GEOVENT

INSTRUCTION MANUAL

PLASTIC FAN

MPV/LPV/RPV

Version 1.0 01.02.12

www.geovent.dk

GENERAL INDEX

FANS
USE AND MAINTENANCE

1 – INSTALLATION

1.1 ACCEPTANCE
The delivered material should be examined and possible defects should be reported immediately. If the machine has been damaged during transport, make a complaint to the transporter.

1.2 TRANSPORT
Use the lifting points and distribute the weight uniformly to avoid deformations and possible damages.

1.3 STORAGE
Protect the fan against bad weather conditions. Particularly, cover bearings, shafts and motor.
Check the fan periodically. If roller bearings are installed, turn the fan weekly by the hand. Do not store the fan near machines producing vibrations.

1.4 FOUNDATIONS
For heavy and high-speed fans it is advisable to use reinforced concrete with flushed foundations.
In case of installation on steel structures, the structures should be reinforced so that their minimum vibration frequency is 50% higher than that of the fan and motor speed.
To avoid vibration propagation through the floor, a vibration-damping supports should be installed under the fan steel structure. Ask us for the choice of the supports.

1.5 FASTENING POINTS
Use the fastening points (unless indicated otherwise). Check that the fan structure does not show any deformation when the bolts are tightened.

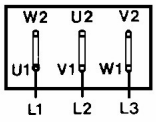
2 – STARTING

2.1 GENERAL CHECK
Before starting the fan, check that the bearings are correctly lubricated and all bolts are tightened.
Rotate the shaft by the hand and check that all components turn freely.
Check that the direction of rotation of the impeller corresponds to that indicated by the arrow on the plate.

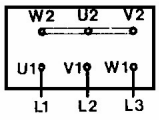
Before connecting the motor to the feeder line, check that the connection between motor terminals is adequate to the line voltage. Connect the screw on the terminal board and the motor foot or flange by/to the earth plate.

CONNECTION TO THE MOTOR TERMINAL BOARD

MOTOR VOLTAGE Volt ***220/380***

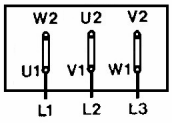


Connection Δ
220 V

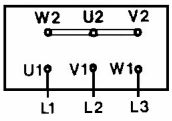


Connection Y
380 V

MOTOR VOLTAGE Volt ***380/660***

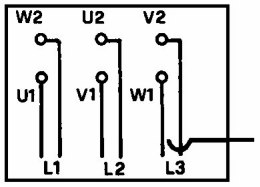


Connection Δ
380 V



Connection Y
660 V

Connection YΔ



To the commutator YΔ

NOTE: The electric equipment should include the following components:

fuses,protectiond against overload and voltage fall suitable for the real starting time and full load current.

Adsorbed Ampere = Measured Ampere x (√3)

2.2 AFTER THE STARTING CHECK THE FOLLOWING POINTS

2.2.1 The direction of rotation should correspond to that indicated by the arrow.

2.2.2 The absorbed current should not exceed that indicated by the motor plate.

2.2.3 The fan should not show excessive vibrations.

2.2.4 The bearing temperature should be constant (a temporary temperature increase and successive decrease is considered to be normal). The temperature to be checked is the working temperature, i.e. the temperature that to be constant.

2.2.5 After some functioning hours, check the bolt tightening and the belt stretch and adjust it, if necessary.

IMPORTANT:

When starting the fan, it is advisable to keep the flap or the delivery regulator completely closed. The starting time is thus lowered avoiding overloaded. For the same reason, unless indicated otherwise, successive starting according to the instructions in the motor order.
Measure the electrical input on the three line wires (L1,L2,L3). In the connection Y the reading should be carried out before the commutator, if this is impossible, measure the phase current on one of the 6 terminal board wires and multiply the value by 1.73 (√3).

3- MAINTENANCE

3.1 HOUSING - NOZZLES

Periodically clean inner parts and remove possible foreign bodies.

3.2 IMPELLER

Remove dirt and deposits that can cause unbalance. In case of abrasive powder suction, vibrations can depend on component wear, in this case replace the impeller as soon as possible.
Periodically check the impeller welding.
Do not separate hub and impeller, since it may endanger the balance.

