

**ebm-papst Mulfingen GmbH & Co. KG**  
 Bachmühle 2  
 D-74673 Mulfingen  
 Phone +49 (0) 7938 81-0  
 Fax +49 (0) 7938 81-110  
 info1@de.ebmpapst.com  
 www.ebmpapst.com

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## 1. SAFETY REGULATIONS AND INFORMATION

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 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 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 qualifications

The device may only be transported, unpacked, installed, operated, maintained and otherwise used by suitably qualified, trained and authorized technical staff.

Only authorized 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.

The locally applicable industrial safety regulations are always to be observed when working on the device.

Keep the workplace clean and tidy. Untidiness in the work area increases the risk of accidents.

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.

### 1.4 Voltage

→ Check the device's electrical equipment at regular intervals; see Chapter 6.2 Safety inspection.

→ Replace loose connections and defective cables immediately.



#### 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 device switched off

Electric shock

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

**CAUTION**

In the event of a fault, the rotor and the impeller will be energized

The rotor and the impeller have basic insulation.

→ Do not touch the rotor and impeller once installed.

**CAUTION**

If control voltage or a stored speed set value is applied, the motor will restart automatically, 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 tools or other objects from the device.

**1.5 Safety and protective features****DANGER****Guard missing and guard not functioning**

Without a guard, hands may become caught up in the device during operation for example, resulting in serious injury. Loose parts or items of clothing could be drawn in.

→ The device is a built-in component. As the owner, you are responsible for ensuring that the device is adequately safeguarded. Operate the device only with a fixed protective device and guard grill.

→ Stop the device immediately if a protective device is found to be missing or ineffective.

**WARNING****Damage to guard grill, parts flying out**

The guard grill is not suitable for heavy loads. Parts lying on the guard grill or falling through the guard grill may be thrown out by the fan when in operation.

→ Never step on the guard grill or subject the guard grill to load.

→ Do not place any objects on the guard grill.

→ There must be sufficient space around the fan to be able to get past the fan.

**1.6 Electromagnetic radiation**

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

If impermissible radiation levels occur following installation, appropriate shielding measures have to be taken by the user.

**NOTE**

Electrical or electromagnetic interference after installing the device in customer equipment.

→ Verify that the entire setup is EMC-compliant.

**1.7 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.

**DANGER****Ejected parts**

Missing protective devices may cause balancing weights or broken fan blades to be ejected and cause injuries.

→ Take appropriate safety measures.

**WARNING****Rotating device**

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

→ Do not wear any loose-fitting or dangling clothing or jewelry while working on rotating parts.

→ Protect long hair with a cap.

**1.8 Emissions****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.

**1.9 Hot surface****CAUTION****High temperature on electronics housing**

Risk of burns

→ Ensure sufficient protection against accidental contact.

**1.10 Transport****WARNING****Transporting the fan**

Injuries from tipping or slipping

→ Wear safety shoes and cut-resistant safety gloves.

→ The fan is only to be transported in its original packaging.

→ The fan is to be transported lying flat, i.e. the motor axis must be vertical.

→ Secure the fan(s) e.g. with a lashing strip to stop anything slipping or tipping.

**1.11 Storage**

- ⇒ Store the device, partially or fully assembled, in a dry place, protected against the weather and free from vibration, in the original packaging 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 3.6 Transport and storage conditions.

- 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.

**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 power systems with grounded neutral (TN/TT power systems).
- The device is to be used in networks with network quality characteristics as per EN 50160.
- Using the device only in stationary systems.
- Performing all maintenance work.
- Conveying air at an ambient air pressure between 800 mbar and 1050 mbar.
- Using the device within the permitted ambient temperature range; see Chapter 3.6 Transport and storage conditions and Chapter 3.2 Nominal data.
- Operating the device with all protective devices.
- Following the operating instructions.

