2010

åkerstedts

industrial fans since 1977

Instructions, Fans
FML, FKL, FAM, FAH

These instructions provide information and documentation about the technology and care of the fans. They should be read by responsible personnel and service

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Åkerstedts Verkstads AB
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Instructions Radial fans

Explanation term

F = Fan

M = Internal code letter

L = Low pressure (M = Medium, H = High)

B = Backwards bent blades (P = Flat, R = Radial)

F = Fan

K = Internal code letter

L = Low pressure

B = Backwards bent blades (P = flat)

F = Fan

A = Internal code letter

M = Medium pressure (H = High)

B = Backwards bent blades (P = Flat, R = Radial)

Symbols

The mark can be seen in sections that users of an Atex-classed product should pay special attention to.

FML, FKL, FAM, FAH

1. Prior to installation

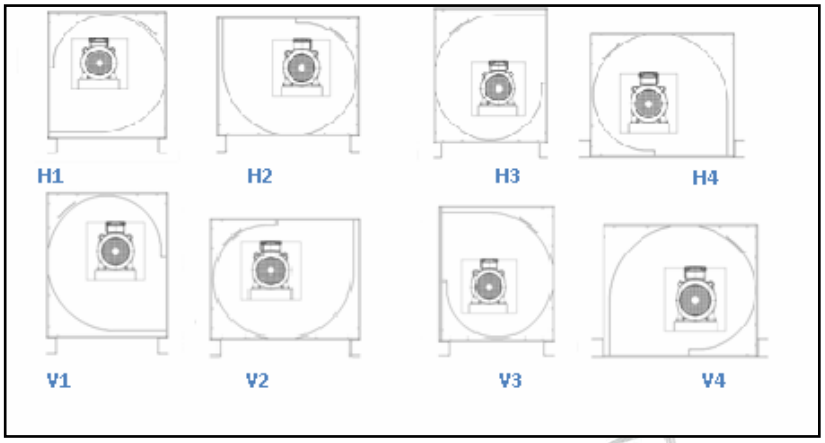
This instruction should be read by concerned personnel prior to commencing work with the product.

The rotational direction of the fan is indicated with an arrow on the fan cowl. Designation of the fan is shown on the fan type plate. In those cases where the product is Atex-classed, this should be visible on the fan information plate. Only the user is responsible for ensuring that the right product is applied for the right application and in the right environment. Please refer to the order acknowledgement for order-specific information.

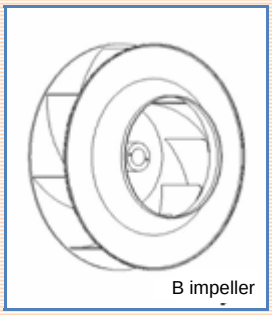
When contacting Åkerstedts Verkstads AB, it is important that the correct designation and layout are specified.

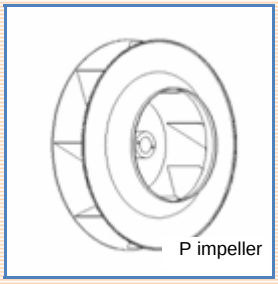
1.2 Blow-off forms

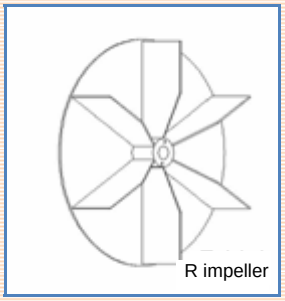
Direct drive



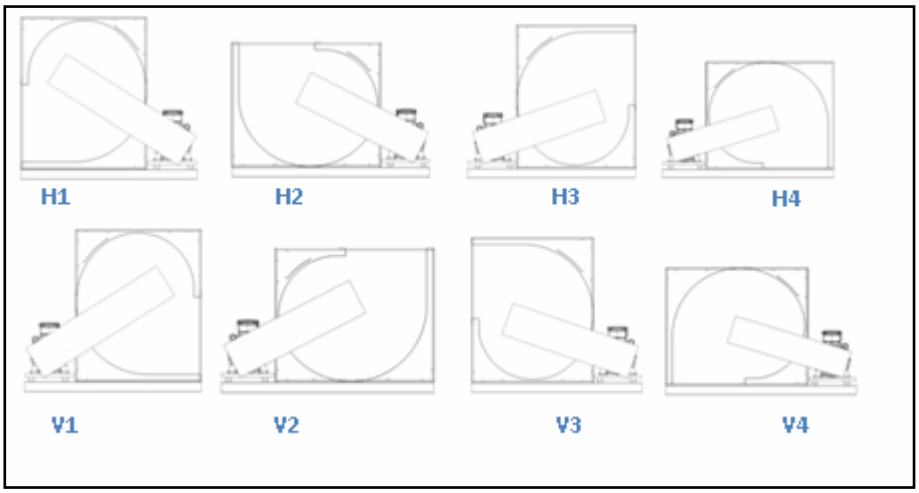
Design of blades


B impeller


P impeller


R impeller

Belt-drive



2. Installation

Set-up and anchoring

All fans are tested prior to delivery.

