of VDMA 24186 Part 1 and VDI 6022.

Warning:

It is essential that the general maintenance information contained in the assembly, commissioning and maintenance instructions for central ventilation units, series AT 4, manufactured by the AL-KO THERM company, is complied with.

4. Commissioning and maintenance

4.1 Fan

Commissioning:

1. Remove transport protection devices from the fan base.
2. Check the fan direction of rotation (see arrow on fan casing) by briefly switching the motor on.
3. If necessary, reverse the motor poles and correct the direction of rotation.
4. Measure current consumption with the service doors closed and compare with the rated current indicated on the rating plate.
5. Measure the differential pressure Dp_{fa} and if necessary adapt the operating point by adjusting the AIR-vent.
6. Check alignment (balance) of the V-belt pulleys.
7. Check V-belt tension and if necessary adjust. (see also 4.9.2)

Warning:

If the direction of rotation is incorrect, there is a risk of motor overload.

Current consumption must not exceed the rated current indicated.

The maximum motor speed must not be exceeded.

Maximum fan speed must not be exceeded.

For a rated motor output of 5 kW upwards: Star delta starting

Maintenance and commissioning:

- Check fan wheel for imbalance
- Check bearings and if necessary re-grease
- Retighten all fixing bolts
- Check operation of vibration dampers
- If necessary check that the draining device is working properly
- Check fan for contamination, damage and corrosion
- Regularly clean fan unit.

Warning:

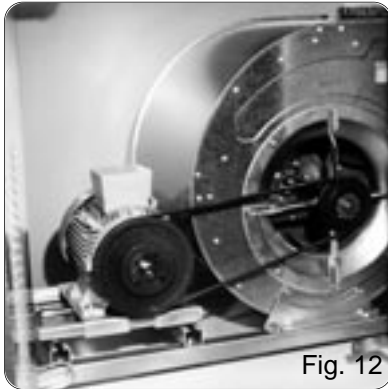
First disconnect unit from mains and switch off master and/or repair switch (disconnect all poles) and secure against unauthorised re-setting (e.g. padlock).

Only open inspection doors when fans have been switched off and are at a standstill.

After the unit has been switched off, the impeller will continue running for 1-3 minutes.

The impeller must never be slowed down by hand or with objects.

Assembly, commissioning and maintenance work must only be carried out by qualified, skilled personnel.



The fan unit can be removed from the side for maintenance purposes:

1. loosen the four bolts on the C-rails.
2. Slacken the canvas connection piece
3. remove fan unit from the side of the casing.

Warning:

Remove the fan unit carefully, to avoid damaging the casing coating.

4.1.1 AIR-vent fan component

Danger:

After the unit is switched off, the impeller continues to run for approx. 1-3 minutes. The fan section is therefore still under excess pressure and must not be opened. The impeller must never be slowed down by hand or with objects.

Commissioning:

- Remove transport protection devices from the fan base.
- The unit must be checked for transit damage before commissioning.
- The impeller must not be in contact with the fan inlet nozzle. This can be checked by rotating the impeller
- The direction of rotation of the motor must then be checked. The correct direction of rotation is marked by a direction arrow on the impeller. The direction of rotation can be established by briefly switching the motor on. If the direction of rotation is incorrect, the motor terminals must be inverted.

Inspection:

- As a general rule, switch off master switch and/or repair switch and secure against unauthorised re-setting (e.g. padlock).
- Inspect at least once a year.
- Check fan for contamination, damage, jammed screws, foreign objects and for corrosion (see 4.1.2)
- Check function of safety devices (catch hook, protective grating)

Setting the operating point:

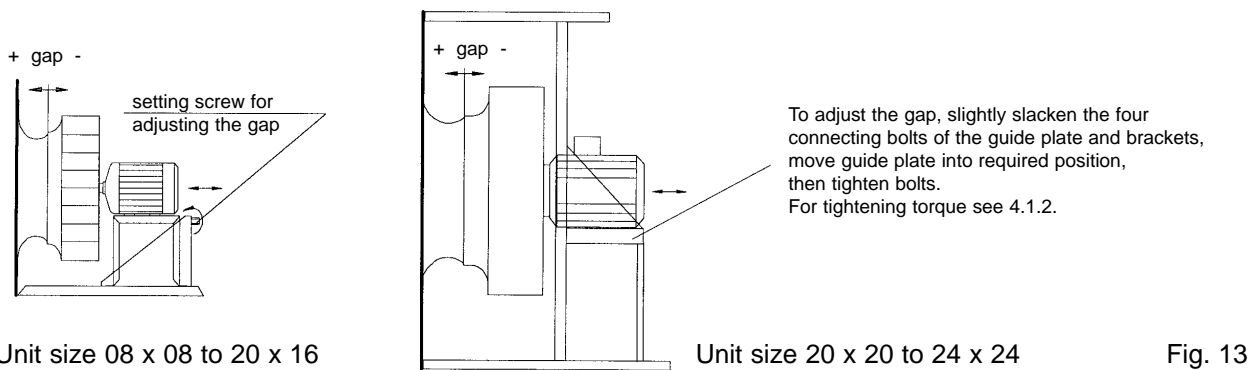
1. For units with AIR-vent adjustment:

When adjusting the air vent, the fan impeller and motor are removed from the inlet nozzle in an axial direction, so that part of the volume of air conveyed can flow back through the vent (by-pass). This causes the pressure to drop and the motor power drawn is reduced.

