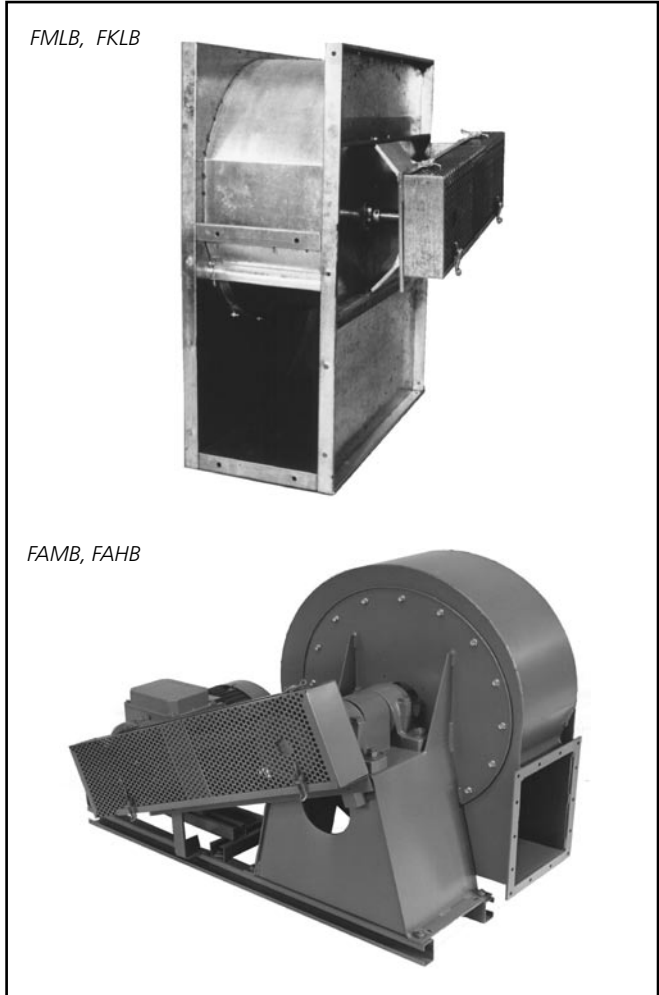


# Instructions for the FMLB, FKLB, FAMB, FAHB (P,R)-1-3 Centrifugal fans

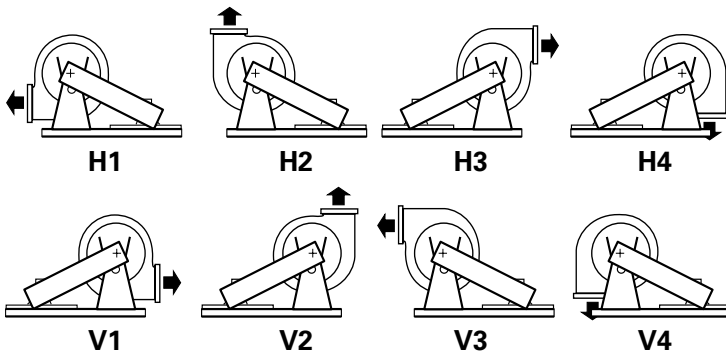
## 1. GENERAL

These instructions, wherever relevant, are applicable to the entire range of Swegon centrifugal fans. The instructions must be read and understood by all personnel concerned before any work with the product is begun.

