Installation, operation and maintenance instructions

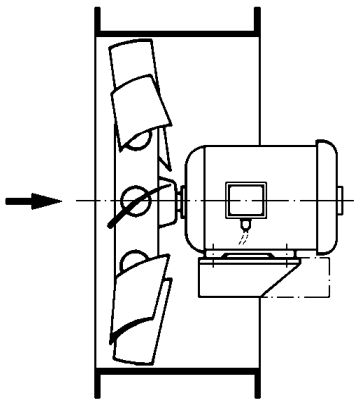
for axial flow fans

AXO . . . / . . .

Standard design

with direct drive

state of the art



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1. Introduction

All people being responsible for this **TLT-Turbo - Axial Fan** have to read and understand all details of these installation, operating and maintenance instructions (IOM). Especially important details for using the fan are separately pointed out in these instructions. The complete IOM therefore should be read when designing the complete plant. Therefore the IOM are already attached to our order confirmation. One copy should be kept near the fan

The IOM should be made available to all people who will be in charge of the fan. If they know them well, operating faults can be avoided and a troublefree operation is guaranteed.

We recommend to read the IOM carefully before startup. We shall not be liable for damages and breakdowns resulting from the non-observance of IOM's!

In case you are faced with problems please contact us, one of our agents, or our in-house representative.

We reserve all rights regarding the contents of these IOM's and technical changes for technical improvement of our fans.

2. Applications

The axial fan is build according to the state of the art and it is failsafe. They are subject to a quality check and trial run in the factory and leave it in perfect condition. (Please check the control card in the service bag, which is enclosed in the fan)

The fan has exclusively been designed for normal and air-conditioned air.

Any other application is not as directed. If the fan is not used as directed the user's or third's life and limb may be in danger, or the machine may be damaged. The risk is on the user's side.

In the IOM's you will find the accompanying symbol everywhere where life and limb of people are in danger. Please observe the information given and be particularly careful.

This symbol designates guidelines, regulations and information being particularly important to protect the machine and other components of the plant, as well as correct work sequences.

This symbol refers to useful information for the user. It helps you to use all functions of the fan in an optimal way.

The partial views of technical drawings in these instructions are simplified.

3. Service

TLT-Turbo GmbH offers you the following services :

- Installation, startup and maintenance of fans
- Measuring, analysis and evaluation of all data being important for operation (e. g.: pressure, volume, noise, vibrations etc.)
- balancing
- spare parts service
- Our service staff ensure professional installation and startup of your fans.
- The specialist in our sales department and field staff offices give you expert advice and assistance on the items to be ordered.

4. Operational safety

The following work safety information has to be particularly observed :

- The user has to make sure that only qualified staff work with the fan.
- Necessary works may only be carried out by properly trained staff, with sufficient experience and knowledge of the relevant standards, specifications, regulations for prevention of accidents and operating conditions. They have to be appointed by the person being responsible for the safety of the plant.
- Among others they also need to have knowledge about first aid and local rescue equipment.
- The user has to undertake to run the fan in perfect condition.
- Any person being in charge of assembly, disassembly, startup, operation and maintenance of the fan have to have read and understood the complete IOM's.
- Remove foreign objects (tools etc.) and water from the housing of the fan.
- Before the first trial run you have check if mechanical and electric protecting devices were correctly installed.
- If the fan is shipped without protecting devices the user has to make sure that they are mounted. Protecting devices not meeting DIN 24 617 standard have to be considered as residual endangering.

- After installation or repair of electric equipment the protective measures taken have to be checked (e.g. earthing resistor).
- Never touch the fan wheel while the fan is running.
- In case of failure switch the fan off immediately and eliminate the disturbance.
- Unauthorized modifications and changes effecting the safety of the fan are prohibited.
- Before starting maintenance works the fan has to be switched off and secured with a lock to prevent unauthorized switching in. Protection devices may only be removed if the fan is out of action.
- For all types of work on the fan, as a rule it has to be out of action. The impeller has to be locked to prevent turning.
- After repair works you have to check before starting the fan, if all protection devices were reinstalled.
- It is only allowed to open inspection doors if the fan is out of action.

5. Transport

For fan transport the local safety regulations have to be observed.

Avoid shocks by all means during transport. You have to make sure that the fan cannot slip and tilt.

To avoid damages caused by forced rupture and careless loading or unloading, transport has to be carried out carefully and cautiously.

Don't put down the fan too hard to avoid deformation of impeller, housing or bearing damages.

The hoisting equipment and means of transport used have to be designed for the weight of the fan.

6. Scope of delivery

Upon receipt of the shipment check the packing lists to make sure the shipment is complete. If you are missing parts please report in writing to the shipping department of TLT-Turbo GmbH, Bad Hersfeld.

7. Intermediate storage

If the fan is not installed immediately after shipment, it has to be properly stored at a protected location. The fan has to be properly covered to make sure no dust or moisture can enter the fan.
Turn the impeller by hand several rotations once a month.

8. Design

Directly driven axial fan without outlet guide vane.

