

CF

Radial fan
Direct drive D3

Original operating
manual

EN

CFL1, CFL2, CFM1, CFM 2, CFH1, CFH2, CFH3, CFXH, CFXH1, CFXH2,
CFMT, CFMT1,CFMT2, CFM1D, CFH1D

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Legal notice

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Original Operating Manual

This Operating Manual is an original operating manual within the meaning of the Machinery Directive 2006/42/EC.

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List of abbreviations

Table 1: List of abbreviations

Abbreviation	Explanation
ArbSchG	Arbeitsschutzgesetz Labour Protection Act
ASR	Technische Regel für Arbeitsstätten Technical rules for the workplace
ATEX	Atmosphère Explosibles, Directive 2014/34/EU
BGV	Berufsgenossenschaftliche Vorschrift Provision issued by a professional association
BetrSichV	Betriebssicherheitsverordnung Regulation on work safety
BGI	Berufsgenossenschaftliche Information Information issued by a professional association
BGR	Berufsgenossenschaftliche Regeln Rules issued by a professional association
BGV	Berufsgenossenschaftliche Vorschrift Provision issued by a professional association
CE	Conformité Européenne (European standardization)
DGUV	Deutsche Gesetzliche Unfallversicherung German statutory accident insurance
EMF	Elektromagnetische Felder Electromagnetic fields
EMV	Elektromagnetische Verträglichkeit Electromagnetic compatibility
EX	Explosion Explosion
LpA	Messflächenschalldruckpegel Sound pressure level on the measuring surface
PSA	Personal protective equipment
TRBS	Technische Regel für Betriebssicherheit Technical rules for work safety

1 Introduction

1.1 Important information about the Operating Manual

The operating manual applies to D3 fan.

The operating manual is a separate part of the technical documentation and part of the product.

The operating manual is a source of information for the fan user, allowing for safe and efficient use of the fan.

Please read the operating manual carefully. Understanding of this operating manual is a prerequisite for proper fan operation. You should always follow its recommendations and information, especially in the area of security. Do not proceed according to the information extracted from individual chapters without including the manual as a whole.

The operating manual contains references to other documents. You also need to follow the content of these documents.

Some figures, included in the operating manual, are used to explain technical details. The colours of the presented elements may differ from the original.

The operating manual requires storage in a binder in a way that allows it to be accessed at all times.

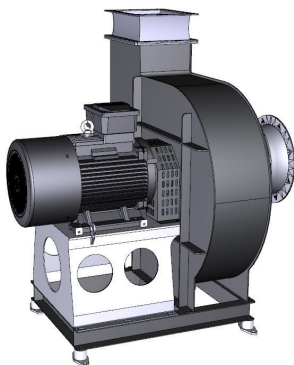
In the case of providing the digital manual and the need to prepare a printout for internal use, if such action is not a copyright infringement, it is generally advisable to print in colour, as some of the information contains full information only as a colour presentation.

1.2 Liability

Information on liability and warranty rights is included in the terms and conditions of the contract for this project. The manufacturer excludes all liability for delays and damages resulting from non-compliance with this operating manual.

The manufacturer is not responsible for errors in this operating manual. Liability for indirect and direct damages related to the delivery or use of this operating manual is excluded to the extent permitted by applicable law.

1.3 Short description of the fan



The fan is a single-stage radial fan, welded, used to convey air, gases similar to air or gas mixtures.

The electric drive is carried out via the motor shaft, where the impeller was mounted

1.4 Use in a manner consistent with the intended use

The fan has been designed, constructed, inspected and delivered to the operating conditions in accordance with the conditions specified during the order. Do not exceed the values specified in the data sheet.

Any use of the fan, having a divergent nature from use in a manner consistent with its intended use is considered to be use in a manner inconsistent with the intended use.

1.4.1 Fan according to Directive 2014/34/UE

Using the fan in a manner consistent with the intended use according to Directive 2014/34/EU is limited to:

- field of application
- category of use
- category of explosivity of gases and vapors
- type of gas or dust
- category of temperature

You can find this data on the nameplate.

Use in an environment showing conditions differing from those given or in another zone of the plant is prohibited.

1.4.2 Limits of fan use according to Directive 2014/34/UE

The limit conditions for the use of the fan in accordance with Directive 2014/34/EU are:
maximum temperature in the given atmosphere in the temperature range from -20 °C to + 60 °C
absolute pressure from 0,8 to 1,1 bar
Volume fraction of oxygen up to 21%

If the conditions are divergent in relation to the above-mentioned limit conditions, a separate contract for execution is required. The implementation should be followed up with documentation and a separate risk assessment.

1.4.3 Operating conditions



It should be remembered that the operating conditions contained in the fan data sheet are binding for the fan. If the fan is operated under different conditions, the manufacturer's consent should be obtained in advance.

1.5 Predictable uses in a manner inconsistent with the intended use

The use of a fan in a manner not intended in the contents of the operating manual that may result from predictable human behaviour is considered to be "predictable uses in a manner inconsistent with the intended use".

Predictable uses in a manner inconsistent with the intended use:

- Failure to comply with the conditions of placing and installation of the fan.
- Fan dimensions are not calculated in relation to the conditions of use.
- The fan sucks in foreign matter, which may cause damage to the fan.
- The control and adjustment environment generates data that can lead to conflicts within the fan.
- Installation personnel would switch the positions of the fan connections.

- Installation personnel would switch the fan accessories (e.g. compensator with deflector).
- Installation personnel would make faulty electrical connection of the fan (electric motor).
- The technical service personnel would forget tools or other items inside the fan. During start-up it is possible that tools or other objects are not noticed inside the fan.
- The technical service personnel would perform activities on the fan and its components when the fan is running.
- Personnel would tamper with safety systems.
- Personnel would remove the safety devices that separate the fan from people and start the fan.
- Personnel would fail to comply with the obligation to wear personal protective equipment.
- Personnel would use the console as an auxiliary ladder.

The above points only contain predictable uses in a way incompatible with the intended use, the list may not be complete. Its content is based on the manufacturer's experience.

1.6 Necessary qualifications to operate the fan

The operating manual establishes qualifications for various areas of activity.

Cleaning personnel

The cleaning personnel was instructed by the user about the tasks assigned to him and possible risks in the event of inadequate handling. This personnel carries out cleaning of the fan.

Electrical engineer

The electrical engineer, due to his professional qualifications, knowledge and experience as well as knowledge of standards and provisions, is able to independently perform work on the electrical installation and identify risks and avoid them.

The electrical engineer is trained in the location of the place of work and knows the relevant standards and regulations.

Maintenance engineer

The maintenance engineer, due to his professional qualifications, knowledge and experience as well as knowledge of standards and provisions, is able to independently perform mechanical work on the fan and identify risks and avoid them.

The maintenance engineer is trained in the location of the place of work and knows the relevant standards and regulations.

Employee authorized to give instructions

The employee authorized to give instructions, due to the professional qualification and authorization by the company, is authorized to give instructions to qualified personnel and is obliged to perform control. The employee authorized to give instructions simultaneously coordinates work and processes running in parallel.

Authorized person with additional qualifications for EX protection according to TRBS 1203

The authorized person with additional qualifications in the scope of EX protection, due to his professional qualifications, knowledge and experience as well as knowledge of standards and provisions, is able to independently perform work in potentially explosive areas and in the area of explosion protection components, and identify and avoid risks.



Information on assigning qualifications to activities at various stages of the machine's life is available in the chapter "Activities and qualifications" for a specific stage of the device's life.

2 Safety rules

The fan has been constructed and manufactured in accordance with the currently valid technical level and recognized safety techniques. Despite this, it is possible that a risk to persons or valuable objects occurs, because the scope of an effective protective system does not allow avoiding all possible threats. However, it is possible to prevent accidents resulting from these risks and disruptions through exhaustive training of personnel regarding the provisions of this operating manual and the information contained therein. At the same time, strict adherence to these operating manual allows you to take full advantage of the performance and capabilities of the fan and to avoid unnecessary disturbances.

The basic condition for safe and uninterrupted operation of the fan is full knowledge of safety rules and applicable regulations.

Therefore, before starting the fan operation, read this section. You must also follow the recommendations and warnings found on the relevant pages in the text and in the following chapters. Failure to comply with the rules and warnings may result in the manufacturer being released from product liability.

In addition to the provisions of this operating manual, regulations, in particular safety regulations and accident prevention shall apply.

2.1 Symbols contained in the operating manual

This manual as well as signs on the fan use symbols and coloured backgrounds that require special attention. The appearance and symbols of the operating manual are described below.

2.1.1 Information



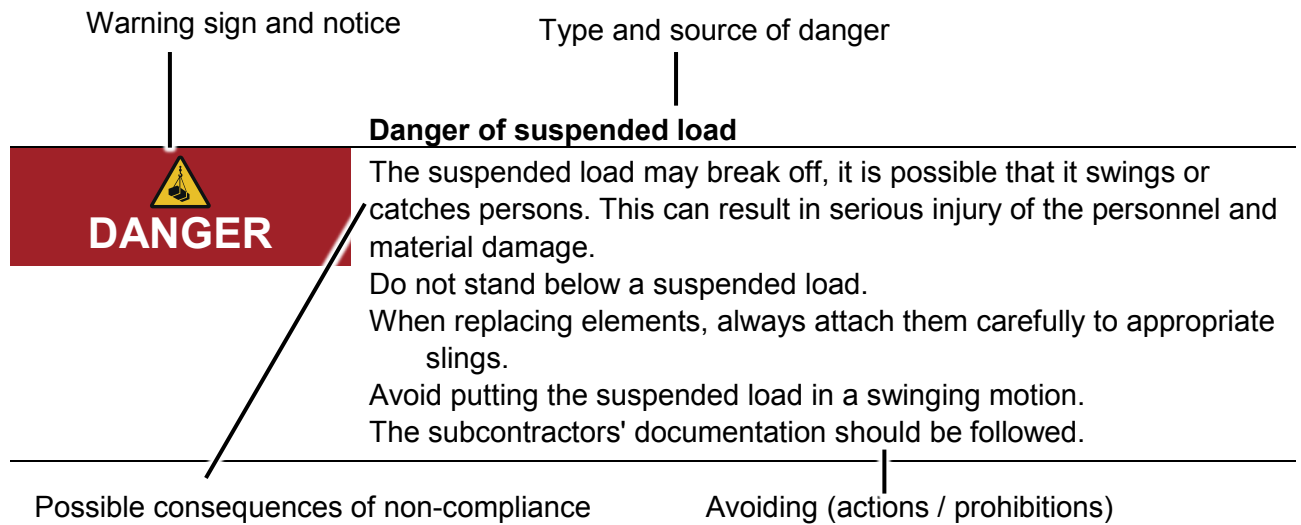
This symbol draws attention to favourable tips, explanations and additions regarding the fan operation.




The symbol refers to a chapter in the operating manual or other information.


2.1.2 Warnings


2.1.2.1 Structure of a warning



Structure of a warning

 DANGER	<p>DANGER</p> <p>Informs about a dangerous situation. Failure to follow the recommendations related to this information can most likely result in a fatal accident.</p>
--	--

 WARNING	<p>WARNING</p> <p>Informs about a dangerous situation. Failure to follow the recommendations related to this information can result in a fatal accident or serious injury.</p>
---	---

 ATTENTION	<p>ATTENTION</p> <p>Informs about a dangerous situation. Failure to follow the recommendations related to this information can most likely result in an accident. Injuries can occur; however, fatalities and serious injuries are unlikely.</p>
---	---

ATTENTION	<p>ATTENTION</p> <p>Informs about a situation during which material damage may occur. Failure to follow the recommendations related to this information can result in material damage. The notice functions without being associated with a warning sign.</p>
------------------	--

2.1.3 Safety signs

2.1.3.1 Warning signs

Warning signs indicate dangerous situations.



Warning against risk

The symbol warns against a risk for which there is no standard warning sign in the form of a pictogram. If the threat is not visible immediately, the next tab with the explanation is located under the sign.



Warning against electricity

The symbol warns against a risk from electricity. Warning symbol, placed among others on the terminal boxes of electric motors.



Warning against hot surface

The symbol warns against the risk of a hot surface. Warning symbol, placed among others on the housing of the fan.



Warning against suspended load

The symbol warns against the danger caused by suspended loads (e.g. transport of heavy loads by cranes and gantries).



Warning against automatic start

The symbol warns against mechanical risk (e.g. gripping, drawing in or getting caught by the impeller) and of automatic start.



Warning against being drawn inside the machine

The symbol warns against mechanical risk – pulling in while using consumables.



Warning against hand injury

The symbol warns against mechanical risk – crushing or cutting while using consumables.



Warning against explosion

The symbol warns against risks caused by sparks or hot surfaces. Warning symbol, placed among others on electrical components.

Warning against the emission of hot or dangerous gases

The symbol warns against risks due to hot or dangerous gases escaping from hub or flange seals.



Warning against cutting off

The symbol warns against mechanical risk – cutting off when opening the inspection hatch.

2.1.3.2 Prohibition signs



No unauthorized access

The prohibition sign indicates an area to which access is only allowed to authorized persons.



No use of open fire and smoking

The prohibition sign indicates an area where the use of open fire and smoking is forbidden.

2.1.3.3 Mandatory signs



General mandatory sign

This sign is used in combination with an additional sign. You should strictly follow the instructions shown on the additional sign.



The order of compliance with the instructions

The sign informs about the obligation to comply with the operating instructions. For information on operating instructions, please refer to the user's manual.



