

Product Data Sheet **9691900183**  
VWCE040JKDES  
428J/2HPU

**ebmpapst**

engineering a better life



428J/2HPU

INDEX

- 1 General ..... 3**
- 2 Mechanics ..... 3**
  - 2.1 General ..... 3
  - 2.2 Connections ..... 3
- 3 Operating Data ..... 4**
  - 3.1 Electrical Interface - Input ..... 4
  - 3.2 Electrical Operating Data ..... 5
  - 3.3 Electrical Interface - Output ..... 6
  - 3.4 Electrical Features ..... 7
  - 3.5 Aerodynamics ..... 8
  - 3.6 Sound Data ..... 9
- 4 Environment ..... 9**
  - 4.1 General ..... 9
  - 4.2 Climatic Requirements ..... 10
  - 4.3 Mechanical Requirements ..... 11
- 5 Safety ..... 13**
  - 5.1 Electrical Safety ..... 13
  - 5.2 Approval Tests ..... 13
- 6 Reliability ..... 13**
  - 6.1 General ..... 13

1 General

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

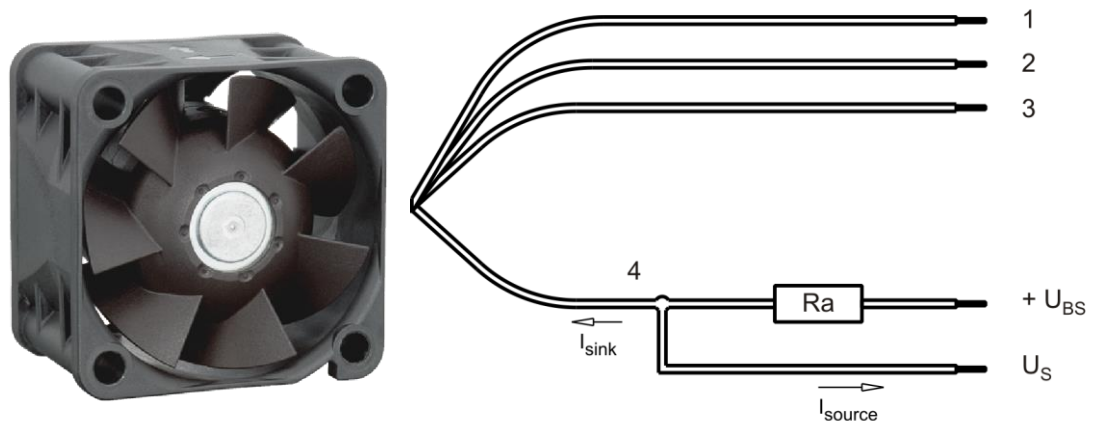
2 Mechanics

2.1 General

|   |   |  |
|---|---|--|
| Width   | 40,0 mm   |  |
| Height  | 40,0 mm   |  |
| Depth   | 28,0 mm   |  |
| Mass  | 0,050 kg  |  |
| Housing material                                      | Plastic   |  |
| Impeller material                                     | Plastic   |  |
| Max. torque when mounted across both mounting flanges | Wire outlet corner: 40 Ncm<br>Remaining corners: 60 Ncm                 |  |
| Screw size  | ISO 4762 - M3 degreased, without an additional brace and without washer |  |

2.2 Connections

|                       |             |  |
|-----------------------|-------------|--|
| Electrical connection | Wires       |  |
| Lead wire length      | L = 310 mm  |  |
| Tolerance             | + - 10,0 mm |  |



| Wire | Color  | Operation | Wire size | Insulation diameter |
|------|--------|-----------|-----------|---------------------|
| 1    | red    | + UB      | AWG 28    | 0,90 mm             |
| 2    | blue   | - GND     | AWG 28    | 0,90 mm             |
| 3    | violet | PWM       | AWG 28    | 0,90 mm             |
| 4    | white  | Tacho     | AWG 28    | 0,90 mm             |

