Operating instructions

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Translation of the original operating instructions

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 6.2 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
If control voltage is applied or a speed setpoint is stored, the motor will restart automatically, e.g. after a mains failure.
Risk of injury

→ Keep out of the device hazard zone.# When working on the device, switch off the mains power and ensure that it cannot be switched back on.

→ Wait until the device stops.

→ After working on the device, remove any tools used or other objects from the device.

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.



DANGER
Flying parts
Missing safety devices may cause balancing weights or broken fan blades to be ejected at high speeds, causing bodily harm.

→ Take appropriate safety measures.

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 electronics housing
Risk of burns

→ Ensure sufficient contact protection.

1.10 Transport

WARNING
Transportation of fan
Injuries from tipping or slipping.

→ Wear safety shoes and cut-resistant safety gloves. #Only transport the fan in its original packaging. #Transport the fan lying flat, in other words with the motor axis vertical.

→ Secure the fan(s) so that nothing can slip or tip, e.g. by using a lashing strip.

1.11 Storage

⇒ Store the device, partially or fully assembled, in the original packaging in a clean, dry and weatherproof place free of vibrations.

⇒ 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 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.

⇒ Please make sure that all screwed cable glands are fitted with dummy plugs.

Translation of the original operating instructions

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:

- Use the device in power systems with earthed neutral (TN/TT power systems) only.
- Only using the device in stationary systems.
- Carrying out all maintenance.
- Conveying of air at an ambient air pressure of 800 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

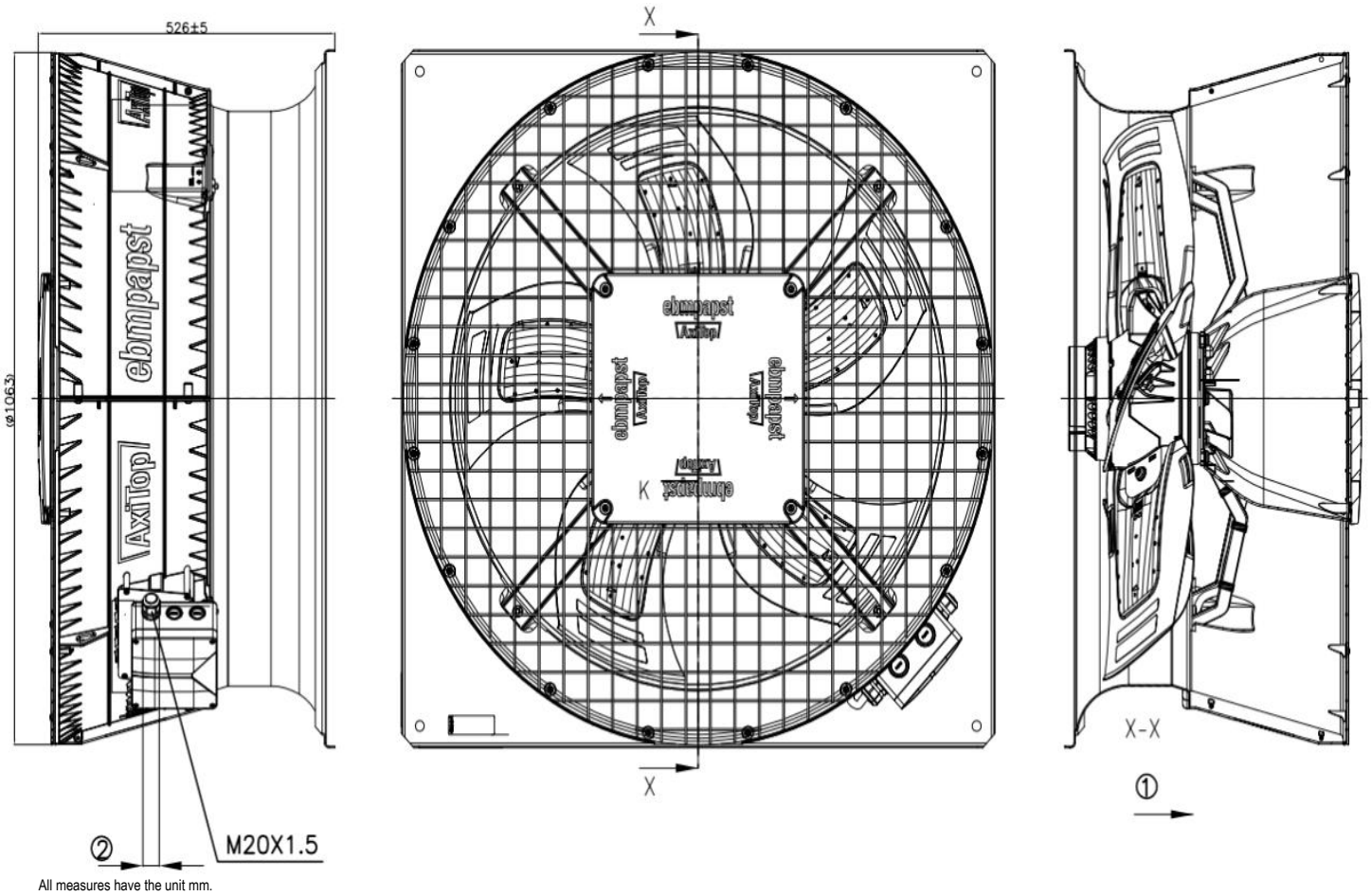
Using the device in the following ways is particularly prohibited and may cause hazards:

- Operating the device with an imbalance, e.g. caused by dirt deposits or icing.
- Resonance mode, operation with heavy vibrations. These also include vibrations that are transmitted from the customer system to the fan.
- Operation in medical equipment with a life-sustaining or lifesaving function.
- Operation with external vibrations.
- Moving solids content in flow medium.
- Painting the device
- Connections (e.g. screws) coming loose during operation.
- Opening the terminal box during operation.
- 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.

Translation of the original operating instructions

3. TECHNICAL DATA

3.1 Product drawing



All measures have the unit mm.

1	Direction of air flow "V"
2	Cable diameter min. 4 mm, max. 10 mm, tightening torque 4±0.6 Nm

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3.2 Nominal data

Motor	M3G150-IF

Phase	3~
Nominal voltage / VAC	400
Nominal voltage range / VAC	380 .. 480
Frequency / Hz	50/60

Type of data definition	ml
Speed (rpm) / min^{-1}	885
Power input / W	2100
Current draw / A	3.2
Max. back pressure / Pa	160
Min. ambient temperature / °C	-25
Max. ambient temperature / °C	60

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

Subject to alterations

3.3 Data in accordance with ecodesign regulation EU 327/ 2011

	Actual	Request 2015
01 Overall efficiency η_{es} / %	44.8	35.7
02 Measurement category	A	
03 Efficiency category	Static	
04 Efficiency grade N	49.1	40
05 Variable speed drive	Yes	
06 Year of manufacture	The year of manufacture is specified on the rating plate on the product.	
07 Manufacturer	ebm-papst Ventilator (Shanghai) Co.,Ltd.	
08 Type	W3G910-HU22-01/F01	
09 Power input P_{ed} / kW	2.06	
09 Air flow q_v / m³/h	19665	
09 Pressure increase total p_{sf} / Pa	160	
10 Speed (rpm) n / min^{-1}	890	
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_{fs} / 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	33kg
Size	910 mm
Surface of rotor	Coated in black
Material of electronics housing	Die-cast aluminium, coated in black
Material of blades	Aluminium sheet insert, sprayed with PP plastic
Number of blades	5
Blade angle	0
Direction of air flow	"V"
Direction of rotation	Clockwise, seen on rotor
Type of protection	IP 55
Insulation class	"F"
Humidity (F)/ environmental protection class (H)	F4-1
Mounting position	Shaft horizontal or rotor on bottom; rotor on top on request
Condensate discharge holes	Rotor-side
Operation mode	S1
Motor bearing	Ball bearing
Technical features	- Output 10 VDC, max. 10 mA - Output 20 VDC, max. 50 mA - Output for slave 0-10 V - Input for sensor 0-10 V or 4-20 mA - External 24 V input (programming) - External release input - Alarm relay - Integrated PID controller - Output limit - Motor current limit - PFC, passive - RS485 MODBUS RTU - Soft start -Maximum EEPROM write cycles 100,000 - Control input 0-10 VDC / PWM - Control interface with SELV potential safely disconnected from the mains - Over-temperature protected electronics / motor - Line undervoltage / phase failure detection
Touch current acc. IEC 60990 (measuring network Fig. 4, TN system)	<= 3.5 mA
Electrical leads	Via terminal box
Motor protection	Reverse polarity and locked-rotor protection
Protection class	I (if protective earth is connected by customer)
Product conforming to standard	EN 61800-5-1;CE
Approval	C22.2 NR.77+CAN/CSA-E60730-1; UL 1004-7+60730;EAC

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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.