Hearing protection

An order to wear hearing protection when performing activities in a noise environment up to 80 dB(A) and / or exceeding a peak noise level of 135 dB(C).



Head protection

An order to wear head protection when performing activities in conditions of risk of falling objects or the possibility of hitting head against a hard object during normal body movements.



Hand protection

An order to wear protective gloves when performing activities in conditions of risk of injury, such as cutting, sticking, clamping, the effect of temperature or harmful substances.



Foot protection

An order to wear foot protection when performing activities in conditions of risk of falling or cramping objects, walking on sharp objects, effects of temperature or harmful substances.



Eye protection

An order to wear eye protection when performing activities in an environment in which there is possibility of liquids and gases under pressure or solid particles getting to the eyes.

2.1.3.4 Symbols, indicating hazardous materials and the rules for their disposal



Risk to the environment.

The hazard symbol indicates materials exhibiting properties that pose risk to the environment.

2.2 Information plates on the fan



Make sure that the descriptions and markings placed on the fan are visible and legible.





Markings on the fan

Table 2: Markings on the fan (examples)

Item	Symbol	Description	Location
01		Warning against electricity The symbol warns against a risk from dangerous electricity.	On the terminal box of electric motor
02		Warning against hot surface The symbol warns against thermal risk – hot surface burns.	On the housing and bearing of the fan
03		Warning against rotating impeller The symbol warns against the mechanical risk caused by the rotating impeller.	
04		Warning against cutting off The symbol warns against mechanical risk – cutting off when opening the inspection hatch.	On the lid of the inspection opening
05		Arrow indicating the direction of rotation The symbol indicates the direction of rotation.	On the fan housing there are two arrows indicating direction (the direction of rotation and air exhaust)
06		Direction of air exhaust The symbol indicates the direction of air exhaust.	
07		Earthing lugs The symbol indicates the earthing lugs connection	Earthing lugs connection on the console
08		Warning against risk of explosion The symbol warns against risks caused by sparks or hot surfaces.	On electric motor

2.2.1 Marking with warning labels according to ANSI

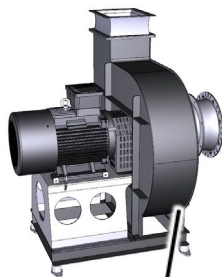


Item	Symbol	Description	Location
01	 <div style="border: 1px solid black; padding: 2px; width: fit-content;"> <p>⚠ WARNING Electrical hazards. Authorized personnel only.</p> </div>	<p>Warning against electricity The symbol warns against a risk from dangerous electricity.</p>	On the terminal box of electric motor
02	 <div style="border: 1px solid black; padding: 2px; width: fit-content;"> <p>⚠ WARNING Burn hazard. Hot surface inside. Allow to cool before servicing.</p> </div>	<p>Warning against hot surface The symbol warns against thermal risk – hot surface burns.</p>	On the housing and bearing of the fan

2.3 Fan safety systems

2.3.1 Protective measures separating persons from the device

Guards



Touch guards
hub seal / cooling disc and clutch

The rotating parts of the fan, such as the cooling disc are protected by touch guards.

2.3.2 Protection of electrical components

2.3.2.1 Motor circuit breaker

The motor circuit breaker protects the electric motor against thermal overload in the event of mechanical overload or failure of a single wire or multiple external conductors.

2.3.3 Information and markings

Special hazard areas and security systems are marked using appropriate means.

2.4 Overview of residual risk

Table 4 shows the residual risk of the fan.

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Table 3: Overview of residual risk

Cause of risk	Risk situation	Actions
Contact with electrical components during troubleshooting	Directly touching the active elements (electric motor)	Necessary training of personnel in dealing with live components.
Improper visibility	All activities at the fan	Lighting system, provided by the user
Gripping, winding	Contact with rotating parts of the fan	Preparation of work instruction by the user
Overload, fatigue, stress	All activities at the fan	Preparation of work instruction by the user
Human error	All activities at the fan	Preparation of work instruction by the user
Operating error	All activities at the fan	Preparation of work instruction by the user
Security bypass	All activities at the fan	Preparation of work instruction by the user
Insufficient information from the user	All activities at the fan	Preparation of work instruction by the user
Crushing, clamping	Operation of machinery components	The order to wear personal protective equipment
Burn, freezing	Contact with hot surfaces	The order to wear personal protective equipment
		Preparation of work instruction by the user
Constant noises	Fan operation	The order to wear personal protective equipment
Use, application of hazardous materials	All activities at the fan	The order to wear personal protective equipment
Inhalation of dangerous liquids, gases, aerosols, mists of vapours and dust (hazardous materials)	Improper use of cleaning products	Preparation of work instruction
	Improper use of lubricants	Preparation of work instruction
Chemical reactions	Improper use of cleaning products	Preparation of work instruction

2.5 Basic safety rules

i *The basic safety rules are a condition for the safe use of the fan. It is worth using the basic safety rules to train and instruct the personnel. Communicating these rules will allow for safe conduct of personnel and will enable transfer of responsibility.*

Use in a manner consistent with the intended use

Disregarding the rules of use in a manner consistent with the intended use may result in significant personal and material damage.

- It is recommended to use the fan only as intended, according to the content of chapter "Use in a manner consistent with the intended use".

Qualified and authorized personnel

Performing any activities on the fan by unqualified and unauthorized personnel may result in significant personal and material damage.

- All activities performed on the fan should be carried out by qualified and authorized personnel.

Personal protective equipment

Absence, use of defective personal protective equipment or using them improperly can cause considerable material damage.

- Personnel should be trained in the use of personal protective equipment in the right way.
- Regularly check personal protective equipment to prevent damage and expiry.
- In the event of damage and expiry of personal protective equipment, it is necessary to replace them with new ones.
- Provide the personnel with the necessary personal protective equipment required in a certain stage of life of the device

Accident prevention regulations

- Regardless of observing safety rules and warnings, you should also follow accident prevention regulations.

Safety rules

- Train personnel in terms of safety rules (content of operating instructions, emergency plans, wearing personal protective equipment, safe working methods, etc.).
- Check the observance of safety rules by the personnel.
- Do not allow personnel to wear long hair, loose clothing and jewellery, including rings, ties, etc.
- Do not allow personnel to disassemble or disable security systems.

Changes within the fan

- Do not make changes to the fan without the consent of the manufacturer.
- Do not tamper with the fan components.

Substances harmful to health

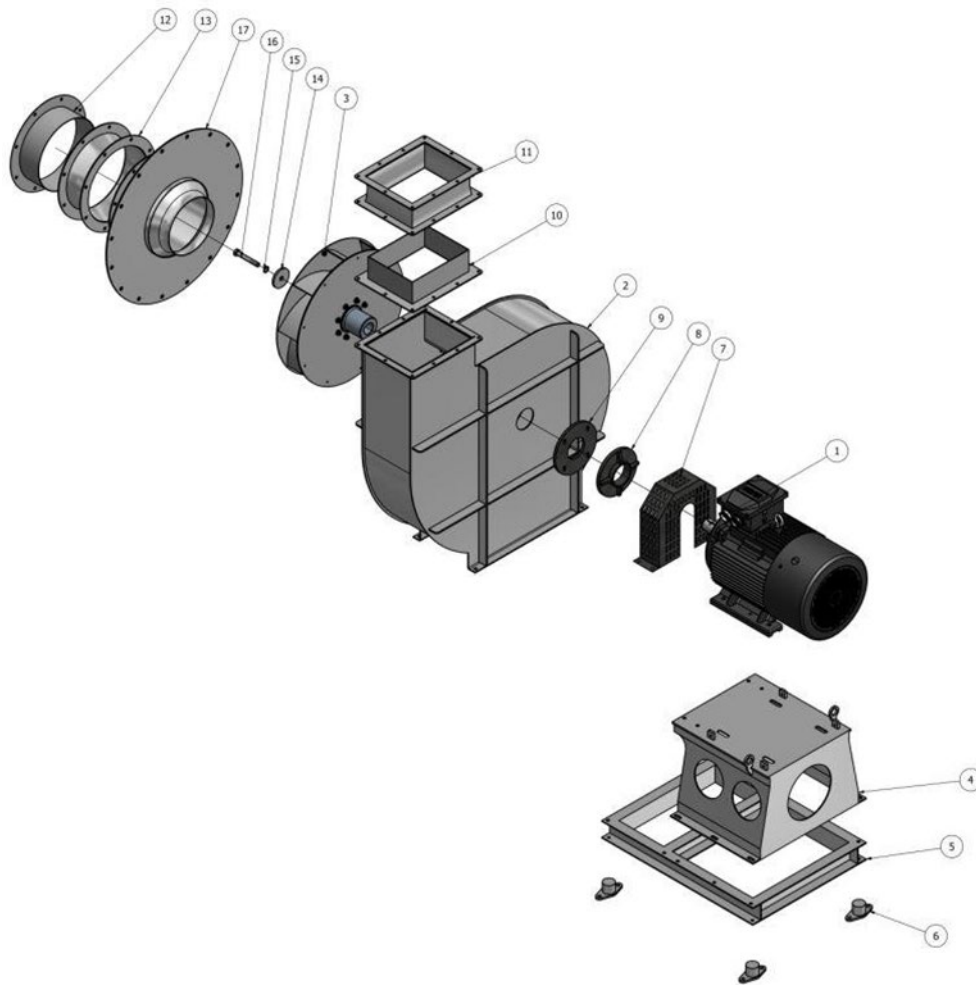
- When using substances harmful to health, e.g. cleaning products, the safety data sheet and the operating manual must be observed.

Sub-supplier documentation

- The content of sub-contractors' documentation should be followed.

3 Description

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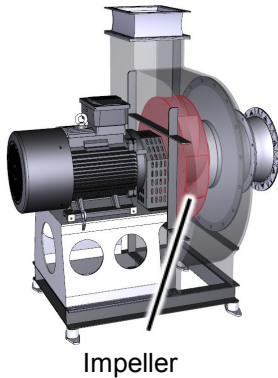
Main components of the fan

The following main components are included in the fan:

Table 4: Hauptkomponenten des Ventilators

Item	Name	Chapter	Item	Name	Chapter
01	Electric motor (drive motor)	3.6	10	Deflector on the pressure side	
02	Housing	3.2	11	Compensator on the pressure side	3.8.1
03	Impeller	3.1	12	Deflector on the suction side	
04	Console	3.4	13	Compensator on the suction side	3.8.1
05	Base frame		14	Impeller hub end plate	
06	Anti-vibration metal buffer	3.8.2	15	Lock spacer	
07	Cooling disk cover		16	Impeller hub mounting screw	
08	Cooling disk	3.5	17	Housing cover	
09	Hub seal	3.3			

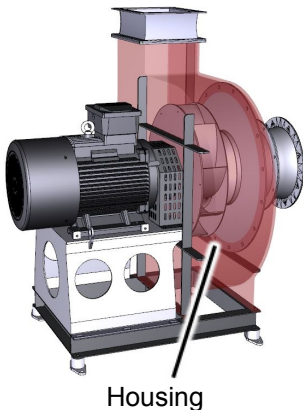
3.1 Impeller



Impeller

The impeller has been constructed in accordance with the latest achievements of air flow technology, it is electrodynamically balanced in two planes. The impeller is mounted on the shaft journal of the electric motor.

3.2 Housing



Housing

The housing is a welded design, equipped with flanges on the suction and pressure sides. On the suction side there is a housing cover with a suction connection. On the pressure side there is a housing cover with a seal.

3.2.1 Inspection opening



Inspection opening

The inspection opening is located on the perimeter of the housing and is used to inspect the inside of the fan.

3.2.2 Condensate drain pipe



Condensate drain pipe with plug

The condensate drain pipe with a plug is located at the lowest point of the housing and is used to drain condensate.

3.3 Hub seal

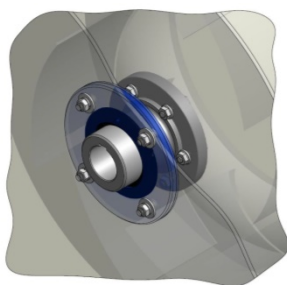


Hub seal

The hub seal is normally equipped with a sealing ring.



3.3.1 Standard seal (temperature range up to +120 °C)



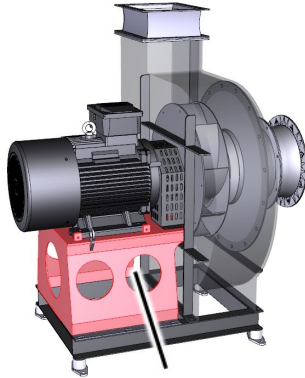
Standard seal

The hub seal is normally made in the form of a sealing ring. The hub seal in the form of a sealing ring (cellulose, aramid or fibre) is intended for the temperature range up to +120 °C.

3.3.2 Standard seal (temperature range up to +300 °C)

The hub seal is made in the form of a sealing ring. The hub seal in the form of a sealing ring (cellulose, aramid or fibre) is intended for the temperature range up to +300 °C.

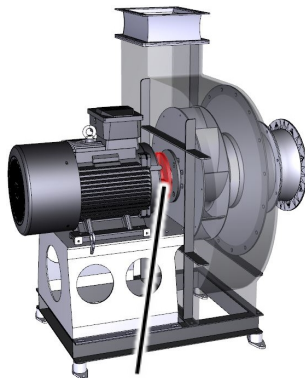
3.4 Console with frame



Consoles

The console with frame is used to fasten drive elements.

