Ventilatoren Lti

BSE Centrifugal Fan Series O&M Manual

1. Designated Use

Operating Data / Maximum Ratings

CAUTION!

Risk of injury!
► Adhere to technical specifications and permissible limits.

For technical specifications reference should be made to the type plate, technical data sheet and technical catalogue!
To be observed specially!

- specified motor rating
- smallest permitted pulley diameter
- maximum fan rpm
- bearing load limits
- fan weight
- permitted temperatures of conveying medium

CAUTION **The centrifugal fans are suitable for extracting dust-free air and other non-corrosive gases or vapours.**

RER **Measures with transport medium temperatures > +80°C:**

- **+80°C**: provide bearings which can be lubricated as necessary.
- **+80°C**: provide heat resistant fittings.
- **+120°C**: an additional cooling disk is necessary to remove heat from around the shaft.

CAUTION **Maximum ambient temperature at the drive motor: +40°C**

Examples of incorrect use include the following:

- Extraction of media with impermissibly high or low temperatures
- Extraction of corrosive media
- Extraction of very dusty media
- Extraction of potentially explosive media.

The results are:

- Bearings damage
- Corrosion damage
- Unbalancing
- Vibration
- Deformation
- Abrasion damage

CAUTION **Unauthorised operation**

- No operation above the indicated rpm (see type plate, data sheet)
- No operation at rpm ranges with increased vibration (resonance)
- No operation at rpm ranges out of permitted fan curve area (stability of flow pattern)
- No operation if fan becomes polluted

CAUTION **Avoid dynamic load of the impeller.**
No frequent alteration of load!

CAUTION **Danger points:**
There can be injury to personnel and material damage through impeller breakage, shaft breakage, fatigue failure, fire from spark creation.

2. Installation and Maintenance

The following steps should be taken before working on the centrifugal fan:

1. Switch off the machine and take measures to prevent it from being switched back on accidentally.
2. Display the following message on a sign:
   "Do not switch on! Work currently in progress on the machine"

2.1 Signs on the Centrifugal Fan

Depending on the model, the type plate and the arrow indicating the direction of rotation are fitted to the housing or handle for high visibility.

2.1.1 Arrow Indicating Direction of Rotation

Fig.
Arrow indicating direction of rotation

2.2 Safety Instructions for Installation

► Observe the safety instructions and preventive measures and the relevant legal requirements.

2.3 Installation Preparation

☑ Place of installation suitable for the centrifugal fan in terms of its category, condition, ambient temperature and environmental media.
☑ The installation surface is plane and able to support the weight.

1. Unpack centrifugal fan carefully.
2. Unfasten or dismantle transport locks
3. Packing material to be fully removed and disposed.

2.4 Carrying out Installation

1. The fan or base frame must be fixed without stresses to the supporting structure.
2. AVM to be regularly placed around centre of gravity and definitely fixed. Check whether AVM evenly under load.

☑ No forces or vibrations may be transferred from other plant parts
☑ The flexible connections at intake and/or discharge are installed well aligned and freely moving.
☑ The AVM are freely moving and under even load!
☑ The impeller is turning idly and does not touch at intake cone!
☑ The stability against collapse of the fan has been checked.

<u>Conveying humid air outside installation:</u>
☑ Is a condense water drain fitted to the lowest point of the casing

<u>RER 13/17: If expansion of duct work due to high temperature can be expected:</u>
☑ Sliding connectors or heat resistant flexible installed.

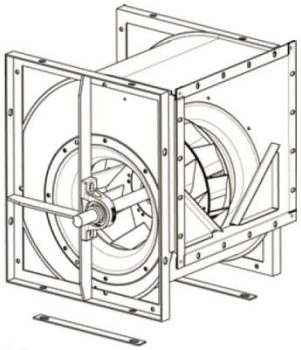


Figure
RZR 14 - Height-compensation rails

RZR 14-0315 and 0355; Fitting with compensating rails for casing positions 0°, 90°, 270°:
☑ Enclosed height-compensation rails are laid underneath.

