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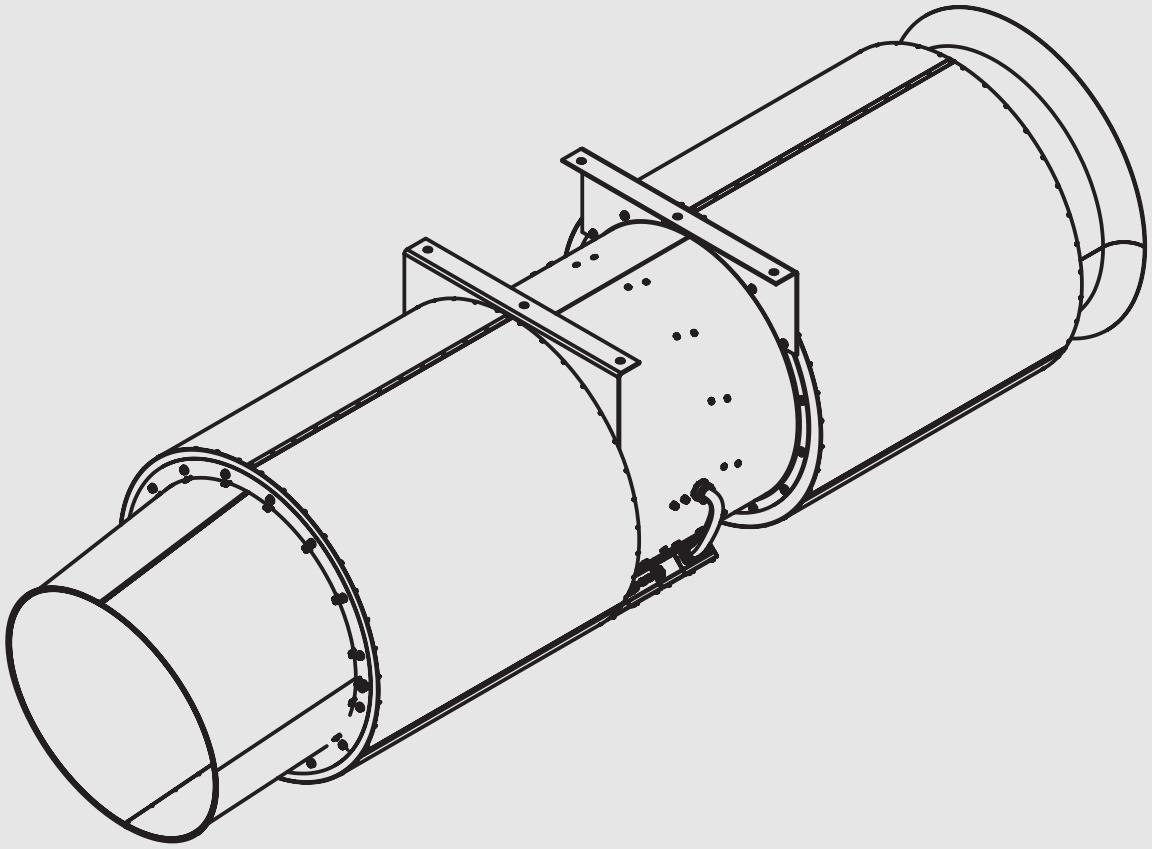
SCHAKO Group



NOVENCO®
Tunnel fans AUZ 500-1250
Installation and maintenance

Important

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

The fans are designed for continuous operation. The following kinds of operation may cause fatigue break in the impellers and endanger people.

- Operation in stall area
- Operation with pulsating counter pressure – called pump mode
- Operation with repeated start and stop

If in doubt, Novenco should be contacted to assess the suitability of the fans.

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1. Application

The Novenco® tunnel jet fans type AUZ are unidirectional and implement use of the high performance Novenco ZerAx® axial flow fans. The fans are for conventional ventilation and smoke exhaust in road traffic and train tunnels. Tunnel fans type AUZ cannot be used in explosive environments.

1.1 Reading guide

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

Icons	Descriptions
	Risk of injuries and damage to equipment
	Risk of injury or death
	Installation tip

Table 1. Icons in guide

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 AUZ fans have nameplates on the fan casings and motors.