Notes on surface quality

The surfaces of the products conform to the generally applicable industrial standard. The surface quality may vary during the production period. Strength, dimensional stability and dimensional accuracy are not affected by this.
The colour pigments of the paints used react perceptibly to UV light over the course of time. This does not however have any influence on the technical properties of the products. To prevent the formation of patches and fading, the product is to be protected against UV radiation. Changes in colour are not a reason for complaint and are not covered by the warranty.

3.5 Mounting data

⇒ 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

3.7 Electromagnetic compatibility

EMC interference immunity	Acc. to EN 61000-6-2 (industrial environment)
EMC interference emission	Acc. to EN 61000-6-3 (household environment)

If several devices are switched in parallel on the mains side so that the line current of the arrangement is in the range of 16 - 75 A, then 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 system is greater than or equal to 120 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 a S_{sc} value that is greater than or equal to 120 times the rated output of the arrangement.

4. CONNECTION AND START-UP

4.1 Connecting the mechanical system

CAUTION
Cutting and crushing hazard when removing the fan from the packaging

→ Carefully remove the device from its packaging, holding it by the centre of the blades only. Make sure to avoid any shock.

→ Wear safety shoes and cut-resistant safety gloves.

CAUTION
Device weighs more than 25 kg! Heavy load when removing the device!
Risk of physical injury, such as back injuries.

→ Use suitable hoisting equipment to remove the device from the packaging.

CAUTION
The blades of the impeller could be damaged.

→ Set down the fan carefully on a soft surface. Make sure the blades are not subjected to load. #After installation, make sure the impeller moves easily and that the blades of the impeller are not deformed or bent and do not catch anywhere.

NOTE
Damage to device from vibration
Bearing damage, reduced service life

→ Forces or impermissibly high vibration levels must not be transmitted to the fan from system components. #If the fan is connected to air ducts, it should isolated from vibrations, for example using compensators or similar elements. #Fasten the fan to the substructure without distorting it.

⇒ 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.

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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 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.

NOTE
Interferences and failures are possible
Maintain a distance to the power supply line when routing the control lines of the device.

→ Ensure a sufficiently large clearance.
Recommendation: clearance > 10 cm (separate cable routing)

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 that the data on the type plate match the connection data.

⇒ 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.

Protective earth contact resistance as per EN 61800-5-1

Compliance with the resistance specifications as per EN 61800-5-1 for the protective earth connection circuit must be verified in the 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 Power supply connection, fuse protection

Assignment of conductor cross-sections and the fuse protection required for them (overload protection only, no device protection).

Nominal voltage	Safety fuse		Automatic circuit breaker	Wire cross-section	Wire cross-section
	VDE	UL	VDE	mm²	*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
3/PE AC 380 - 480 VAC	32 A	30 A	C32A	6.0	10

* AWG = American Wire Gauge

4.2.3 Idle current

Because of the EMC filter integrated for compliance with EMC limits (interference emission and interference immunity), idle currents in the mains cable can be measured even when the motor is at a standstill and the mains 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 operated device

If the use of a residual current device (RCD) is required in your installation, only universal residual current devices (type B or B+) are permissible. Residual current devices (RCD) cannot provide personal safety while operating the device, as is also the case with frequency converters. When the device power supply is switched on, charging current pulses from the capacitors in the integrated EMC filter can lead to the instant triggering of residual current devices. We recommend residual current circuit breakers (RCCB) with an activation 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 start-up current (LRA) is equal to or less than the nominal current (FLA).

Translation of the original operating instructions

4.3 Connection in terminal box

4.3.1 Preparing connection lines for the connection

Strip the cable just enough so that the screwed cable gland is tight and the terminals are relieved of strain. Tightening torque, see chapter 3.1 Product drawing.

