NOVenco Zerax® Fan Types
AZL-AZN-AZW
Installation and Maintenance
Novenco ZerAx® axial flow fan types AZL-AZN-AZW

Installation and maintenance

1. Application
The high performance Novenco axial flow fans types AZL-AZN-AZW are for applications within land-based industries and marine sectors. All types are for duct connection. The AZL type has a free inlet and connects to duct on the outlet side.

1.1 Reading guide
Please read this complete guide, before beginning installation or maintenance.

1.2 Handling
Avoid exposure of fans and motor parts to shocks, as these can result in imbalance and deformations. Motor bearings and fan components are vulnerable parts.

2.1 Marking
The AZL-AZN-AZW fans have nameplates on the fans and motors.

Fan nameplate information
• Manufacturer information
• Product type, e.g. AZN 1000/350
• Serial no.
• Fan speed
• Year of manufacture
• Weight

Motor nameplate information
• Manufacturer information
• Power consumption and efficiency
• Voltages
• RPMs
• Weight
• Terminal connections
• Lubrication and service info.

2.2 Weights
The total weight depends on the fan size, casing thickness, motor size and accessories. Refer to the Airbox program for further information and weights of specific fan solutions. See table 11 on page 11 for max. weights of 4-pole motors.

2.3 Design conditions
The AZL-AZN-AZW fans are designed for operation at standard temperatures from -20 to +50 °C. With reduced fan speed and increased blade clearance the temperature range can be extended from -40 to +120 °C.

2.4 Transport and lifting
Any transport or lifting of the fans must be in accordance to current directives and guidelines for safety. Pay attention to limitations and direction for use of lifting gear.

The fans are delivered on pallets or bearers to allow for forklift transport. Transport and lifting must be done with care, as the fans are vulnerable to vibrations and shocks. These can result in imbalance and deformations. Refer to the weights in the shipping papers, on the motor and fan casing nameplates and in appendix “A. Fan weights” on page 10.

Further transport depends on the fan size and the fitted accessories.

Transport
• Fans mounted on support frames
  Transport and store these on the transportation pallets. Leave in the transportation rods for fans with vibration dampers.
• Fans without support frames
  Transport fans resting on the inlet flanges or cones. The rotors must point downwards.
• Large fans or fans with large motors
  Transport and store these on the transportation pallets. Store very large fans on suitable bearers.

Lifting
• With straps
  Lift with a strap around the fan casing at the centre of gravity. Please note, that directives and...
guidelines may dictate lifting in the flange holes. Novenco recommends lift of fans with straps.

- **In flange holes**
  - Lift in a minimum of three holes - two in the outlet flange and one in the inlet. On fans with inlet cones mounted, remove the bolt in the topmost position to use the hole as the third point for lifting. Reinsert and tighten the bolt once the fan is in place. Deformation of the flanges must be avoided.

  Eyebolts on motors are unsuited for lifting the fans.

Figure 1. Lift of fan with a strap

### 3. Storage

Correct storage conditions are important for the function and durability of the fans.

- **Damages due to incorrect storage void the warranty.**

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Specifications</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outdoor</td>
<td>One month</td>
<td>Packaging must be intact</td>
</tr>
<tr>
<td>Indoor or</td>
<td>Max. six months</td>
<td>For unprotected fans with no or</td>
</tr>
<tr>
<td>Sheltered</td>
<td></td>
<td>broken packaging</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ventilated location</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No condensation</td>
</tr>
</tbody>
</table>

Table 2. Storage recommendations

### 4. Installation

#### 4.1 Preparations

Complete the below checklist to ensure a safe work environment and fan functionality.

**Checklist prior to installation**

- Unpack the fan.
- Check that the rotor rotates freely in the fan casing with equal blade tip distances to the casing around the circumference.
- **Outdoor installations:** Make sure the installation location is sheltered. Fans, motors and frequency converters must be protected from rain and water that drips.
- Ground the fan before installation to avoid static electricity. For example, by assembly on non-conducting vibration dampers and foundations.
- Clear the fan installation location to ensure free and unimpeded airflow through the inlet and outlet. Optimum airflow from all sides removes risk of stall, gives best performance and keeps sound levels down.
- Secure the installation to at least IP20, i.e. protect people and surroundings from the fan and the fan against foreign particles with wire guards and filters before and after the fan. Wire guards from e.g. Novenco must be installed at least 120 mm before and after the fan. See section “4.5 Connection to duct” for minimum distances for undisturbed airflow.

- **The vibration level of the installation depends on how the fans are installed, the operational conditions and the natural frequency of the foundation and supports.** Follow the below guidelines to avoid resonance.
  - **Soft suspension:** Fan is fixated through springs or dampers. The natural frequency [Hz] of the system should be at least 20% below fan speed. Soft suspensions are available from Novenco.
  - **Stiff suspension:** Fan is fastened to a duct or a hard surface. The natural system frequency should be at least 20% above fan speed.
  - **Elastic structure:** Fan is fastened to an elastic structure. The natural system frequency should be at least 20% higher or lower than fan speed.

The owner is responsible for compliance with the above requirements. Non-compliance affects the product warranty.

#### 4.2 Installation

**Installation of fans**

1. Place and orient the fans in accordance with the airflow direction arrow on the fan casing.
2. **Recommendation:** Install the fans on support frames.
3. **Optional:** As an alternative to installation on support frames, fans may be suspended in the casing flanges or with special carriers.
4. Check that the fan rotors rotate freely once the fans are in position.
5. **Fans on support frames and with vibration dampers:** Remove the transportation rods from the support frames. The handles are marked with a strong colour.

Position fans with motors fitted with drain holes with the holes downwards at the lowest point.
4.3 Support frames
These are optional extras and are recommended for installation.

Support frames must be grounded to prevent electrical shocks.

The AZL, AZN and AZW fans can all be installed on horizontal support frames. The AZN and AZW can also be fitted with frames for vertical mounting. Refer to the order and technical specifications.

For the AZL, two types of horizontal support frames are available. The first type, in figure 2, is for installation on flat surfaces and consists of a frame (item 01) on rails with optional dampers (item 02).