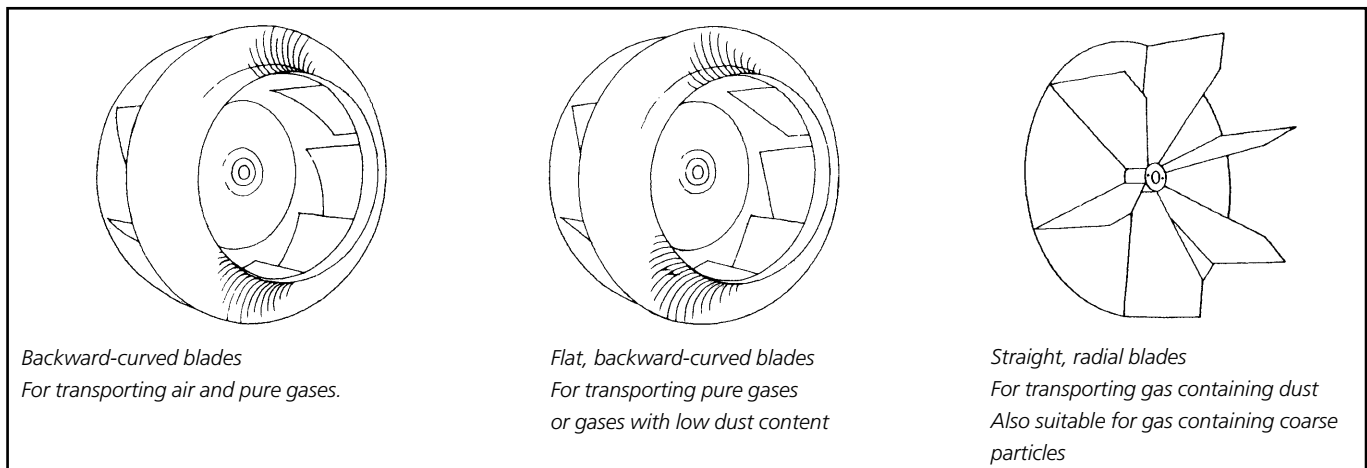
The direction of rotation of the fan is indicated by an arrow on the fan casing. The type designation of the fan is specified on an identification plate on the fan. The fan designation begins with a four-letter combination such as: FMLB. F denotes a fan, M is a code letter for in-house use and L denotes that the fan is of low-pressure type (M = intermediate pressure or H = high-pressure may instead be specified). The last letter, B, denotes backward-curved impeller blades (can also be P for flat, backward-curved blades or R for straight, radial blades). The digits after the four-letter combination indicate the size, variant and other particulars. Whenever you get in touch with Swegon, it is important that you state the correct fan designation and design. If the identification plate of the fan is missing, the illustrations below may be of help.



*Variants for various directions of discharge*



*Impeller Blade Design*



*Backward-curved blades  
For transporting air and pure gases.*

*Flat, backward-curved blades  
For transporting pure gases  
or gases with low dust content*

*Straight, radial blades  
For transporting gas containing dust  
Also suitable for gas containing coarse  
particles*

## 2. INSTALLATION

### 2.1 Installation and anchoring

The rotating parts in the centrifugal fans have been both statically and dynamically balanced.

All the fans are thoroughly tested and test-run prior to delivery.

The fans are normally delivered mounted on a steel base. If the fan is mounted on a concrete foundation, it is advisable to secure it by means of expansion-shell bolts.

### 2.2 Connection to the ducting

The dead weight of the connected ducting must not apply a load on the fan casing. Otherwise, the casing may be deformed and come in contact with the impeller. Fans that are mounted on anti-vibration mountings or on an anti-vibration insulated base, should be connected to the ducting across a flexible duct.

