# Product Data Sheet

**9295414754**
VWS0184XULCZ
2214F/2TDHOU-754

ebmpapst
The engineer's choice

GREEN TECH

**2214F/2TDHOU-754**

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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 | |

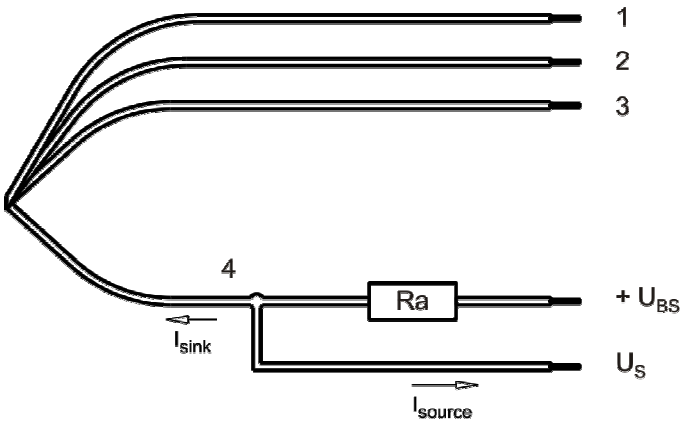
## 2 Mechanics

### 2.1 General

| | | |
|---|---|---|
| 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 - Plug | |
| Lead wire length<br>Tolerance | L = 360 mm | |
| Plug | See drawing | |
| Contact | See drawing | |




