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CONTENTS

1. SAFETY REGULATIONS AND INFORMATION	1
1.1 Hazard levels for warnings	1
1.2 Staff qualifications	1
1.3 Basic safety rules	1
1.4 Voltage	2
1.5 Safety and protective features	2
1.6 Electromagnetic radiation	2
1.7 Mechanical movement	2
1.8 Emissions	2
1.9 Hot surface	2
1.10 Transport	2
1.11 Storage	2
2. INTENDED USE	3
3. TECHNICAL DATA	4
3.1 Product drawing	4
3.2 Nominal data	6
3.3 Data according to Commission Regulation (EU) 327/2011	6
3.4 Technical description	6
3.5 Mounting data	7
3.6 Transport and storage conditions	7
3.7 Electromagnetic compatibility	7
4. CONNECTION AND STARTUP	7
4.1 Mechanical connection	7
4.2 Electrical connection	7
4.3 Connecting the cables	8
4.4 Connection diagram	9
4.5 Checking connections	10
4.6 Switching on the device	10
4.7 Switching off the device	10
5. MAINTENANCE, MALFUNCTIONS, POSSIBLE CAUSES AND REMEDIES	10
5.1 Cleaning	11
5.2 Safety inspection	11
5.3 Disposal	11

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.

**WARNING**

To reduce the risk of fire, electric shock or injury to people, do not use any replacement or add-on parts that have not been approved by ebm-papst (e.g. parts manufactured with a 3D printer).



1.4 Voltage

- ⇒ Check the device's electrical equipment at regular intervals; see Chapter 5.2 Safety inspection.
- ⇒ Replace loose connections and defective cables immediately.



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.

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.

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.

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

- The fan is always to be transported with care and in its original packaging.
- If set down too hard or at an angle for example, the impact can lead to bearing damage or deformation of the frame or impeller.
- It must be ensured that the fans cannot tip over during transportation and handling.
- Secure the fan(s) with appropriate equipment such as a lashing strip so that nothing can slip or tip, especially when stacking multiple fans.
- Also make allowance for possible wind forces.

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.

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.

Operation is only permitted with systems having Class 1 vehicle electrical system architecture according to EN 50533.

Intended use also includes

- Using the device in DC grids only.
- 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

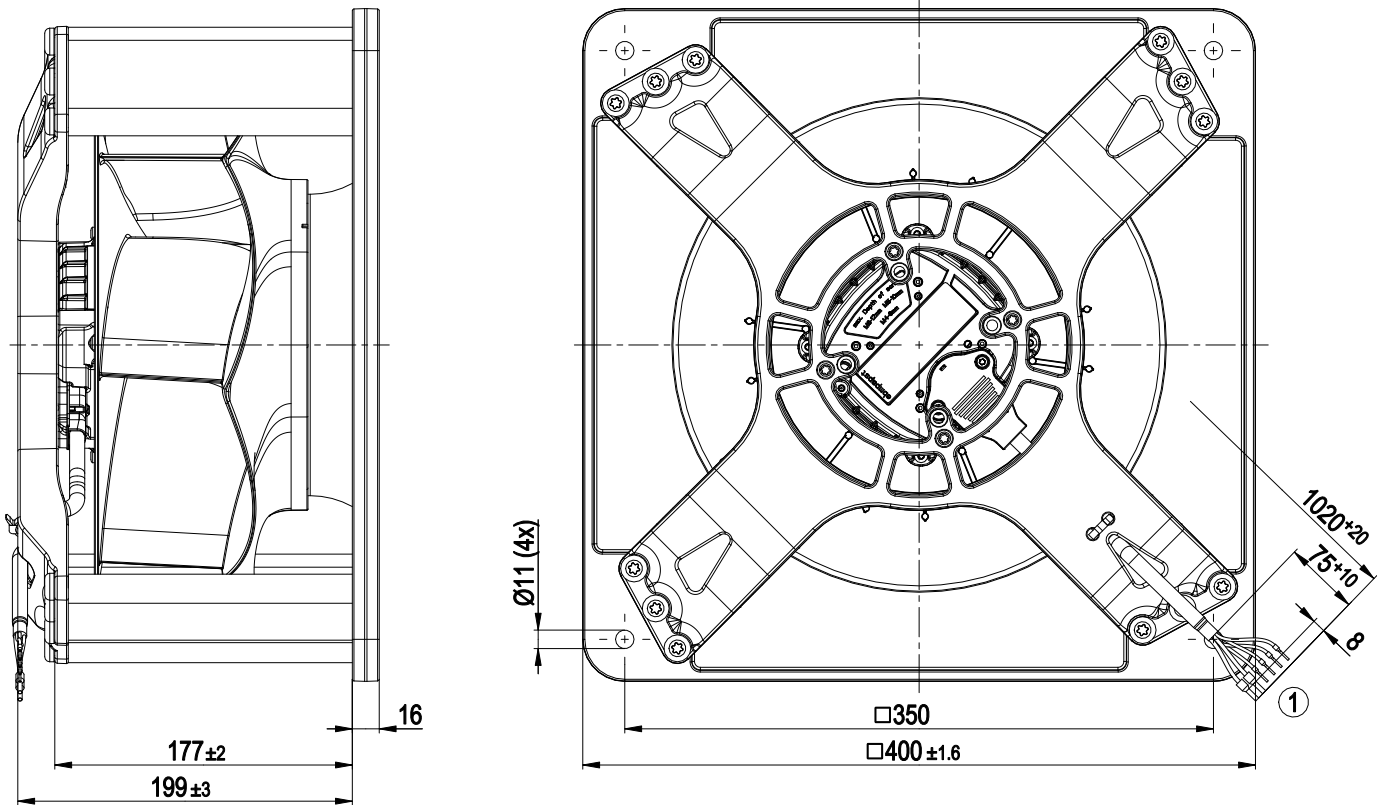
In particular, operating the device in the following ways is prohibited and could be hazardous:

- 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.
- 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.



3. TECHNICAL DATA

3.1 Product drawing

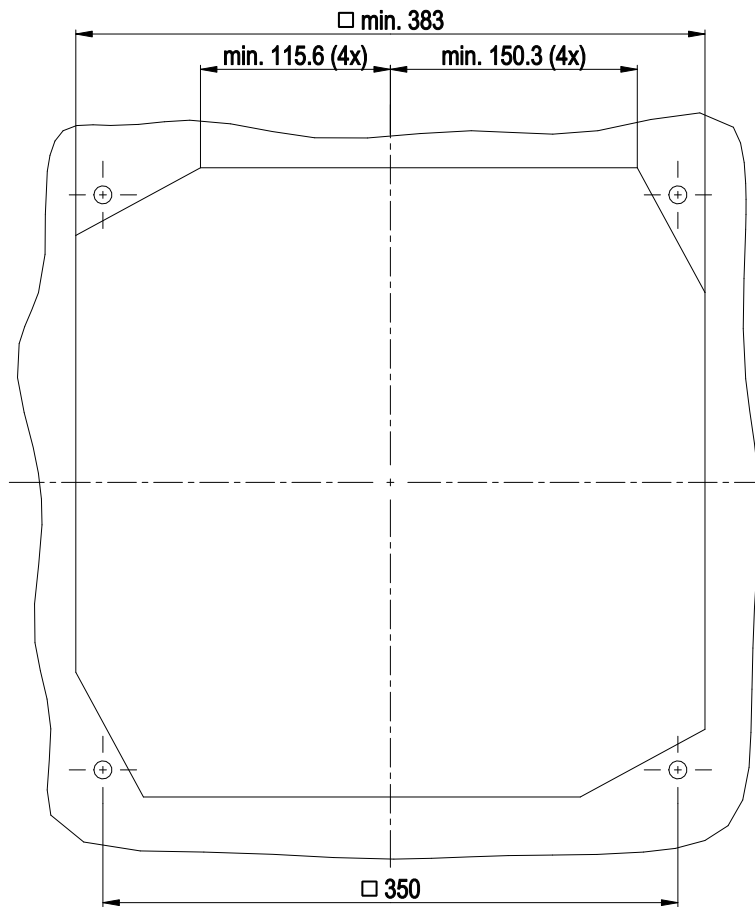


All dimensions in mm.

1	Cable, halogen-free, railway application EN 45545, 2x 2.5 mm², 4x 1.0 mm²
	6x wire-end ferrule



3.1.1 Mounting dimensions



All dimensions in mm.

3.2 Nominal data

Motor	M3G084-CF
Nominal voltage / VDC	26
Nominal voltage range / VDC	16 .. 32
Method of obtaining data	fa
Speed (rpm) / min ⁻¹	2350
Power consumption / W	252
Current draw / A	10.5
Min. ambient temperature / °C	-40
Max. ambient temperature / °C	70

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 η_{es} / %	66.3	46.2
02 Measurement category	A	
03 Efficiency category	Static	
04 Efficiency grade N	82.1	62
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	K3G280-RU26-81	
09 Power consumption P_e / kW	0.31	
09 Air flow q_v / m ³ /h	1600	
09 Pressure increase total p_{ts} / Pa	415	
10 Speed (rpm) n / min ⁻¹	2265	
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 = $1 + p_{ts} / 100\,000\text{ Pa}$

Data obtained at optimum efficiency level. The efficiency values displayed for achieving conformity with the Ecodesign Regulation EU 327/2011 has been reached with defined air duct components (e.g. inlet rings). The dimensions must be requested from ebm-papst. If other air conduction geometries are used on the installation side, the ebm-papst evaluation loses its validity/the conformity must be confirmed again. The product does not fall within the scope of Regulation (EU) 2019/1781 due to the exception specified in Article 2 (2a) (motors completely integrated into a product).