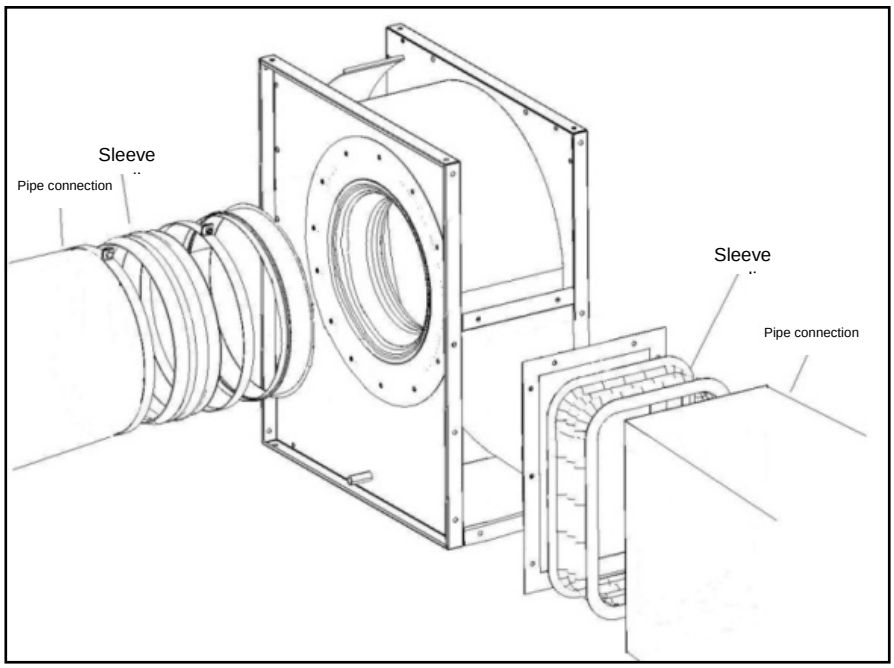
Rotating parts in the radial fans are both statically and dynamically balanced.

Normally, the fans are delivered mounted on a steel base. For mounting on a concrete base, we recommend that the fan be secured using expansion bolts.

2.1 Connection to ducts

Assembly without vibration dampers:

Connection ducts must NOT place a strain on the fan cowl; it can be deformed and come into contact with the impeller.



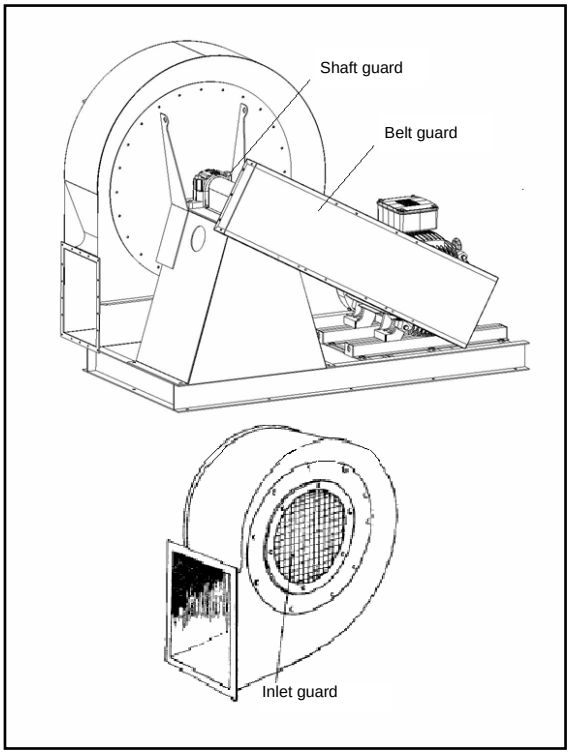
Assembly without vibration dampers:

Connecting ducts shall be connected onto flexible sleeve couplings on inlets/outlets on the fan.

