

Product Data Sheet

9295420047

VWS0148XULDS

6318/2TDH4PU-047

**ebmpapst**

The engineer's choice



6318/2TDH4PU-047

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**1 General**

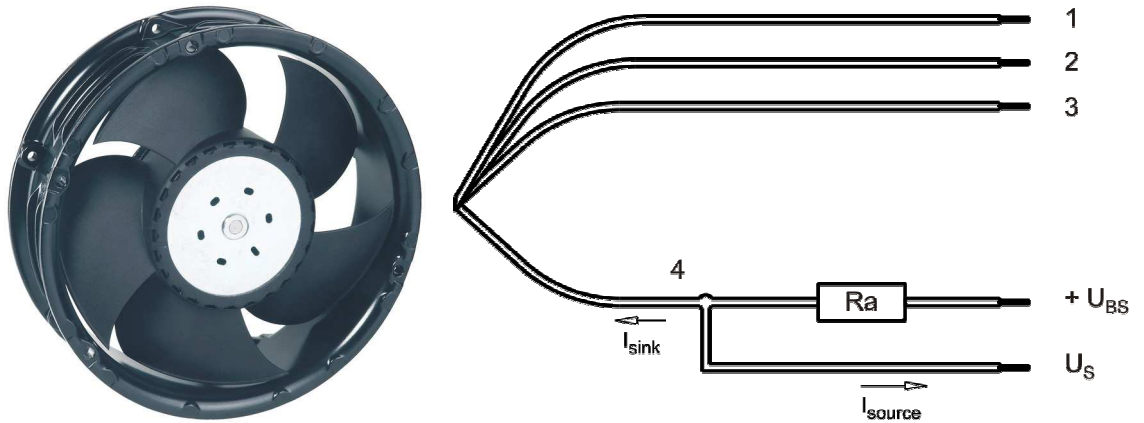
Fan type	Fan	
Rotating direction looking at rotor	Counterclockwise	
Airflow direction	Air outlet over struts	
Bearing system	Ball bearing	
Mounting position - shaft	Any	

**2 Mechanics****2.1 General**

Depth	51,0 mm	
Diameter	172,0 mm	
Mass	0,875 kg	
Housing material	Metal	
Impeller material	Plastic	
Max. torque when mounted across both mounting flanges Screw size	Wire outlet corner: 600 Ncm Remaining corners: 600 Ncm ISO 4762 - M4 degreased, without an additional brace and without washer	

**2.2 Connections**

Electrical connection	Wires	
Lead wire length	L = 365 mm	
Tolerance	+ - 10,0 mm	
Tube length	S = 15 mm	
Tolerance	+ - 5 mm	
Electrical connection		
Lead wire length	See drawing	
Tolerance		



Wire	Color	Operation	Wire size	Insulation diameter
1	red	+ UB	AWG 18	2,2 mm
2	blue	- GND	AWG 18	2,2 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.

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 Electrical Interface - Input

Control input	PWM
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Features

Input type	Open collector	
PWM - Frequency		1 kHz - 20 kHz typical: 2 kHz

<p><b>Characteristics</b></p>	<table border="1"> <caption>Approximate data from the fan speed vs PWM graph</caption> <thead> <tr> <th>PWM [%]</th> <th>Speed [1/min]</th> </tr> </thead> <tbody> <tr><td>0 - 7</td><td>0</td></tr> <tr><td>7</td><td>1000</td></tr> <tr><td>10</td><td>1000</td></tr> <tr><td>20</td><td>2000</td></tr> <tr><td>30</td><td>3000</td></tr> <tr><td>40</td><td>4000</td></tr> <tr><td>50</td><td>5000</td></tr> <tr><td>60</td><td>6000</td></tr> <tr><td>70</td><td>7000</td></tr> <tr><td>80</td><td>8000</td></tr> <tr><td>90</td><td>9000</td></tr> <tr><td>100</td><td>9000</td></tr> </tbody> </table>	PWM [%]	Speed [1/min]	0 - 7	0	7	1000	10	1000	20	2000	30	3000	40	4000	50	5000	60	6000	70	7000	80	8000	90	9000	100	9000
PWM [%]	Speed [1/min]																										
0 - 7	0																										
7	1000																										
10	1000																										
20	2000																										
30	3000																										
40	4000																										
50	5000																										
60	6000																										
70	7000																										
80	8000																										
90	9000																										
100	9000																										
<p><b>Schematics</b></p>	<p><b>Lüfter / Fan</b>      <b>Kunde / Customer</b></p> <p>+ interne Referenz / + internal reference</p> <p>R2      R1      Eingang / Input</p> <p>C      T</p> <p>+ U<sub>B</sub></p> <p>- GND</p>																										