Figure 2. Horizontal support frame for AZL

The second type, in figure 3, is also for installation on flat surfaces and can either be put directly on the surfaces or put on rails transversally to the airflow. Dampers (item 02) are optional.

Figure 3. Horizontal support frame for AZL – compact type

For the AZN-AZW the horizontal support consists of two plates (item 01) with two stiffeners (item 03) between them. Screw size is M10x20. Dampers are optional (item 02). See figure 4.

Figure 4. Horizontal support frame for AZN-AZW

For the AZN-AZW the vertical support consists of a plate (item 01) onto which the fan is mounted in the flange. Dampers (item 02) are optional. See figure 5.

Figure 5. Fans for vertical mounting with support frame and anti-vibration dampers (left) and with support frame

To prevent spread of vibrations to the surroundings, it is recommended to insert anti-vibration mounts between the fan and support. Flexible connections in the ducts before and after the fan are also recommended. The accessories are available as optional extras from Novenco. Secure anti-vibration mounts (figure 4) in the support frame by means of bolts. Mount base plates for attachment to the foundation at the bottom of the rubber elements.

The natural frequency of the support must lie at least 20% from the fan speed.

The anti-vibration mounts help to ensure the natural frequency of the system is below 10 Hz and that the damping is at least 80%.

To load the vibration dampers evenly, the front flange of the fan must be the distance X from the centre of the front damper. See figure 6. The distance is found in the AirBox fan calculation. Loading of dampers vary depending on air pressure. Uneven loading can strain and reduce damper functionality.

Figure 6. AZN-AZW on support frame

4.4 Wire guard installation
Fans must always be installed so that parts that rotate cannot be touched. The fans can be optionally fitted with wire guards on the inlet and outlet sides. If ducts are connected, these can alternatively be provided with wire guards.

Novenco offers wire guards for in-pipe installation on outlets. Drill holes in the pipe and fixate with the bolts and nuts included in the kit.

Figure 7. In-pipe installation of wire guard

4.5 Connection to duct

The fans cannot be used as structural elements, e.g. for duct or building support.

Install the fans with optimum conditions in mind to ensure smooth and undisturbed airflows. The space before and after the fans should preferably meet the requirements in figure 8. See figure 9 for reduced conditions. Allow for free areas to facilitate assembly.
Novenco ZerAx® axial flow fan types AZL-AZN-AZW

and disassembly as well as maintenance.

Flexible connections can be placed as close as ½D before the fan inlet.

AZN-AZW fans are for circular duct connections with flanges on both inlet and outlet sides. The AZL has an outlet flange only.

Flanges are as standard for type AZL-AZN according to Eurovent 1/2.

Flanges on the AZW are as standard type DIN 24154 row 4.

Systems with high vibration levels or more exacting performance requirements must be provided with expansion joints between fan and duct.

4.6 Electric connection

- Connect the supply voltage directly in the terminal box or
- connect the supply voltage to the frequency converter and the converter to the terminal box

- Permanent magnet (PM) motors
- Connect the supply voltage to the frequency converter and the converter to the terminal box

The terminal box is on the outside of the fan casing. Connection diagrams are inside the box lid.

The cable run must be in accordance with current regulations, e.g. the EU standard for electromagnetic compatibility (EMC).

Frequency converters must be installed in accordance to the manufacturer’s installation documentation. Refer also to the Novenco document “Configuration of frequency converters for Novenco fans”.

Shield and connect the fans electrically to ground to eliminate interference and protect the motor bearings and windings.

Refer to the motor documentation for methods to avoid impairment of the supply voltage quality, among them distances between supply and signal cables. Methods may involve installation of rectifiers, filters etc.

Connection references

- Connection diagram in terminal box lid on fan
- Motor name plate
- Order specification
- Appendix “D. Wiring – motors up to 16 A” on page 14
- Appendix “E. Wiring – motors over 16 A” on page 14

Only fans with steel inner hubs may be run in reverse and this for short periods at speeds up to the max. allowable of normal direction. The airflow is reduced to approx. 50% of normal for the same system resistance. The pressure is reduced to 25%. Reversible operation increases the risk

---

Table 3. Max. allowable speed at 20 °C

<table>
<thead>
<tr>
<th>Fan size, ( \phi_0 ) [mm]</th>
<th>RPM ( 1 )</th>
<th>Maximum</th>
<th>Optimal</th>
<th>Reduced</th>
</tr>
</thead>
<tbody>
<tr>
<td>250</td>
<td>4919</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>280</td>
<td>4747</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>315</td>
<td>4570</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>355</td>
<td>4408</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>400</td>
<td>4269</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>450</td>
<td>4145</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>500</td>
<td>4086</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>500</td>
<td>3660</td>
<td>3660</td>
<td>3483</td>
<td></td>
</tr>
<tr>
<td>560</td>
<td>3460</td>
<td>3460</td>
<td>3286</td>
<td></td>
</tr>
<tr>
<td>630</td>
<td>3238</td>
<td>3238</td>
<td>3059</td>
<td></td>
</tr>
<tr>
<td>710</td>
<td>3000</td>
<td>3000</td>
<td>2804</td>
<td></td>
</tr>
<tr>
<td>800</td>
<td>2751</td>
<td>2751</td>
<td>2523</td>
<td></td>
</tr>
<tr>
<td>900</td>
<td>2498</td>
<td>2498</td>
<td>2217</td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>2270</td>
<td>2270</td>
<td>1918</td>
<td></td>
</tr>
<tr>
<td>1120</td>
<td>2029</td>
<td>1900</td>
<td>1568</td>
<td></td>
</tr>
<tr>
<td>1250</td>
<td>1809</td>
<td>1500</td>
<td>1201</td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>2034</td>
<td>2034</td>
<td>1904</td>
<td></td>
</tr>
<tr>
<td>1120</td>
<td>1893</td>
<td>1893</td>
<td>1727</td>
<td></td>
</tr>
<tr>
<td>1250</td>
<td>1751</td>
<td>1751</td>
<td>1552</td>
<td></td>
</tr>
<tr>
<td>1400</td>
<td>1599</td>
<td>1599</td>
<td>1371</td>
<td></td>
</tr>
<tr>
<td>1600</td>
<td>1419</td>
<td>1419</td>
<td>1166</td>
<td></td>
</tr>
<tr>
<td>1800</td>
<td>1262</td>
<td>1262</td>
<td>1002</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>1130</td>
<td>1130</td>
<td>878</td>
<td></td>
</tr>
</tbody>
</table>

---

The PM motors require connection through frequency converters. Direct connection of the supply voltage in the terminal boxes on PM motors ruins the motors and voids the warranty.