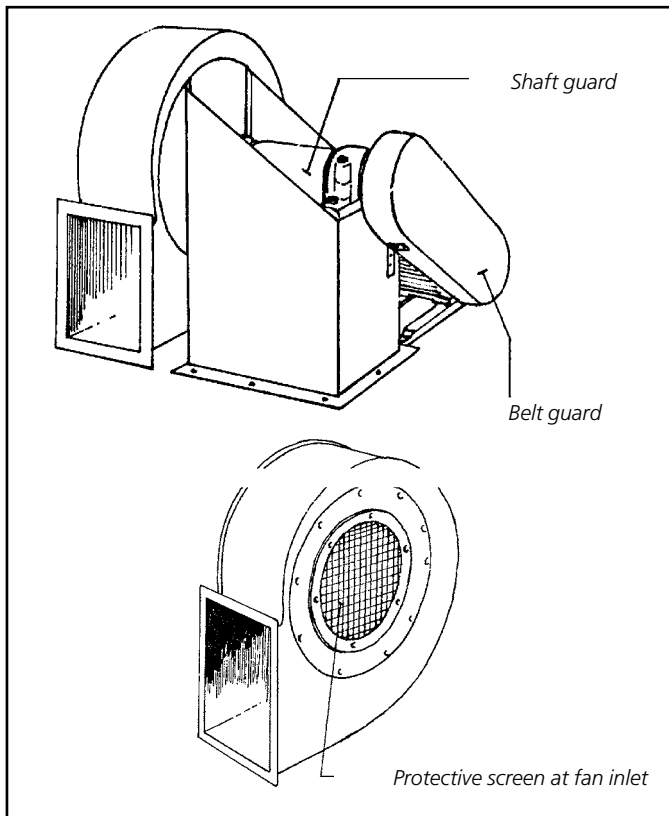
### 2.4 Safety guards

In accordance with the Labour Welfare Act and the directives of the National Board of Occupational Safety and Health, adequate protection is required for rotating machine parts.

If the fan will be situated 2 metres or lower from the floor, a platform or similar, then safety guards must be required at both the impeller and at the belt drive.

This also applies if greasing or other necessary inspection must be carried out when the machinery is running.

The belt guard is normally included in the supply. Protective screens for the fan inlet or outlet are available to special order.

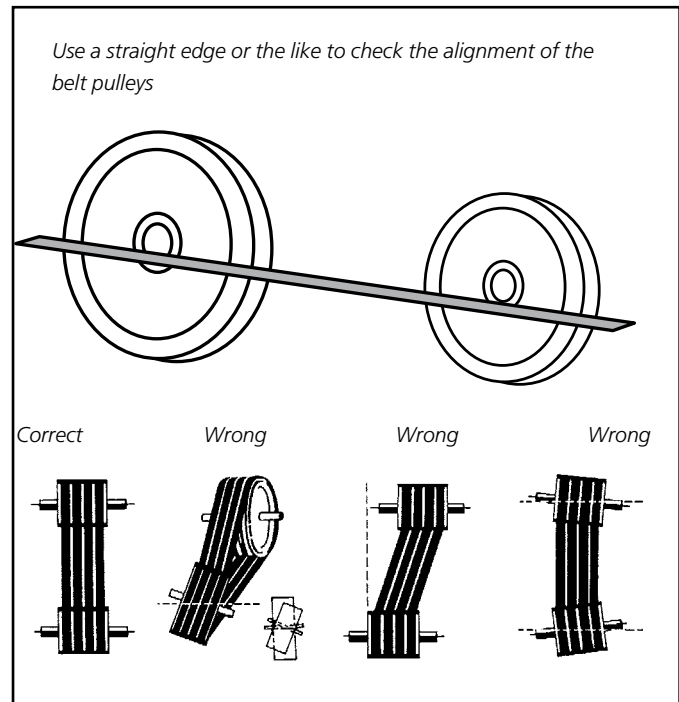


## 2.5 V-belt drives

### 2.5.1 Alignment

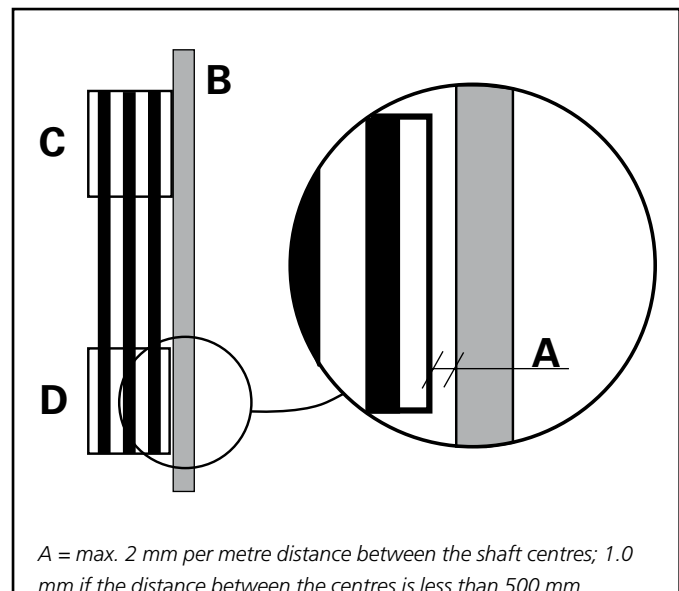
Make sure that the shafts are parallel and that the belt pulleys do not pitch while you align them.