NOTE
Tightness and strain relief depend on the cable used.
→ The user must check this.

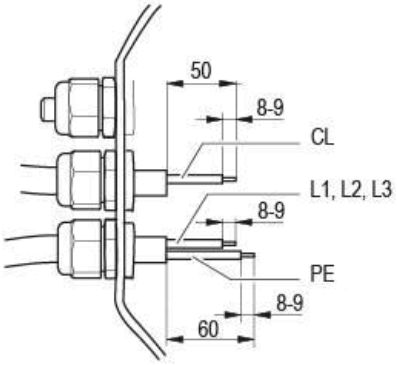


Fig. 1: Recommended stripping lengths in mm (inside the terminal box)
Legend: CL = control lines

4.3.2 Connecting cables with terminals

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.

⇒ Remove the cap from the screwed cable gland.

Remove the cap only in those places where cables are inserted.

⇒ Mount the screwed cable glands with the seal inserts provided in the terminal box.

⇒ Insert the line(s) (not included in the standard scope of delivery) into the terminal box.

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

⇒ Connect the lines to the corresponding terminals.

Use a screwdriver to do so.
During the connection work, ensure that no cables splice off.

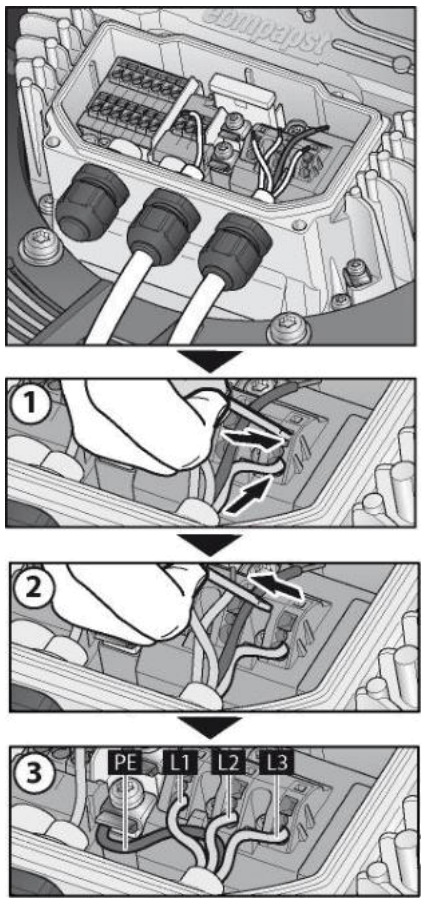


Fig. 2: Connecting the wires to terminals

⇒ Seal the terminal box.

4.3.3 Cable routing

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

Fans installed lying flat

Make sure that the cable is routed in the form of a loop (water trap).

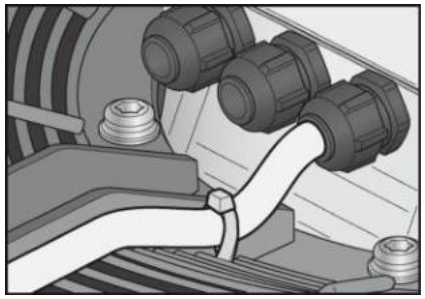


Fig. 3: Fan installed lying flat, cable routed as a water trap.

Fans installed in upright position

When routing the cable, ensure that the screwed cable glands are arranged at the bottom. The cables must always be routed downwards.

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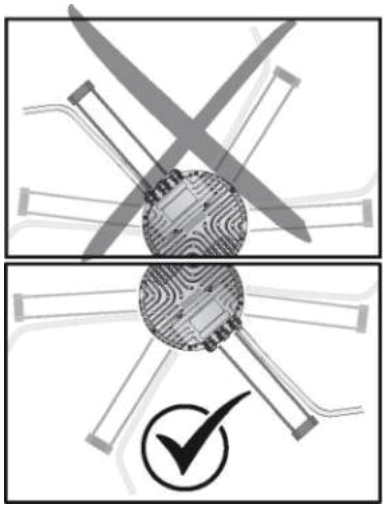


Fig. 4: Cable routing for fans installed upright.

