

**Product Data Sheet**

**9295414752**  
VWS0184XULCS  
2218F/2TDHO

**ebmpapst**

The engineer's choice



2218F/2TDHO

INDEX

**1 General ..... 3**

**2 Mechanics ..... 3**

2.1 General..... 3

2.2 Connections..... 3

**3 Operating Data ..... 5**

3.1 Electrical Interface - Input..... 5

3.2 Electrical Operating Data ..... 7

3.3 Electrical Interface - Output..... 8

3.4 Electrical Features ..... 9

3.5 Aerodynamics ..... 11

3.6 Sound Data..... 12

**4 Environment..... 12**

4.1 General..... 12

4.2 Climatic Requirements ..... 12

**5 Safety..... 13**

5.1 Electrical Safety ..... 13

5.2 Approval Tests ..... 13

**6 Reliability..... 13**

6.1 General..... 13

**1 General**

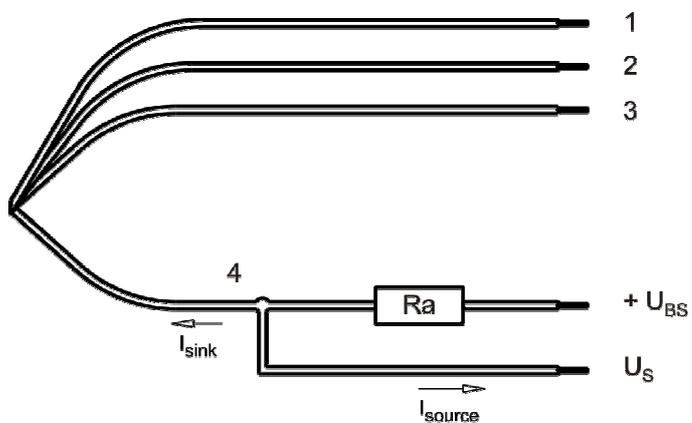
Fan type	Fan	
Rotating direction looking at rotor	Counterclockwise	
Airflow direction	Air outlet over struts	
Bearing system	Ball bearing	
Mounting position - shaft	Any	

**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	L = 400 mm	
Tolerance	+ - 10 mm	
Tube length	S = 10 mm	
Tolerance	+ - 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 auxiliaries shown on the schematic diagram (which are required for the intended use) are not part of our delivery.

