



Operating Instructions

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1. SAFETY REGULATIONS AND INFORMATION

Please read these operating instructions carefully before starting work on the device. Observe the following warnings to prevent malfunctions or danger to persons. These operating instructions are to be regarded as part of the device. The device is only to be sold or passed on together with the operating instructions. These operating instructions may be duplicated and distributed to inform about potential dangers and their prevention.

1.1 Hazard levels for warning

These operating instructions use the following hazard levels to indicate potentially hazardous situations and important safety regulations:



DANGER

Indicates an imminently hazardous situation which will result in death or serious injury if the specified actions are not taken. Compliance with the instructions is imperative.

WARNING

Indicates a potentially hazardous situation which can result in death or serious injury if the specified actions are not taken. Exercise extreme caution while working.

CAUTION

Indicates a potentially hazardous situation which can result in minor or moderate injury or damage to property if the specified actions are not taken.

NOTE

A potentially harmful situation can occur and, if not avoided, can lead to property damage.

1.2 Staff qualification

The device may only be transported, unpacked, installed, operated, maintained and otherwise used by suitably qualified, trained and authorised technical staff. Only authorised specialists are permitted to install the device, to carry out a test run and to perform work on the electrical installation.

1.3 Basic safety rules

The safety hazards associated with the device must be assessed again following installation in the final product.

Note the following when working on the device:

- Do not perform any modifications, additions or conversions on the device without the approval of ebm-papst A&NZ.

1.4 Voltage

- Check the electrical equipment of the device at regular intervals, see Chapter 5.2 Safety test.
- Replace loose connections and defective cables immediately.



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DANGER Electrically charged device

Risk of electric shock
→ When working on an electrically charged device stand on a rubber mat.

WARNING Live terminals and connections even with deviceswitched off

Electric shock
→ Wait five minutes after disconnecting the voltage at all poles before opening the device.

CAUTION In the event of failure, the rotor and the impeller will be energised

The rotor and the impeller have basic insulation.
→ Do not touch the rotor and impeller once installed.

CAUTION The motor restarts automatically when operating voltage is applied, e.g. after a power failure.

Risk of injury
→ Keep out of the device's danger zone.
→ When working on the device, switch off the line voltage and ensure that it cannot be switched back on.
→ Wait until the device comes to a stop.
→ After working on the device, remove any used tool or other objects from the device.
→ Install the externally wired thermal overload protector in the control circuit so that following a malfunction the motor does not switch on again automatically after cooling off.

1.5 Safety and protective features



DANGER Protective device missing and protective device not functioning

Without a protective device there is a risk of seriously injury, for instance when reaching into the device during operation.

- Operate the device only with a fixed protective device and guard grille.
- The fixed protective device must be able to withstand the kinetic energy of a fan blade that becomes detached at maximum speed. There must not be any gaps which it is possible to reach into with fingers, for example.
- The device is a built-in component. As the operator, you are responsible for ensuring that the device is secured adequately.
- Stop the device immediately if you notice a missing or ineffective protective device.

1.6 Mechanical movement



DANGER Rotating device

Risk of injury to body parts coming into contact with the rotor or the impeller.
→ Secure the device against accidental contact.

- Before working on the system/machine, wait until all parts have come to a standstill.

WARNING Rotating device

Long hair, loose items of clothing and jewellery and the like can become entangled and be pulled into the device. Injuries can result.

- Do not wear any loose-fitting clothing or dangling clothing or jewellery while working on rotating parts.
- Protect long hair with a cap.

1.7 Emission

WARNING Depending on the installation and operating conditions, the sound pressure level may exceed 70 dB(A).

Risk of noise-induced hearing loss
→ Take appropriate technical safety measures.
→ Protect operating personnel with appropriate safety equipment such as hearing protection.
→ Also observe the requirements of local agencies.

1.8 Hot surface



CAUTION High temperature on motor housing

Risk of burns
→ Ensure sufficient protection against accidental contact.

1.9 Transport

NOTE Transporting the device

- Transport the device in its original packaging only.
- Secure the device so it cannot slip, e.g. by using a clamping strap.

