Product Data Sheet 2218F/2TDHO

ebmpapst

The engineer's choice

GREEN TECH

2218F/2TDHO

INDEX

1 General

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

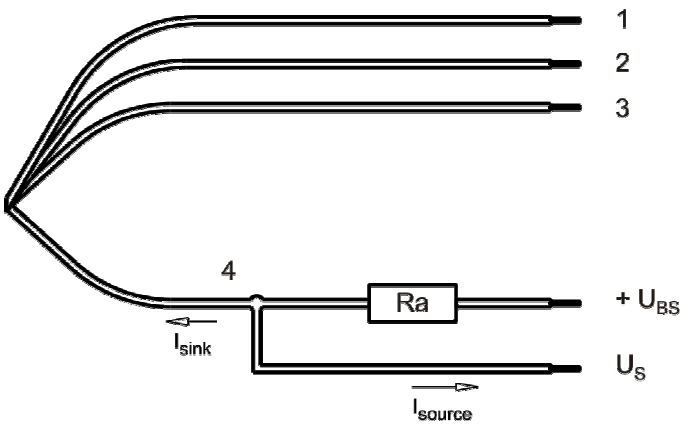
2 Mechanics

2.1 General

Width	200 mm	
Height	200 mm	
Depth	51,0 mm	
Diameter	220 mm	
Mass	1,0 kg	
Housing material	Metal	
Impeller material	Plastic	

2.2 Connections

Electrical connection	Wires	
Lead wire length Tolerance	L = 400 mm +- 10 mm	
Tube length Tolerance	S = 10 mm +- 5 mm	



Wire	Color	Operation	Wire size	Insulation diameter
1	red	+ UB	AWG 22	1,7 mm
2	blue	- GND	AWG 22	1,7 mm
3	violet	PWM	AWG 22	1,7 mm
4	white	Tacho	AWG 22	1,7 mm