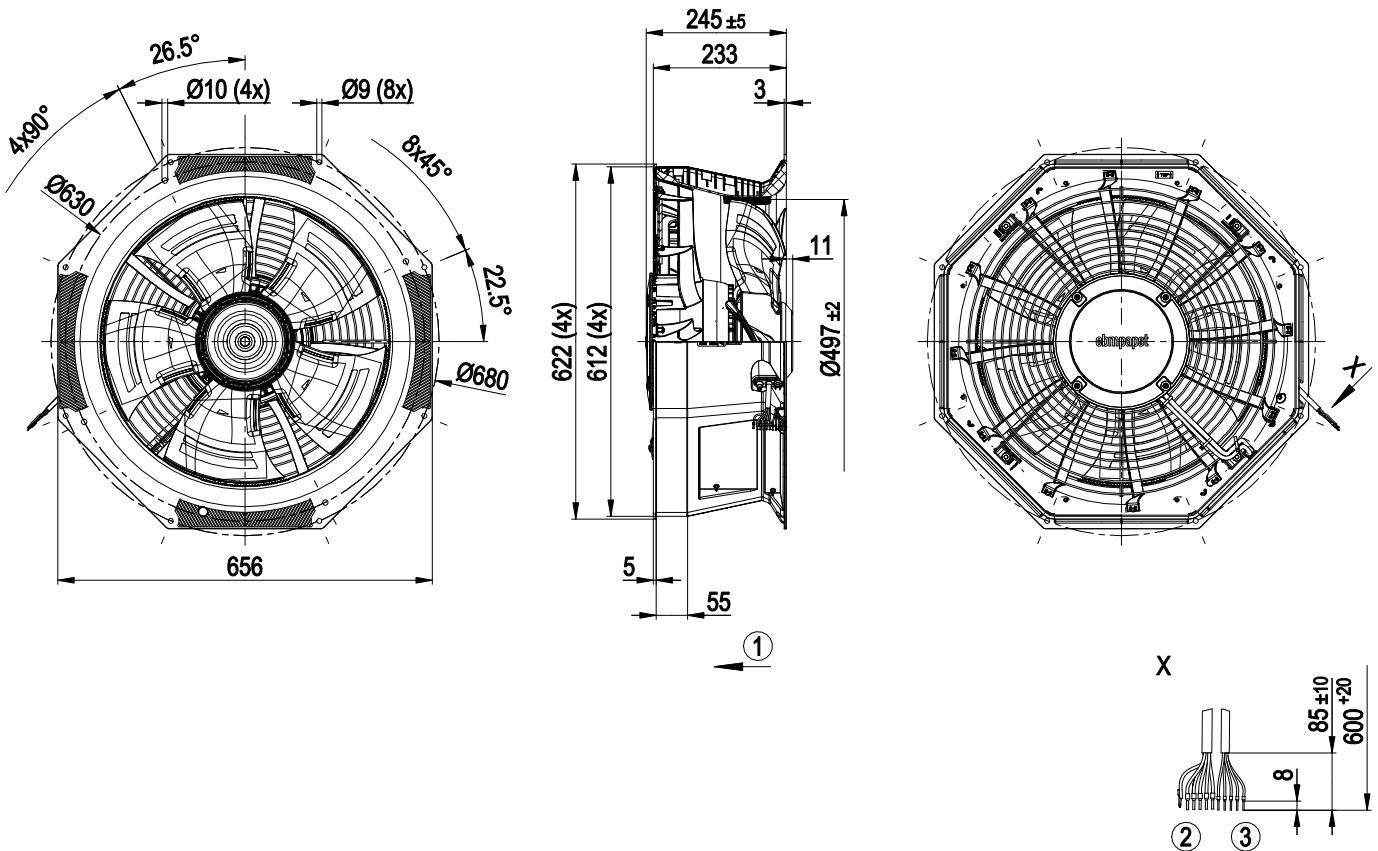
**Improper use**

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.
- 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.