Fan nameplate information

- Manufacturer information
- Product type, e.g. AUZ 1250/350
- 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 technical fan specifications from Novenco for further information and weights of specific fan solutions.

2.3 Design conditions

The AUZ fans are for operation at standard temperatures from -20 to +40 °C / -4 to 104 °F. As fans for smoke removal and containment they meet the requirements of F300 approved fans for smoke exhaust and are certified according to the European standards EN12101-3 and EN13501-4. Refer to the Novenco product declarations of performance for more details.

2.4 Transport and lifting

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 “Appendix - A. Max. unit weights” on page 18.

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

⚠ Verify that the fans and accessories are undamaged upon receipt. Also, spin the impellers by hand to see they rotate freely in the fan casings. Inform the carrier and Novenco immediately of damages.

Transport

- **Jet fans on pallets**
  Transport and store these on pallets.
- **Jet fans bolted together with transport brackets**
  Transport and store these as received, i.e. on the pallets and bolted together with the brackets.

Lifting

- **Lift in eyebolts fitted in the suspension brackets**
  Preferably, fit four eyebolts – optional accessory – in a square configuration in the suspension brackets on top of the fan casing.

3. Storage

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

⚠ Damages due to incorrect storage void the warranty.

Conditions	Specifications	Comments
Outdoor	One month	• Packaging must be intact
Indoor or sheltered	Max. six months	• For unprotected fans with no or broken packaging • Ventilated location • No condensation

Table 2. Storage recommendations

Conditions	Specifications	Comments
Prolonged	Max. two years	• Indoor • Remove packaging • Ventilated location • No condensation • Turn impeller 20 times every six months • Add additional anti-corrosive coating on motor shaft • Change motor ball bearings after two years of storage
Vibrations	No	• Location must be vibration free
Temperatures	-20 to 50 °C -4 to 122 °F	• Constant temperature, preferably 20 °C / 68 °F • Ventilated • No condensation
Humidity	Below 70%	• Avoid condensation • Exceedance requires airtight packaging of complete fan and use of a moisture absorbent agent such as silica gel

Table 2. Storage recommendations (Cont.)

4. Installation

4.1 Before installation

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

Before installation

- Unpack the fan with care.
- Check that the impeller rotates freely in the fan casing with equal blade tip distances to the casing around the circumference.
- Ground the fan before installation to avoid static electricity. For example, by assembly on non-conductive mats.
- Clear the fan installation location to ensure free and unimpeded airflows for the inlet and outlet. Optimal 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 against solid objects up to 12 mm.
  Also, install wire guards on fans where there is direct access to the impeller. Wire guards from Novenco can be installed as close as 120 mm before and after the impeller.

⚠ 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 frequency of this system 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 of fans

STOP Jet fans that are installed within smoke reservoirs must be fastened to non-flammable materials only, which must meet current national requirements. In general, the jet fans must be mounted so that there is no risk of them falling down in case of fire.

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

Installation

1. Check the installation location is correct. This includes check of minimum distances to nearby obstructions that can affect the airflow.
   - Inlet side – requires a free field of at least 1 x fan-diameter, D m to nearby obstacles.
   - Outlet side – requires a free field to nearby obstacles, which depends on fan size, mounting height, deflection angle, and the size and location of obstacles.

⚠ Arrows on the fan casings indicate the airflow and impeller rotational directions.

⚠ It is essential for the performance and sound levels that the airflows are unimpeded and free from eddies.

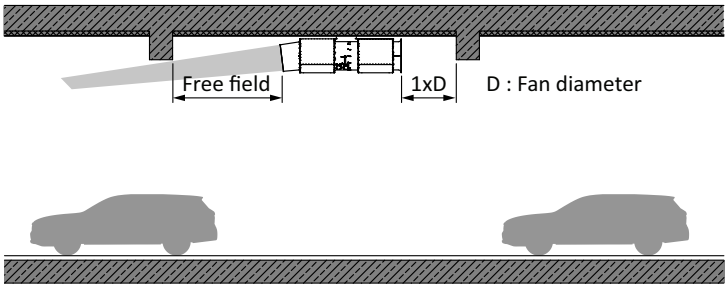
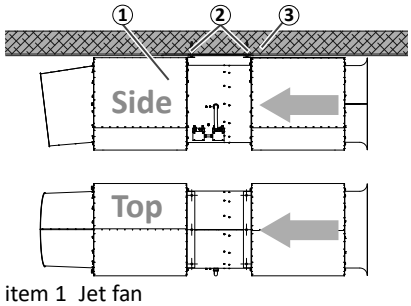


