Product Data Sheet 2218F/2TDH4OR-227

ebmpapst

The engineer's choice



GREEN TECH

2218F/2TDH4OR-227

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1 General

Fan type	Axial fan	
Rotating direction looking at rotor	Counterclockwise	
Airflow direction	Air outlet over struts	
Bearing system	Ball bearing	
Mounting position - shaft	Any	

2 Mechanics

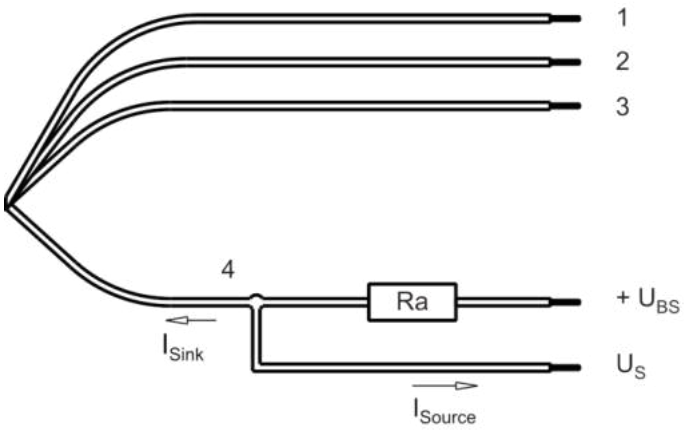
2.1 General

Width	200 mm	
Height	200 mm	
Depth	51 mm	
Diameter	220 mm	
Mass	1,06 kg	
Housing material	Metal	
Impeller material	Plastic	

2.2 Connections

Electrical connection	Wires	
Lead wire length Tolerance	L = 450 mm +- 10 mm	
Tube length Tolerance	S = 410 mm +- 10 mm	
Wire size (AWG)	18 22	
Insulation diameter	2,20 mm 1,70 mm	





Wire	Color	Operation
1	red	+ UB
2	blue	- GND
3	violet	CONTR
4	white	Tacho

The auxilliaries shown on the schematic diagram (which are required for the intended use) are not part of our delivery.

Lead wire 1 - 2: AWG18 (Insulation diameter 2,20 mm)
Lead wire 3 - 4: AWG22 (Insulation diameter 1,70 mm)

3 Operating Data

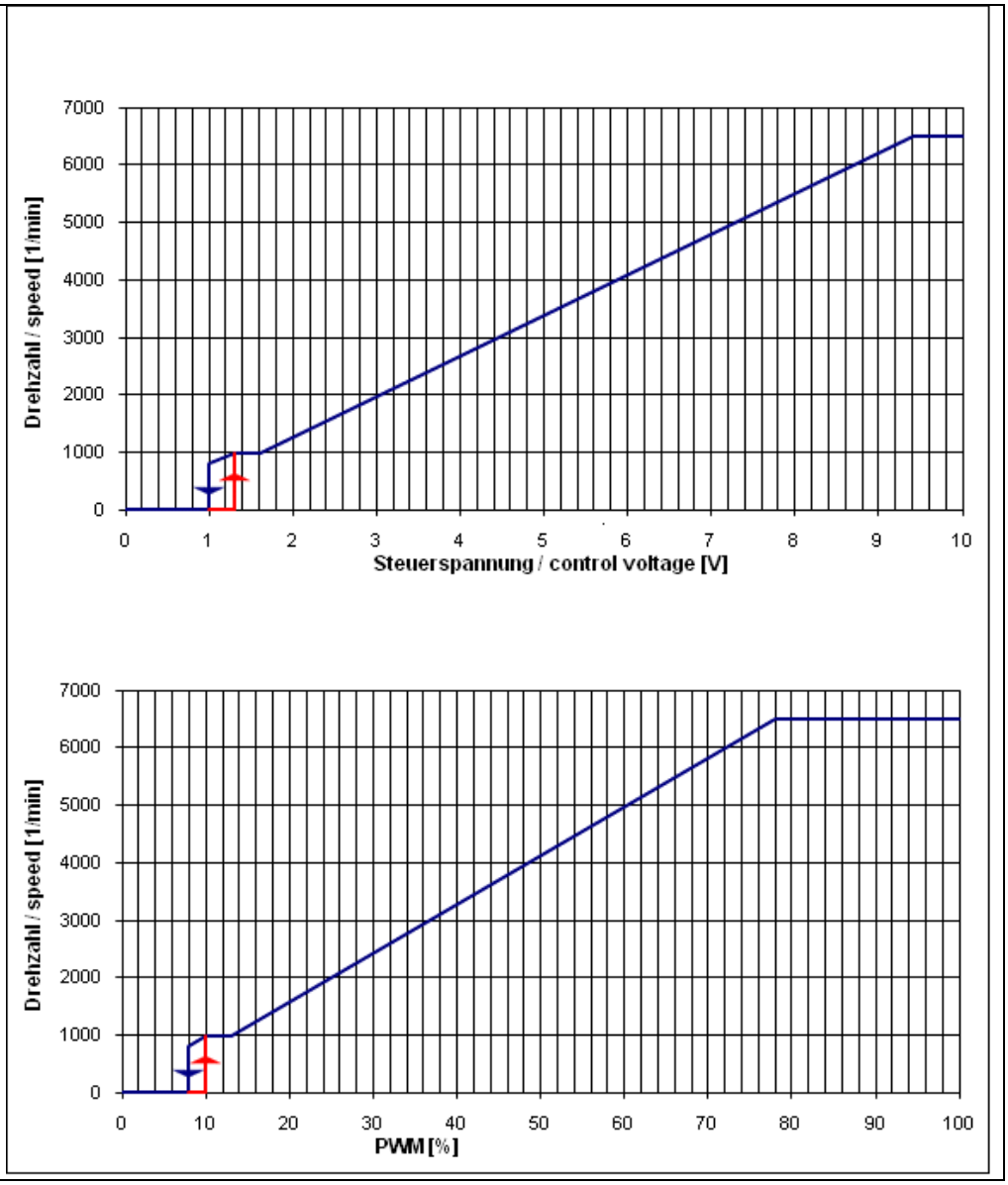
3.1 Operating Data - Electrical Interface - Input