The shown pull-up resistor to the internal reference voltage (+5V) has 4.7kOhm.

**Information to the curve:**

- 0% - <=7% PWM:      0 1/min (Fan off)
- 7% PWM:              1.000 1/min (Start-up, comming from 0% PWM)
- 7% - 10 % PWM:      1.000 1/min (corresp. to min fan speed)

10% - 90% PWM: Linear increasing curve  
 90% - 100% PWM: 8.900 1/min (corresp. to max fan speed)  
 5% PWM: 800 1/min or 0 1/min (Fan turns off, comming from 100% PWM)

**Transistor Requirements:**

VCE max.  $\geq$  12V  
 Isink max  $>$  5mA  
 VCEsat  $<$  0,15V

**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

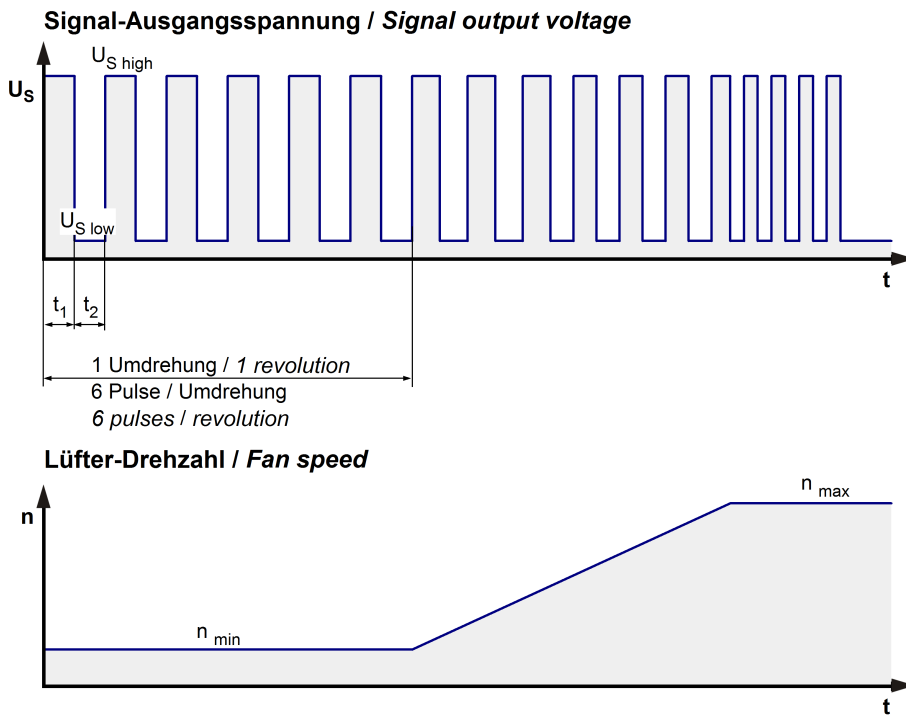
Name	Condition
PWM 0001	PWM: 95 %; f: 2 kHz

**>90% PWM; f = 2 kHz or broken lead wire (open control input)**

Features	Condition	Symbol	Values		
Voltage range		U	36 V		72,0 V
Nominal voltage		U <sub>N</sub>		48,0 V	
Power consumption	$\Delta p = 0$	P	79 W	140 W	144 W
Tolerance	PWM 0010		+/- 10 %	+/- 10 %	+/- 10 %
Current consumption	$\Delta p = 0$	I	2.200 mA	2.900 mA	2.000 mA
Tolerance	PWM 0010		+/- 10 %	+/- 10 %	+/- 10 %
Speed	$\Delta p = 0$	n	7.500 1/min	8.900 1/min	8.900 1/min
Tolerance	PWM 0010		+/- 10 %	+/- 5 %	+/- 5 %