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

3 Operating Data

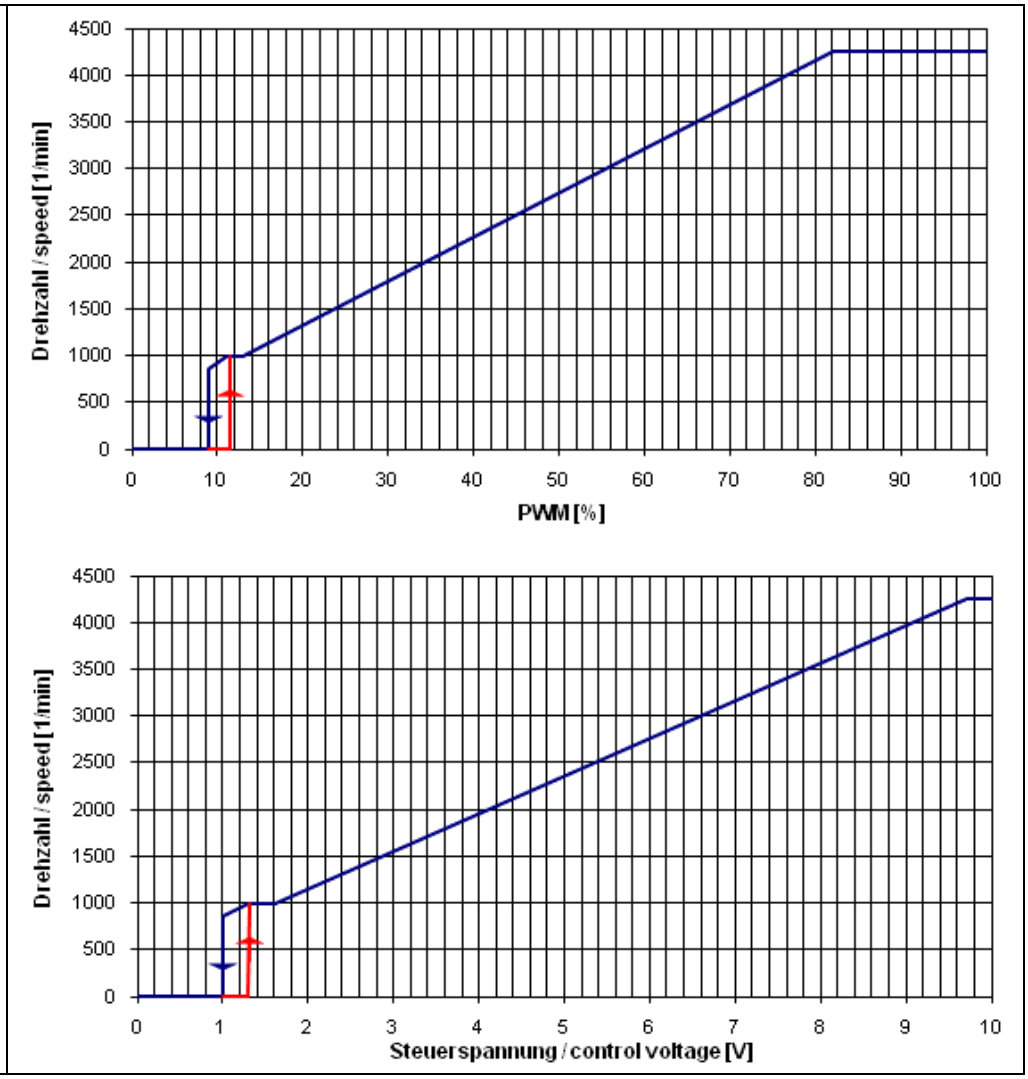
3.1 Electrical Interface - Input

Control input	Analog

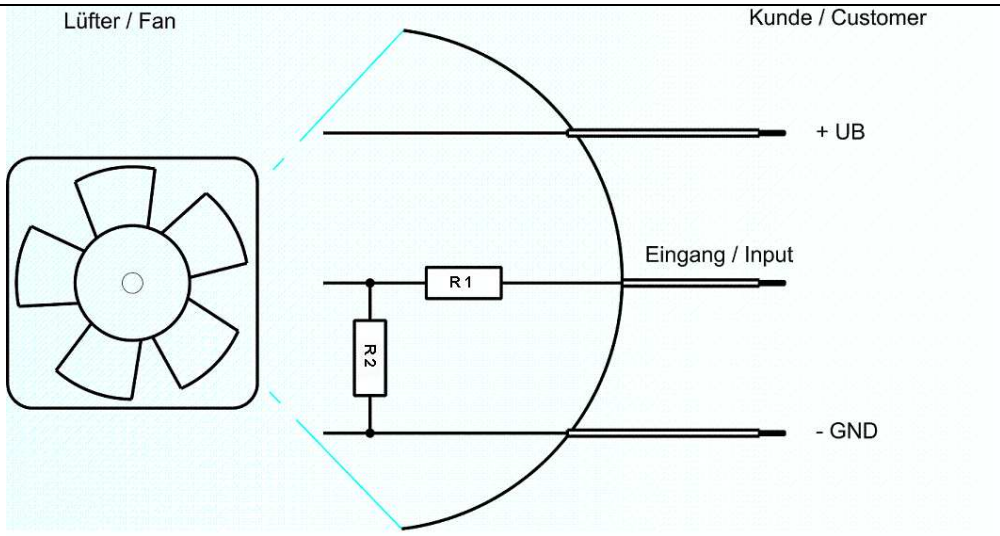
Features

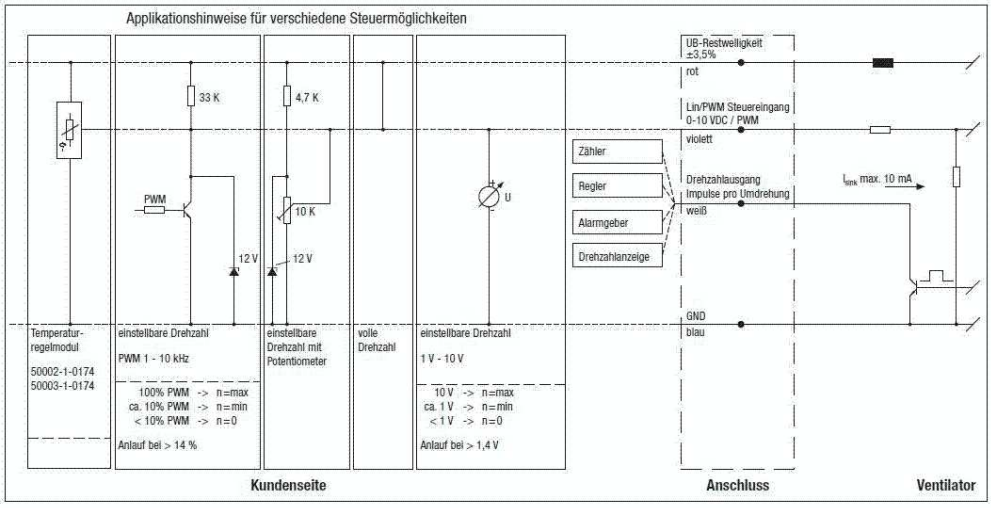
PWM - Frequency		1 kHz - 10 kHz typical: 2 kHz
Input voltage range		0 V - 10 V

Characteristics



Schematics





Input voltage divider:
R1 = 47 kOhm
R2 = 36 kOhm

Speed control:
By pulse-width modulation (PWM) 0 ... 100%
Open collector in relation to Signal-ground
Frequency = 2 kHz (1 - 10 kHz)
Push-Pull-Signal with high = 12 V

Information to the curve PWM:

0% - 10% PWM:	0 1/min
11% PWM:	1.000 1/min (Fan on, comming from 0% PWM)
11% - 13% PWM:	1.000 1/min (corresponding to min. speed)
13% - 82% PWM:	linear increasing curve
82% - 100% PWM:	4.250 1/min (corresponding to max. speed)