Figure 1. Minimum distance requirements

2. Drill holes in the ceiling in accordance to the installation footprint. See figure 4 on page 19.



item 1 Jet fan
item 2 Certified high temperature bolts
item 3 Ceiling

Figure 2. Principle of installation

⚠ Tunnel jet fans are subject to significant static and dynamic loads. Secure installation requires robust anchor bolts with carefully selected specifications, including appropriate diameter, high-strength material, sufficient embedment depth, and a high safety factor. Load-spreading techniques and corrosion-resistant materials enhance installation reliability and long-term performance.

3. **Optional:** Install lowering brackets in the ceiling, if applicable.
4. Place the fan on a platform that can be raised, for example a scissor lift.
5. Fasten the fan in the suspension points to the ceiling or, if applicable, to lowering brackets.
6. Check that the rotor rotates freely in the fan casing.
7. Remove the transport brackets on the underside of the fan casing. Reinsert the screws from the brackets in the casing.
8. Connect fan electrically.

⚠ Use bolts certified for fire conditions and make sure the load is within the approval rating. See section “2.2 Weights” on page 4.

4.3 Electrical connection

STOP The installation and connection to power and control networks must be done by authorised personnel and according to current legislation. In the EU, refer to the standard for electromagnetic compatibility (EMC). In the US, refer to National Electrical Code (NEC) and NFPA 70.

Electric connection

1. Check if current legislation prescribes installation of f.x. an emergency stop and include this in the installation.
2. Remove the lid on the external terminal box.
3. Connect the motor through a thermal relay based on the motor nominal current. Refer to the following information.

Connection references

- Connection diagram in terminal box lid on fan
- Motor nameplate (delta or star)
- Order specification
- Appendix G on wiring on page 21

4.4 Approval for operation

The installation must be approved with regard to operation and interaction. The person responsible for the operation of the system must initiate this approval test. The test must be confirmed.

The person responsible for the operation of the system must keep the approval test documents. For jet fans approved for smoke control, the documents must be presented upon request from the authorities.

5. Operation

Fans fitted with frequency converters must have the control unit set up, before start of operation.

Perform the below steps every time the fans have been stopped.

5.1 Before start-up

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

Checklist

- **Safe operation**
  Make sure that any wire guards on the suction side as well as guide vanes on the pressure sides are correctly mounted.
- **Clean fans**
  The fans 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 impeller. Refer to the arrow plates on the fan casings.

5.2 Start-up procedure

The acceleration of directly driven fans with direct start to max. RPM is typically very fast. Dependent on the control system, fans such as these may be able to reach max. RPM in about 1 s. For normal operation, however, acceleration times up to 60 s are common.

Start-up procedure

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

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

- Operation with uninterrupted and repeated starts and stops
- Uneven flow velocity through the fans

Contact Novenco if in doubt.

6. Maintenance

> **STOP** Repair and maintenance of Novenco fans must be carried out by authorised personnel and in accordance with Novenco instructions. Keep records signed by the competent personnel for all services, tests and changes performed.

Keep the fans in good and operational condition to ensure safety, functionality, and warranty.

Safe and proper function of the fans require maintenance at regular intervals. Improper maintenance of fans covered by warranty renders the warranty void.

Maintenance checklist

- Inspection of each complete unit
- Repair and service units – includes both non-electrical and electrical parts
- Check and re-tighten bolts for mounting and silencers
- Test of functionality

Fan types	Maintenance [1]	Cleaning [2]
CO-fans	Once a year	Three to six months
Smoke fans	Six months	
Unused fans	Three months	

Table 3. Maintenance intervals

1.The site operator may have set other test intervals. Smoke control fans and other fans, which run infrequently or in case of emergencies, must be run tested every week, for example during normal operation.
2.Intervals for cleaning depend on the operating conditions and environment.