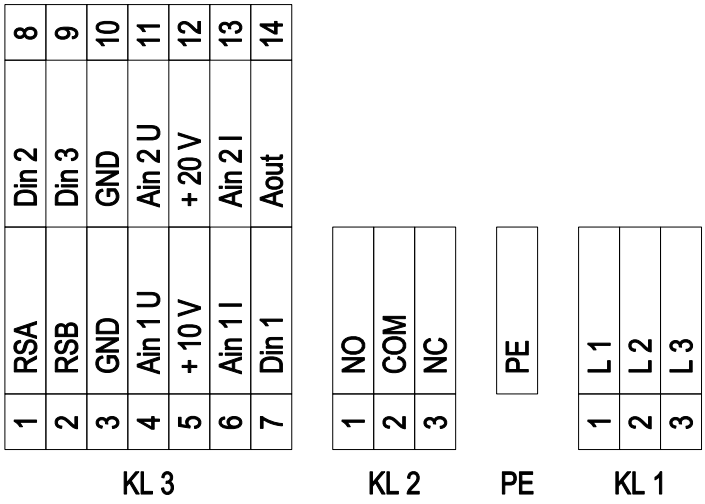
4.4 Factory settings

Factory settings with which the device is pre-set by ebm-papst.

Control mode parameter set 1	PWM controlling
Control mode parameter set 2	PWM controlling
Fan / device adress	01
Max. PWM / %	100
Min. PWM / %	5
Save set value to EEPROM	Yes
Set value control	Analogue (linear)
Control function parameter set 1	Positive (heating)
Control function parameter set 2	Positive (heating)

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4.5 Connection screen



No.	Conn.	Designation	Function / assignment
KL 1	1	L1	Mains supply connection, supply voltage 3~380-480 VAC; 50/60 Hz
KL 1	2	L2	Mains supply connection, supply voltage 3~380-480 VAC; 50/60 Hz
KL 1	3	L3	Mains supply connection, supply voltage 3~380-480 VAC; 50/60 Hz
PE		PE	Earth connection, PE connection
KL 2	1	NO	Status relay, floating status contact; normally open; close with error
KL2	2	COM	Status relay; floating status contact; changeover contact; common connection; contact rating 250 VAC / max. 2 A (AC1) / min. 10 mA
KL2	3	NC	Status relay, floating status contact; break with error
KL 3	1	RSA	Bus connection RS-485, RSA, MODBUS RTU; SELV
KL 3	2	RSB	Bus connection RS-485, RSB, MODBUS RTU; SELV
KL 3	3 / 10	GND	Signal ground for control interface; SELV
KL 3	4	Ain1 U	Analogue input 1, set value: 0-10 V, Ri = 100 kΩ, parametrisable curve, only usable as alternative to input Ain1; SELV
KL 3	5	+ 10 V	Fixed voltage output 10 VDC, +10 V ±3%, max. 10 mA, short-circuit-proof, power supply for external devices (e.g. potentiometer), SELV
KL 3	6	Ain1 I	Analogue input 1, set value: 4-20 mA; Ri = 100 Ω, parametrisable curve, only usable as alternative to input Ain1 U; SELV
KL 3	7	Din1	Digital input 1: enabling of electronics, enabling: open pin or applied voltage 5-50 VDC disabling: bridge to GND or applied voltage <1 VDC reset function: triggers software reset after a level change to <1 VDC; SELV
KL 3	8	Din2	Digital input 2: parameter set switch 1/2, according to EEPROM setting, the valid/used parameter set can be selected via bus or via digital input DIN2. Parameter set 1: open pin or applied voltage 5-50 VDC Parameter set 2: bridge to GND or applied voltage <1 VDC; SELV
KL 3	9	Din3	Digital input 3: controller function of integrated controller, according to EEPROM setting, the controller function of the integrated controller is normally/inversely selectable per bus or per digital input normal: open pin or applied voltage 5-50 VDC inverse: bridge to GND or applied voltage <1 VDC; SELV
KL 3	11	Ain2 U	Analogue input 2, actual value: 0-10 V, Ri = 100 kΩ, parametrisable curve, only usable as alternative to input Ain2; SELV
KL 3	12	+ 20 V	Fixed voltage output 20 VDC, +20 V +25/-10%, max. 50 mA, short-circuit-proof, power supply for external devices (e.g. sensors); SELV
KL 3	13	Ain2 I	Analogue input 2, actual value: 4-20 mA, Ri = 100 Ω, parametrisable curve, only usable as alternative to input Ain2 U; SELV
KL 3	14	Aout	Analogue output 0-10 VDC, max. 5 mA, output of the current motor level control coefficient / motor speed parametrisable curve; SELV

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4.6 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.