Touch guard

According to the Swedish Occupational Safety and Health Act and The Swedish Board of Occupational Safety and Health, adequate protection for rotating machine elements is required.

Normally a touch guard for the drive mechanism is included in the delivery. Guards for inlets and outlets must be specially ordered. In cases where the product is Atex-classed, the fan shall be equipped with an protective guard to prevent objects from being sucked into the fan.

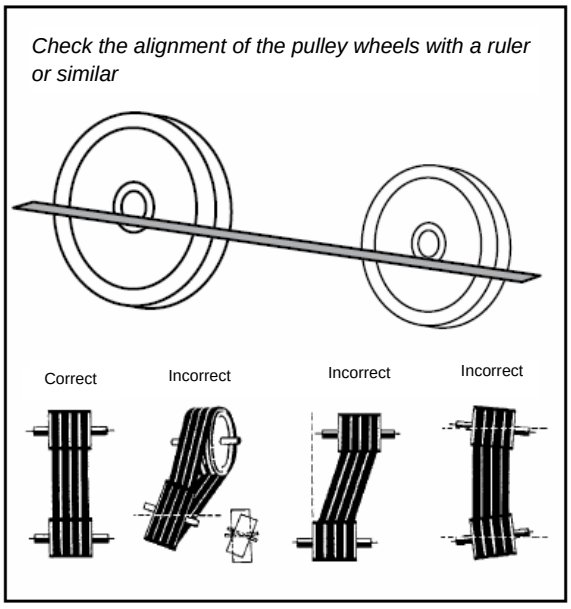


2.3 V-belt drives

2.3.1. Alignment

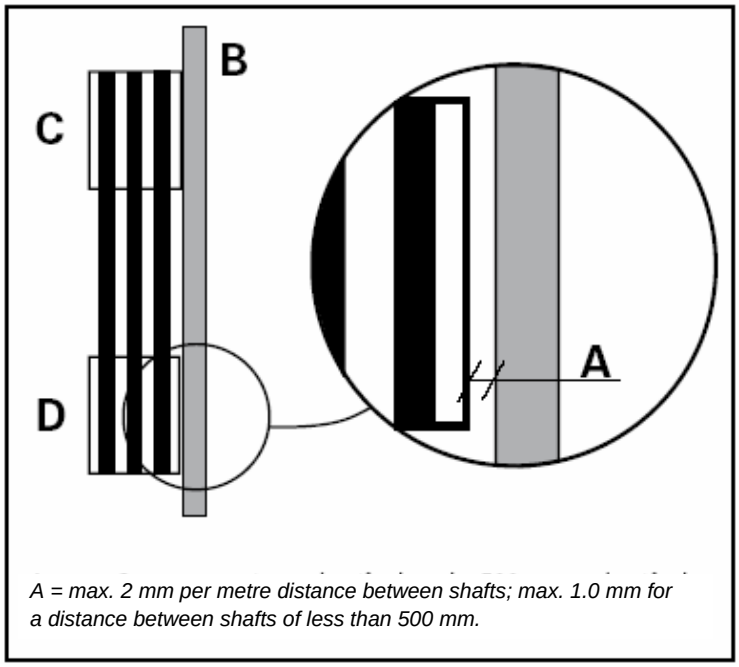
- Check that the shafts are parallel
- Check that the pulley wheels do not run out of true during alignment

The check can be made using a ruler or similar that is placed along the sides of the pulleys. The ruler should be in contact with the entire side on both the driving and the driven pulley.



- The maximum angular fault of the belt (measurement A in the figure, next page) may not exceed 2.00 mm per shaft distance
- For a shaft distance of less than 500 mm, a maximum angular misalignment of 1.00 mm is allowed

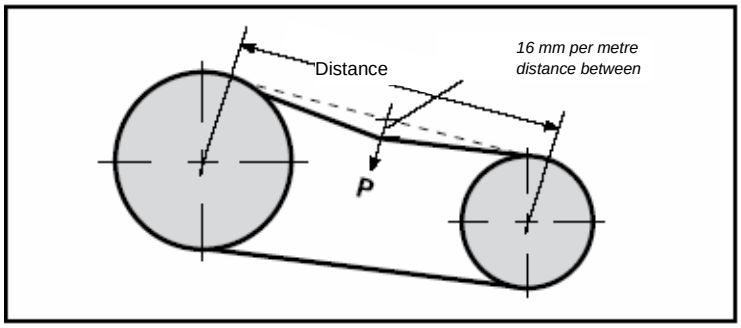
Place rule B against both edges of pulley wheel C. Turn pulley wheels C and D so the maximum distance A is obtained.