9% PWM:	800 1/min or 0 1/min (Fan off, comming from 100% PWM)

or:

Speed control:
By analog voltage 0 - 10 V (Max. permitted 30 V)

Information to the curve analog:

0 V - 1,2 V:	0 1/min
1,3 V:	1.000 1/min (Fan on, comming from von 0 V)
1,3 V - 1,6 V:	1.000 1/min (corresponding to min. speed)
1,6 V - 9,7 V:	linear increasing curve
9,7 V - 10 V:	4.250 1/min (corresponding to max. speed)
1,0 V:	800 1/min or 0 1/min (Fan off, comming from 10 V)

3.2 Electrical Operating Data

Measurement conditions: Normal air density = 1,2 kg/m3; Temperature 23℃ +/ - 3℃; 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.

Δp = 0: corresp. to free air flow (see chapter aerodynamics)
I: corresp. to arithm. mean current value

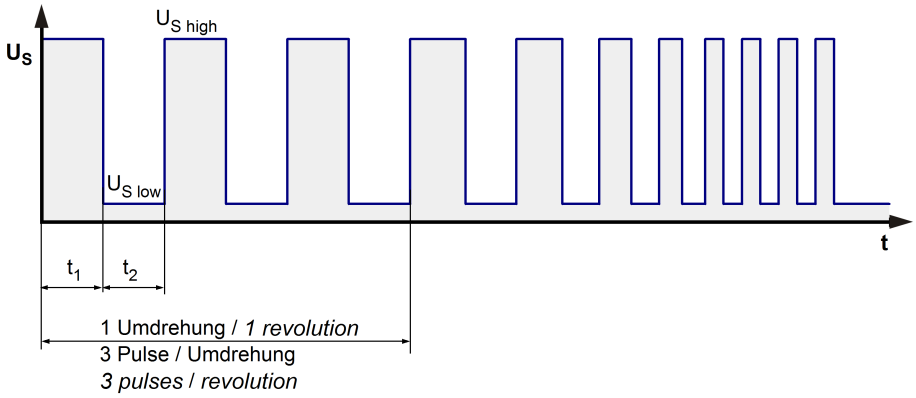
Name	Condition		
U Contr. 0001		U Contr. min.: 9,7 V	U Contr. max.: 10,0 V