1.10 Storage

- Store the device, partially or fully assembled, in a dry place, protect against the weather and free from vibration, in the original packing in a clean environment.
- Protect the device against environmental effects and dirt until final installation.
- We recommend storing the device for no longer than one year in order to guarantee trouble-free operation and the longest possible service life.
- Even devices explicitly intended for outdoor use are to be stored as described prior to commissioning.
- Maintain the storage temperature, see Chapter 3.5 Transport and storage conditions.
- Make sure that all cable glands are fitted with dummy plugs.



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2. INTENDED USE

The device is exclusively designed as a built-in device for conveying air according to its technical data.

Any other usage above and beyond this does not conform with the intended purpose and constitutes misuse of the device.

Customer equipment must be capable of withstanding the mechanical and thermal stresses that can arise from this product. This applies for the entire service life of the equipment in which this product is installed.

Intended use also includes

- Using the device only in stationary systems
- Conveying air at an ambient air pressure between 80kPa and 105kPa.
- Using the device within the permitted ambient temperature range, see Chapter 3.5 Transport and storage conditions and Chapter 3.2 Nominal data.
- Operating the device with all protective devices.
- Following the operating instructions.

Improper use

In particular, operating the device in the following ways is prohibited and could be hazardous:

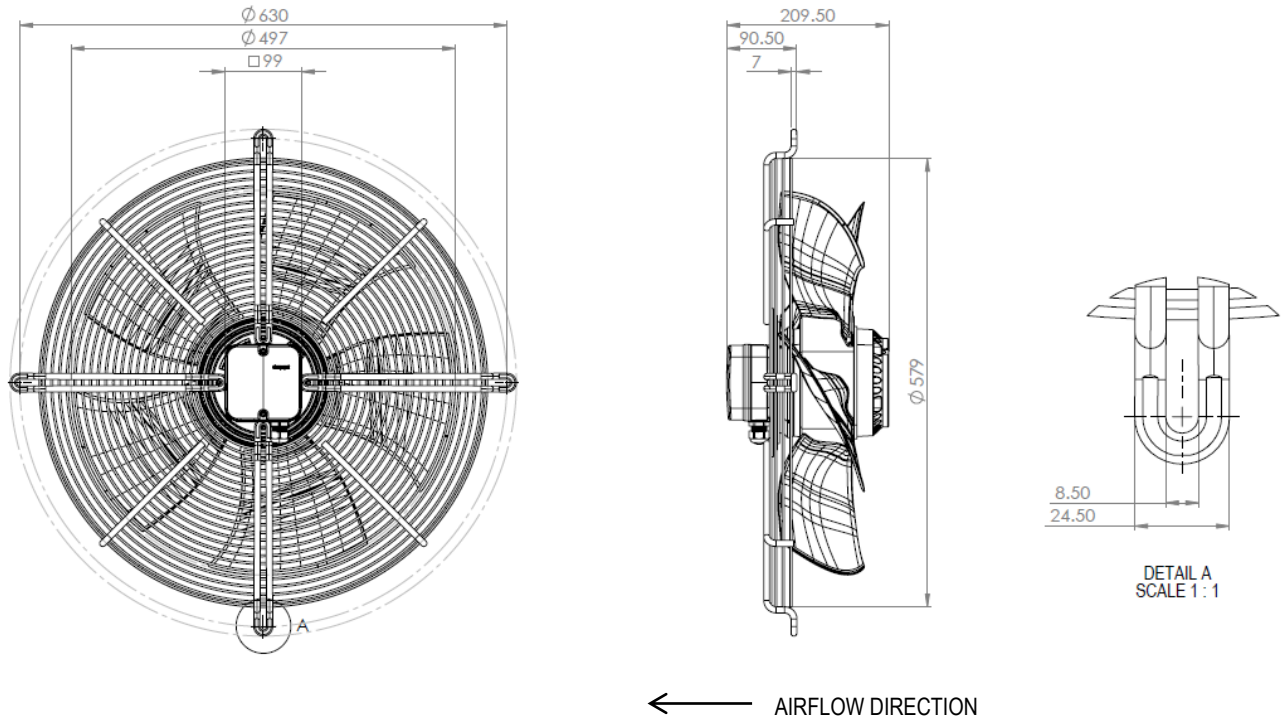
- Operating the device in an unbalanced state, e.g. due to dirt deposits or ice formation.
- Resonant operation, operation with severe vibration. This also includes vibration transmitted to the fan from the customer installation.
- Operation in medical equipment with a life-sustaining or life-support function.
- Conveying solids in the flow medium.
- Painting the device
- Connections (e.g. screws) coming loose during operation.
- Opening the terminal box during operation.
- Conveying air that contains abrasive particles.
- Conveying highly corrosive air, e.g. salt spray. Exception: devices designed for salt spray and correspondingly protected.
- Conveying air with high dust content, e.g. suctioning off sawdust.
- Operating the device close to flammable materials or components.
- Operating the device in an explosive atmosphere.
- Using the device as a safety component or to perform safety-related functions.
- Operation with completely or partially disassembled or manipulated protective devices.
- In addition, all applications not listed among the intended uses.