Check the alignment by placing a straight edge or the like against both the drive pulley and the driven pulley, in full contact with the sides of the pulleys.



The maximum angular error of the pulleys (**A** in the figure below) must not exceed 2 mm per metre distance between the shaft centres. If the distance between the centres is less than 500 mm, a max. angular error of 1.0 mm is permissible.

Place the straight-edge **B** with both its edges against pulley **C**. Turn pulleys **C** and **D** to provide the greatest distance at **A** occurs.



## 2.5.2 Belt replacement

If any of the drive belts should become worn, the complete set should be replaced. If only some of the belts are replaced, these will carry a higher load, since they are shorter than worn, stretched belts. Adjust the distance between the centres to enable the belts to be slipped on the pulleys by hand. Under no circumstances should the belts ever be forced into the grooves by means of a lever, screwdriver or the like.

CAUTION! Do not apply belt dressing to the belts.

## 2.5.3 Belt tension

If drive belts are insufficiently tensioned, they are likely to slip, and if they are excessively tensioned, the motor and fan bearings may be overloaded. If the belts are tapped, they should give slightly and give the impression of elasticity. They should not feel slack or lifeless.

The belt tension should be rechecked after 50 hours of operation. Belt elongation mostly arises during the initial hours of operation.

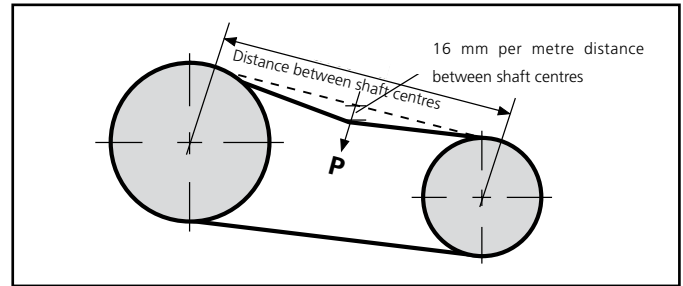
The belt tension must always be checked whenever a new fan is commissioned, whenever new belts have been fitted and if the fan has not been in use for a longer period. In other cases, the belt tension should be checked at least once every six months.

The belt tension should be checked for correctness as follows:

1. Measure the distance between the shaft centres.
2. Measure the force **P** required for deflecting the belt 16 mm per metre distance between the centres, perpendicular to the direction of belt movement and about halfway between the pulleys. The use of a Trelleborg tensiometer or a small (fish) scale is recommended for this measurement. Use calibrated measuring instruments only.
3. Increase the belt tension if the force is less than **P** in the adjacent table and vice versa.
4. The recommended belt tension is  $0.8 \times P_{\max}$ .

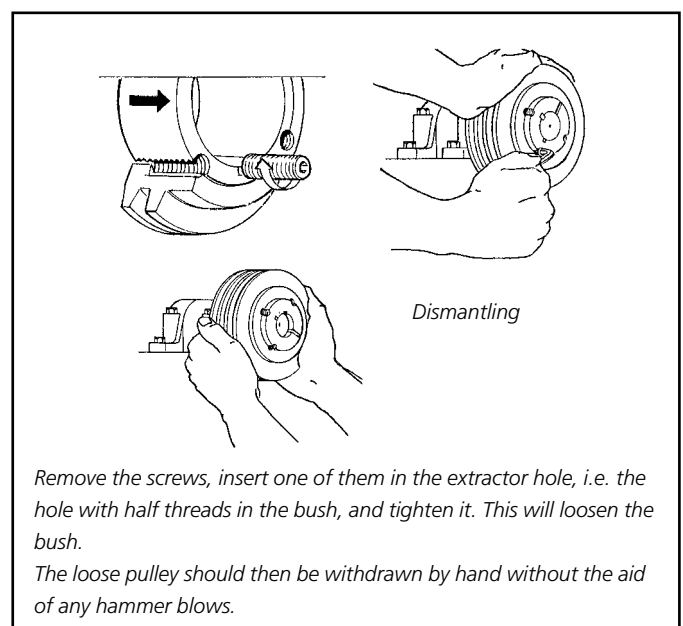
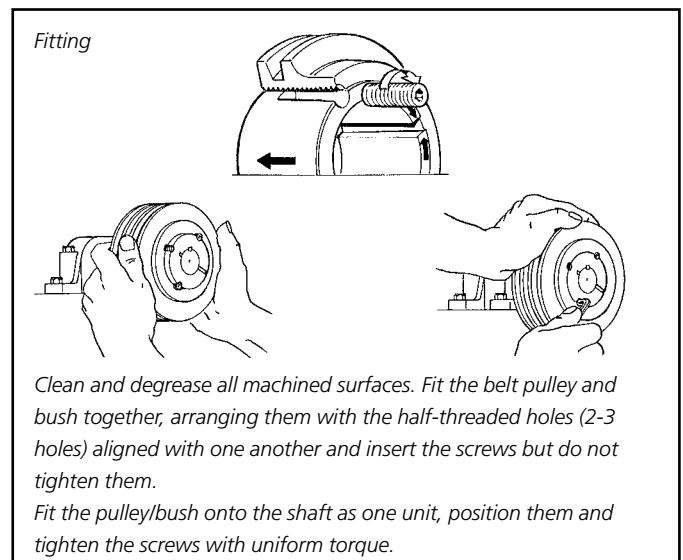
New belts must be tensioned so that the necessary deflection and force will be as equivalent as possible to the higher P value in the table.

