

Operating instructions

for built-in fans with three-phase powered motors, sizes 112 and 150

The device type, date of manufacture (calendar week/year) and the conformity sign are located on the type plate on the fan.

For questions about the fan or the delivery of spare parts, please provide the entire content of the type plate.

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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 danger to persons.

Ensure that the operating instructions are always readily available at the 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.

Warning notices

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



Danger!

Indicates a potentially hazardous situation, Exercise extreme caution while working.

Warning!

Indicates a potentially hazardous situation, which, if not avoided, can result in injuries. Exercise extreme caution while working.

Caution!

Indicates a potentially hazardous situation, which, if not avoided, can result in minor injuries or property damage.

Attention!

Indicates a potentially harmful situation, which, if not avoided, can result in property damage.

Staff qualification

Only specialised electrical personnel may install the device, perform the test run and work on electrical system.

Only trained and authorised specialist personnel are permitted to transport, unpack, assemble, operate or maintain the device, or to use it in any other manner.

Basic safety rules

Observe the following when working with the unit:

Warning!

Rotating fan

Long hair, dangling items of clothing and jewellery could become entangled and pulled into the device. You could be injured.

→ Do not wear any loose clothing or jewellery while working on moving parts. Protect long hair with a hood.

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

1.1 Electrical voltage and current

Check the electrical equipment of the device at regular intervals. Remove loose connections and defective cables immediately.



Danger!

Electrical load (> 50 μ C) between mains wire and protective earth connection when switching multiple devices in parallel

Electric shock, risk of injury

→ Ensure that sufficient protection against accidental contact is provided. Before working on the electrical connection, the L1, L2, L3 and PE connections to the mains supply must be shorted.

Caution!

In the event of fault, electric voltage is present at the rotor and impeller

The rotor and impeller are base insulated.

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

1.2 Safety and protective functions



Danger!

Missing safety device and non-functioning protective features

Risk of fatal injury

→ Shut down the device immediately if you detect a missing or ineffective protective feature. The device is an installation item that has no function on its own. As the operator, you are responsible for ensuring that the device is adequately secured.

1.3 Electromagnetic radiation

Interference from electromagnetic radiation possible, e.g. in conjunction with open and closed-loop control devices.

If unacceptable emission intensities occur when the fan is installed, suitable shielding measures must be taken before the device is commissioned.

1.4 Mechanical movement



Danger!

Rotating fan

Body parts that come into contact with the fan while it is rotating can be injured.

→ Secure the fan to prevent contact. Before working on the installation/machine, wait until all parts have come to a standstill.

Warning!

Ejected parts in the exhaust zone

Danger of injury

In the event of a fault, balancing weights or broken fan blades may be ejected.

→ Take appropriate safety measures.
Do not stay in the exhaust zone.

Caution!

Self-starting fan

Danger of injury

If control voltage is applied or a speed setpoint is stored, the motor automatically restarts, for example after a power failure.

→ Do not stay in the danger area of the fan. When working on the fan, switch off the mains supply voltage at all poles and secure it from being switched on again!

1.5 Hot surface

Caution!

High temperature at the motor housing

Danger of burn injuries

→ Ensure that sufficient protection against accidental contact is provided.

1.6 Emission

Warning!

Depending on the installation and operating conditions, a sound pressure level greater than 70 dB(A) can arise.

Danger of noise-induced hearing loss

→ Take appropriate technical safety measures. Safeguard the operating personnel with appropriate protection measures, e.g. ear protectors.

1.7 Transport



Caution!

Transport of fan

Cutting and crushing hazard

→ Wear safety shoes and cut-resistant safety gloves. Transport the fan in its original packaging only. The vibration values listed in the technical data must not be exceeded during the entire transport. Secure the fan so that it does not slip, for example using a lashing strap.



1.8 Storage

Store the device in a dry place, where it is protected in a clean environment. Keep to the specified storage temperatures, *please refer to Chapter 3, Technical data*. If the device remains out of use for some time, we recommend switching the device on once a month for about 15 minutes to move the bearings.

1.9 Cleaning

Attention!

Damage to the device during cleaning.

Malfunction possible

→ Do not clean the device using a water jet or high-pressure washer. Do not use any cleaners containing acids, bases or solvents.

1.10 Disposal

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

2. PROPER USE

The device is designed exclusively as built-in fan for moving air according to the technical data.

Any other or secondary use is deemed improper use and a misuse of the device. Installations necessary on the part of the commissioning party must meet the mechanical, thermal and service life-related stresses that can occur.