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

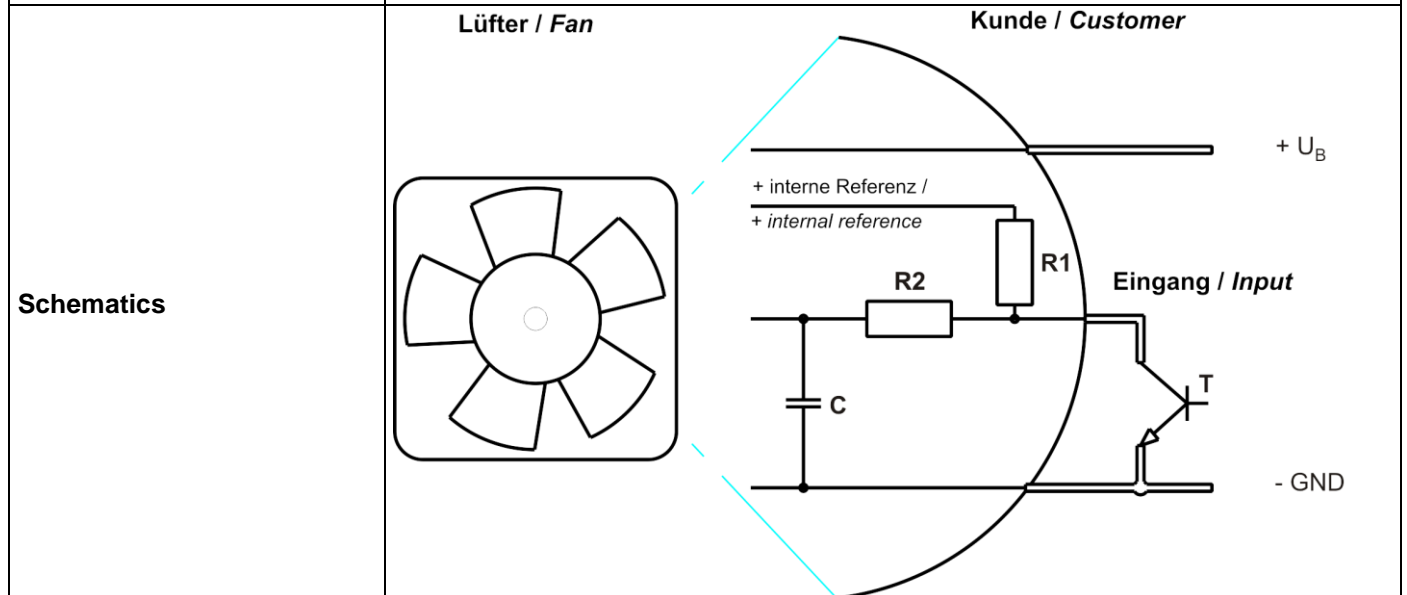
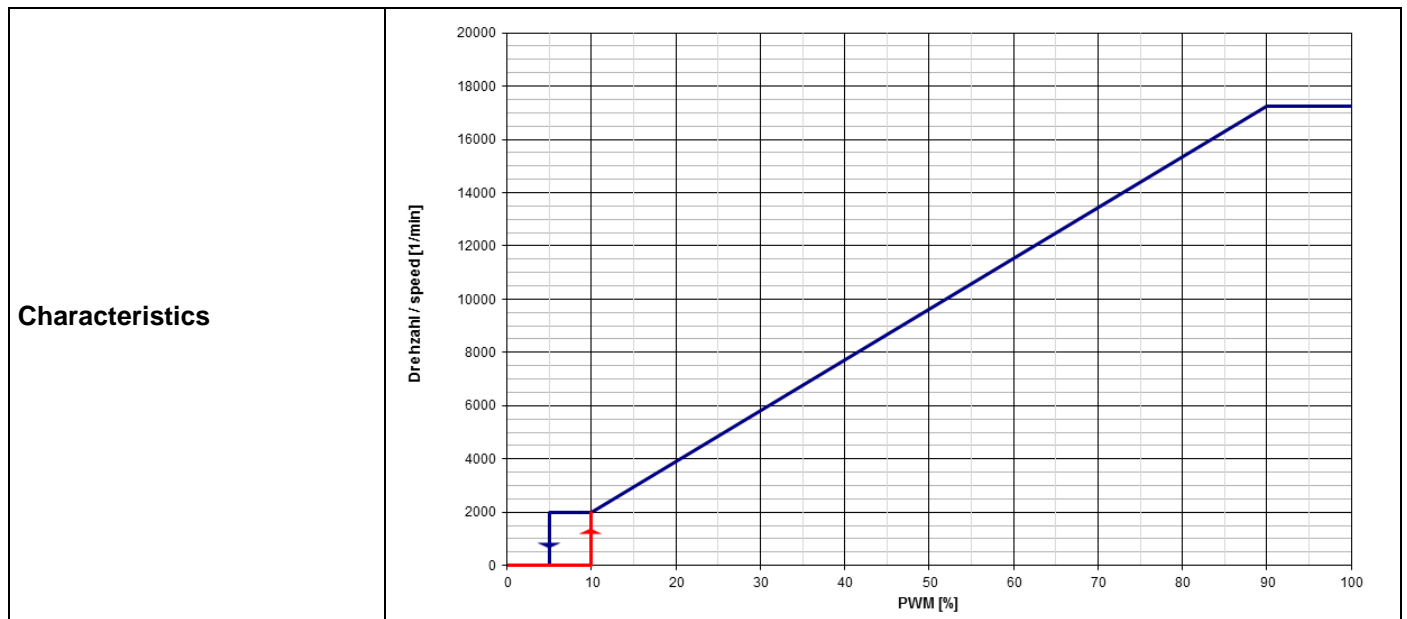
3 Operating Data

