

Operating Instructions

High performance fans

Radial fans
Axial fans

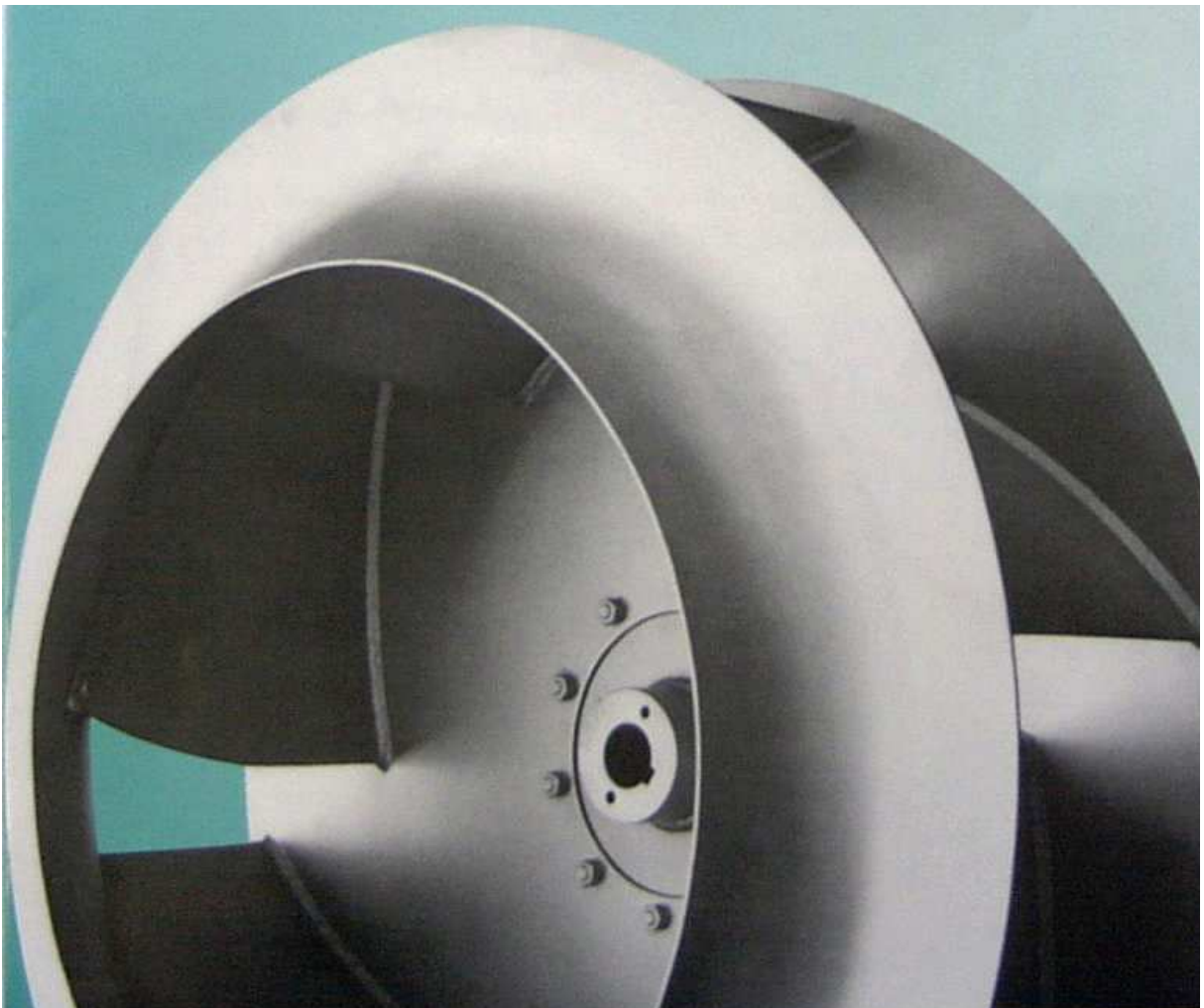


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1. Introduction

The Operating Instructions contain important notes for the safe, expert and economic operation of the fan. Complying with them helps to avoid dangers and to reduce repair costs and downtimes and increases the reliability and durability of the fan. The documentation contains additional details, which should also be observed. Should you require more information with regard to the fan than those contained in these Operating Instructions, please do not hesitate to contact the manufacturer. These Operating Instructions are valid for all series and drive types. The technical execution of the fans complies with DIN 24166 "Technical Delivery Conditions for Fans".