Control input	Analog

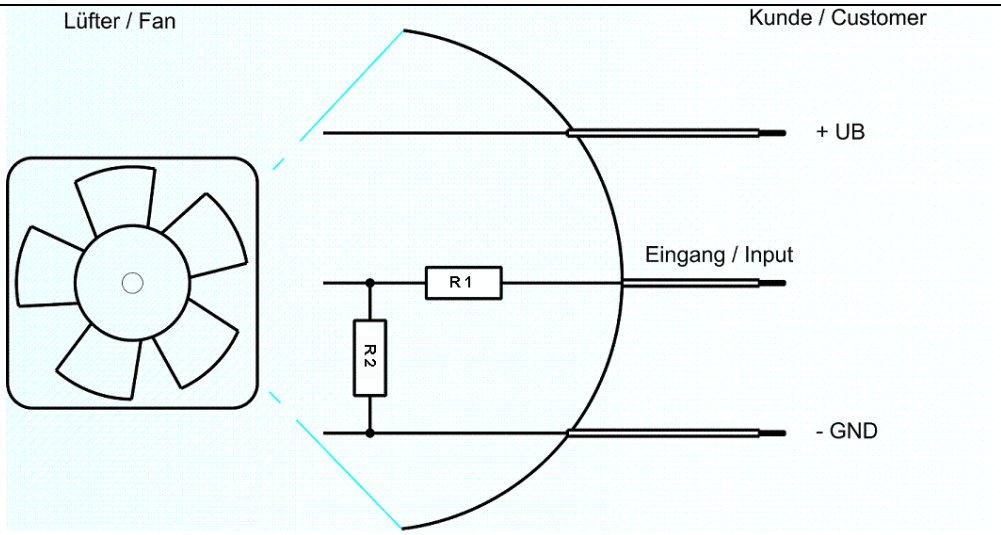
Features

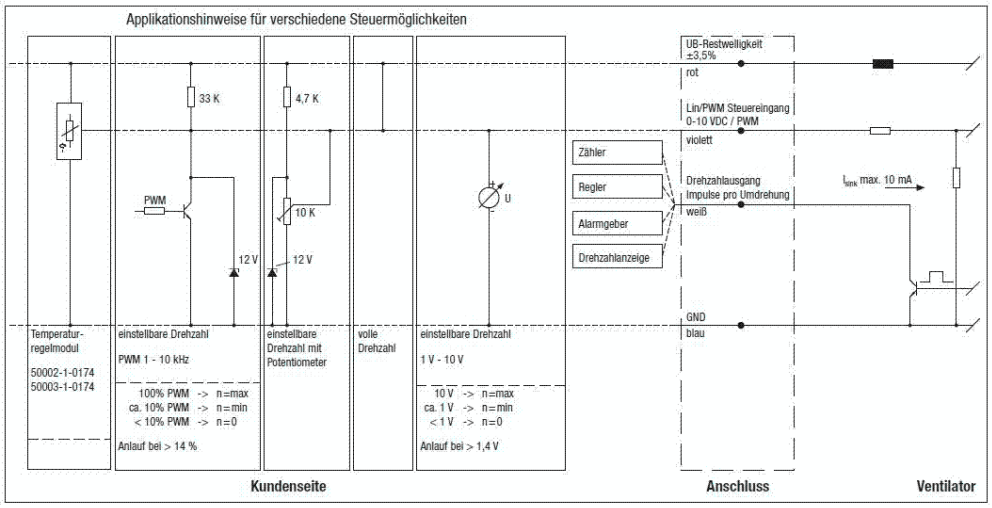
PWM - Frequency		1 kHz - 10 kHz typical: 2 kHz
Input voltage range		0 V - 10 V

Characteristics



Schematics





Input voltage divider:
R1 = 47 kOhm
R2 = 36 kOhm
For protection: There is a 5,1 V Z-Diode in parallel to R2.

Speed control:
By pulse-width modulation (PWM) 0 ... 100%
with switching transistor in emitter circuit and collector resistor to 12 V
Frequency = 2 kHz (1 - 10 kHz)

Information to the curve PWM:

0% - <10% PWM:	0 1/min
10% PWM:	1.000 1/min (Fan on, coming from 0% PWM)
10% - 13% PWM:	1.000 1/min (corresponding to min. speed)
13% - 78% PWM:	linear increasing curve
78% - 100% PWM:	6.500 1/min (corresponding to max. speed)
10% - >8% PWM:	linear decreasing curve (coming from 100% PWM)
8% PWM:	800 1/min or 0 1/min (Fan off, coming from 100% PWM)

or:

Speed control:
By analog voltage 0 - 10 V

Information to the curve analog:

0 V - < 1,3 V:	0 1/min
1,3 V:	1.000 1/min (Fan on, coming from von 0 V)
1,3 V - 1,6 V:	1.000 1/min (corresponding to min. speed)
1,6 V - 9,4 V:	linear increasing curve
9,4 V - 10 V:	6.500 1/min (corresponding to max. speed)
1,3 V - > 1,0 V:	linear decreasing curve (coming from 10 V)
1,0 V:	800 1/min or 0 1/min (Fan off, coming from 10 V)

Note:
It must be ensured that the power supply is applied before the control signal (U Contr) is turned on !!
The fan has no sensor break detection. This means - when the input is not connected, the speed is set to zero !!

3.2 Electrical Operating Data

Measurement conditions: Normal air density = 1,2 kg/m3; Temperature 23°C +/- 3°C; Motor axis horizontal; warm-up time before measuring 5 minutes (unless otherwise specified). In the intake and outlet area should not be any solid obstruction within 0,5 m.

