

2218F/2TDH4OR-212

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1 General

Fan type	Fan	
Rotational direction looking at rotor	counterclockwise	
Airflow direction	Air outlet over struts	
Bearing system	Ball bearing	
Mounting position	any	

2 Mechanics

2.1 General

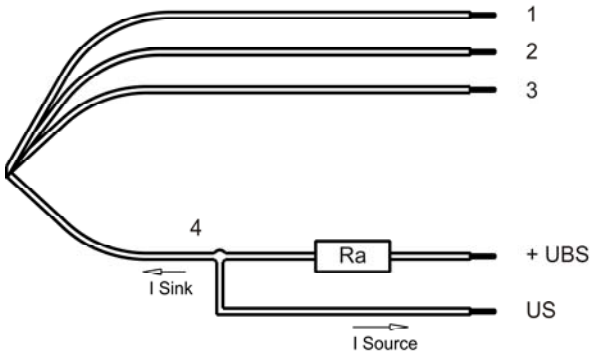
Width	200 mm	
Height	200 mm	
Depth	51 mm	
Diameter	220 mm	
Weight	1,06 kg	
Housing material	Metal	
Impeller material	Plastic	

2.2 Connections

Electrical connection	Wires - Plug		
Length of lead wire Tolerance	146 mm +- 10 mm		
Length of tube Tolerance	10 mm +- 2,0 mm		
Wire gauge (AWG)	18	22	
Insulation diameter	1,35 mm	2,2 mm	
Contacts	Molex 39-00-0428		
Connector 1	Molex 39-01-2025		
Connector 2	Molex 15-06-0041		
Barcode label	Serial number & product number		

→ additional information see fan drawing No 9295420212





	Colour	Operation
Wire 1	red	+ UB
Wire 2	blue	- GND
Wire 3	yellow	CONTR
Wire 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 2,2 mm)
Lead wire 3 - 4: AWG22 (Insulation diameter 1,35 mm)

3 Operating Data

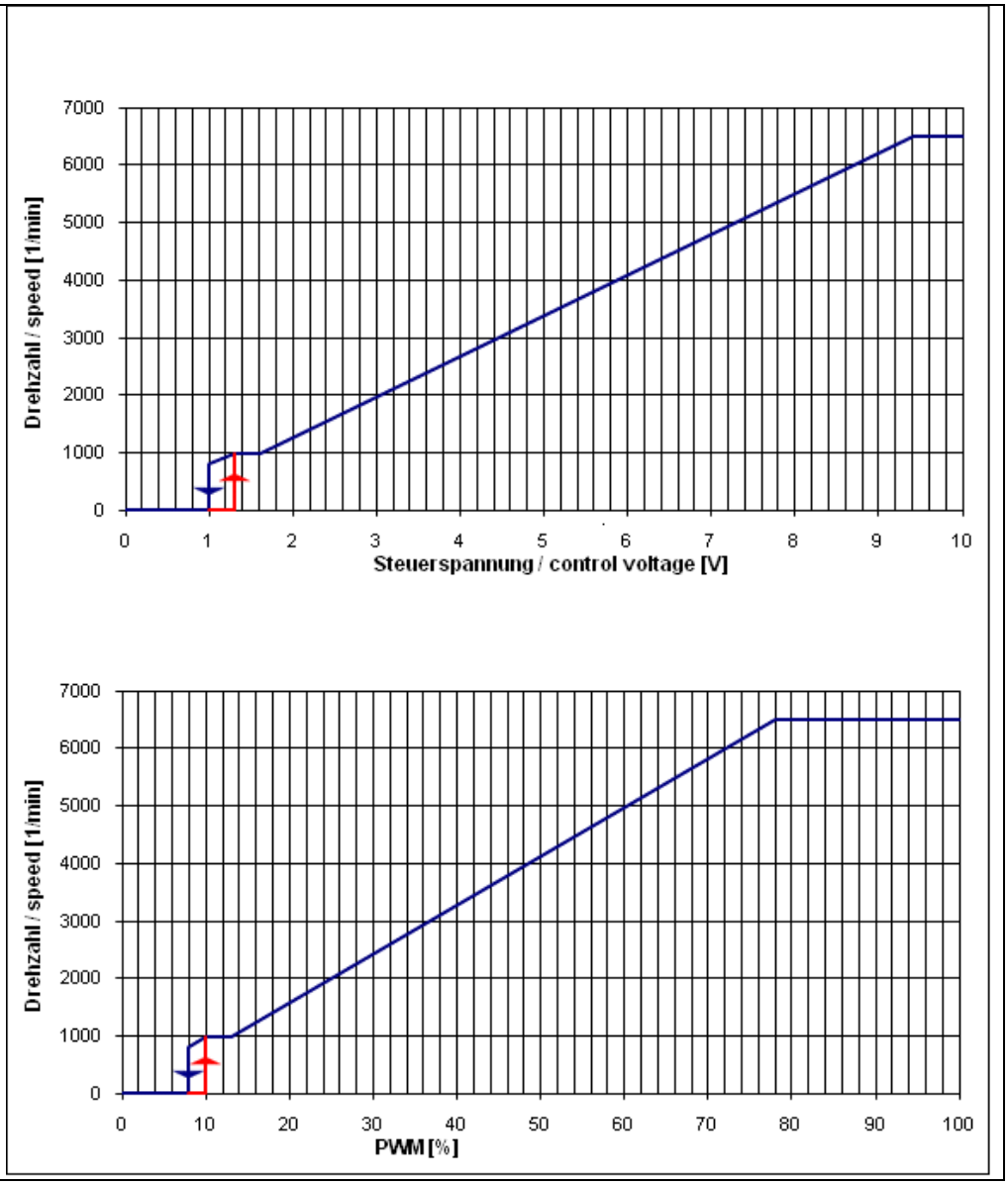
3.1 Operating Data - Electrical Interface - Input

