

Transport, assembly,
commissioning and maintenance
of flat ventilation units

Series AT 2

Unit size: 12

22

32

42

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AL-KO THERM flat series

Ventilators constructed in galvanised, frameless, sheet steel with 20 mm thick insulation and panels.

Heat transfer co-efficient: $K = 1,4 \text{ W/m}^2\cdot\text{K}$

Sound insulation value: 31 dB

Division into four unit sizes:

	V min. [m ³ /h]	V max. [m ³ /h]	dp max. at V max. [Pa]	Housing width [mm]	Housing height [mm]
<u>Unit size 12</u>					
V 252-12	350	1600	190	640	350
V 282-12	350	2300	200	640	350
V 215-12	350	2700	880	640	350
<u>Unit size 22</u>					
V 352-22	500	2000	340	930	350
V 215-22	500	2900	380	930	350
V 215-22	500	4000	700	930	350
<u>Unit size 32</u>					
V 215-3	650	4500	550	1240	350
<u>Unit size 42</u>					
V 200-42	550	4300	720	640	539

The AL-KO THERM flat series has been specially designed for use in false ceilings or other confined spaces.



Fig. 1

Design features:

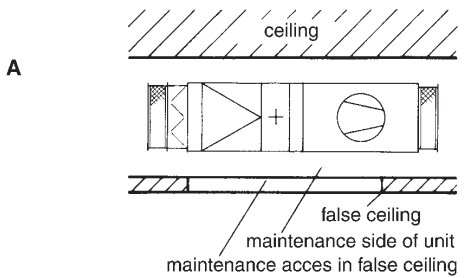
- ⇨ Easy to assemble
- ⇨ Easily accessible, external side unit connection with self-centring up to and including unit size 32.
For unit size 42 external rear unit connection and internal unit connection on maintenance side, with self-centring.
- ⇨ Including threaded bushes for unit suspension up to unit size 32.
- ⇨ Including suspension brackets up to unit size 32.
Unit size 42 for assembly on support or sub-structure on site.
- ⇨ The connection side can be on either the left or right side at the heat exchanger by merely turning the registers.
- ⇨ Heat exchanger connections generally on the narrow side.
- ⇨ Operating side at bottom or top up to unit size 32.
Operated from the side for unit size 42.
- ⇨ Can be installed horizontally or vertically..
Except for: cooler and unit size 42 (see instructions for use, page 2)

Units delivered as single components packed in cardboard boxes, up to unit size 22.

Delivered as single components in welded film on pallet, from unit size 32 upwards.

Accessories, such as canvas connection pieces, screws/bolts etc. are enclosed loose in the box up to unit size 32. For unit size 42, they are loose in the fan section.

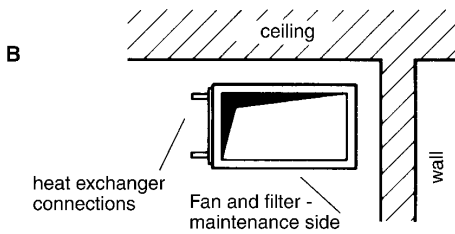




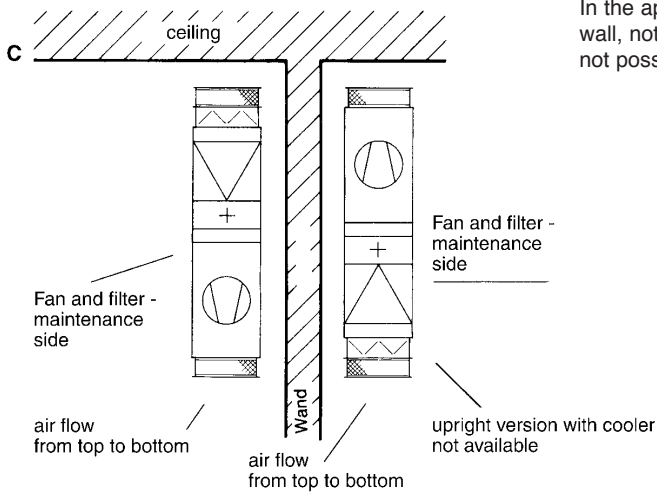
The figure alongside shows the common form of installation in a false ceiling. Because of their flat design (only 350 mm high), the units are ideal for this purpose.