Use drive belts having the same nominal length in each belt drive. Make sure that the pulleys are aligned with one another. Regular inspections of the belt tension will give the belts a long useful service life.



| Force P for 16 mm deflection/m distance between the shaft centres |                                 |                 |
|---|---------------------------------|-----------------|
| Belt profile  | Dia. of small pulley $d_d$ (mm) | P in Newton (N) |
| SPZ   | 67 – 95                         | 10 – 15         |
|   | 100 – 140                       | 15 – 20         |
| SPB   | 160 – 224                       | 35 – 50         |
|   | 236 – 315                       | 50 – 65         |

## 2.6 Fitting V-belt drive pulleys



## 3. COMMISSIONING

### 3.1 Before starting the fan

Before starting the fan, check the following:

- 1) That the electric motor is wired for the correct mains voltage and that all phases are connected (fuses are intact).
- 2) That the fan motor and belt drive have been aligned and are securely anchored.
- 3) That the V-belts are correctly tensioned.
- 4) That the ducting is properly secured and is tight against the fan without applying any load on the casing.
- 5) That the flexible ducts are correctly fitted.
- 6) That no tools or other objects have been left inside the fan.

### 3.2 After the fan has been started

After the fan has been started, check the following:

- 1) That the impeller is rotating in the right direction.
- 2) That there are no abnormal vibrations or noise.
- 3) That the bearing temperature is normal.
- 4) That the motor doesn't exceed the rated current, and that there is equal amperage in all the phases.

## 4. MAINTENANCE

### 4.1 Fan

The following items must be checked at least once every 12 months:

1. Check the fan balance. Feel the fan casing and ascertain that there are no abnormal vibrations.
2. If the fan has a drain connection, make sure that it isn't clogged.
3. Check that the connected flexible ducts are intact.
4. Fans that are used for transporting material should be inspected from the inspection cover. Clean the fan casing, if needed.
5. Check that the motor doesn't exceed the rated current, and that there is equal amperage in all the phases.

### 4.2 Electric motor

Inspect at least once every 12 months:

Listen to the bearings. A normal bearing emits a slight humming sound. A whistling sound indicates that the bearing has run dry. A scraping or thumping sound indicates that bearing balls or ball races are damaged.

Any damaged bearings ought to be replaced. Also check that the motor mounts are intact and that the mounting bolts are properly tightened.

Clean at least once every 12 months:

The interior of the motor should be kept free of dust, grime and oil. In particular, clean the motor cooling fan and the grille below.

Clean with a dry cloth. If the motor is especially dirty, non-caustic cleaning agent will be used. The motor is likely to overheat if layers of dirt obstruct the flow of air that cools the stator.