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3. TECHNICAL DATA

3.1 Product drawing



All dimensions are in mm

Direction of air flow "V"

Fan cable requirement

Power supply cable diameter: min 6mm, max 12 mm, tightening torque for cable gland 2 ± 0.3 Nm.

Fan terminal box requirements

Tightening torque 1.5 ± 0.2 Nm for 2x screws on lid.



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3.2 Nominal data

Motor	M4E110-GF	
Phase	1~	1~
Nominal voltage / VAC	230	230
Frequency / Hz	50	60

Method of obtaining data	maximum load	running at free air
Valid for approval / standard	CE	CE
Speed / rpm	1300	1400
Power input / W	680	880
Current draw / A	3.0	3.88
Capacitor / μ F	12	12
Capacitor voltage / VDB	450	450
Max. back pressure / Pa	150	100
Min. ambient temperature / °C	-40	-40
Max. ambient temperature / °C	65	40
Starting current / A	6.65	6.0
Max. Safe operating speed / rpm	1920 @ 55°C	1920 @ 55°C

Subject to alterations

3.3 Technical description

Mass	TBC kg
Size	500 mm
Rotor surface	Painted black
Terminal box material	PP plastics
Blades material	Press-fitted sheet steel blank, sprayed with PP plastic
Guard grille material	Steel, coated in black plastic (RAL9005)
Number of blades	5
Airflow direction	"V"
Direction of rotation	Counter clockwise, viewed towards rotor
Degree of protection	IP 54
Moisture (F) / Environmental (H) protection class	H2
Installation position	Shaft horizontal or rotor on bottom; rotor on top on request
Condensate drainage holes	Rotor-side
Mode	S1
Motor bearing	Ball bearing
Touch current according to IEC 60990 (measuring circuit Fig. 4, TN system)	< 3.5 mA
Electrical connection	Via terminal box, capacitor integrated and connected
Motor protection	Thermal overload protector (TOP) internally connected
Cable exit	Axial
Protection class	I (with customer connection of protective earth)

Motor capacitor according to EN 60252-1 in safety protection class	S0
Conformity with standards	EN 61800-5-1



With regard to cyclic speed loads, note that the rotating parts of the device are designed for maximum of one million load cycles. If you have specific questions, contact ebm-papst A&NZ for support.

→ Use the device in accordance with its degree of protection.

Information on surface quality

The surfaces of the products conform to the generally applicable industrial standard. The surface quality may change during the production period. This has no effect on strength, dimensional stability and dimensional accuracy.

The colour pigments in the paints used perceptibly react to UV light over the course of time. This does not however in any way affect the technical properties of the products. The product is to be protected against UV radiation to prevent the formation of patches and fading. Changes in colour are not a reason for complaint and are not covered by the warranty.

3.4 Mounting data

Strength class of screws	8.8
--------------------------	-----

→ Secure the mounting screws against unintentional loosening (e.g. using self-locking screws).

Any further mounting data required can be taken from the product drawing.

3.5 Transport and storage conditions

Max. permitted ambient temp. for motor (transp./storage)	+ 80 °C
Min. permitted ambient temp. for (transp./storage)	- 40 °C



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4. CONNECTION AND START-UP

4.1 Mechanical connection



CAUTION
Cutting and crushing hazard when removing fan from packaging

- Carefully remove the device from its packaging, by the guard grille. Strictly avoid shocks.
- Wear safety shoes and cut-resistant safety gloves.