Up to and including unit size 32, maintenance is carried out from underneath. Supply and discharge connections of heat exchangers are always located on the side.

For installation in a false ceiling, sufficient space must be provided for the on-site siphon, where cooler elements are used.



This illustration shows an arrangement flat against the ceiling to the wall. Ensure that there is a space (30-50 mm is sufficient) between unit, ceiling and wall. This prevents the transmission of structure-borne noise.



In the application shown alongside, with the unit vertical against a wall, note what has been described in A and B. In this case it is not possible to use air-to-air coolers and unit size 42.

Warning:
Maintenance for all applications can only be carried out as shown in the illustrations.

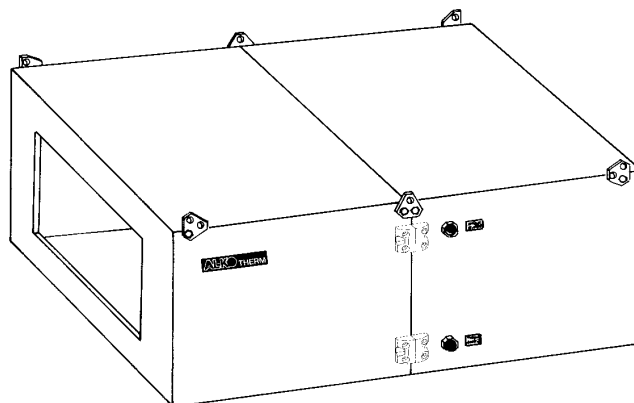


Fig. 2

General:

When assembling, commissioning and maintaining the units, the relevant standards and guidelines must be observed. In particular we recommend compliance with VDMA 24 186 DIN 3801 and VDI 2079.

Lock

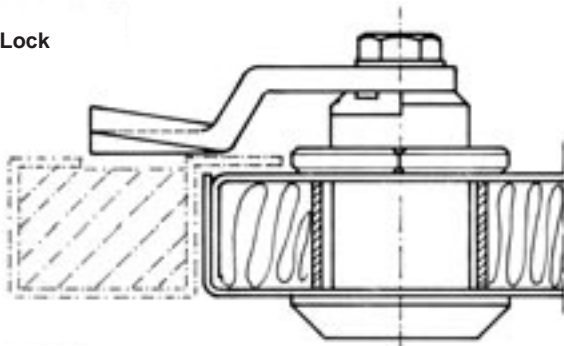


Fig. 3

To open the service cover, turn lock by 90°

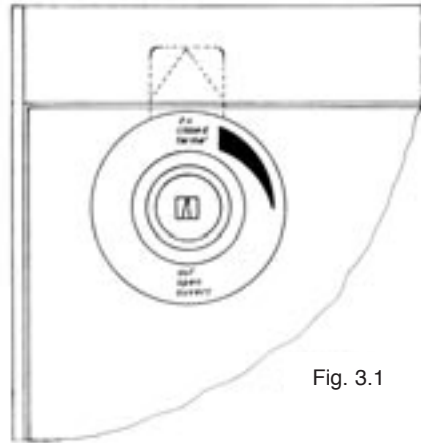


Fig. 3.1

Unit connection

The sealing strip supplied must be fitted at the unit separation point. The unit connections are then installed.

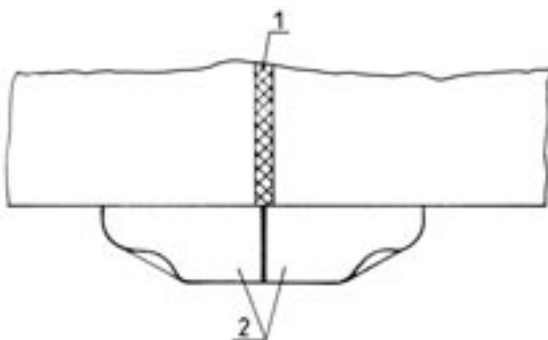


Fig. 4

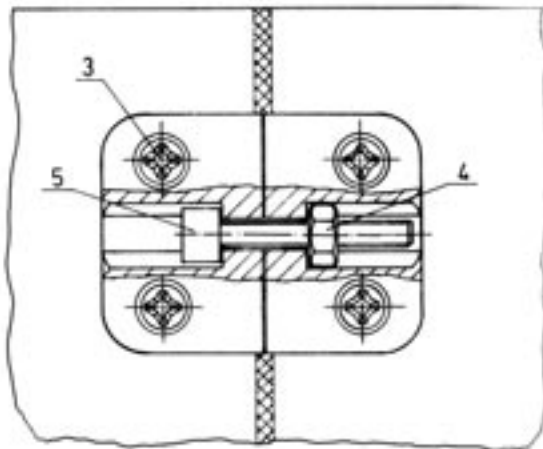


Fig. 4.1

Where the unit is separated, stick on enclosed 15 x 10 sealing strip [item 1] flush with the internal edge of the unit.