Features	Condition	Symbol	Values		
Voltage range		U	36 V		60 V
Nominal voltage		U_N		48 V	
Power consumption Tolerance	Δp = 0 U Contr. 0010	P	29,5 W +- 12,5 %	36 W +- 10 %	35 W +- 10 %
Current consumption Tolerance	Δp = 0 U Contr. 0010	I	820 mA +- 12,5 %	710 mA +- 10 %	585 mA +- 10 %
Speed Tolerance	Δp = 0 U Contr. 0010	n	4.100 1/min +- 7,5 %	4.250 1/min +- 5 %	4.250 1/min +- 5 %

3.3 Electrical Interface - Output

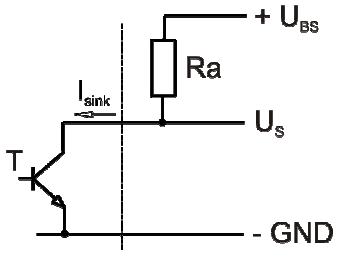
Tacho type	/2 (open collector)

Signal-Ausgangsspannung / *Signal output voltage*

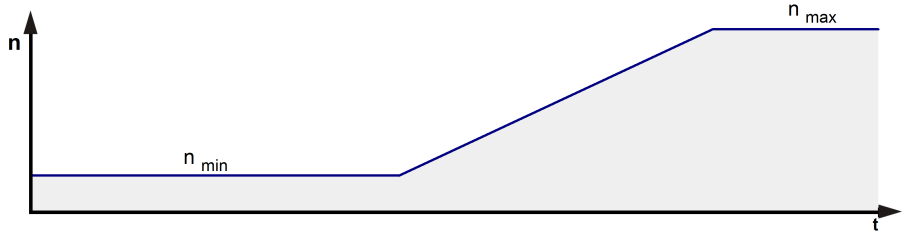


$$Ra = \frac{U_{BS} - U_{S\,low}}{I_{sink}}$$

Lüfter / *Fan* **Kunde / *Customer***



Lüfter-Drehzahl / *Fan speed*

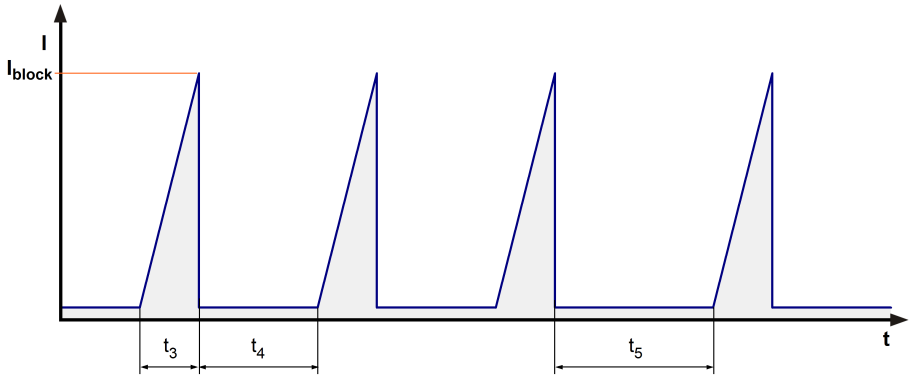


Features		**Note**	**Values**
Tacho operating voltage	U_{BS}		<= 60,0 V
Tacho signal Low	$U_{S\,low}$	I sink: 2 mA	<=0,4 V
Tacho signal High	$U_{S\,high}$	I source: 0 mA	<=60,0 V
Maximum sink current	I_{sink}		<= 20 mA
External resistor		External resistor Ra from UBS to US required. All voltages measured to GND.	
Tacho frequency		(3 x n) / 60	
Tacho isolated from motor		No	
Slew rate			=> 0,5 V/us