1.1. Use for the intended purpose

Use for the intended purpose is defined by the operating parameters set out in the order and the confirmation of order.

2. Order data

2.1. Performance data

The order and performance data can be found on the fan's type/rating plate.

2.2. Motor data

The motor data is shown on the motor's rating plate.

3. Safety

3.1. Symbols



- General danger reference



- Information / tip:

3.2. General Safety references

- Each person in the operating authority's company dealing with the transport, installation, dismounting, putting into operation, operation and maintenance of the fan must have read and understood the entire operating instructions. It is recommended that the operating authority have this fact confirmed in writing before work.
- Apart from the operating instructions and the regulations with regard to the prevention of accidents valid at the place of use, it is also necessary to comply with the approved technical regulations for safe and professional work.
- The fan has been manufactured according to state-of-the-art technology and recognized safety regulations. Nevertheless it is possible for dangers to life and limb of persons, or damages to or impairments of the facility and other material assets to arise.
- The fan may only be operated if it is in a perfect technical condition and if it is used in accordance with the intended use and with the necessary awareness of safety aspects and the dangers involved under consideration of the operat-

ing instructions. It is in particular necessary to repair failures impairing the safety of the facility without delay.

- The delivery scope supply is specified in the Order Confirmation. If additional safety measures are required, these must be provided and installed by the operator of the fan.
- Installation, dismounting, operation, maintenance and corrective maintenance of the fan may only be carried out by authorised and competent staff.
- Warning signs must be kept in a legible condition.
- The Operating Instructions must be available at all times at the fan's place of use. The manufacturer cannot be held liable for any damages resulting from the inappropriate use of the fan or from non-compliance with the technical documentation.



In explosive atmospheres, fans may only be used in accordance with Directive 94/9/EC (ATEX). The "Supplementary information for explosion-proof fans" must be observed.

3.3. Special Safety references

- Any work on the fan may only be carried out while the fan is standing still. It must be ensured that the motor cannot be switched on unintentionally. This may e.g. be achieved by means of a lockable repair switch (not contained in the delivery scope).
- The drive motor must be connected in accordance with the general electric regulations as well as with the manufacturer's connection specifications.
- Freely accessible air intake and pressure joints must be safeguarded by adequate protection (e.g. wire trellis).
- Before switching on the fan it is to be verified that all safety devices and cleaning flaps have been properly installed.
- After the relevant electric installation has been completed, the direction of rotation and the protective measures employed have to be checked.
- Hot gas fans with operating temperatures exceeding 100°C may not be operated at less than half the operating speed. When switching off the system, the fans must continue to run until the temperature is lower than 100°C.
- In case of an event of power failure hot gas fans shall be prevented from a continued flow of hot gas or be cooled down by natural ventilation to a temperature below 100°C. If this is impossible, the safety of operation must be checked before putting into operation.
- In case of an event of power failure a dangerous situation shall not occur. This is meant especially for fans transporting hazardous substances.
- The valid standards and regulations must be observed with regard to the approved surface temperatures. It may be necessary on the customer side to plan on having design measures in place e.g. to insulate the housing or to mount warning signs.
- The danger due to noise must be considered and suitable protective measures taken.

4. Warranty

The warranty period may be found in our Terms of Business. If requested, we would be pleased to send you a copy of our Terms of Business. If any special agreements have been reached apart from this, these have been specified in the Order Confirmation.

The warranty agreed upon can only be accepted if the following requirements have been met:

- Transportation has been done professionally
- Expert installation, commissioning and operation in accordance with the operating instructions on hand.
- Provable observance of the stipulated maintenance intervals.
- Operation of the fan only in the permitted range with regard to speed, temperature, etc. (see rating plate on fan or Order Confirmation)
- Fan is operated using pumping media that has the chemical and physical properties outlined in the Order Confirmation.
- All damages are reported to the manufacturer immediately.
- Only original spare parts are used.
- The manufacturer must agree any structure modifications to the original state.