Tighten connection piece [item 2] using the pan-head tapping screw [item 3].

Insert hexagonal nut [item 4] into connection piece and tighten with hexagon socket screw [item 5].

The housing parts are centred using the connection piece [item 2].

For unit size 32, also use connection plate [included in accessories] located in the centre on the service side.



4.1 Fans

4.1.1 Typ V fans

The speed of the standard fans for unit sizes 12 and 22 can be controlled.

- Galvanised, directly driven radial fans with suction on one side
- 100% speed controllable motor, type of protection IP 54, ISO Class F
- max. operating temperature 40 °C
- Drum impeller and motor, statically and dynamically balanced
- Motor protection provided by bimetal contacts

All motors are fitted with bimetal contacts to protect against thermal overload and must be connected on site. These guarantee appropriate motor protection in conjunction with the AL-KO THERM controls. .

Commissioning:

- Check direction of fan rotation according to arrow on fan housing by briefly switching on the motor. If necessary, reverse motor poles and correct direction of rotation (Note: if the direction of rotation is incorrect, there is a risk of motor overload).
- The motor must be wired according to valid guidelines and standards and, in particular, the wiring diagrams must be followed.
- Check the motor by measuring current consumption and comparing it with the values in the technical data sheet. When doing this, close all covers.
- Measure air volume.
- For speed control, the output of the control unit must be matched to the output of the motor.

Maintenance:

- The installed motors are completely maintenance-free and do not require re-greasing.
- Noise-tested, deep grooved ball bearings sealed at both ends and lubricated with special grease are used
- Before commissioning the unit, disconnect the power supply, switch off master switch and/or repair switch and secure against unauthorised switching on.
- Check to ensure that the fan is free from dirt, damage and corrosion.
- Check that the fan contains no foreign bodies.

4.1.2 Type VR fans

- Galvanised, radial fan with suction on both sides
 - Typ TZR 04-215 Maintenance-free deep grooved ball bearings for quiet running.
Radial impeller with forward curved circular arc blades.
 - Typ RZR 11-200 Maintenance-free deep grooved ball bearings with sectional strut attachment for quiet running.
Radial impeller with backward curved, hollow-section blades.
- Fan, together with electric motor and V-belt drive, attached to housing by way of motor-driven rocker dolly switch.
- V-belt drive consisting of easily replaceable driving pulleys with Tapperlock holding bushings
- Electric motor, type of protection IP 55, ISO-Class F.
- Motor protected by PTC thermistor.

Commissioning:

1. Remove transit securing devices from fan base.
2. Check direction of fan rotation (see arrow on fan housing) by briefly switching on the motor.
3. If necessary, change motor poles and correct direction of rotation.
4. Measure current consumption with service doors closed and compare the result with the rated current indicated on the rating plate.
5. Check alignment of V-belt pulleys.
6. Check V-belt tension and, if necessary, adjust.

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.
The maximum fan speed must not be exceeded.
From a rated motor output of 3 kW and above: star delta start.

Maintenance and commissioning:

- Check balance of fan impeller.
- Check bearings and if necessary, re-grease.
- Tighten all attachment screws.
- Check operation of vibration dampers.
- If necessary, check operation of draining device.
- Check to ensure that the fan is free from dirt, damage and corrosion.
- Regularly clean fan unit.

Warning:

Before commissioning the unit, disconnect the power supply, switch off master switch and/or repair switch (disconnect all poles) and secure against unauthorised switching on. Only open inspection doors when fans have been switched off and are at a standstill. When the unit is switched off, the impeller continues to run for approx. 1-3 minutes. Never slow down impeller by hand or with objects..