It is recommended to implement maintenance procedures in accordance with the above requirements.

In the following, please also see “Appendix - H. Checklists” on page 22.

6.1 Before maintenance

> **STOP** Disconnect the fans from the electrical system, before initiation of any kinds of service on the fans. Make sure the fans cannot start accidentally. Fans controlled by automation may start suddenly, unless they are disconnected.
> Fan units with external safety switches must be disconnected at the switches and secured, e.g. with locks. This is done in the fuse box or other centrally placed switch.

Ensure the work area is safe before the commencement of work on the fans. For tunnel fans such as the Novenco AUZ, that are for installation in traffic dense environments, this is especially important. Refer to the local regulations for safe work conditions in the tunnel.

Switch off power supply for fans

1. Locate the central fan power supply.
2. Turn off the power for the fans.
3. Disconnect the power supply.
4. Lock the power switches. Alternatively, lock access to the power switches.

Service of the fans can now begin.

6.2 Cleaning

Clean fans and silencers when needed at least according to the maintenance intervals. See table 3 “Maintenance intervals”.
Use pressurised air or vacuum cleaning.

> ⚠ Do not use high-pressure water for cleaning the fans or silencers.

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

6.3 Vibration levels

After installation and also in connection with regular inspection and cleaning, the vibration levels must be measured and be less than or equal to max. 6.3 mm/s.

> ⚠ Fan vibration levels depend on installation type and fan speed. Vibrations have significant effect on fan life and efficiency.

Measure the levels at operational fan speed, radially at two points with a 90° offset and at the free shaft end of the motor.

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

> ⚠ Shut down fans with vibration levels that exceed 12.5 mm/s RMS.

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 little maintenance other than regular inspection and cleaning.

Keep painted casings in good condition through repair of the paint work.

6.5 Silencers and diffusers

The silencers and diffusers require regular cleaning, depending on the operational conditions.

The fixation bolts that secure attachment of the silencers and diffusers must be re-tightened once a year. Use a lubricant and a torque wrench to ensure the correct tightening.

6.6 Impellers

The impellers are carefully balanced and the blades are set at precise angles in the production. The impellers 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.

Impeller maintenance

- Inspect for wear signs and damages.
- Check for and remove objects that obstruct the airflow to and inside the fan.
- Clean the impeller blades, hub and guide vanes.
- Rotate the impeller by hand to check that it rotates freely, i.e. the blade clearance must be equidistant between the blade tips and the fan casing on the entire circumference.

6.7 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. Clean the terminal box with a dry cloth.
- Lubricate bearings – refer to the motor manufacturer's instructions for service information such as lubrication intervals, grease amounts, when to replace bearings etc. Observe differences between motor Drive End (DE) and Non-Drive End (NDE).

⚠ Use a manual grease gun for lubrication. Excess grease causes bearings to overheat and results in failure.

6.8 Motor removal

STOP Switch off the power and disconnect the motor cable in the terminal box, before beginning work on the impeller and motor.

The below procedure is with reference to figures 5 and 6 on page 19.

Motor removal

1. Disconnect the supply cable in the terminal box (figure 5, item 4).
2. Support the fan, f.x. with a scissor lift.
3. Remove the nuts from the bolts (figure 5, item 1) and take down the fan.
4. Mark the mounting positions of the silencers with strips of tape on the fan and silencer casings in order to be able to mount them in the exact same positions.
5. Remove both silencers (figure 5, item 3) by removal of the set screws (figure 5, item 5). Removal of the outlet nozzle and inlet cone is unnecessary.
6. Disconnect the motor cable in the terminal box.

⚠ 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.

7. Remove the impeller hub screw (figure 6, item 6) and hub cover (figure 6, item 7).
8. Remove the hub clip with screws and washers (figure 6, item 1).
9. Remove the centre bolt and washers (figure 6, item 2).
10. Dismount the impeller with a puller fastened in two threaded holes of impeller hub. See figure 7 on page 20.
11. Disconnect the motor cable from the motor.
12. Support the motor. See the weight in the technical specifications included with the fan.
13. Detach the motor from the motor shell by removal of the bolts and washers (figure 6, items 9 and 10).
14. Remove the motor (figure 6, item 12).