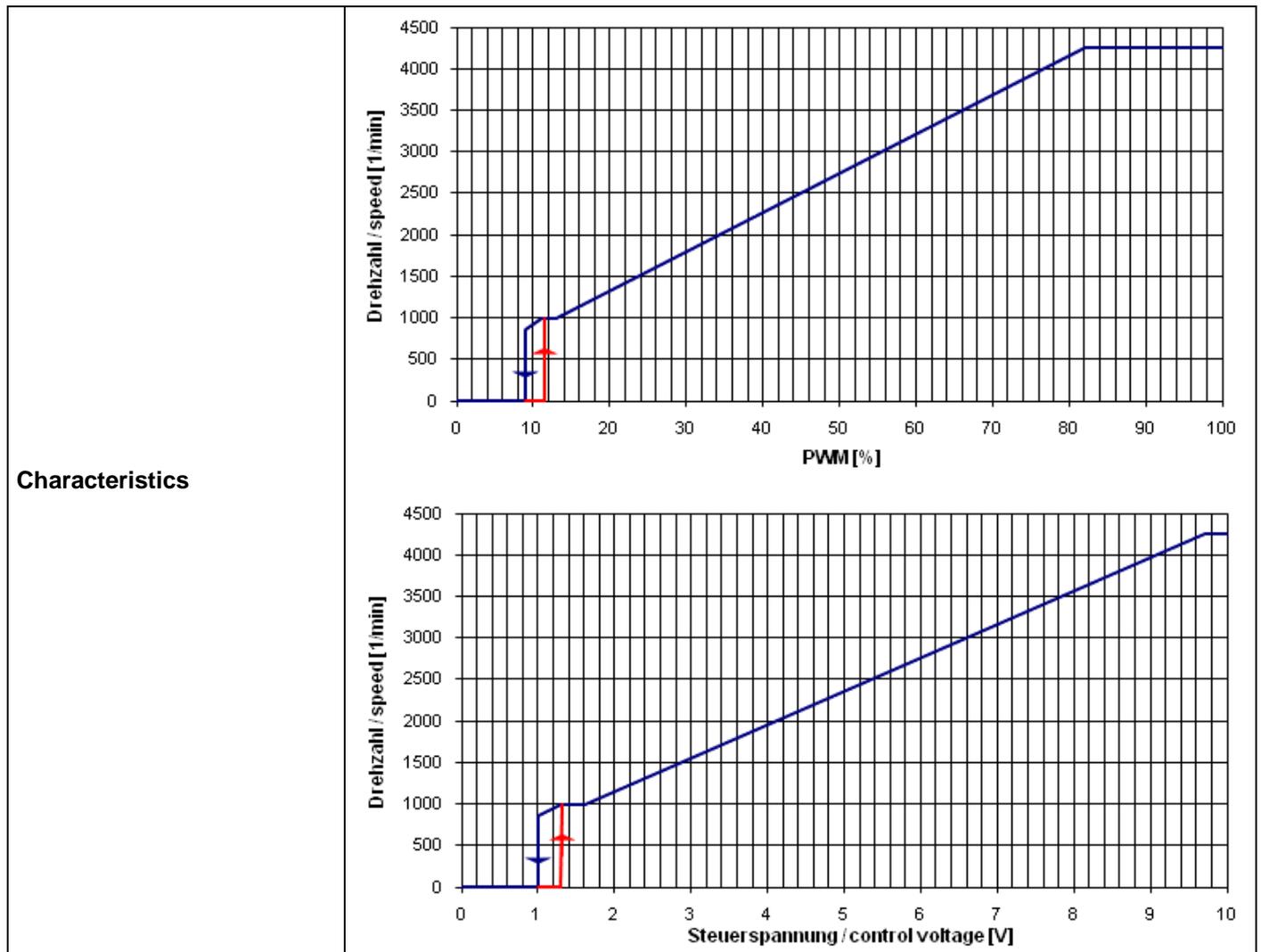
3 Operating Data

3.1 Electrical Interface - Input

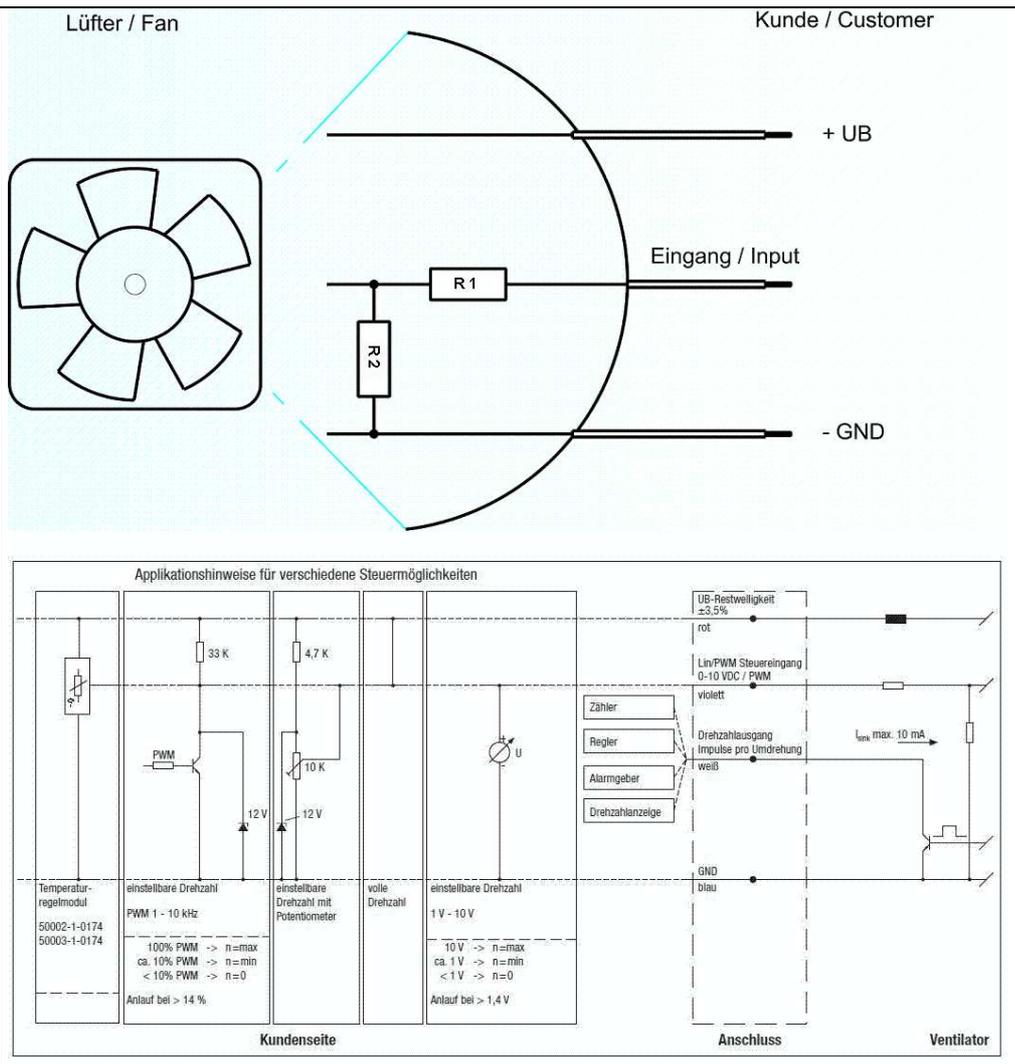
Control input	Analog
---------------	--------