⇒ Screw the terminal box cover closed again. Terminal box tightening torque, see chapter 3.1 Product drawing.

⇒ Route the connecting cables in the terminal box so that the terminal box cover closes without resistance.

⇒ Use all plug screws (the entire number). In doing so, insert the screws manually to avoid damage to the thread.

⇒ Make sure that the terminal box is correctly closed and sealed and that all screws and screwed cable glands are properly tightened.

4.7 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 fan.

⇒ 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.

⇒ Start the device by changing the input signal.

NOTE
Damage to device by vibrations
Bearing damage, reduced service life

→ The fan must operate free of vibrations throughout its speed control range. #Strong vibrations can result from improper handling, imbalance resulting from damage during transport, or component-induced or structural resonances. #When putting the fan into service, determine the speed ranges with excessive vibration levels and also any resonance frequencies that may be present. #When regulating the speed, pass through resonance ranges as quickly as possible or find another remedy.# Operation at excessive vibration levels can lead to premature failure.

4.8 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 work:

⇒ 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 supply voltage.

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

5. INTEGRATED PROTECTIVE FUNCTIONS

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

Malfunctions	Description / Function of safety feature
Rotor position detection error	An automatic restart occurs.
Locked rotor	⇒ After the blockage is removed, the motor restarts automatically.
Line under-voltage (mains input voltage outside of permitted nominal voltage)	⇒ If the mains supply voltage returns to permitted values, the motor restarts automatically.
Phase failure	A phase of the supply voltage fails for at least 5 s. ⇒ If 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. 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
If control voltage is applied or a speed setpoint is stored, the motor will restart automatically, e.g. after power failure.
Risk of injury

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

→ After working on the device, remove any tools used or other objects from the device.

If the device remains out of use for over four months, we recommend switching the device on for at least three hours at full speed to allow any condensate to evaporate and to move the bearings.

Malfunction/error	Possible cause	Possible remedy

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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. Important! The error message resets automatically. The device starts up again automatically without advance warning.
	Faulty connection	De-energise, correct connection, see connection diagram.
	Motor winding broken	Replace device
	Insufficient cooling	Improve cooling. Let the device cool down. To reset the error message, switch off the mains supply voltage for a min. of 25 s and switch it on again. Alternatively, reset the error message by applying a control signal of <0.5 V to DIN1 or by short circuiting Din1 to GND.
	Ambient temperature too high	Reduce the ambient temperature. Let the device cool down. To reset the error message, switch off the mains supply voltage for a min. of 25 s and switch it on again. Alternatively, reset the error message by applying a control signal of <0.5 V to DIN1 or by short circuiting Din1 to GND.
	Unacceptable operating point (e.g. counterpressure is too high)	Correct the operating point. Let the device cool down. To reset the error message, switch off the mains supply voltage for a min. of 25 s and switch it on again. Alternatively, reset the error message by applying a control signal of <0.5 V to DIN1 or by short circuiting Din1 to GND.

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

6.1 Cleaning

NOTE
Damage to the device during cleaning
Malfunction possible

→ Do not use a high-pressure cleaner to clean the device.# Do not use any acid, alkali or solvent-based cleaning agents.

→ Do not use any pointed or sharp-edged objects for cleaning

6.2 Safety test

NOTE
High-voltage test
The integrated EMC filter contains Y capacitors. Therefore, the trigger current is exceeded when AC testing voltage is applied.

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

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
Check the insulation of the wires for damage	Visual inspection	At least every 6 months	Replace wires

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Tightness of screwed cable gland	Visual inspection	At least every 6 months	Retighten, replace if damaged
Condensate discharge holes for clogging, as necessary	Visual inspection	At least every 6 months	Open bore holes
Weld seams 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, 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 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 lines
- 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.

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