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

4.1.3 Electric motor

Electric motors up to a rated power of 3 kW can be started directly on line. Increased switching frequencies of the motors ("cycling") result in premature failures. The electric motors are generally fitted with permanently lubricated motor bearings.

For electric motors with re-greasable motor bearings, the latter must be regularly checked and, if necessary, re-greased. The maintenance intervals and the amount of grease required for re-greasing are shown on the motor rating plate.

Commissioning:

1. Wire motor in accordance with the wiring diagrams supplied.
2. Measure current consumption in all three phases and compare with the values indicated in the technical datasheet.

Warning:

Wiring must be effected to DIN VDE 0100, DIN VDE 0113 and DIN VDE 0116.

The motor wiring must be carried out in such a way that the motor can be moved to tension the V-belt. Current consumption may only be measured with the service doors and covers closed, because of the risk of motor overload. Current consumption must not exceed the rated current indicated.

Warning:

Motors with bimetal contact and PTC thermistor must be protected by way of a motor protection device with a restart lock-out. All other motors must be protected by an overload switch.

Warning:

In the case of variable-speed motors, the maximum current consumption of the transformer and motor must not be exceeded. In the case of variable-speed motors, the motor protection device must be dimensioned accordingly.

Maintenance:

- Check motor for dirt, damage and corrosion.
- Check motor attachment and also retighten all attachment screws.
- Check bearings and, if necessary, re-grease.
- Regularly clean the motor and motor base.
- Check operation of safety devices.

4.1.4 Belt drive

Commissioning:

1. Check V-belt drive and set belt tension as necessary.
2. Check positive fit of V-belt pulleys and that they are perfectly aligned (parallelism).
3. After approx. 1 hour's running time, check V-belt pulleys, motor and fan screws and if necessary, tighten. Check belt tension and, if necessary, adjust.

Warning:

Incorrectly tensioned V-belts can cause bearing damage to the fan and electric motor. When the machine has been at a standstill for 3 months or more, the V-belts must be slackened or removed in order to avoid bearing damage, otherwise the warranty in this respect will lapse.

Maintenance:

- Check V-belt drive for dirt, damage and wear.
- Check V-belt tension and, if necessary, adjust.
- Check alignment of V-belt pulleys.
- Regularly clean V-belt drive.

Warning:

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

4.1.5 Tightening torques for screw connections on fan section

After the fan has been running for approx. 1 hour, check screw connections on fan base and, if necessary, tighten evenly using a torque spanner in line with the screw tightening torques indicated in table 1 alongside.

Thread dimension	Screw tightening torque (Nm)
M 6	10
M 8	25
M 10	49
M 12	85

Table 1

Maintenance or inspection of the taper lock holding bushings:

1. Clean and degrease all unpainted surfaces, such as the bore and conical surface of the taper holding bushing and the tapered bore of the pulley. Insert taper holding bushing into the hub and render all connection bores congruent (half thread bores must, in each case, be opposite half smooth bores).
2. Apply light covering of screw-locking varnish to threaded pin (size 1008-3030) or cylinder head screws (size 3535 – 5050) and screw in. Do not tighten screws yet!
3. Clean and degrease shaft, slide pulley with taper holding bushing onto shaft.
4. Where a feather key is used, it must first of all be placed in the groove of the shaft. There must be clearance between the feather key and bore groove.
5. Using a torque spanner, evenly tighten DIN 11 threaded pins or cylinder-head screws according to the tightening torques indicated in table 2.

Bushing	Screw tightening torque (Nm)	Screws	
		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 2

Removing the taper lock holding bushings:

1. Slacken all screws and, according to bushing size, fully unscrew one or two screws, lubricate and screw into the replica bores
2. Tighten the screw[s] uniformly until the bushing becomes detached from the hub and the pulley can be freely moved on the shaft
3. Remove pulley and bushing from shaft.

4.2 Heat exchangers

The heat exchangers are largely maintenance-free.

In order to guarantee fault-free operation, the heat exchangers must be regularly cleaned.

Note:

Vent and drain valves must be provided in the pipe on site.

Warning:

Ensure that the unit remains accessible for maintenance purposes.

At the time of installation, particularly of the connection piping, it is essential to ensure that the inspection doors can always be opened.

Assembly:

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

Warning:

When connecting the heat exchangers, hold them steady by suitable means (e.g. pipe wrench) so as to avoid damage. Fit pipes and connections in such a way that the heat exchanger is freely accessible for maintenance.