3.3 PULLEYS

Check the alignment and adjust it, if necessary.
Periodically clean the belts races accurately.

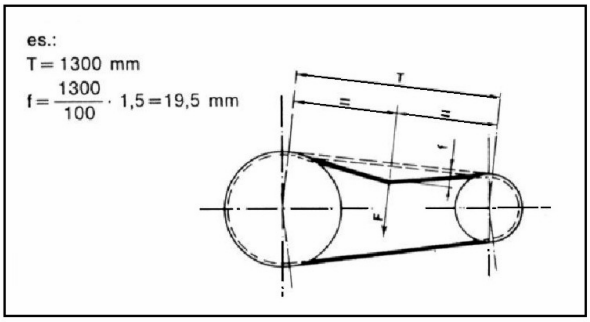
3.4 BELTS

Clean each side.
Check the tension and adjust it, if necessary.

TENSIONING METHOD

Good functioning of the belt transmission depends on a correct tension. Carry out the following operations by operating on the idler:
1. Measure the free lenght T.
2. For each belt, apply, in the middle of T, a perpendicular force F by a dynamometer. The force applied should produce an arrow f of 1.5 mm for each 100 mm of T.
3. Compare the F value supplied by the dynamometer with the F' and F" values indicated in the table.

es.:
T = 1300 mm
$f = \frac{1300}{100} \cdot 1{,}5 = 19{,}5$ mm



Belt section	Minor pulley external diameter	RPM minor pulley	F' min. Newton	F" max. Newton
SPZ	50 ÷ 90 100 ÷ 150 155 ÷ 180	1200 ÷ 5000 900 ÷ 1800 600 ÷ 1200	10 20 25	15 30 35
SPA	90 ÷ 145 150 ÷ 195 200 ÷ 250	900 ÷ 1800 600 ÷ 1200 400 ÷ 900	25 30 35	35 45 50
SPB	170 ÷ 235 250 ÷ 320 330 ÷ 400	900 ÷ 1800 600 ÷ 1500 400 ÷ 900	35 40 45	45 60 65
SPC	250 ÷ 320 330 ÷ 400 440 ÷ 520	900 ÷ 1800 600 ÷ 1200 400 ÷ 900	70 80 90	100 115 130

Notes:
1) The table refers to transmissions showing ratios from 2 to 4. If F < F', the belt should be further tensioned. If F > F', the belt is too tensioned.
2) During the transmission running-in period, the tension decreases rapidly. Therefore, the belts should be tensioned so that the force F, producing the arrow f, is 1.3 times higher than the force indicated in the table. The belt tension should be checked frequently.

4 – GENERAL FUNCTIONING INFORMATION

4.1 INFORMATION ABOUT RADIAL FANS

Radial fans equipped with impellers with radial or forward-curved blades should always be connected to tubing or devices, which limit the fan delivery a resistance.
If the fan would work without resistance (with free inlet), the motor could burn, since the fan produces the maximum delivery and overloads the motor.

a) If the circuit supplies the calculated resistance, the fan shows the calculated delivery and the motor electrical input correspond to that indicated in the table.

b) If the circuit resistance is higher than calculated, the fan shows a lower delivery and the motor electrical input is lower.

c) If the circuit resistance is lower than calculated, the fan shows a higher delivery and the motor electrical input is higher. Therefore, it is advisable to install a flap on the circuit to be adjusted when starting the installation.

4.2 RADIAL FAN WITH IMPELLER WITH BACKWARD-CURVED BLADES

These fans can work also with circuits showing lower resistance without running the risk of burning the motor, since they cause a slight delivery increase with decreasing circuit resistance.

These fans show the maximum power adsorption near the maximum efficiency point. Therefore, the observations at a),b),c), fit also for these fans, except for power adsorption.impeller turns in the opposite direction, reverse the connections of two phases of the feeder line (three phase motor).

NOTE: Important: The impeller direction of rotation is indicated by the arrow on the housing side. If the impeller turns in the opposite direction, reverse the connections of two phases of the feeder line (threephase motor).