Features

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



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, coming 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, coming 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, coming 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, coming from 10 V)

**3.2 Electrical Operating Data**

Measurement conditions: Normal air density = 1,2 kg/m<sup>3</sup>; 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.

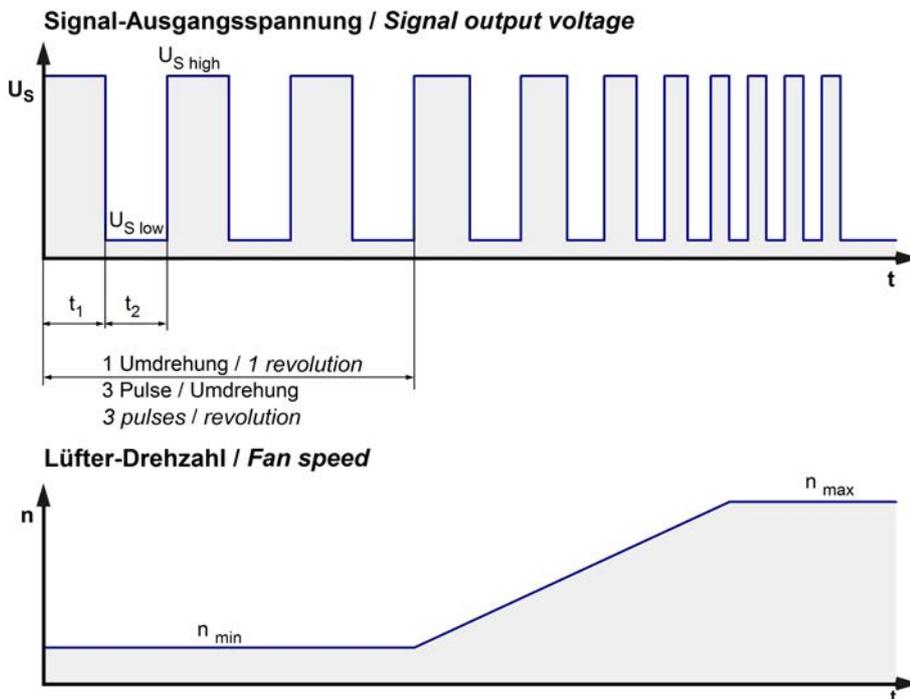
$\Delta p = 0$ : corresp. to free air flow (see chapter aerodynamics)  
I: corresp. to arithm. mean current value

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	$\Delta p = 0$	P	29,5 W	36 W	35 W
Tolerance	U Contr. 0010		+/- 12,5 %	+/- 10 %	+/- 10 %
Current consumption	$\Delta p = 0$	I	820 mA	710 mA	585 mA
Tolerance	U Contr. 0010		+/- 12,5 %	+/- 10 %	+/- 10 %
Speed	$\Delta p = 0$	n	4.100 1/min	4.250 1/min	4.250 1/min
Tolerance	U Contr. 0010		+/- 7,5 %	+/- 5 %	+/- 5 %