Motor in air stream (without encapsulation), air direction "D" or "S".

Conduit box mounted at the outer wall of the fan housing, or on the motor (accessible via inspection door).

The impeller is mounted on the motor shaft end. It is not adjustable.

Fan housing with drilled flanges DIN 24154 - series 3.

Max. working temperature with motor iso-cl. B 40° C
F 60° C

Motors mounted on the foot.

9. Technical information

Air inlet and outlet

The characteristic curves imply a uniform irrotational speed distribution in the fan inlet. This means for instance that an inlet nozzle has to be mounted in an open inlet.
If mounted in channels or pipelines an inlet or discharge area of 1.5 times the diameter of the fan has to be provided.
If the design does not allow that, baffle plates have to be mounted to optimize the air flow, so that the air speed is as equal as possible when entering the fan.

For an open outlet of the fan the shock loss in relation to the discharge speed (ring surface) has to be observed.

Motor power calculation

To calculate the motor power we recommend to add the following rates to the calculated shaft output (Pw with 20° C of the delivery rate):

- for direct start: + 10 %
- for star/delta start: + 25 %

10. Installation and mounting

The valid laws, standards, regulations, guidelines etc. have to be observed.

The fans are suitable for indoors and outdoors installation (provided correct surface protection is used).

They may be installed with open inlet using an air inlet nozzle with guard or in pipe / channel in horizontal or vertical position, depending on the order.

It is recommended to put them on vibration dampers.
You may use rubber or spring vibration dampers (depending on the design), or flexible connections.
Mount flexible connection exactly (not staggered).
Observe length of installation exactly!

If the fans are installed on vibration dampers, an extension duct is required.
For installation without vibration dampers contact the manufacturer first.

For fan installation we offer various accessories.

Please check our catalogue or talk to our field staff specialists, or call us in our works in Bad Hersfeld.

Important information for installation of our fans

For maintenance or repair works it may be necessary to disassemble the fan completely. In any case the fan must be easily accessible.

Therefore the following has to be observed:

1) The fan must be accessible at any time and it must be possible to disassemble it without great effort. Furthermore there must be sufficient clear space around the fan to carry out maintenance works.

2) Our warranty after parts replacements or repair works will not cover additional costs caused by the non-observance of item 1; these will be charged to the customer.

Electrical connection

Connection has to be made by an electrician according to VDE regulations.
Observe the indications on the nameplate!
Compare mains voltage!
Connect the motor as shown on the circuit diagram in the conduit box.

If cable entries in the conduit box are not used, they have to be carefully locked to prevent dust and moisture from entering the conduit box. Tighten all contact screws and nuts properly, to avoid transition resistance.

Screwed cable glands have to be equipped with pull-relief.

- For outdoors installation the supply cable has to be inserted waterproof from below or the side into the conduit box on the fan.
- No local isolator should be mounted on the fan. It should be mounted in the power supply cable near the fan.
- Standard motors have no motor protection.

On site the motor has to be protected with an overload current protection.
Upon special wish they can be equipped with barretter (thermal resistor protection) or thermal contacts. The required tripping units have to be provided by the customer.

11. Trial run / startup

BEFORE TRIAL RUN AND STARTUP BY ALL MEANS READ THE SECTION "OPERATIONAL SAFETY" AGAIN.

Proceed as follows:

Clean the fan and remove foreign objects (tools, dirt etc.) before startup of the fan.

Check if all screw joints are tight.

For open inlet and outlet a guard must be mounted. Make sure it is.

The connection pieces in the inlet and outlet and the complete channel system must be completely mounted.

After having connected the fan motor you have to check if the motor turns to the correct direction: When looking from the motor side the motor has to turn to the left. (If you look from the inlet of the impeller, it has to turn to the right). The direction of rotation must be the same as indicated by the arrow.

If the direction of rotation is wrong, the poles of the motor have to be changed. (change phases in the conduit box or the switch cabinet.)
Make sure that the impeller does not touch the housing.

Measure the current absorption of the motor and compare it with the max. current consumption on the nameplate.

The impellers of our fans were balanced according to ISO 1940 quality G 6.3.

Since after installation of the fan the system may cause vibrations, during startup appropriate measures have to be taken to reduce vibrations to a minimum according to VDI 2056 machine group T.

This especially applies to fans with several speeds or variable speed, where vibrations have to be measured over the complete speed range.

The fan should not be operated in a stall (bad air inlet or resistance of the machine higher than expected). It has to run at the operating point it was designed for (measure air quantity and pressure increase and compare the values with the nameplate.)

12. Breakdowns

If after some time the fan starts vibrating, the cause may be the following:

a) Particles sticking on the impeller blades.
Troubleshooting: clean the impeller, retighten the screws, check the weld seams of the housing.

b) Impeller corroded.
Troubleshooting: Clean and rebalance the impeller, unless heavily corroded. Retighten the screws. Check the weld seams of the housing.