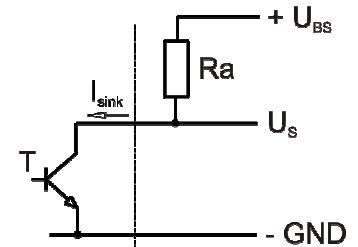
3.3 Electrical Interface - Output

Tacho type	/2 (open collector)
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$$R_a = \frac{U_{BS} - U_{S\ low}}{I_{sink}}$$

Lüfter / Fan      Kunde / Customer

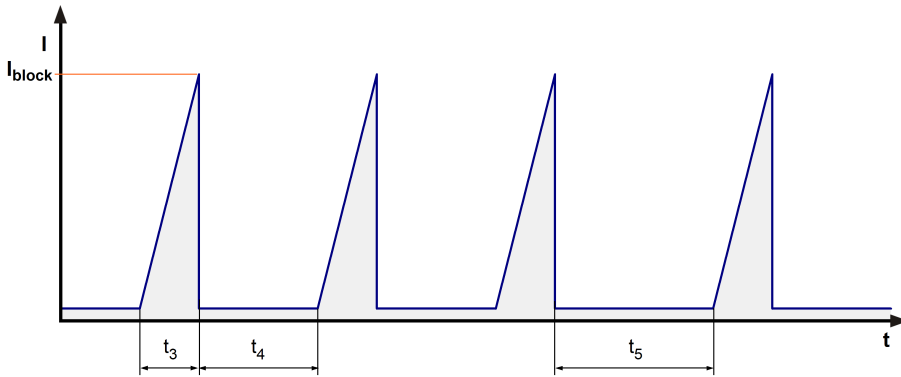


Features	Note	Values
Tacho operating voltage	$U_{BS}$	$\leq 60\ V$
Tacho signal Low	$U_{S\ low}$	$\leq 0,4\ V$
Tacho signal High	$U_{S\ high}$	$60,0\ V$
Maximum sink current	$I_{sink}$	$\leq 20\ mA$
External resistor	External resistor $R_a$ from $U_{BS}$ to $U_S$ required. All voltages measured to GND.	
Tacho frequency	$(6 \times n) / 60$	
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	P-CH FET	
Max. residual current at $U_N$	$I_F \leq 5 \text{ mA}$	
Locked rotor protection	Auto restart	
Locked rotor current at $U_N$	$I_{block}$	
Lock signal at locked rotor	$t_3 / t_4$ typical: 1,5 s / 10,0 s	



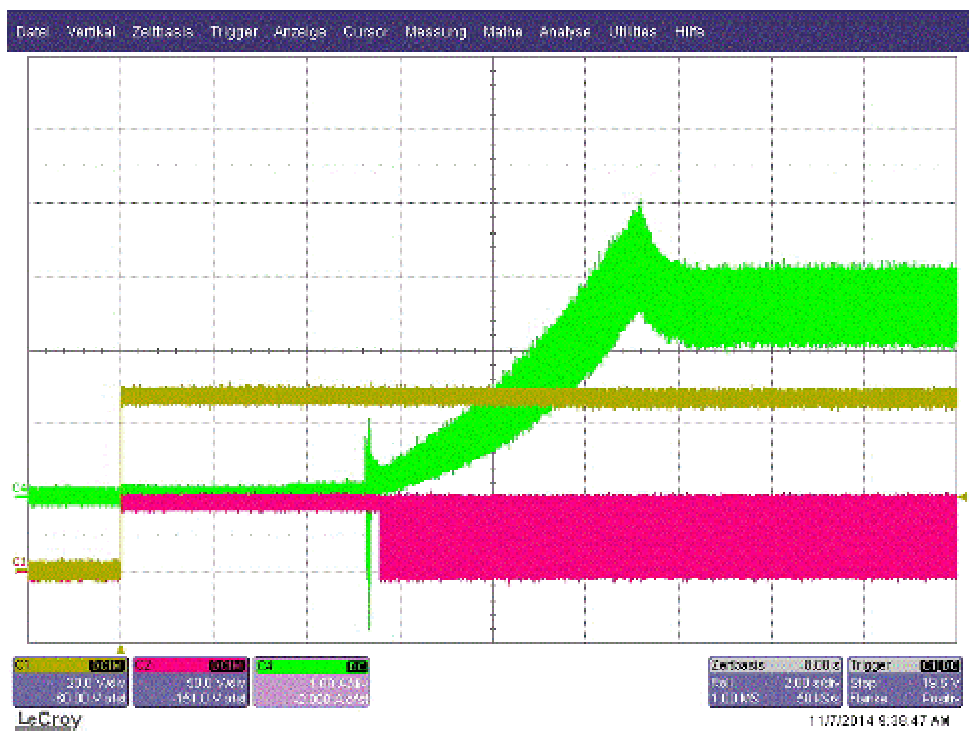
Locked rotor signal  $t_5$ :