5. Design and operation

In the axial fan, the air is conveyed in the axial direction.

The radial fan is equipped with an impeller in which the incoming axial air is diverted in a radial direction. Inside the impeller, the supplied energy is transformed into a mass flow and an increase in the pressure.

The standard design of the fan consists of a motor console with the bolted-on drive motor; the impeller is fastened on the shaft journal above the hub. Using an absolutely impervious shaft surround seals the place where the root exits the housing. Depending on where and for which purpose the fan is being used, other designs (e.g. with V-belt drive or coupling) and additional features (e.g. high quality shaft seals, control organs, sound-proofing measures, vibration dampening subassemblies, electric monitoring, etc) are available.

6. Transportation, delivery and storage

6.1. Transportation

A suitable means of transit in accordance with local situations and regulations must be used for transportation.

The following must be observed:

- Accident prevention guidelines (issued in Germany by the German employer's liability insurance associations)
- Securing of the load in accordance with the Highway Code.

The fan must be lifted and transported using suitable load-bearing hoisting equipment (crane, forklift truck).

The fan may only be suspended by the fan housing or the basic frame on the transportation rack using the suspension shackles provided for this purpose.

For lifting the fan all suspension shackles must be used at the same time.

The shackles on the motor are only designed for the weight of the motor itself.

During transportation, the fan must be secured against tipping over or shifting. The responsible carrier, crane driver or forklift driver must check the load-bearing capabilities of the existing pallets or transit racks on site and they must be secured in that position.

Setting the fan down hard or tilting it can result in damages to the fan.

No claims for replacement or warranty claims will be recognized because of inadequate means of transportation or improper methods of transportation.

6.2. Delivery

The fans are predominantly supplied as pre-assembled units plus any loose accessory parts, which may have been ordered.



Please check whether the delivery is correct and complete using the delivery documents.

Report any complaints to the manufacturer without delay

6.3. Storage

These recommendations are value-retaining measures for periods during which the fan is out of commission. The intervals and types of measurements must be ascertained by the owner/operator according to the storage conditions. The Operating Instructions from other manufacturers (motor, coupling, etc.) must also be observed.

6.3.1. Storage location

The storage location should be dry, free from vibrations and dust-free. The relative humidity should be lower than 60%. The recommended storage temperature equals -20 to $+40^{\circ}\text{C}$.

6.3.2. Storage measures

- If the unit is to be stored after extensive use exceeding 6 months, then the bearing grease in the shaft bearing must be replaced prior to storage. The fan should then be operated for a period of an hour, so that the grease can distribute evenly over the bearings.
- Cover the suction and pressure joints in such a way that no foreign matter is able to penetrate. It is necessary to ensure the interior of the housing is ventilated to prevent corrosion (e.g. open condensate drainage sleeve)
- Unpainted metal surfaces may need to be conserved
- Loosen belt

6.3.3. Regular measures during downtimes

- To avoid downtime corrosion, start up fan every 2 weeks for 5 minutes, or in case of need turn impeller with some item (Caution: danger of accident).

6.3.4. Re-commissioning

Observe the instructions in the "Commissioning" chapter during re-commissioning. Special attention is required here with regard to storage-related damages (corrosion, foreign matter, damaged bearings, damaged belts, etc.). Remove all the covers and safety features and tighten the belt drive. The inspection cover may need to be re-sealed. All the threaded connections must be checked.

If stored for more than 1 year, the bearing grease in the motor and shaft bearing must be replaced before re-commissioning (see motor manufacturer's Operating Instructions).

If the storage time exceeds 3 years, the anti-friction bearings should be replaced before re-commissioning. In some brands of motors / types of motors, the motor bearings need to be replaced after downtimes of 3-4 years.

7. Installation

This chapter refers to the initial installation of the fan and the installation of sub-assemblies as part of any maintenance or replacement work. The entire Operating Manual must be observed here. As this chapter cannot address all the variations fully, please contact the manufacturer if you have any queries.