CAUTION
Heavy load when unpacking device

- Risk of physical injury, such as back injuries
- Two people should work together to remove the device from its packaging.



CAUTION
The blades of the impeller could be damaged

- Carefully set down the fan on a soft surface. Make sure the blades are not subjected to load. Following the installation, make sure the impeller moves easily and that the blades of the impeller are not deformed or bent and do not catch at any point.

NOTE

Damage to the device from vibration

- Bearing damage, shorter service life
- The fan must not be subjected to force or excessive vibration from sections of the installation. If the fan is connected to air ducts, the connection should be isolated from vibration, e.g. using compensators or similar elements. Ensure stress-free attachment of the fan to the substructure.

- Check the device for transport damage. Damaged devices are not to be installed.
- Install the undamaged device in accordance with your application.
- Do not perform any modifications, additions or conversions on the device. Replacing the terminal box is not permitted.



NOTE
Motor capacitor

- The product is equipped with a motor capacitor with safety protection class P0/S0 according to EN 60252-1. Take this into consideration when fitting it to the end product on the basis of applicable regulations.



CAUTION
Possible damage to the device

- If the device slips during installation, serious damage can result.
- Ensure that the device is securely positioned at its place of installation until all fastening screws have been tightened.
- The fan must not be strained on fastening

4.2 Electrical connection



DANGER
Voltage on the device

- Electric shock
- Always connect a protective earth first.
- Check the protective earth.



DANGER
Faulty insulation

- Risk of fatal injury from electric shock
- Use only cables that meet the specified installation regulations for voltage, current, insulation material, capacity, etc.
- Route cables so that they cannot be touched by any rotating parts.



DANGER
Electrical charge (>50µC) between phase conductor and protective earth connection after switching off supply with multiple devices connected in parallel

- Electric shock, risk of injury
- Ensure sufficient protection against accidental contact. Before working on the electrical connection, short the supply and PE connections.

CAUTION
Voltage

- The fan is a built-in component and has no disconnecting switch.
- Only connect the fan to circuits that can be switched off with an all-pole disconnection switch.
- When working on the fan, secure the system/machine in which the fan is installed so as to prevent it from being switched back on.

NOTE

Water ingress into wires or cables

- Water ingress at the customer end of the cable can damage the device.
- Make sure the end of the cable is connected in a dry environment.



- Only connect the device to circuits that can be switched off with an all-pole disconnection switch.

4.2.1 Requirements

- Check whether the information on the nameplate matches the connection data.
- If the motor run capacitor was not installed by ebm-papst, check whether the information on the motor run capacitor matches the information on the nameplate.
- Before connecting the device, make sure the power supply matches the information on the nameplate.
- Only use cables designed for the current level indicated on the nameplate. For determining the cross-section, note the sizing criteria according to EN 61800-5-1. The protective earth must have a cross-section equal to or greater than that of the phase conductor.
We recommend the use of 105°C cables. Ensure that the minimum cable cross-section is at least AWG26/0.13 mm².



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Protective earth contact resistance according to EN 61800-5-1

Compliance with the resistance specifications according to EN61800-5-1 for the protective earth connection circuit must be verified in the end application. Depending on the installation situation, it may be necessary to connect an additional protective earth conductor by way of the extra protective earth terminal provided on the device. The protective earth terminal is located on the housing and provided with a protective earth symbol and a hole.

4.2.2 Residual current circuit breaker (RCCB)



If the use of a residual current device (RCD) is required in your installation, only pulse-current and/or AC/DC-sensitive residual current devices (type A or B) are permissible. As with variable frequency drives, residual current devices cannot provide personal safety while operating the device.

4.2.3 Voltage control



With speed control using transformers or electronic voltage regulators (e.g. phase control), excessive current may occur. In addition, depending on how the device is installed, noises can occur with phase control.

4.2.4 Frequency inverter

Please sure a variable frequency drive only after consultation with ebm-papst.

When a variable frequency device is used for speed adjustment, the maximum safe operating speed (see 3.2 Nominal data) may not be exceeded.