A = max. 2 mm per metre distance between shafts; max. 1.0 mm for a distance between shafts of less than 500 mm.

2.3.2. Belt replacement

When a belt or belts in an operation are worn, a complete, new set of belts must be applied. Otherwise the new belts will be subjected to a greater load as they are shorter than the worn belts. Adjust the centre distance so that the belts can easily be manually applied. Under no circumstances may the belts be bent down into the grooves using a sharp screwdriver of similar.



Indentation force P for an arrow height of 16 mm/m distance between shafts		
Belt profile	The small pulley wheel's D	P Newton (N)
SPZ	67-95 100-140	10 to 15 15 to 20
SPB	160-224 236-315	35 to 50 50 to 65

NOTE! The belts must not be lubricated or rosined!

2.3.3. Belt tension

- Insufficiently tensioned belts will involve a risk for skidding
- Over-tensioned belts will involve a risk for bearing damage in the motor and fan.

Checking: When hit, the belts should feather slightly and provide a good sense of resilience. They must not feel slack or lifeless.

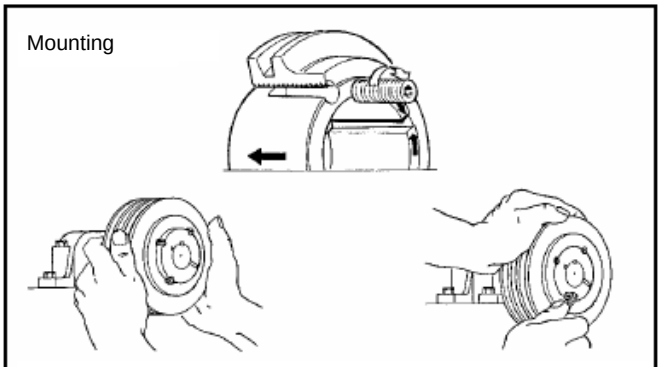
The belt tension should be checked after 50 hours of operation. The major part of belt extension occurs during the first hours of operation.

Belt tension shall always be checked in conjunction with:

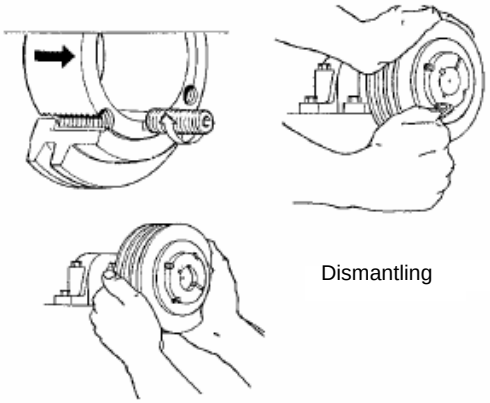
- The commissioning of a new fan
- New belts have been applied
- A long period of standstill
- Every 6 months

Check for correct belt tension as follows:

1. Measure the distance between shafts
2. Measure the force **P** that is required to press the belt 16 mm calculated per metre of distance between shafts, perpendicular to the direction of the belt and approximately in between the pulley wheels. Trelleborg's tensiometer or a small fish scale is recommended. Only use a calibrated meter.
3. Increase the belt tension if the force is less than P in the table, and vice versa.
4. Recommended belt tension: 0.8 *Pmax
   New belts should be tensioned so that the pressing force as far as possible corresponds to the higher table value, P, in the table.
   In each pulley gear, use belts with the same nominal length. Make sure that the pulley wheels are flush with each other.
   Regular checking of the belt tension assures maximum service life of the belts.



Clean and degrease all blank surfaces. Mount the same pulley wheel and bushing; place the holes.
(2- 3) with half thread aligned with each other, insert the screws loosely.
Push the pulley/bushing unit onto the shaft, align in the appropriate place and tighten the screws uniformly.



Unscrew the bolts, place one of them in the puller hole, i.e. the hole with a half thread in the bushing, and tighten it. The bushing will come lose in this way.
The loose pulley can be pulled off by hand without hitting it.