Maximum operating pressure: 16 bar

Maximum hot water flow temperature: 120 °C

Maintenance:

- Check heat exchangers for dirt, damage and corrosion on the air intake side.
- Clean heat exchangers with compressed air. Galvanised heat exchangers may also be cleaned with steam jet cleaners.
- Check connections and screw connections.
- Check supply and return operation.
- Check vent valve and filling of heat exchangers.
- Check frost-protection thermostats.
- If necessary, check concentration of anti-freeze.
- Check siphon and, if necessary, top up.
- If necessary check function of water drain and trap.
- Check drip catcher and clean if necessary (see point 4.6).

Warning:

Where temperatures are below freezing point, the heat exchanger must be either drained and blown out with compressed air or filled with commercial anti-freeze **containing** corrosion inhibitor, because of the danger of frost and corrosion..

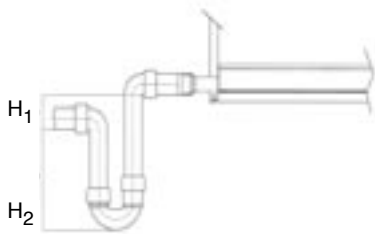
Additional information on the use of direct evaporators:

Installation must be carried out by an approved specialist refrigeration company.

Only safety refrigerants to DIN 8962 may be used as the coolant.

A siphon (as described below) is also required on site for the cooler and direct evaporator:

Double siphon:



The double siphon, with screw cover for filling and inspection, is a fillable siphon, for draining reverse conducting thyristors in the vicinity of the coolers, humidifiers or other wet areas at excess pressure compared with ambient pressure.

Excess pressure in the unit: $H_1 = 50 \text{ mm}$
 $H_2 = \Delta p + 50 \text{ mm}$
 Low pressure in the unit: $H_1 = \Delta p + 50 \text{ mm}$
 $H_2 = \Delta p/2 + 50 \text{ mm}$

Δp = unit pressure in mm WC
 (100 Pa = 10 mm WC)

Fig. 5: Siphon dimensioning

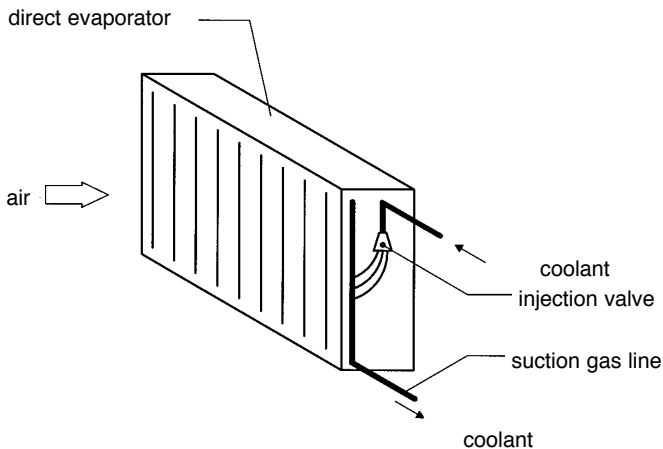
Ball siphon:

The ball siphon is a self-filling siphon for draining the coolers, steam humidifiers and other wet areas at low pressure compared with ambient pressure. In the dry operating state a float prevents the intake of air, so that the first condensate to accumulate can fill the siphon. The ball also acts as a non-return valve when there are pressure surges in the system and prevents emptying by suction.

4.2.1 Evaporator K

The refrigeration installation must be carried out by an approved specialist company, observing the corresponding DIN standards, such as ISO 5149, VDG 20 etc.

Only safety refrigerants to DIN 8962 (R 22 etc.) may be used as the coolant in the refrigeration circuit.



If speed controllable fans and controls are used, then the refrigeration unit must be provided with an output control. The cut-out section for the pressure gas line (connection of distributor manifold) must be provided on site.

Fig. 6: Direction of air when fitting a direct evaporator

Warning:

The cut-out section must be provided on site for the suction gas line.