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

## 3 Operating Data

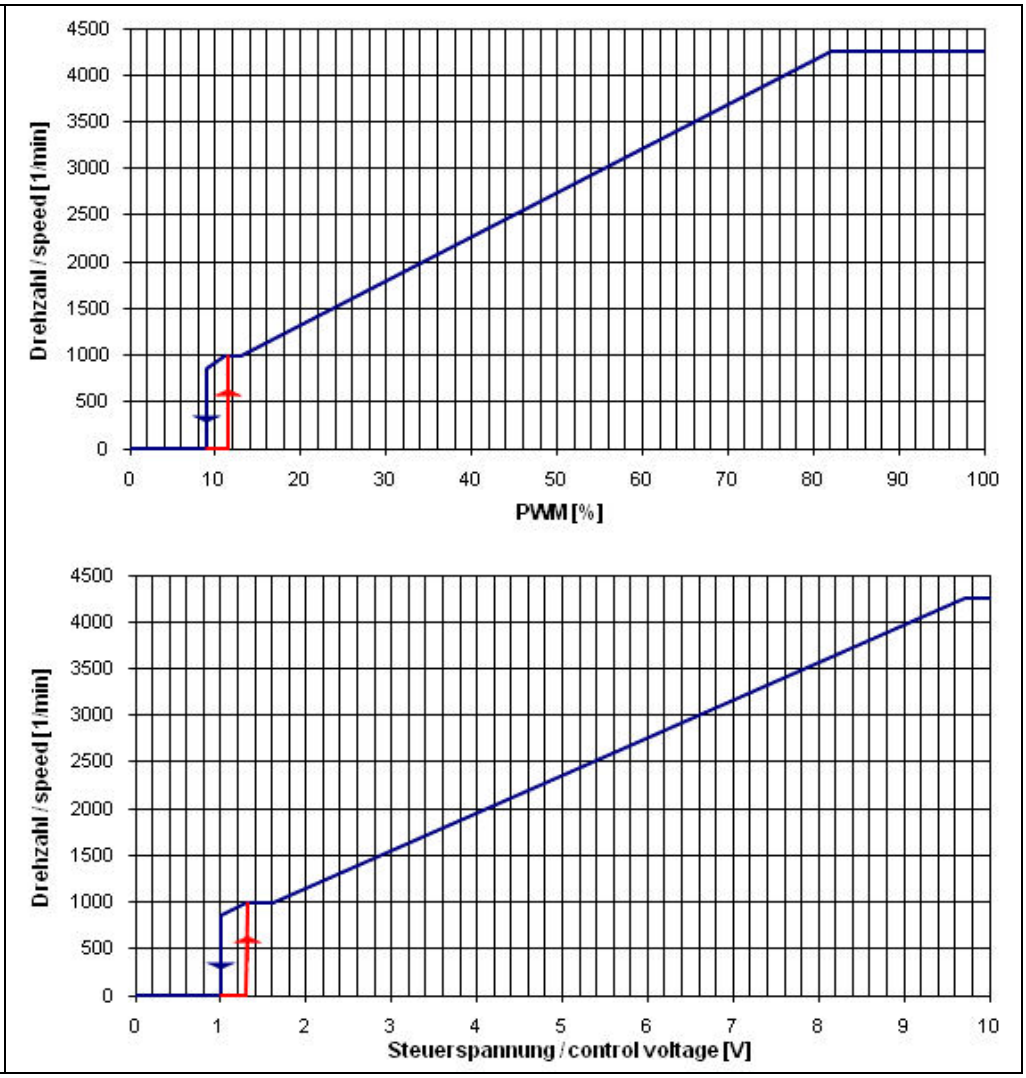
### 3.1 Electrical Interface - Input

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

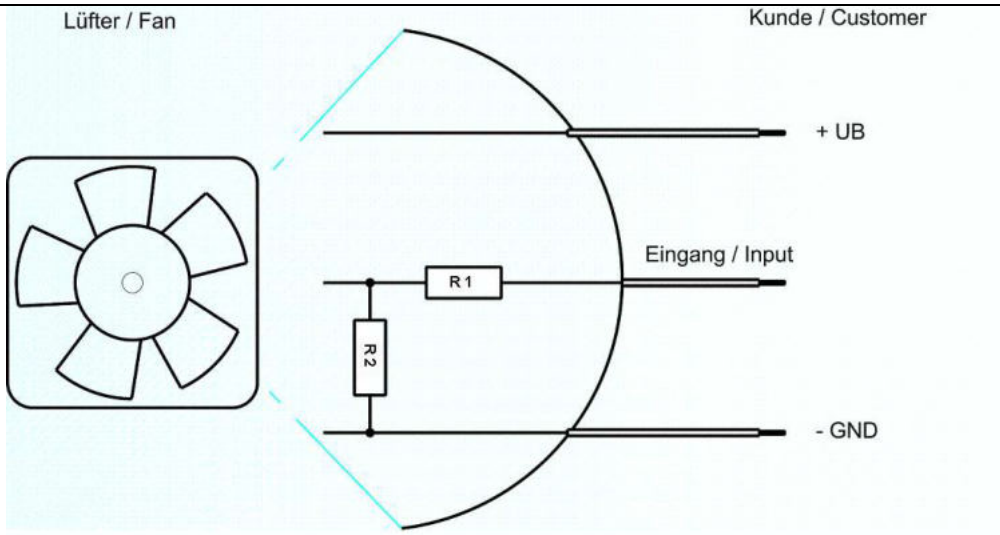
**Features**

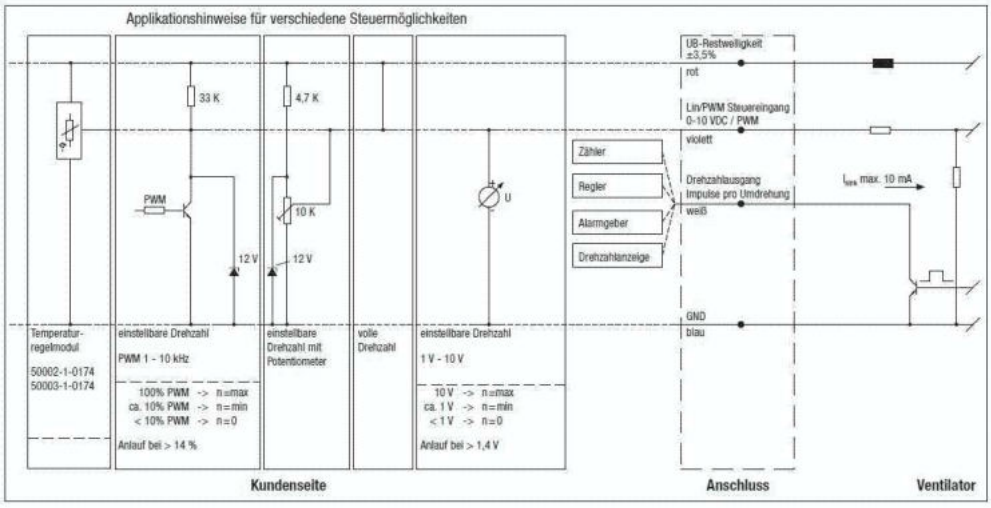
| | | |
|---|---|---|
| PWM - Frequency | | 1 kHz - 10 kHz<br>typical: 2 kHz |
| Input voltage range | | 0 V - 10 V |

**Characteristics**



**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, comming 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, comming 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, comming 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, comming from 10 V) |

### 3.2 Electrical Operating Data

Measurement conditions: Normal air density = 1,2 kg/m3; Temperature 23℃ +/ - 3℃; 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.