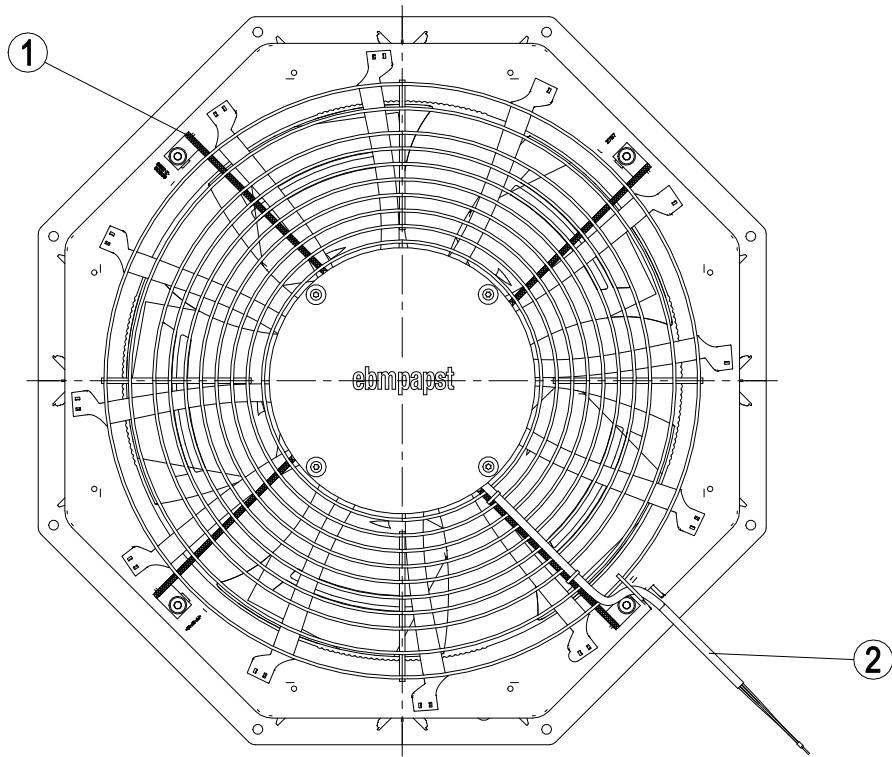
## 3. TECHNICAL DATA

## 3.1 Product drawing



All dimensions in mm.

1	Airflow direction "V"
2	Cable PVC AWG18
	6x wire-end ferrule
3	Cable PVC AWG22
	5x wire-end ferrule



All dimensions in mm.

1	Installation position: Shaft horizontal (install support struts only in X-position as illustrated) or rotor on bottom
2	For horizontal shaft installation position, the cable exit must be at the bottom right.

## 3.2 Nominal data

Motor	M3G112-GA
Phase	3~
Nominal voltage / VAC	400
Nominal voltage range / VAC	380 .. 480
Frequency / Hz	50/60
Method of obtaining data	ml
Status	prelim.
Speed (rpm) / min <sup>-1</sup>	1770
Power consumption / W	1300
Current draw / A	2.1
Max. back pressure / Pa	300
Min. ambient temperature / °C	-40
Max. ambient temperature / °C	40

ml = Max. load · me = Max. efficiency · fa = Free air  
cs = Customer specification · ce = Customer equipment

Subject to change

## 3.3 Data according to Commission Regulation (EU) 327/2011

	Actual	Req. 2015
01 Overall efficiency $\eta_{\text{es}}$ / %	48.2	34.4
02 Measurement category	A	
03 Efficiency category	Static	
04 Efficiency grade N	53.8	40
05 Variable speed drive	Yes	
06 Year of manufacture	The year of manufacture is specified on the product's rating label.	
07 Manufacturer	ebm-papst Mulfingen GmbH & Co. KG Amtsgericht (court of registration) Stuttgart · HRA 590344 D-74673 Mulfingen	
08 Type	W3G500-KD59-03	
09 Power consumption $P_{\text{ed}}$ / kW	1.3	
09 Air flow $q_v$ / m <sup>3</sup> /h	7525	
09 Pressure increase total $p_{\text{fs}}$ / Pa	280	
10 Speed (rpm) n / min <sup>-1</sup>	1760	
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 =  $1 + p_{\text{fs}} / 100\,000 \text{ Pa}$

Data obtained at optimum efficiency level. The ErP data is determined using a motor-impeller combination in a standardized measurement setup.