Control input	Analog or PWM

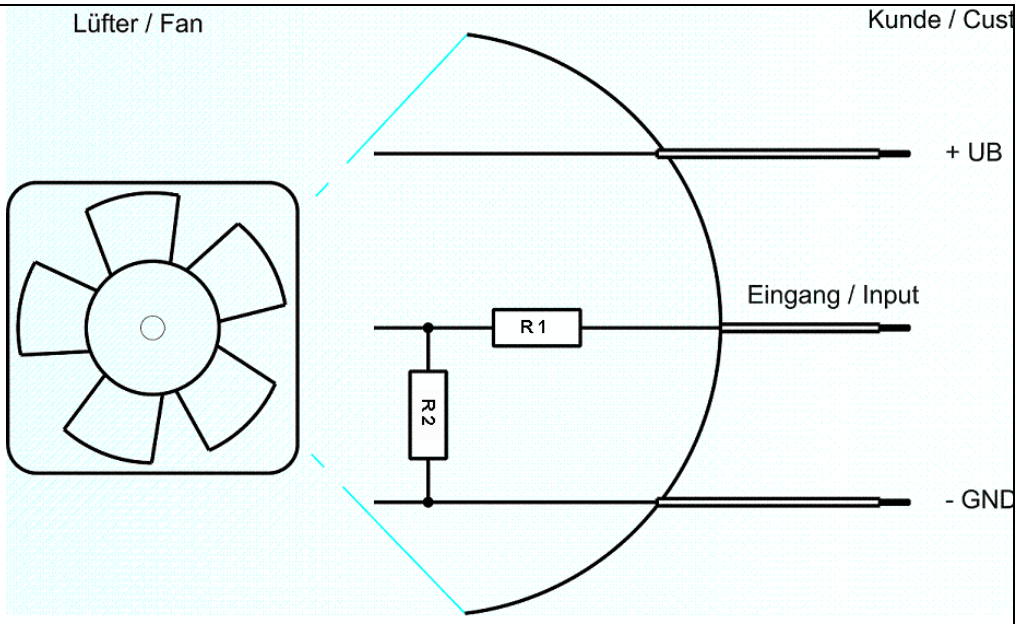
Features

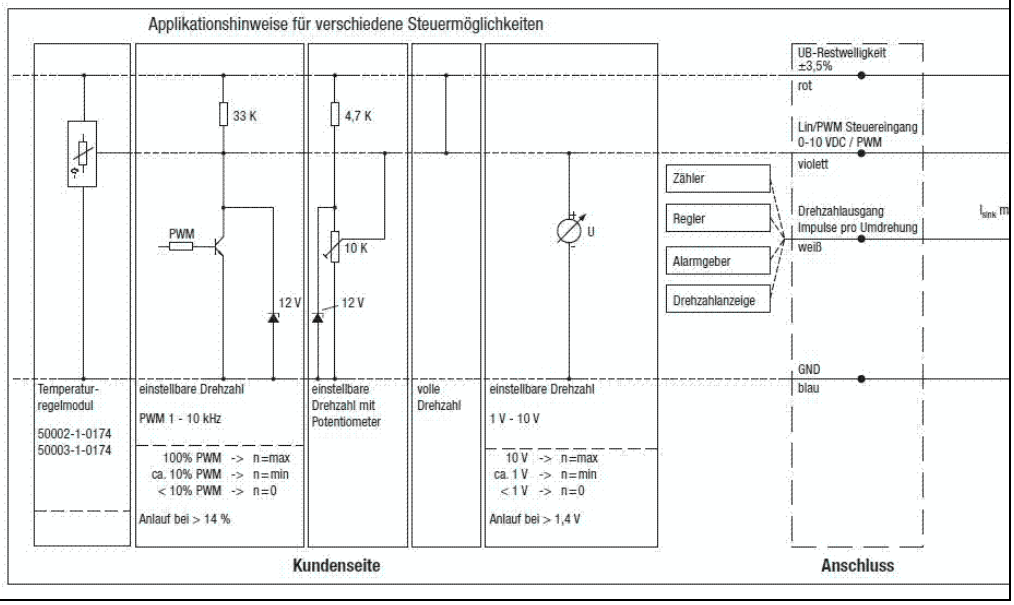
PWM - Frequency		1 kHz - 10 kHz Typical: 2 kHz
Inpute voltage range		0 V - 10 V

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:	1.000 1/min (Fan on, comming 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 (comming from 100% PWM)
8% PWM:	800 1/min or 0 1/min (Fan off, comming 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, comming 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 (comming from 10 V)
1,0 V:	800 1/min or 0 1/min (Fan off, comming 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.