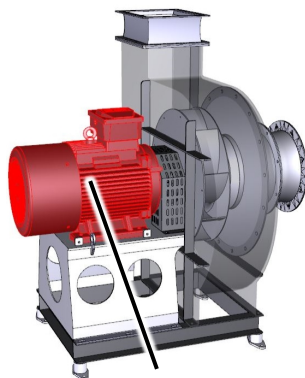
3.5 Cooling disk



Cooling disk

Between the hub seal and the bearing block, a cooling disk for discharging heat is fitted.

3.6 Electric motor (drive motor)



Electric motor

The electric motor is designed according to DIN VDE 0530.

3.7 Connections

Suction and pressure connections are made as flanged connections.

3.8 Accessories

3.8.1 Compensators

The compensators prevent the transmission of material sound of forces caused by vibration. In addition, the transfer of forces of pipelines connected to the fan should be avoided. The compensators also compensate for the convergence of the axis of connected pipes with the axis of the connection. The compensators are to be connected directly to the fan flange. If a throttling device is used, the compensator is connected to this element.


If the fan is set on oscillating elements, compensator should be provided on the suction and pressure side.

3.8.2 Vibration isolators

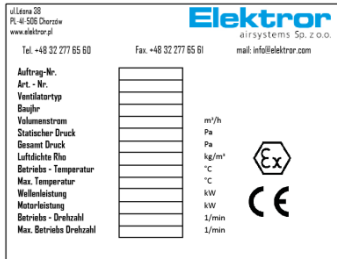
Metal vibration isolators are used to set the fan in such a way so as not to expose it to excessive vibration.

The place of installation of vibration isolators results from the overview drawing.

4 Technical specifications

 Dimensions are shown in the figure, and technical specifications in the content of the data sheet. These documents are a part of delivery.

4.1 Nameplate – Identification




(template)

The nameplate is used to identify the fan. The nameplate contains the following data:

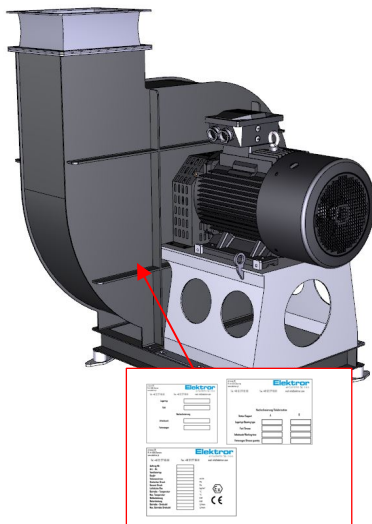
- Name of manufacturer
- Manufacturer's address
- Serial number
- Year of manufacture
- Technical specifications
- CE marking

4.1.1 Marking according to Directive 2014/34/EU

The fan was manufactured according to the provisions of Directive 2014/34/EU. There is a second nameplate containing the following data under the identification plate:

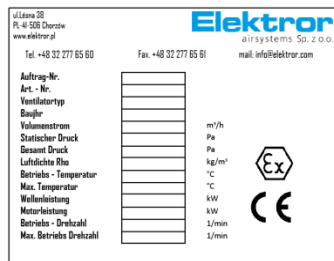
- Name of manufacturer
- Manufacturer's address
- Marking (e.g.  II 2G IIA T3) according to Directive 2014/34/EU.
- Fan number

4.1.2 Markings on the fan



- 1 – Nameplate
- 2 – Marking according to ATEX

Location of the nameplate on the left side (as seen from the engine).



Nameplate

Location of the nameplates

ul.Letra 38
 Pl.-41 505 Dierow
 www.elektor.pl
 Tel. +48 32 277 65 60 Fax. +48 32 277 65 61 mail: info@elektor.com

Elektor
air systems Sp. z o.o.

Nachschmierung/Re lubrication

Stütze/Support	A	B
Lagertyp/Bearing type	<input type="text"/>	<input type="text"/>
Fett/Grease	<input type="text"/>	<input type="text"/>
Arbeitszeit/Working time	<input type="text"/>	<input type="text"/>
Fettmengen/Grease quantity	<input type="text"/>	<input type="text"/>

Plate relating to bearings

ul.Letra 38
 Pl.-41 505 Dierow
 www.elektor.pl
 Tel. +48 32 277 65 60 Fax. +48 32 277 65 61 mail: info@elektor.com

Elektor
air systems Sp. z o.o.

Lagertyp

Fett

Nachschmierung

Arbeitszeit

Fettmengen

Lubrication intervals



4.2 Emissions

4.2.1 Noise level

Component	Fan
Sound pressure level at a distance of 1 m LpA	< 110 dB(A)

5 Transport and storage

i The chapter presents only the main content; it should be treated as a source of basic information.

i You must comply with contractually agreed provisions regarding the assumption of responsibility for the fan in connection with its delivery.

5.1 Safety rules

Failure to take into account the load-bearing capacity of the ground can lead to substantial personal and material damage.

- When unloading, take into account the load-bearing capacity (statics) of the ground or the base structure.

Means of transport

The use of improper means of transport can lead to personal and material damage of considerable value.

- When using means of transport, account should be taken of applicable regulations, e.g. accident prevention rules "Cranes" (DGUV regulation 52), "Lift trucks" (DGUV regulation 68) and "Vehicles" (DGUV regulation 70).

5.2 Personal protective equipment



Hand protection

An order to wear protective gloves when performing activities in conditions of risk of injury, such as cutting, sticking, clamping, the effect of temperature or harmful substances.



Foot protection

An order to wear foot protection when performing activities in conditions of risk of falling or cramping objects, walking on sharp objects, effects of temperature or harmful substances.



Head protection

An order to wear head protection when performing activities in conditions of risk of falling objects or the possibility of hitting head against a hard object during normal body movements.

5.3 Special tools, equipment and material

Products and materials which are assumed to be not a component of a typical workshop in an industrial standard are considered special tools, devices and materials. At the stage of "Transport" there is no need to use special tools, equipment and materials.

5.4 Activities and qualifications

Table 5: Transport – Activities and qualifications

Activity	Qualification
Transport, operation of crane, operation of lift trucks	Qualified personnel authorized to drive and operate the transport and lifting equipment used. In addition, the unloading and lifting of components should be entrusted only to personnel who are qualified due to training in the area of secure fastening of components in lashing points and using load suspension devices and slings
Coordination of various activities	An employee authorized to give instructions

5.5 Fan transport

This chapter describes the transport of the fan after transferring responsibility to the user according to delivery conditions.

Risk due to the insufficient securing of load



Loads that are not properly secured and loaded without taking into account the centre of gravity can move away from the vehicle that transports them.

- Load must be sufficiently secured with the use of approved fasteners (belts, etc.).
- The centre of gravity of the load must be taken into account.
- The condition and bearing capacity of the transport vehicle must be taken into account.

Risk of heavy objects falling from a height



The suspended load may break off, it is possible that it swings or catches persons. This can result in serious injury of the personnel and material damage.

- Do not stand below a suspended load.
- When replacing elements, always attach them carefully to appropriate slings.
- Avoid putting the suspended load in a swinging motion.
- The sub-contractors' documentation should be followed.

Risk caused by lifting and transporting in an inappropriate way



The result of lifting and transporting the fan components in an inappropriate way may be injuries and destruction of these

components.

- Use only hoists, slings and fasteners with sufficient load capacity.
- For transporting and lifting the fan, use the holes provided for this purpose for transport lugs, slings and fasteners which should be in perfect condition. It is possible to fasten only in the intended fixing points of the transport lugs.
- Do not tie wire ropes and chains.
- Do not connect ropes by binding them.
- Twisted ropes should be straightened before lifting.
- Do not allow ropes to bend sharply.
- Make sure that thimbles, rope eyes, rings and other elements of the slings are freely movable on the hooks.
- Do not carry loads over people.
- Any auxiliary lugs, for example at the drive, etc. are only suitable for suspending individual components.

5.5.1 Lifting and transporting



When lifting and transporting the fan, comply with applicable accident prevention regulations and generally recognized technical rules.

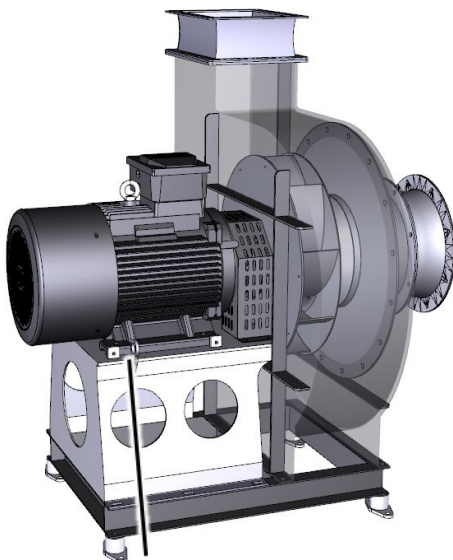
After unloading the fan:

- Remove the packaging (according to the transport version).
- Check the fan in order to exclude damage.
- Check the accessories for compliance with the delivery note to confirm completeness.
- Move the fan to the place of installation or to the warehouse only by appropriate means of transport.

If transported to the place of installation by truck:

- The fan should be lifted with a suitable lift onto the loading surface.
- The fan must be secured against slipping / falling using appropriate fasteners (e.g. ropes, belts, chains).

Load lashing points



Load lashing points

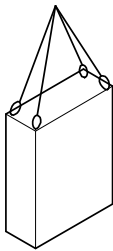
- For transporting and lifting the fan, use the tools and transport lugs provided for this purpose.
- Do not use the motor transport element to transport the whole fan.
- The fan is equipped with holes to unscrew bolts in lifting lugs
- The slings should only be attached to the transport lugs.
- The slings should be fixed carefully so as not to damage the components of the device.
- Do not attach slings to drive components.
- It is possible to damage the fan, which excludes manufacturer's warranty.
- Only slings of the same length should be used, observing the principles of uniform distribution of the load.



Lashing points on the console

- The sling attachment angle should not exceed 45°.

Transport of small parts in packaging in a vertical position with a crane



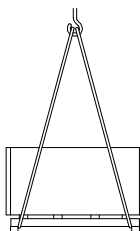
Vertical transport of the fan requires the use of the following auxiliary elements:

- 4 x transport lugs
- 4 x loops with a capacity of 1,000 kg

Using the auxiliary elements mentioned above, taking into account the following steps, lift the fan, transport it and set it to a horizontal position in the installation site.

1. Pull the loops through the transport lugs.
2. Hang the loops on the crane hook.
3. Raise the fan evenly.
<p>Note:</p> <ul style="list-style-type: none"> - When lifting, move the crane horizontally to maintain the position of the pivot point. - Make sure that the fan is hanging straight. If necessary, take into account the location of the centre of gravity.
4. The fan should be transported to the place of installation.
5. Carefully set the fan in the place of installation.
<p>Result:</p> <p>The fan is located in the place of installation as intended.</p>

Transport of pallets in a horizontal position with a crane



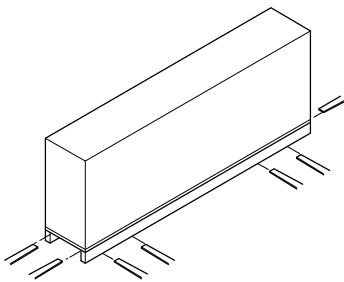
The transport of pallets in a horizontal position requires the use of the following auxiliary elements:

- 2 x loop with a capacity of 1,000 kg

Using the auxiliary elements mentioned above, taking into account the following steps, lift the pallet, transport it and set it to a horizontal position in the installation site.

1. Fix the loops in the corners of the pallet, respectively.
2. Hang the loops on the crane hook.
3. Raise the pallet evenly. Note: When lifting, move the crane horizontally to maintain the position of the pivot point.
4. The pallet should be transported to the place of installation.
5. Carefully set the pallet in the place of installation.
Result: The fan is located in the place of installation as intended.

Transport of pallets in a horizontal position with a forklift



The transport of pallets in a horizontal position with a forklift requires the use of the following auxiliary elements:

- 1 x Forklift with suitable forks

Using the auxiliary elements mentioned above, taking into account the following steps, lift the fan, transport it and set it to a horizontal position in the installation site.

1. Slide the forks of the forklift under the pallet or between the pallet feet.
2. Raise the pallet evenly horizontally so that it can be detached from the ground.
3. The pallet should be transported to the place of installation.
4. Carefully set the fan in the place of installation.
Result: The fan is located in the place of installation as intended.

5.6 Packaging

The fan is prepacked in accordance with the requirements of:

- transport route
- storage at the customer's
- customer's request

Types of packaging:

- on the pallet
- directly on the truck
- packaging in a closed wooden box
- in a container

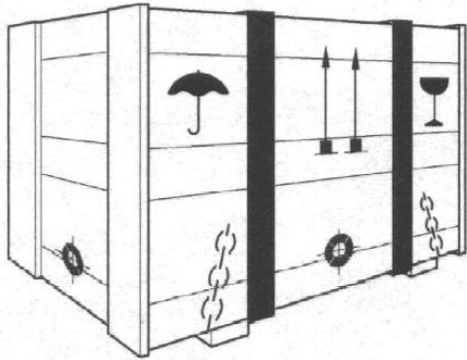
Further transport of the fan should be carried out only with appropriate protection:

- transport security
- protective cover (foil)
- drying material

The protection "protective cover (foil)" and "drying material" prevent penetration of foreign particles and moisture into the fan or components of electrical equipment.





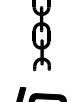





Packaging materials should be collected separately in appropriately marked containers for proper disposal.



