Operating instructions

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CONTENTS

1. SAFETY REGULATIONS AND NOTES

Please read these operating instructions carefully before starting to work with the device. Observe the following warnings to prevent malfunctions or physical damage to both property and people.
These operating instructions are to be regarded as part of this device. If the device is sold or transferred, the operating instructions must accompany it.
These operating instructions may be duplicated and forwarded for information about potential dangers and their prevention.

1.1 Levels of hazard warnings

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

DANGER
Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Compliance with the measures is mandatory.

WARNING
Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. Exercise extreme caution while working.

CAUTION
Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or damage of property.

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 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

Any safety hazards stemming from the device must be re-evaluated once it is installed in the end device.
Observe the following when working on the unit:

⇒ Do not make any modifications, additions or conversions to the device without the approval of ebm-papst.

1.4 Electrical voltage

⇒ Check the electrical equipment of the device at regular intervals, refer to chapter 5.2 Safety test.

⇒ Replace loose connections and defective cables immediately.

DANGER
Electrical load on the device
Risk of electric shock

→ Stand on a rubber mat if you are working on an electrically charged device.

WARNING
Terminals and connections have voltage even with a unit that is shut off
Electric shock

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

CAUTION
In the event of failure, there is electric voltage at the rotor and impeller
The rotor and impeller are base insulated.

→ Do not touch the rotor and impeller once they are installed.

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

→ Keep out of the danger zone of the device.

→ When working on the device, switch off the mains supply voltage and secure the latter from being switched on again.

→ Wait until the device stops.

→ Insert the brought-out thermal overload protector into the control circuit so that the cooled off motor does not switch on independently after a fault.

1.5 Safety and protective functions

DANGER
Protective device missing and protective device not functioning
Without a protective device there is a risk of serious injury, for instance if the hands reach or are sucked 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 the 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 a protective device is found to be missing or ineffective.

1.6 Electromagnetic radiation

Interference from electromagnetic radiation is possible, e.g. in conjunction with open and closed-loop control devices.
If unacceptable emission intensities occur when the fan is installed, appropriate shielding measures have to be taken by the user.

NOTE
Electrical or electromagnetic interferences after integrating the device in installations on the customer's side.

→ Verify that the entire setup is EMC compliant.

1.7 Mechanical movement

DANGER
Rotating device
Body parts that come into contact with the rotor and impeller can be injured.

→ 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, dangling items of clothing, jewellery and similar items can become entangled and be pulled into the device. Risk of injury.

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

1.8 Emission

WARNING
Depending on the installation and operating conditions, a sound pressure level greater than 70 dB(A) may arise.
Danger of noise-induced hearing loss

→ Take appropriate technical safety measures.

→ Protect operating personnel with appropriate safety equipment, e.g. hearing protection.

→ Also observe the requirements of local agencies.

1.9 Hot surface

CAUTION
High temperature at the motor housing
Danger of burn injuries

→ Ensure that sufficient protection against accidental contact is provided.

1.10 Transport

NOTE
Transport of device

→ Transport the device in its original packaging only.

→ Secure the device so that it does not slip, e.g. by using a clamping strap.

1.11 Storage

⇒ Store the device, partially or fully assembled, in a dry and weatherproof manner in the original packing in a clean environment.

⇒ Protect the device from environmental impacts and dirt until the final installation.

⇒ We recommend storing the device for a maximum up to one year to guarantee proper operation and longest possible service life.

⇒ Even devices explicitly suited for outdoor use are to be stored as described prior to being commissioned.

⇒ Maintain the storage temperature, see chapter 3.6 Transport and storage conditions.

1.12 Disposal

When disposing of the device, please comply with all relevant requirements and regulations applicable in your country.

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2. PROPER 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.

Proper use also includes:

- Conveying of air at an ambient air pressure of 750 mbar to 1050 mbar.
- Using the device in accordance with the permitted ambient temperature, see chapter 3.6 Transport and storage conditions and chapter 3.2 Nominal data.
- Operating the device with all protective features in place.
- Minding the operating instructions.

Improper use

Using the device in the following ways is particularly prohibited and may cause hazards:

- Operating the device with an imbalance, e.g. caused by dirt deposits or icing.
- Moving air that contains abrasive particles.
- Moving highly corrosive air, e.g. salt spray mist. Exceptions are devices that are intended for salt spray mist and protected accordingly.
- Moving air that contains dust pollution, e.g. suctioning off saw dust.
- Operating the device close to flammable materials or components.
- Operating the device in an explosive atmosphere.
- Using the device as a safety component or for taking on safety-related functions.
- Operation with completely or partially disassembled or modified protective features.
- In addition, all application options that are not listed under proper use.