---

Table 3. Max. allowable speed at 20 °C

1. Fan speeds depend on the installation space.
2. Fans with \( \phi 160 \) hubs can run at maximum RPMs irrespective of the installation conditions.

AZN-AZW fans are for circular duct connections with flanges on both inlet and outlet sides. The AZL has an outlet flange only.

Flanges are as standard for type AZL-AZN according to Eurovent 1/2.

Flanges on the AZW are as standard type DIN 24154 row 4.

Systems with high vibration levels or more exacting performance requirements must be provided with expansion joints between fan and duct.

The installation and connection to the supply network must be done by authorised personnel and according to current legislation, e.g. the EU standard for electromagnetic compatibility (EMC).

Connection of the supply voltage depends on the motor type and if a frequency converter is to control the motor.

Connection of motor types

- Alternating current (AC) motors

---

Figure 8. Optimum installation space

Figure 9. Reduced installation space

Flexible connections can be placed as close as ½D before the fan inlet.

Figure 10. Installation in duct

Figure 11. Duct installation with inlet cone and wire guards

---

Table 3. Max. allowable speed at 20 °C

<table>
<thead>
<tr>
<th>Fan size, ( \phi_0 ) [mm]</th>
<th>RPM ( 1 )</th>
<th>Maximum</th>
<th>Optimal</th>
<th>Reduced</th>
</tr>
</thead>
<tbody>
<tr>
<td>250</td>
<td>4919</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>280</td>
<td>4747</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>315</td>
<td>4570</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>355</td>
<td>4408</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>400</td>
<td>4269</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>450</td>
<td>4145</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>500</td>
<td>4086</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>500</td>
<td>3660</td>
<td>3660</td>
<td>3483</td>
<td></td>
</tr>
<tr>
<td>560</td>
<td>3460</td>
<td>3460</td>
<td>3286</td>
<td></td>
</tr>
<tr>
<td>630</td>
<td>3238</td>
<td>3238</td>
<td>3059</td>
<td></td>
</tr>
<tr>
<td>710</td>
<td>3000</td>
<td>3000</td>
<td>2804</td>
<td></td>
</tr>
<tr>
<td>800</td>
<td>2751</td>
<td>2751</td>
<td>2523</td>
<td></td>
</tr>
<tr>
<td>900</td>
<td>2498</td>
<td>2498</td>
<td>2217</td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>2270</td>
<td>2270</td>
<td>1918</td>
<td></td>
</tr>
<tr>
<td>1120</td>
<td>2029</td>
<td>1900</td>
<td>1568</td>
<td></td>
</tr>
<tr>
<td>1250</td>
<td>1809</td>
<td>1500</td>
<td>1201</td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>2034</td>
<td>2034</td>
<td>1904</td>
<td></td>
</tr>
<tr>
<td>1120</td>
<td>1893</td>
<td>1893</td>
<td>1727</td>
<td></td>
</tr>
<tr>
<td>1250</td>
<td>1751</td>
<td>1751</td>
<td>1552</td>
<td></td>
</tr>
<tr>
<td>1400</td>
<td>1599</td>
<td>1599</td>
<td>1371</td>
<td></td>
</tr>
<tr>
<td>1600</td>
<td>1419</td>
<td>1419</td>
<td>1166</td>
<td></td>
</tr>
<tr>
<td>1800</td>
<td>1262</td>
<td>1262</td>
<td>1002</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td>1130</td>
<td>1130</td>
<td>878</td>
<td></td>
</tr>
</tbody>
</table>

---

The PM motors require connection through frequency converters. Direct connection of the supply voltage in the terminal boxes on PM motors ruins the motors and voids the warranty.

The terminal box is on the outside of the fan casing. Connection diagrams are inside the box lid.

The cable run must be in accordance with current regulations, e.g. the EU standard for electromagnetic compatibility (EMC).

Frequency converters must be installed in accordance to the manufacturer’s installation documentation. Refer also to the Novenco document “Configuration of frequency converters for Novenco fans”.

Shield and connect the fans electrically to ground to eliminate interference and protect the motor bearings and windings.

Refer to the motor documentation for methods to avoid impairment of the supply voltage quality, among them distances between supply and signal cables. Methods may involve installation of rectifiers, filters etc.

Connection references

- Connection diagram in terminal box lid on fan
- Motor name plate
- Order specification
- Appendix “D. Wiring – motors up to 16 A” on page 14
- Appendix “E. Wiring – motors over 16 A” on page 14

Only fans with steel inner hubs may be run in reverse and this for short periods at speeds up to the max. allowable of normal direction. The airflow is reduced to approx. 50% of normal for the same system resistance. The pressure is reduced to 25%. Reversible operation increases the risk
of stall and shortens fan life. The rotor must be completely stationary, before restart of the fan for directional change of rotation. It is recommended to install a time delay for this purpose.

Check that the rotational direction of the rotor complies with the arrow on the outside of the fan casing. Flick the fan power briefly On, then Off. If the direction is wrong, disconnect the main power supply and check the connections.

5. Start of operation

Fans fitted with frequency converters must have the control unit set up, before start of operation. Refer to the Novenco document “Configuration of frequency converters for Novenco fans”. Perform the below steps every time the fans have been stopped.

5.1 Before startup

Check the fans and installation location in accordance to the below checklist and correct and improve as necessary.

Checklist

• Safe operation
  The blade clearance must be minimum 0.1x motor shaft diameter (min. 2 mm, max. 13 mm) all around the rotor circumference. The axial distance between the rotor hub and stator must be min. 3.5 mm. Wire guards should be mounted on the inlet and outlet sides.

