

1 General

Fan type	Blower without chassis with intake nozzle	
Rotating direction looking at rotor	Clockwise	
Airflow direction	Air in axially, Air out radially	
Bearing system	Ball bearing	
Mounting position - shaft	Any	

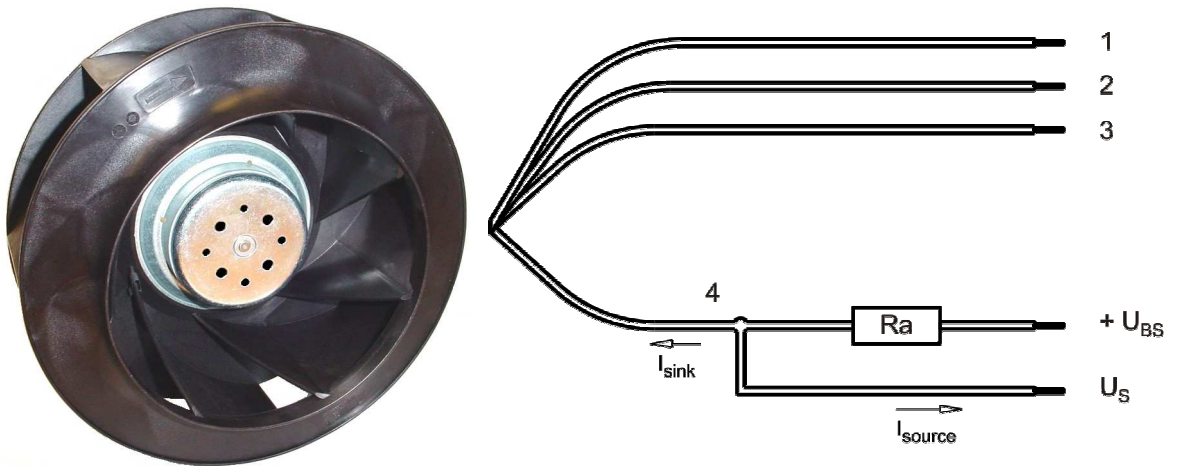
2 Mechanics

2.1 General

Depth	99,0 mm	
Diameter	225,0 mm	
Mass	1,060 kg	
Housing material		
Impeller material	Plastic	

2.2 Connections

Electrical connection	Wires	
Lead wire length	L = 425 mm	
Tolerance	+/- 10,0 mm	
Tube length	S = 115 mm	
Tolerance	+/- 5,0 mm	



Wire	Color	Operation	Wire size	Insulation diameter
1	red	+ UB	AWG 20	2,05 mm
2	blue	- GND	AWG 20	2,05 mm
3	violet	CONTR	AWG 22	1,30 mm
4	white	Tacho	AWG 22	1,30 mm