Service the motor according to the manufacturer's instructions. These are included with the fan.

6.9 Mounting of motor

The below procedure is with reference to figures 5 and 6 on page 19.

Replace lock washers and nuts during assembly.

Mounting of motor

1. Remount the motor (figure 6, item 12) and make sure the motor shaft is centred in the fan casing. A centring tool is available as an accessory from Novenco.

Consult Novenco if the replacement motor weight exceeds the original specifications. Refer to the technical specifications.

2. **Fans with motor sizes 160 or 180:** These motors are mounted with pins to prevent rotation of the motor shell in relation to the motor flange. Replace these pins when re-mounting the motor and before mounting the impeller. If a new motor is mounted, holes in the motor flange must be drilled to be able to mount the pins.
3. Insert and tighten the bolts and washers (figure 6, items 9 and 10). See table 6 on page 20.
4. Mount the impeller (figure 6, item 3) on the motor shaft with a tool fastened in the threaded hole of the motor shaft. The impeller hub must rest against the motor shaft collar.
5. Use a feeler gauge to check that the blade tip clearance between the impeller blade tips and fan casing is the same throughout the circumference.
6. Adjust the motor position. See step 5.
7. Mount the centre washers and bolt (figure 6, item 2).
8. Mount the hub clip, screws and washers (figure 6, item 1).

Hub, [mm]	Impeller, ØD [mm]	Min. [mm]	Hub, [mm]	Impeller, ØD [mm]	Min. [mm]
Ø350	500	0.5	Ø350	900	0.9
	560	0.6		1000	1.0
	630	0.6		1120	1.1
	710	0.7		1250	1.3
	800	0.8			

Table 4. Blade tip clearances at standard temperatures

9. Mount the impeller hub cover (figure 6, item 7) and screws (figure 6, item 6).
10. Connect the motor cable to the motor and the power cables in the terminal box.
11. Mount the silencers (figure 5, item 3).
12. Lift the fan back into position.
13. Mount the bolts (figure 5, item 5) and tighten to specified torques.

14. Connect the supply cable in the terminal box (figure 5, item 4).

Follow the procedure in section "5. Operation" to start the fan.

6.10 Blade angles

The fan impeller blade angles are the result of careful calculations to achieve a specific point of operation. The mount on the hub and balancing are therefore closely related to the angles and cannot be changed. Please contact Novenco for further information.

7. Troubleshooting

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

⚠ Fans that operate in the stall area are more likely to break down.

Lack of performance

- Blocked
  - Inlets
  - Outlets
- Auxiliary fans stopped
- Motors defective
- Motors disconnected
- Electric connection defective
- Wrong rotation direction

Noises and vibrations

- Motor bearings worn
- Impellers out of balance
- Impellers damaged or worn
- Bolts or components loose
- Wrong blade angles
- Fan operates in stalling area

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 product life. Fans with inspection hatches allow for inspection through these.

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
  - Impellers
  - Fan casings
  - Electrical connections
- Vibration measurement on fan casing

Novenco recommends keeping a log of all values and observations regarding the fans.

9. Sound

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

Refer to the technical 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 for changes in safety regulations and revise the installation accordingly.
- 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.

- Technical specifications
- Motor manufacturer's maintenance documentation – included with the fan
- Commissioning documentation that relate to the maintenance of the specific installation

Novenco product declaration of performance

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 recyclable materials. Make sure worn-out motors and fan parts are disassembled and recycled for the benefit of the environment.

13. Quality management

Novenco Building & Industry A/S is ISO 9001 and 14001 certified. All fans are inspected and tested in the production.

14. Warranty

Novenco Building & Industry A/S provides the statutory 12 months warranty from the factory, which covers materials and defects from the manufacture. Wear parts are not covered.

Extended warranty can be agreed upon.

15. Spare parts

Contact Novenco for information about and ordering of spare parts.