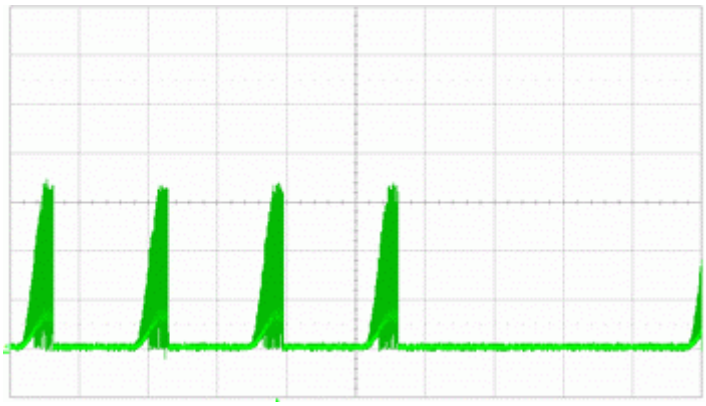
n = revolutions per minute (1/min)

3.4 Electrical Features

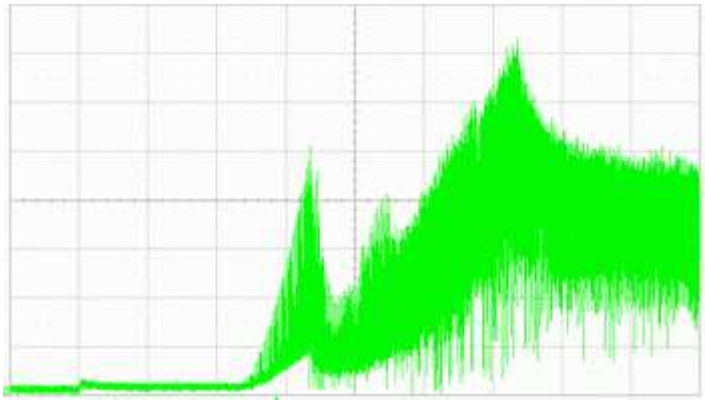
Electronic function	Speed-Controlled	
Reversed polarity protection Max. residual current at U_N	Rectifying diode I_F < 5 mA	
Locked rotor protection	Auto restart	
Locked rotor current at U_N	I_{block}	
Clock signal at locked rotor	t_3 / t_4 typical: 4 s / 10,0 s	



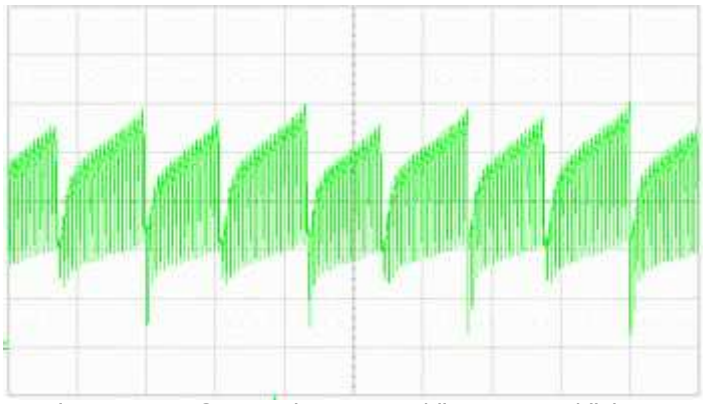
After 4 failed start-ups there is an extended timeout t5 of 40s.