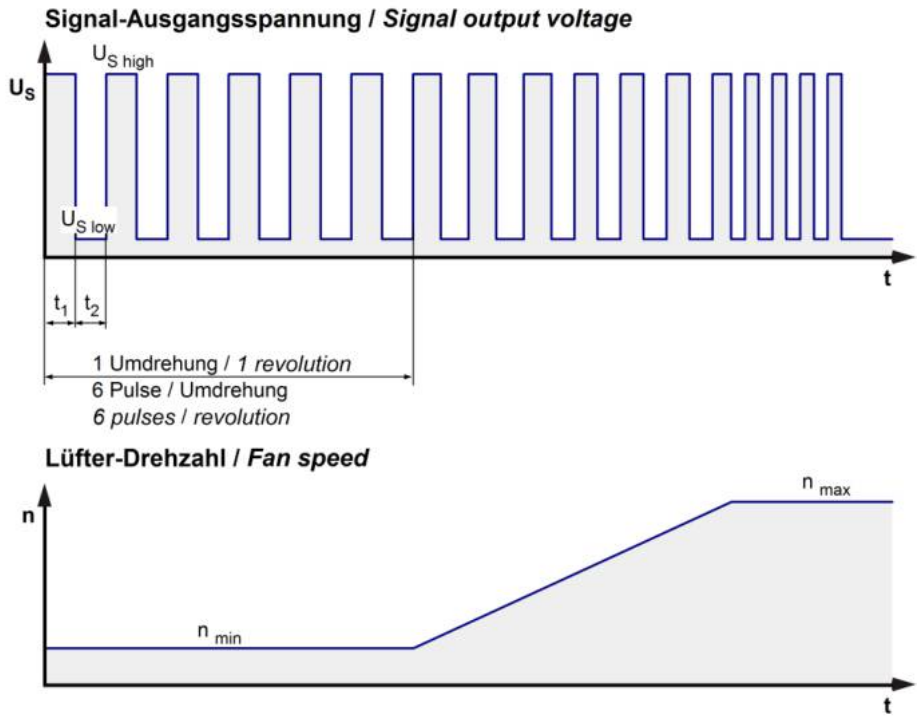
$\Delta p = 0$: corresp. to free air flow (see section 3.5)
I: corresp. to arithm. mean current value

Name	Condition		
U Contr. 0001	U Contr.: 10 V		

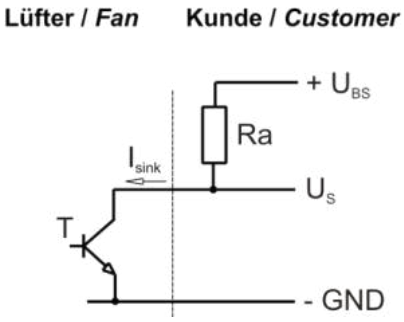
Features	Condition	Symbol	Values		
Voltage range		U	36 V		72 V
Nominal voltage		U_N		48 V	
Power consumption Tolerance	$\Delta p = 0$ U Contr. 0010	P	76 W +- 15 %	103 W +- 10 %	108 W +- 10 %
Current consumption Tolerance	$\Delta p = 0$ U Contr. 0010	I	2.100 mA +- 15 %	2.150 mA +- 10 %	1.500 mA +- 10 %
Speed Tolerance	$\Delta p = 0$ U Contr. 0010	n	5.900 1/min +- 10 %	6.500 1/min +- 3 %	6.500 1/min +- 3 %

3.3 Operating Data - Electrical Interface - Output

Tacho type	/2 (open collector)



$$Ra = \frac{U_{BS} - U_{S\,low}}{I_{sink}}$$

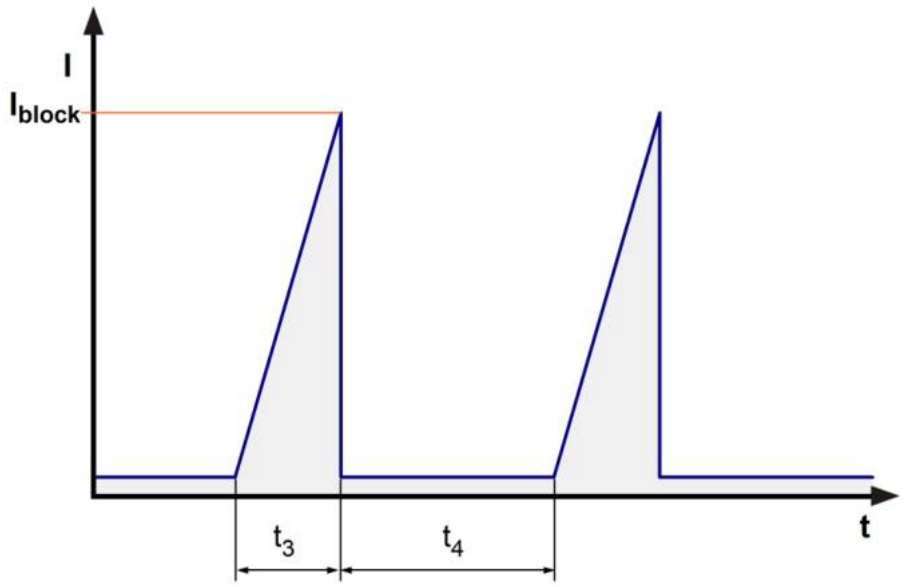


Features		Note	Values
Tacho operating voltage	U_{BS}		<= 60 V
Tacho signal Low	$U_{S\,low}$	I sink: 2 mA	<=0,4 V
Tacho signal High	$U_{S\,high}$	I source: 0 mA	<=60 V
Maximum sink current	I_{sink}		<= 20 mA
External resistor		External resistor Ra from UBS to US required. All voltages measured to GND.	
Tacho frequency		(6 x n) / 60	
Tacho isolated from motor		No	
Slew rate			=> 0,5 V/us