7.1. Installation preparations

The foundation or the machine anchoring point must be flat and stable. No forces may be transferred onto the fan by system parts (vibrations, heat expansions, weights etc.). The transit locks must be removed shortly before installation. Transit locks can be threaded bars on compensators, rigid connections on the plane of the vibration dampers, etc.

7.2. Installing the fan



Please comply with the accident prevention regulations!

The fan may only be operated if all the parts are mounted in accordance with the regulations. The safety measures and installation regulations must be observed, especially if individually supplied parts are to be installed by the customer (e.g. loose inlet nozzles, fans on equipment to protect against accidental contact on the customer side, etc.).



Additional components that are not included in the scope of delivery, but which are required for operational safety, operational requirements or value retention must be installed.



The transport cable may not be fastened onto the impeller, the motor shaft or the motor under any circumstances.



During installation works the fan must be switched off and made sure that it cannot be switched on unintentionally. (e.g. by means of a lockable repair switch)



In case of explosion-proof fans please observe the supplementary page entitled "Supplementary instructions for explosion-proof fans"



The fan must be fixed securely to the base or the mounting point on the machine, because of the danger that the fan tilts.



Climbing on the fan may lead to falling down.
The fan shall be ascended only with a suitable climbing aid.
(e.g. ladder or scaffolding)

7.3. Air tube connections

- In the case of flanged joints, screws are to be tightened alternatively and in several steps.
- Air tubing running to the suction and pressure joints must be perfectly straight and the connections must not be mismatched (offset)
- It may be necessary to install spoilers to avoid damages and pressure losses on the compensators.
- Compensators must be installed in such a way that displacements and expansions can be absorbed.



A poorly laid pipeline can lead to diminished performance and unacceptably high vibrations, which can damage and destroy the fan.

7.4. Impeller

- The impeller must move freely at all times and may not bump into anything!
- The inlet nozzles delivered separately (uninstalled) must be aligned exactly.



The impeller and the impeller hub are balanced as one unit. After loosening the connection, it is necessary to re-balance the hub again.

To dismantle the impeller, please contact the manufacturer.

7.5. Anti-friction bearings

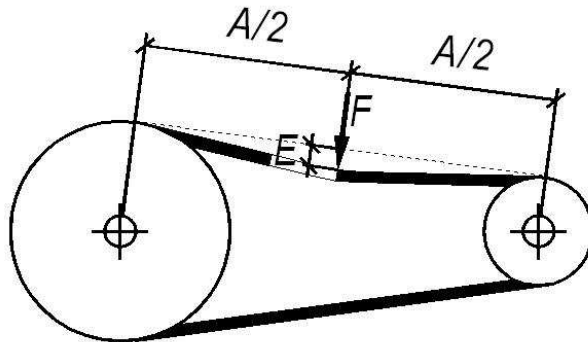


Work on the bearings may only be carried out by experienced technicians, as there is a danger of accidents and a danger of damaging the fan, depending on the design type and the installation site.

The shaft and the bearings can be removed after the opening the bearing case. Here it is necessary to observe that the subassemblies must be reinstalled in the reverse order to that of dismantling the subassemblies in the same position. All the subassemblies must be cleaned carefully; during this procedure, examine subassemblies for wear and replace subassemblies, if required. Anti-friction bearings may need to be mounted or pulled off warm. Commonly available extractors must be used for this. The recommended warm-up temperature is 80°C.

7.6. V-belts

Placing a ruler over the face end of both pulleys controls the alignment of the pulleys. The pulleys must be exactly on one plane and the axes must be situated parallel to one another. The v-belts must be loose when they are not tensioned and must be fitted onto the pulleys without using any force. The recommended setting force F is shown on the plate and is measured as shown in Fig 1.