Example – markings on a transport box

Explanation of symbols:

-  Store in a dry place
-  Top
-  Fragile package contents
-  Center of gravity
-  Attach slings here
-  Prohibition of transport with a forklift
-  Permissible pressure on the packaging
-  Cannot be loaded with another component

5.7 Quality control of deliveries – transport damages

The fan along with the accessories should be checked after delivery in order to exclude transport damage and damage to the packaging.

Transport damage should be reported immediately to the manufacturer and forwarder.

All deliveries should be checked for completeness on the basis of the attached delivery note.

In other cases, the terms of sale and delivery of the producer must be followed.



The operating manual is included in the scope of delivery

5.8 Fan storage

Material damage caused by unfavourable storage conditions

ATTENTION

Exceeding the dew point and corrosive atmosphere may cause corrosion of the fan and major material damage.

- Keep the fan in a suitable place with a humidity of <60% free of corrosive atmosphere throughout the storage period.
- Regularly check the condition of the stored fan.
- Avoid condensation inside the fan packaging.

Storage policy:

- The fan requires storage in a transport packaging in a dry place with a controlled temperature in the temperature range of +5 °C to +45 °C.
- The fan requires protection against mechanical damage, UV radiation and shocks.
- Metal surfaces without a coating should be protected with a preservative for ferrous and non-ferrous metals.

i *In the event of corrosion or damage resulting from improper storage, e.g. keeping the fan in a damp room or in inappropriate conditions, the manufacturer does not take over the guarantee.*

6 Mounting, installation and connection



The chapter presents only the main content; it should be treated as a source of basic information.

6.1 Safety rules

Ambient temperature of the fan

Exceeding the permissible ambient temperature and damage to the fan cooling can lead to serious material and personal damage.

- Before mounting, check the ambient conditions at the place of installation, e.g. temperature and atmosphere properties.
- The air-cooled electric motor should not stand directly against the wall.
- Please note that the cooling capacity depends on the difference between the temperatures of the cooling air and the medium. Make sure that the impeller can transport sufficient amounts of cool air to the fan.

Loads, statics

Failure to take into account the load-bearing capacity of the ground can lead to substantial personal and material damage.

When unloading, take into account the load-bearing capacity (statics) of the ground or the base structure.

Means of transport

The use of improper means of transport can lead to personal and material damage of considerable value.

When using means of transport, account should be taken of applicable regulations, e.g. accident prevention rules "Cranes" (DGUV regulation 52), "Lift trucks" (DGUV regulation 68) and "Vehicles" (DGUV regulation 70).

6.2 Personal protective equipment



Hand protection

An order to wear protective gloves when performing activities in conditions of risk of injury, such as cutting, sticking, clamping, the effect of temperature or harmful substances.



Foot protection

An order to wear foot protection when performing activities in conditions of risk of falling or cramping objects, walking on sharp objects, effects of temperature or harmful substances.



Hearing protection

An order to wear hearing protection when performing activities in a noise environment up to 80 dB(A) and / or exceeding a peak noise level of 135 dB(C).

EN



Head protection

An order to wear head protection when performing activities in conditions of risk of falling objects or the possibility of hitting head against a hard object during normal body movements.

6.3 Special tools, equipment and material

Products and materials which are assumed to be not a component of a typical workshop in an industrial standard are considered special tools, devices and materials. At the stage of "Mounting, installation and connection" there is no need to use special tools, equipment and materials.

6.4 Activities and qualifications

Table 6: Installation – Activities and qualifications

Activity	Qualification
Transport, operation of crane, operation of lift trucks	Qualified personnel authorized to drive and operate the transport and lifting equipment used. In addition, the unloading and lifting of components should be entrusted only to personnel who are qualified due to training in the area of secure fastening of components in lashing points and using load suspension devices and slings
Mounting and mechanical installation of the fan	Qualified personnel authorized to mechanically assemble the fan
Electrical connections	Qualified electrical engineer
Inspection, testing and receipt of mechanical components of the fan	Qualified personnel authorized to inspect, test and receive mechanical components of the fan
Inspection, testing and receipt of electrical components of the fan	Qualified personnel authorized to inspect, test and receive electrical components of the fan
Cleaning (except for live parts)	Cleaning personnel
Cleaning of live components, e.g. the interior of the control cabinet	Qualified electrical engineer
Coordination of various activities	An employee authorized to give instructions

6.5 Installation and assembly of the fan

The fan has been designed, constructed, inspected and delivered to the operating conditions in accordance with the conditions specified during the order. Do not exceed the values specified in the data sheet.

Danger of suspended load



The suspended load may break off, it is possible that it swings or catches persons. This can result in serious injury of the personnel and material damage.

- Do not stand below a suspended load.
- When replacing elements, always attach them carefully to appropriate slings.
- Avoid putting the suspended load in a swinging motion.
- The subcontractors' documentation should be followed.

Risk caused by lifting and transporting fan components in an inappropriate way



The result of lifting and transporting the fan components in an inappropriate way may be injuries and destruction of these components.

- Use only hoists, slings and fasteners with sufficient load capacity.
- For transporting and lifting the fan, use the holes provided for this purpose for transport lugs, slings and fasteners which should be in perfect condition. It is possible to fasten only in the intended fixing points of the transport lugs.
- Do not tie wire ropes and chains.
- Do not connect ropes by binding them.
- Twisted ropes should be straightened before lifting.
- Do not allow ropes to bend sharply.
- Make sure that thimbles, rope eyes, rings and other elements of the slings are freely movable on the hooks.
- Do not carry loads over people.
- Any auxiliary lugs, for example at the drive, etc. are only suitable for suspending individual components.

6.5.1 Mounting conditions

Material damage resulting from improper location



Placing the fan outdoors or in a chemically aggressive atmosphere may damage the fan components and cause considerable material damage.

- The fan needs to be placed in the correct location. Observe the operating conditions according to the specifications on the nameplate or in the drawing.

Observe the following location and ambient conditions:

- Sufficient space must be provided for the flow and outflow of the air to cool the electric motor.
- Sufficient space must be provided for installation, maintenance and repair work.

In addition, if the fan is located in enclosed spaces, the following rule should be followed:

- Sufficient ventilation should be provided. The heat delivered to the environment should not cause exceeding the acceptable room temperature.

In addition, if the fan is located outside, please follow the following rule:

- Electrical components, e.g. electric motor, must be protected against the effects of weather conditions.

6.5.2 Installation location

Steel foundations, point and concrete foundations will prove themselves as the construction of the fan base, guaranteeing the fan operation in conditions of protection against shocks, vibrations and twisting. In addition, it is required that the design of the fan base provides for axial alignment of the fan in the horizontal and vertical axis and secure attachment.

The fan should be designed with a sufficient minimum distance from the walls and other elements.

Check the dimensions of the foundations based on the dimensional drawing of the fan and the foundation design.

Observe the recommended ambient conditions of the fan and make sure that:

- sufficient space has been provided for tool changing, installation, maintenance and repair work.
- sufficient space has been provided for the flow and outflow of the air to cool the drive motor.
- sufficient fan protection is provided against solar radiation.

Installation materials, such as compensating plates, fastening screws, etc., are also available from the manufacturer.

The fan needs to be aligned when placed on the foundation. To this end appropriate measuring instruments, tools, pressing screws and metal spacers should be used.

If the fan is placed in a chemically aggressive atmosphere or in the open air, use stainless steel spacers.

6.5.2.1 Mounting

Mounting the fan without vibration silencers on a steel structure

1. Place the fan at its destination.
2. The fan should be levelled. If necessary, use sheet metal spacers.
3. Fasten the fan with hexagon bolts. The correct tightening torques in chapter 11.1 "Tightening torques for fastening bolts" must be observed.
Result: The fan is mounted and installed at the destination.

Mounting the fan without vibration isolators on a concrete foundation

1. Place the fan at its destination.
2. The fan should be levelled. If necessary, use sheet metal spacers.
3. Fasten the fan using appropriate fixing material (e.g. anchors, screws) on a concrete foundation. The correct tightening torques in chapter 11.1 "Tightening torques for fastening bolts" must be observed.
Result: The fan is mounted and installed at the destination.

Mounting the fan on a steel structure using vibration silencers (without mounting plates)

1. On the steel structure, the vibration damping elements should be placed and fixed with hexagon bolts. The correct tightening torques in chapter 11.1 "Tightening torques for fastening bolts" must be observed.

2. The fan should be carefully placed on the damping elements. When fitting the fan, place the threaded pins in the fan openings.
3. The fan should be levelled.
4. Fasten the fan with hexagon bolts. The correct tightening torques in chapter 11.1 "Tightening torques for fastening bolts" must be observed.
Result: The fan is mounted and installed at the destination using damping elements.

Mounting the fan on a steel structure using vibration silencers (with mounting plates)

1. Vibration damping elements should be connected with the fan holes using bolts. The correct tightening torques in chapter 11.1 "Tightening torques for fastening bolts" must be observed.
2. The fan should be carefully placed together with damping elements on the steel structure.
3. The fan should be levelled. If necessary, use sheet metal spacers.
4. Fasten the fan with hexagon bolts. The correct tightening torques in chapter 11.1 "Tightening torques for fastening bolts" must be observed.
Result: The fan is mounted and installed at the destination using damping elements.

Mounting the fan on a steel structure using spring vibration silencers

5. Spring vibration silencers should be connected with the steel structure with hexagon bolts. The correct tightening torques in chapter 11.1 "Tightening torques for fastening bolts" must be observed.
6. The fan should be carefully placed on the spring damping elements. When fitting the fan, place the threaded pins in the fan openings.
7. The fan should be levelled.
8. Fasten the fan with hexagon bolts. The correct tightening torques in chapter 11.1 "Tightening torques for fastening bolts" must be observed.
Result: The fan is mounted and installed at the destination using spring damping elements.

Mounting the fan on a concrete foundation using vibration silencer (with mounting plates)

1. Vibration damping elements should be connected with the mounting plates using bolts.

The correct tightening torques in chapter 11.1 "Tightening torques for fastening bolts" must be observed.

2. The fan should be carefully placed on the spring damping elements on a concrete foundation.

3. The fan should be levelled.
If necessary, use sheet metal spacers.

4. Drill holes in the foundations corresponding to the holes in the mounting plates.

5. Fasten the fan using appropriate fixing material (e.g. anchors, screws) on a concrete foundation.

The correct tightening torques in chapter 11.1 "Tightening torques for fastening bolts" must be observed.

Result:

The fan is mounted and installed at the destination using damping elements.

Mounting the fan on a concrete foundation using spring vibration isolators

1. Connect spring vibration isolators with hexagon bolts on a concrete foundation.

The correct tightening torques in chapter 11.1 "Tightening torques for fastening bolts" must be observed.

2. The fan should be carefully placed on the spring damping elements.
When fitting the fan, place the threaded pins of damping elements in the fan openings.

3. The fan should be levelled.

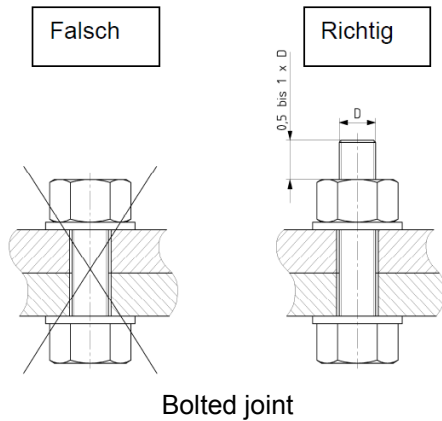
4. Fasten the fan with hexagon bolts.

The correct tightening torques in chapter 11.1 "Tightening torques for fastening bolts" must be observed.

Result:

The fan is mounted and installed at the destination using spring damping elements.

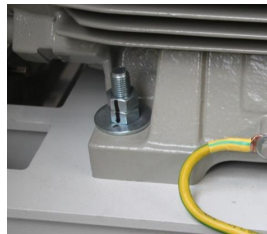
6.5.2.2 Bolted connections



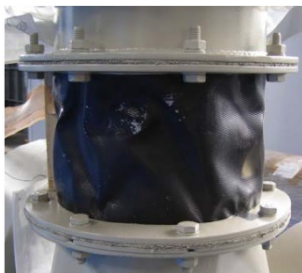
For all bolted connections (except for screw connections of compensators), make sure that after tightening the fastening bolt or nut there is an allowance of at least the same size as the bolt diameter.

The position of the bolt head must be adjusted so that loosening of the bolted connection and the loss of the bolt are immediately recognizable. For a horizontal bolted connection, always insert the nut from above.

The correct tightening torques of bolted connections in chapter 11.1 "Tightening torques for fastening bolts" must be observed.



Bolted joint of the motor



For compensators, the ends of the bolts should be directed outside the compensator.

Bolted joint of the compensator

6.5.2.3 Connection of pipes

Connecting the fan to service lines, in the event of stress in the pipeline can lead to changes, e.g. changing the gap of the impeller nozzle.

1. Remove transport covers from the connectors.
2. Bring the piping to the suction and pressure ports of the fan.
Note: A displacement should not occur between the pipeline and the connector pipe.
3. Pipelines or ducts should be connected to the fan without loads.
Result: Pipelines or ducts are connected to the fan.