4.3 GENERAL INFORMATION

a) Noise
The fan noise mainly depends on the anchorage to the base plate and on the connections to the suction and delivery tubes. It is suggested to install the fan on a vibration-damping plate in order to reduce vibration propagation to the base plate, also interrupt the metal connection between fan and piping by using vibration-damping cloth joints.

b) Electric motor protection
The intensity of the current absorbed by the motor at steady state should not exceed the value indicated on the plate. If the current exceeds the value indicated on the plate, the absorbed current should be adjusted by decreasing the fan delivery by partially closing the flap (for radial fans).
To protect the motor, it is advisable to install an automatic switch equipped with thermomagnetic components. Check the switch contacts periodically.

c) Protection from accidental contacts
All fans are equipped with protections against contact risks according to UNI 9219 specifications.

Before starting the plant, technician and final user should check that all protections are correctly assembled, especially the housing protecting the transmission and the cooling impeller. It is strictly forbidden to start the machine without these protections.
It is also strictly forbidden to open the cleaning door when the fan is in motion. The door should be assembled when the machine is standing still.

NOTE: The risks due to foreign bodies and dangerous gas (explosive, flammable, toxic etc.) inlet should also be considered. Maintenance operations (cleaning, balancing, lubrication, door opening) should be carried out under SECURITY conditions. Therefore, it is necessary to electrical insulate the fan from the main engine before starting maintenance operations.

d) ATEX specifications execution
According to ATEX specifications, SAMA built fans conforming to 1/21 (2G/2D) zone and to 2/22 (3G/3D) zone, keeping in mind these following technical characteristics;

- Fully welded scroll house.
- Inspection fan door.
- Viton seal for motor shaft and scroll.
- Copper inserts for nozzle and impeller.
- Self-locking tightening bolt.

5 – DISASSEMBLY AND ASSEMBLY

5.1 SUCTION NOZZLE
Remove the nuts that fasten the nozzle to the fan side.

5.2 HOUSING
The housing of adjustable fan is fastened to the chair disk by bolts. Loosen the corresponding nuts to disassemble the housing. For big fans the housing is welded directly on the fan base plate. In this case, the housing cannot be disassembled.

5.3 IMPELLER (single inlet)

Disassembly:
Remove the suction nozzle and the housing, if possible. Remove then the screw and the washer that fasten the impeller to the shaft. Place a sheet protection washer on the shaft end. Remove then the impeller from the shaft by the extractor.
It is advisable to hook heavy impellers to a tackle until they are completely removed.

Assembly:
Place the impeller in front of the shaft, then tighten the nut o the screw in order to push the impeller against the shoulder.

6 – DEFECTS AND FUNCTIONING

THE MALFUNCTIONNING OF AN AEROHYDRAULIC INSTALLATION MAY DEPEND ON DIFFERENT CAUSES, WICH SHOULD BE SYSTEMATICALLY DETECTED AND REMOVED.

6.1 AEROHYDRAULIC DEFECTS

It may depend on the following causes:

- Insufficient delivery.
- Excessive delivery.
- Excessive power adsorption.
- Wrong starting.
- Air pulses, noise and vibrations.

6.2 INSUFFICIENT AIR DELIVERY

For radial fans, especially with forward-curved or radial blades, insufficient air delivery is combined with power decrease.
For radial fans with backward-curved blades power adsorption does not show considerable changes. For some special applications it shows a slight increase, this is true also for some axial fans.

Carry out the following operations:

6.2.1 Check the direction of impeller rotation, a radial fan turning backwards blows anyway air into the circuit, but the air delivery is insufficient.
6.2.2 Check the motor rotation speed and that the belts do not slide.
6.2.3 Choose a straight air tube segment, preferably before the fan, and measure the instant air delivery at by the Pitot tube.
6.2.4 Measure the static pressure during suction and delivery, the algebraic difference indicates the fan static pressure.
6.2.5 Compare the results obtained by **6.2.3** and **6.2.4** operations with the project data.
6.2.6 If the value obtained for **6.2.3** is low and that one obtained for **6.2.4** is equal or lower than the project value, the defect probably depends by the circuit and not by the fan. Check the circuit sections to detect too high flow resistance by checking the static and total pressure in the main points of the circuit. Excluding estimation errors, flow resistance can depend by one of the following causes:
6.2.7 Improper flap adjustment.
6.2.8 There are two or more clogged curves or section, or very narrow section changes.
6.2.9 A suction or diffusion grid is too close-meshed, an air delivery decrease through sharp edge openings. This type of punched or expanded metal protection placed on an opening can provide a free area 30% or more lower than the measurable passage area.
6.2.10 There is an overloaded filter.
6.2.11 There is a foreign body accumulation.
6.2.12 There is a turbulence (usually after an axial fan without rectifier or centrifugal dust separator).
6.2.13 Flaps or registers are not positioned correctly or circuit components have not been installed.
6.2.14 There are air leaks beyond the test points (for example opened inlet doors, wrong construction or installation of ducts or components) or beyond the masonry ducts.
6.2.15 The bypass flaps are not perfectly closed (for example in a boiler installation).
6.2.16 Unbalance between parallel-working fans, contact the constructor in this case.
6.2.17 Excessive estimation of the circuit flow resistance, in this case should be decrease the fan rotation speed (or close the flaps) until reaching the required performance.

6.3 EXCESSIVE POWER ADSORPTION

It may depend on the following causes:

6.3.1 A radial fan with forward-curved or radial blades delivers too much air.
6.3.2 A radial fan with backward-curved blades turns in the opposite direction or an impeller with wrong direction of rotation turns correctly.
6.3.3 There is an air pre-rotation during suction in the opposite direction with respect to the sense of direction of the fan. Check the suction hood.
6.3.4. There is an short pitch axial fan or an axial fan working with an excessive pressure.
6.3.5. An alternating current motor turns at a lower rotation speed because of a detective winding or starting or because of a low feeding voltage.

6.4 DANGEROUS STARTING

It may depend on an excessive power adsorption (**see 6.4**) or on the following causes:

6.4.1 The feeding voltage is too low.
6.4.2 The starting voltage on the transformer is too low.
6.4.3 The maximum relay is not suitable for the starting conditions.
6.4.4 There is a defect in the motor causing a static characteristic decrease.
6.4.5 The evaluation of the moment of inertia of the fan rotating parts, with respect to the selected motor and its starting type, is wrong.

When starting radial fan, it is possible to restrict the load by closing the flaps completely until reaching full speed ,this is not true for most axial fans.

6.5 AIR PULSES (PUMPING), NOISE OR VIBRATIONS

Air pulses are caused by delivery unsteadiness and may depend on the following causes:

- An axial fan works within the initial area of its functioning characteristics under stall conditions.
- Most fans working near to zero delivery conditions may cause air pulses.
- There are fan fluctuations in the parallel arrangement.
- The suction has been connected improperly or is obstructed thus unsteady air inlet conditions (ex.: vortex)
- The flow alternately touches or is detached form divergent duct walls.

Generally, all fans produce noise that should be reduced only if it is unacceptable. Noise may be caused by air, mechanical components, electrical hum or a combination of them. Noise produced by air may increase because of obstructions near the fan suction and delivery. Noise id commonly due to a wrong fan choice. In this case, replace the fan by a noiseless one (generally having a larger diameter and a lower speed) or apply soundproof devices.

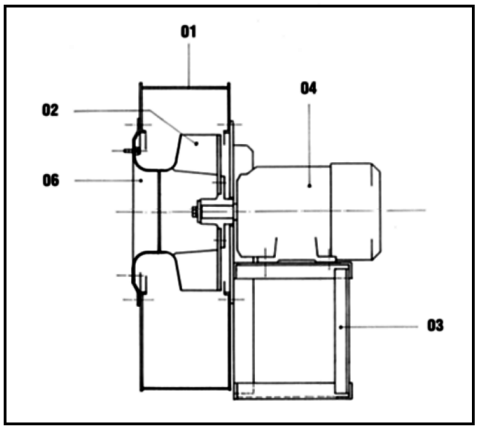
The mechanical noise may depend on friction of moving parts, wrong bearing choice, sheet vibrations etc. Generally, the causes can be detected easily but it may be useful to apply the stethoscope to detect noise in bearings or in the electric motor.

The electrical noise may depend on eccentricity between rotor and stator, defects or porosity in the rotor die-casting winding vibrations etc. Some single-phase motors often show these defects. Noise may considerably increase or decrease according to the motor assembly method.