## 3.4 Technical description

Weight	15.5 kg
Size	500 mm
Motor size	112
Rotor surface	Painted black
Electronics housing material	Die-cast aluminum, painted black
Blade material	Press-fitted sheet steel blank, sprayed with PP plastic
Fan housing material	PP plastic
Material guide vanes	PP plastic
Guard grille material	Steel, coated with black plastic (RAL 9005)
Number of blades	5
Airflow direction	V
Direction of rotation	Counterclockwise, viewed toward rotor
Degree of protection	IP55
Insulation class	"F"
Moisture (F) / Environmental (H) protection class	H2
Ambient temperature note	If there is a risk of ice formation, the fan is only to be operated with a heating tape in the fan housing. Further information can be obtained from ebm-papst. As fan only suitable for use with industrial evaporators
Installation position	See fitting instructions
Condensation drainage holes	On rotor side
Mode	S1
Motor bearing	Ball bearing with low-temperature lubricant
Technical features	<ul style="list-style-type: none"> <li>- Output 10 VDC, max. 10 mA</li> <li>- Operation and alarm display</li> <li>- External 24 V input (parameter setting)</li> <li>- Alarm relay</li> <li>- Integrated PID controller</li> <li>- Motor current limitation</li> <li>- PFC, passive</li> <li>- RS-485 MODBUS-RTU</li> <li>- Soft start</li> <li>- EEPROM write cycles: 100,000 maximum</li> <li>- Control input 0-10 VDC / PWM</li> <li>- Control interface with SELV potential safely disconnected from the mains</li> <li>- Thermal overload protection for electronics/motor</li> <li>- Line undervoltage / phase failure detection</li> </ul>
Touch current according to IEC 60990 (measuring circuit Fig. 4, TN system)	<= 3.5 mA
Motor protection	Thermal overload protector (TOP) internally connected
Protection class	I (with customer connection of protective earth)
Conformity with standards	EN 61800-5-1; CE



Approval	UL 1004-7 + 60730-1; CSA C22.2 No. 77 + CAN/CSA-E60730-1; EAC
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With regard to cyclic speed loads, note that the rotating parts of the device are designed for a maximum of one million load cycles. If you have special questions, consult ebm-papst 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 color pigments in the paints used perceptibly react to UV light over the course of time. The product is to be protected against UV radiation to prevent the formation of patches and fading. Changes in color are not a reason for complaint and are not covered by the warranty. UV radiation in the frequency range and the intensity of natural solar radiation has no effect on the technical properties of the products.

#### 3.5 Mounting data

Any further mounting data required can be taken from the product drawing or Section Chapter 4.1 Mechanical connection.

Strength class of screws	8.8
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For screw clearance, see Chapter 3.1 Product drawing

⇒ Secure the screws against unintentional loosening (e.g. use self-locking screws).

#### 3.6 Transport and storage conditions

Max. permitted ambient temp. for motor (transport/storage)	+70 °C
Min. permitted ambient temp. for motor (transport/storage)	-40 °C

#### 3.7 Accessories

##### 3.7.1 AxiCool heating tape

A heating tape that can be integrated into the fan housing is available for the AxiCool fans. To prevent ice formation, ebm-papst recommends the use of a heating tape for all applications below 0°C. The heating tape designed for the AxiCool fan housing is available from ebm-papst under the following item number.

Size	Item no.
500 mm	00500-2-7680

During assembly, comply with the installation instructions included with each ebm-papst heating tape. ebm-papst assumes no liability when heating tapes from other manufacturers are used. Note the maximum permitted temperature of +80 ± 5 °C for the heating tape to prevent damage to the fan housing.



#### NOTE

The heating tape has only basic insulation.

→ The heating tape may only be used with a closed fan housing cover to prevent heat losses and contact with live parts.

#### 3.7.2 AxiCool drip pan

A heated drip pan that reliably discharges any water emerging from the outflow side is available for the AxiCool fans. ebm-papst recommends the use of a drip pan in conjunction with the AxiCool heating tape. The drip pan designed for the AxiCool fan housing is available from ebm-papst under the following item number.