The gap can be set within a range of +8 to -15 mm.

The correct air gap is shown in the contract documents (technical data sheet).

If the air gap has to be changed, then the new gap measurement has to be determined using the diagram enclosed with the unit. Ensure that the motor power available is not exceeded.



2. For units with speed regulator (e.g. frequency converter):

The operating point can be precisely approached by means of the adjustable fan speed.

When regulating the speed, care must be taken that the maximum and minimum fan speeds and the maximum motor power are not exceeded or undershot.

The air gap must not be altered, it must always remain at the ideal set value of + 8 mm.

Determining the volume of air

The volume of air can be determined at any time from the unit characteristic and the differential pressure Dp_{fa} . (Ring line measuring points on fan unit. These are not included in the standard version; they are optional accessories)

4.1.2 Tightening torques for screw connections on fan section

After the fan has run for approx. 1 hour, check the screw connections on the fan base and, if necessary, evenly tighten with a torque spanner with the screw torques indicated in Table 2 alongside.

thread size	screw tightening torque (Nm)
M 6	10
M 8	25
M 10	49
M 12	85

Table 2

Maintaining or checking the Taper-Lock clamping bushes:

- Clean and degrease all unpainted surfaces, such as the hole and taper surface of the taper lock clamping bush and the tapered hole in the washer.
Insert taper clamping bush into the hub and align all fixing bolts (semi-threaded holes must be opposite half smooth holes in each case).
- Coat threaded pin (size 1008-3030) or cheese-head bolts (size 3535-5050) lightly with screw locking varnish and screw in – do not tighten bolts yet!
- Clean and degrease shaft. Push washer with taper clamping bush onto the shaft
- If a fitting key is used, this must first be placed in the shaft groove.
There must be backplay between the fitting key and hole groove.
- Using a torque spanner, DIN 911, tighten threaded pins or cheese-head bolts evenly with the tightening torques indicated in Table 3.

bushing	bolt tightening torque (Nm)	bolts	
		number	size
1008/1108	6	2	1/4" BSW
1310/1315	20	2	3/8" BSW
1210/1215	20	2	3/8" BSW
1610/1615	20	2	3/8" BSW
2012	31	2	7/16" BSW
2517	48	2	1/2" BSW
3020/3030	90	2	5/8" BSW
3535	112	3	1/2" BSW
4040	170	3	5/8" BSW
4545	192	3	3/4" BSW
5050	271	3	7/8" BSW

Table 3

Removing the taper-lock clamping bushes:

1. Slacken all bolts and, depending on bushing size, completely unscrew one or two bolts, grease and screw into the counterpart holes.
2. Evenly tighten the bolt or bolts until the bushing becomes detached from the hub and the washer can be freely moved on the shaft.
3. Remove washer and bushing from the shaft.

4.2 Heat exchangers

The heat exchangers are largely maintenance free. In order to guarantee long life, the heat exchangers require regular cleaning.

Note:

The customer is to supply vent and drain valves in the piping.

Warning:

Generally ensure that the unit remains accessible for maintenance purposes. When installing, particularly the connecting pipes, care must be taken that the inspection doors can always be opened.

Assembly:

1. Connect heat exchanger on the counter-flow principle (direction of water flow in the unit opposite to the direction of air).
2. Install water feed at bottom and water return at the top.

Warning:

When connecting the heat exchangers, support with suitable means (e.g. pipe brackets) so as to avoid damage. Fit lines and connections in such a way that the heat exchangers are freely accessible for maintenance.

Max. operating pressure: 16 bar

Max. hot water supply temperature: 120°C.

Maintenance:

- Check heat exchangers for airside contamination, damage and corrosion.
- Clean heat exchangers with compressed air. Galvanised steel heat exchangers can also be cleaned with steam jet units
- Check connections and screw connections
- Check operation of flow and return
- Check vent valve and heat exchanger filling
- Check operation of antifrost thermostat
- If necessary, check concentration of anti-freeze
- Check siphon and top up as necessary
- Check function of water drain and odour trap
- Check moisture eliminator and clean if necessary.