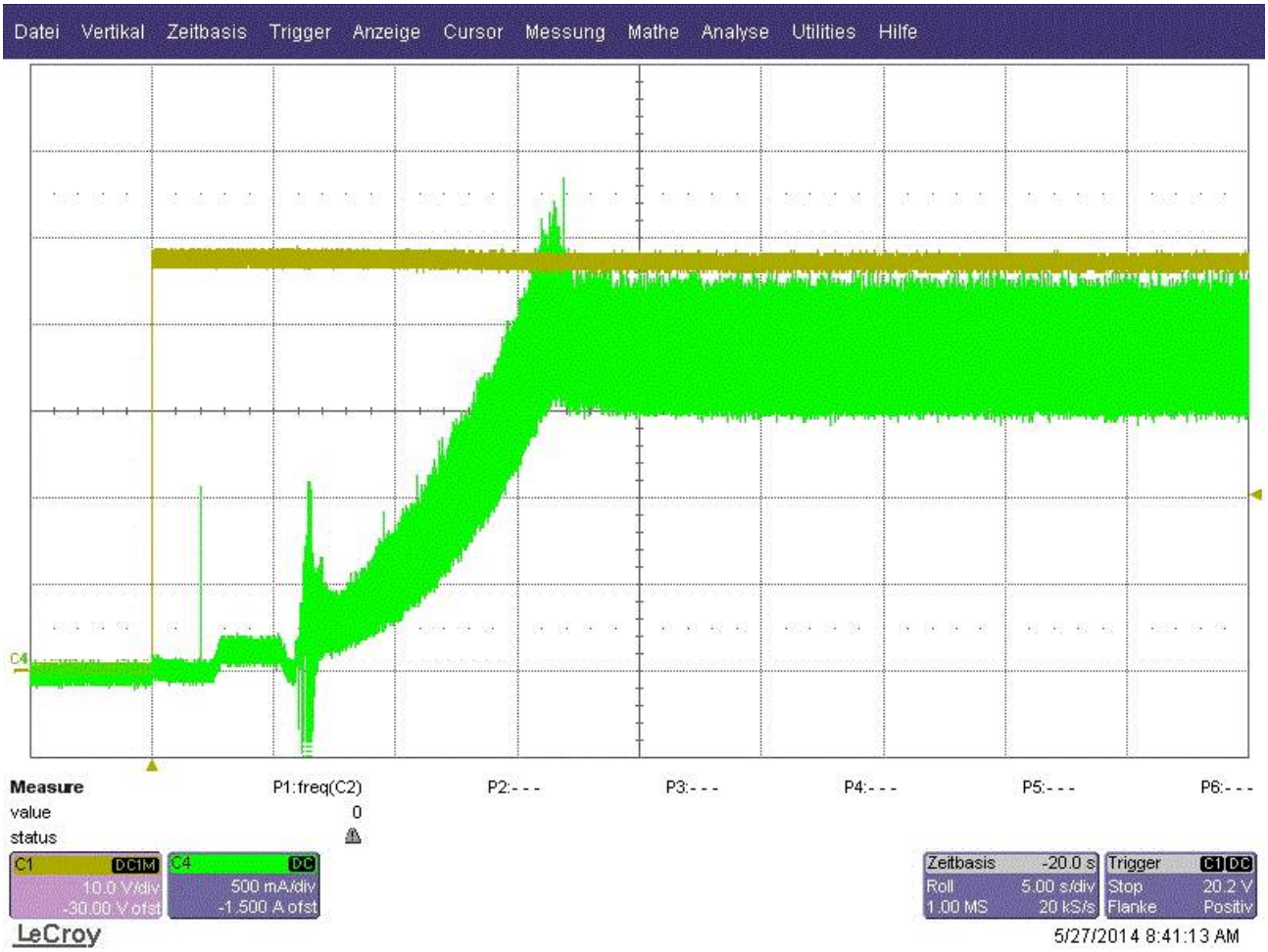
n = revolutions per minute (1/min)

3.4 Electrical Features

Electronic function	Speed-Controlled	
Reversed polarity protection Max. residual current at U_N	P-CH FET I_F <= 5 mA	
Locked rotor protection	Auto restart	
Locked rotor current at U_N	I_{block} approx. 2.500 mA	
Clock signal at locked rotor	t_3 / t_4 typical: 3,0 s / 10,0 s	



The locked rotor current is measured as peak current at nominal voltage.
After 3 not successful start-up attempts, the fan will be turned off for 40 seconds.



Start_up current @ 48V



Locker rotor current @ 48V

Internal Fuse:
Littelfuse NANO2(R) FUSE; Very fast acting 451 Series; 10 A (Art.-Nr.: 0451010.MRL)

Inrush current limiter:
This fan is equipped with an inrush current limiter to reduce the charging current of the internal capacitor. By this circuit the fan gets a start-up delay of 2 s after connecting the supply voltage. Only a short peak current can be measured at the inrush by charging the small internal filter capacitors with approximately 6,6 µF.

3.5 Data According ErP Directive

Installation / Efficency category	A / static
Speed control	integrated
Specific ratio	1,00359
Target overall efficiency 2015	29,1 %
Overall efficiency	52,4 %
Efficiency grade	40
Power input	188 W
Speed	6.570 1/min

All values measured in optimum energy efficiency point.