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

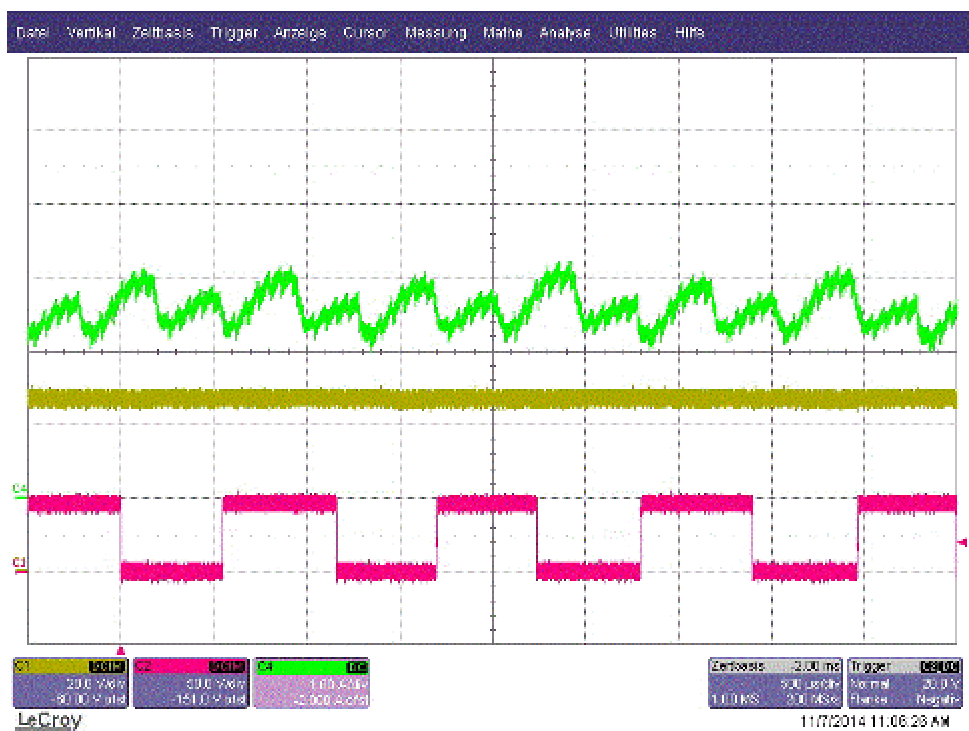


Start-up current @ 48 V ( $I = 1\text{A/div}$  ;  $t = 2\text{s/div}$ )





Running current @ 48 V (I = 1A/div ; t = 500us/div)



**Internal Fuse:**

Littelfuse Nano2 Fuse  
Very Fast-Acting 451/453 Series  
10A / 125V

**3.5 Data According ErP Directive**

Installation / Efficiency category	A / static
Speed control	integrated
Specific ratio	1,00485
Target overall efficiency 2015	29,2 %
Overall efficiency	45,1 %
Efficiency grade	40
Power input	198 W
Speed	8.860 1/min

All values measured in optimum energy efficiency point.

Productiondatecode is printed on the fan label.