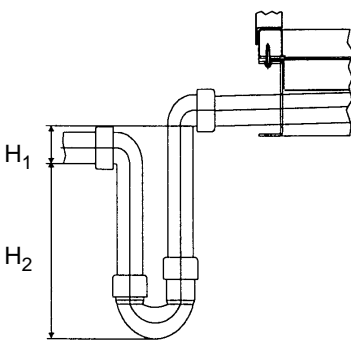
Warning:

Where the ambient temperature is below freezing point, the heat exchanger must either be drained and blown out with compressed air, or filled with correct solution of commercial anti-freeze containing anti-corrosive, because of the risk of frost and corrosion.

Additional instructions for using direct expansion evaporators:

Installation must be carried out by an approved specialist refrigeration company. Only safety refrigerant to DIN 8962 may be used as the refrigerant.

For the cooler and the direct expansion evaporator, a siphon (as described below) is also required on site:

Double siphon:

The double siphon with screw-on cover for filling and inspection is a fillable siphon for draining ventilation units in the vicinity of coolers, humidifiers or other wet areas at higher than ambient pressure.

Excess pressure in the unit: $H_1 = 50 \text{ mm}$

$$H_2 = Dp + 50 \text{ mm}$$

Negative pressure in unit: $H_1 = Dp + 50 \text{ mm}$

$$H_2 = Dp/2 + 50 \text{ mm}$$

Dp = unit pressure in mm, water column
(100 Pa = 100 mm water column).

Fig. 14 Siphon dimensions

Ball siphon:

The ball siphon is a self-filling siphon for draining the cooler, steam humidifier and other wet areas at pressure lower than that of ambient pressure. A float ball prevents the air from being sucked in during dry operating conditions so that the initial condensate can fill the siphon. The ball also acts as a return valve where there are pressure surges in the system, thus preventing emptying.

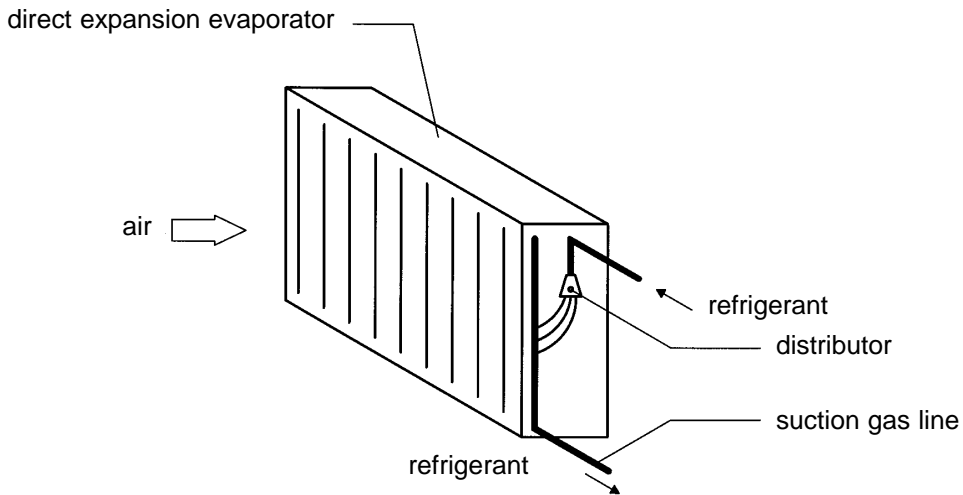


Fig. 15 Air direction when installing a direct evaporator

Note:

The customer must provide sufficient access for the refrigerant gas connections.

4.3 Heat recovery

4.3.1 Plate exchanger

Maintenance:

- Regularly clean plates:
 - a) remove dust, fibres etc. with a brush
 - b) remove oil and grease deposits with hot water, steam or grease-dissolving detergents
- Clean condensate drain
- Check siphon and if necessary, top up.
- Check damper connection, drive and control functions.

4.3.2 Rotary heat exchanger

Maintenance:

- Check drive and control elements
- Regularly clean rotor with compressed air, water, steam or grease-dissolving detergents.

4.3.3 Recuperative energy recovery: Integrated circuit system KVS

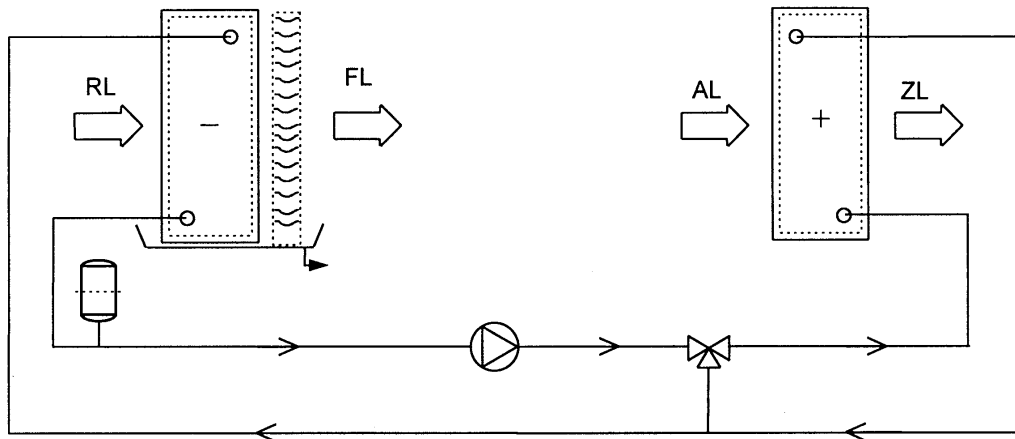


Fig. 16 Integrated circuit system

The heat exchangers must be maintained regularly.