6.6 Connection of power media

i *The connection of power media to the fan must be carried out in accordance with current standards.*

6.6.1 Connection to the electricity mains

Risk of electric shock



- It is possible to touch live components and cause fatal injuries.
- Follow the documentation of the electric motor.
 - Disconnect the electrical components from the mains supply. The electrical components include, among others, the main switch, the power switch and the automatic fuse.
 - On the duration of the activity the circuits disconnected from the mains supply should be earthed.
 - On the duration of the activity the circuits disconnected from the mains supply should be shorted.
 - Adjacent live parts must be shielded or isolated.
 - Place appropriate warning signs.
 - Ensure that there is no voltage at all in the area of operation.
 - After performing the activities, proper functioning of the areas should be ensured so that there are no defects.
 - After performing the activities, remove any protections (bridges, etc.).

i *When making the electrical connection of the fan, comply with the regulations and connection conditions issued by the local energy supplier.*



Connection data is included in the wiring diagrams that form part of the technical documentation.

Check that the voltage and frequency of the mains correspond to the voltage and frequency values on the nameplate.



Follow the manufacturer's electrical documentation and use the information available in it in a professional manner.

6.6.2 Earthing



Earthing lugs connectors

Safe operation of the fan requires earthing lugs according to the rules in force at the place of installation.

Make sure that the earthing conductor is of sufficient diameter. Earthing lugs quality requires inspection by an authorized facility.

6.6.3 Connection of monitoring devices

The fan is optionally equipped with monitoring systems.

6.6.3.1 Rotation speed monitoring



Rotation speed monitoring

The pulse shield, mounted at the end of the shaft on the drive side, is responsible for monitoring the speed. The encoder collects the impulse for further processing.

6.7 General inspections and testing

Risk of electric shock



It is possible to touch live components and cause fatal injuries.
– Follow the documentation of the electric motor.

Table 7: General inspections and testing

No.	Test / inspection	Activity
1	Mechanical test	<p>A general visual inspection of the fan should be carried out and it should be ensured that:</p> <ul style="list-style-type: none"> - there are no mechanical disturbances (e.g. the impeller does not turn when it is moved by hand). - all structural components (electric motor, temperature monitoring system, vibration damping elements, etc.) are properly set and attached. - security devices are properly installed and are in a condition that provides protection. - bolted joints are properly tightened. - the entire fan area is clean, in particular no oil and grease stains, waste, equipment and cloth. - all security devices are properly installed and are in a condition that provides protection.
2	Electrical test	<ul style="list-style-type: none"> - A general visual inspection of the condition of electrical connections and wires should be carried out. In the event of damage and installation defects, restore them to the appropriate condition. - Check the conformity of the electrical connection parameters with the values stated on the nameplate. - Check the proper execution of earth connections and equipotential bonding. - Check the correct status of the neutral wire. - Check the fastening of cables and terminals. - Check that all existing junction boxes and cable ducts are closed and that the cables are connected. - Check the rotation direction of the electric motor to see if it matches the arrow. - Check earthing lugs connections, if present.
3	Testing of monitoring and auxiliary equipment	<ul style="list-style-type: none"> - Check the connected devices that monitor the fan operation in order to confirm their proper operation. - Check the connections and wiring of the monitoring and auxiliary equipment. - Check the installation and operational status of safety systems and protective devices. - According to the drawings, check the stationary and mobile safety systems to confirm their correct operation.

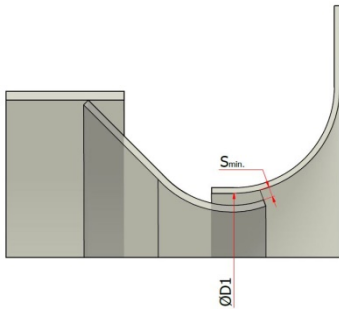
6.7.1 Checking the gap

Before first starting the fan, check the radial gap between the intake nozzle and the impeller and note its width.

Transporting the fan to its destination site does not exclude the possibility of moving the inlet side cone in relation to the impeller. The minimum size of this gap is a prerequisite for safe fan operation.

6.7.2 Checking the gap

6.7.2.1 Impeller with intake nozzle



Situation of impeller installed with intake nozzle

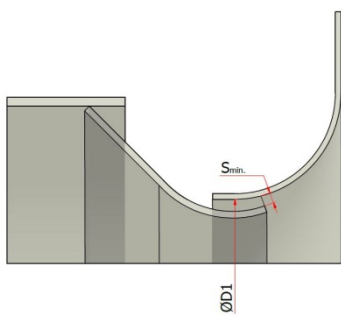
Table 8: Minimum gap width – impeller with intake nozzle

DN	ØD1	ØD _{nozzle}	S _{min}	Remark
112	90	76	2.0	Cone
125	100	84	2.0	Cone
140	112	102	2.0	Cone
160	126	116	2.0	Cone
180	141	132	2.0	Cone
200	158	147	2.5	Cone
224	178	172	3.0	
250	199	194	3.0	
280	224	219	3.0	
315	251	246	3.0	
355	282	276	3.0	
400	316	310	4.0	
450	355	348	4.0	
500	398	391	5.0	
560	447	440	7.0	
630	501	495	7.0	
710	562	555	8.0	
800	631	624	9.0	
900	708	700	10.0	
1000	794	785	12.0	
1120	891	882	15.0	
1250	1000	986	17.0	
1400	1120	1106	15.0	
1600	1280	1250	15.0	Cone
1800	1390	1350	20.0	Cone
2000	1600	1556	20.0	Cone

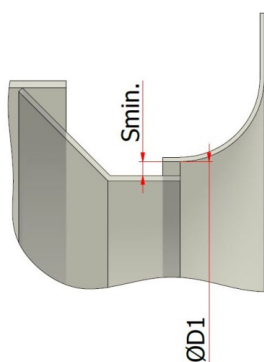
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6.7.2.2 Impeller with inlet cone

Table 9: Minimum gap width – impeller with inlet cone

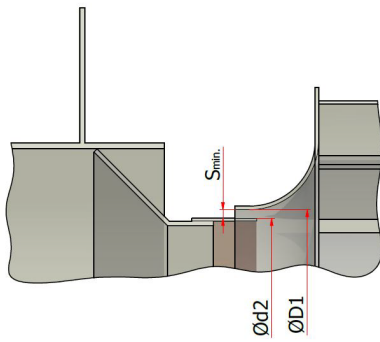


Situation of impeller installed with a standard cone



DN	ØD1		S _{min}	Remark
112	90		2.0	Cone
125	100		2.0	Cone
140	112		2.0	Cone
160	126		2.0	Cone
180	141		2.0	Cone
200	158		2.5	Cone
224	178		3.0	
250	199		3.0	
280	224		3.0	
315	251		3.0	
355	282		3.0	
400	316		4.0	
450	355		4.0	
500	398		5.0	
560	447		7.0	
630	501		7.0	
710	562		8.0	
800	631		9.0	
900	708		10.0	
1000	794		12.0	
1120	891		15.0	
1250	1000		17.0	
1400	1120		15.0	
1600	1280		15.0	Cone
1800	1390		20.0	Cone
2000	1600		20.0	Cone

6.7.2.3 Impeller with cone



Situation of impeller installed with cone

Table 10: Minimum gap width – impeller with cone (ATEX)

DN	ØD1	ØD _{nozzle}	S _{min}	Remark
112	112	90	76	
125	125	100	84	
140	140	112	102	
160	160	126	116	
180	180	141	130	
200	200	158	148	
224	224	178	168	
250	250	199	188	
280	280	224	212	
315	315	251	240	
355	355	282	270	
400	400	316	304	
450	450	355	342	
500	500	398	384	
560	560	447	432	
630	630	501	484	
710	710	562	542	
800	800	631	612	
900	900	708	688	
1000	1000	794	770	
1120	1120	891	866	
1250	1250	1000	970	
1400	1400	1120	1090	
1600	1600	1280	1250	
1800	1800	1390	1350	
2000	2000	1600	1560	

6.7.3 Installation of compensators

The compensators need to be installed only after the pipeline has been assembled.

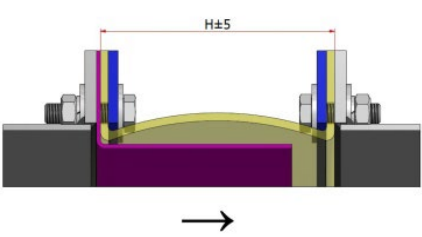
Hose compensators

The hose compensators are pulled on the pipeline and fixed with hose clamps.

1. The hose compensator should be carefully pushed onto the pipeline.
2. The hose compensator should then be secured with hose clamps.
Result: The hose compensator is installed.

Flange compensators with deflectors

Put the flange compensator carefully over the deflector and mount it between the mounting flanges.

	1. Put the flange compensator carefully over the deflector.
	2. Then place the flange compensator between the mounting flanges.
	3. Place a seal or a sealing cord under the deflector.
	<p>4. Insert the fixing bolts and screw them on. Tighten the bolts with equal force.</p> <p>The correct tightening torques of bolted connections in chapter 11.1 "Tightening torques for fastening bolts" must be observed"</p>
	Result: The compensator with deflector is installed and fixed with bolts.

7 Commissioning

i The chapter presents only the main content; it should be treated as a source of basic information.

7.1 Personal protective equipment



Hearing protection

An order to wear hearing protection when performing activities in a noise environment up to 80 dB(A) and / or exceeding a peak noise level of 135 dB(C).



Eye protection

An order to wear eye protection when performing activities in an environment in which there is possibility of liquids and gases under pressure or solid particles getting to the eyes.



Hand protection

An order to wear protective gloves when performing activities in conditions of risk of injury, such as cutting, sticking, clamping, the effect of temperature or harmful substances.



Foot protection

An order to wear foot protection when performing activities in conditions of risk of falling or cramping objects, walking on sharp objects, effects of temperature or harmful substances.

7.2 Activities and qualifications

Table 11: Commissioning – Activities and qualifications

Activity	Qualification
Commissioning of the fan	Qualified personnel authorized to perform fan commissioning
Commissioning of electric motor	Qualified personnel authorized to perform the commissioning of electrical devices
Coordination of various activities	An employee authorized to give instructions

7.3 Installation and assembly of the fan

As part of the commissioning, the fan will be prepared for use in a manner consistent with its intended use. The end of commissioning procedure is the first use of the fan in a manner consistent with its purpose.

Risk of electric shock



It is possible to touch live components and cause fatal injuries.
– Care should be taken of the danger zones of live parts.

7.3.1 Test run

- Make sure that there are no foreign bodies in the fan housing and in the pipeline.
- As part of the commissioning, a test run should be carried out with the check of all safety systems.
- Be aware of unusual sounds and vibrations.
- Check the supply of cooling air to the electric motor.
- Check the direction of rotation (according to the arrow on the housing).
- Check the gap (impeller and intake nozzle) according to the chapter 6.7.1.
- Check the network, control and monitoring devices as well as cable cross sections according to the type of start, start time and intensity peak in order to confirm correct calculation / acceptance of the correct dimensions by the user's designer.
- If the fan is equipped with transport securing device, it must be removed.

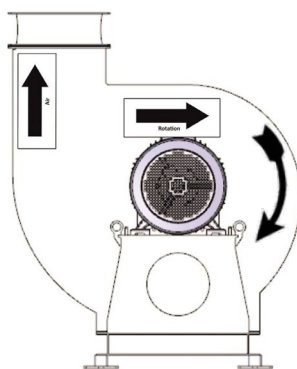
7.3.2 Rotation direction control

Risk of electric shock



It is possible to touch live components and cause fatal injuries.

- Care should be taken of the danger zones of live parts.
- When checking the direction of rotation in the impeller hazard zone, only the person performing the checks may be present.
- Make sure that the electric motor is disconnected from the power supply.
- The electric motor must be protected against re-start.
- Mark the hazard area using the placard.
- Confirm the absence of voltage.



Rotation direction

- Verify that the shaft rotates when it is moved by hand
- Turn on the electric motor (see chapter 7.3.2).
- Check the rotation direction of the electric motor to see if it matches the arrow on the rear side of the motor.
- In the event of a wrong direction of rotation, the appropriate switching must be made.

7.3.3 Switching the wrong direction of rotation

Switching the direction of rotation is possible after changing the connection points of any two connecting cables. Follow the wiring diagram in the junction box.

7.3.4 Installation and assembly of the fan

The fan cannot be started until a sufficient acceleration torque is present throughout the entire start-up range.

To start the fan, perform the steps given below.

1. Fan operation in the closed condition of the throttling device.

Note:

When the final fan speed is reached, the throttling device should be opened.

2. Connect the fan via the main switch or the power switch.

Note:

The following values should be observed and recorded.

During start-up

- current requirement,
- voltage,
- vibration (quiet running),
- noises.

After start-up

- current / voltage,
- vibration,
- noises,
- bearing temperatures (electric motor)
- heating of fan housing.

3. After the start-up, the fan should be loaded.

Note:

The following values should be observed and recorded.

- current requirement / voltage,
- vibration (quiet running),
- noises,
- bearing temperatures.

4. The fan should be turned off in case of:

- exceeding the values specified in the data sheet,
- occurrence of unacceptable vibration values or noise level during fan operation,
- exceeding limit values (see chapter).

Result:

The fan is on.

7.3.4.1 Start-up after direct connection

In the case of a direct electric motor connection (delta), the electric motor generates a high inrush current in addition to the high torque.

At the start-up stage, the inrush current is 6 to 8 times the rated current depending on the circuit. This high current consumption should be taken into account for motor protection.

7.3.4.2 Start-up in the case of a star-delta connection

In the case of a star-delta connection in the star position the electric motor generates only 1/3 of the torque. From a certain speed, the load torque of the fan is greater than the torque of the

electric motor. The electric motor does not increase the speed. At this stage, it is necessary to switch the power supply system into a delta. The current peak is much lower than in the case of a direct connection.

The frequency of starting the electric motor is limited to 6 switching processes per hour. The motor manufacturer's specifications must be observed.