2.4 Mounting V-belt pulleys

3. Commissioning

3.1 Prior to start-up

Check the following before starting the fan:

1. The electric motor is connected to the correct mains voltage
2. All phases are connected (fuses are whole)
3. That V-belts have the correct tension
4. Fan motors and belt drive are aligned and anchored
5. Ducts are properly attached and sealed against the fan WITHOUT burdening this!
6. Flexible sleeve couplings are correctly installed
7. Tools or other objects have not been left in the fan

3.1 After start-up

Check the following after start-up:

1. Rotational direction of the impeller
2. That there are no vibrations or dissonant noises
3. That the bearing temperature is normal
4. That the motor does not use more than nominal current
5. That the current in the phases is of the same size

4. Maintenance

4.1 Fan

The following must be checked at least once per year:

1. Check fan balance. Feel the fan cowl and establish that there are no abnormal vibrations.
2. If there is drainage, check that this is not clogged.
3. Check that any connected flexible sleeve couplings are intact.
4. Fans that are used for transporting material should be checked via the inspection cover: clean the impeller when necessary.
5. That the motor does not use more than nominal current and that the current in the phases is identical.

4.2 Electric motor

Inspect at least once a year!

Bearings:

- Listen to the bearings. If the bearing is correct, a slight humming sound should be audible.
- A squeaking sound means that the bearing has gone dry
- A scraping or clonking sound means that balls or ball races have been damaged.

Damaged bearings must be replaced!
Check that the motor's attachments are intact and that the retaining screws are tightened.

Cleaning at least once a year:

Externally the motor must be kept clean for dust, dirt and oil. In particular, clean the motor's cooling fan and grille at the bottom.

Cleaning should be carried out with a drying cloth. In the event of severe contamination, white spirit or similar can be used as a solvent. There is a risk for internal overheating if layers of dirt prevent cooling of the stator frame.

Lubrication of roller bearings:

For motors up to size 200: Under normal operating conditions, it is sufficient to replenish grease every 3rd year.

For motors 225 and upwards: These motors have valve lubrication as standard. Instructions are provided on a special plate.

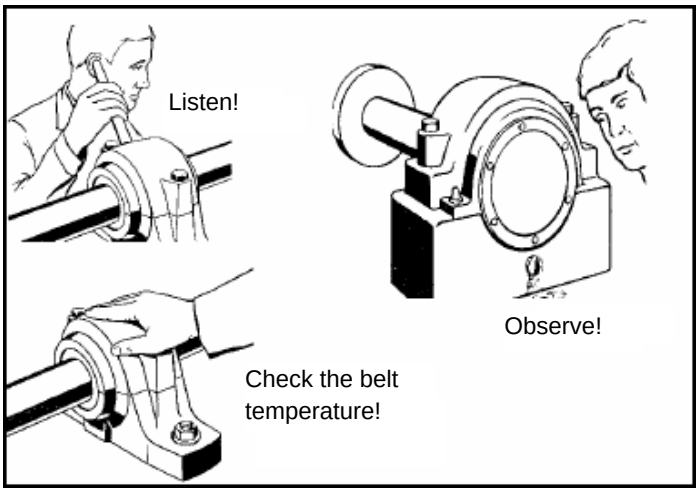
4.3 Bearings

4.3.1 Inspection

Bearings mounted in machines where stoppage can have serious consequences should be inspected on a regular basis. Less critical bearing locations where operating conditions are not too demanding can often be left without any other supervision than normal lubrication.

- Check that lubricants are not leaking out through broken seals or poorly tightened plugs.
- Normally, impurities discolour the lubricant making it darker.
- Check sealing devices in the vicinity of the bearing. They should be in such a condition that hot or corrosive liquids, etc. cannot penetrate to the bearing.
- Check that any lubricating automatics are working.
- Listen to the bearing by placing a wooden stick, screwdriver of similar tool against the bearing housing. Press your ear against the tool and listen.
    - A correct bearing emits a soft, purring sound.
    - A damaged bearing emits a harsh sound, often irregular and noisy.
- Check the temperature of the bearing with a thermometer, heat sensitive chalk or by feeling the bearing housing with your hand. If the temperature seems abnormally high or changes suddenly, this is a sign of a disruption in the function of the bearing.

Grease replacement:
When replacing grease, the bearing housing must be opened and cleaned of old grease and soap residue, which are decomposition products of grease, before new grease can be applied.



Cause:

- Lack of lubricant
- Too much lubricant
- Impurities
- Overloading
- Bearing damage
- Slight play in bearing
- Pinching
- Friction in seals
- Heat supplied from surroundings

NOTE! After lubrication, there is often a completely natural increase in temperature that can remain for 24-48 hours.