3.4 Technical description

Weight	8.78 kg
Size	280 mm
Motor size	84
Rotor surface	Painted black
Electronics housing material	Die-cast aluminum
Impeller material	PA plastic, sheet-metal plate painted black
Spacer material	Aluminum
Inlet nozzle material	Sheet steel, galvanized
Support structure material	Aluminum
Number of blades	6
Direction of rotation	Clockwise, viewed toward rotor
Degree of protection	Motor IP24 KM, electronics IP6K9K (mating connector installed)
Insulation class	"B"
Moisture (F) / Environmental (H) protection class	H3
Installation position	Shaft horizontal or rotor on bottom; rotor on top on request
Cooling hole/opening	On rotor side
Mode	S1
Motor bearing	Ball bearing
Technical features	- Lowering input - Error output (high-side switch) - INVLIN (inverse linear control input) - Power limiter - Load dump (58 V) - Motor current limitation - Soft start - Control input 0-10 VDC / PWM - Temperature derating - Overvoltage detection - Thermal overload protection for electronics - Line undervoltage detection - Reverse polarity protection
with cable	Lateral
Protection class assignment	III; Requires supply with safety extra-low voltage SELV. This component for installation may have several local protection classes. This information relates to this component's basic design. The final protection class is based on the component's intended installation and connection.
Conformity with standards	EN 15085-1, CPC3; EN 45545-2, HL3; EN 50155; EN 61373, Cat. 1B
Approval	EAC

⇒ 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

Further mounting data can be taken from the product drawing or Chapter 4.1 Mechanical connection as required.

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

3.7 Electromagnetic compatibility

EMC regulations	according to EN 50121-3-2
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4. CONNECTION AND STARTUP**4.1 Mechanical connection****CAUTION**

Risk of cutting and crushing when removing device from packaging



→ Carefully remove the device from the packaging by grasping hold of the frame. Never subject to any impact.

→ Wear safety shoes and cut-resistant safety gloves.

**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.

→ It is advisable to use spring or rubber isolators for decoupling (not included in scope of delivery). The fan is to be operated sufficiently far away from the resonant frequency of the vibration isolators.

→ 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 sub-structure.

⇒ The fan may not be handled in the area around the inlet nozzle during transport and installation.

There is a risk of damage to the impeller.

⇒ 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.

• The fan must not be strained on fastening.

4.2 Electrical connection**CAUTION**

Voltage

The fan is a built-in component and has no disconnecting switch.

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

→ When working on the fan, secure the system/machine in which the fan is installed so as to prevent it from being switched back on.

NOTE

Water ingress into wires or cables

Water ingress at the customer end of the cable can damage the device.

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

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 mm².



Operate the device with a safely isolated power supply.