Warning:

Piping shall be provided by the client.

Circulating pump must be of the size indicated in the technical data sheets.

Heat exchangers must be connected according to the counter-current principle.

Concentration of anti-freeze must comply with the specifications indicated in the technical data sheets.

We recommend the use of Antifrogen N in a mixing ratio of 25 to 35%.

Following the pressure test, the entire system must be thoroughly checked.

It must be purged until no more scale or residual particles are flushed out.

4.4 Filters

4.4.1 Bag filters

Maintenance:

- Check standard class G3 to G4 bag filters no later than every 6 months for clogging and damage. If necessary, replace.
- Replace class F5 to F9 bag filters no later than every 12 to 18 months.
- Size 08 x 08. When changing permanently installed filters, the filter clamp has to be dismantled.



Bag filters can be replaced either at the dirty air or clean air end.

Up to filter class G4 and up to casing width 1300 mm, the filter frame can be removed from the side of the casing.

Up to an including size 20 x 20, the filter bags are supplied already fitted at delivery. From 24 x 24 size upwards, the filters are packed for delivery in a box inside the marked components.



As an option, a quick-acting filter fitting device is available up to a machine clearance height of 1836 mm.

Replacing the filter bags:

- Release clamping device by simply pulling out with the extraction lever supplied.
- Remove filter bags singly from the machine.
- Clean filter seals, check and if necessary, replace damaged seals.
- Insert new filter bags.
- Close clamping device by pushing in.

Warning:

In general, when the maximum ultimate pressure difference indicated on the rating plate is reached, the filter bags must be replaced.

4.4.2 Activated carbon filters

Once saturated, the activated carbon must be replaced.

Maintenance and assembly are generally carried out on the clean airside.

As a rule, activated carbon cartridges are supplied for delivery, packed in a box in the marked components.

Changing the filter cartridge

1. Release bayonet fixing on base plate (key optional extra)
2. Remove activated carbon from between the two perforated plate cylinders
3. Re-attach filter cartridges to the base plate with the bayonet fixing.
4. Check that filter insert is tightly in position.

4.4.3 Grease trap filter

When clogged with grease or dust or once the recommended maximum pressure difference (rating plate) has been reached, the grease trap filter must be cleaned with hot water (> 80°C) or steam. Maintenance and assembly are generally carried out on the dirty airside.

Cleaning the filter elements:

1. Up to unit size 16 x 16:
 - Remove filter element and retaining frame, including collector troughs, from the unit.
 - Release clamp strap on filter frame and clean filter element, including collector trough.
2. From unit size 20 x 16 upwards:
 - Release clamp strap on filter frame.
 - Remove filter element and clean
 - Clean collector trough.

4.4.4 Particulate filter

Once the recommended maximum pressure difference (rating plate) has been reached, the particulate filter must be replaced.

Maintenance and assembly are generally carried out on the dirty airside.

As a rule, the particulate filter element is supplied for delivery, packed in a box in the marked components.

Replacing the filter elements:

1. Slacken bolts on filter frame
2. Remove filter element
3. Insert new filter element and tighten bolts.

4.5 Louvre flaps

Maintenance:

- Check dampers for contamination, damage and corrosion.
- Check mechanical function of dampers
- Lubricate bearings
- Clean dampers regularly
- Check final position of damper drive motors and adjust as necessary.

4.6 Noise attenuators

The noise attenuators are generally maintenance free.

Recommendation:

Following long breaks in operation, clean noise attenuator silencer faces with a vacuum cleaner.

4.7 Drip collector



Fig. 19

For maintenance purposes, the moisture eliminator can be pulled out of the casing from the side and can be dismantled for cleaning.

Maintenance:

- Check moisture eliminator for contamination, damage and corrosion.
- Clean moisture eliminator and condensate collector trough with compressed air, water, steam or grease-dissolving detergents.
- Check water drain and odour seal.

Make sure that the drip collector can be pulled out and is not hindered by site installed pipework.

4.8 Air humidifier

4.8.1 Spray humidifier (air washer)

Warning:

- A siphon must be provided by the client if a spray humidifier (air washer) is to be installed (see Fig. 14: Siphon dimensioning, page 14).