Proper use also includes:

- Operating the device with all protective features.
- Observing the operating instructions.
- Use of the device in accordance with the permissible ambient temperature, see Chapter 3 "Technical data"

Improper use

In particular, the following uses of the fan are prohibited and can lead to dangerous situations:

- Moving air that contains abrasive particles.
- Moving highly corrosive air.
- Moving air that contains dust pollution, e.g. suctioning off saw shavings.
- Using the fan to move flammable gases/particles.
- Operating the fan in the vicinity of flammable materials or components.
- Operating the fan in an explosive atmosphere.
- Using the fan as a safety component or for taking on safety-related functions.
- Operation in medical equipment with a life-sustaining or lifesaving function.
- Operation in non-stationary installations such as railroad vehicles, aircraft and spacecraft.
- Operation with completely or partially disassembled or modified protective features.
- Operation in IT networks.
- Operation with external vibrations that exceed the permissible vibration load.
- In addition, all application options that are not listed under proper use.

If you have specific questions, contact ebm-papst for support.

3. TECHNICAL DATA

Additional device-specific data are available upon request from ebm-papst.

Mounting data

The following must be observed:

- Tightening torque of the screwed cable gland: 3.0 Nm
- Tightening torque of mounting screws of terminal box cover: 2.5 Nm
- Strength of mounting screws: 10.9

Secure mounting screws against accidentally coming loose (e.g. self-locking screws).

Leakage current

Leakage current ≤ 3.5 mA

Ambient conditions

	Transport & storage	Operation
Permitted ambient temperature for motor	-40 °C to +80 °C	-25 °C to +60 °C
Resistance to vibrations	1 g (acc. to IEC 60068-2-6)	0.5 g (acc. to IEC 60068-2-6)

4. CONNECTION AND START-UP

4.1 Connecting the mechanical system

Install the device according to your application. Use the device according to its moisture class.



Caution!

Cutting and crushing hazard when removing the fan from the packaging

→ Carefully lift the device out of the packing at using inside area of the blades (axial fan) or the impeller (radial fan). Be certain to avoid any shock. Wear safety shoes and cut-resistant safety gloves. Two people should lift the device out of its packaging if it is heavier than 10 kg.



Warning!

Hot motor housing

Danger of fire

→ Ensure that no combustible or flammable materials are located in the vicinity of the fan.

Attention!

Incorrect mounting position, condensation occurs

The condensation water cannot run off.

→ Install the device only in an installation position with the shaft horizontal or the rotor at the bottom. This allows the condensation water to run off.



Installations necessary on the part of the commissioning party must meet the mechanical, thermal and service life-related stresses that can occur. They should also be able to stand up to higher loads, e.g. those caused by a failure of a thermal overload protector.

In ambient conditions where there is no condensation, the device may be installed in any installation position.

4.2 Connecting the electrical system

The connection to the electrical system is made after the connection to the mechanical system.

- Before connecting the device, ensure that the mains supply voltage matches the fan voltage.
- Only use cables that are configured for current according to the nameplate.



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.

Attention!

Device malfunctions are possible

→ Do not route the control lines of the device directly parallel to the power supply line. Ensure a sufficiently large clearance.

Recommendation: clearance > 10 cm (separate cable routing).

Stripping connecting cables

Strip the cable just enough so that the screwed cable gland is tight and the terminals are relieved of strain (for tightening torques, refer to Chapter 3 "Technical data").

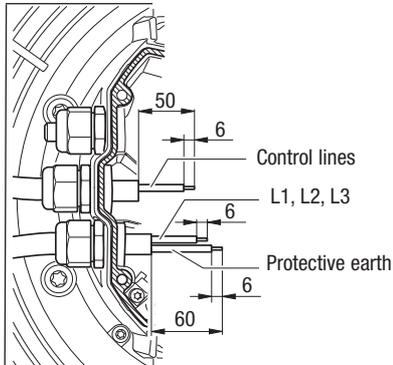


Figure 1: Recommended stripping lengths in mm (inside the terminal box)

Connecting cables with terminals

Caution!

Electrical voltage

The fan is a built-in component and features no electrically isolating switch.

→ Only connect the fan to circuits that can be switched off with an all-pole separating switch. When working on the fan, you must switch off the installation/machine in which the fan is installed and secure it from being switched on again.



Dangerous external voltages may be present at the terminals and connections, even when the device is switched off.

- Open the terminal box.
- Open the screwed cable gland.

Size 112 motors

All screwed cable gland are supplied with a sealing cap and insert for cables with \varnothing 4 - 10 mm, see Fig. 2.

Size 150 motors

All screwed cable gland are supplied with a sealing cap and insert for cables with \varnothing 5 - 9 mm, see Fig. 2.

- Remove the cap, see image 3. Remove the cap only at those places where cables are introduced.

Size 112 motors

For two cables \varnothing 5 mm, see Figure 4, you must equip the screwed cable glands with the seal inserts provided in the terminal box.