4.3 Electric damper register E

The local regulations of the electricity supply companies, DIN 57 100 and VDE 0100/420 and the manufacturer's instructions must be observed in respect of connection and wiring. For safety reasons, the electric air heater must always be operated in relation to the fan motor. Depending on type, the damper register can be incorporated in front of or behind the fan section. Generally a fan after-run facility shall be provided (accumulated heat frequently results in damage). Where the surface temperature of the electric heater register is high, it must be guaranteed that adjacent components, e.g. filter, drip collector and electric motor, do not suffer damage. We generally recommend that the electric damper register be fitted to the pressure side, but care must be taken that any scale particles that become detached, are not carried any further.

- Max. surface temperature 230°C at the radiators
- Max. air temperature increase via electric air heater 40K
- In order to prevent the heating elements and wiring from overheating, safety temperature limiters and temperature detectors must be fitted at the works.
- Flow rate monitors must be provided on site!

- It is not permitted to switch off the unit by the master switch, otherwise it could incur damage as a result of residual heat (risk of fire).
- The switching stages must always be operated in relation to the fan stages, i.e. in the case of multi-stage fan motors, the heating output must be reduced in line with the reduction in air volume flow (observe Δt -range).

Maintenance:

- Check register for scale and corrosion
- Check existing safety devices, such as temperature limiter, flow monitor, after-running device etc.

4.3.1 Heat recovery

4.3.2 Plate exchanger

Maintenance:

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

4.4 Recuperative energy recovery: Integrated closed-circuit system

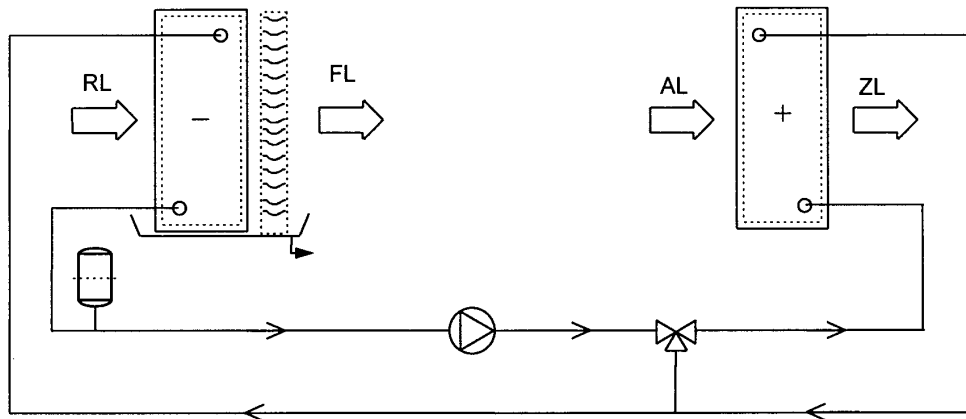


Fig. 7: Integrated closed-circuit system

Maintenance work on the heat exchangers must be carried out regularly.**Warning:**

Piping is to be provided on site.

Circulating pump must be dimensioned in line with the technical datasheet.

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

The concentration of anti-freeze must comply with the specifications in the technical datasheet.

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

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

Flush out until no more residual particles and scale are washed out.

4.5 Filter - G4-48 / G4-200 / G4-360 / F5-350 / F7-350

- The pocket filters are fixed in a galvanised fitting frame and can be pulled out on the service side.

Maintenance::

- Check pocket filters for dirt, corrosion and damage.
- Contamination must be checked by way of a differential pressure display (e.g. inclined tube, U-shaped pipe or direct reading manometer). Once the end pressure differential indicated on the rating plate or in the technical datasheet has been reached, the filter pockets must be replaced by new ones of the same quality. Treat the pockets carefully. Torn filter material cannot be used.
- All classes of filter must be checked at least every 6 months for dirt and damage and, if necessary, replaced.
- Replace the first filter stage at least every 12 months.
- Replace the second filter stage at least every 24 months.
- Check filter system for leaks.