• Transportation rods
  Fans on support frames and with vibration dampers have transportation rods in the support frames, which must be removed before start of operation. The handles are marked with a strong colour.

• Clean ducts
  The fans and duct connections must be clean and free from tools and objects that can affect the airflow.

• Electrical connections
  The electrical connections must be correct and in accordance to the prescribed requirements. Switch the fan power briefly On, then Off, to check the rotational direction of the rotor.

5.2 Motors with Y/Δ–start

Set the relay for start of the fans to the Startup time from the technical specifications from the AirBox program. Alternatively, calculate the value with the below formula.

\[
\tau_s = \frac{0.24 \times n^2 \times (I_m + I_v)}{10^4 \times P \times \left(\frac{M_s}{M} + \frac{M_k}{M} - \frac{P}{P_v}\right)}
\]

\( \tau_s \) : Startup time [s]
\( P \) : Rated output of motor [kW]
\( n \) : Fan speed [RPM]
\( M_s \) : Ratio between the start and nominal motor torque
\( M_k \) : Ratio between maximum and nominal motor torque
\( I_v \) : Polar moment of inertia for fan [kgm²]
\( I_m \) : Polar moment of inertia for motor [kgm²]

The motor torque can vary within the below limits and affect the startup time.

\( M_k \) : -15% to +25% of catalogue value
\( M_k \) : -10% to 0% of catalogue value

5.3 Startup procedure

Refer to the motor manual and the AirBox technical specifications for specific information and procedures.

Start up procedure

1. Start the fan.
2. Check that no abnormal noises are present.
3. Check that the vibration levels are acceptable. See section “6.3 Vibration levels”.
4. Check that the fan operates normally after 30 minutes of operation.

The fans are designed for continuous operation. The below kinds of operation may cause fatigue breaks in the rotors and endanger people.

• Operation in stall area, i.e. with counter pressure that pulsates - called pump mode
• Operation with uninterrupted and repeated starts and stops
• Uneven flow velocity through fans

Ask Novenco if in doubt.

5.4 Air volumes for free inlet fans

For fans with measuring pipes and free inlets, the air volume can be calculated as shown below. The measuring pipes are optional accessories and fitted close to the fan inlet.

The below formula gives the air volume in m³/s. Multiply by 3,600 to convert to m³/h, or by 2188.88 to convert from m³/s to CFM.

\[ q = \frac{k}{\sqrt{dps}} \]

\( q \) : Air volume [m³/s]
\( k \) : A constant, see table 4.
\( dps \) : Difference between \( p_{away} \) and \( p_{fan} \) [Pa]
\( p_{away} \) : Static pressure at fan inlet [Pa]
\( p_{fan} \) : Static pressure away from fan [Pa]

Table 4. Constants for air volumes

<table>
<thead>
<tr>
<th>Fan sizes</th>
<th>Constant, k</th>
<th>Fan sizes</th>
<th>Constant, k</th>
</tr>
</thead>
<tbody>
<tr>
<td>250/160</td>
<td>0.0510</td>
<td>900/350</td>
<td>0.7204</td>
</tr>
<tr>
<td>280/160</td>
<td>0.0694</td>
<td>1000/350</td>
<td>0.9001</td>
</tr>
<tr>
<td>315/160</td>
<td>0.0917</td>
<td>1120/350</td>
<td>1.2019</td>
</tr>
<tr>
<td>355/160</td>
<td>0.1183</td>
<td>1250/350</td>
<td>1.5636</td>
</tr>
<tr>
<td>400/160</td>
<td>0.1502</td>
<td>1000/560</td>
<td>0.871</td>
</tr>
<tr>
<td>450/160</td>
<td>0.1894</td>
<td>1120/560</td>
<td>1.129</td>
</tr>
<tr>
<td>500/160</td>
<td>0.2343</td>
<td>1250/560</td>
<td>1.441</td>
</tr>
<tr>
<td>500/350</td>
<td>0.1921</td>
<td>1400/560</td>
<td>1.844</td>
</tr>
<tr>
<td>560/350</td>
<td>0.2537</td>
<td>1600/560</td>
<td>2.453</td>
</tr>
</tbody>
</table>

Table 12. Measurement of pressure difference

The fans are designed for continuous operation. The below kinds of operation may
The suction must be directly from the suction chamber.

6. Maintenance

6.1 Before maintenance

Switch off the power and disconnect the motor cable in the terminal box, before beginning work on the rotor and motor. For fans with PM motors, make sure the motor axles cannot rotate during service, e.g. by blocking the fan rotors. PM motors can generate high voltages when the motor axles rotate, even though the power is disconnected.

6.2 Cleaning

Clean the fans at least quarterly. The intervals may have to be adjusted, dependent on the operation and operational conditions. Corrosive and dust filled atmospheres typically reduce the intervals. Please note that deposits of dust can be ignited by high surface temperatures and constitute a safety risk.

6.3 Vibration levels

Once the installation is complete and for every 1,000 hours of operation the vibration levels must be evaluated and checked if they appear excessive.

The vibration levels depend on the installation and the fan speed. Vibrations have significant effect on the fan life and efficiency.

Table 4. Constants for air volumes (Cont.)

<table>
<thead>
<tr>
<th>Fan sizes</th>
<th>Constant, k</th>
<th>Fan sizes</th>
<th>Constant, k</th>
</tr>
</thead>
<tbody>
<tr>
<td>630/350</td>
<td>0.3324</td>
<td>1800/560</td>
<td>3.142</td>
</tr>
<tr>
<td>710/350</td>
<td>0.4329</td>
<td>2000/560</td>
<td>3.913</td>
</tr>
<tr>
<td>800/350</td>
<td>0.5603</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fans in operation with vibration levels that exceed 12.5 mm/s RMS must be shut down.

Fans that exceed the limits usually require cleaning or balancing of the rotors. Alternatively, the causes must be investigated and removed. Refer to ISO 14694.

For variable speed fans the vibration level limits are likely to be exceeded at certain speeds. Continuous operation at these speeds must be avoided.