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

3 Operating Data

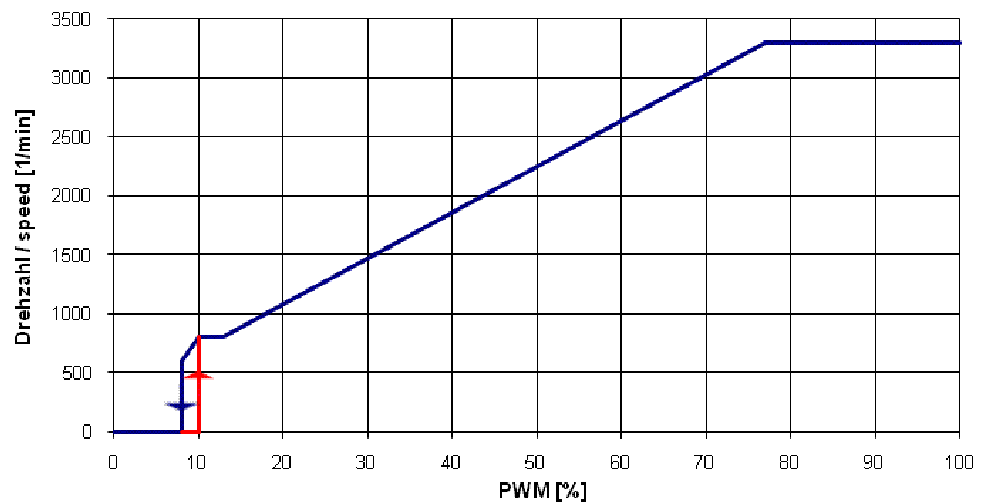
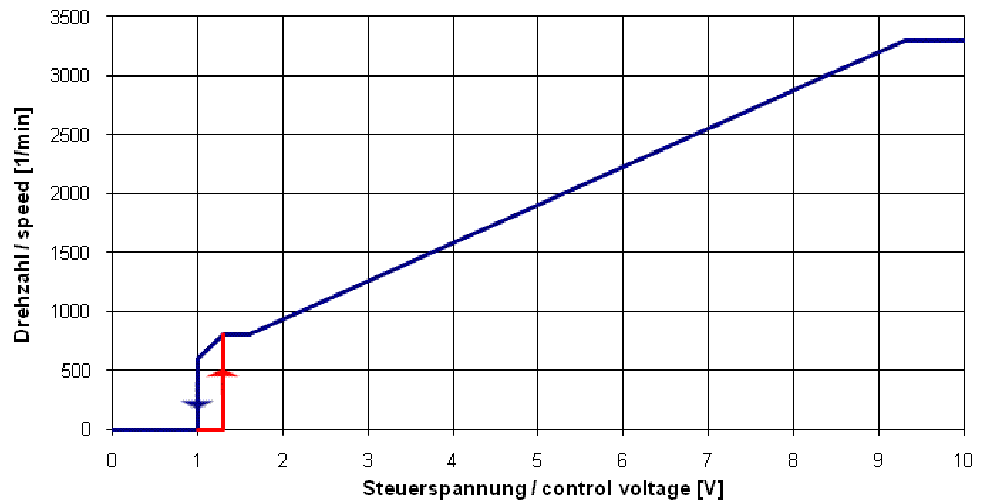
3.1 Electrical Interface - Input