16. Classifications

Flange standards

- Eurovent 1/2

Temperature ranges

- **Standard:** -20 to 40 °C / -4 to 104 °F

17. Product lifetime

The fans, excluding the motors and frequency converters, have product lifetimes of 20 years. Storage, installation and maintenance must be in accordance with Novenco's instructions, which include this installation and maintenance guide as well as any referenced documentation and written agreements.
Product lifetimes of the motors and frequency converters appear from the manufacturers' documentation.

EU declaration of conformity

Novenco Building & Industry A/S
Oeverup Erhvervsvej 50-52
4700 Naestved
Denmark

hereby declares that the Novenco tunnel fans type AUZ have been manufactured in accordance to the below legislation of the European Council and of the United Kingdom.

EU directives and regulations

CPR 305/2011 • Ecodesign 2019/1781 • Ecodesign 2024/1834 • EMC 2014/30/EU • Energy labelling 2017/1369 • LVD 2014/35/EU • Machinery 2006/42/EC

UK regulations

Construction Products 2013/1387 • Ecodesign for ErP 2010/2617 • Energy Information 2011/1524 • Electrical Equipment (Safety) 2016/1101 • Electromagnetic Compatibility 2016/1091 • Supply of Machinery (Safety) 2008/1597

Relevant parts of the following harmonised standards have been applied

EN ISO 5801:2017 • EN ISO 12100:2011 • EN 12101-3:2015 • EN ISO 12499:2009 • EN ISO 12944-2:2017 • EN ISO 13350:2015 • EN ISO 13857:2019 • ISO 14694:2003 • ISO 21940-11:2016 • EN 60204-1:2018 • EN IEC 61000-6-1:2019 • EN IEC 61000-6-2:2019 • EN IEC 61000-6-4:2019 • EN IEC 61800-3:2018

This declaration is valid for installations and products that comply with the instructions in this guide or that Novenco Building & Industry provides.

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Signed for and on behalf of Novenco Building & Industry A/S

Naestved, 1st December 2024

Peter Holt
Technical director
Novenco Building & Industry A/S

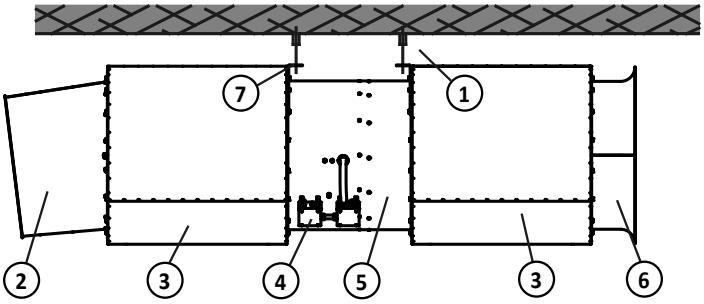
Appendices

Appendix - A. Max. unit weights

Fan sizes. ød [mm]	Weights [kg]
1000	809
1120	995
1250	1,250

Table 5. Max. unit weights incl. motors, but excl. accessories

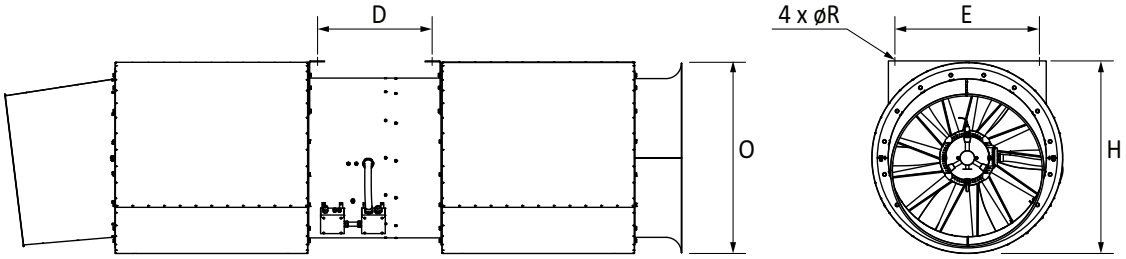
Appendix - B. Main components



1. Certified high temperature bolts – not Novenco supply
2. Outlet nozzle
3. Silencers
4. Terminal box
5. Fan casing
6. Inlet cone
7. Suspension brackets