Recommendation:

AL-KO THERM recommends that an electrical dry-run protection should be fitted for the water-circulating pump. Only use de-mineralised water to operate spray humidifiers, so as to prevent corrosion damage. Arrange spray humidifier as the final component in the ventilation unit, directly at the inlet of the ducting system.

Assembly and commissioning:

- Check spray humidifier to see that it is complete and for any transport damage.
- Remove heavy soiling from the humidifier trough and check that the pump suction basket is correctly positioned.
- Check direction of spray and correct seat of spray diffusers.
- Fill humidifier trough up to approx. 10 mm below the top edge of the internal siphon or overflow connection and then adjust the float of the float valve to this water level.
- Check operation of drain and overflow and clean the dirt trap and siphon.
- Check direction of rotation of water circulation pump
- Check tightness of the screw and flange connections of the pump pressure line
- Adjust sludge drainage unit (if fitted), in such a way that the sludge draining rate is twice that of the volume of water evaporated.
- Check installation of water filter.
- Run system on airside and if necessary adjust the operating point of the spray humidifier by regulating the volume of water.
- Check moisture eliminator to see that there are no holes or damage.
- The specified water quality must be maintained and regularly adjusted.
- If there is a reduction in the rate of volumetric flow (e.g. where a frequency converter is used), the pump output must also be reduced.

Warning:

The direction of rotation of the water circulation pump must only be checked when the washer trough is full. The water level in the humidifier trough must be sufficient to prevent the water circulation pump from running dry.

The rate of sludge discharge is reduced by 50% where fully demineralised water is used.

With drip collectors made from plastic sections, slight amounts of water may seep through for a short period in exceptional circumstances, because the surface has not become weathered, due to the production method used. Weathering sets in after approx. 24 operating hours.

Maintenance:

- Check spray humidifier for contamination, damage and corrosion.
- Clean spray humidifier unit, including jets and stems at least once a year
- Check siphon and if necessary top up
- Check float valve
- Check sludge drainage unit and clean, if necessary.
- Check and clean drip collector / rectifier.

Warning:

Observe maintenance, commissioning and assembly instructions of humidifier manufacturer.
Do not clean spray humidifiers with foaming cleaning agents.

4.8.2 Steam humidifier**Maintenance:**

- Check steam humidifier for contamination, damage and corrosion
- Regularly clean steam humidifier and dirt trap
- Check tightness of steam and condensate pipe
- Check operation of steam distributor
- Check operation of solenoid valves
- Check measurement and control devices.

Additional maintenance work for steam humidifier with own steam generator

- Check operation of water supply system and water level
- Measure current consumption
- Check steam cylinder for deposits and replace, if necessary.

Additional maintenance work for steam humidifier without own steam generator

- Check operation of control valve
- Adjust control valve stuffing box

Note:

AL-KO THERM will accept no guarantee for the customer's own steam humidifier installations or casing ducts provided by the customer, or for any incorrect handling of the bottom trough and drainage connections not properly connected.

This also applies to humidifiers not properly operated and to the humidifier performance.

4.9 Drive elements

4.9.1 Electric motor

Electric motors with a power rating of 5 kW and upwards must be operated with star delta starting. Increased frequency of motor operating cycles ("cycling") will soon result in motor failure. Generally, the standard electric motors are fitted with permanently lubricated motor bearings.

In the case of electric motors with motor bearings that require re-greasing, these bearings will require regular inspection and greasing. The motor rating plate indicates the maintenance intervals and the greasing requirements.

Commissioning:

1. Wire motor according to the wiring diagrams enclosed.
2. Measure current consumption for all three phases and compare with the values indicated in the technical data sheet.

Warning:

Wiring to be in accordance with DIN VDE 0100, DIN VDE 0113 and DIN VDE 0116 and any local or national regulations.

Motor wiring to be such that the motor can be adjusted for V-belt tensioning.

Current consumption can only be measured with the service doors and covers locked, because of the risk of motor overload.

Current consumption must not exceed the rated current indicated.

Warning:

Motors with thermo contacts and PTC thermistor must be protected by way of a motor protection device with manual re-set.

All other motors must be protected by an overload switch.

Warning:

In the case of variable speed motors, the max. current consumption of the transformer and motor must not be exceeded. For variable speed motors, the protection must be rated accordingly.

Maintenance:

- Check motor for contamination, damage and corrosion
- Check motor attachment and tighten all attachment bolts
- Check bearings and re-grease if necessary
- Regularly clean motor and motor sub-structure
- Check function of protection devices.

4.9.2 Belt drive

Commissioning:

1. Check V-belt drive and adjust belt tension as necessary.
2. Check non-positive seat of V-belt pulleys and that they are precisely aligned (parallel)
3. After approx. 1 hour's running, check pulley, motor and fan bolts and re-tighten if necessary.
Check belt tension and adjust, if necessary.