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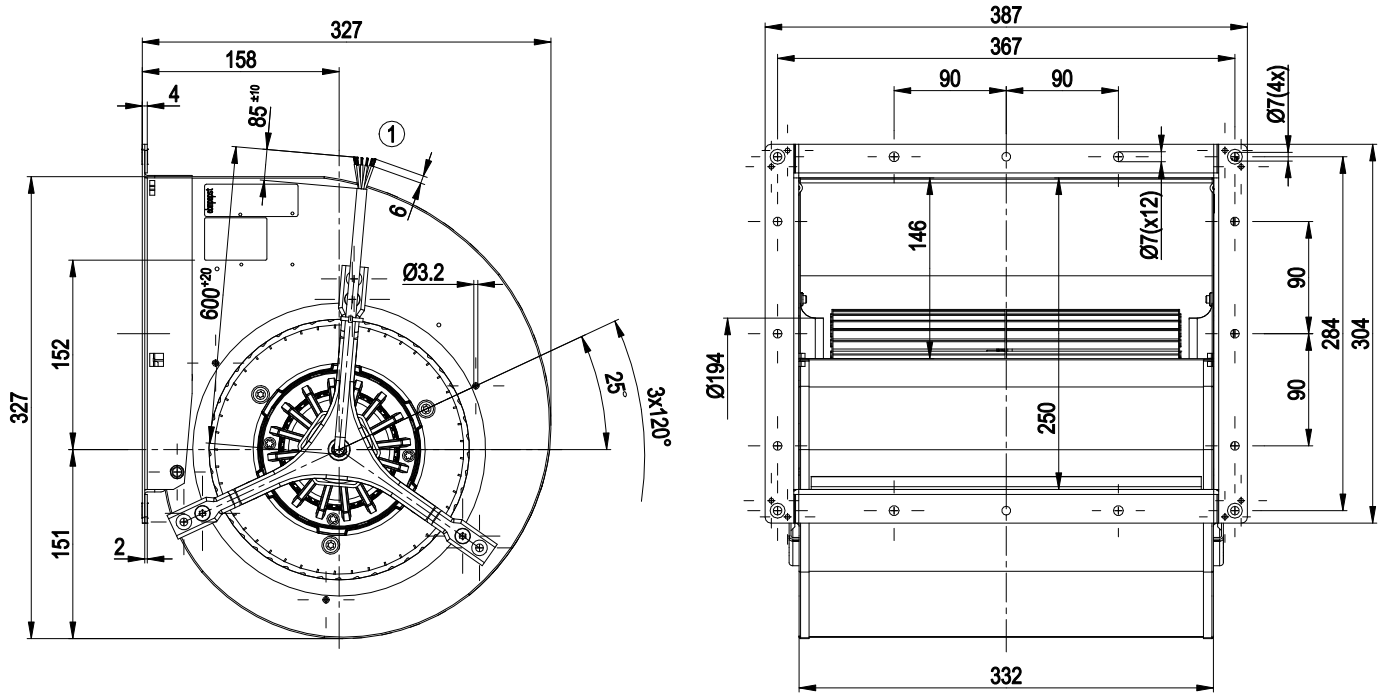
3. TECHNICAL DATA

3.1 Product drawing



All measures have the unit mm.

1	Connection line PFA 0.5 mm², 6x brass lead tips crimped

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3.2 Nominal data

Motor	M4E094-LA	
Phase	1~	1~
Nominal voltage / VAC	230	230
Frequency / Hz	50	60
Type of data definition	ml	ml
Valid for approval / standard	CE	CE
Speed / min^{-1}	1230	1370
Power input / W	1060	1120
Current draw / A	5.38	5.4
Motor capacitor / µF	10	10
Capacitor voltage / VDB	450	500
Min. back pressure / Pa	100	250
Min. ambient temperature / °C	-40	-40
Max. ambient temperature / °C	55	45
Max. safe operating speed / min^{-1}	1800	1800

ml = Max. load · me = Max. efficiency · fa = Running at free air
cs = Customer specs · cu = Customer unit

Subject to alterations

3.3 Data according to ErP directive

	Actual	Request 2015
Overall efficiency η_e / %	40.9	40.9
02 Measurement category	B	
03 Efficiency category	Total	
04 Efficiency grade N	49	49
05 Variable speed drive	No	
06 Year of manufacture	The year of manufacture is specified on the rating plate on the product.	
07 Manufacturer	ebm-papst Mulfingen GmbH & Co. KG County court Stuttgart · HRA 590344 D-74673 Mulfingen	
08 Type	D4E225-DH01-01	
09 Power input P_e / kW	0.52	
09 Air flow q_v / m³/h	2020	
09 Pressure increase total p_{sf} / Pa	371	
10 Speed n / min^{-1}	1415	
11 Specific ratio*	1.00	
12 Recycling/disposal	Information on recycling and disposal is provided in the operating instructions.	
13 Maintenance	Information on installation, operation and maintenance is provided in the operating instructions.	
14 Additional components	Components used to calculate the energy efficiency that are not apparent from the measurement category are detailed in the CE declaration.	