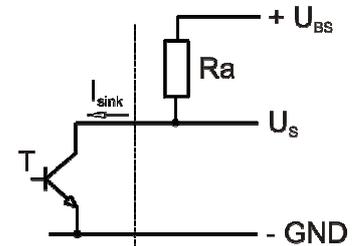
3.3 Electrical Interface - Output

Tacho type	/2 (open collector)
------------	---------------------



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

Lüfter / Fan      Kunde / Customer

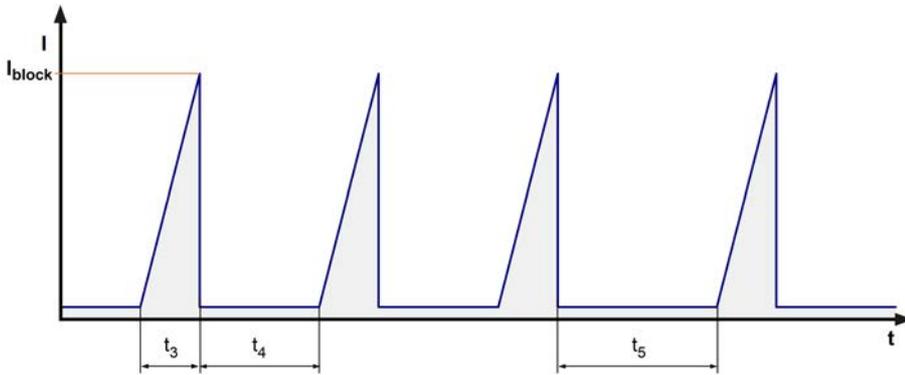


Features	Note	Values
Tacho operating voltage	$U_{BS}$	$\leq 60,0\ V$
Tacho signal Low	$U_{S\ low}$	$\leq 0,4\ V$
Tacho signal High	$U_{S\ high}$	$\leq 60,0\ V$
Maximum sink current	$I_{sink}$	$\leq 20\ mA$
External resistor	External resistor $R_a$ from $U_{BS}$ to $U_s$ required. All voltages measured to GND.	
Tacho frequency	$(3 \times n) / 60$	
Tacho isolated from motor	No	
Slew rate		$\Rightarrow 0,5\ V/\mu s$

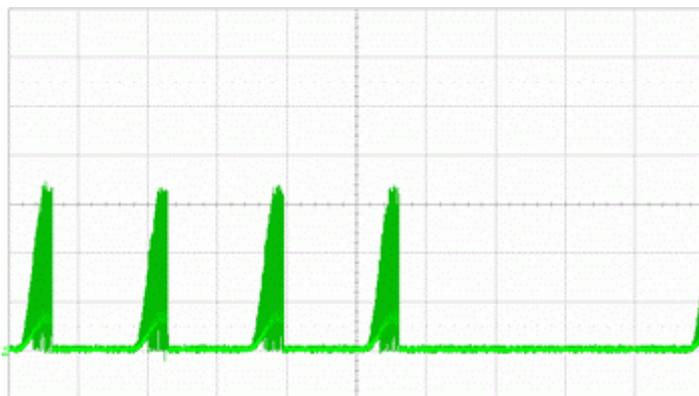
n = revolutions per minute (1/min)

3.4 Electrical Features

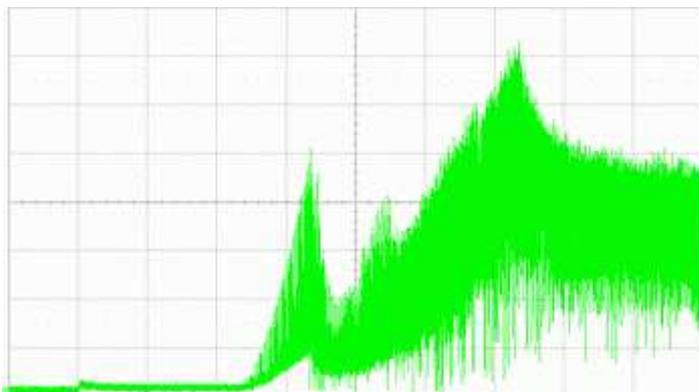
Electronic function	Speed-Controlled	
Reversed polarity protection	Rectifying diode	
Max. residual current at $U_N$	$I_F < 5 \text{ mA}$	
Locked rotor protection	Auto restart	
Locked rotor current at $U_N$	$I_{\text{block}}$	
Clock signal at locked rotor	$t_3 / t_4$ typical: 4 s / 10,0 s	



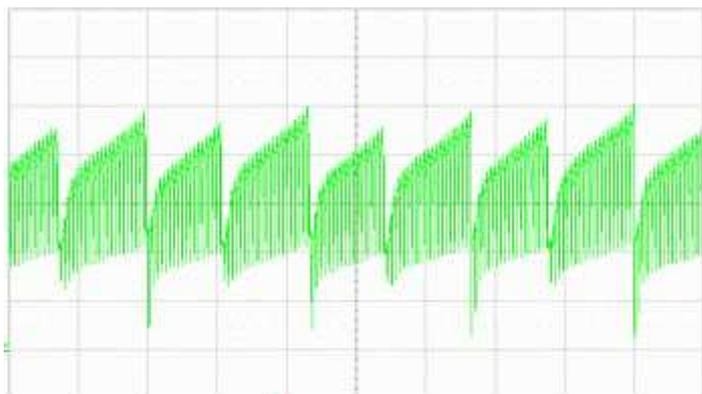
After 4 failed start-ups there is an extended timeout  $t_5$  of 40s.