Warning:

Incorrectly tensioned V-belts can cause damage to fan bearings and to the electric motor. In order to avoid bearing damage, after a downtime of 3 months or more the V-belts must be slackened or removed, otherwise the guarantee will lapse.

Maintenance:

- Check V-belt drive for contamination, damage and wear.
- Check V-belt tension and adjust, if necessary (see also point 4.1)
- Check alignment of V-belt pulleys
- Regularly clean V-belt drive.

Warning:

When replacing V-belts in multiple-groove drives, the entire set of V-belts must always be replaced.

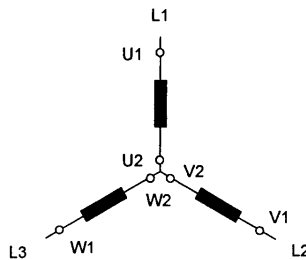
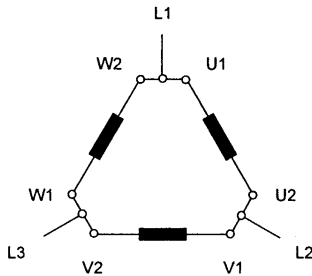
4.9.3 Rotary three phase a.c. motor connections

Warning:

With multi-speed motors, do not switch directly on to high speed, always start on low speed. For motors with PTC thermistor or thermo-contact, it is essential that note be taken of the connection diagram in the terminal box.

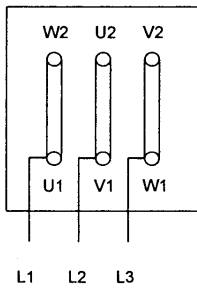
Circuits for one speed:

Arrangement of the phase windings

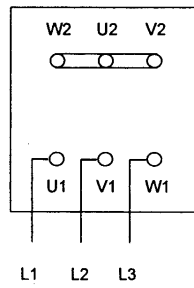


The ends of the three phase windings go to the YD switch

Arrangement on the terminal board



D arrangement



Y arrangement

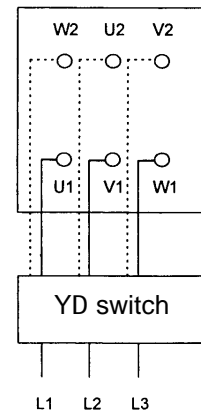
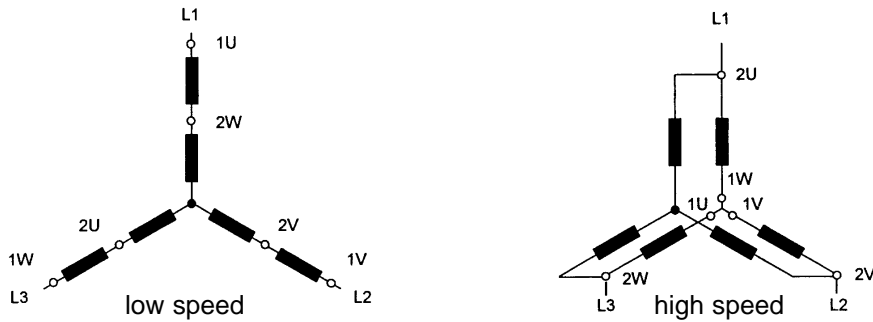


Fig. 20

Arrangements for two speeds in the ratio of 1 : 2

(Dahlander pole-change winding)

Designed, for example, for 1500/3000 rpm or 4/2-pole or 750/1500 rpm or 8/4-pole



Winding designed for a rating class that corresponds to a torque curve for ventilator drives.

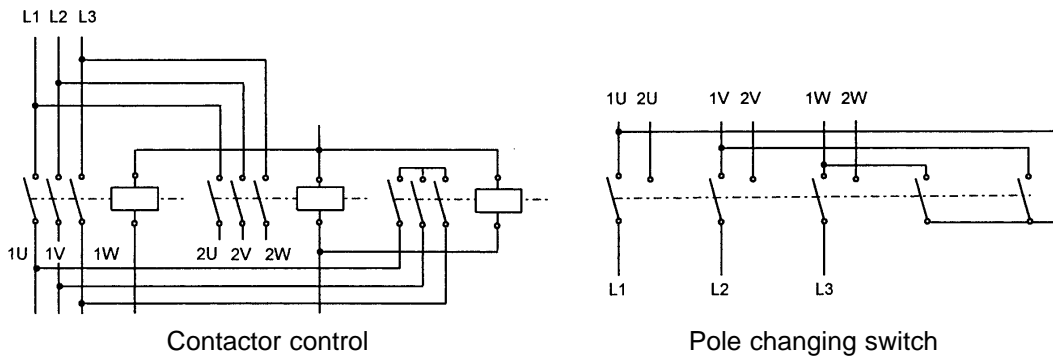


Fig. 21

For motors with Dahlander speed change switching, the six winding ends 1U, 1V, 1W and 2U, 2V and 2W are connected to the six terminals of the terminal board of a normal terminal box.