For operation with variable frequency drives, install sinusoidal filters that work on all poles (phase-phase and phase-ground) between the drive and the motor. During operating with variable frequency drives, an all-pole sine filter protects the motor against high-voltage transients that can destroy the coil insulation system, and against harmful bearing currents.

Heating of the motor due to the use of a variable frequency drive must be checked in the application by the customer.

4.3 Connection in terminal box

4.3.1 Preparing cables for connection

Only strip the cable as far as necessary, ensuring that the cable gland is sealed and there is no strain on the connections. For tightening torques, see Chapter 3.1 Product drawing.



NOTE
Tightness and strain relief are dependent on the cable used.

→ This must be checked by the user.

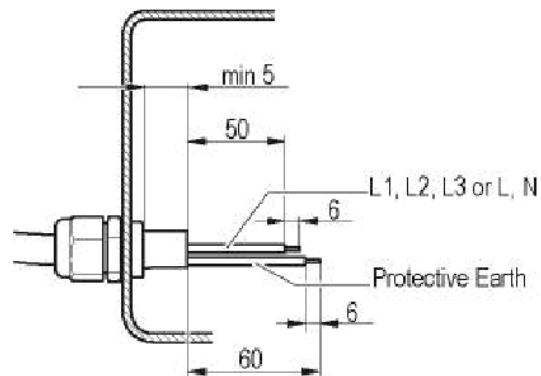


Fig. 1: Preparing cables for terminal box.

4.3.2 Connecting wires to terminals

- Remove the cap from the cable gland.
Only remove caps where cables are inserted.
- Route the wire(s) (not included in scope of delivery) into the terminal box.
- First connect the "PE" (protective earth).
- Connect the wires to the corresponding terminals.
- Connect the wires to the corresponding terminals
- Connect the thermal overload protector (TOP)
Use a screwdriver to do so.
When connecting, ensure that no wire ends fan out.
The terminal strip is equipped with a penetration guard
- Seal the terminal box.

4.3.3 Cable routing

Water must be prevented from reaching the cable gland along the cable.



NOTE
Damage caused by moisture penetration.
Moisture can penetrate into the terminal box if water is constantly present at the cable glands.
→ To prevent the constant accumulation of water at the cable gland, the cable should be routed in a U-shaped loop wherever possible. If this is not possible, a drip edge can be produced by fitting a cable tie directly in front of the cable gland for example.

Fans installed lying flat

Make sure the cable is routed in a U-shaped loop (water trap).



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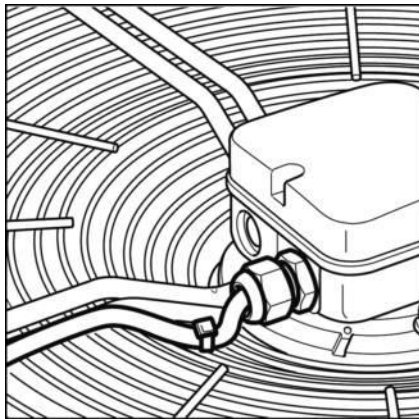


Fig. 2: Fan installed lying flat, cable routed as a water trap.

Fans installed in upright position

When routing the cable, make sure that the cable glands are located at the bottom. The cables must always be routed downwards.

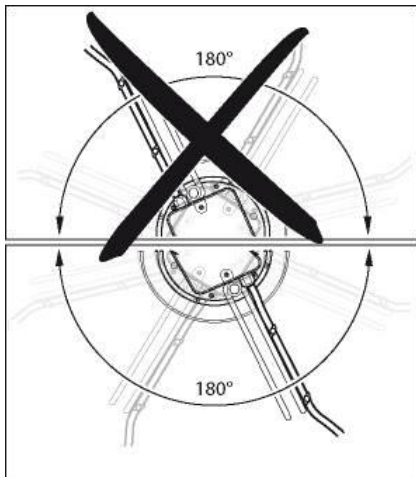


Fig. 3: Cable routing for fans installed upright.

4.3.4 Motor protection



CAUTION Voltage

- The device is a built-in component and has no disconnecting switch
- Connect the device to a suitable tripping unit.
- Only connect the device to circuits that can be switched off with an all-pole disconnection switch.
- When working on the device, secure the system/machine in which the device is installed so as to prevent it from being switched back on.