Size	Item no.
500 mm	41200-1-4050

Installation instructions are included with every ebm-papst drip pan and must be heeded on assembly.

#### 3.7.3 AxiCool terminal box

A terminal box kit for attachment to the fan housing is available for AxiCool fans. This terminal box kit provides an ideal means of connecting the electrical connections of the motor, heating tape and drip pan. The terminal box kit to suit the AxiCool fan housing and motor is available from ebm-papst under the following item number.

Motor/connection	Item no.
M3G084, M3G112 /EC	50025-1-7612

Installation instructions are included with every ebm-papst terminal box kit and must be heeded on assembly.

#### 3.8 Electromagnetic compatibility

EMC immunity to interference	According to EN 61000-6-2 (industrial environment)
EMC interference emission	According to EN 61000-6-3 (household environment), except EN 61000-3-2 for professionally used equipment with a total rated power greater than 1 kW



If several devices are connected in parallel on the supply side so that the line current of the arrangement is in the range 16 - 75 A, this arrangement conforms to IEC 61000-3-12, provided that the short-circuit power  $S_{sc}$  at the connection point of the customer system to the public power grid is greater than or equal to 250 times the rated output of the arrangement. It is the responsibility of the installation engineer or operator/owner of the device to ensure, if necessary after consultation with the network operator, that this device is only connected to a connection point with an  $S_{sc}$  value greater than or equal to 250 times the rated output of the arrangement.



## 4. CONNECTION AND STARTUP

### 4.1 Mechanical connection



#### CAUTION

**Cutting and crushing hazard when removing device from packaging**

Blades can bend

- Carefully remove the device from its packaging, by the fan housing. 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 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.



#### 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.

Recommendation for fastening AxiCool fan with screws: (based on VDI 2230)

- Use screws of strength class 8.8.
- For sizes 500 and 630, screws M8 with a tightening torque of max. 20 Nm.

- For size 800, screws M10 with a tightening torque of max. 40 Nm.

The tightening torques specified above are based on the following values are only valid for them:

- The contact surfaces must be flat.
- The fan must not be strained on fastening.
- As every application is different, the tightening torque recommended by ebm-papst must be checked in the application concerned.

### 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 (>50 µC) 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 hookup, 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

**Device malfunctions possible**

Route the device's control lines separately from the supply line.

- Maintain the greatest possible clearance. Recommendation: clearance > 10 cm (separate cable routing)



#### NOTE

**Water ingress into wires or cables**

Water ingresses at the customer cable end and can damage the device.

- Make sure the end of the cable is connected in a dry environment and that the connection point is lower than the motor if possible.

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.
- Before connecting the device, make sure the power supply matches the device voltage.
- 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 AWG 26 / 0.13 mm<sup>2</sup>.

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

Compliance with the resistance specifications according to EN 61800-5-1 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 Supply connection and fuses

Assignment of supply cable cross-sections and their required fuses (line protection only, no equipment protection).

Nominal voltage	Fuse		Automatic circuit breaker	Cable cross-section	Cable cross-section
	VDE	UL	VDE	mm <sup>2</sup>	*AWG
3/PE AC 380-480 VAC	16 A	15 A	C16A	1.5	16
3/PE AC 380-480 VAC	20 A	20 A	C20A	2.5	14
3/PE AC 380-480 VAC	25 A	25 A	C25A	4.0	12

\* AWG = American Wire Gauge

#### 4.2.3 Reactive currents



Because of the EMC filter integrated for compliance with EMC limits (interference emission and immunity to interference), reactive currents can be measured in the supply line even when the motor is at a standstill and the line voltage is switched on.

- The values are typically in the range < 250 mA
- At the same time, the effective power in this operating state (operational readiness) is typically < 5 W.