Size 150 motors

With two cables \varnothing 4 - 6 mm, see Fig. 4, or with one cable with \varnothing 6 - 12 mm, you must fit the sealing inserts provided in the terminal box to the screwed cable gland.



Figure 2. Screwed cable gland with cap



Figure 3. Cap removed



Figure 4. Seal insert, equipped for two cables



Figure 5. Seal inserts fitted with one cable are prohibited!

- Guide the cable through the screwed cable gland.
- Connect "PE" (protective earth) conductor.
- Connect the remaining leads to the respective terminals. To do so, use a 3.5 mm screwdriver, see Figure 6.

During the connection work, ensure that no wires splice off.

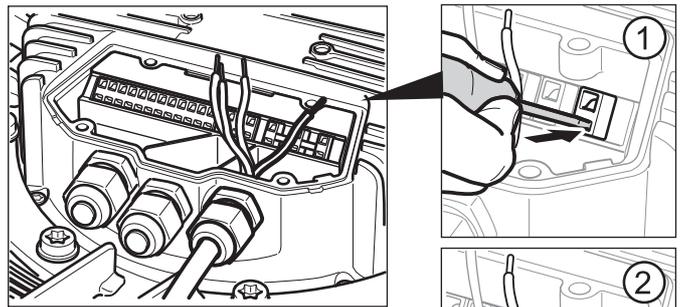


Figure 6: Connecting the wires to terminals



No water may penetrate along the cable in the direction of the cable gland.

Mounting position of fan: shaft vertical, rotor at bottom

Ensure that the cable is routed in the form of a loop ("water trap" - see Figure 7).

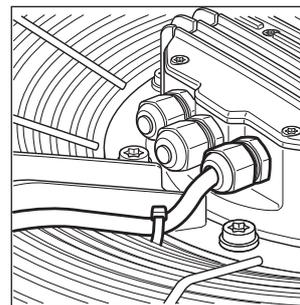


Figure 7: Fan installed lying flat (shaft vertical, rotor on bottom), cable routed as "water trap"

Mounting position: shaft horizontal

When routing the cables, make sure that the screwed cable gland is located at the bottom, see Fig. 8.

The cables must always be routed downwards.

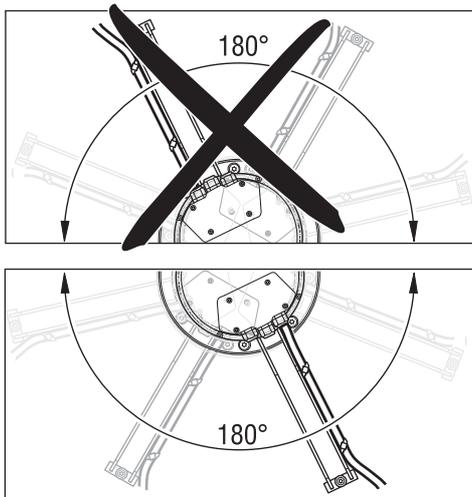


Figure 8: Cable routing for upright built-in fans (shaft horizontal)

4.3 Checking the connections



Danger!

Electric voltage on the device

Electric shock

→ Always install an earth wire. Check the protective earth.

Ensure power is off.

Secure it from being switched on again.

- Check the correct fit of the connecting cables.
- Fasten the screwed cable gland again.
- Ensure that the cable gland is securely tightened. Any unused screw connections must always be fitted with a cap and securely tightened.
- Tighten the cable gland enough to ensure that water cannot ingress. Refer to Chapter 3, "Mounting data" section, for the maximum tightening torque
- Fasten the terminal box again.
Refer to Chapter 3, "Mounting data" section, for the maximum tightening torque

Make sure that the terminal box is correctly closed and sealed after completing the work and that all screws are properly tightened.

Power supply connection, fuse protection

Rated-voltage	Safety fuse		Circuit breaker	Wire cross-section	
	VDE	UL		VDE	mm ²
3~ /PE	16 A	15 A	C16 A	1,5	16
380 - 480 VAC	20 A	20 A	C20 A	2,5	14
3~ /PE	—	15 A	—	1,5	16
200 - 240 VAC	—	20 A	—	2,5	14

Residual current operated device



Only all-current-sensitive RCD protective devices (type B) are permissible. Like frequency inverters, RCD protective devices cannot provide personal safety while operating the device.