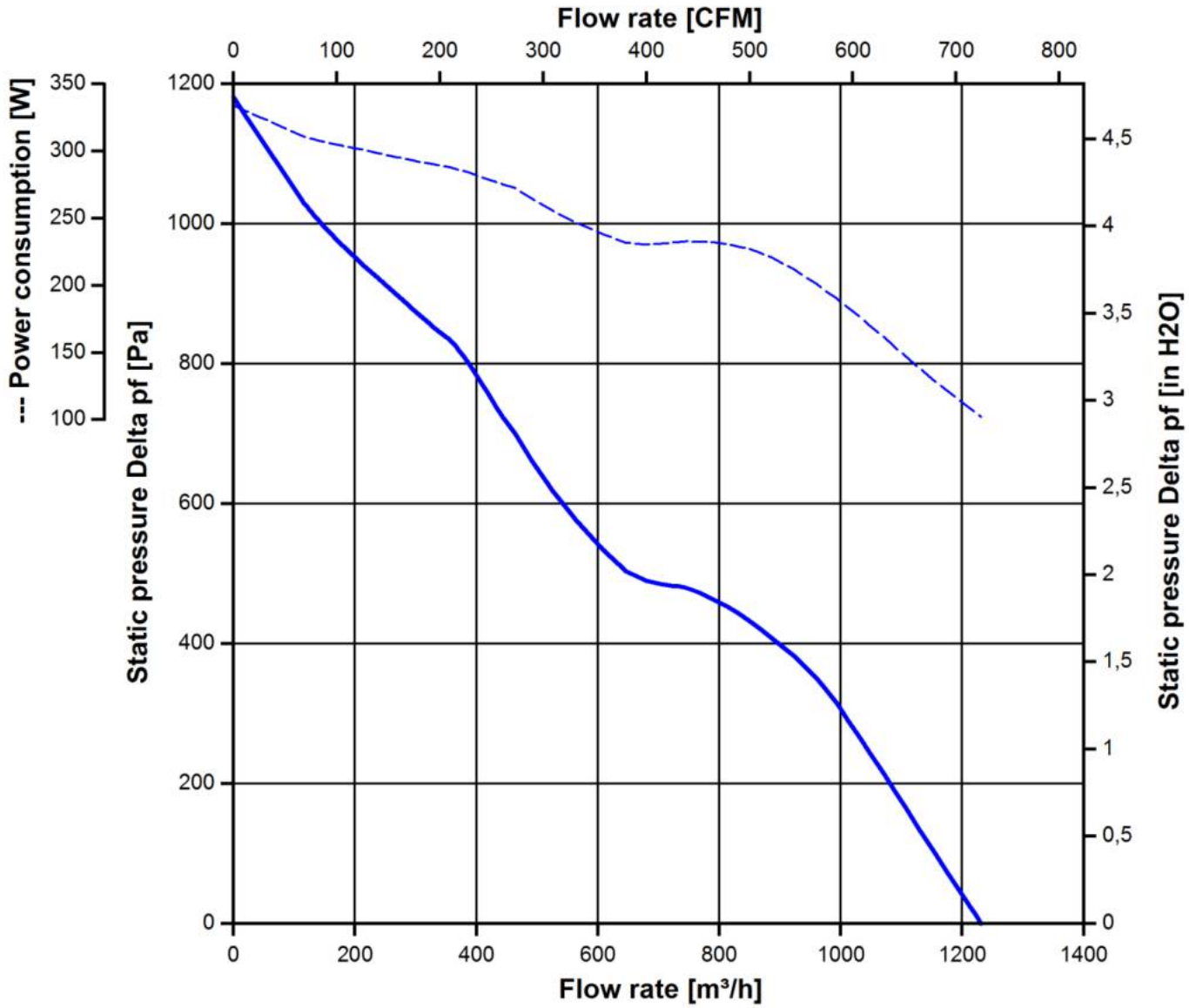
3.6 Aerodynamics

Measurement conditions:	Measured with a double chamber intake rig acc. to DIN EN ISO 5801. Normal air density = 1,2 kg/m3; Temperature 23°C +/- 3°C; In the intake and outlet area should not be any solid obstruction within 0,5 m. The information is only valid under the specified test conditions and may be changed by the installation conditions. If there are deviations from the standard test conditions, the characteristic values must be checked under the installed conditions. Power consumption of the fan motor when operating at normal voltage is shown. Depending on the operating conditions of the application, the power input may be higher.

a.) Operation condition:

6.500 1/min at free air flow	U Contr. 10 V		

Max. free-air flow (Δp = 0 / $\dot{V}$ = max.)	1.220 m3/h	
Max. static pressure (Δp = max. / $\dot{V}$ =0)	1.170 Pa	



3.7 Sound Data

Measurement conditions:	Sound pressure level: 1 Meter distance between microphone and the air intake. Sound power level: Acc. to DIN 45635 part 38 (ISO 10302) Measured in a semianchoic chamber with a background noise level of Lp(A) < 5 dB(A) For further measurement conditions see section 3.5

a.) Operation condition:

6.500 1/min at free air flow	U Contr. 10 V		

Optimal operating point	1.200,0 m3/h @ 44 Pa	
Sound power level at the optimal operating point	8,2 bel(A)	
Sound pressure level at free air flow, measured in rubber bands	74,0 dB(A)	

4 Environment

4.1 General

Min. permitted ambient temperature TU min.	-20 °C	
Max. permitted ambient temperature TU max.	65 °C	
Min. permitted storage temperature TL min.	-40 °C	
Max. permitted storage temperature TL max.	80 °C	

4.2 Climatic Requirements

Humidity requirements	humid heat, cyclic; according to DIN EN 60068-2-30, 6 cycle	
Water exposure	None	
Dust requirements	Dust check; according to DIN EN 60068-2-68, 6g/m2d, 1 day	
Salt fog requirements	None	

Permitted application area:
The product is for the use in sheltered rooms with limited controlled temperature. Occasionally condensed water is allowed. Direct exposure to water must be avoided. Saline ambient conditions must be avoided.

Pollution degree 2 (according DIN EN 60664-1)
It occurs only non-conductive pollution. Occassionally, temporary conductivity caused by condensation occurs.