#### 4.2.4 Residual current circuit breaker (RCCB)



If the use of a residual current device (RCD) is required in your installation, only AC/DC-sensitive residual current devices (type B or B+) are permissible. As with variable frequency drives, residual current devices cannot provide personal safety while operating the device. When the device power supply is switched on, pulsed charging currents from the capacitors in the integrated EMC filter can lead to the instant tripping of residual current devices. We recommend the use of residual current circuit breakers (RCCB) with a trip threshold of 300 mA and delayed tripping (super-resistant, characteristic K).

#### 4.2.5 Leakage current



For asymmetrical power systems or if a phase fails, the leakage current can increase to a multiple of the nominal value.

#### 4.2.6 Locked-rotor protection



Due to the locked-rotor protection, the starting current (LRA) is equal to or less than the nominal current (FLA).

#### 4.3 Connecting the cables

The device has external leads.

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

- Connect the cables according to your application. When doing so, observe Chapter 4.5 Connection diagram.

#### 4.3.1 Cable routing

Water must be prevented from reaching the cable exit 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 glands, 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.

For installation position with horizontal shaft the cables must always be routed downward.

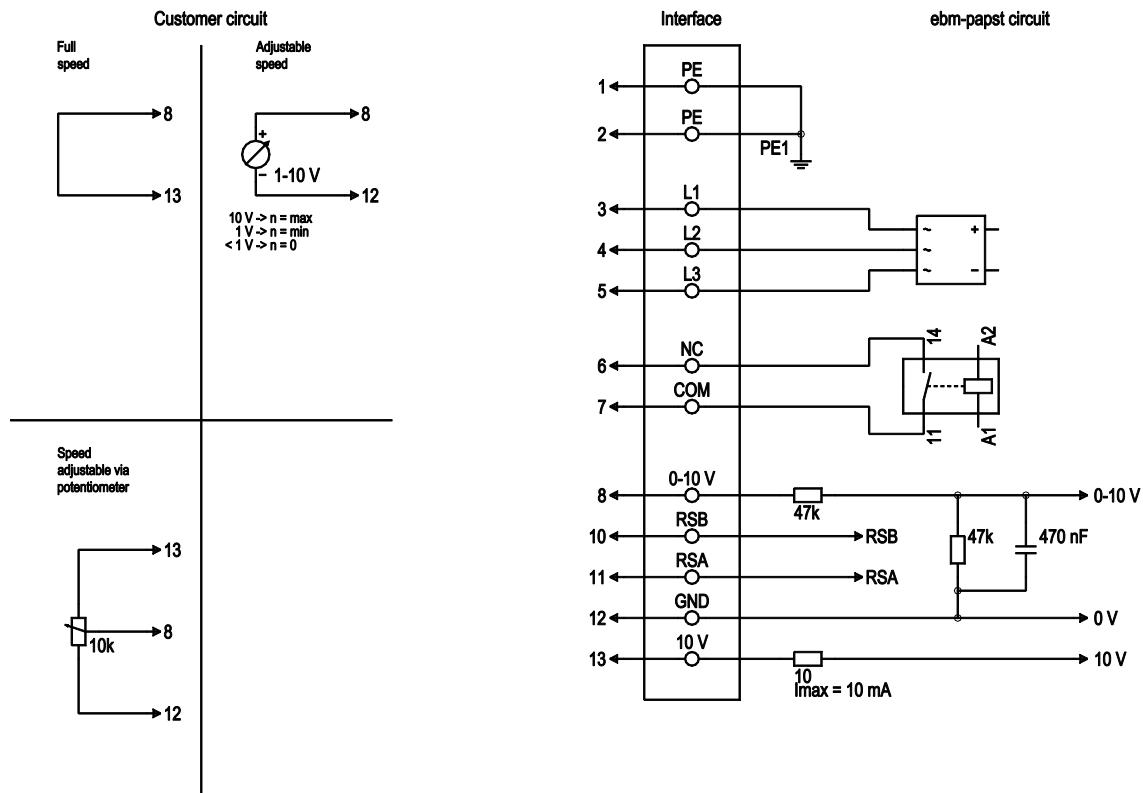
#### 4.4 Factory settings

Factory settings made for the device by ebm-papst.