2.5 Installing Safety Devices

Note Conformity with DIN EN ISO 13857 only relates to the safety guard installed insofar as it is supplied with the fan. The operator of the system is responsible for full compliance with DIN EN ISO 12100.

1. Fit guards to protect exposed inlet openings (DIN EN ISO 13857).
2. Design safety devices in such a way that they prevent objects from being sucked in or from falling in.
3. Ensure that all the mechanical safety devices are fitted.

3. Electrical Connection

3.1 Safety Instructions for Electrical Connection

DANGER!

Caution! Danger of electric shock!

- Observe the safety instructions and preventive measures and the relevant legal requirements.
- EN 60204-1, IEC 60364-1 / DIN VDE 0100

CAUTION **In order to protect the fan against unexpected operation a service switch is recommended. (Option).**

CAUTION **If control units with electronically components (e.g. frequency inverter) are installed please respect instructions of the control unit supplier about prevention of electro magnetic radio noise (EMV) – earthing, cable lengths, shielding, etc.**

CAUTION **In order to avoid damages caused by electric current passing through the bearings when operating with inverter the use of isolated motor bearings is recommended from motor size 225 up.**
Please respect information given by the motor manufacturer.

3.2 Connecting the Motor

- ☑ Current, voltage and frequency of mains supply checked for conformity with fan type plate and motor rating plate.
- ☑ Star-delta or soft start provided for motors with a nominal output >4 kW.
- ☑ Inspection switch present if applicable.
- ☑ **Measures taken to prevent centrifugal fan from starting suddenly.**
  1. Fit inspection switch if applicable.
  2. Connect feed line to fan or service switch.
  3. Connect motor as shown on connection diagram supplied.
  4. Ensure that all the electrical safety devices have been fitted and connected.

Note **The evaluation of respect of the radio noise standards and regulations can only be made when considering the complete installation in its existing configuration.**
This is to be checked under the responsibility of the customer.

3.3 Motor Protection

- Motors are to be protected against overload in accordance with DIN EN 60204-1.
- Standard motor protection switches are to be provided and set to the nominal motor current. A higher setting is not permitted!
- Motors with built-in thermistors must be protected through a thermistor operated trigger unit.

CAUTION **Fuses or circuit breakers do not provide sufficient motor protection. Damage due to insufficient motor protection invalidates the manufacturer's guarantee.**

Note **In all cases the power limitations provided by the existing power supply company must be taken into account.**
In the event that plant conditions necessitate a direct start the suitability of the fan design is to be confirmed with the manufacturer.
Fans with high inertia impellers can take over 6 seconds to reach top running speed. In these cases heavy duty motor protection relays or bimetal relays must be provided.

3.4 Carrying out a Test Run

DANGER!

Risk of injury from rotating impeller!
► Never reach into the impeller when the fan is open.

1. Take measures to prevent centrifugal fan from being switched on accidentally.
2. Clear the ducting system and fan of all foreign bodies (tools, small parts, construction waste, etc.).
3. Close all the inspection openings.
4. Switch on fan and check direction of rotation of impeller by comparing it with the arrow on the fan indicating the direction of rotation.
5. If the direction of rotation is wrong, reverse the polarity of the motor having due regard to the safety instructions.
6. Once operating speed has been reached measure the current consumption and compare it with the nominal motor current on the fan type plate or motor rating plate.
7. If there is continuous overload switch the centrifugal fan off immediately.
8. Check that the fan runs smoothly and quietly. Ensure that there are no unusual oscillations or vibrations.
9. Check the motor for any abnormal noises.

4. Commissioning / Operation

The motors are designed for continuous operation S1. If operations involve more than three starts per hour it shall be required to confirm the suitability of the motor.

4.1 Commissioning the Centrifugal Fan

Risk of injury from rotating parts and hot surfaces!

- ► Ensure that all the safety devices are fitted.
- ► Ensure that the impeller has been secured acc. to DIN EN ISO 13857.

CAUTION **Possible damages of the mains by overload through high starting current!**

☑ Respected the given limitations by the power supply company .