NOTE

Lack of motor protection

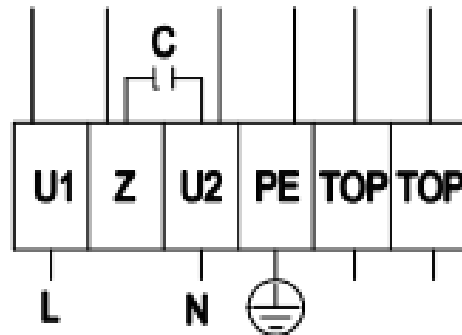
- Without motor protection, the motor can overheat and suffer damage
- Connect the thermal overload protector installed in the winding.

The motors are equipped with thermal overload protectors to protect the devices.

Check to make sure that the thermal overload protector is correctly connected before each operation.

Failure to connect the thermal overload protector is correctly will void your warranty claim.

4.4 Connection diagram



Label	Colour	Function / assignment
L	U1 = blue	Live
Z	brown	
N	U2 = black	Neutral
PE	green/ yellow	Protective earth
TOP	Grey	Thermal overload protection

4.5 Opening additional cable glands

A second cable gland opening can be made in the terminal box.

WARNING

In event of a fault, the cable gland is energised

Electric shock

→ Do not use metal cable glands with plastic terminal boxes.

- Screw the cable gland into the pre-cut thread using a wrench. When doing so, take note of the tightening torques, see Chapter 3.1 Product drawing.
- Remove the plastic tab that falls off inside the terminal box when it is penetrated.

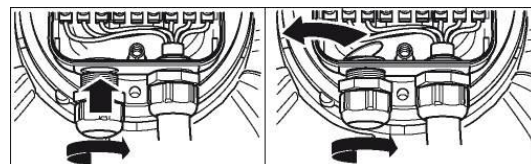


Figure 4: Screwed cable gland opening



NOTE

Tightness and strain relief are dependent on the cable used.

→ This must be checked by the user.



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4.6 Checking connections

- Ensure isolation from supply (all phases).
- Make sure a restart is impossible.
- Check the cables for proper fit.
- Screw the terminal box cover closed back on again. Terminal box tightening torque, see Chapter 3.1 Product drawing.
- Make sure the terminal box is correctly closed and sealed and that all screws and cable glands are properly tightened.

4.7 Switch on the device

The device may only be switched on if it has been installed properly and in accordance with its intended use, including the required safety mechanisms and professional electrical connections. This also applies for devices which have already been equipped with plugs and terminals or similar connectors by the customer.



WARNING
Hot motor housing
Risk of fire

→ Ensure that no combustible or flammable materials are located close to the fan.

- Before switching on, check the device for visible external damage and make sure the protective devices are functional.
- Check the fan's air flow paths for foreign matter and remove any foreign matter found.
- Apply the nominal supply voltage.



NOTE
Damage to the device from vibration
Bearing damage, shorter service life

→ Low-vibration operation of the fan must be ensured over the entire speed control range. Severe vibration can arise for instance from inexpert handling, transportation damage and resultant imbalance or be caused by component or structural resonance. Speed ranges with excessively high vibration levels and possibly resonant frequencies must be determined in the course of fan commissioning. Either run through the resonant range as quickly as possible with speed control or find another remedy. Operation with excessively high vibration levels can lead to premature failure.

4.8 Switching off the device

- Disconnect the device from the power supply at the supply line's main switch.
- When disconnecting, be sure to disconnect the ground connection last.

5. MAINTENANCE, MALFUNCTIONS, POSSIBLE CAUSES AND REMEDIES

Do not perform any repairs on your device. Return the device to ebm-papst A&NZ for repair or replacement.

WARNING

Live terminals and connections even with device switched off

Electric shock

→ Wait five minutes after disconnecting the voltage at all poles before opening the device.

CAUTION

Electrical charge on capacitor after device is switched off

Electric shock, risk of injury

→ Discharge the capacitors before working on the device.

CAUTION

The motor restarts automatically when operating voltage is applied, e.g. after a power failure.

Risk of injury

→ Keep out of the device's danger zone.
→ When working on the device, switch off the mains supply voltage and ensure that it cannot be switched back on.