Control input	Analog
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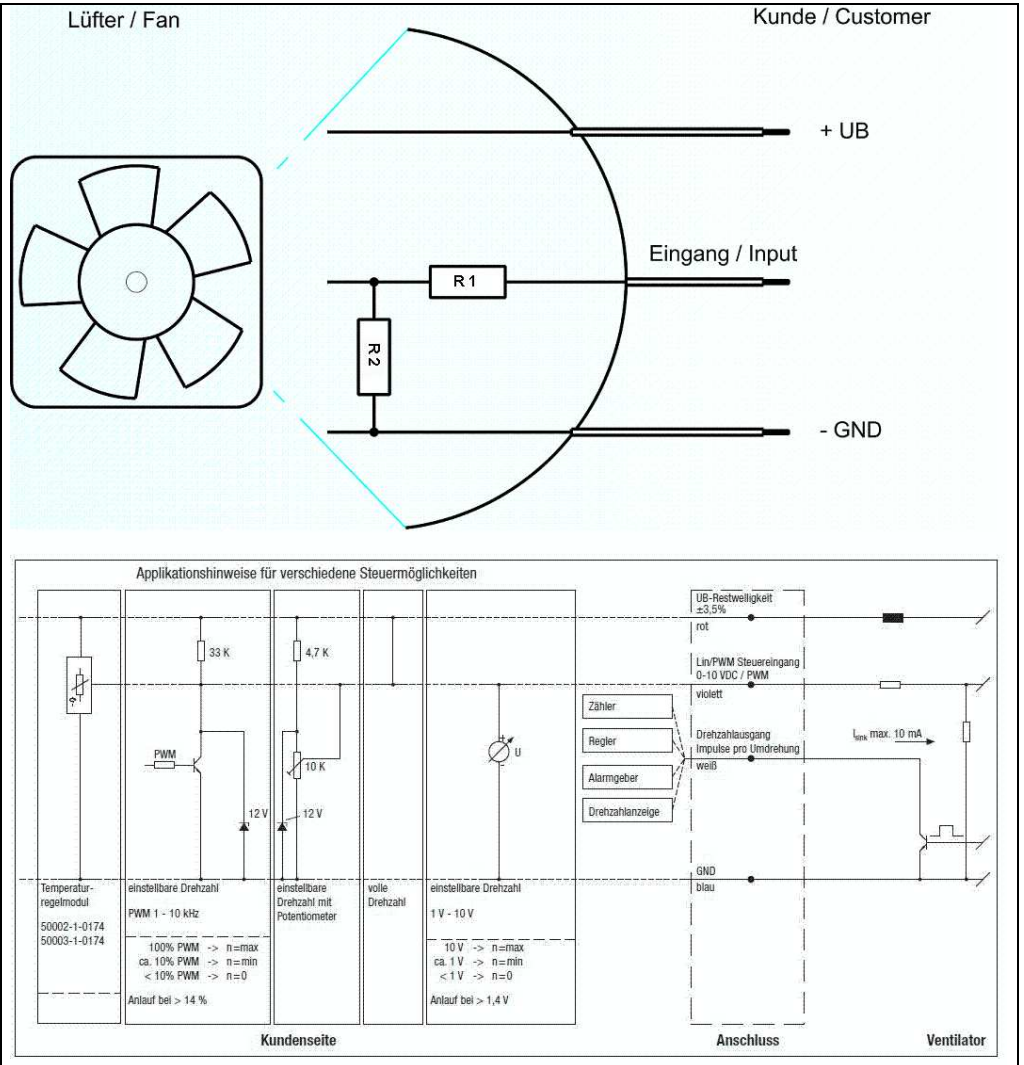
Features

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 parallel to R2 a 5,1 V Z-Diode

Speed control:

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

Information to the curve PWM:

- 0% - <10% PWM: 0 1/min
- 10% PWM: 800 1/min (Fan on, coming from 0% PWM)
- 10% - 13% PWM: 800 1/min (corresponding to min. speed)
- 13% - 78% PWM: linear increasing curve
- 78% - 100% PWM: 3.300 1/min (corresponding to max. speed)
- 10% - >8% PWM: linear decreasing curve (coming from 100% PWM)
- 8% PWM: 600 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:	800 1/min (Fan on, coming from von 0 V)
1,3 V - 1,6 V:	800 1/min (corresponding to min. speed)
1,6 V - 9,4 V:	linear increasing curve
9,4 V - 10 V:	3.300 1/min (corresponding to max. speed)
1,3 V - > 1,0 V:	linear decreasing curve (coming from 10 V)
1,0 V:	600 1/min or 0 1/min (Fan off, coming from 10 V)

The fan have no sensor break detection!**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.

Measurement setup:	Measured between two steel plates
Steel plate:	230 mm x 230 mm
Intake nozzle:	D: 146 mm; R: 25 mm
Distance between bottom and top plate:	123,5 mm
Overlapping impeller / nozzle:	2 mm

 $\Delta p = 0$: corresp. to free air flow (see chapter aerodynamics)