4.3 Mechanical Requirements

severity level	Vibration (sinusoidal)	
2 G	Vibration (sinusoidal) in use IEC 60068-2-6 Displacement / frequency range Acceleration / frequency range Sweep rate Sweep cycles Duration Axes of vibration	 Vibration (sinusoidal) 0,15 mm / 10-58, 58-10 Hz 2 G / 58-500-58 Hz 1 Oct./min 10 2 hrs. 3

severity level	stationary use		
1	storage / transportation	Random vibration not in use IEC 60068-2-64 Frequency range / ASD G_{RMS} Axes of vibration Test duration	 Random vibration 5 - 20 Hz : 1,0 m² / s³ 20 - 500 Hz : - 3 dB / Oct 0,91 G 3 3 x 30 min
	storage / transportation	Bump not in use IEC 60068-2-29 Shock spectrum Acceleration Duration Number of bumps (+X, -X, -Y, +Y, -Z, +Z) Total bumps	 Bump half sine 18 G 6 ms 100 in each direction 600
	stationary use	Random vibration in use IEC 60068-2-64 Frequency range / ASD G_{RMS} Axes of vibration Test duration	 Random vibration 5 - 10 Hz : +6 dB / Oct 10 - 50 Hz : 1,0 m^2 / s^3 50 - 200 Hz : - 6 dB / Oct 0,65 G 3 3 x 30 min
	stationary use	Bump in use IEC 60068-2-29 Shock spectrum Acceleration Duration Number of bumps (+X, -X, -Y, +Y, -Z, +Z) Total bumps	 Bump half sine 5 G 11 ms 100 in each direction 600

severity level	Railroad application	
1 IEC 61373 Category 1 Class B	Random vibration in use IEC 60068-2-64 Frequency range / ASD G_{RMS} Axes of vibration Test duration	 Random vibration 5 - 10 Hz : +6 dB / Oct 10 - 50 Hz : 1,0 m^2 / s^3 50 - 200 Hz : - 6 dB / Oct 0,65 G 3 3 x 30 min
	Shock in use IEC 60068-2-27 Shock spectrum Acceleration Duration Number of bumps (+X, -X, -Y, +Y, -Z, +Z) Total bumps	 Shock half sine 7 G 18 ms 10 in each direction 60

5 Safety

5.1 Electrical Safety

Dielectric strength DIN EN 60950 (VDE 0805) and DIN EN 60335 (VDE 0700) A.) Type test Measuring conditions: After 48h of storage at 95% R.H. and 25°C. No arcing or breakdown is allowed! All connections together to ground. B.) Routine test Measuring conditions: At indoor climate. No arcing or breakdown is allowed! All connections together to ground.	 1000 VAC / 1 Min. 1000 VAC / 1 Sec.	
Isolation resistance Measuring conditions: After 48h of storage at 95% R.H. and 25°C measured with U=500 VDC for 1 min.	RI > 10 MOhm	
clearance / creepage distance	1,0 mm / 1,5 mm	
Protection class	I	

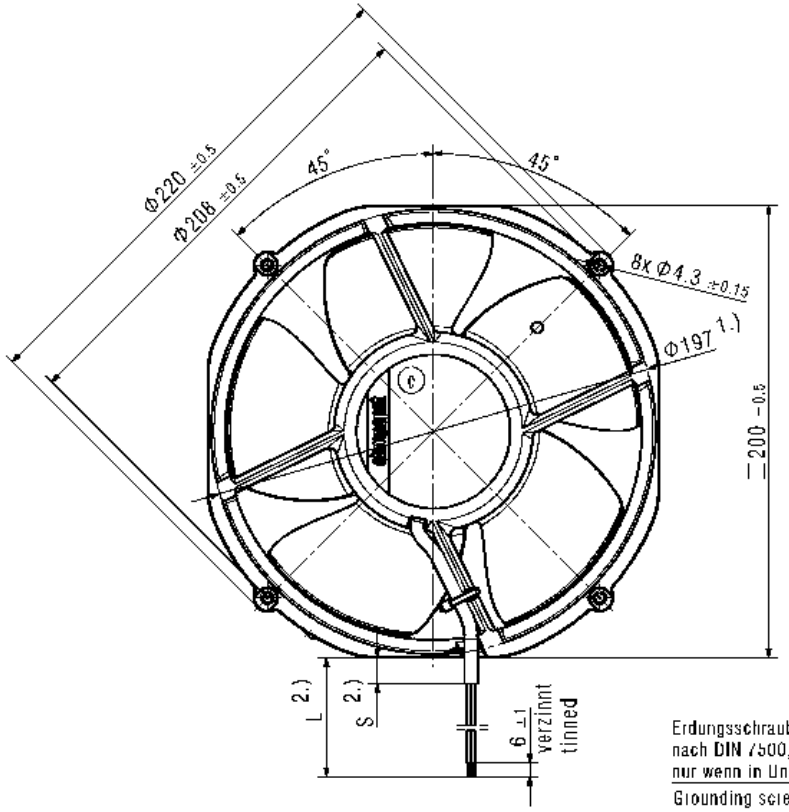
5.2 Approval Tests

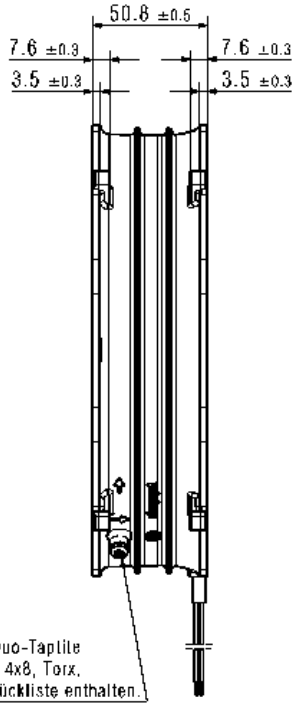
CE	EC Declaration of Conformity	No
EAC	Eurasian Conformity	Yes
UL	Underwriters Laboratories	Yes / UL audited by CSA according to UL507, Electric Fans
VDE	Association for Electrical, Electronic and Information Technologies	Yes / Approval acc. to EN 60950 (VDE 0805) - Information technology equipment
CSA	Canadian Standards Association	Yes / C22.2 No. 113 Fans and Ventilators
CCC	China Compulsory Certification	Yes / GB 12350 Safety Requirements for small Power Motors