3.1 Electrical Interface - Input

|               |     |
|---------------|-----|
| Control input | PWM |
|---------------|-----|

Features

|                 |                |                                  |
|-----------------|----------------|----------------------------------|
| Input type      | Open collector |                                  |
| PWM - Frequency |                | 1 kHz - 30 kHz<br>typical: 2 kHz |



### 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 15 minutes. 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

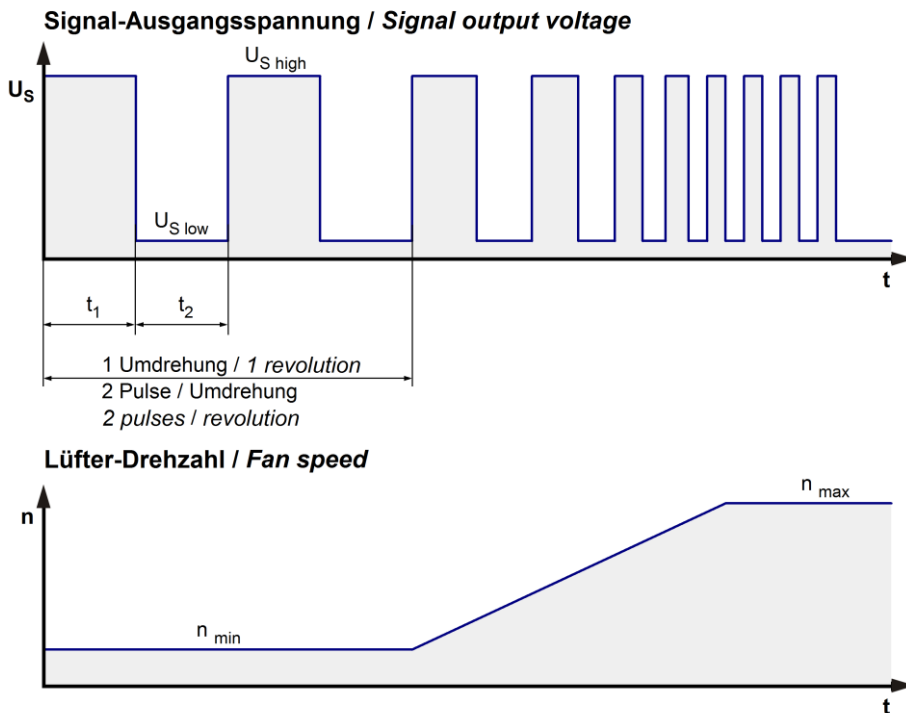
| Name     | Condition            |
|----------|----------------------|
| PWM 0001 | PWM: 100 %; f: 2 kHz |