Lubricating rolling bearings:

Under normal operating conditions, bearing lubrication will last about 3 years in the size 200 and smaller motors. When a grease change is necessary, the bearing casing must be opened and thoroughly cleaned. All old grease and any remaining degreasing agent must be removed before new grease is applied.

The size 225 – 355 motors have grease nipples as standard. Lubrication instructions are specified on a special label.

### 4.3 BEARINGS

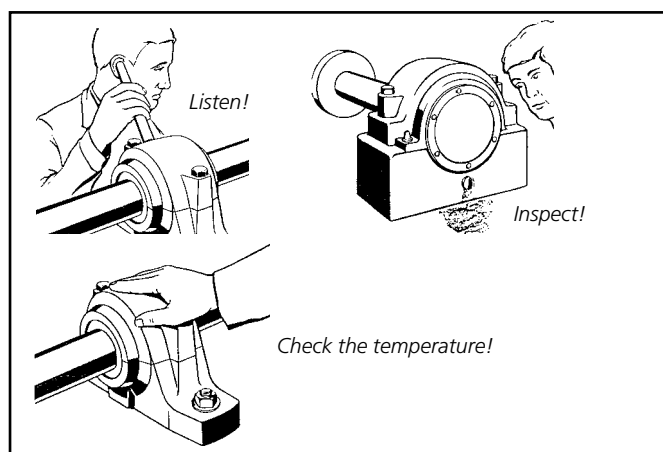
#### 4.3.1 Inspection

The bearings in machines where a stoppage would give rise to serious consequences, should be regularly inspected. Bearings at less critical locations where the operating conditions are not particularly demanding, need in most cases only be lubricated. Check that grease is not leaking out through defective seals or insufficiently tightened plugs. Impurities usually discolour the grease and make it darker. Also check the seal arrangements in the vicinity of the bearing. They should be intact so that hot or corrosive liquids cannot penetrate the seal and reach the bearing. Check that the automatic lubricator, if fitted, is lubricating properly.

Listen to the bearing by holding a stick of wood, a screwdriver or the like against the bearing casing. Press your ear against the tool and listen. A correct bearing emits a soft purring sound whereas a damaged bearing emits a harsh, often irregular and rumbling noise.

Check the bearing temperature with a thermometer, heat-sensitive crayon or by feeling the bearing casing with your hand. If the bearing temperature seems abnormally high or suddenly changes, this is a sign that bearing function is impaired.

This may be due to insufficient grease, excessive grease, impurities, overloading, bearing damage, insufficient bearing clearance, excessive friction in seals or heat absorbed from the surroundings. However, keep in mind that a natural rise in bearing temperature often occurs after topping up with grease. This condition may last for 1 – 2 days



### 4.3.2 Quantity of grease necessary for lubrication

It is vitally important to lubricate parts with the correct type of grease and that the quantity of grease used on each occasion follows our recommendation. Overfilling in the bearing housing may cause a sharp rise in the bearing temperature and subsequently degrade the lubricant. Suitable lubricant is "SKF LGEP 2 Lubricant".

The correct quantity of grease for re-lubrication is tabulated below.

### 4.3.3 Lubrication interval

The type FML(B,P,R)-3 fans have permanently lubricated bearings.

The bearings of the other fans must be re-lubricated after the fan has operated for given number of hours depending on size and speed of rotation according to the Tables on this page.

The tables specify suitable lubricating intervals, expressed in hours in operation, for non-ageing grease of average quality.

The tables are applicable to bearings under normal load conditions and for a bearing temperature of +70°C.

For bearing temperatures exceeding +70°C, the lubrication interval must be reduced to half for each 15°C increase in temperature. For operating temperatures lower than +70°C, the lubrication interval can be lengthened – even doubled if the operating temperature is below +50°C.