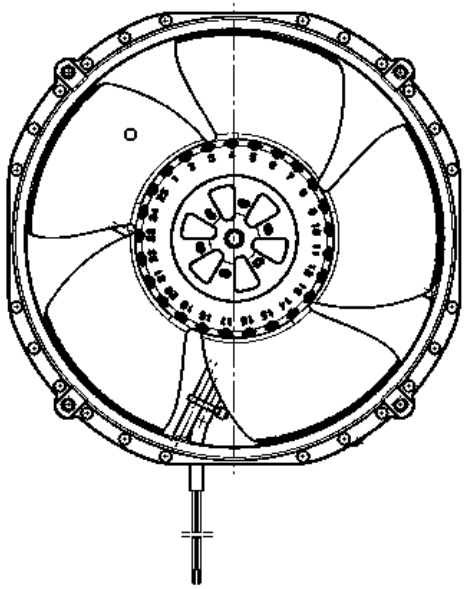
6 Reliability

6.1 General

Life expectancy L10 at TU = 40 °C	70.000 h	
Life expectancy L10 at TU max.	40.000 h	
Life expectancy L10 acc. to IPC 9591 at TU = 40 °C	117.500 h	

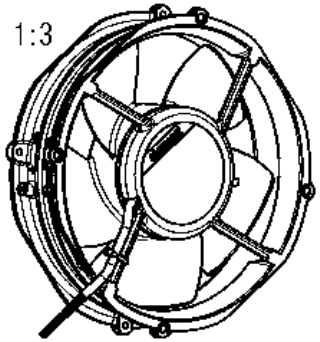






Erdungsschraube: Duo-Taptite
nach **DIN** 7500, CM 4x8, Torx,
nur wenn in Unterstückliste enthalten.

Grounding screw: Duo Taptite
according to **DIN** 7500, CM 4x8, Torx,
only if contained in sub-bill of materials.



- Axialspiel der Kugellager mit Feder spielfrei verspannt
1.) Maße für Montageausschnitt
2.) Anzahl und Länge der Litzen sowie Länge des Schlauchs siehe Produktspezifikation

- ball bearings without clearance by a pre-loaded spring
1.) measures of mounting cut-out
2.) length and number of wires and length of lube see product specification

Dokument-Status / Document-Status	CAD-Version/ CATIA Version	ERO Ersetzung/ CAT-ERO-Formular	Werkstoff / Material:	Volumen / Volume [liter]:	
Änd.-Nr./ Change-No.	BOSS-QUICK SPECIFIC			Gewicht / Mass [kg]:	
Toleranzen / Tolerances:	3D Referenzmodell / 3D Reference model		Artikel / Title:		
Allgemeintoleranzen / Gen. Tolerances:	Datum / Name		Zeichn.-Nr./ Drawing No:		Ers.f./Folgy. / Replaces:
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ebmpapst	ebm-papst St. Georgen GmbH & Co. KG				Format / Size: Maßstab/Scale

Safety instructions

for EC and DC built-in fans

The device type, date of manufacture (calendar week/year) and the conformity sign are located on the type plate on the fan.
For questions about the fan, please provide the entire content of the type plate.

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

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1. SAFETY REGULATIONS AND NOTES

Please read these operating instructions carefully before starting to work with the device. Observe the following warnings to prevent malfunctions or 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 Hazard levels of 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 property damage.

NOTE

A potentially harmful situation can occur and, if not avoided, can lead to property damage.

1.2 Staff qualification

Only specialised electrical personnel may install the device, perform the test run and work on the electrical system.
Only trained and authorised specialist personnel are permitted to transport, unpack, assemble, operate or maintain the device, or to use it in any other manner.

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 and current

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



DANGER

Electrical load on the device
Electric shock
➜ Stand on a rubber mat if you are working on an electrically loaded device.

WARNING
Terminals and connections have voltage even in a unit that is shut off
Electric shock
➜ Wait five minutes after disconnecting the voltage at all poles before touching the unit.

CAUTION

In the event of fault, electric voltage is present at the rotor and impeller
The rotor and impeller are base insulated.
➜ Do not touch the rotor and impeller when they are installed.

CAUTION

If control voltage is applied or a speed setpoint is stored, the motor automatically restarts, e.g. after a power failure.
Danger of injury
➜ Keep out of the danger zone of the device.
➜ When working on the device, switch off the mains supply voltage and secure the latter from being switched on again.
➜ Wait until the device stops.

If the leakage current of the device is greater than 3.5 mA, a permanent earth wire connection is required. The device can be earthed using two earth wires with a respective outer conductor cross-section or one earth wire with at least 10 mm².

1.5 Safety and protective functions



DANGER

Missing safety device and non-functioning protective features
If there is no safety device, you could be seriously injured, for example by reaching into the running device with your hands.
➜ Operate the device only with a fixed guard and guard grille. The guard must withstand the kinetic energy of a fan blade.
➜ The device is a built-in component that has no function on its own. As the operator, you are responsible for ensuring that the device is adequately secured.
➜ Shut down the device immediately if you detect a missing or ineffective protective feature.

1.6 Electromagnetic radiation

Interference from electromagnetic radiation possible, e.g. in conjunction with open and closed-loop control devices.
If unacceptable emission intensities occur when the fan is installed, suitable shielding measures must be taken before the device is commissioned.

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

WARNING

Rotating device
Long hair, loose items of clothing and jewellery could become entangled and pulled into the device. You could be injured.
➜ Do not wear any loose clothing or jewellery while working on moving parts.
➜ Protect long hair with a hood.

1.8 Emission

WARNING

Depending on the installation and operating conditions, a sound pressure level greater than 70 dB(A) can arise.
Danger of noise-induced hearing loss
➜ Take appropriate technical safety measures.
➜ Safeguard the operating personnel with appropriate protection measures, e.g. ear protectors.