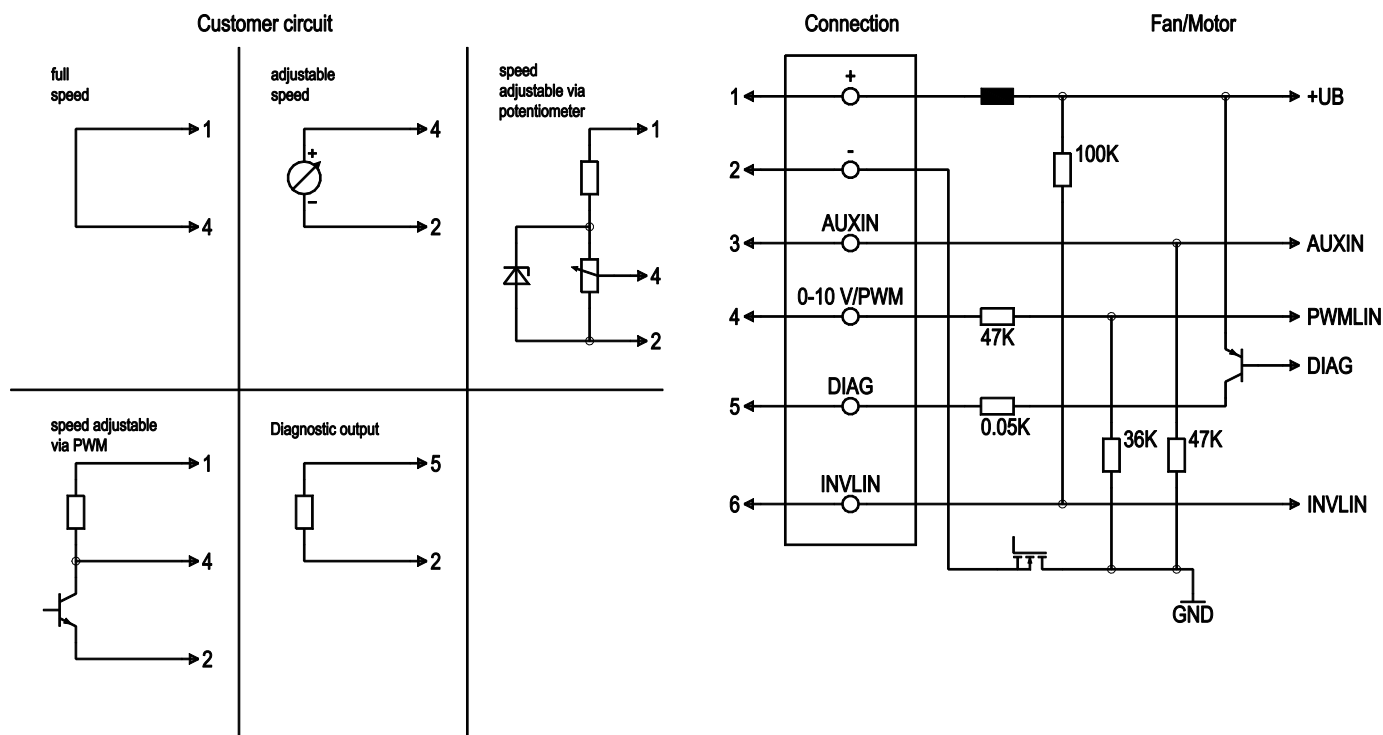
4.3 Connecting the cables

The device has external leads.

- Connect the cables according to your application. When doing so, observe Chapter 4.4 Connection diagram.



4.4 Connection diagram



Drawing preliminary!

No.	Conn.	Designation	Color	Function/assignment
1	+		black	Power supply, see nameplate for voltage range
2	-		brown	Power supply, see nameplate for voltage range
3	AUXIN		blue	Digital input: when active (> 4 V), value of PWM signal is halved
4	0-10 V / PWM		yellow	Control input: $R_i > 47\text{ k}\Omega$ 0-10 V (typ. < 1 V -> n=0; 1.5 V -> n=min; > 10 V -> n=max) PWM (amplitude 10 V; 1-50 kHz; typ. < 5 % -> n=0; 15% -> n=min; > 100% -> n=max)
5	DIAG		white	Diagnostic output: Open collector, $I_{\text{source max}} = 20\text{ mA}$, Fan OK -> low; fan error -> high
6	INVLIN		orange	Control input, inverse linear

4.5 Checking connections

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

4.6 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.
- The maximum permissible vibration severity must not exceed 3.5 mm/s and should be checked at intervals of 6 months. #It is to be determined at the motor mount at the motor support plate at least in axial direction and transversely to this. #Measurement of the vibration in all three axes is recommended and should be performed over the entire speed range in order to obtain a complete picture of the vibrations occurring in the application, see Chapter 5. Maintenance, malfunctions, possible causes and remedies.

4.7 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.

5. 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, apply control signal.
	Faulty connection	Isolate from supply, correct connection; see connection diagram.

Motor/electronics overtemperature	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.
	Ambient temperature too high	Reduce the ambient temperature. Reset by reducing control input to 0.
	Impermissible point of operation	Correct the operating point. Let the device cool down.



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

5.1 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.

- ⇒ 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!
- ⇒ 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.

5.2 Safety inspection

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
Insulation of cables for damage	Visual inspection	At least every 6 months	Replace cables
Impeller for wear/deposits/corrosion and damage	Visual inspection	At least every 6 months	Clean impeller or replace device
Condensation drainage holes for clogging, where necessary	Visual inspection	At least every 6 months	Open holes
Abnormal bearing noise	acoustic	At least every 6 months	Replace device
Vibration test	Vibration tester, start-up or deceleration measurement	Recommended every 6 months	Clean impeller or replace device

5.3 Disposal

For ebm-papst, environmental protection and resource preservation are top priority corporate goals.

ebm-papst operates an environmental management system which is certified in accordance with ISO 14001 and rigorously implemented around the world on the basis of German standards.

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

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

5.3.1 Country-specific legal requirements



NOTE

Country-specific legal requirements

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

5.3.2 Disassembly

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

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



WARNING

Heavy parts of the product may drop off. Some of the product components are heavy. These components could drop off during disassembly.

This can result in fatal or serious injury and material damage.

→ Secure components before unfastening to stop them falling.

5.3.3 Component disposal

The products are mostly made of steel, copper, 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.