6.4 Fan casings

The fan casings require no other maintenance than ordinary cleaning. Check painted casings regularly and keep them in good condition.

6.5 Rotors

The rotors are carefully balanced and the rotor blades are set at precise angles in the production. The rotors are thereby optimised for vibration free operation at the desired operation point with regard to pressure, airflow and fan speed.

Vibrations that occur in operation may be due to accumulation of dust and dirt on the hubs and blades. If vibrations persist after cleaning, expert assistance should be called for immediately. Continued operation with vibrations shorten the life of the fan and motor bearings.

6.6 Motors

Refer to the motor manufacturer’s documentation and the nameplates for how to service the motors.

Motor maintenance

- Inspect the motor for wear signs and damaged parts.
- Clean the motor casing, motor cooling fan and motor shell.
- Drain the motor of condensed water.
- Check supply cables and electrical connections for impairments.
- Check terminal box seals and cable glands.
- Lubricate bearings

Refer to the motor manual for service information such as lubrication intervals, grease amounts, when to replace bearings etc.

- Permanent magnet motors are lifetime lubricated. Bearings may, however, need replacement.
- AC motors up to size 132 have lifetime-lubricated bearings. Motor sizes 160 to 280 require lubrication according to the manufacturer’s instructions. Fans with motor sizes 225 to 280 have nipples on the outer fan casings. For fans with motor sizes 160 to 200, nipples on the outer fan casings are optional. Refer to the motor nameplates for recommended grease type, amount and interval.

Table 5. Grease amounts and intervals for WEG W22 TEFC motors – ball bearings

<table>
<thead>
<tr>
<th>Motor size</th>
<th>Poles</th>
<th>Lubrication</th>
<th>Grease amount [g]</th>
</tr>
</thead>
<tbody>
<tr>
<td>160</td>
<td>2</td>
<td>22000</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>25000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>25000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>2</td>
<td>17000</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>25000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>25000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>2</td>
<td>15000</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>25000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>25000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>225</td>
<td>2</td>
<td>5000</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>14000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>20000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>24000</td>
<td></td>
</tr>
<tr>
<td>250</td>
<td>2</td>
<td>4000</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>13000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>18000</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>20000</td>
<td></td>
</tr>
</tbody>
</table>

Novenco ZerAx® axial flow fan types AZL-AZN-AZW
7. Support the motor. See table 11 on page 11 for max. motor weights.
8. Detach the motor from the motor shell by removing the nuts and bolts (items 7a and 7b) for hub sizes Ø350 and Ø560, or bolts and washers (items 7b and 7c) for hub sizes Ø160.

**Notice:** Nuts holding motors mounted in rear motor shells are accessed through the front motor shells.

9. Remove the motor (item 8).

**Avoid exposure of fans and motor parts to shocks, as these can result in imbalance and deformations. Motor bearings and fan components are vulnerable parts.**

### 6.8 Mounting of motor

The below procedure is with reference to figure 14 on page 12.

#### Mounting of motor

1. Remount the motor (item 8) and make sure the motor shaft is centred in the fan casing. A centring tool is available as an accessory from Novenco.
2. Fans with Ø350 hubs and motor sizes 160 or 180: These motors are mounted with pins. The pins must be replaced with new ones when re-mounting the motors.
3. Insert and tighten the nuts and bolts (items 7a and 7b) for hub sizes Ø350 and Ø560, or bolts and washers (items 7b and 7c) for hub sizes Ø160.

**Notice:** Nuts holding motors mounted in rear motor shells are accessed through the front motor shells.

4. Mount the rotor (item 6) on the motor shaft with a tool fastened in the threaded hole of the motor shaft. The rotor hub must rest against the motor shaft collar.
5. Use a feeler gauge to check that the blade tip clearance between the rotor blade tips and fan casing is the same throughout the circumference.
6. Adjust the motor position with reference to step 5.
7. Mount the centre washers and bolt (item 3).
8. **Fans with hub clips:** Mount the hub clip, screws and washers (item 4).
9. Mount the hub cap (item 2) and screws (item 1).
10. Connect the motor cable to the motor and the power cables in the terminal box.
11. Reconnect any ducts.

Follow the procedure in section “5. Start of operation” to start the fan.

### 6.9 Blade angle adjustment

The rotor blade angles are set in the factory to deliver the required performance.

If the fan performance needs to be changed, it is possible to change the angles of the blade. This requires knowledge of the motor load and of the max. permissible angle with relation to the motor rating. If the angles are changed, the rotor has to be re-balanced. Consult Novenco, before changing the angles. The blade angle tool for adjustment, along with instructions for use, is available from Novenco.

<table>
<thead>
<tr>
<th>Motor size</th>
<th>Lubrication</th>
<th>Grease amount [g]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poles</td>
<td>50 Hz</td>
<td>60 Hz</td>
</tr>
<tr>
<td>160</td>
<td>2</td>
<td>16000</td>
</tr>
<tr>
<td>4</td>
<td>25000</td>
<td>25000</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>180</td>
<td>2</td>
<td>11000</td>
</tr>
<tr>
<td>4</td>
<td>25000</td>
<td>25000</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>2</td>
<td>9000</td>
</tr>
<tr>
<td>4</td>
<td>25000</td>
<td>25000</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>225</td>
<td>4</td>
<td>11000</td>
</tr>
<tr>
<td>8</td>
<td>20000</td>
<td>19000</td>
</tr>
<tr>
<td>250</td>
<td>4</td>
<td>9000</td>
</tr>
<tr>
<td>8</td>
<td>14000</td>
<td>12000</td>
</tr>
<tr>
<td>280</td>
<td>8</td>
<td>19000</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 6.** Grease amounts and intervals for WEG W22 TEFC motors – roller bearings

**Stop**

Switch off the power and disconnect the motor cable in the terminal box, before beginning work on the rotor and motor. For fans with PM motors, make sure the motor axles cannot rotate during service, e.g. by blocking the fan rotors. PM motors can generate high voltages when the motor axles rotate, even though the power is disconnected.