E... Deflection in millimetres

F... Setting force in Newton

Fig 1:

For this, e.g. a belt pre-tension measuring device is placed in the middle of the distance between the axis centres at right angles on a belt. By exerting pressure on the measuring device, the belt is deflected to measurement E on the deflection scale; the force F used for this is then shown on the measuring device. The second belt or a ruler, in the case of single belt drives, acts as a straight reference line. New belts must be set to a force F that is 1.25 times higher (than what is shown on the plate).



The fan shall not be operated without v-belt-guard.

The screws are to be mounted completely and tightened with the correct torque.

7.7. Electrical connection

When connecting the electric motor, the following points must be taken into consideration:

- The respective valid national electric regulations.
- All connection work may only be carried out by an authorised specialist and in accordance with the motor manufacturer's instructions.
- The available supply voltage and frequency must correspond with the data specified on the motor rating plate.
- The circuit diagrams inside the motor terminal box must be observed.
- The power supply cable must be protected against damages and dimensioned in accordance with the power consumption.
- The protective devices (protective motor relay, earthing resistor, etc.) must be connected, checked and adjusted/set.
- The cooling air supply for the motor must not be obstructed.
- The earthing must be performed in accordance with the national regulations and the regulations of the local energy supply company.
- The motor start-up must be performed using a suitable circuit (delta or star-delta) and must be secured accordingly.



High-voltage! The connection may only be carried out while the network is voltage-free!

Check for the impeller's correct rotating direction using brief activation and compare this with the rotating direction arrow on the fan housing (or on the motor). In case of an incorrect direction of rotation, the drive motor may become overloaded!

If the commissioning is not done immediately after the installation, then the fan must be secured against unauthorized use.

8. Commissioning

The following points must be checked prior to commissioning:

- Foundation anchors
- Smooth running of the impeller
- Inlet nozzle must be aligned exactly to the impeller
- Foreign matter must be removed from the fan housing and any supply lines
- Threaded connections must fit firmly
- Air tube connections
- Pulley alignment
- V-belt tension
- Coupling alignment
- Electrical connection
- Safety devices (e.g. touch protector, safety switches,...)

Please observe the following points during commissioning:

- When the fan is switched on for the first time, the throttle in the facility system should be closed, as otherwise the motor could overload. After the fan has run up, the throttle must be opened slowly until the desired operating point has been reached.
- The motor's power consumption must not exceed the nominal current at the operating speed.
- The maximum operating speed may not be exceeded.
- The fan's vibration response must be checked. The valid standards and regulations must be observed with regard to this.
- In the case of belt-driven fans, switch off the motor after a few hours of initial operation under operating conditions, check belt tension and correct if necessary.



The fan must not be operated at resonant frequencies, since this can lead to damage and destruction. Resonant frequencies are to be avoided in the case of FC operation.



We recommend preparing a Commissioning Report.

8.1. Trouble-shooting during commissioning

Malfunction	Possible cause	Possible remedy
- The motor switches off before reaching the operating speed	- Existing switchgears have been incorrectly adjusted or are not suitable	- Adjust switchgears accordingly, possibly provide for heavy run up
- The motor's power consumption is excessive	- The motor's direction of rotation is incorrect - The system's resistances are too low - Excessive rotating speed	- Changing the direction of rotation by exchanging 2 phases - Close available throttle until the desired quantity of air has been reached - Correct rotating speed
- The desired air volume is not reached	- The motor's direction of rotation is incorrect - A throttle is closed too far	- Changing the direction of rotation by exchanging 2 phases - Open throttle accordingly
- The effective vibration speed is too high	- Fan was warped while being installed - The impeller is unbalanced - Resonance	- Check screwed connections - Check impeller, possibly have it rebalanced by an expert - Change the installation position - Correct the rotary speed
- Grinding noise in fan	- Impeller rubs against the intake nozzle or on the housing - Motor noises	- Check fan for warping and transit damages - Check position of motor / bearing as well as threaded connections - Check hub fit - Check motor for bearing damages, replace bearing if necessary
- Fan runs erratically	- Coupling halves are not in true alignment - V-belt pretension too low - Pulley out of balance - Pulleys are not in true alignment	- Check alignment according to Manual - Check pre-tension and adjust tension - Balance pulley - Align pulleys

9. Maintenance

The operating safety and service life depends considerably on proper maintenance. Failures caused by insufficient or improper maintenance may give rise to high repair costs and long downtimes. Thus, regular maintenance is imperative.