The permissible length of the lubrication interval may substantially vary for various qualities of grease, even if they appear to be the same.

| Fan type and size | Recommended lubrication interval in hours in operation for various speeds* |             | Quantity of grease<br>gram |
|-------------------|--|-------------|----------------------------|
|                   | 5000 hrs   | 3000 hrs    |                            |
| FKL(B,P,R)        |  |             |                            |
| 90                | <800   | 800-1450    | 10                         |
| 100               | <750   | 750-1300    | 10                         |
| 112               | <700   | 700-1150    | 10                         |
| 125               | <650   | 650-1050    | 15                         |
| 140               | <600   | 600-900 rpm | 20                         |

\* The lubrication interval for this type of fan applies to bearings on the drive side. Bearings when purchased are permanently lubricated.

| Fan type and size |            | Recommended lubrication interval in hours in operation for various speeds* |           |           |           |           |           | Quantity of grease |
|-------------------|------------|--|-----------|-----------|-----------|-----------|-----------|--------------------|
| FAM(B,P,R)        | FAH(B,P,R) | 3000 hrs   | 2000 hrs  | 1500 hrs  | 1000 hrs  | 500 hrs   | 350 hrs   | gram               |
| 012-016           |            | <5000  | 5000-6000 | 6000-7500 |           |           |           | 10                 |
| 020-025           | 010-012    |  |           | <2700     | 2700-3500 | 3500-5500 | 5500-6500 | 10                 |
| 031               | 025        |  | <1800     | 1800-2000 | 2000-2500 | 2500-4000 | 4000-4800 | 10                 |
| 040               | 031        |  | <1500     | 1500-1800 | 1800-2200 | 2200-3200 | 3200-3800 | 15                 |
| 050-071           | 040        |  | <1400     | 1400-1700 | 1700-2000 | 2000-2700 | 2700-3000 | 20                 |
| 080-090           | 050-071    |  | <1300     | 1300-1400 | 1400-1700 | 1700-2400 |           | 20                 |
| 100-112           |            |  | <1100     | 1100-1300 |           |           | rpm       | 30                 |

#### 4.3.4 Fault tracing the bearings

| Symptom  |  | Possible cause  | Action  |
|--|--|---|---|
| noise<br><br>Abnormal noise<br>noise               | Loud metallic with less play or softer grease.               | Abnormal load.  | Alter the fit, play or pretension.                                  |
|  |  | Faulty assembly.  | Check the assembly and alignment.                                   |
|  |  | Lack of lubrication or dirt inside the bearing.   | Lubricate or change the lubricant.                                  |
|  |  | Wrong type of bearing used.   | Change to silent-running bearings or bearings with less play.       |
|  |  | Skidding rollers.   | Correct the pretension, select bearings                             |
|  |  | Contact with rotating parts.  | Adjust the labyrinth seal.  |
|  | Regular loud noise   | Impeller comes in contact with the inlet cone.  | If possible: Balance impeller and shaft.                            |
|  |  | Rust or scratches on races.   | Replace the bearing, improve seals, use clean lubricant.            |
|  |  | Indentations on rollers.  | Replace the bearing.  |
|  | Irregular noise  | Peeling in the races.   | Replace the bearing.  |
|  |  | Too much play.  | Alter the fit, play, pretension.                                    |
|  |  | Embossing by foreign particles. Interior damage.  | Replace the bearing, clean, improve the seals, use clean lubricant. |
| Abnormal temperature rise                          | Scratches or roller damage.                                  | Replace the bearing.  |   |
|  | Excessive lubricant. grease.                                 | Reduce the volume of grease, use softer grease.   |   |
|  | Insufficient lubricant, or dirt inside bearing.              | Top up or change the grease. Inspect the bearing.   |   |
|  | Abnormal load. pretension.                                   | Check the fit, play,  |   |
|  | Faulty assembly.   | Check the assembly and alignment.   |   |
| Vibrations bearing casing and the contact surfaces | Slipping between fitted surfaces, excessive seal friction.   | Check the seals, replace the bearing alter the fit.   |   |
|  | Indentations in rollers.                                     | Replace the bearing.  |   |
|  | Peeling in the races.  | Replace the bearing.  |   |
|  | Faulty assembly. Imbalance.                                  | Check for angular deviation of the shaft/ of the spacer rings. Check the balance.               |   |
| Loss of lubricant or discoloured lubricant         | Penetration by foreign particles.                            | Replace bearing, clean. Improve seals.  |   |
|  | Excessive lubricant, penetration by foreign particles, wear. | Reduce the volume of grease, use firmer grease, replace bearing casing and connection fittings. |   |