* Specific ratio = 1 + p_f / 100 000 Pa

Data definition with optimum efficiency. The ErP data is determined using a motor-impeller combination in a standardised measurement configuration.

3.4 Technical features

Mass	16.5 kg
Size	225 mm
Material of impeller	Sheet steel, hot-galvanised
Housing material	Sheet steel, hot-galvanised
Motor suspension	Motor anti-vibration mounted on both sides
Direction of rotation	Clockwise, seen on rotor
Type of protection	IP 10; (Motor); depending on installation and position
Insulation class	"F"
Humidity (F)/ environmental protection class (H)	F0
Mounting position	Any
Condensate discharge holes	None, open rotor
Operation mode	S1
Motor bearing	Ball bearing
Touch current acc. IEC 60990 (measuring network Fig. 4, TN system)	<= 3.5 mA
Motor protection	Thermal overload protector (TOP) brought out, basic insulation
Cable exit	Axial
Protection class	I (if protective earth is connected by customer)
Product conforming to standard	EN 60034-1 (2004); CE
Approval	CCC; EAC

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

3.5 Mounting data

For depth of screw, see chapter 3.1 Product drawing

⇒ Secure the mounting screws against accidentally coming loose (e.g. by using self-locking screws).

Strength class for mounting screws	8.8

You can obtain additional mounting data from the product drawing if necessary.

3.6 Transport and storage conditions

⇒ Use the device in accordance with its protection type.

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

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4. CONNECTION AND START-UP

4.1 Connecting the mechanical system

CAUTION
Cutting and crushing hazard when removing blower from packaging

→ Carefully remove the blower from its packaging by grasping hold of the housing. Never subject to impact.# Wear safety shoes and cut-resistant safety gloves.

CAUTION
Heavy load when taking out the device
Bodily harm, e.g. back injuries, are possible.

→ Two people should remove the device out of its packaging together.

⇒ Check the device for transport damage. Damaged devices must no longer be installed.

⇒ Install the undamaged device according to your application.

CAUTION
Possibility of damage to the device
Serious damage may result if the device slips during assembly.

→ Keep the device fixed in position at the installation location until all attachment screws have been tightened.

4.2 Connecting the electrical system

DANGER
Electric voltage on the device
Electric shock

→ Always install a protective earth first.

→ Check the protective earth.

DANGER
Incorrect insulation
Risk of fatal injury from electric shock

→ Use only cables that meet the specified installation requirements for voltage, current, insulation material, load etc.

→ Route cables such that they cannot be touched by any rotating parts.

DANGER
Electrical load (>50 µC) between mains wire and protective earth connection after switching of the supply when switching multiple devices in parallel.
Electric shock, risk of injury

→ Make sure that sufficient protection against accidental contact is provided.
Before working on the electrical connection, the connections to the mains supply and PE must be shorted.

CAUTION
Electrical voltage
The device is a built-in component and features no electrically isolating switch.

→ Connect the device only to circuits that can be switched off using an all-pole disconnecting switch.

→ When working on the device, you must switch off the system/machine in which the device is installed and secure it from being switched on again.

NOTE
Water penetration into leads or wires
Water enters at the cable end on the customers side and can damage the device.

→ Make sure that the cable end is connected in a dry environment.

Connect the device only to circuits that can be switched off using an all-pole disconnecting switch.

4.2.1 Prerequisites

⇒ Check whether the data on the type plate agree with the connection data and the data of the operating capacitor.

⇒ Before connecting the device, ensure that the supply voltage matches the operating voltage of the device.

⇒ Only use cables designed for current according to the type plate. For determining the cross-section, follow the basic principles in accordance with EN 61800-5-1. The protective earth must have a cross-section equal to or greater than the outer conductor cross-section.
We recommend the use of 105°C cables. Ensure that the minimum cable cross-section is at least
AWG26/0.13 mm².

4.2.2 Residual current operated device

Only pulse-current sensitive and/or universal RCD protective devices (Type A or B) are permitted. Like frequency inverters, RCD protective devices cannot provide personal safety while operating the device.

4.2.3 Voltage control

With open loop speed control using transformers or electronic voltage regulators (e.g. phase angle control), excessive current may occur.
In addition, noises can occur with phase angle control depending on the mounting situation.