Unless otherwise specified in the table a general fan speed tolerance applies, relating to the maximum value of the required characteristic curve. Tolerance: +/-10%

| Features                     | Condition      | Symbol         | Values       |              |              |
|------------------------------|----------------|----------------|--------------|--------------|--------------|
| Voltage range                |                | U              | 36 V         |              | 60 V         |
| Nominal voltage              |                | U <sub>N</sub> |              | 48 V         |              |
| Power consumption            | $\Delta p = 0$ | P              | 4,3 W        | 7 W          | 7,2 W        |
| Tolerance                    | PWM 0010       |                | +/- 17,5 %   | +/- 20 %     | +/- 20 %     |
| Current consumption          | $\Delta p = 0$ | I              | 120 mA       | 145 mA       | 125 mA       |
| Tolerance                    | PWM 0010       |                | +/- 17,5 %   | +/- 20 %     | +/- 20 %     |
| Speed                        | $\Delta p = 0$ | n              | 14.500 1/min | 17.250 1/min | 17.250 1/min |
| Tolerance                    | PWM 0010       |                | +/- 12,5 %   | +/- 5 %      | +/- 5 %      |
| Starting current consumption |                |                |              | <= 815 mA    |              |

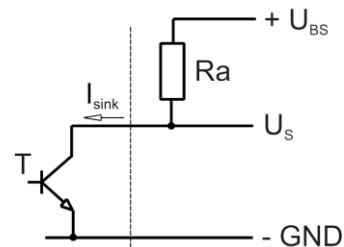
3.3 Electrical Interface - Output

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



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

Lüfter / Fan      Kunde / Customer

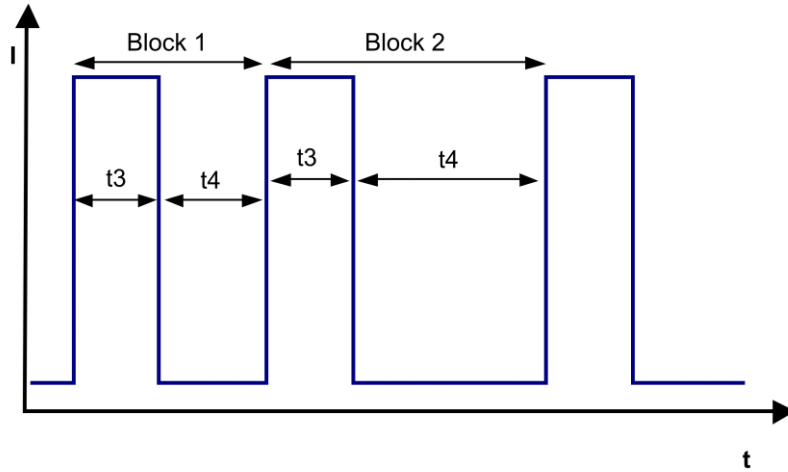


| Features                  | Note   | Values                     |
|---------------------------|--|----------------------------|
| Tacho operating voltage   | $U_{BS}$   | $\leq 60\ V$               |
| Tacho signal Low          | $U_{S\ low}$   | $\leq 0,9\ V$              |
| Tacho signal High         | $U_{S\ high}$  | $60\ V$                    |
| Maximum sink current      | $I_{sink}$   | $4\ mA$                    |
| External resistor         | External resistor $R_a$ from $U_{BS}$ to $U_S$ required. All voltages measured to GND. |                            |
| Tacho frequency           | $(2 \times n) / 60$  |                            |
| 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 $U_N$ | $I_F \leq 900 \mu A$          |  |
| Locked rotor protection        | Auto restart                  |  |
| Locked rotor current at $U_N$  | $I_{block}$ approx. 380 mA    |  |
| Clock signal at locked rotor   | $t_3 / t_4$ typical: 0,17 s / |  |



Block1: special locked rotor protection: 5 cycles  $t_3 / t_4 = 0,17 \text{ s} / 1 \text{ s}$  Block2: locked rotor protection  $t_3 / t_4 = 0,17 \text{ s} / 10 \text{ s}$