Replacement filters:	GG 12	type	F - G4-200	1 x 592 x 287 x 200 mm
	GG 22	type	F - G4-200	1 x 592 x 287 x 200 mm 1 x 287 x 287 x 200 mm
	GG 32	type	F - G4-200	2 x 592 x 287 x 200 mm
	GG 42	type	F - G4-200	1 x 592 x 490 x 200 mm
	GG 12	type	F - G4-48	1 x 595 x 290 x 48 mm
	GG 22	type	F - G4-48	1 x 595 x 290 x 48 mm 1 x 290 x 290 x 48 mm
	GG 32	type	F - G4-48	2 x 592 x 287 x 48 mm
	GG 42	type	F - G4-48	1 x 592 x 490 x 48 mm
		type	F - G4-360	ditto, but pocket length 360 mm
			F - F5-350	ditto, but pocket length 350 mm
			F - F7-350	ditto, but pocket length 350 mm

4.6 Drip collector

Maintenance:

- Check drip collector for dirt, damage and corrosion.
- Check operation of water drain and trap.
- Clean to maintain operation.

4.7 Louvre shutters

Commissioning:

- Check shutter positioning motors for correct fitting and correct ultimate position and, if necessary, reposition.
Note: voltage 24 V or 230 V.

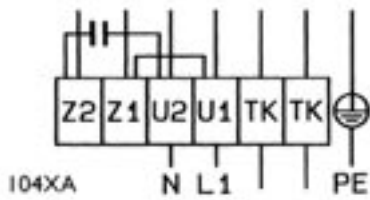
Maintenance:

- Check louvre shutters for dirt, damage and corrosion.
- Check mechanical function.
- Clean to maintain operation.

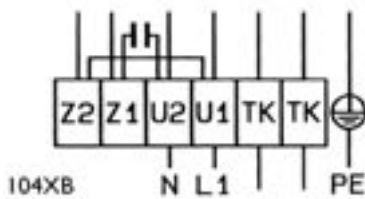
4.8 Noise dampers D

The noise dampers are largely maintenance-free.

However, after long periods of operation, we recommend cleaning, for example, with a vacuum cleaner.



V252 / V282: I~ motor with running capacitor and temperature detector



V312 / V352: I~ motor with running capacitor and temperature detector

Colours:

- U1 brown
- U2 blue
- Z1 black
- Z2 orange

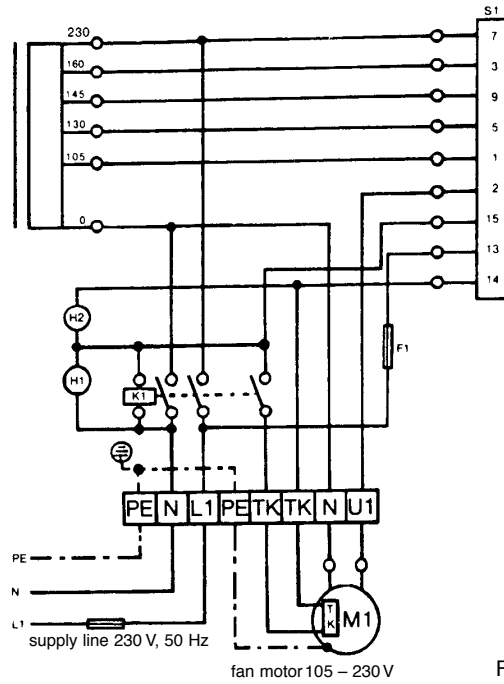


Fig. 8

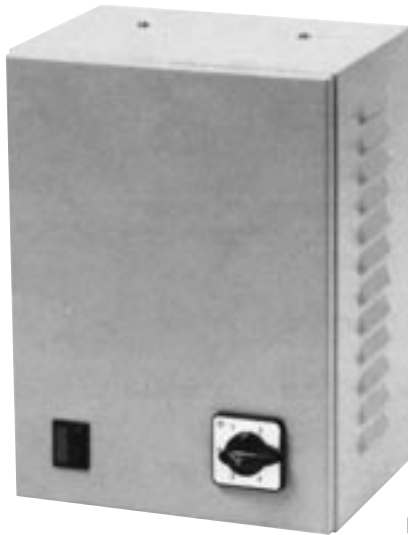


Fig. 9

5-stage controller in IP 23 housing

IISO class T 40 E, sheet steel housing, step switch, fault alarm light, operating status light with restart lock-out.

Motor voltage 230 V / 50 Hz

Type:

ESM 5-5 - max. 5 A (for V 252-12 + V 312-22)
 ESM 5-7 - max. 7 A (for V 282-12 + V 352-22)

Dimensions:

Height: 305 mm
 Width: 220 mm
 Depth: 170 mm

Controls

For information on the standard controls, please see technical documentation R-AT 2.