Mode parameter set 1	PWM control
Mode parameter set 2	PWM control
Fan/device address	01
Max. PWM / %	100
Min. PWM / %	5
Save set value to EEPROM	Yes
Set value requirement	Analog (linear)
Direction of action parameter set 1	Positive (heating)
Direction of action parameter set 2	Positive (heating)



## 4.5 Connection diagram



Drawing preliminary!

No.	Conn.	Designation	Color	Function/assignment
1	1, 2	PE	green/ yellow	Protective earth
1	3	L1	black	Power supply
1	4	L2	black	Power supply
1	5	L3	black	Power supply
1	6	NC	white 1	Status relay, floating status contact, break for failure, contact rating 250 VAC / 2 A (AC1) / min. 10 mA; reinforced insulation on supply side and basic insulation on control interface side
1	7	COM	white 2	Status relay, floating status contact, break for failure, contact rating 250 VAC / 2 A (AC1) / min. 10 mA; reinforced insulation on supply side and basic insulation on control interface side
2	8	0-10V	yellow	Analog input (set value), 0-10 V, $R_i = 100 \text{ k}\Omega$ , adjustable curve, SELV
2	10	RSB	brown	RS485 interface for MODBUS, RSB; SELV
2	11	RSA	white	RS485 interface for MODBUS, RSA; SELV
2	12	GND	blue	Reference ground for control interface, SELV
2	13	+10V	red	Fixed voltage output 10 VDC, $+10 \text{ V} \pm 3\%$ , max. 10 mA, short-circuit-proof power supply for external devices (e.g. pot), SELV fixed voltage input 24 VDC for setting parameters via MODBUS without line voltage supply

#### 4.6 Opening additional cable glands

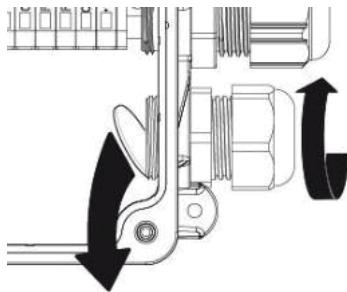


Fig. 1: Cable gland opening



##### NOTE

Tightness and strain relief are dependent on the cable used.

→ This must be checked by the user.

#### 4.7 Checking connections

- ⇒ Ensure isolation from supply (all phases).
- ⇒ Make sure a restart is impossible
- ⇒ Check the cables for proper fit.

#### 4.8 Switching 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 hookup. 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.
- ⇒ Start the device by changing the input signal.



##### 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.

#### 4.9 Switching off the device

Switching off the device during operation:

- ⇒ Switch off the device via the control input.
- ⇒ Do not switch the motor (e.g. in cyclic operation) on and off via power supply.

Switching off the device for maintenance:

- ⇒ Switch off the device via the control input.
- ⇒ Do not switch the motor (e.g. in cyclic operation) on and off via power supply.
- ⇒ Disconnect the device from the power supply.
- ⇒ When disconnecting, be sure to disconnect the ground connection last.

### 5. INTEGRATED PROTECTIVE FEATURES

The integrated protective functions cause the motor to switch off automatically in the event of the faults described in the table.

Fault	Safety feature description/ function
Rotor position detection error	An automatic restart follows.
Blocked rotor	⇒ After the blockage is removed, the motor restarts automatically.
Line undervoltage (line voltage outside of permitted nominal voltage range)	⇒ If the line voltage returns to permitted values, the motor restarts automatically.
Phase failure	A phase of the supply voltage fails for at least 5 s. ⇒ When all phases are correctly supplied again, the motor automatically restarts after 10-40 s.

## 6. MAINTENANCE, MALFUNCTIONS, POSSIBLE CAUSES AND REMEDIES

Do not perform any repairs on your device. Send the device to ebm-papst 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

**If control voltage or a stored speed set value is applied, the motor will restart automatically, 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 tools or other objects from the device.