Please comply with the accident prevention regulations! Especially the following:

- Switch off machines and secure against re-starting
- Wait until impeller is stationary
- Surface temperature of subassemblies
- Hazardous or dangerous substances

9.1. Service notes

- The service intervals are dependent on the operating conditions and are defined by the owner/operator of the equipment; the owner/operator is responsible for this.
- The fan is to be inspected optically and acoustically on a regular basis while it is in an operating state. In case of any changes compared to the normal state, the cause must be determined without delay and eliminated accordingly.
- Provided protective and safety devices must be inspected on a regular basis and, if necessary, must be repaired while the fan is switched off.
- Threaded connections must be controlled at regular intervals and may need to be retightened.
- Regular examination of the belt tension (e.g. using a hand-held measuring device) guarantees a long service life for the belts. New v-belts should be checked frequently during the run-in phase.
- Observe the instructions in the "Commissioning" chapter during re-commissioning.



Balancing errors can appear as a result of encrustations or wear on the impeller; these can damage the fan. We therefore recommend the vibrations be monitored under corresponding operating conditions.

9.2. Maintenance and inspection list

This list is considered to be recommendation for normal operation

Maintenance and inspection intervals	Maintenance and inspection work
24 hours after commissioning	<ul style="list-style-type: none"> - Check air-tightness of housing - Check smoothness of running - Check temperature of bearing - Re-tighten screws
Monthly	<ul style="list-style-type: none"> - Check smoothness of running (bearing noises and vibrations) - Check bearing temperature (for belt and clutch drives) - Perform visual examination of shaft seal or shaft surround
Annually	<ul style="list-style-type: none"> - Check air-tightness of housing; check housing for tension cracks - Re-tighten screws - Check impeller for deformations, tension cracks and wear - Clean fan (more frequently, depending on operating conditions) - Open bearing case and replace bearing grease. (Depending on operating conditions, maybe after 2 years) - Examine belt drive, coupling and all other wearing parts for wear and tear



After re-greasing the bearing, see Chapter entitled "Bearing grease – addition and replacement".



If the fan is equipped with accessories and externally supplied parts, then it is necessary to comply with the operating and maintenance instructions in the appendix!



Maintenance and inspection work should be recorded in a certificate and should be documented showing the name of the person instructed to carry out this work and the date.

9.3. Bearing grease – addition and replacement



Please pay attention to the instructions in the “Maintenance” Chapter. Use grease-resistant protective gloves when lubricating – danger of allergic skin reactions!



The amount of grease to be used for re-lubricating, the grease type and the lubrication intervals can be found on the plate on the motor or on the fan.

In re-greasable bearings, the grease is usually applied on the housing using a grease gun and a grease nipple. To effectively suppress the grease being used, the machine must be running. Excessive pressure should be avoided with the grease gun, as otherwise the seals can be damaged. The shaft bearings must be lubricated using lithium-soap grease.

9.3.1. Adding grease in the motor bearing

Re-lubrication equipment is generally considered a custom accessory. Please observe the Operating Instructions from the motor manufacturer.

9.3.2. Adding grease in the shaft bearing

With lubrication periods of more than 6 months, the whole grease quantity in the bearings must be renewed after the lubrication period has expired.

9.3.3. Replacing grease in the shaft bearing

The interval for replacing the grease can be found in the chapter “Maintenance and inspection list”. The bearing case must be opened while the fan is stationary to renew the grease. The old grease must be replaced and the bearing must be filled with fresh grease (see plate for grease quantity for initial filling). Pay attention to cleanliness, so that no contaminants can get into the bearing case.

Used lubricants are to be handled and disposed of according to the applicable regulations.



Caution: Danger of accident - See Chapter entitled “Assembly – Anti-friction bearings”

9.4. Dealing with defects and corrective maintenance

If a malfunction does occur, you should run through the following checklist. Should a malfunction occur which has not been taken into account in this list, please contact manufacturer directly.