7.3.4.3 Avoiding high, peak torque values in test run

In general, the fan should only be started after the impeller has completely stopped. This avoids the peak torque values that can occur when the remaining impeller speed has not yet stopped at the time of reactivation. Peak torque values can cause significant damage to many components (impeller).

7.3.4.4 Operation of a fan with frequency converter

When operating the fan with a frequency converter, observe the specifications in the chapter 8.6 "Automatic operation of the fan".

7.3.5 Shutting down the fan

To shut down the fan, perform the steps given below.

1. Turn off the fan using the factory-supplied power switch or main switch.

Note:

- The inertial rotation of the fan should be allowed to stop without braking.
- Observe the safety rules in accordance with DIN VDE 0105.

In general, the fan should only be started after the impeller has completely stopped. In this way, peak torque values are avoided, which can cause significant damage to many components, e.g. impeller.

8 Operation of the fan

8.1 Safety rules

Staying under a suspended load

The suspended load may break off, it is possible that it swings or catches persons. This can result in serious injury of the personnel and material damage.

- Do not stand below a suspended load.
- Never stay within the range of the suspended load.
- Components should be hung on the appropriate fastening elements and properly secured

Determination and removal of the causes of disturbances

If the determination and removal of the causes of disturbances only covers the area of the fan part, the rest of the same fan must be additionally considered. Failure to comply with this rule may result in substantial personal and material damage.

- When determining and removing the causes of disturbances, consider the entire fan and its surroundings.

De-commissioning of the fan

In the event of carrying out activities related to the dismantling of the fan without a complete de-commissioning, serious personal injury may occur.

- Activities related to dismantling the fan require its prior de-commissioning.
- Activities related to dismantling the fan require approval by an authorized unit.

Disconnection of the fan from the mains

If during the de-commissioning there is no professional and complete disconnection from the mains, there is a risk of material and personal damage.

- When disconnecting the fan from the mains, make sure that it is safely disconnected from the grid to prevent unintentional activation.

Maintenance intervals

If maintenance intervals are not observed, there is a risk of material and personal damage.

- Please observe the maintenance intervals contained in this operating manual.
- It should be taken into account that the fan manufacturer does not have experience in long-term operation in production conditions. Therefore, the data from this operating manual should be supplemented with your own experience.

8.2 Personal protective equipment



Hearing protection

An order to wear hearing protection when performing activities in a noise environment up to 80 dB(A) and / or exceeding a peak noise level of 135 dB(C).



Eye protection

An order to wear eye protection when performing activities in an environment in which there is possibility of liquids and gases under pressure or solid particles getting to the eyes.

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Hand protection

An order to wear protective gloves when performing activities in conditions of risk of injury, such as cutting, sticking, clamping, the effect of temperature or harmful substances.



Foot protection

An order to wear foot protection when performing activities in conditions of risk of falling or cramping objects, walking on sharp objects, effects of temperature or harmful substances.

8.3 Activities and qualifications

Table 12: Fan operation – Activities and qualifications

Activity	Qualification
Activities at mechanical components	Mechanical maintenance worker
Activities at electrical components	Qualified electrical engineer
Activities related to control and regulatory components.	Qualified personnel who are authorized to perform activities related to control and regulatory components
Cleaning (except for live parts)	Cleaning personnel
Coordination of various activities	An employee authorized to give instructions

8.3.1 Fans according to Directive 2014/34/UE

Repair and maintenance of fans according to Directive 2014/34/EU may only be entrusted to qualified persons according to TRBS 1203.

Table 13: Fans according to Directive 2014/34/UE – Activities and qualifications

Life phase	Activity	Recommendation	Competence
Maintenance	Impeller wear check	Follow the rules in the Operating Manual	User
			User
Repair	Impeller replacement	Follow the rules in the Operating Manual	User

8.4 Behaviour of the fan during operation

Check the following fan properties at regular intervals

1. Check the power consumption and voltage. The recommended values are shown on the rating plate of the electric motor.
2. Be aware of the noise and vibration of the fan (in particular sounds similar to rubbing). (please refer to the contents of the chapter 11.2 "Limit values of vibrations")
3. Check the condition of the hub seal.

The fan should be turned off in case of:

- exceeding the given values of current, voltage and temperature,
- vibration or elevated noise level of the fan,
- exceeding the axial play of the clutch,
- leakage of the hub seal.

8.5 Emergency shutdown of the fan

If a fan is installed in a ventilation system, operated in part or fully automatically, the emergency shutdown of the fan installation is not a problem.

The fan is not equipped with an emergency stop or trip system. Shutting down the fan in the event of failure should be done through the control system. The correct implementation of the control system is the responsibility of

If the fan is equipped with monitoring systems, the emergency shutdown will occur if certain values are exceeded.

Following are the possible monitoring parameters:

- Rotational speed (fan and electric motor)
- Direction of rotation
- Temperature of the conveyed medium

The following limit values can be distinguished:

- **Pre-alarm**
Possible further operation of the fan only possible under uninterrupted supervision.
- **Main alarm**
Immediate shutdown of the fan.

For the pre-alarm and shut-down, please refer to the contents of the chapter 11.2 "Limit values of vibrations".

8.6 Automatic operation of the fan

8.6.1 Rotational speed control by means of a frequency converter

During automatic fan operation, the fan shaft speed should not fluctuate by a preset value (periodic adjustment). Fluctuation leads to damage on the drive side.

In addition, it is necessary to secure the correct time of

- fan start-up to achieve the appropriate rotational speed or maximum speed
- lowering the speed to standstill
- changing the operating point and thus the rotational speed of the fan.

In order to avoid too high loads, in particular acceleration and braking in a short time, the speed control by means of a frequency converter requires, if possible, a high "inertia" setting. In this way it is possible to maintain the phenomenon of fatigue of the impeller at a low level. The following indications allow to maintain as little as possible the additional load on the shaft, caused by control procedures that affect the drive elements.

The ramp time is valid, its crossing is not allowed.

Regardless of the above, appropriate boundary conditions for a particular application case should be taken into account (moment of inertia of the impeller and drive system, acceleration of the motor, current draw, adjustment procedures according to the needs of the process, etc.).

Table 14: Rate of change of the rotational speed (Frequency converter ramp time)

Fan rotation speed [min^{-1}]	Ramp time [s]
750	38
1000	50
1200	60
1500	75
1800	90
3000	150
3600	180

8.6.2 Natural frequency of the fan

Each fan component (in particular the impeller) shows its own natural frequency excited by a specific fan speed, in which case resonance is not excluded.

Fans are calculated and constructed in such a way that during operation at a constant rated speed the resonance phenomenon does not occur.

The operation of a fan with speed control by means of a frequency converter allows the occurrence of excitation in any case the rotational speed (frequency) is being changed. Additional excitation by the frequency converter is possible. If the component's own frequencies are in the fan rotational speed range, they require extinguishing due to the appropriate parameterization of the frequency converter.

8.6.3 Parameterisation of the frequency converter

Where the fan is supplied with a frequency converter, the set parameter values must be retained. Any change in parameter values leads to the loss of warranty rights. The possible effects of changing parameter values or entering incorrect parameter values are listed below:

- operation does not generate low vibrations according to DIN ISO 10816-3
- fatigue cracking of the impeller
- resonant vibrations of different components
- destruction of the impeller due to too fast start-up and braking as well as changing the fan operating points.

8.6.4 Adjustment range of rotational speed

In order to maintain the bearing lubrication condition, the speed range of 1:10 should not be exceeded. In particular, in the 5 Hz range of the output frequency of the frequency converter, torsional vibrations of the drive may occur, which should be avoided.

8.7 Disturbances, error search and troubleshooting


In the case of damage that occurred during the warranty period, inform the manufacturer immediately.


Before contacting the manufacturer, make a note of the data on the nameplate.

Disturbances and observations should be presented as accurately as possible. The more accurate the information, the faster and more accurate the manufacturer's help can be.

8.7.1 Searching for errors


The error search will determine the nature of the disturbance. If a malfunction occurs, immediately perform a search for errors.

 DANGER	<p>Risk of electric shock</p> <p>It is possible to touch live components and cause fatal injuries.</p> <ul style="list-style-type: none"> – Care should be taken of the danger zones of live parts.
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 WARNING	<p>Warning against burns</p> <p>Fan housing becomes hot during operation.</p> <ul style="list-style-type: none"> – Do not touch the fan until the housing has cooled down.
---	--

8.7.2 Troubleshooting

Error correction eliminates the disturbance. If a malfunction is detected, immediately remove the fan's operating errors.

 *If the determination of the error proves the need to replace certain components of the fan, the exchange is considered repair. Information regarding repairs can be found in the chapter "Repairs".*

8.7.3 Disturbances

Table 15: Disturbances of fan operation

Disturbance	Possible cause	Countermeasure
The impeller does not run smoothly	Deposits on impeller blades	The impeller should be thoroughly cleaned
	The impeller shows wear	The impeller must be replaced
	The impeller exhibits thermal deformations	The impeller must be replaced
	Fan stresses caused by uneven foundation	Remove the foundation fastening and align the foundation. Then re-attach the fan.
	Incorrect alignment of vibration isolators	Correct the alignment
	Pipelines mounted with stress	Use flexible pipe connections (compensators)
The fan generates noise similar to rubbing	The impeller rubs against the inlet cone	Unscrew the housing cover with the suction connector and set it again
	The electric motor generates noises	Check the electric motor to eliminate noise from the bearings, or replace the bearings
The medium leaks around the hub seal	The seal is damaged or worn	Replace the seal
Permanent exceeding of the current consumption value	Too much air mass	Reduce the air flow with the throttle until the correct current consumption is reached

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on the nameplate	Different rotational speed in the 60 Hz network	Check the frequency
The fan does not start	Electrical motor incorrectly connected	Check the connection
	In the case of a star-delta connection, the engine remains in the star position	Reduce switching time from star to delta
	The fan starts due to low resistance	Close the throttling device or install additional covers
	The engine protection system is calculated too low	The cable cross-section and protective systems require adjustment to the inrush current
	Too long to start-up	Close the throttling device and check the tightening torque of the MA/MN electric motor
	The electric motor is damaged	Switch off and replace the electric motor if necessary
	The electric motor is too hot due to too high switching values.	The fan should be used in continuous mode and regulated with a throttling device or a frequency converter
	Too high inrush current	Incorrect voltage
Star-delta start-up should be provided, too weak local mains		

8.8 Maintenance

Maintenance work within a fan requires, in principle, the involvement of the manufacturer or an authorized representative. These persons are able to ensure that only original spare parts are used and that the fan life span is extended. In order to obtain technical information and purchase spare parts, please provide all data indicated on the nameplate.

8.8.1 Before the start of maintenance work

Before starting maintenance work, do the following:

- Turn the fan off and secure it against being switched on again.
- All heated areas should be allowed to cool (e.g. housing).
- Mark the fan with a sign to prevent unwanted switching on.
- Before starting the activity, the elements of the hydraulic and pneumatic systems should be brought to the non-pressure state.
- Settings and operating statuses should be recorded.
- Observe the safety instructions and the content of safety data sheets issued by manufacturers of oils, lubricants, cleaning products and spare parts

8.8.2 Cleaning of the fan.

Regular cleaning serves the trouble-free operation, safety and maintenance of the fan. First of all, remove dust, production residues, oils and greases. Please note that incorrect cleaning may result in damage.

**Risk of electric shock**

It is possible to touch live components and cause fatal injuries.

- Care should be taken of the danger zones of live parts.

**Warning against burns**

Fan housing becomes hot during operation.

- Do not touch the fan until the housing has cooled down.

**Damage caused by incorrect cleaning**

Improper cleaning and improper handling of cleaning agents may result in damage.

- Do not clean the fan components with compressed air.
- Do not use high pressure spacers.
- Follow the instructions regarding the use of cleaning agents issued by the manufacturers.

8.8.3 Fan maintenance

Careful, preventive fan maintenance is a prerequisite for health and safety of personnel working in the fan area. In addition, maintenance serves to maintain the functionality of the fan.

**Risk of electric shock**

It is possible to touch live components and cause fatal injuries.

- Care should be taken of the danger zones of live parts.

**Warning against burns**

Fan housing becomes hot during operation.

- Do not touch the fan until the housing has cooled down.