### NOTE

If the device is not operated for a lengthy period in installed condition in a dry environment, it is to be started up and operated at full speed for one hour at least every four months. If the device is not operated for a lengthy period in installed condition in a damp environment (e.g. outdoors), it is to be started up and operated at full speed for at least two hours once a month to move the bearings and allow any condensate that may have ingressed to evaporate.

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.
	Line voltage faulty	Check line voltage, restore power supply. Attention! The error message resets automatically. Device restarts automatically without warning.
	Faulty connection	Isolate from supply, correct connection; see connection diagram.
	Broken motor winding	Replace device

	Thermal overload protector activated	Allow motor to cool off, locate and rectify cause of error, release restart lockout if necessary
	Deficient cooling	Improve cooling. Let the device cool down. To reset the error message, switch off the line voltage for at least 25 s and then switch it on again. Alternatively, reset the error message by applying a control signal of < 0.5 V to Din1 or by shorting Din1 to GND.
	Ambient temperature too high	Reduce the ambient temperature. Let the device cool down. To reset the error message, switch off the line voltage for at least 25 s and then switch it on again. Alternatively, reset the error message by applying a control signal of < 0.5 V to Din1 or by shorting Din1 to GND.
	Impermissible point of operation (e.g. back pressure too high)	Correct the operating point. Let the device cool down. To reset the error message, switch off the line voltage for at least 25 s and then switch it on again. Alternatively, reset the error message by applying a control signal of < 0.5 V to Din1 or by shorting Din1 to GND.



In the event of further malfunctions, contact ebm-papst.

### 6.1 Cleaning

To ensure a long service life, check the fans regularly for proper operation and soiling. The frequency of checking is to be adapted accordingly depending on the degree of soiling.



### DANGER

**Risk of injury from rotating fan.**

→ Only clean when not in motion. Do not disconnect the fan from the power supply, just switch it off via the control input. This will prevent start-up of the fan.

⇒ Dirt deposits on the motor housing can cause overheating of the motor.

- ⇒ Soiling of the impeller can cause vibration that will shorten the service life of the fan.
- ⇒ Severe vibration can destroy the fan.
- ⇒ In such cases, switch off the fan immediately and clean it.
- ⇒ The preferred method of cleaning is dry cleaning, e.g. using compressed air.
- ⇒ Do not use aggressive cleaning agents!

**NOTE****Damage to the device during cleaning**

Malfunction possible

- Do not clean the device using a high-pressure cleaner. # Do not use acid, alkali or solvent-based cleaning agents.
- Do not use any pointed or sharp-edged objects for cleaning.
- ⇒ Completely remove any cleaning agents used.
- ⇒ If severe corrosion is visible on load-bearing or rotating parts, switch off the device immediately and replace it.
- ⇒ Repair of load-bearing or rotating parts is not permitted!
- ⇒ Operate the fan for 2 hours at maximum speed so that any water that has ingressed can evaporate.
- ⇒ If cleaning does not eliminate vibrations, the fan may need to be rebalanced. To have it rebalanced, contact ebm-papst.
- ⇒ The fan is equipped with maintenance-free ball bearings. The lifetime lubrication of the ball bearings is designed for a service life of 40,000 hours.
- ⇒ If bearing replacement is necessary after that period, contact ebm-papst.
- ⇒ Adapt the maintenance intervals to the actual level of dust exposure.

**6.2 Safety inspection****NOTE****High-voltage test**

The integrated EMC filter has Y capacitors. The tripping current is exceeded when AC testing voltage is applied.

- Test the device with DC voltage when you perform the legally required high-voltage test. The voltage to be used corresponds to the peak value of the AC voltage required by the standard.

What to check	How to check	How often	What action?
Contact protection cover for intactness or damage	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 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

Condensation drainage 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

**6.3 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.

**6.3.1 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.

**6.3.2 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.

**6.3.3 Component disposal**

The products are mostly made of steel, copper, aluminum and plastic. Metallic materials are generally considered to be fully recyclable.

Separate the components for recycling into the following categories:

- Steel and iron
- Aluminum
- 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 Mulfingen GmbH & Co. KG.

- ⇒ 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.