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	$\Delta p = 0$	U	36,0 V		72,0 V
Nominal voltage	$\Delta p = 0$	U_N		48,0 V	
Power consumption Tolerance	$\Delta p = 0$ U Contr. 0001	P	78 W +- 12,0 %	99 W +- 10,0 %	101 W +- 10,0 %
Current consumption Tolerance	$\Delta p = 0$ U Contr. 0001	I	2.170 mA +- 12,0 %	2.060 mA +- 10,0 %	1.400 mA +- 10,0 %
Speed Tolerance	$\Delta p = 0$ U Contr. 0001	n	6.150 1/min +- 5,0 %	6.500 1/min +- 3,0 %	6.500 1/min +- 3,0 %

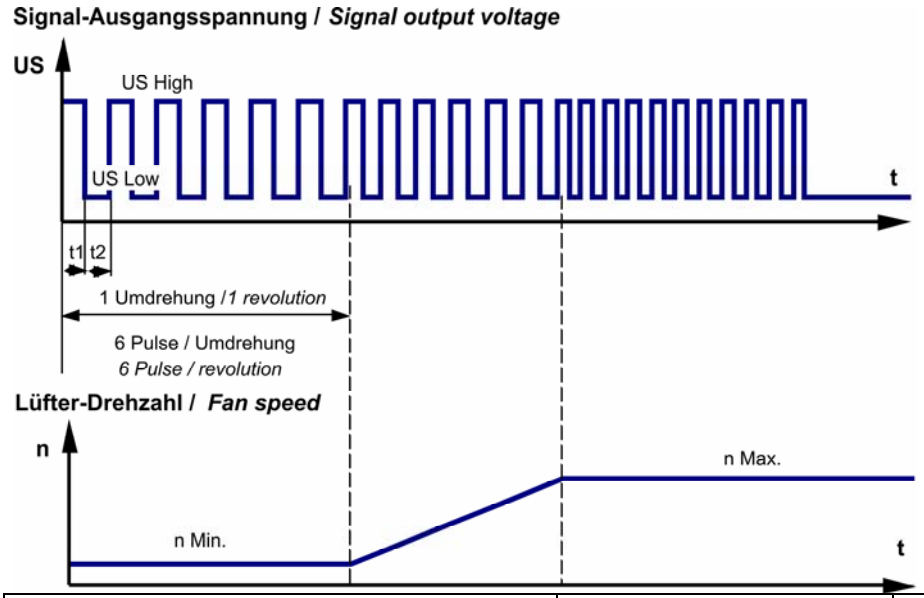
In the fan is an additionally under- and overvoltage control build-in. This switches the power stage and the fan off.
At U <= 32 V and / or U >= 80 V is n= 0 1/min