Locked rotor current @ 48 V (I = 500mA/div ; t = 10s/div)



Start-up current @ 48 V (I = 200mA/div ; t = 2s/div)



Running current @ 48 V (I = 200mA/div ; t = 1ms/div)

Internal Fuse:
Littelfuse NANO2(R) FUSE; Very fast acting 451 Series; 3,5 A (Art.-Nr.: 045103.5MRL)

Inrush current limiter:
This fan is equipped with an inrush current limiter to reduce the charging current of the internal capacitor. This circuit delays the start-up of the fan by 4 s after connecting it to the supply voltage. Only a short peak current can be measured at the inrush by charging the small internal filter capacitors with approximately 200 nF.

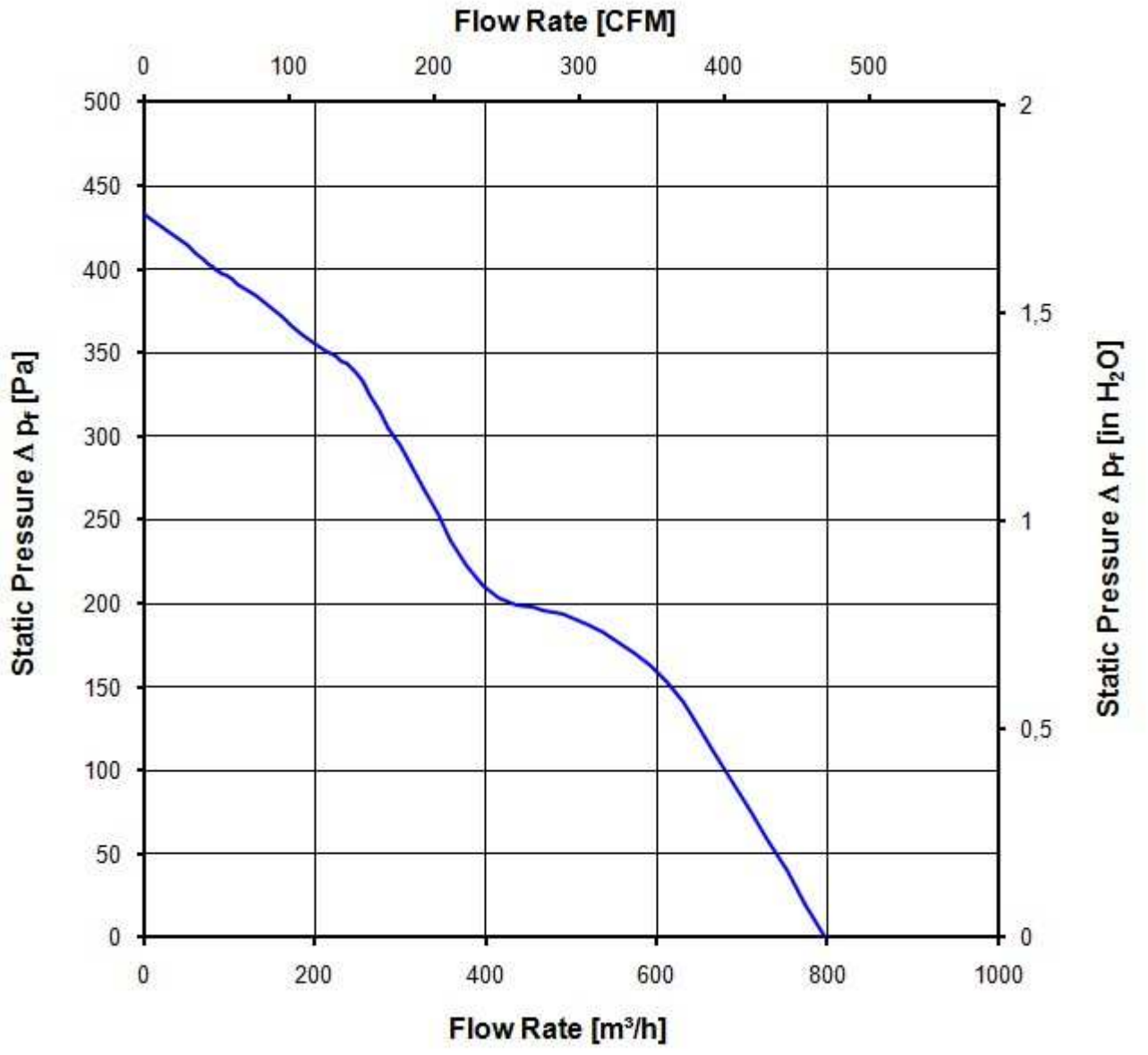
3.5 Aerodynamics

Measurement conditions:	Measured with a double chamber intake rig acc. to DIN EN ISO 5801. Normal air density = 1,2 kg/m3; Temperature 23℃ +/ - 3℃; In the intake and outlet area should not be any solid obstruction within 0,5 m. Motor shaft horizontal. 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.

a.) Operation condition:

4.250 1/min at free air flow		U Contr. min.: 9,7 V	U Contr. max.: 10,0 V

Max. free-air flow (Δp = 0 / $\dot{V}$ = max.)	800 m3/h	
Max. static pressure (Δp = max. / $\dot{V}$ =0)	390 Pa	



3.6 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 chapter aerodynamics.

a.) Operation condition:

4.250 1/min at free air flow		U Contr. min.: 9,7 V	U Contr. max.: 10,0 V

Optimal operating point	688 m3/h @ 80 Pa	
Sound power level at the optimal operating point	7,1 bel(A)	
Sound pressure level at free air flow, measured in rubber bands	62,0 dB(A)	

4 Environment

4.1 General

Min. permitted ambient temperature TU min.	-20 °C	
Max. permitted ambient temperature TU max.	70 °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, constant; according to DIN EN 60068-2-78, 14 days	
Water exposure	None	
Dust requirements	None	
Salt fog requirements	None	

Permitted application area:
The product is intended for use in sheltered rooms with controlled temperature and controlled humidity. Directly exposure to water must be avoided.

Pollution degree 1 (according DIN EN 60664-1)
There is either no pollution or it occurs only dry, non-conductive pollution. The pollution has no negative impact.

Please require severity levels and specification parameters from the responsible development departments.

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℃. 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.	500 VAC / 1 Min. 850 VDC / 1 Sec.	
Isolation resistance Measuring conditions: After 48h of storage at 95% R.H. and 25℃ measured with U=500 VDC for 1 min.	RI > 10 MOhm	
Clearance / creepage distance	1,0 mm / 1,2 mm	
Protection class	III	