1.9 Hot surface



CAUTION

High temperature at the electronics enclosure
Danger of burn injuries
➜ Ensure that sufficient protection against accidental contact is provided.

1.10 Transport

CAUTION

Transport of fan
➜ Transport the fan in its original packaging only.
➜ Secure the fan so that it does not slip, for example using a lashing strap.

1.11 Storage

Store the device in a dry and weatherproof manner in the original packing in a clean environment.
Protect the device from environmental impacts and dirt until the final installation.
We recommend storing the device for a maximum of one year.
Maintain the storage temperature.

1.12 Disposal

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

2. PROPER USE

The device is exclusively designed as a built-in device for moving air according to its technical data.
Any other or secondary use is deemed improper and constitutes a misuse of the device.
Installations on the customer's side must meet the mechanical, thermal and service life-related stresses that can occur.

Proper use also includes:

- Using the device only in power systems that are earthed at the neutral. (Applicable only to 3-phase devices)
- Moving air with a density of 1.2 kg/m³.
- Using the device in accordance with the permitted ambient temperature.
- Operating the device with all protective features.
- Observing the operating instructions.

Improper use

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

- Moving air that contains abrasive particles.
- Moving highly corrosive air, 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 shavings.
- Operating the fan in the vicinity of flammable materials or components.
- Operating the fan in an explosive atmosphere.
- Using the fan as a safety component or for taking on safety-related functions.
- In addition, all application options that are not listed under proper use.

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

Electromagnetic compatibility



If several fans 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 Ssc 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 Ssc value that is greater than or equal to 120 times the rated output of the arrangement.

3. CONNECTION AND START-UP

3.1 Connecting the mechanical system



CAUTION

Cutting and crushing hazard when removing the device from the packaging
➜ Carefully lift the device out of the packaging; be sure to avoid any shock.
➜ Wear safety shoes and cut-resistant safety gloves.

CAUTION

Heavy load when taking out the device
Bodily injuries, e.g. back injuries, are possible.
➜ Two people should lift the blower out of its packaging if it is heavier than 10 kg.

➜ Install the device according to your application.
➜ Use suitable fastening hardware for the installation.

3.2 Connecting the electrical system



DANGER

Electric voltage on the device
Electric shock
➜ Always install an earth wire. Check the protective earth. (Not applicable to DC-fed devices)



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.



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
➜ Ensure 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. (Not applicable to DC-fed devices)

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

CAUTION

Electric shock
Electric voltage on the metal part
➜ Use the device only with the cable guard provided for this purpose. (Applicable only to devices with terminal boxes)

NOTE

Device malfunctions are possible

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

Recommendation: clearance > 10 cm (separate cable routing). (Not applicable to DC-fed devices)



If the leakage current of the device is greater than 3.5 mA, a permanent earth wire connection is required. The device can be earthed using two earth wires with a respective outer conductor cross-section or one earth wire with at least 10 mm². (Not applicable to DC-fed devices)

Prerequisites

➜ Check whether the data on the type plate agree with the connection data.
➜ Before connecting the device, ensure that the mains supply voltage matches the fan voltage.
➜ Only use cables that are configured for current according to the type plate.

Residual current operated device



For 3-phase types and types with active PFC, only universal (type B) RCD protective devices are permitted.
For 1-phase types without PFC, a universal RCD protective device (type A) can be used.
Like frequency inverters, RCD protective devices cannot provide personal safety while operating the device.

Connecting cables with terminals (applicable only to devices with terminal connection)

WARNING

Terminals and connections have voltage even in a unit that is shut off

Electric shock

➜ Wait five minutes after disconnecting the voltage at all poles before touching the unit.

WARNING

Electric voltage on cable gland

Electric shock

➜ Do not use plastic terminal boxes with metal cable glands.

3.3 Checking the connections

➜ Ensure that the power is off.
➜ Secure it from being switched on again.
➜ Check the correct fit of the connecting cables.

3.4 Switching on the device

WARNING

Hot motor housing

Fire hazard

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

➜ Inspect the device for visible external damage and the proper function of the protective features before switching it on.
➜ Apply nominal voltage to the voltage supply.
➜ Start the device by changing the input signal.

3.5 Switching off the device

– Switch off the device during operation:
  ➜ Switch the device off using the control input in order to protect the device.
  ➜ Do not switch the motor (e.g. in cyclic operation) on and off by means of the power supply.
– Switching off the device for maintenance work:
  ➜ Separate the device from the supply voltage.

4. MAINTENANCE, MALFUNCTIONS, POSSIBLE CAUSES AND REMEDIES

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

WARNING

Terminals and connections have voltage even in a unit that is shut off
Electric shock
➜ Wait five minutes after disconnecting the voltage at all poles before touching the unit.

CAUTION

If control voltage is applied or a speed setpoint is stored, the motor automatically restarts, e.g. after a power failure.
Danger of injury
Keep out of the danger zone of the device.
➜ When working on the device, switch off the mains supply voltage and secure the latter from being switched on again.
➜ Wait until the device stops.

If the device remains out of use for some time, e.g. when in storage, we recommend switching the device on for at least 2 hours to allow any condensate to evaporate and to move the bearings.

Malfunction/error	Possible cause	Possible remedy
Motor does not turn	Mechanical blockage – Mains supply voltage faulty	– Switch it off and remove mechanical blockage – Check mains supply voltage, restore power supply – Apply control signal
Impeller running roughly	– Imbalance in rotating parts	– Clean the device; if imbalance still evident after cleaning, replace device
Overtemperature of electronics	– Ambient temperature too high – Insufficient cooling – Unacceptable operating point	– Lower ambient temperature if possible. – Reset by reducing control input to 0.
Overtemperature of motor		
Incorrect rotor position detection	– Failure of electronics (not applicable to DC-fed devices)	

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

4.1 Safety examination

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