→ Wait until the device comes to a stop.

→ Install the externally wired thermal overload protector in the control circuit so that following aa malfunction the motor does not switch on again automatically after cooling off.



If the device is out of use for some time, e.g. when in storage, we recommend switching it on for at least two hours to allow any condensate to evaporate and to move the bearings.

Malfunction/fault	Possible cause	Possible remedy
Impeller not running smoothly	Imbalance in rotating parts	Clean the device; replace it if imbalance persists after cleaning. Make sure no weight clips are removed during cleaning.
Motor not turning	Mechanical blockage	Switch off, isolate from supply and remove mechanical blockage.
	Mains supply voltage faulty	Check mains supply voltage, restore power supply.
	Faulty connection	Isolate from supply, correct connection, see connection diagram.
	Thermal overload protector activated	Allow motor to cool off, locate and rectify cause of error, release restart lockout if necessary.



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	Unacceptable operating point	Check operating point.
Motor over temperature	Ambient temperature too high	Reduce ambient temperature if possible.
	Insufficient cooling	Improve cooling.



In the event of further malfunctions, contact ebm-papst A&NZ

5.1 Cleaning

NOTE

Damage to the device during cleaning.

Malfunctions possible

- Do not clean the device using a water jet or high-pressure washer.
- Do not use any cleaners containing acids, bases or solvents.
- Do not use any pointed or sharp-edged objects to clean.

5.2 Safety inspection

What to check	How to check	How often	What action
Check protection cover for damage and to ensure that it is intact	Visual inspection	At least every 6 months	Repair or replacement of device
Device for damage to blades and housing	Visual inspection	At least every 6 months	Replacement of the device
Fastening the cables	Visual inspection	At least every 6 months	Fasten
Fastening the protective earth terminal	Visual inspection	At least every 6 months	Fasten
Insulation of cables for damage	Visual inspection	At least every 6 months	Replace cables
Tightness of cable gland	Visual inspection	At least every 6 months	Retighten replace if damaged
Condensate discharge holes for clogging, where necessary	Visual inspection	At least every 6 months	Open holes
Welds for crack formation	Visual inspection	At least every 6 months	Replace device
Abnormal bearing noise	Acoustic	At least every 6 months	Replace device

5.3 Disposal

For ebm-papst, environmental protection and resource preservation are top priority corporate goals, ebm-papst operates an environmental management system which is certified in accordance with ISO 14001 and rigorously

implemented around the world on the basis of German standards.

Right from the development stage, ecological design, technical safety and health protection are fixed criteria.

The following section contains recommendations for ecological disposal of the product and its components.

5.3.1 Country-specific legal requirements



NOTE

Country-specific legal requirements

Always observe the applicable country-specific legal regulations with regard to the disposal of products or waste occurring in the various phases of the life cycle. The corresponding disposal standards are also to be heeded.

5.3.2 Disassembly

Disassembly of the product must be performed or supervised by qualified personnel with the appropriate technical knowledge.

The product is to be disassembled into suitable components for disposal employing standard procedures for motors.



WARNING

Heavy parts of the product may drop off. Some of the product components are heavy. These components could drop off during disassembly. This can result in fatal or serious injury and material damage.

- Secure components before unfastening to stop them falling.

5.3.3 Component disposal

The products are mostly made of steel, copper, aluminium and plastic.

Metallic materials are generally considered to be fully recyclable. Separate the components for recycling into the following categories:

- Steel and iron
- Aluminium
- Non-ferrous metal, e.g. motor windings
- Plastics, particularly with brominated flame retardants, in accordance with marking
- Insulating materials
- Cables and wires
- Electronic scrap, e.g. circuit boards

Only ferrite magnets and not rare earth magnets are used in external rotor motors from ebm-papst

Ferrite magnets can be disposed of in the same way as normal iron and steel.

Electrical insulating materials on the product, in cables and wires are made of similar materials and are therefore to be treated in the same manner.

The materials concerned are as follows:

- Miscellaneous insulators used in the terminal box
- Power cables
- Cables for internal wiring
- Electrolytic capacitors

Dispose of electronic components employing the proper procedures for electronic scrap.



Please contact ebm-papst for any other questions on disposal.