I: corresp. to arithm. mean current value

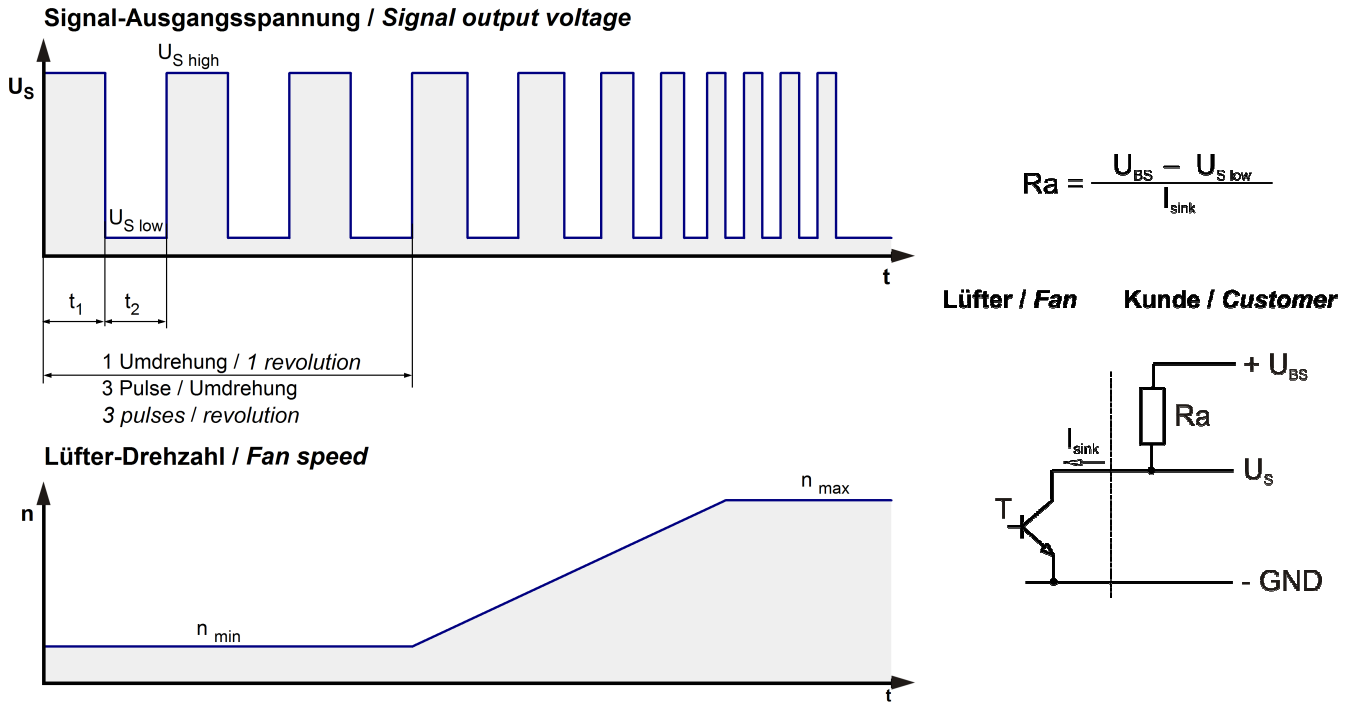
Name	Condition
U Contr. 0001	U Contr.: 10 V

The data at 5V are no FK features and need not be tested.

Features	Condition	Symbol	Values		
Voltage range		U	36 V		72 V
Nominal voltage		U_N		48 V	
Power consumption	$\Delta p = 0$	P	114 W	159 W	166 W
Tolerance	U Contr. 0010		+/- 10,0 %	+/- 10,0 %	+/- 10,0 %
Current consumption	$\Delta p = 0$	I	3.170 mA	3.310 mA	2.300 mA
Tolerance	U Contr.0010		+/- 10,0 %	+/- 10,0 %	+/- 10,0 %
Speed	$\Delta p = 0$	n	2.900 1/min	3.300 1/min	3.300 1/min
Tolerance	U Contr. 0010		+/- 7,5 %	+/- 5,0 %	+/- 5,0 %

3.3 Electrical Interface - Output

Tacho type	/2 (open collector)
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Features	Note	Values
Tacho operating voltage	U_{BS}	$\leq 60,0\text{ V}$
Tacho signal Low	$U_{S\ low}$	$\leq 0,4\text{ V}$
Tacho signal High	$U_{S\ high}$	$\leq 60,0\text{ V}$
Maximum sink current	I_{sink}	$\leq 20\text{ mA}$
External resistor	External resistor R_a from U_{BS} to U_S required. All voltages measured to GND.	
Tacho frequency	$(3 \times n) / 60$	165 Hz
Tacho isolated from motor	No	
Slew rate		$\Rightarrow 0,5\text{ V/us}$

n = revolutions per minute (1/min)