The below procedure is with reference to figures 14 and 15 beginning on page 12.

#### Motor removal

1. Dismount any ducts on the inlet and outlet sides.
2. Remove the screws (item 1) that hold the hub cap and remove the cap (item 2) itself.
3. Remove the rotor centre bolt and washers (item 3).
4. **Fans with hub clips:** Remove the hub clip, screws and washers (item 4).
5. Dismount the rotor with a puller fastened in the threaded holes of the hub boss (item 5).
6. Disconnect the motor cable from the motor.

7. Motor removal

8. Detach the motor from the motor shell by removing the nuts and bolts (items 7a and 7b) for hub sizes Ø350 and Ø560, or bolts and washers (items 7b and 7c) for hub sizes Ø160.

**Notice:** Nuts holding motors mounted in rear motor shells are accessed through the front motor shells.

9. Remove the motor (item 8).

**Avoid exposure of fans and motor parts to shocks, as these can result in imbalance and deformations. Motor bearings and fan components are vulnerable parts.**

The below procedure is with reference to figures 14 and 15 beginning on page 12.

#### Mounting of motor

1. Remount the motor (item 8) and make sure the motor shaft is centred in the fan casing. A centring tool is available as an accessory from Novenco.
2. Fans with Ø350 hubs and motor sizes 160 or 180: These motors are mounted with pins. The pins must be replaced with new ones when re-mounting the motors.
3. Insert and tighten the nuts and bolts (items 7a and 7b) for hub sizes Ø350 and Ø560, or bolts and washers (items 7b and 7c) for hub sizes Ø160.

**Notice:** Nuts holding motors mounted in rear motor shells are accessed through the front motor shells.

4. Mount the rotor (item 6) on the motor shaft with a tool fastened in the threaded hole of the motor shaft. The rotor hub must rest against the motor shaft collar.
5. Use a feeler gauge to check that the blade tip clearance between the rotor blade tips and fan casing is the same throughout the circumference.
6. Adjust the motor position with reference to step 5.
7. Mount the centre washers and bolt (item 3).
8. **Fans with hub clips:** Mount the hub clip, screws and washers (item 4).
9. Mount the hub cap (item 2) and screws (item 1).
10. Connect the motor cable to the motor and the power cables in the terminal box.
11. Reconnect any ducts.

Follow the procedure in section “5. Start of operation” to start the fan.

### 6.9 Blade angle adjustment

The rotor blade angles are set in the factory to deliver the required performance.

If the fan performance needs to be changed, it is possible to change the angles of the blade. This requires knowledge of the motor load and of the max. permissible angle with relation to the motor rating. If the angles are changed, the rotor has to be re-balanced. Consult Novenco, before changing the angles. The blade angle tool for adjustment, along with instructions for use, is available from Novenco.

<table>
<thead>
<tr>
<th>Fan size, ØD [mm]</th>
<th>Minimum [mm]</th>
<th>Fan size, ØD [mm]</th>
<th>Minimum [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>250</td>
<td>0.3</td>
<td>800</td>
<td>0.8</td>
</tr>
<tr>
<td>280</td>
<td>0.3</td>
<td>900</td>
<td>0.9</td>
</tr>
<tr>
<td>315</td>
<td>0.3</td>
<td>1000</td>
<td>1.0</td>
</tr>
<tr>
<td>355</td>
<td>0.4</td>
<td>1120</td>
<td>1.1</td>
</tr>
<tr>
<td>400</td>
<td>0.4</td>
<td>1250</td>
<td>1.3</td>
</tr>
<tr>
<td>450</td>
<td>0.5</td>
<td>1400</td>
<td>1.4</td>
</tr>
<tr>
<td>500</td>
<td>0.5</td>
<td>1600</td>
<td>1.6</td>
</tr>
<tr>
<td>560</td>
<td>0.6</td>
<td>1800</td>
<td>1.8</td>
</tr>
<tr>
<td>630</td>
<td>0.6</td>
<td>2000</td>
<td>2.0</td>
</tr>
<tr>
<td>710</td>
<td>0.7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 8.** Blade tip clearance
7. Troubleshooting

Fans that operate in the stall area are more likely to suffer breakdowns.

Check for the below faults in case of breakdowns or lack in performance. Call for service, if problems persist.

Lack in performance
- Blocked - Inlets
- Blocked - Outlets
- Damplers
- Supply air reduced
- Motors defective
- Motors disconnected
- Wrong fan rotation direction

Noises and vibrations
- Motor bearings defective
- Rotors out of balance
- Rotors damaged or worn
- Bolts or components loose
- Wrong rotor blade pitch angles

8. Inspection and test

It is recommended to test and inspect the fans at regular intervals with regard to operability and operation conditions. Inspect the fans twice a year to ensure satisfactory function and long life.

Extent of inspection
- Measure power consumption
- Verify torques of fixation bolts
- Cleaning
  - inside with pressurised air
  - outside with a lint-free cloth with a mild soapy water solution
- Visual inspection
  - Rotors
  - Fan casings
  - Electrical connections

Enter all values and observations in a log.

9. Sound

The sound emissions depend on the installation and operation conditions, hence no general data can be given.

Refer to the fan specifications from the AirBox calculation program for specific emissions and to the product catalogue for more general data.

10. Safety

The installation must be in accordance to Novenco’s, the current and the local safety regulations. At a minimum these include EN 13850.

It is recommended to review and revise safety procedures regularly.

Safety check
- Test if safety procedures and the installation work correctly.
- Check if safety regulations have been changed and if the installation should be revised.
- Consider additional measures to improve the safety of the installation.

11. Reference documentation

Please refer to the below documents for further information about the fans.
- Catalogue
  - ZerAx axial flow fans standard, ATEX and EX
  - Novenco configuration user guide
  - Frequency converter Danfoss FC101
- Technical specifications

12. Disposal

Dispose of fans suitable for scrapping in environmentally safe ways and in accordance to current regulations.

The fans and especially the electric motors contain a wide range of materials, which can all be recycled. Make sure worn-out motors and fan parts are disassembled and recycled for the benefit of the environment.