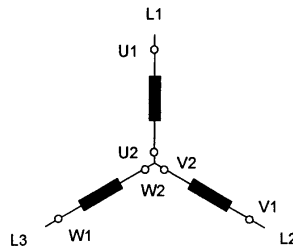
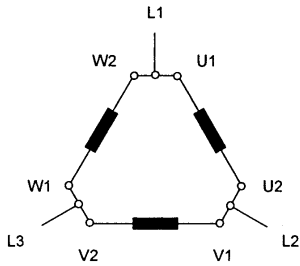
Connection of three-phase a.c. motors

Warning:

Do not operate top speed directly.
 For motors with PTC thermistor or bimetal contact, it is essential to observe the connection diagram in the terminal box.

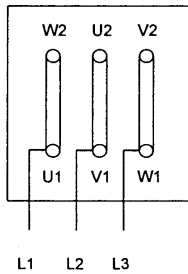
7.1 Wiring for one speed:

Connection of the winding phases

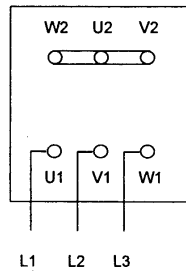


The ends of the three winding phases go to the YΔ switch.

Connection to the terminal board



Δ connection



YΔ switch

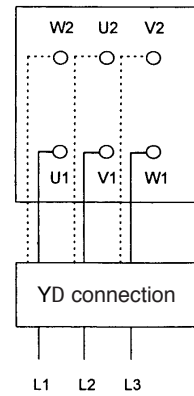
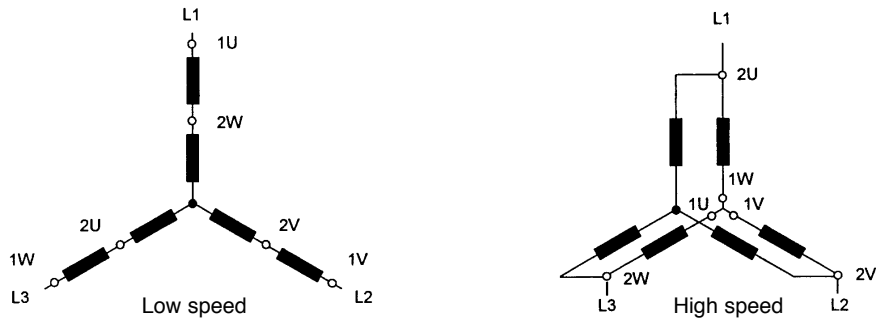


Fig. 10

7.2 Circuit arrangements for two speeds in the ratio 1:2

(Winding in Dahlander pole-changing circuit)

Version for example for 1500/3000 rpm and 4/2 pole or 750/1500 rpm and 8/4 pole



Winding arrangement for a rating class corresponding to a torque characteristic for fan drives.

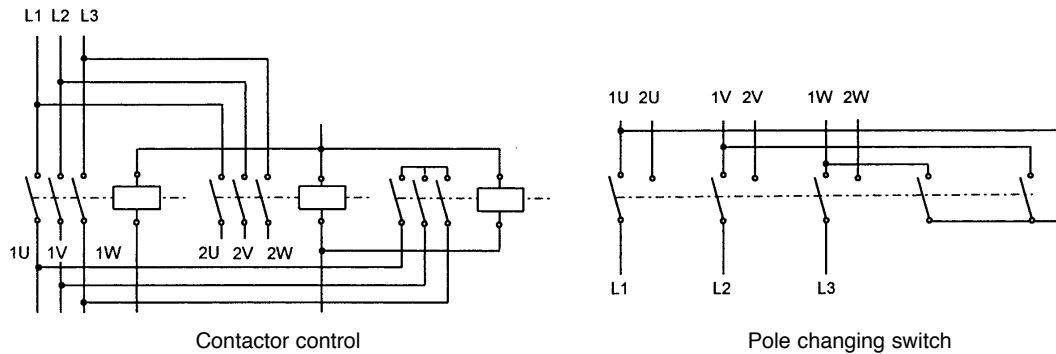


Fig. 11

For motors with Dahlander pole-changing circuit, the six winding ends, 1U, 1V, 1W and 2U, 2V, 2W, are connected to the six terminals of the terminal board of a normal terminal box.

Memos / Comments / Maintenance schedules

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