1. Check working order of all control instruments connected.
2. Switch on centrifugal fan.

4.2 Checks after Running-In phase

After a running-in phase of 1 to 2 hours the following checks have to be made:

☑ Centrifugal fan secured against involuntary switching on!

1. Check belt tension and retighten if necessary.
2. Check bearing temperature

5. Maintenance

5.1 Safety Instructions for Maintenance

- ► **Observe the safety instructions and preventive measures and the relevant legal requirements.**
- ► **Follow the directions of the motor supplier and the instructions specified by the manufacturers of the switches and control units.**

Works on the fan are authorised only when fully cut off power supply!

5.2 Maintenance Preparation

1. Disconnect motor from the mains.
2. Centrifugal fans fitted with an inspection switch should be switched off by means of the inspection switch.
3. Take measures to prevent centrifugal fan from being switched on accidentally.
4. Wait until the impeller has stopped.
5. Wait until all hot surfaces have cooled down.
6. Remove any residues from the fan.

- ► According the situation installation components may be unfitted for inspection and maintenance.

☑ Maintenance prepared

5.3 Observing Regular Inspection Intervals

In the interests of upkeep and safety we recommend having the operation and condition of the fans inspected at regular intervals by duly qualified service personnel or a professional maintenance firm and documenting these inspections.
The nature and extent of the maintenance work, the service intervals and any additional work required needs to be specified on a case-by-case basis depending on the use of the fans and the general conditions on site!

Maintenance recommandations for Centrifugal fans:

- ► Conduct test run if applicable
- ► Document inspection intervals observed.

CAUTION **Pressure washers can cause damage to property!**

- ► Do not use pressure washers (steam jet cleaners) to clean the equipment.

5.3.1 Belt drive

The belt drive is from the run-in phase onwards generally maintenance free.
It is however recommended that depending on the installation site and the type of operation the belt tension is regularly checked. The test force F_p is given on the type plate and the design sheet.

5.3.2 Tensioning rules for V-belt drives

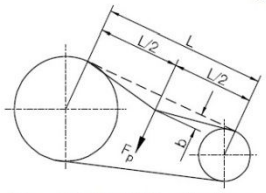


Fig. 10-3: V-belt drive

L = Span between shaft centres
b = Belt deflection under test force F_p
F_p = Test force in N from the

- ► The correct tensioning for a belt is achieved if the individual test force F_p produces a belt deflection b of 16 mm per 1000 mm of span.

5.3.3 Tensioning rules for flat belts

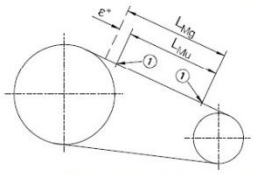


Fig. 10-4: Flat belt drive

L_{Mu} = Measurement mark spacing on un-tensioned flat belt
L_{Mg} = Measurement mark spacing on correctly tensioned belt
ε* = Increase in mm from the manufacturer documentation

- ► The correct belt tensioning has been achieved when the measurement mark spacing L_{Mu} has increased by ε*. The adjustment should take place in two stages with a time period of some hours in between to avoid overloading the bearings.

5.3.4 Tensioning rules for V-belt and flat belt drive

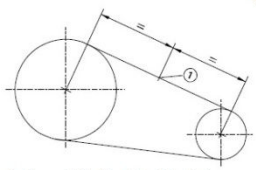


Fig. 10-5: Belt drive

The check of the belt tension is made through observation of the static belt frequency. For this purpose the flat or V-belt is hit and vibrating at resonance frequency. An electronically measuring device - the so-called Trummeter – will relate this to the tension force. The oscillation in Hz has to correspond to the value indicated in the documentation/type plate.
The measuring point is places in the centre (1) of the belt, i.e. between both pulleys.

5.3.5 Belt changing

- ► The centre distance should be reduced until the new belt/s can be easily fitted by hand.
- ► The tensioning of the belt follows in accordance to the respective tensioning rules.
  Observe the running-in phase!