4.3.2 Type of lubrication and quantity

Recommended lubricants are: Grease SKF LGEP 2

It is very important that the correct lubricant is used and that the amount of lubricant adheres to the recommendations by Åkerstedts on each occasion. Overfilling can result in a severe rise in bearing temperature resulting in the decomposition of the lubricant.

4.3.3 Lubrication interval

FML has bearings that are only greased once. Others should be greased according to table 1.

The tables apply for normal load and a bearing temperature of 70°C (measured at outer ring)

At a temperature above 70°C:

Reduce the lubrication interval by half for each temperature increase by +15°C. NOTE! Naturally, the maximum permitted temperature of the grease must not be exceeded.

At a temperature below 70°C:

Extend the lubrication intervals by up to twice the values when the operating temperature is lower than +50°C. The permitted length of the lubrication interval can vary greatly for different types of grease even if these seem to be visibly similar.

Type of fan	Recommended lubrication interval in operating hours at different rotational speeds *)		Amount of lubricant
FKL (B,P,R)	5,000	3,000 hours	gram
90	<800	800-1,450	10
100	<750	750-1,300	10
112	<700	700-1,150	10
125	<650	650-1,050	15
140	<600	600-900 rpm	20

Table 1: *) The lubrication interval for this type of fan applies for bearings on the drive side. Bearings at the inlet are only lubricated once.

Type of fan		Recommended lubrication interval in operating hours at different rotational speeds						Lubricant quantity
FAM (B,P,R)	FAH (B,P,R)	3,000	2,000	1,500	1,000	500	350 hours	gram
012-016		<5,000	5,000-6,000	6,000-7,500				10
020-025	010-012			<2,700	2,700-3,500	3,500-5,500	5,500-6,500	10
031-031	025-025		<1,800	1,800-2,000	2,000-2,500	2,500-4,000	4,000-4,800	10
040-040	031-031		<1,500	1,500-1,800	1,800-2,200	2,200-3,200	3,200-3,800	15
050-071	040-040		<1.400	1,400-1,700	1,700-2,000	2,000-2,700	2,700-3,000	20
080-090	050-071		<1,300	1,300-1,400	1,400-1,700	1,700-2,400		20
100-112			<1,100	1,100-1,300			rpm	30

4.4 Troubleshooting

Disruption		Possible cause	Action
	Loud metallic sound	Abnormal load.	Change in fit, play or pre-tension.
		Incorrect mounting.	Check installation and alignment
		Deficient lubrication or dirt in bearing	Refill or change lubricant.
		Wrong bearing version	Change to silent running bearings, alternatively bearings with less play
		Slipping rolling elements.	Correct pre-tension, select bearing with less play alternatively Softer grease.
		Contact with rotating parts	Adjust labyrinth seal
		The impeller is in contact with the inlet cone.	If possible, balance the impeller, shaft
	Regularly loud sound	Rust or scratches on the runways.	Replace bearing, clean, improve seals, use clean lubricant.
		Indentations in rolling elements.	Replace bearing.
		Scaling on runways.	Replace bearing.
	Irregular sound	Excessive bearing play	Change fitting, play, pre-tension.
		Stamping through foreign particles. Damage to design.	Replace bearing, clean, improve seals, use clean lubricant.
		Scratches or rolling element damage.	Replace bearing.
Abnormal temperature increase		Too much lubricant	Reduce the amount of lubricant, use a weaker grease.
		To little lubricant, Or dirt in the bearing.	Refill or alternatively change lubricant. Inspect the bearing.
		Abnormal load.	Check fit, play pre-tension.
		Incorrect mounting	Check installation and alignment.
		Slipping between fitting surfaces, excessive sealing friction	Check seals, replace bearing, change the fit.
Vibrations.		Indentations in rolling elements.	Replace bearing.
		Scaling on runways.	Replace bearing.
		Incorrect mounting, imbalance.	Check angular deviations shaft/ bearing housing and contact surfaces of spacer rings. Check balancing.
		Penetration of foreign particles.	Replace bearing, clean. Improve seals.
Loss of lubricant or discolouring of lubricant		Too much lubricant, penetrating of foreign particles, wear.	Reduce amount of lubricant, use more solid grease, replace bearing housing contact parts.

5. Other instructions and limitations

- The ambient temperature should be between -20°C and +40°C.

- The fan's operating position is specified in the order acknowledgement. Any deviation from this may only take place after advice from Åkerstedts.

- In the event the product is Atex-classed:
  - The gas temperature may not exceed +70°C.
  - The fan must be fitted with protective earth.
  - Temperature class T5 applies; maximum outer temperature +100°C.