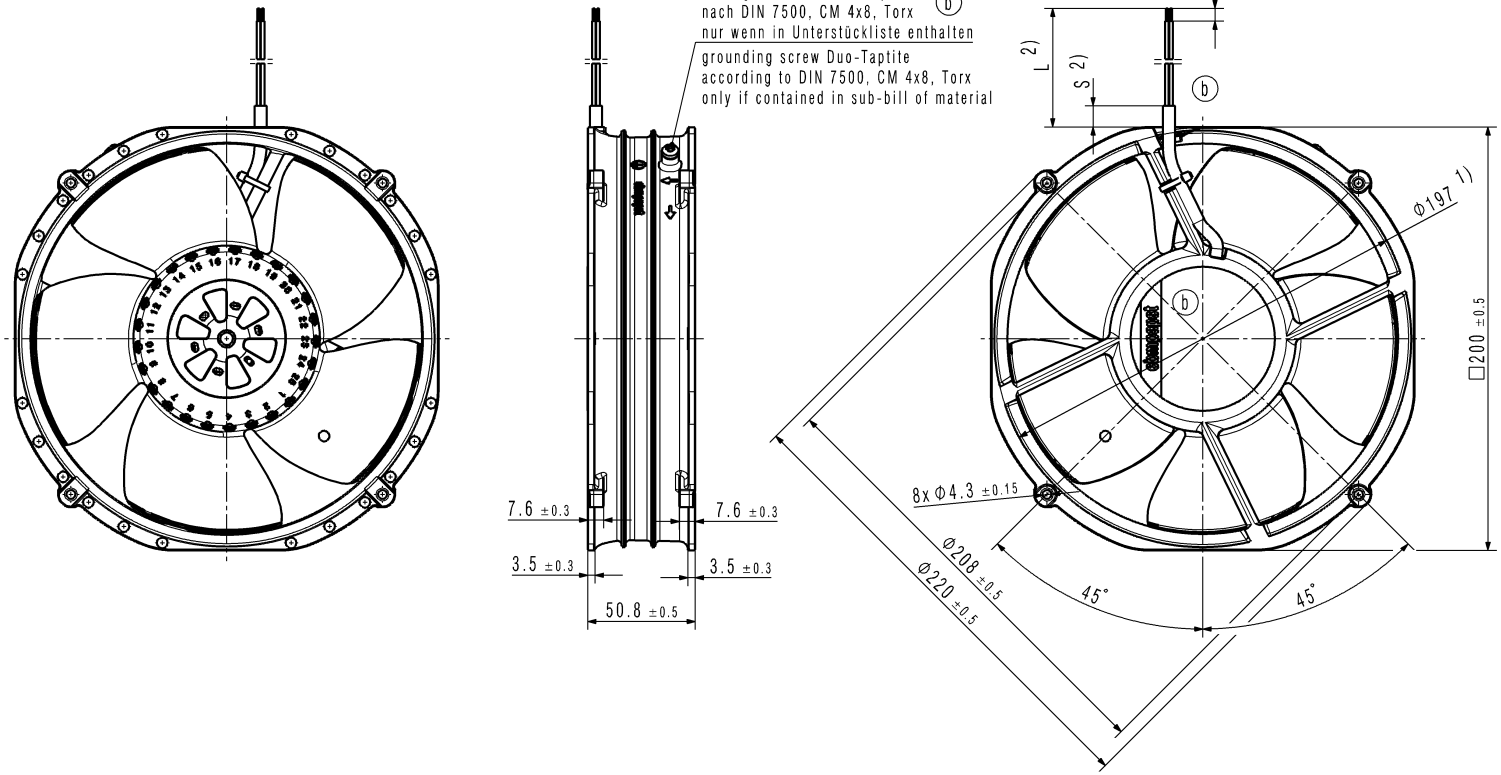
5.2 Approval Tests

CE	EC Declaration of Conformity	Yes
EAC	Eurasian Conformity	Yes
UL	Underwriters Laboratories	Yes / 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 ℃	90.000 h	
Life expectancy L10 acc. to IPC 9591 at TU = 40 ℃	152. 500 h	



1) Maße für Montageausschnitt
2) Anzahl und Länge der Litzen sowie Länge des Schlauchs siehe Produktspezifikation

- Axialspiel der Kugellager mit Feder spielfrei verspannt

1) measures of mounting cut-out
2) length and number of wires and length of tube see product specification

- ball bearings without clearance by a pre-loaded spring

SAP-Status/State	Aend.-Nr./ Change-No.	CATIA-System-Version/ CATIA-System-Version	CAD-Umgebung/ CAD-Environment	Werkstoff / Material:	Volumen / Volume (mm^3):
		92954147 50 CPR0008			Gewicht / Mass (g):
		3D-Referenzmodell / 3D-Referencemodel		Artikel / Title:	
Tolerierung / Tolerances:		Datum	Name		
	Bearb./ Drawn				
Allgemeintoleranzen / Gen. Tolerances:	Gepr./ Checked			Zchg.-Nr./ Drawing No:	Ers.f.Zchg. / Replaces:
	Freig./ Release.				
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