Name	Condition		
U Contr. 0002	U Contr.: 5 V		

Features	Condition	Symbol	Values		
Voltage range	$\Delta p = 0$	U	36,0 V		72,0 V
Nominal voltage	$\Delta p = 0$	U_N		48,0 V	
Power consumption Tolerance	$\Delta p = 0$ U Contr. 0002	P	21 W +- 10,0 %	23,0 W +- 12,0 %	23,5 W +- 12,0 %
Current consumption Tolerance	$\Delta p = 0$ U Contr. 0002	I	585 mA +- 10,0 %	480 mA +- 12,0 %	325 mA +- 12,0 %
Speed Tolerance	$\Delta p = 0$ U Contr. 0002	n	3.650 1/min +- 5,0 %	3.650 1/min +- 5,0 %	3.650 1/min +- 5,0 %

3.3 Operating Data - Electrical Interface -Output

Tacho type	/2 (Open collector)



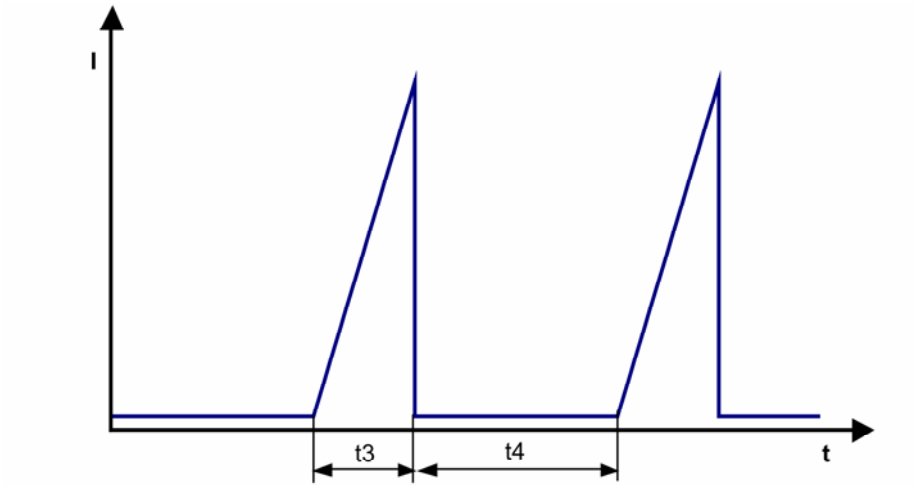
$$Ra = \frac{UBS - US\ Low}{I\ Sink}$$

Features	Note	Values
Tacho operating voltage (UBS)		<= 60 V
Tacho signal Low	I sink: 2 mA	<= 0,4 V
Tacho signal High	I source: 0 mA	<= 60 V
Maximum sink current		<= 20 mA
External resistor	External resistor Ra from UBS to US required. All voltages measured to GND.	
Tacho frequency	(6 x n) / 60	650 Hz
Tacho isolated from motor	No	
Slew rate		=> 0,5 V/us

Alarm type	None

3.4 Electrical Features

Electronic function	Speed-Controlled	
Reversed polarity protection Max. residual current at Un	P-CH FET IF <= 5 mA	
Locked rotor protection	Auto restart	
Locked rotor current at Un	approx. 2.000 mA	
Clock signal t3/t4 at locked rotor	Typical: 3,0 s / 10,0 s	