13. Patents and trademarks

Novenco®, 株式会社, 诺万科 and 诺克 are registered trademarks of Novenco Marine & Offshore A/S.

AirBox™ and NovAx™ are trademarks of Novenco Building & Industry A/S. The ZerAx® processes of manufacture, technologies and designs are patented by Novenco A/S or Novenco Building & Industry A/S.


Granted patents include Canada no. 2.777.140, 2.777.141 and 2.777.144; China no. ZL2010800458824, ZL201080046065, ZL2010800462575 and ZL2012800387210; EU no. 2488759, 2488760 and 2488761; India no. 312464; South Korea no. 10-1907239, 10-1933724 and 10-1980660; US no. 8.967.983, 9.200.641, 9.273.696 B2, 9.683.577 and 9.926.943 B2. Granted designs include Brazil no. BR-30-2012-003932-0; Canada no. 146333; China no. 1514732, 1517779, 1515003, 1555664 and 2312963; EU no. 001622945-0001 to 001622945-0009 and 001985391 - 0001; India no. 246293; South Korea no. 30-0735804; US no. D665895S, D683840S, D69219S, D704328S, D712053S, D7430185, D755365S, D7565005, D8215605 and D8234525.

Other trademarks in this document are the property of their respective owners.

This document is provided ‘as is’. Novenco Building & Industry A/S reserves the right to changes without further notice due to continuous product development.

Copyright © 2009 - 2019, Novenco Building & Industry A/S. All rights are reserved.

14. Quality management

Novenco Building & Industry A/S is ISO 9001 and 14001 certified. All fans are inspected and tested in the production.
15. Warranty
Novenco Building & Industry A/S provides in accordance to the law a standard 12 months warranty from the product leaves the factory. The warranty covers materials and defects from the manufacture. Wear parts are outside the warranty scope. Extended warranty can be agreed upon.

15.1 Rotor weldings
First generation ZerAx fans have the rotor blades welded onto the hubs. The weldings may look uneven or have small pores, which is due to the use of robot-welding. The production method is verified by high-speed tests, which confirm the maximum allowable speed with a large safety margin. The appearance of the weldings has no impact on rotor strength and should not be reported as a quality issue. It will not be accepted as a basis for a warranty case.

16. Spare parts
Contact Novenco for information about and ordering of spare parts.

17. Classifications

Flange standards
- Eurovent 1/2
- Marine fans: DIN 24154 R4

Temperature ranges
- Standard: -20 to 50 °C
- Max.: -40 to 120 °C

Marine motor classification
- Refer to AirBox program

Calculation software
- AirBox program certified by TÜV

18. Product lifetime
The fans have a product lifetime of 20 years. Storage, installation and maintenance must be in accordance with Novenco’s instructions, which include this installation and maintenance guide.

19. Declaration of conformity
Novenco Building & Industry A/S hereby declares that the axial flow fans type AZL-AZN-AZW have been manufactured in accordance to the below directives of the European Council and that they comply with the below standards and regulations.

Directives
- Machinery 2006/42/EU
- ECO design 2009/125/EU and regulation 2017/1369/EU
- EMC 2014/30/EU
- LVD 2014/35/EU

Applied standards and regulations
- ANSI/AMCA 300-14
- EU regulation 327/2011
- DS 447:2013
- DS/EN 1037 + A1:2008
- DS/EN ISO 1461:2009
- DS/EN 1886:2008
- DS/EN 1993-1-1 + AC:2007
- DS/EN ISO 5801:2017
- DS/EN ISO 9001:2015
- EN ISO 12100:2011
- DS/EN ISO 12499:2009
- DS/EN ISO 12944-2:2017
- ISO 13348:2007, class AN3
- DS/EN ISO 13857:2008
- DS/EN ISO 14001:2015
- ISO 14694:2003
- ISO 20607:2019
- DS/ISO 21940-14:2012
- DS/EN 61000-6-1:2007
- DS/EN 61000-6-2:2005
- EN ISO 13857:2008
- EN ISO 14694:2003
- EN ISO 5801:2017
- EN ISO 12499:2009
- EN ISO 12944-2:2017
- ISO 13348:2007, class AN3
- DS/EN ISO 13857:2008
- DS/EN ISO 14001:2015
- ISO 14694:2003
- ISO 20607:2019
- DS/ISO 21940-14:2012
- DS/EN 61000-6-1:2007
- DS/EN 61000-6-2:2005

This declaration is valid, provided that the installation and maintenance instructions are followed. Changes to the product without prior consultation with Novenco Building & Industry A/S invalidates the declaration and warranty.