Arrangement for two speeds (two separate windings)

Designed, for example, for 1000/1500 rpm or 6/4-pole or 750/1000 rpm or 8/6-pole

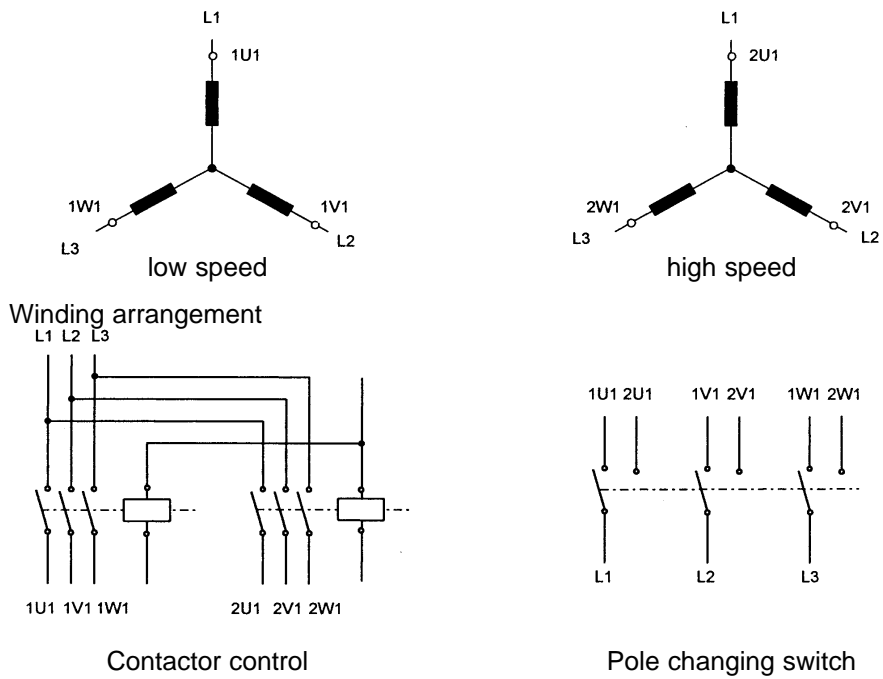


Fig. 22

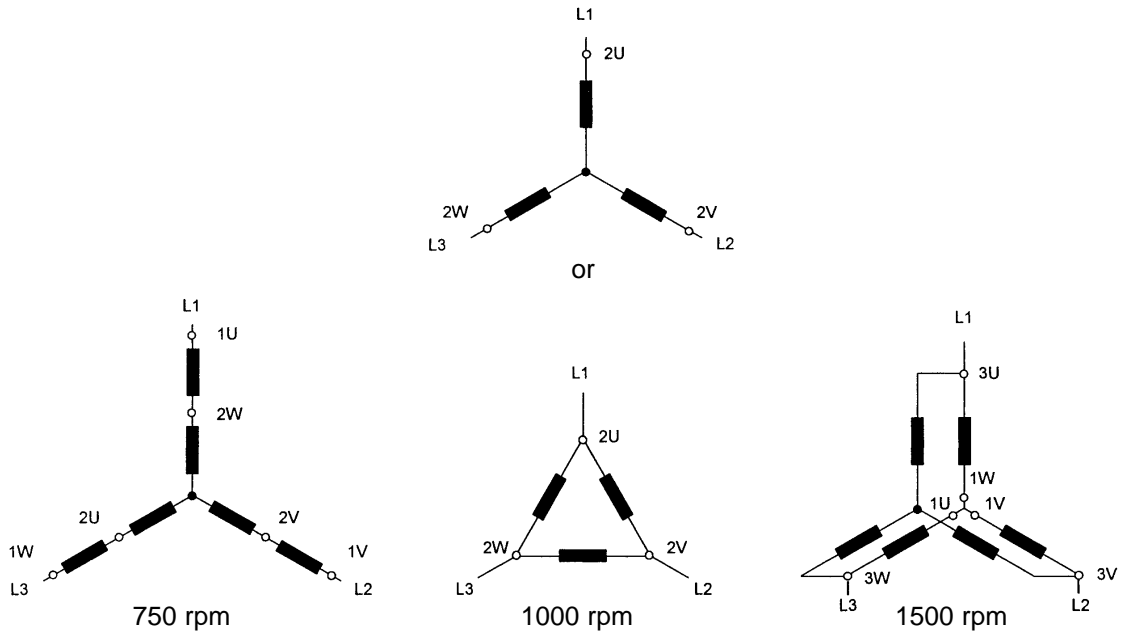
Arrangements for three speeds

(two separate windings, one in Dahlander (speed change multi-circuit arrangement).