8.8.4 Maintenance schedule

C: Cleaning personnel M: Maintenance engineer
 E: Qualified electrical engineer K: Employee authorized to coordinate work

Table 16: Maintenance schedule

Daily maintenance					
Element	Activity	C	E	M	K
Fan	Check the fan to confirm cleanliness and reliable operation.	X			
	- If necessary, clean contaminated surfaces.	X			
	- If necessary, have the restoration of operational readiness.		X	X	X
Movable parts (impeller, and electric motor)	Check the fan to exclude unusual phenomena, noise during operation, heating up, odours and leaks.	X			
	- If necessary, have the restoration of operational readiness.		X	X	X
Impeller	Inspection of the impeller is essential, if - the permissible limit values have been exceeded in accordance with the chapter "Limit values of vibrations". - there will be a change in the typical operation sound.			X	X
Hub seal	Check the hub seal to eliminate leakage.			X	X
	In the event of a leakage, check the sealing rings and replace them if necessary. - Damaged and worn seals should be completely replaced. - If the seal consists of several parts, the entire seal set must be replaced.			X	X
Electric motor	When checking the electric motor, pay attention to operational noises and smooth running			X	
	If necessary, remove dust deposits from the electric motor.	X			
Protection	Check the protection to confirm cleanliness, completeness and reliable operation.	X			
	- If necessary, clean contaminated surfaces.	X			
	- If necessary, have the restoration of operational readiness.		X	X	X

C: Cleaning personnel M: Maintenance engineer
 E: Qualified electrical engineer K: Employee authorized to coordinate work

Daily maintenance					
Element	Activity	C	E	M	K
Descriptions and information plates	Check their stable fixing and readability.	X	X	X	
	- If necessary, clean illegible elements.	X			
	- If necessary, install detached elements.			X	
Electric wires, connections and bolted joints	Check their damage, tightness and stable fixing.		X		
	- If necessary, clean illegible elements.		X		
	- If necessary, install detached elements.		X		
Compensators and deflectors	Check compensators in case of process changes.			X	
Condensate drain pipe	Check if water has accumulated in the housing.	X			
	- If necessary, open the condensate drain pipe and allow the water to drain.	X			
Weekly maintenance					
Element	Activity	C	E	M	K
The fan as a whole	The fan as a whole should be checked in order to exclude abnormal operating phenomena, noise during operation, heating up, occurrence of odours and leaks.	X			
	- Remove dust deposits from the fan, in particular from the hub sealing area and the bearing housing	X		X	
	- If necessary, have the restoration of operational readiness.		X	X	X

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C: Cleaning personnel M: Maintenance engineer
 E: Qualified electrical engineer K: Employee authorized to coordinate work

Maintenance every 3 months					
Element	Activity	C	E	M	K
The fan as a whole	The fan as a whole should be checked in order to exclude abnormal operating phenomena, noise during operation, heating up, occurrence of odours and leaks	X			
	- Check all bolt connections to confirm their proper tightening, or tighten the bolts.	X		X	
Electric motor	Check cleanliness and stable fixing.	X			
	- If necessary, clean the impeller cover from impurities.	X			
	- If necessary, clean the electric motor from dirt.	X			
	- If necessary, fasten the loose motor.			X	
Compensators and deflectors	- Check the compensators and tighten the fixing screws if necessary.			X	
	- In case of wear, the compensators must be replaced.			X	

Annual maintenance					
Element	Activity	C	E	M	K
Fan (All components)	A complete test of functions and safety should be performed (e.g. in cooperation with the manufacturer).		X	X	
Fan (Electrical connections)	Check the stability of fixing of power connections, their damage and wear.		X		
	- If necessary, fasten the loose power connections.		X		
	- If necessary, exchange those damaged power connections.		X		
Electric motor	Check the electric motor according to the motor manufacturer's maintenance schedule			X	
	- If necessary, replace the motor bearings.			X	
	- Check the mounting of the motor foot			X	

8.8.5 Lubrication of the fan

Damage caused by the use of incorrect lubricants

ATTENTION

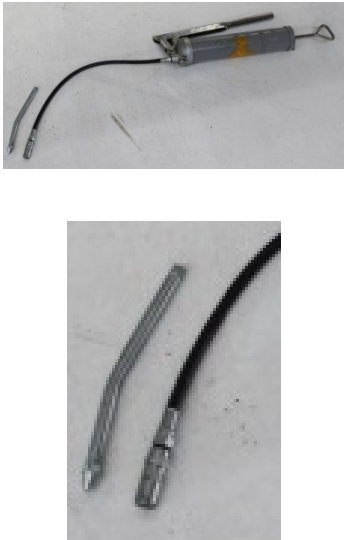
The use of unsuitable lubricants and incorrect handling of these materials may cause damage to the fan.

- Do not mix lubricants of different quality because their composition is different and different additives are used for their production. This principle applies primarily to lubricants based on mineral and synthetic oils.
- Always use the amount of lubricants given, as both excess and shortage of these agents can degrade the functionality of the fan.

8.8.5.1 Special tools, equipment and materials

Products and materials which are assumed to be not a component of a typical workshop in an industrial standard are considered special tools, devices and materials. At the stage of "Maintenance" there is no need to use special tools, equipment and materials.

Table 17: Special tools, equipment and materials

Name	Appearance	Use	Manufacturer
Manual lubrication press		Supplying lubrication points with a lubricant	-






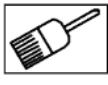

8.8.5.2 Lubricants

Only lubricants specified by the manufacturer should be used so as not to degrade perfect accessibility of the fan. Specifications of lubricants are included in the chapter "Lubrication schedule" and assigned to lubrication points.

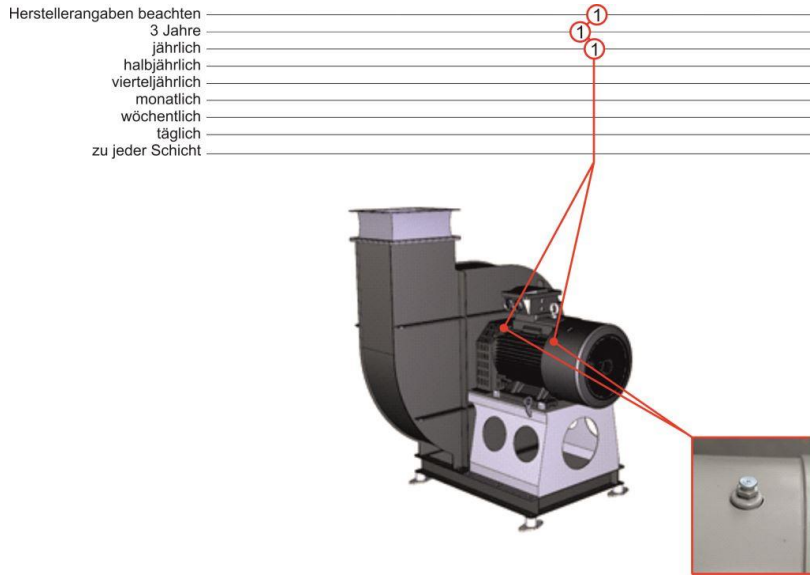
The bearings are filled with a suitable quantity of grease at the factory and are ready for operation. The types of grease presented below are standard lubricants. If other lubricants are to be used, they are listed in the "Addendum to the operating manual" or in the "Instructions for the job". Lubrication is carried out using a manual lubrication press, available commercially (see Table 1718: Special tools, equipment and materials).

8.8.5.3 Symbols in lubrication schedules



Table 18: Explanation of symbols in lubrication schedules

						
Check the level	Fill	Replace	Lubricate with oil	Lubricate with a grease press	Lubricate with a brush	Shower

8.8.5.4 Lubrication schedule



Lubrication schedule

Lubrication point number:	1	
Objects:	Electric motor	
Type :	see nameplate for lubrication	
Lubrication point:	2 x M 10x1 grease nipple	
Graphic designation		
Type of interference		
Check and possibly top up	see nameplate for lubrication	
Lubricate	-	
Clean or replace	-	
Replace	-	
Grease (DIN 51825)		
Container capacity	-	
Individual lubrication instructions	Lubrication according to the manufacturer's (electric motor) data	

8.8.6 After maintenance activities

After completing maintenance work and before turning on the fan, perform the following steps:

- Make sure that all components removed during maintenance work are reassembled.
- Make sure that any tools, materials and other equipment used are removed from the work area.
- Clean the work area and dispose of any leakage of consumables.

8.9 Repair

Fan repairs generally require the involvement of the manufacturer or an authorized representative. These persons are able to ensure that only original spare parts are used and that the fan life span is extended. In order to obtain technical information and purchase spare parts, please provide all data indicated on the nameplate.

8.9.1 Performing repairs

Before starting the repair:

- Disconnect the electrical components from the mains supply.
- Prepare the area of work and all the necessary elements for the planned course of work.
- Prepare equipment necessary for installation / dismantling and tools.
- Keep the workplace clean and tidy.
- Prepare spare parts, only these recommended or provided by the manufacturer.
- Special operating instructions must be followed.

Before performing the repair:

- Before removing screw connections:
 - Protect the disassembled elements from falling.
- Before removing the elements:
 - Protect the fan from tipping over.
- Before removing the chains / ropes:
 - Relax the chains / ropes.
 - Secure the chain / rope against unwinding.
- First, connect / disconnect previously disconnected electrical components.
- Then disconnect the elements of the hydraulic / pneumatic system, after depressurization.
- Remember about the weight of the removable elements. If necessary, use appropriate devices, e.g. cranes or forklifts.
- Please refer to the specific manufacturer's specifications for bolted connections (tightening torques, bolt retaining, etc.).

After performing the repair:

- The fan should be started only after it has been approved by an authorized person.
- Replaceable parts should be disposed of in a manner consistent with the regulations.

8.9.2 Repairs of the fan

Fan repairs are performed to restore its functionality and reliability.

Risk caused by lifting and transporting fan components in an inappropriate way



The result of lifting and transporting the fan components in an inappropriate way may be injuries and destruction of these components.

- Use only hoists, slings and fasteners with sufficient load capacity.
- For transporting and lifting the fan, use the holes provided for this purpose for transport lugs, slings and fasteners which should be in perfect condition. It is possible to fasten only in the intended fixing points of the transport lugs.
- Do not tie wire ropes and chains.
- Do not connect ropes by binding them.
- Twisted ropes should be straightened before lifting.
- Do not allow ropes to bend sharply.
- Make sure that thimbles, rope eyes, rings and other elements of the slings are freely movable on the hooks.
- Do not carry loads over people.
- Any auxiliary lugs, for example at the drive, etc. are only suitable for suspending individual components.



Risk of electric shock

It is possible to touch live components and cause fatal injuries.

- Follow the documentation of the electric motor.
- Disconnect the electrical components from the mains supply. The electrical components include, among others, the main switch, the power switch and the automatic fuse.
- On the duration of the activity the circuits disconnected from the mains supply should be earthed.
- On the duration of the activity the circuits disconnected from the mains supply should be shorted.
- Adjacent live parts must be shielded or isolated.
- Place appropriate warning signs.
- Ensure that there is no voltage at all in the area of operation.
- After performing the activities, proper functioning of the areas should be ensured so that there are no defects.
- After performing the activities, remove any protections (bridges, etc.).



Warning against burns

Fan housing becomes hot during operation.

- Do not touch the fan until the housing has cooled down.

Damage caused by the use of non-original spare parts



The use of non-original spare parts can cause damage to the fan and thus expose personnel to the injury.
 – Only use original parts.

8.9.3 Spare Parts

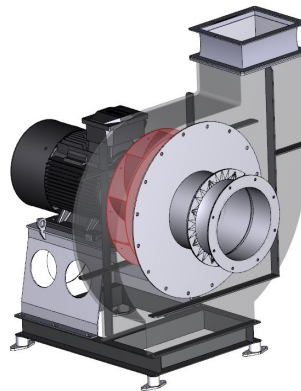
When ordering spare parts, please provide the following information:

- Series designation
- Type designation
- Serial number

The type designation and serial number can be found on the nameplate.

Alternatively, it is possible to send a specimen of the part requiring replacement to the manufacturer.

8.9.4 Impeller replacement



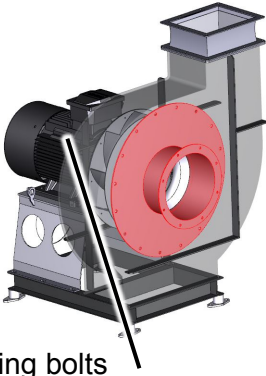
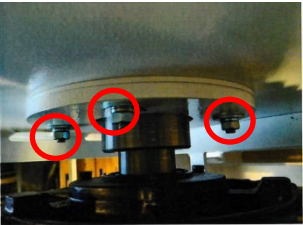

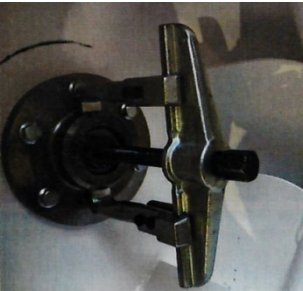
Necessary tools and materials

	<p>– Puller</p>
	<p>– Lead screw (tensioning device)</p>

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Disassembling the impeller

To disassemble the impeller, perform the steps given below.

 <p>Fixing bolts</p>	<p>1. Remove the fixing bolts that secure the intake nozzle or housing cover.</p>
 <p>Fixing nuts</p>	<p>2. Remove the intake nozzle or housing cover. 3. Loosen the nuts that secure the hub seal.</p>
 <p>Lock screw</p>	<p>4. Loosen the lock screw securing the impeller hub.</p>
	<p>5. Fit the puller to pull the impeller.</p>
	<p>6. Slowly pull the impeller using the puller from the shaft journal.</p> <p>Note: Axial impacts during pull-off are unacceptable due to the possibility of damage to the bearing. During pull-off, the impeller must be secured against tilting and falling.</p>
	<p>7. Remove the impeller and place it in the right place.</p>
	<p>Result: The impeller is disassembled.</p>



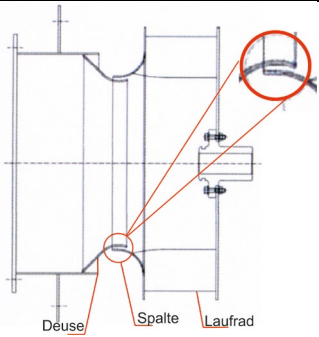

Mounting the impeller

To disassemble the impeller, perform the steps given below.

Note:

Axial impacts during pull-off are unacceptable due to the possibility of damage to the bearing. During mounting, the impeller must be secured against tilting and falling.

Before pulling the impeller on, lubricate the shaft journal with a thin layer of oil or graphite paste.