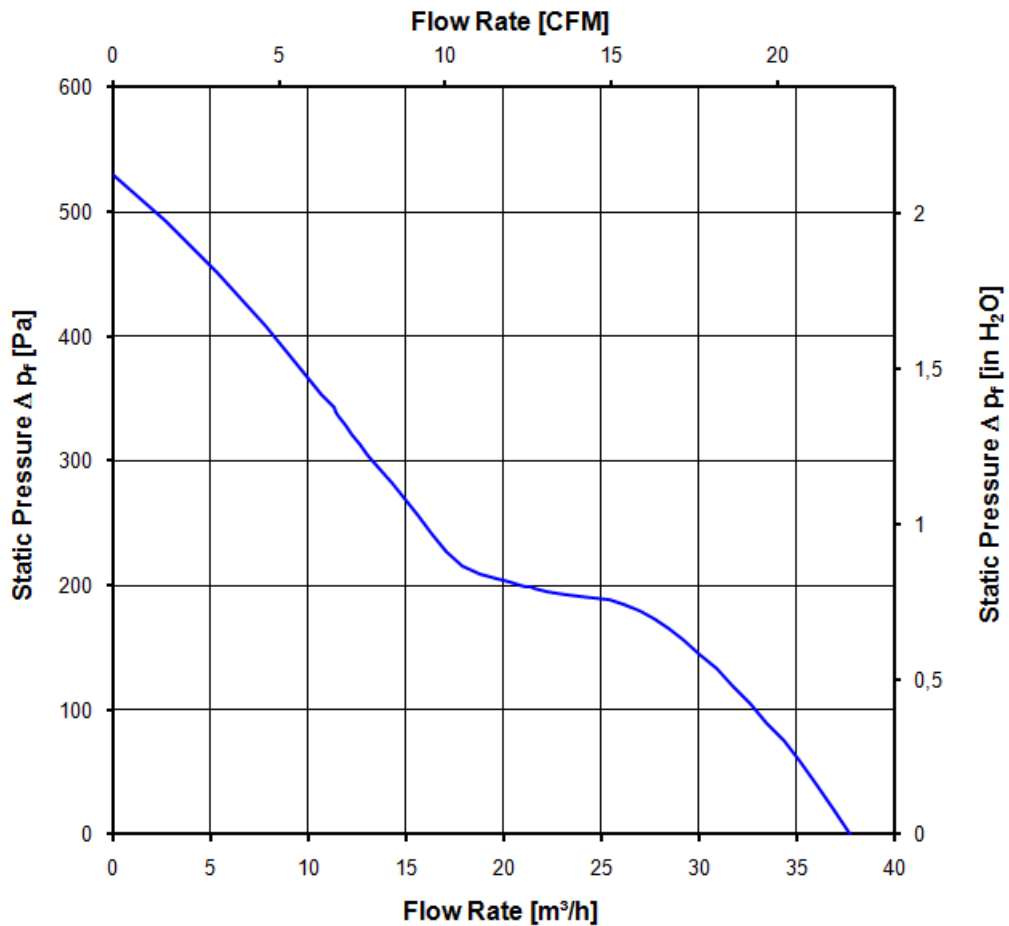
3.5 Aerodynamics

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:

|                               |                     |  |  |
|-------------------------------|---------------------|--|--|
| 17.250 1/min at free air flow | PWM 100 %; f: 2 kHz |  |  |
|-------------------------------|---------------------|--|--|

|   |                      |  |
|---|----------------------|--|
| Max. free-air flow ( $\Delta p = 0 / \dot{V} = \text{max.}$ )   | 37 m <sup>3</sup> /h |  |
| Max. static pressure ( $\Delta p = \text{max.} / \dot{V} = 0$ ) | 527 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 semianechoic chamber with a background noise level of  $L_p(A) < 5 \text{ dB(A)}$   
 For further measurement conditions see chapter aerodynamics.

a.) Operation condition:

|                               |                     |  |  |
|-------------------------------|---------------------|--|--|
| 17.250 1/min at free air flow | PWM 100 %; f: 2 kHz |  |  |
|-------------------------------|---------------------|--|--|

|   |                                 |  |  |
|---|---------------------------------|--|--|
| Optimal operating point   | 26,0 m <sup>3</sup> /h @ 164 Pa |  |  |
| Sound power level at the optimal operating point                | 6,6 bel(A)                      |  |  |
| Sound pressure level at free air flow, measured in rubber bands | 54,0 dB(A)                      |  |  |

**4 Environment**

**4.1 General**

|  |        |  |  |
|--|--------|--|--|
| Min. permitted ambient temperature TU min. | -40 °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

|                                |   |  |
|--------------------------------|---|--|
| 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          | salt fog, cyclic, in operation; according to DIN EN 60068-2-52, 3 cycle   |  |

Permitted application area:

The product is for the use in open and unsheltered areas. Direct exposure to water as well as saline ambient conditions are allowed provided that this does not prevent the normal operation.