Figure 3. Main components of AUZ tunnel fan

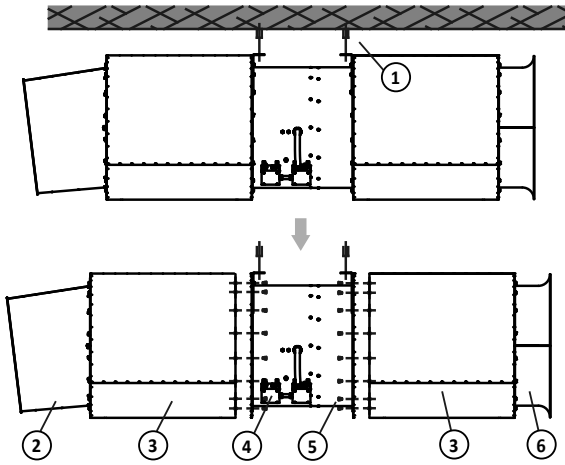
Appendix - C. Installation footprint



Fan size	D [mm]	E [mm]	O [mm]	H [mm]	4 x øR
AUZ 1000/350	950	900	1210	1220	4 x ø24
			1338	1348	
AUZ 1120/350			1330	1340	
			1505	1515	
AUZ 1250/350			1460	1470	
			1569	1579	

Figure 4. Installation footprints – connection dimensions

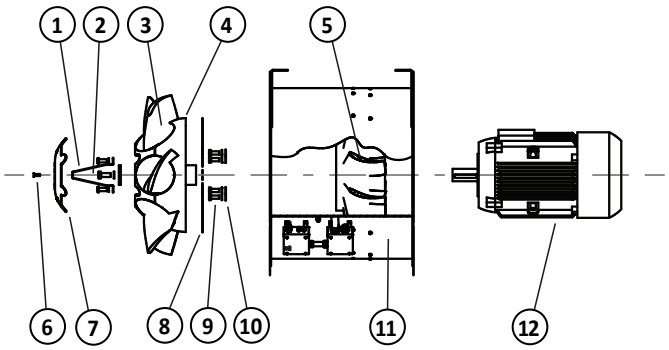
Appendix - D. Dismounting unit



1. Certified high temperature bolts 2. Outlet nozzle 3. Silencers 4. Terminal box 5. Set screws 6. Inlet cone

Figure 5. Item descriptions – dismounting unit

Appendix - E. Removal and remounting of motor



Size	Torques [Nm]	
	Bolts (item 9)	Centre bolt (item 2)
M6	9	6
M8	23	12
M10	45	20
M12	78	20
M16	190	25
M20	370	25

Table 6. Tightening torques

1. Hub clip with screws and washers
2. Centre bolt and washers
3. Impeller
4. Impeller hub
5. Guide vanes
6. Impeller hub screw
7. Impeller hub cover
8. Impeller hub back-cover
9. Bolts
10. Washers
11. Fan casing
12. Motor