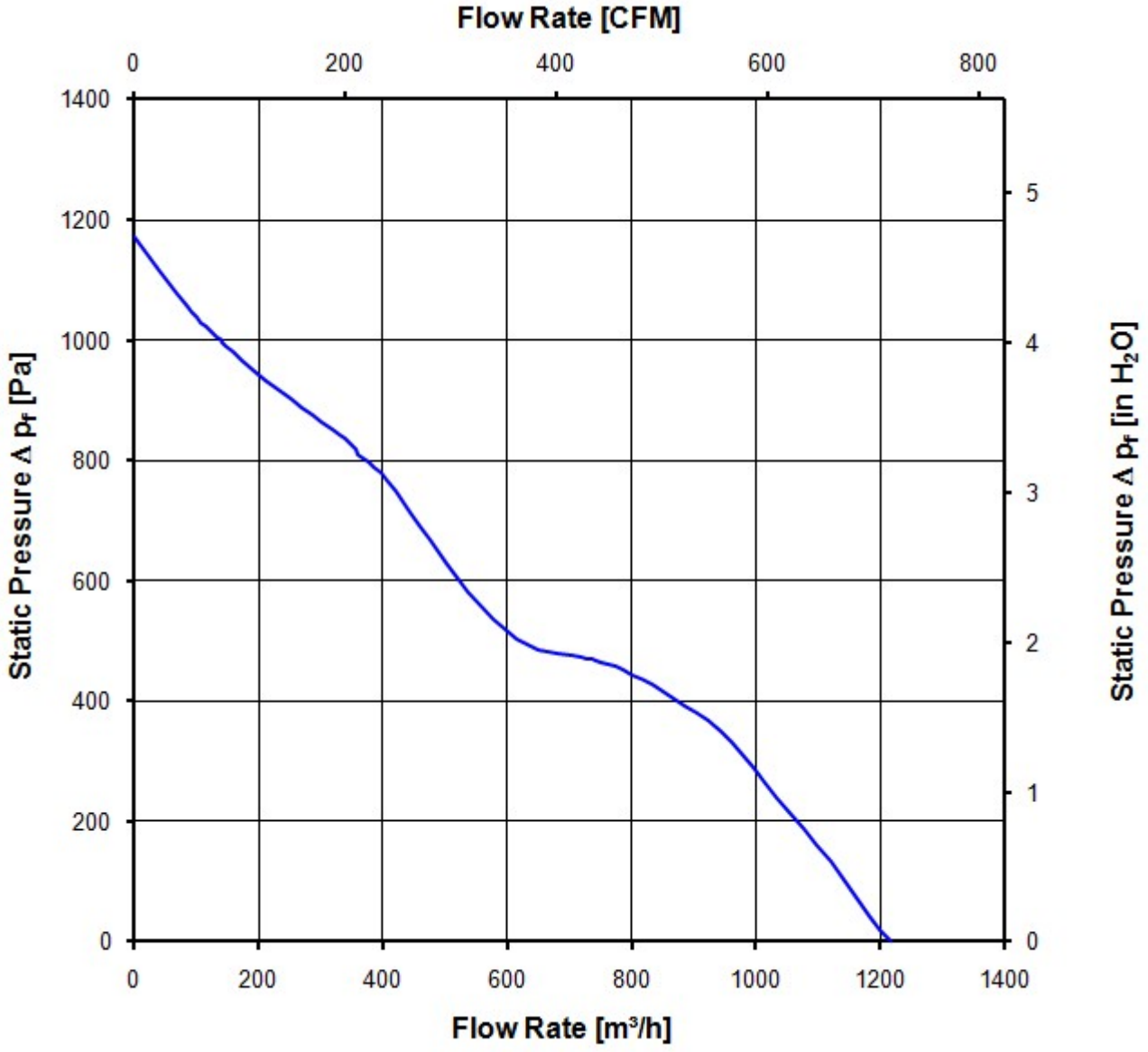


3.5 Aerodynamic

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.

a.) Operation condition:

6.500 1/min at free air flow	U Contr. 10 V		
Max. free-air flow (Δp = 0 / V̇ = max.)		1.220,0 m3/h	
Max. static pressure (Δp = max. / V̇ =0)		1.170 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 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, constant; according to DIN EN 60068-2-78, 14 days	
Water exposure	Splash water IPX4 acc. to DIN EN 60529 see Test Report No 05607/2012	
Radiation exposure	None	
Dust requirements	None	
Salt fog requirements	None	
Harmful gas requirements	None	

*) Permittet application area:
The product is intended for use in sheltered rooms with controlled temperature and controlled humidity.

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.

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	
Air and leakage distances	1,0 mm / 1,5 mm	
Protection class	I	

5.2 Approval Tests

CE	No
UL	Yes / UL audited by CSA according to UL507, Electric Fans
VDE	Yes / Approval acc. to EN 60950 (VDE 0805) - Information technology equipment
CSA	Yes / C22.2 No. 113 Fans and Ventilators
CCC	Yes / GB 12350 Safety Requirements for small Power Motors

The approval tests are observed to:
Maximal permitted operating voltage (see section 3.1) and max. permitted ambient temperature TU max.

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 Delta (40 °C)	140.000 h	