Malfunction	Possible cause	Possible remedy
Fan runs erratically	<ul style="list-style-type: none"> - Impeller is unbalanced due to following: - Encrustations - Material decomposition, e.g. because of aggressive pumping media - Deformation - Wear - Wear on flexible elements - V-belt pretension too low 	<ul style="list-style-type: none"> - Carefully remove encrustations, re-balance if necessary - Consult manufacturer, replace impeller, check bearing, if necessary - Replace flexible elements - Check pre-tension and retighten, replace v-belt, if necessary
Temperature rise near bearing	<ul style="list-style-type: none"> - Increased flexing work inside the bearing due to recent re-lubrication, and/or replace bearings - Greasing intervals were not observed - Bearings were warped while being installed - Excessive heat transfer in the case of fans with hot conveying media 	<ul style="list-style-type: none"> - Continue to operate fan, after a certain time temperature will return to normal by itself - Re-lubricate and replace bearing if necessary - Correct bearing installation and replace bearing if necessary - Decrease temperature of pumping media; replace bearing if bearing is already damaged
Leak at the shaft exit	<ul style="list-style-type: none"> - Sealing element worn 	<ul style="list-style-type: none"> - Exchange sealing element
Grinding noise in fan	<ul style="list-style-type: none"> - Impeller grinds against inlet nozzle - Motor noises 	<ul style="list-style-type: none"> - Check fan for warping and check for transit damages - Check position of motor / bearing as well as threaded connections - Check hub fit - Check motor for bearing damages, replace bearing if necessary

10. Spare Parts

10.1. Maintaining spare parts

In order to keep the fan ready for operation and available at all times, it is necessary to keep a stock of the most important spares and wearing parts. Respective spare parts can be found in the Spare Part Lists.



The use of non-original spare parts can have a detrimental effect on the fan's properties and may impair safety. We would like to point out again that the warranty is only valid as long as original spare parts are used exclusively.

10.2. Ordering of spare parts

When ordering spare parts, please always specify the following data:

- Order number of supplied fan
- Serial number of supplied fan
- Item number of spare part in Spare Parts List
- Description of spare part
- Desired quantity

10.3. Spare part and after-sales service address

Please contact the following address:

SAACKE GmbH

Postfach 21 02 61

D-28222 Bremen

Telephone: 0421 / 6495 - 0

Telefax: 0421 / 6495 - 224

11. Decommissioning, dismantling and recycling

Dismantling is the disassembly of the fan for installation in another place or for scrapping. Section 3.2 "General safety references" is to be observed.



Please comply with the accident prevention regulations! Especially the following:

- Switch off machines and secure against re-starting
- Wait until impeller is stationary
- Surface temperature of subassemblies
- Hazardous or dangerous substances



Climbing on the fan may lead to falling down.
The fan shall be ascended only with a suitable climbing aid.
(e.g. ladder or scaffolding)

The following items must be observed when decommissioning fans for the conveying or harmful or hazardous substances:

- the plant user's regulations
- switch off or seal the source of hazardous substances
- reduce the concentration of dangerous substances in the plant to a harmless level (caution when supplying oxygen where there are deposits)
- disconnect power lines to the fan properly
- seal pipelines so that the impeller is safely at a standstill
- wear personal protective equipment (e.g. heat protection, gas mask)
- check the condition within the system for harmful or dangerous substances and static electric charges
- avoid heat development when opening (no angle grinders)



When releasing fastening components:
hazard due to components tipping over or falling down.
Use suitable lifting tools.
Do not remain under suspended loads.

Structural elements and components of the fan that have reached the end of their service life must be disposed of properly in accordance with laws and regulations after dismantling. Also observe the plant user's regulations.



Further use of worn or used components and auxiliary materials can lead to the endangerment of persons and damage to the plant.



Recycling information

Industrial fans consist of:

- Housing: structural steel, stainless steel, special steels
- Impeller: structural steel, stainless steel, special steels, cast iron, aluminium
- Accessories: rubber, (fibre-reinforced) plastics, etc.

For precise details for certain fans, please contact the manufacturer with the order and machine number.