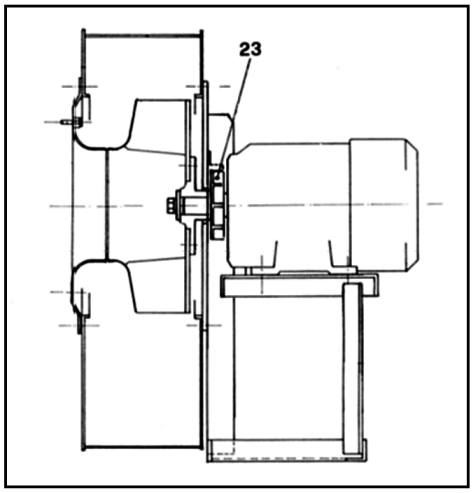
Unacceptable vibrations may depend on unbalances, inadequate support structure or a combination of both causes. When the natural frequency of a support structure is near to that corresponding to the fan rotation speed it is impossible to avoid vibrations. The structure can be reinforced or its resonance natural frequency can be changed (ex.: by adding weights), in case of excessive unbalance, contact the fan constructor or a vibration specialist.

7 FAN DRAWINGS AND SCHEME

Execution type 4



Execution type 4 (with cooling fan)



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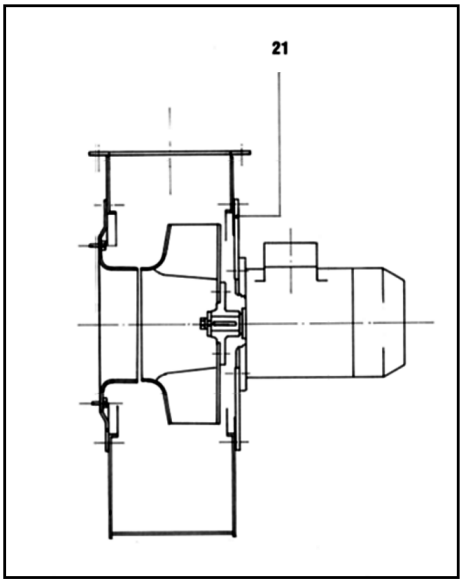

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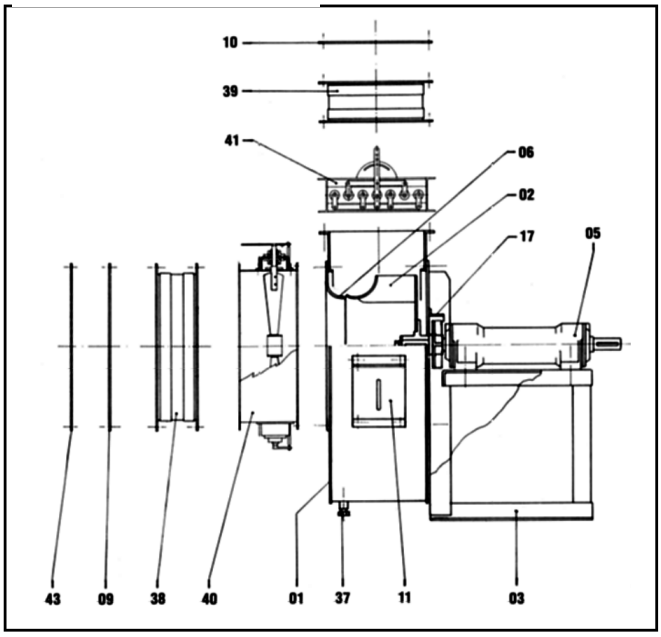

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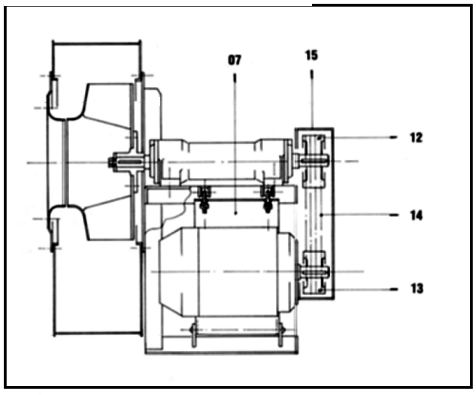

Execution type 12