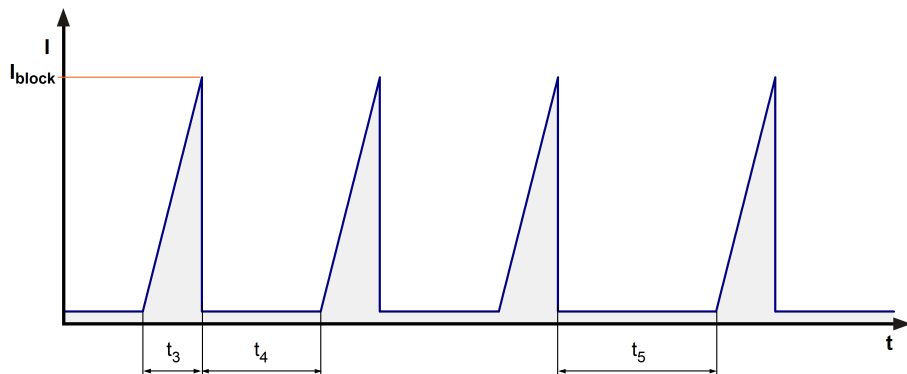
Please note:

At zero speed the tacho signal is at a static HIGH. It will be also HIGH when the fan is still spinning, but the speed control signal is set to zero speed already.
 The tacho signal is only activated after the start-up is completed.

3.4 Electrical Features

Electronic function	Speed-Controlled	
Reversed polarity protection	P-CH FET	
Max. residual current at U_N	$I_F \leq 5\text{ mA}$	

Locked rotor protection	Auto restart	
Locked rotor current at U_N	I_{block} approx. 3.000 mA	
Clock signal at locked rotor	t_3 / t_4 typical: 3 s / 10,0 s	



Locked rotor signal t5:

After 2 failed start-ups there is an extended timeout of 50 s.

3.5 Data According ErP Directive

Installation / Efficiency category	A / static
Speed control	integrated
Specific ratio	1,00503
Target overall efficiency 2015	45,0 %
Overall efficiency	55,4 %
Efficiency grade	62
Power input	240,9 W
Speed	3.260 1/min

All values measured in optimum energy efficiency point.

Productiondatecode is printed on the fan label.