### 3.6 Aerodynamics

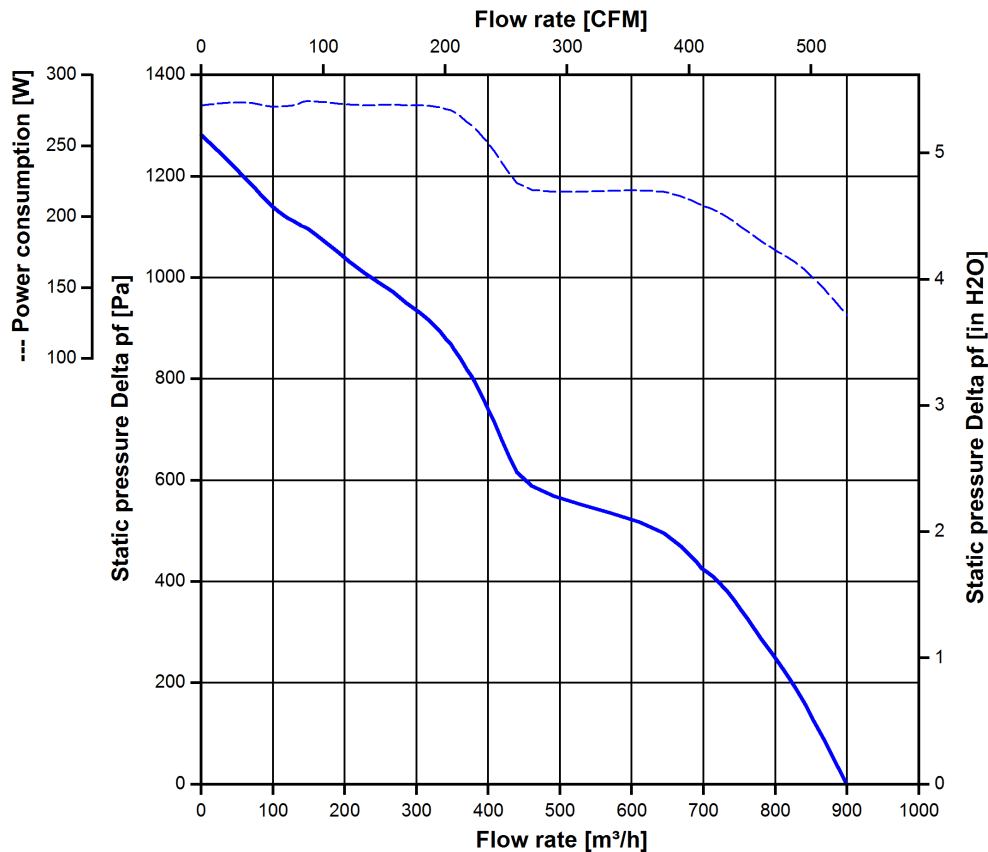
Measurement conditions: Measured with a double chamber intake rig acc. to DIN EN ISO 5801. Normal air density = 1,2 kg/m<sup>3</sup>; Temperature 23°C +/- 3°C; In the intake and outlet area should not be any solid obstruction within 0,5 m. Motor shaft horizontal.

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. 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:

8.900 1/min at free air flow	PWM 95 %; f: 2 kHz		
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Max. free-air flow ( $\Delta p = 0 / \dot{V} = \text{max.}$ )	900,0 m <sup>3</sup> /h	
Max. static pressure ( $\Delta p = \text{max.} / \dot{V} = 0$ )	1.280 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:

8.900 1/min at free air flow	PWM 95 %; f: 2 kHz		
------------------------------	--------------------	--	--

Optimal operating point	863,0 m <sup>3</sup> /h @ 83 Pa		
Sound power level at the optimal operating point	8,7 bel(A)		
Sound pressure level at free air flow, measured in rubber bands	73,0 dB(A)		

## 4 Environment

### 4.1 General

Min. permitted ambient temperature TU min.	-20 °C		
Max. permitted ambient temperature TU max.	60 °C		
Min. permitted storage temperature TL min.	-40 °C		
Max. permitted storage temperature TL max.	80 °C		

## 4.2 Climatic Requirements

IP-protection type (certified)	IP 68 (for fan only, not for connector if applicable) **)	
Humidity requirements	humid temperature, cyclic; according to DIN EN 60068-2-38, 10 cycle and condensation water check; according to DIN EN ISO 6270-2, 14 days	
Salt fog requirements	None	

Permitted application area:

The product is for the use in partial sheltered rooms or open, roofed areas. Direct exposure to water is allowed provided that this does not prevent the normal operation. Saline ambient conditions must be avoided.