Naestved, 01.12.2019

Peter Holt
Technical director
Novenco Building & Industry A/S
## Appendices

### A. Fan weights

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>250</td>
<td></td>
<td>21.4</td>
<td>25.7</td>
<td>33.6</td>
<td>49.1</td>
<td>51.9</td>
<td>59.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>280</td>
<td></td>
<td>22.3</td>
<td>26.6</td>
<td>34.5</td>
<td>50.0</td>
<td>57.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>315</td>
<td></td>
<td>23.6</td>
<td>27.9</td>
<td>35.8</td>
<td>51.3</td>
<td>58.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>355</td>
<td></td>
<td>25.0</td>
<td>29.4</td>
<td>37.3</td>
<td>52.7</td>
<td>59.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>400</td>
<td></td>
<td>26.1</td>
<td>30.5</td>
<td>38.4</td>
<td>53.8</td>
<td>61.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>450</td>
<td></td>
<td>27.1</td>
<td>31.4</td>
<td>39.3</td>
<td>54.7</td>
<td>61.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>500</td>
<td></td>
<td>28.0</td>
<td>32.3</td>
<td>40.2</td>
<td>55.6</td>
<td>62.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>560</td>
<td></td>
<td>36.1</td>
<td>36.1</td>
<td>36.1</td>
<td>51.9</td>
<td>51.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>630</td>
<td></td>
<td>42.7</td>
<td>42.7</td>
<td>42.7</td>
<td>61.4</td>
<td>61.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>710</td>
<td></td>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
<td>71.9</td>
<td>71.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>800</td>
<td></td>
<td>58.4</td>
<td>58.4</td>
<td>58.4</td>
<td>84.0</td>
<td>84.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>900</td>
<td></td>
<td>67.9</td>
<td>67.9</td>
<td>67.9</td>
<td>97.1</td>
<td>97.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td></td>
<td>79.9</td>
<td>79.9</td>
<td>79.9</td>
<td>115.2</td>
<td>116.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1120</td>
<td></td>
<td>90.8</td>
<td>90.8</td>
<td>90.8</td>
<td>130.4</td>
<td>131.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1250</td>
<td></td>
<td>114.5</td>
<td>114.5</td>
<td>114.5</td>
<td>117.4</td>
<td>116.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td></td>
<td>211</td>
<td>211</td>
<td>211</td>
<td>211</td>
<td>211</td>
<td>211</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1120</td>
<td></td>
<td>239</td>
<td>239</td>
<td>239</td>
<td>239</td>
<td>239</td>
<td>239</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1250</td>
<td></td>
<td>259</td>
<td>259</td>
<td>259</td>
<td>259</td>
<td>259</td>
<td>259</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1400</td>
<td></td>
<td>284</td>
<td>284</td>
<td>284</td>
<td>284</td>
<td>284</td>
<td>284</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1600</td>
<td></td>
<td>319</td>
<td>319</td>
<td>319</td>
<td>319</td>
<td>319</td>
<td>319</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1800</td>
<td></td>
<td>351</td>
<td>351</td>
<td>351</td>
<td>351</td>
<td>351</td>
<td>351</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td>381</td>
<td>381</td>
<td>381</td>
<td>381</td>
<td>381</td>
<td>381</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1000</td>
<td></td>
<td>211</td>
<td>211</td>
<td>211</td>
<td>211</td>
<td>211</td>
<td>211</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1120</td>
<td></td>
<td>239</td>
<td>239</td>
<td>239</td>
<td>239</td>
<td>239</td>
<td>239</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1250</td>
<td></td>
<td>259</td>
<td>259</td>
<td>259</td>
<td>259</td>
<td>259</td>
<td>259</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1400</td>
<td></td>
<td>284</td>
<td>284</td>
<td>284</td>
<td>284</td>
<td>284</td>
<td>284</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1600</td>
<td></td>
<td>319</td>
<td>319</td>
<td>319</td>
<td>319</td>
<td>319</td>
<td>319</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1800</td>
<td></td>
<td>351</td>
<td>351</td>
<td>351</td>
<td>351</td>
<td>351</td>
<td>351</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td></td>
<td>381</td>
<td>381</td>
<td>381</td>
<td>381</td>
<td>381</td>
<td>381</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 9. Max. weights of AZL and AZN fans, excl. motors and accessories [kg]

1. Weights of AZL fans are the top values in cells with two values.
2. Includes a fan casing extension.
<table>
<thead>
<tr>
<th>Hub diameter</th>
<th>Fan sizes, ØD [mm]</th>
<th>Motor sizes</th>
</tr>
</thead>
<tbody>
<tr>
<td>350</td>
<td></td>
<td></td>
</tr>
<tr>
<td>500</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>560</td>
<td>102</td>
<td>102</td>
</tr>
<tr>
<td>630</td>
<td>114</td>
<td>114</td>
</tr>
<tr>
<td>710</td>
<td>126</td>
<td>126</td>
</tr>
<tr>
<td>800</td>
<td>141</td>
<td>141</td>
</tr>
<tr>
<td>900</td>
<td>157</td>
<td>157</td>
</tr>
<tr>
<td>1000</td>
<td>172</td>
<td>172</td>
</tr>
<tr>
<td>1120</td>
<td>198</td>
<td>198</td>
</tr>
<tr>
<td>1250</td>
<td>218</td>
<td>218</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>403 and 578</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td>288</td>
<td>288</td>
</tr>
<tr>
<td>1120</td>
<td>378</td>
<td>378</td>
</tr>
<tr>
<td>1250</td>
<td>411</td>
<td>411</td>
</tr>
<tr>
<td>1400</td>
<td>452</td>
<td>452</td>
</tr>
<tr>
<td>1600</td>
<td>512</td>
<td>512</td>
</tr>
<tr>
<td>1800</td>
<td>566</td>
<td>566</td>
</tr>
<tr>
<td>2000</td>
<td>619</td>
<td>619</td>
</tr>
</tbody>
</table>

Table 10. Max. weights of AZW fans, excl. motors and accessories [kg]

B. 4-pole motor weights

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor weights</td>
<td>11.0</td>
<td>15.5</td>
<td>24.3</td>
<td>39.4</td>
<td>46.9</td>
<td>101</td>
<td>139</td>
<td>201</td>
<td>304</td>
<td>503</td>
<td>595</td>
<td>880</td>
</tr>
</tbody>
</table>

Table 11. Max. weights for 4-pole motors [kg]
C. Drawings – fan assembly

Ø160 hubs

1. Screws
2. Hub cap
3. Centre bolt and washers
4. Hub clip with screws and washers
5. Hub boss
6. Rotor
7a. Nuts
7b. Bolts
7c. Washers
8. Motor
9. Fan casing
10. Guide vanes

Ø350 hubs

Welded

With hub clip

123 6 5 7 b 9 7 c 10 8

Figure 14. Fan disassembly and assembly
1. Screws 7a. Nuts
2. Hub cap 7b. Bolts
3. Centre bolt and washers 7c. Washers
4. Hub clip with screws and washers 8. Motor

Figure 15. Fan disassembly and assembly
D. Wiring – motors up to 16 A

![Diagram showing terminal box delta connected for motors up to 16 A.](image1)

**Figure 16.** Terminal box delta connected for motors up to 16 A

![Diagram showing terminal box star connected for motors up to 16 A.](image2)

**Figure 17.** Terminal box star connected for motors up to 16 A

E. Wiring – motors over 16 A

![Diagram showing terminal box delta connected for motors over 16 A.](image3)

**Figure 18.** Terminal box delta connected for motors over 16 A
Figure 19. Terminal box star connected for motors over 16 A