Other possible deficiencies

a) Fan does not start.
Troubleshooting: check power supply, check motor

b) Impeller rubbing.
Troubleshooting: Check if there are any particles on the impeller , check fastening of the motor.

c) Protective motor switch triggers when starting the fan.
Troubleshooting: Check if the motor turns hard (bearing and winding damaged), check power supply, check blade adjustment angle.

d) The fan does not reach its rated output.
Troubleshooting: Clean the impeller, clean the duct system (all flaps open?), was the duct system changed?

13. General maintenance

In regular intervals, but at least once a year, the fan should be checked by a specialized company.

Items to be checked are:
- correct functioning
- operating condition
- visual test of weld seams
- screwed connections
- low vibrations
- motor/current absorption (see section maintenance / motor)

If required, the fan has to be cleaned, maintained and repaired.

If the fan is not always used, it has to run at least 1 hour every 2 months approximately. This is important, because the motor bearings suffer if not used for a long time.

All checks, maintenance and repair works should be noted in a inspection book.

14. Description of the impeller

Impeller hub of aluminum, blades of plastic.
Depending on the desired output they are supplied with 6, 8, 9, 10 or 12 blades.

The impeller blades are not adjustable.

The blade angles in the performance curve sheets refer to the blade tips.

Impeller disassembly

a) Disconnect the motor from the electric power supply.

b) Loosen the hub lock.

c) Extract the impeller from the motor shaft using a special extractor.

d)Handle the impeller with care. Don't roll it or deposit it on the blades. Avoid shocks on the blades.

Assembly of the impeller

Slightly grease the end of the shaft. Then mount the wheel using a special fitting tool.
(Threaded hole in the face of the shaft according to DIN 332).

Make sure that the impeller does not slide along parts when turning it by hand.

Finally the wheel is secured on the shaft using the parts belonging to it (thrust disk **1**, hexagonal screw **2**, seal **3**, and screw securing **4**).
(Refer to the drawing in the annex)

15. Motor

Motor disassembly

a) Disassemble the impeller (as described under item 14).

b) Loosen the clamping bolts from the impeller side

c) Take the motor out towards the back.

Motor assembly

in opposite order as disassembly

Motor maintenance

Up to size 200 the motor bearings are life-greased. They are filled in the factory with grease, which under normal operating conditions only needs to be replaced after many years. It is recommended to take the bearings of these motors out every 2 years and to clean them (or to replace them by new bearings). For this purpose the motor has to be disassembled. At the same time the winding and other parts should be cleaned.

The bearings have to be thoroughly cleaned with benzine. After evaporation of the detergent first class grease has to be filled into the bearings (refer to the chart in the annex).
To prevent the bearings from running hot, the cavities between the rolling elements and the roller tracks have to be filled completely, and the grease chambers only half.
The shaft leadthroughs in the bearing covers also have to be coated with grease.
Larger motors than size 200 have regreasing devices (observe our separate indications).
If motors have not run for a long time, also brand new motors, we recommend to regrease the bearings before starting them. Especially if you hear noise caused by hardened grease in the bearing, causing vibrations of the bearing cage.

Also refer to the assembly, operating and maintenance instructions of the motor manufacturer. (Please request separately, if needed.)

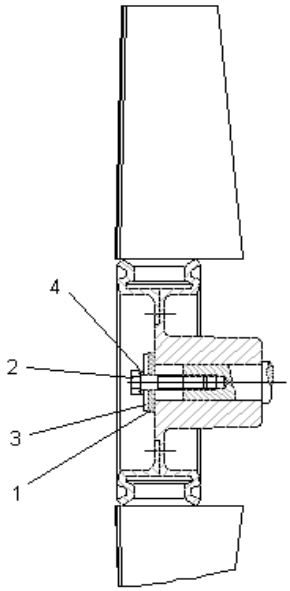
16. Spare part stockkeeping

Spare and wear parts with long delivery time should be stocked by yourselves. Production loss usually is more expensive than the cost of the part. (Please request the spare and wear parts list seperatelylook into the spare and wear parts list in the annex; please request separately).

We would like to point out particularly, that spare parts not supplied by us are were not checked and released by us. The manufacturer shall not be liable for damages caused by the use of not original parts and accessories.

If you have questions please contact our field staff or the specialists in our Bad Hersfeld plant.

17. Annex



Assembly of the impeller
Slightly grease the end of the shaft. Then mount the wheel using a special fitting too.
(Threaded hole in the face of the shaft according to DIN 332)

Make sure that the impeller does not slide along parts when turning it by hand. The required air gap between the tip of the blade and the duct wall is listed in the air gap chart.

Finally the wheel is secured on the shaft using the enclosed parts (thrust disk❶, hexagonal screw ❷, seal ❸ and mounting screws

Heat class	Roller bearing grease	Application
B	Lithium soap roller bearing grease K3K DI 51825	-35° C - +140° C
F	High-temperature long-life grease	-35° C - +155° C short time 200° C
H	Long-life grease on synthetic oil basis	-25° C - +210° C

For motors which are used for special operating conditions
the grease types used and the regreasing dates
are marked on a special indication plate on the motor