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)  |  |
|----------------|---|--|
| 2 G            | Vibration (sinusoidal) in use<br>IEC 60068-2-6<br>Displacement / frequency range<br>Acceleration / frequency range<br>Sweep rate<br>Sweep cycles<br>Duration<br>Axes of vibration | Vibration (sinusoidal)<br>0,15 mm / 10-58, 58-10 Hz<br>2 G / 58-500-58 Hz<br>1 Oct./min<br>10<br>2 hrs.<br>3 |

| severity level | stationary use           |  |   |
|----------------|--------------------------|--|---|
| 1              | storage / transportation | Random vibration not in use<br>IEC 60068-2-64<br>Frequency range / ASD<br><br>G <sub>RMS</sub><br>Axes of vibration<br>Test duration       | Random vibration<br>5 - 20 Hz : 1,0 m <sup>2</sup> / s <sup>3</sup><br>20 - 500 Hz : - 3 dB / Oct<br>0,91 G<br>3<br>3 x 5 h |
|                | storage / transportation | Bump not in use<br>IEC 60068-2-29<br>Shock spectrum<br>Acceleration<br>Duration<br>Number of bumps (+X, -X, -Y, +Y, -Z, +Z)<br>Total bumps | Bump<br>half sine<br>18 G<br>6 ms<br>100 in each direction<br>600   |
|                | stationary use           | Random vibration in use<br>IEC 60068-2-64<br>Frequency range / ASD<br><br>G <sub>RMS</sub><br>Axes of vibration<br>Test duration           | Random vibration<br>5 - 20 Hz : 2,0 m <sup>2</sup> / s <sup>3</sup><br>20- 150 Hz : - 3 dB / Oct<br>0,83 G<br>3<br>3 x 5 h  |
|                | stationary use           | Bump in use<br>IEC 60068-2-29<br>Shock spectrum<br>Acceleration<br>Duration<br>Number of bumps (+X, -X, -Y, +Y, -Z, +Z)<br>Total bumps     | Bump<br>half sine<br>5 G<br>11 ms<br>100 in each direction<br>600   |

| severity level               | Railroad application   |   |
|------------------------------|--|---|
| 1<br>IEC 61373<br>Category 1 | Random vibration in use<br>IEC 60068-2-64<br>Frequency range / ASD | Random vibration<br>5 - 20 Hz : 2,0 m <sup>2</sup> / s <sup>3</sup> |

|         |   |  |
|---------|---|--|
| Class B | GRMS<br>Axes of vibration<br>Test duration  | 20- 150 Hz : - 3 dB / Oct<br>0,83 G<br>3<br>3 x 5 h              |
|         | Shock in use<br>IEC 60068-2-27<br>Shock spectrum<br>Acceleration<br>Duration<br>Number of bumps (+X, -X, -Y, +Y, -Z, +Z)<br>Total bumps | Shock<br>half sine<br>7 G<br>18 ms<br>10 in each direction<br>60 |

## 5 Safety

### 5.1 Electrical Safety

|   |  |  |
|---|--|--|
| Dielectric strength<br>DIN EN 62368 and DIN EN 60335<br>A.) Type test<br>Measuring conditions: After 48h of storage at 95% R.H. and 25°C.<br>No arcing or breakdown is allowed!<br>All connections together to ground.<br>B.) Routine test<br>Measuring conditions: At indoor climate.<br>No arcing or breakdown is allowed!<br>All connections together to ground. | 500 VAC / 1 Min.<br><br>850 VDC / 1 Sec. |  |
| Isolation resistance<br>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 62368 - Audio/video, information and communication technology equipment |
| CSA | Canadian Standards Association                                      | Yes   |
| CCC | China Compulsory Certification                                      | Yes / GB 12350 Safety Requirements for small Power Motors   |