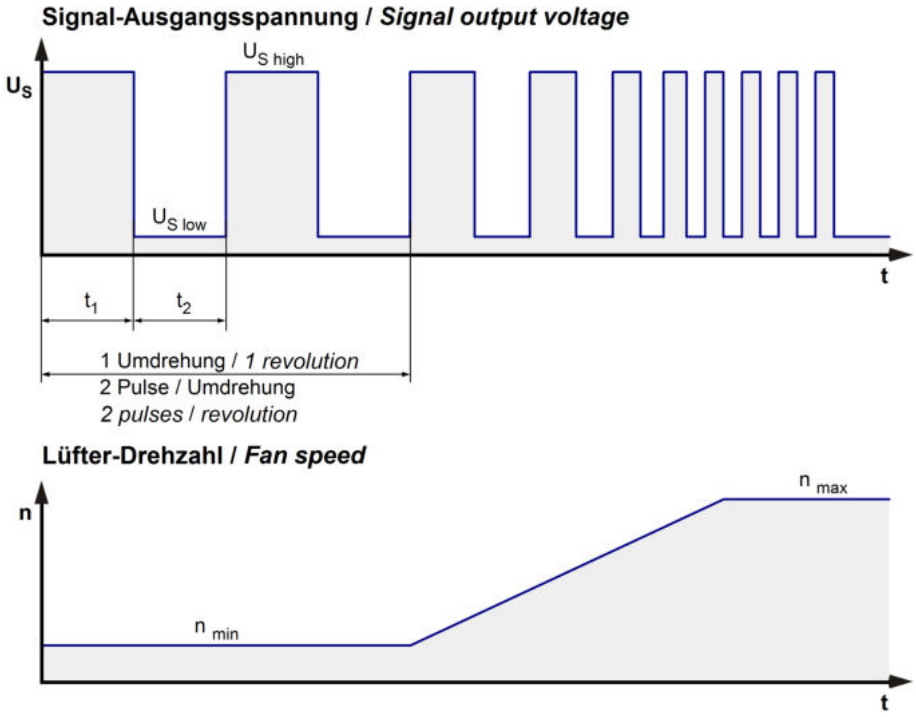
Δp = 0: corresp. to free air flow (see chapter aerodynamics)
I: corresp. to arithm. mean current value

| Name | Condition | | |
|---|---|---|---|
| U Contr. 0001 | | U Contr. min.: 9,7 V | U Contr. max.: 10,0 V |

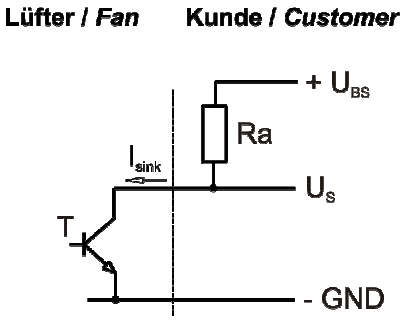
| Features | Condition | Symbol | Values | | |
|---|---|---|---|---|---|
| Voltage range | | U | 16 V | | 30 V |
| Nominal voltage | | $U_N$ | | 24 V | |
| Power consumption<br>Tolerance | Δp = 0<br>U Contr. 0010 | P | 31 W<br>+- 10 % | 36 W<br>+- 10 % | 35 W<br>+- 10 % |
| Current consumption<br>Tolerance | Δp = 0<br>U Contr. 0010 | I | 1.950 mA<br>+- 10 % | 1.450 mA<br>+- 10 % | 1.170 mA<br>+- 10 % |
| Speed<br>Tolerance | Δp = 0<br>U Contr. 0010 | n | 4.100 1/min<br>+- 7,5 % | 4.250 1/min<br>+- 5 % | 4.250 1/min<br>+- 5 % |