Terminal assignment

KL3						KL2			KL1			PE						
12	11	10	9	8	7	6	5	4	3	2	1	3	2	1	3	2	1	PE
RS A	RS B	RS A	RS B	GND	D-10V PWM	4-20mA	+20V	+10V	D-10V PWM	GND	OUT	NO	COM	NC	L1	L2	L3	PE

	PIN	Name	Function
PE	---	PE	Protective earth conductor
KL1	1	L3	Mains; L3
	2	L2	Mains; L2
	3	L1	Mains; L1
KL2	1	NC	Relay status; NC contact with error Load max. 250 VAC / 2 A at $\cos\varphi = 1$
	2	COM	Relay status; COMMON Load max. 250 VAC / 2 A at $\cos\varphi = 1$
	3	NO	Relay status; NO contact with error Load max. 250 VAC / 2 A at $\cos\varphi = 1$
KL3	1	OUT 0 - 10 V	Master output for control of several slave fans; max. 10 mA
	2	GND	GND
	3	0 - 10 V / PWM	Analogue input; Input resistance 100 k Ω PWM frequency ≥ 1 kHz
	4	10 V	10 V + 15 % supply for ext. potentiometer; max. 10 mA; short-circuit-proof
	5	20 V	20 V +/- 20 % supply for ext. sensor; max. 50 mA; short-circuit-proof
	6	4 - 20 mA	Analogue input; 4 - 20 mA; Load 100 Ω ; Voltage drop 2 V at 20 mA
	7	0 - 10 V / PWM	Analogue input; Input resistance 100 k Ω PWM frequency ≥ 1 kHz
	8	GND	GND
	9	RS B	RS485 interface for ebmBUS; RS B connection
	10	RS A	RS485 interface for ebmBUS; RS A connection
	11	RS B	RS485 interface for ebmBUS; RS B connection
	12	RS A	RS485 interface for ebmBUS; RS A connection

KL3 is a current circuit separate from the power system.

Factory settings

The factory settings/modes of operation have the following default values upon delivery:

Mode of operation: PWM control
 Set value input: Analogue input
 Store set value in EEPROM: ✓ (ticked)
 Min. PWM: 0%
 Max. PWM: 100 %
 Direction of action of controller: positive (heat)
 Fan address: 1
 Group address: 1

If you have not obtained your device directly from ebm-papst, we recommend that you obtain the default settings from your supplier. Your supplier may have modified the settings.

4.4 Switching on the device

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

- Apply the voltage to the device.
- Switch on the device via the control voltage.

If you switch off the device, for example for service or due to malfunctions, note the following:



The control voltage circuit is not electrically isolated. Only connect the fan to circuits that can be switched off with an all-pole separating switch.

5. INTEGRATED PROTECTIVE FUNCTIONS

Error	Description / Function of safety feature
Overtemperature of electronics	If one of these errors occurs, the motor switches off electronically, the status relay drops out and the error is reported via ebmBUS.
Overtemperature of motor	No automatic restart occurs.
Rotor position detection error	→ Reset by switching off the mains supply voltage for at least 20 s after motor standstill or by reset via ebmBUS.
Blocked rotor	If the rotor is blocked, the motor switches off electronically, the status relay drops out and the error is displayed via ebmBUS. → After the block is removed, the motor automatically restarts.
Line under-voltage	If the mains input voltage drops below the voltage 3~ 290 VAC (nominal voltage 380 - 480 V) or 3~ 145 VAC (nominal voltage 200 - 240 V) for at least 5 s, the motor is shut off electronically, the status relay drops off and the fault is displayed via ebmBUS. → If the supply voltage returns to permitted values, the motor automatically restarts.
Phase failure	If a phase of the supply voltage fails for at least 5 s, the motor switches off electronically, the status relay drops out and the error is displayed via ebmBUS. → If all 3 phases are correctly supplied again, the motor automatically restarts after approx. 10 - 40 s.

6. MAINTENANCE, MALFUNCTIONS, POSSIBLE CAUSES AND REMEDIES

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



Danger!

Electric voltage on the motor

Electric shock in case of contact

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

Exterior installation: if the fan remains out of use for some time, we recommend switching the fan on for at least 2 hours to allow any condensation ingress to evaporate.

Malfunction/error	Possible cause	Possible remedy
Motor does not turn	Mechanical blockage – Mains supply voltage faulty	– Switch it off and remove mechanical blockage – Check mains supply voltage, restore power supply – Apply control voltage
Overtemperature of electronics	– Ambient temperature too high – Insufficient cooling	– Reset by switching off the mains supply voltage for at least 20 s after motor standstill – Reset via ebmBUS
Overtemperature of motor	– Unacceptable operating point	
Incorrect rotor position detection	– Failure of electronics	



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

Safety test

What has to be tested?	How to test?	Frequency
Protective covering	Visual inspection	at least every 6 months
Fan for damage	Visual inspection	at least every 6 months
Mounting of fan	Visual inspection	at least every 6 months
Mounting of connecting cables	Visual inspection	at least every 6 months
Mounting of protective earth connection	Visual inspection	at least every 6 months
Insulation of the cables	Visual inspection	at least every 6 months