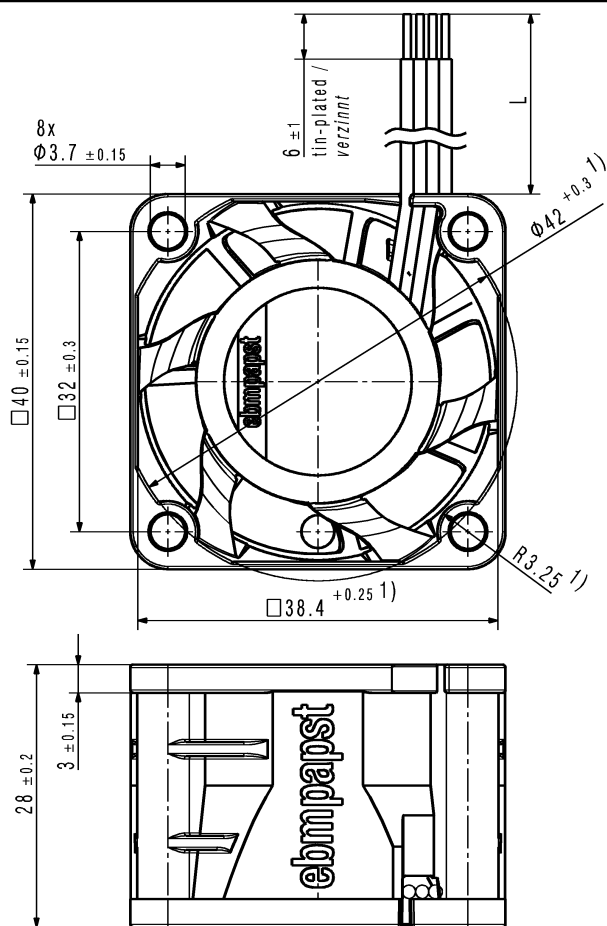
## 6 Reliability

### 6.1 General

|  |           |  |
|--|-----------|--|
| Life expectancy L10 at TU = 40 °C                  | 60.000 h  |  |
| Life expectancy L10 at TU max.                     | 30.000 h  |  |
| Life expectancy L10 acc. to IPC 9591 at TU = 40 °C | 102.500 h |  |

Copying of this document, and giving it others and the use or communication of the contents thereof, are forbidden without express authority. Offenders are liable to the payment of damages. All rights are reserved in the event of the grant of a patent or the registration of a utility model or design.

Schutzvermerk nach DIN ISO 9001 beachten!  
Refer to protection notice DIN ISO 9001.



- 1) Maße für Montagewand / Dimensions for assembly wall Flange side / Flanschseite  
 - mit Feder spielfrei axial verspannt / tensioned without axial clearance by spring  
 - Anzahl und Länge der Litzen siehe Produktspezifikation Blatt 1  
 Number and length of the wires see design specification sheet 1 /

|  |  |  |                                  |                              |  |   |  |
|--|--|--|----------------------------------|------------------------------|--|---|--|
| Dokument-Status / Document-State       |  | CATIA-Version/<br>CATIA-Version        | CAD-Umgebung/<br>CAD-Environment | Werkstoff / Material:        |  | Volumen /<br>Volume (mm <sup>3</sup> ): |  |
| 9291908002 CPR 000 -                   |  |  |                                  |                              |  | Gewicht /<br>Mass (g):                  |  |
| Titel / Title:                         |  | 3D-Referenzmodell / 3D-Reference model |                                  |                              |  |   |  |
| Tolerierung / Tolerances:              |  | Datum / Name                           |                                  | Zchg.-Nr. / Drawing No:      |  | Ers.f.Zchg. / Replaces:                 |  |
| Allgemeintoleranzen / Gen. Tolerances: |  | Bearb./<br>Drawn                       |                                  |                              |  |   |  |
|  |  | Gepr./<br>Checked                      |                                  |                              |  |   |  |
|  |  | Freig./<br>Released                    |                                  |                              |  |   |  |
|  |  | Dokumenttyp /<br>Type of Document      |                                  | Tei1Dokument<br>(Blatt/Page) |  | Index / Index                           |  |
| ebm-papst St.Georgen GmbH & Co KG      |  |  |                                  |                              |  | Format / Size:    Massstab/Scale        |  |