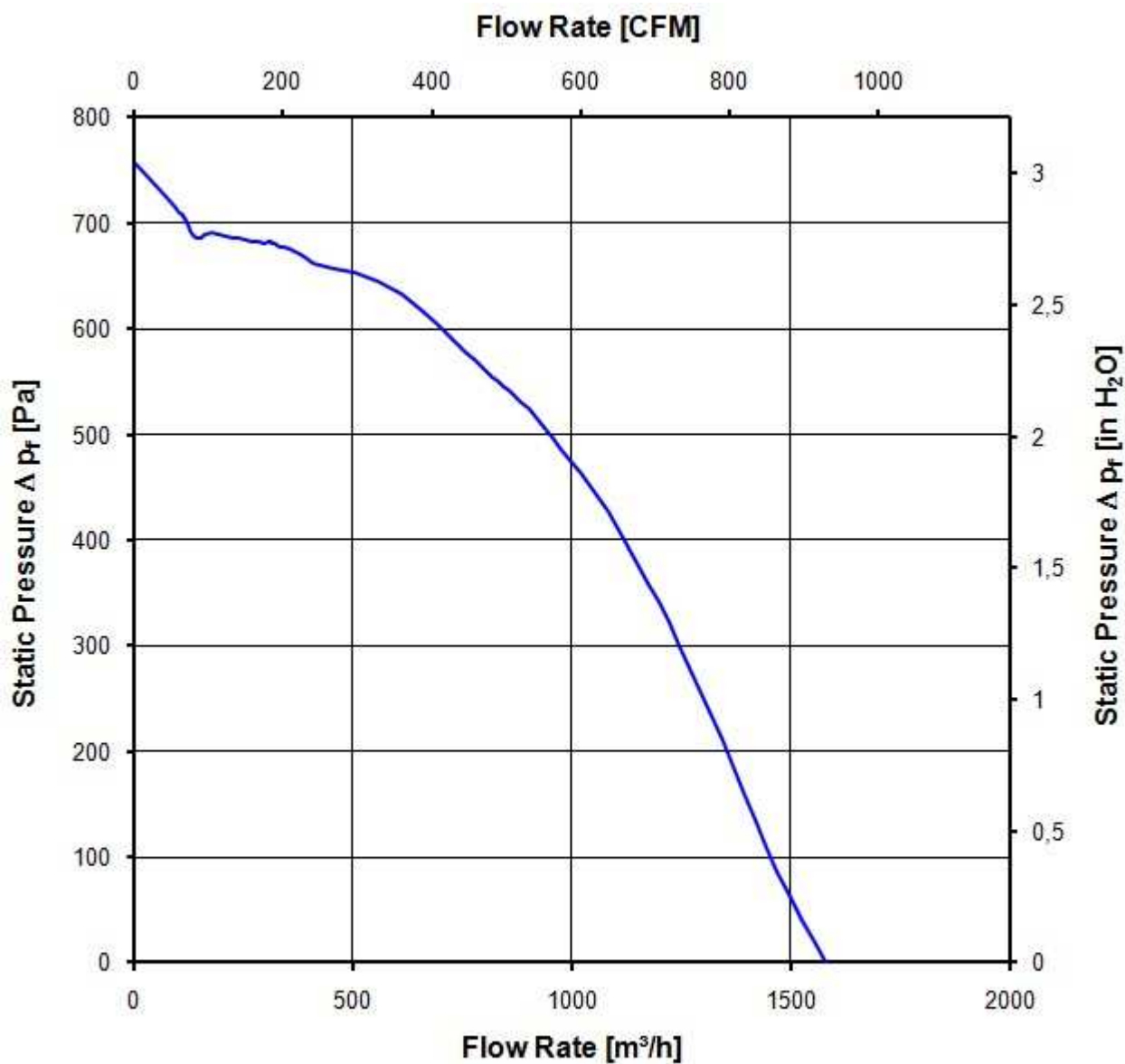
3.6 Aerodynamics

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. 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.

Measurement setup:	Measured between two steel plates
Steel plate:	230 mm x 230 mm
Intake nozzle:	D: 146 mm; R: 25 mm
Distance between bottom and top plate:	123,5 mm
Overlapping impeller / nozzle:	2 mm

a.) Operation condition:

3.300 1/min at free air flow	U Contr. 10 V		
Max. free-air flow ($\Delta p = 0 / \dot{V} = \max.$)		1.580,0 m ³ /h	
Max. static pressure ($\Delta p = \max. / \dot{V} = 0$)		760 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 $L_p(A) < 5 \text{ dB(A)}$
 For further measurement conditions see chapter aerodynamics.

a.) Operation condition:

3.300 1/min at free air flow	U Contr. 10 V		
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Optimal operating point	940,0 m ³ /h @ 462 Pa	
Sound power level at the optimal operating point	8,1 bel(A)	
Sound pressure level at free air flow, measured in rubber bands		

4 Environment

4.1 General

Min. permitted ambient temperature TU min.	-20 °C	
Max. permitted ambient temperature TU max.	55 °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/m ² d, 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. Occasionally, temporary conductivity caused by condensation occurs.

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.	1000 VAC / 1 Min.	
B.) Routine test Measuring conditions: At indoor climate. No arcing or breakdown is allowed! All connections together to ground.	1700 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 / 1,5 mm	
Protection class	I	

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 °C	52.500 h	
Life expectancy L10 at TU max.	37.500 h	
Life expectancy L10 acc. to IPC 9591 at TU = 40 °C	87.5 00 h	