Nine terminals are needed in this case.

Design for ventilator drives 750/1000/1500 rpm or 8/6/4-pole;

750/1500 rpm in Dahlander (speed change multi-circuit arrangement).



Winding arrangement

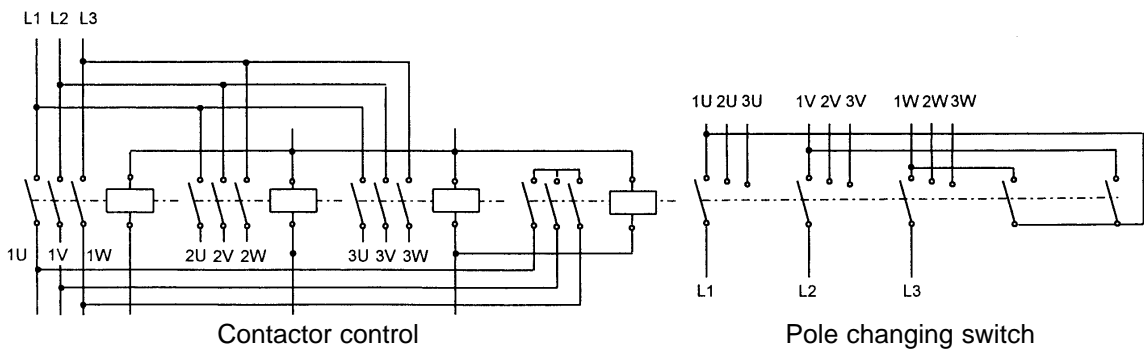


Fig. 23

4.9.4 Arrangement with frequency converter

Wiring example:

Frequency converter with pressure sensor, isolating switch and PTC thermistor

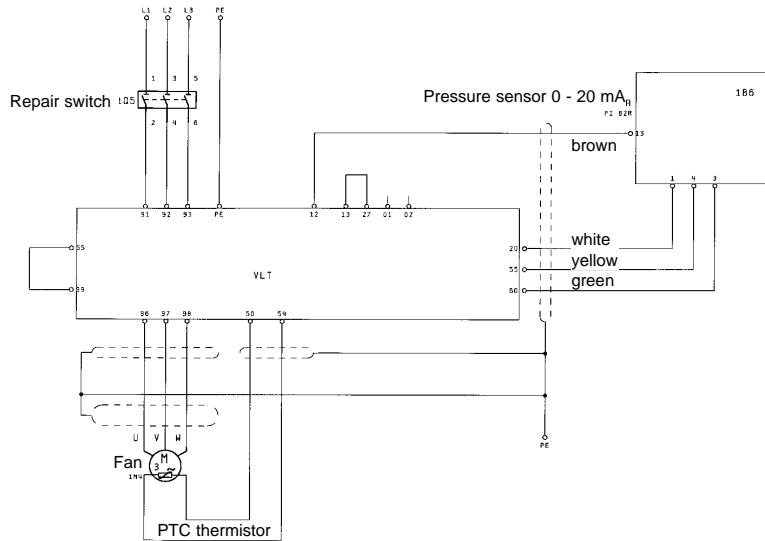


Fig. 24

When working with a frequency converter the following must be observed:

1. The fan motor must be suitable for operation with a frequency converter.
2. The motor must be protected against overload and overheating, e.g. PTC thermistor. A motor protection switch with bimetallic release is not suitable.
3. Shielded leads must be used to wire the motor PTC thermistor to the frequency converter.
4. The permitted maximum speed of the fan and motor must not be exceeded under any circumstances.
5. Refer also to the assembly and operating instructions of the appropriate frequency converter manufacturer.

Example: EMC installation

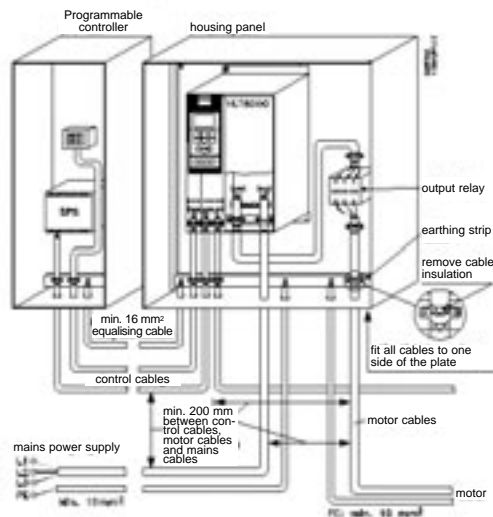


Fig. 25

AL-KO THERM GMBH
Bereich Klimatechnik

Hauptstraße 248-250
D-89343 Jettingen-Scheppach

Telefon 08225/39-0
Telefax 08225/39-113
e-mail info.therm@al-ko.de
Internet <http://www.al-ko.de>