4.2.4 Frequency inverter

Please use a frequency converter only after consultation with ebm-papst. When a frequency converter is used for speed adjustment, the maximum safe operating speed (see 3.2 Nominal data) may not be exceeded.

For operation with frequency converters, fit sinusoidal filters that work on all poles (phase-phase and phase-earth) between the frequency converter and the motor.
During operation with frequency converters, an all-pole sine filter protects the motor against high-voltage transients that can destroy the winding insulation system, and against harmful bearing currents.

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

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4.3 Connection of the cables

External leads are brought out of device.

⇒ First connect the "PE" (protective earth) connection.

- Connect the lines according to your application. When doing so, observe chapter 4.4 Connection screen.

4.3.1 Motor protection

CAUTION
Voltage
The device is a built-in component with no isolating switch.

→ Connect the device to a suitable tripping device.

→ Only connect the device to circuits which can be de-energised with an all-pole disconnection switch.

→ When working on the device, the system/machine in which the device is installed must be secured 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 up the thermal overload protector installed in the coil.

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 up the thermal overload protector correctly will invalidate your warranty claim.

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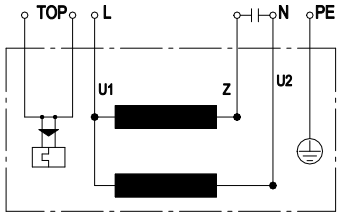
4.4 Connection screen



U1	blue
Z	brown
U2	black
PE	green/yellow
TOP	2 x white

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4.5 Checking the connections

⇒ Make sure that the power is off (all phases).

⇒ Secure it from being switched on again.

⇒ Check the correct fit of the connection lines.

4.6 Switch on device

The device is not to be switched on until it has been installed properly and in accordance with its intended use, including the required protective devices and professional electrical connection. This also applies to devices which have already been equipped with plugs and terminals or similar connectors by the customer.

WARNING
Hot motor housing
Fire hazard

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

⇒ Inspect the device for visible external damage and the proper function of the protective features before switching it on.

⇒ Check the air flow paths of the fan for foreign objects and remove any that are found.

⇒ Apply the nominal voltage to the voltage supply.

4.7 Switching off the device

⇒ Disconnect the device from the supply voltage at the main switch for the supply line.

⇒ When disconnecting, be sure to disconnect the earth wire connection last.

5. MAINTENANCE, MALFUNCTIONS, POSSIBLE CAUSES AND REMEDIES

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

WARNING
Terminals and connections have voltage even with a unit that is shut off
Electric shock

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

CAUTION
Electrical load on the 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.
Danger of injury

→ Keep out of the danger zone of the device.

→ When working on the device, switch off the mains supply voltage and secure the latter from being switched on again.

→ Wait until the device stops.

→ Insert the brought-out thermal overload protector into the control circuit so that the cooled off motor does not switch on independently after a fault.

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

Malfunction/error	Possible cause	Possible remedy
Impeller running roughly	Imbalance in rotating parts	Clean the device; if imbalance is still evident after cleaning, replace the device. If you have attached any weight clips during cleaning, make sure to remove them afterwards.
Motor does not turn	Mechanical blockage	Switch off, de-energise, and remove mechanical blockage.
	Mains supply voltage faulty	Check mains supply voltage, restore power supply.
	Faulty connection	De-energise, correct connection, see connection diagram.
	Thermal overload protector responded	Allow motor to cool off, locate and rectify cause of error, if necessary cancel restart lock-out

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	Unacceptable operating point	Check operating point
Overtemperature of motor	Ambient temperature too high	Lower ambient temperature if possible
	Insufficient cooling	Improve cooling

If you have any other problems, contact ebm-papst.

5.1 Cleaning

NOTE
Damage to the device during cleaning
Malfunction possible

→ Do not clean the device using a water jet or high-pressure cleaner.# Do not use any acid, alkali or solvent-basedcleaning agents.# Do not use any pointed or sharp-edged objects for cleaning

5.2 Safety test

What has to be tested?	How to test?	Frequency	Which measure?
Check the protective casing against accidental contact for damage and to ensure that it is intact	Visual inspection	At least every 6 months	Repair or replacement of the device
Check the device for damage to blades and housing	Visual inspection	At least every 6 months	Replacement of the device
Mounting the connection lines	Visual inspection	At least every 6 months	Fasten
Mounting of protective earth connection	Visual inspection	At least every 6 months	Fasten
Check the insulation of the wires for damage	Visual inspection	At least every 6 months	Replace wires
Impeller for wear/deposits/ corrosion and damage	Visual inspection	At least every 6 months	Clean or replace impeller

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