	<p>1. Slide the end disk onto the lead screw.</p>
	<p>2. The impeller should be placed centrally on the shaft journal. To do this, use appropriate lifting equipment.</p> <p>Note: The fitting key should be inserted flush with the groove.</p>
	<p>3. Screw in the lead screw with the previously installed hexagonal nut.</p>
	<p>4. Pull the impeller on by turning the hexagonal nut clockwise to the shaft flange.</p>
	<p>5. Unscrew the hexagonal nut and unscrew the lead screw.</p>
	<p>6. The impeller must be secured axially with the end disc, spring spacer and fastening bolt. The correct tightening torques in chapter 11.1 "Tightening torques for fastening bolts" must be observed.</p>
	<p>7. Mount the intake nozzle and secure it with fixing bolts. The correct tightening torques in chapter 11.1 "Tightening torques for fastening bolts" must be observed.</p> <p>Note: The gap between the impeller and the intake nozzle should be identical over the whole circumference. Check the free running of the impeller (turn 1x with hand).</p>
 <p style="text-align: center;">Fixing nut</p>	<p>8. Tighten the fixing nut of the hub seal.</p>
	<p>Result: The impeller is mounted.</p>

9 De-commissioning of the fan

Fan de-commissioning generally require the involvement of the manufacturer or an authorized representative. In this case, an option of fan re-commissioning is provided.

9.1 Safety rules

Disconnection of the fan from the mains

If during the de-commissioning there is no professional and complete disconnection from the mains, there is a risk of material and personal damage.

- When disconnecting the fan from the mains, make sure that it is safely disconnected from the grid to prevent unintentional activation.

9.2 Personal protective equipment



Hand protection

An order to wear protective gloves when performing activities in conditions of risk of injury, such as cutting, sticking, clamping, the effect of temperature or harmful substances.



Foot protection

An order to wear foot protection when performing activities in conditions of risk of falling or cramping objects, walking on sharp objects, effects of temperature or harmful substances.



Protective clothing

When performing activities where there is a risk of high temperature, free movement of particles or leakage of liquid.

9.3 Special tools, equipment and material

Products and materials which are assumed to be not a component of a typical workshop in an industrial standard are considered special tools, devices and materials. At the stage of "Decommissioning" there is no need to use special tools, equipment and materials.

9.4 Activities and qualifications

Table 19: De-commissioning – Activities and qualifications

Activity	Qualification
Activities related to the de-commissioning of mechanical components	Mechanical maintenance worker
Activities related to the de-commissioning of electrical components	Qualified electrical engineer
Activities, related to the de-commissioning of control and regulatory components.	Qualified personnel who are authorized to perform activities related to control and regulatory components
Cleaning (except for live parts)	Cleaning personnel
Cleaning live parts (interior of the control cabinet)	Qualified electrical engineer
Coordination of various activities	An employee authorized to give instructions

9.5 De-commissioning of the fan

The de-commissioning of the fan consists in its removal from the operating environment and disconnection from the supplying media. Further activities can be dismantling or restarting in the same location.

Risk of electric shock



It is possible to touch live components and cause fatal injuries.

- Follow the documentation of the electric motor.
- Disconnect the electrical components from the mains supply. The electrical components include, among others, the main switch, the power switch and the automatic fuse.
- On the duration of the activity the circuits disconnected from the mains supply should be earthed.
- On the duration of the activity the circuits disconnected from the mains supply should be shorted.
- Adjacent live parts must be shielded or isolated.
- Place appropriate warning signs.
- Ensure that there is no voltage at all in the area of operation.
- After performing the activities, proper functioning of the areas should be ensured so that there are no defects.
- After performing the activities, remove any protections (bridges, etc.).

WARNING against burns



Fan housing becomes hot during operation.

- Do not touch the fan until the housing has cooled down.

10 Dismantling

The dismantling of the fan consists in its disassembly into individual components, which is necessary for the purpose of its implementation. Further activities can be scrapping or restarting in the same location.

10.1 Safety rules

Staying under a suspended load

The suspended load may break off, it is possible that it swings or catches persons. This can result in serious injury of the personnel and material damage.

- Do not stand below a suspended load.
- Never stay within the range of the suspended load.
- Components should be hung on the appropriate fastening elements and properly secured

De-commissioning of the fan

Performing further dismantling work on a fan that has not been fully decommissioned may cause serious injury.

- Further dismantling work is possible only after complete decommissioning.
- Dismantling should only be carried out after approval by an authorized body.

10.2 Personal protective equipment



Hand protection

An order to wear protective gloves when performing activities in conditions of risk of injury, such as cutting, sticking, clamping, the effect of temperature or harmful substances.



Foot protection

An order to wear foot protection when performing activities in conditions of risk of falling or cramping objects, walking on sharp objects, effects of temperature or harmful substances.



Protective clothing

When performing activities where there is a risk of high temperature, free movement of particles or leakage of liquid.

10.3 Special tools, equipment and material

Products and materials which are assumed to be not a component of a typical workshop in an industrial standard are considered special tools, devices and materials. At the stage of "Dismantling" there is no need to use special tools, equipment and materials.

10.4 Activities and qualifications

Table 20: Dismantling – Activities and qualifications

Activity	Qualification
Activities related to disassembly of mechanical components	Mechanical maintenance worker
Activities related to disassembly of electrical components	Qualified electrical engineer
Activities related to disassembly of control and regulatory components.	Qualified personnel who are authorized to perform activities related to control and regulatory components
Coordination of various activities	An employee authorized to give instructions

10.5 Dismantling of the fan

The dismantling of the fan generally requires the involvement of the manufacturer or an authorized representative. In such case, an option of fan re-assembling and commissioning is provided.

i *Only after all work related to the de-commissioning of the fan has been done, and after approval by an authorized specialist, it is possible to start dismantling. If it is planned to dismantle the fan at the time of its transfer and re-positioning in another destination, the necessary actions may be performed only by qualified personnel of the manufacturer.*

Risk caused by lifting and transporting in an inappropriate way



The result of lifting and transporting the fan components in an inappropriate way may be injuries and destruction of these components.

- Use only hoists, slings and fasteners with sufficient load capacity.
- For transporting and lifting the fan, use the holes provided for this purpose for transport lugs, slings and fasteners which should be in perfect condition. It is possible to fasten only in the intended fixing points of the transport lugs.
- Do not tie wire ropes and chains.
- Do not connect ropes by binding them.
- Twisted ropes should be straightened before lifting.
- Do not allow ropes to bend sharply.
- Make sure that thimbles, rope eyes, rings and other elements of the slings are freely movable on the hooks.
- Do not carry loads over people.
- Any auxiliary lugs, for example at the drive, etc. are only suitable for suspending individual components.

ATTENTION

WARNING against damage resulting from improper storage

If you plan to mount the fan again after some time, remember that improper storage can cause damage.

- All components must be protected against corrosion.
- The fan should be covered.

10.5.1 Disposal (scope of application: EU Member States)



The producer offers the receipt of electrical and electronic components for the purpose of their disposal in a lawful manner. Shipping costs are borne by the sender.

All components belonging to the fan, together with electrical and electronic components and consumables present in the fan and intended to bring it to readiness for work require only disposal in a manner consistent with the law. Their disposal together with household waste or ordinary industrial waste is strictly prohibited!

Electrical and electronic components:

For the disposal of electrical and electronic components, the European Directive 2002/96/EC on electric and electronic waste and its transposition into applicable national law shall apply. According to its provisions, electrical and electronic products shall be collected separately and recycled in an environmentally friendly way.

Consumables:

When disposing of consumables, please follow the waste key numbers contained in the content of the safety data sheets. Waste key numbers are a recommendation, unambiguous determination should be made after possible consultation with the appropriate facility. The disposal instructions apply to the product and its residues after its use in a manner consistent with its intended use. Mixing with other materials or preparations requires individual evaluation.



Oils, greases or cleaners contaminated with oils or greases should be collected in a manner consistent with the law in appropriately marked containers, ensuring appropriate methods for the disposal of these materials.

10.5.2 Disposal (scope of application: countries other than EU Member States)

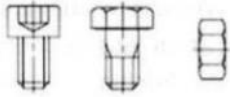
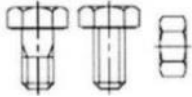


During all disposal procedures, the applicable legal bases and regulations regarding waste disposal must be followed.

11 Annex

11.1 Tightening torques for fastening bolts

The tightening torques of the fastening bolts in the table below must be considered if the manufacturer's and subcontractor's documentation does not prescribe specific values for the fastening bolts and nuts.

Size in mm	Steel bolts and nuts with metric thread and head dimensions according to DIN EN ISO 4762, DIN EN 24014, DIN EN 24032, etc.					Steel bolts and nuts DIN EN 24014, 24017, 24032 with A2/A4 strength class -70			Bolted connections HV DIN 6914 / 6915	
										
	Material								Material	
	4.6	5.6	8.8	10.9	12.9				hot dip galvanized	black lightly covered with oil
MA in NM, coefficient of friction = 0,14 μ										
M4	0.9	1.2	2.7	3.9	4.6					
M5	1.8	2.4	5.3	7.8	9	3.8				
M6	3.1	4.1	9	13.5	16.2	6.6				
M8	7.6	9.9	23	32	39	15.8				
M10	15	20	44	65	75	31.5				
M12	26	35	77	112	130	54			90	108
M14	41	56	121	180	211					
M16	64	85	189	279	328	130			225	315
M18	87	117	270	387	450					
M20	124	166	382	550	639	253			405	540
M22	167	225	522	740	864				585	810
M24	211	283	657	945	1098	242			720	990
M27	315	423	990	1395	1620				1125	1485
M30	427	571	1305	1890	2205				1485	1980
M33	580	778	1800	2520	3060				1980	2430
M36	972	1296	2340	3330	3870				2520	3420
M39	1197	1602	3060	4320	5040					

11.2 Limit values of vibrations

The indicated warning values and values resulting in disabling, in relation to the ambient temperature of 40 °C and the installation height up to 1000m, are the maximum values that can be exceeded in individual cases. In this case, the manufacturer's approval should be sought.

Assessment criteria for vibration according to ISO 14694 or DIN ISO 10816-3.

In the event of vibrations occurring between the limits of warning and disabling values, it is possible to operate the fan under supervision until it is possible to find time for a regular shutdown of the process.

Table 21: Limit values of vibrations according to ISO 14694

Maximum permissible vibration speed		
Limit values according to ISO 14694:2003 (E) - Kategorie BV-3		
	Rigidly mounted [mm/s]	Flexibly mounted [mm/s]
	Effective value [r.m.s]	Effective value [r.m.s]
At installation		
Start-Up	4,5	6,3
Alarm	7,1	11,8
Shutdown	9,0	12,5

Table 22: Limit values of vibrations according to DIN ISO 10816-3

Maximum permissible vibration speed						
Limit values according to DIN ISO 10816-3						
Group of machinery	Motor power KW	Design or setup method	Evaluation zones			
			A	B	C	D
			New product condition	Continuous mode	Permissible short-term	Impermissible
			eff. speed v_{eff} in mm/s			
2	> 15 ≤ 300	rigid	≤ 1.4	1,4 – 2,8	2,8 – 4,5	> 4,5
		flexible	≤ 2.3	2,3 – 4,5	4,5 – 7,1	> 7,1
1	> 300	rigid	≤ 2.3	2,3 – 4,5	4,5 – 7,1	> 7.1
		flexible	≤ 3.5	3,7 – 7,1	7,1 – 11	> 11

12 Declaration of incorporation according to Annex II 1 A Declaration of conformity according to EVPG § 4 passage 1

EN

The manufacturer

Elektror airsystems Sp. z.o.o
Leśna 38
41-506 Chorzów, Polen

Hereby declares that the product to which this declaration refers, meets the basic requirements of the Machinery Directive **(2006/42/EG)** as set forth below.

Description of the incomplete machine:

CFL1, CFL2, CFM1, CFM 2, CFH1, CFH2, CFH3, CFXH, CFXH1, CFXH2, CFMT, CFMT1,CFMT2, CFM1D, CFH1D

Description of the essential requirements of Machinery Directive **(2006/42/EG)**, with which the partially completed machine complies:

Machine directive **(2006/42/EG)**: Annex I, Articles 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.3, 1.3.4, 1.3.7, 1.5.1, 1.6.1, 1.7.1, 1.7.3.

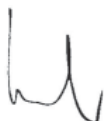
The partially completed machine described here continues to fulfil the protective regulations of the Low Voltage Directive **(2014/35/EU)** according to Annex I, No. 1.5.1 of the Machinery Directive. The commissioning of the partially completed machine is not permitted until it has been verified that the machine in which the partially completed machine is to be installed, complies with the provisions of the Machinery Directive **(2006/42/EG)**.

The following harmonized standards were applied:

DIN EN ISO 12100	2011	Safety of machinery – General principles of design Risk assessment and risk reduction
EN 60204-1	2014	Safety of machinery – Electrical Equipment of machinery Part 1: General requirements
EN 61000-6-2	2011	Electromagnetic compatibility (EMC) Part 6-2: Generic standards immunity – for Industrial Environments
EN 61000-6-3	2011	Electromagnetic compatibility (EMC) Part 6-3: Emission standard for residential, commercial and light industrial environments

Furthermore, we declare that the technical documentation for this machinery was drawn up in accordance with Annex VIII, Module A and we undertake, upon request, to provide the Market surveillance authorities with these documents through our documentation department.

The officer in charge of the documentation is Mr. Kevin Kargar, Tel.: +49 711 31973-1179



Kreher (Managing Director) – 17/10/2019