Locked rotor current @ 48 V ( $I = 500\text{mA/div}$  ;  $t = 10\text{s/div}$ )



Start-up current @ 48 V ( $I = 200\text{mA/div}$  ;  $t = 2\text{s/div}$ )



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.

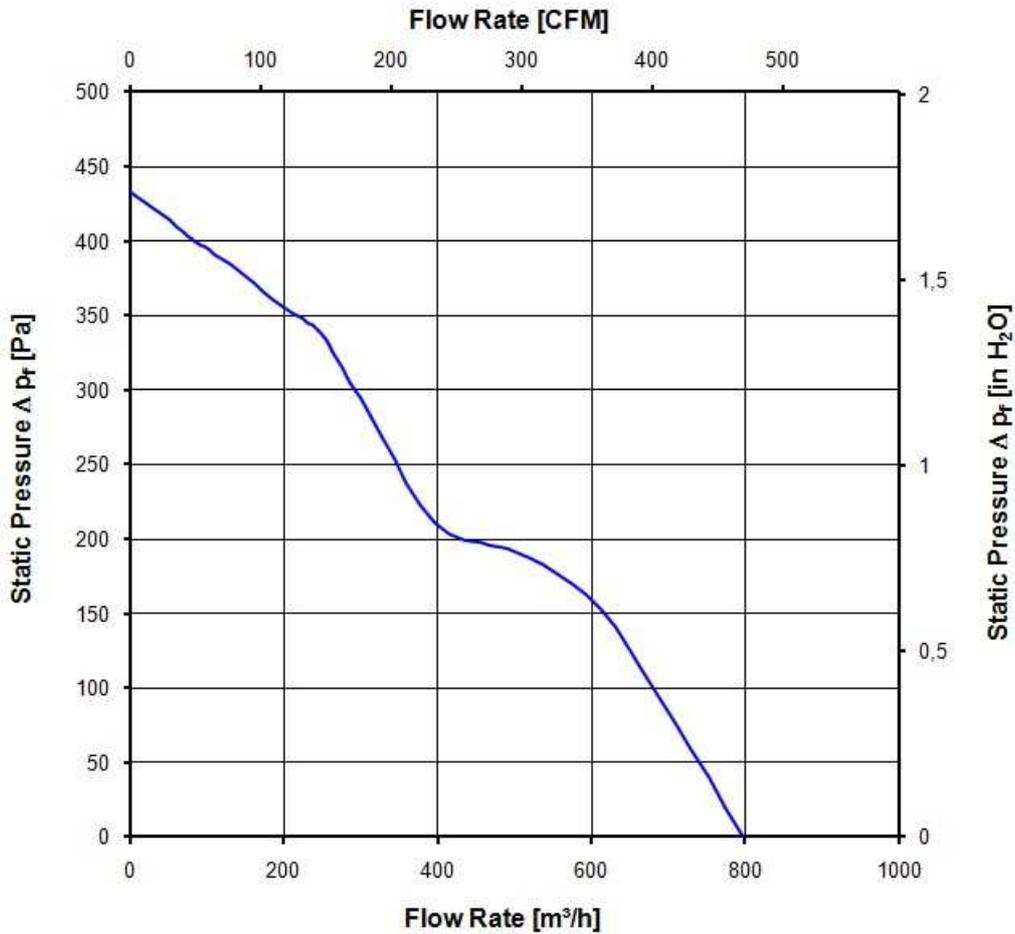
3.5 Aerodynamics

Measurement conditions: Measured with a double chamber intake rig acc. to DIN EN ISO 5801.  
Normal air density = 1,2 kg/m<sup>3</sup>; Temperature 23°C +/- 3°C;  
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 ( $\Delta p = 0 / \dot{V} = \text{max.}$ )	800 m <sup>3</sup> /h	
Max. static pressure ( $\Delta p = \text{max.} / \dot{V} = 0$ )	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  $L_p(A) < 5 \text{ dB(A)}$   
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 m <sup>3</sup> /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°C. No arcing or breakdown is allowed! All connections together to ground.	500 VAC / 1 Min.	
B.) Routine test Measuring conditions: At indoor climate. No arcing or breakdown is allowed! All connections together to ground.	850 VDC / 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 / 1,2 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 E38324
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	90.000 h	
Life expectancy L10 acc. to IPC 9591 at TU = 40 °C	152. 500 h	