Pollution degree 3 (according DIN EN 60664-1)

It occurs conductive pollution or dry non-conductive pollution which becomes conductive due to condensation.

\*\*) The specification of the IP protection refers to the conditions mentioned in certification of the fan. The above mentioned short description of the protection scope is not final. For detailed information of the respective protection scope and definitions, see certification as well as DIN EN 60529 (protection by housings) and ISO 20653 (for vehicles) with the letter K.

### **Short description of the IP-protection type:**

Solid particle Protection: Dust tight.

Protection against deliberate contact: Protected against contact to hazardous parts with a wire.

Protection against water: The fan test according to IP68 (Based on IEC 60529), is conducted in non-operating mode. The fan is tested by a complete immersion in water for a period of 2h at a water-level of 1,2m. Electrical connections are not immersed since they are customer specific.

## 4.3 Mechanical Requirements

severity level	Vibration (sinusoidal)	
0,5 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) 0,035 mm / 10-60, 60-10 Hz 0,5 G / 60-500-60 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 : $1,0 \text{ m}^2 / \text{s}^3$ 20 - 500 Hz : - 3 dB / Oct 0,91 G 3 3 x 5 h
	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 - 20 Hz : $2,0 \text{ m}^2 / \text{s}^3$ 20- 150 Hz : - 3 dB / Oct 0,83 G 3 3 x 5 h
	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	Random vibration in use IEC 60068-2-64 Frequency range / ASD	Random vibration 5 - 20 Hz : $2,0 \text{ m}^2 / \text{s}^3$

Class B	$G_{RMS}$ Axes of vibration Test duration	20- 150 Hz : - 3 dB / Oct 0,83 G 3 3 x 5 h
	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

**Notice:**

In the case of external excitation, noise may increase due to resonance vibrations. Under this conditions the fan should not be operated in the resonance range.

## 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 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

The approval tests are observed to:

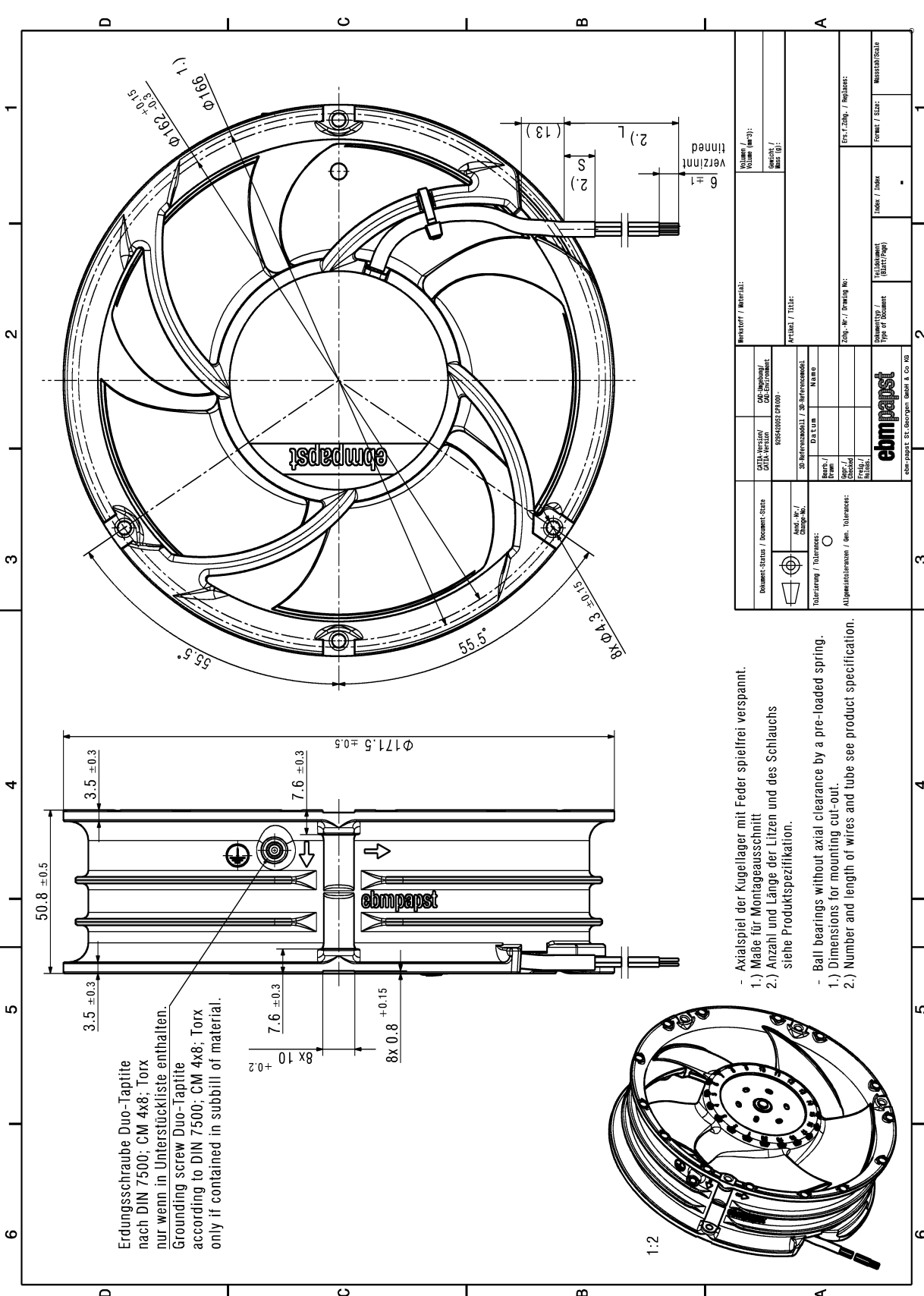
U approval max.: 72 V @ TU approval max.: 60 °C

## 6 Reliability

### 6.1 General

Life expectancy L10 at TU = 40 °C	52.500 h	
Life expectancy L10 at TU max.	32.500 h	
Life expectancy L10 acc. to IPC 9591 at TU = 40 °C	87.5 00 h	





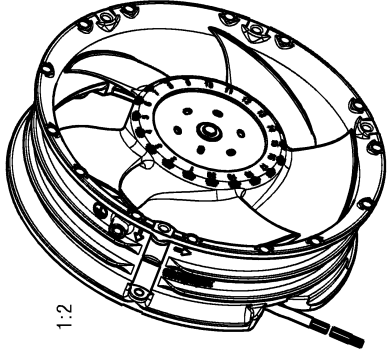
Erdungsschraube Duo-Taptilite nach DIN 7500; CM 4x8; Torx nur wenn in Unterstückliste enthalten. Grounding screw Duo-Taptilite according to DIN 7500; CM 4x8; Torx only if contained in subbill of material.

- Axialspiel der Kugellager mit Feder spielfrei verspannt.

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

- Ball bearings without axial clearance by a pre-loaded spring.

1.) Dimensions for mounting cut-out.  
2.) Number and length of wires and tube see product specification.



1:2

Document Status / Document-Status	CDL Version / CDL-Version	CDL-Modell / CDL-Modell	Revisiert / Material:	Volume / Volume	Volume (in %)
 Toleranzzone / Tolerances: Allgmeintoleranzen / Gen. Tolerances:	03: Referenzmodell / 3D-Referenzmodell Name: Datum: Bearb. / Bearb. / Bearb. / Bearb. /	03: Referenzmodell / 3D-Referenzmodell Name: Datum: Bearb. / Bearb. / Bearb. / Bearb. /	Artikel / Title: Zeich. Nr. / Drawing No.: Ers. / Zeich. / Revision:	Gewicht / Weight (g): Form / Size: Material / Material:	Form / Size: Material / Material:
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