Figure 6. Item descriptions – removal of motor

Appendix - F. How to mount puller

1. Remove impeller hub cover

2. Remove hub clip

– puller –

3. Mount puller in hub

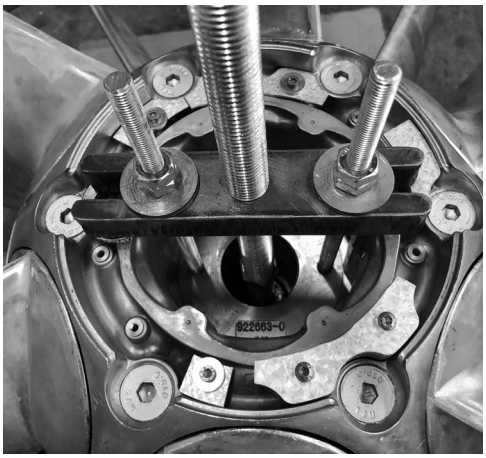


Figure 7. Mounting of puller in Ø350 hubs with hub clips

Appendix - G. Wiring – six-leads motor

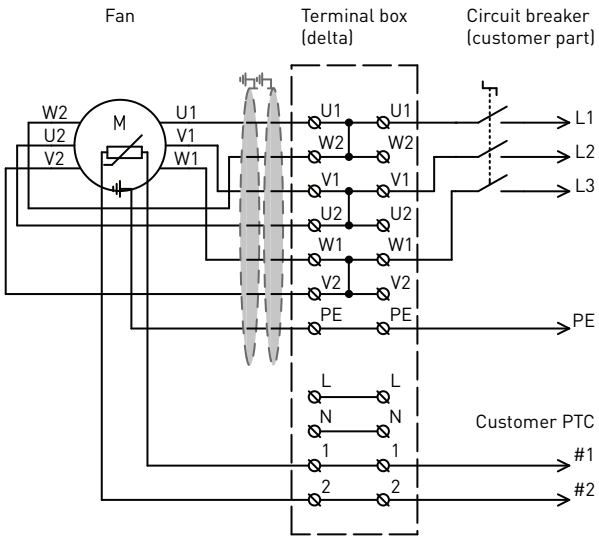


Figure 8. Terminal box delta-connection

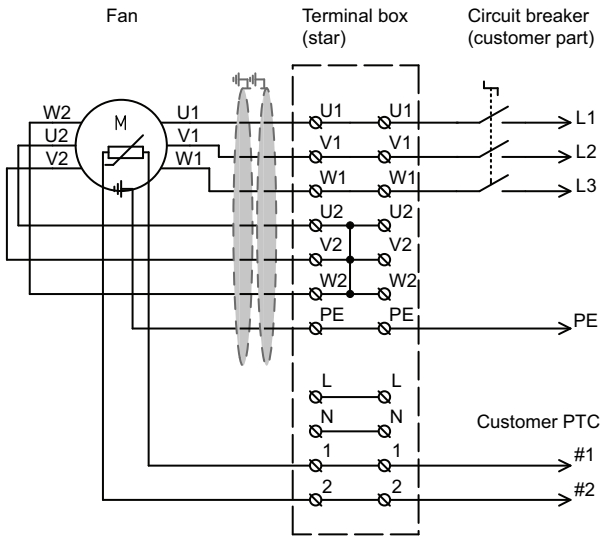


Figure 9. Terminal box star-connection

Appendix - H. Checklists

Before installation

- ☐ Turn impeller by hand - it must turn freely
- ☐ Ground fan to remove static electricity
- ☐ Clear installation location to ensure free airflows

Before start-up

- ☐ Turn impeller by hand - it must turn freely
- ☐ Clear fans and airflow ways
- ☐ Inspect wire guards, nozzles and deflectors
- ☐ Turn fan on briefly to verify rotational direction
- ☐ Tighten anchors, bolts and nuts to correct torques

Start-up

- ☐ Power on fans
- ☐ Check for abnormal sounds and vibrations
- ☐ Measure vibrations – see "Vibration levels" on page 11
- ☐ After 30 min. operation – check for abnormal sounds

Before inspection and maintenance

- ☐ Turn off power for fans
- ☐ Disconnect power supply
- ☐ Lock power switches

Inspection and maintenance

Inspection

- ☐ • Measure power consumption at ½ and full speeds
- ☐ • Verify torques of fixation bolts
- ☐ • Measure vibrations on fan casing
- ☐ • Visual inspection – impeller, casing, silencers and electric connection

Maintenance

- ☐ • See "Before inspection and maintenance"
- ☐ • Clean the fans
- ☐ • Service fans - drain motor, check electrics
- ☐ • Replace broken parts
- ☐ • Lubricate motor bearings
- ☐ • Turn fan on briefly to verify rotational direction

Troubleshooting

Lacking performance

- ☐ • Inlet or outlet blocked
- ☐ • Auxiliary fans stopped
- ☐ • Motor defective
- ☐ • Motor disconnected
- ☐ • Electric connection defective
- ☐ • Wrong rotational direction of impeller

Noise and vibrations

- ☐ • Motor bearings defective
- ☐ • Impeller imbalance
- ☐ • Impeller worn or damaged
- ☐ • Loose components
- ☐ • Wrong impeller blade pitch angles
- ☐ • Fan operates in stalling area

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