5.3.6 Pulley changing

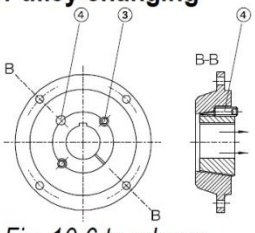


Fig. 10-6 to release

<u>To release the pulley wheel:</u>

1. Unscrew the bolts (3).
2. Tighten the socket head cap screw in the threaded hole (4).
3. Press the clamping bush out of the tapered hole.
4. The pulley wheel can now be easily slid of the shaft.

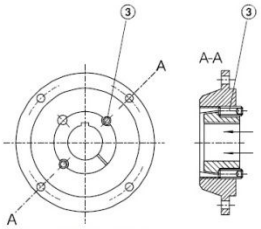


Fig. 10-7: Fixing

<u>To fix the pulley:</u>

1. Pull the pulley wheel and the clamping bush together by means of the socket head cap screw (3).
2. Motor pulley and fan pulley to be exactly in line
3. Belt tension to be set according to instructions

5.3.7 Vibration monitoring

Check fan regularly whether vibrations occur.
The radial vibration speed at fan bearings and motor bearing (drive side) may have not more than the **following max. values:**
- up to size 315 mm ≤ 7,1 mm/s,
- up to size 1600 mm ≤ 4,5mm/s.

5.3.8 Motor bearings

The motor bearings are supplied permanently lubricated by the factory; experience has shown that the grease needs to be changed after several years only under normal operating conditions.

CAUTION **The maintenance instructions of the motor supplier as well as the instructions for the switches and control units have to respected.**

CAUTION **If the state of the fan does not allow adapted action for repair it has to be put out of order immediately and to be replaced if required.**

5.3.9 Periods of stand still

During longer lasting periods of stand still the fan must be from time to time put into operation for a short while. This is to avoid bearing damages by mechanical load and ingress of humidity.
After longer lasting period of storage, fan and motor bearings have to be checked prior to installation.

6. Bearings without Lubricating Device

The bearings are normally supplied greased for life with high performance grease that is resistant to ageing and does not require maintenance under normal operating conditions.
If in the case of normal wear and tear a bearing change is required

6.1 Bearings with Lubricating Device

IWN 01 stand grease (we recommend: Shell Gadus S2 V100 3)
IWN 11 moisture grease(we recommend: Klüber Staburags NBU 12/300KP)
IWN 21 high temperature grease (RER) (we recommend: Shell Aeroshell/Grease 22)

CAUTION **In order to reach the maximum permitted bearing lifetime under heavy duty operating conditions, they have to relubricated within regular intervals.**
The intervals depend on the specific operating conditions and are to be determined by the operator. The maintenance instructions of the fans containing relubrication guidelines have to be taken into account.

6.2 Relubrication intervals

Under normal operating conditions a relubrication has to be carried out at least once a year!
This is applicable for bearings of a shaft in a horizontal position and when the temperature at outer bearing ring does not exceed +70°C.

- **For temperatures exceeding +70°C the relubrication interval has to reduce to half for every 15°C above this value.**

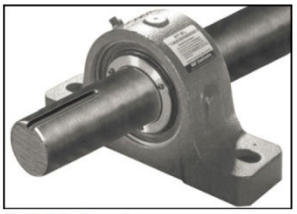
6.2.1 Lubrication tubes

CAUTION **Lubrication tubes are without any grease pre filling!**
To fill the bearings with grease, the tubes first must be filled completely with grease.

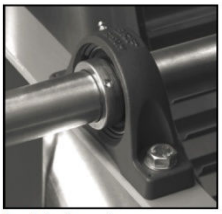
Monobloc pedestal cast iron housing with integrated, self aligning radial insert ball bearings with grease nipple directly fitted to the housing.

Relubrication at least once a year.
Interval to be reduced for heavy duty operation.

Grease Quantity:
Press grease into bearing until fresh grease is escaping.



Outside bearings
Single piece cast iron block housing with integrated self aligning double row roller bearing with grease nipple directly fitted to the housing.



Inside bearings
Single piece cast iron block housing with integrated self aligning single row ball bearing with grease nipple directly fitted to the housing.

Relubrication at least once a year.
Interval to be reduced for heavy duty operation.

Grease Quantity:
Press grease into bearing until fresh grease is escaping.