### 3.3 Electrical Interface - Output

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




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



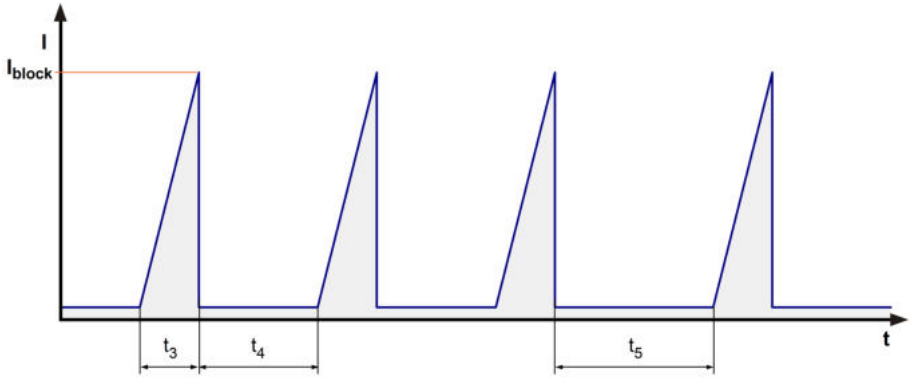

| Features | | Note | Values |
|---|---|---|---|
| Tacho operating voltage | $U_{BS}$ | | <= 30 V |
| Tacho signal Low | $U_{S\,low}$ | I sink: 2 mA | <=0,4 V |
| Tacho signal High | $U_{S\,high}$ | I source: 0 mA | <=30 V |
| Maximum sink current | $I_{sink}$ | | <= 20 mA |
| External resistor | | External resistor Ra from UBS to US required. All voltages measured to GND. | |
| Tacho frequency | | (2 x n) / 60 | 140 Hz @ 4.200 1/min |
| Tacho isolated from motor | | No | |
| Slew rate | | | => 0,5 V/us |

n = revolutions per minute (1/min)

### 3.4 Electrical Features

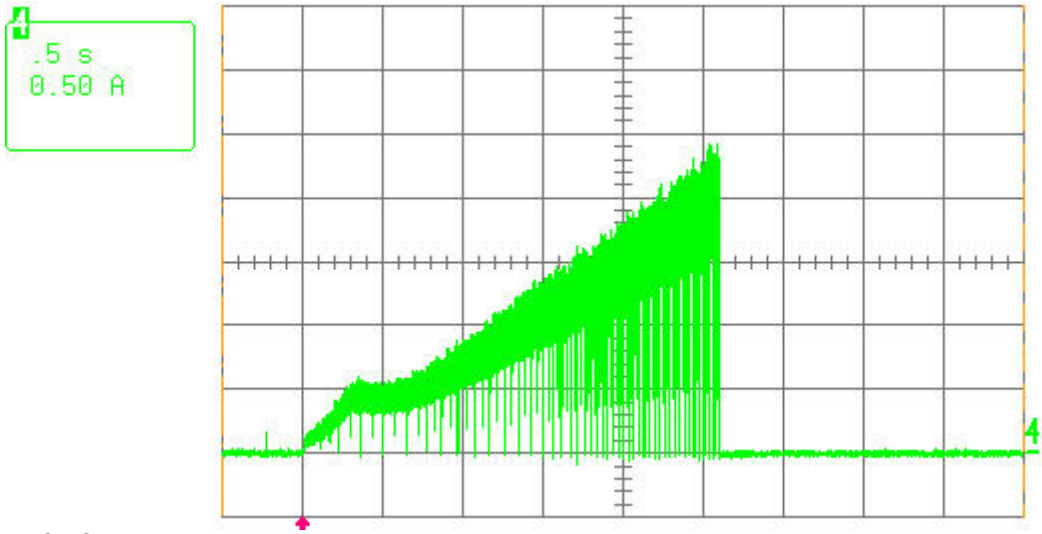
| | | |
|---|---|---|
| Electronic function | Speed-Controlled | |
| Reversed polarity protection<br>Max. residual current at $U_N$ | Rectifying diode<br>$I_F$ < 5 mA | |
| Locked rotor protection | Auto restart | |
| Locked rotor current at $U_N$ | $I_{block}$ | |
| Clock signal at locked rotor | $t_3$ / $t_4$ typical: 2,7 s / 10,0 s | |
| Internal fuse | Littelfuse NANO2 > Very Fast-Acting > 451/453 Series<br>6,3A / 125V (Art.No.: 045106.3MRL) | |
| Voltage control *) | Fan turns on at $U_B$ > 12 V or < 13 V<br>Fan turns off at $U_B$ < 35 V or > 36 V | |

*) This fan has an undervoltage and overvoltage control circuit integrated which turns the motor off if the voltage is out of range.

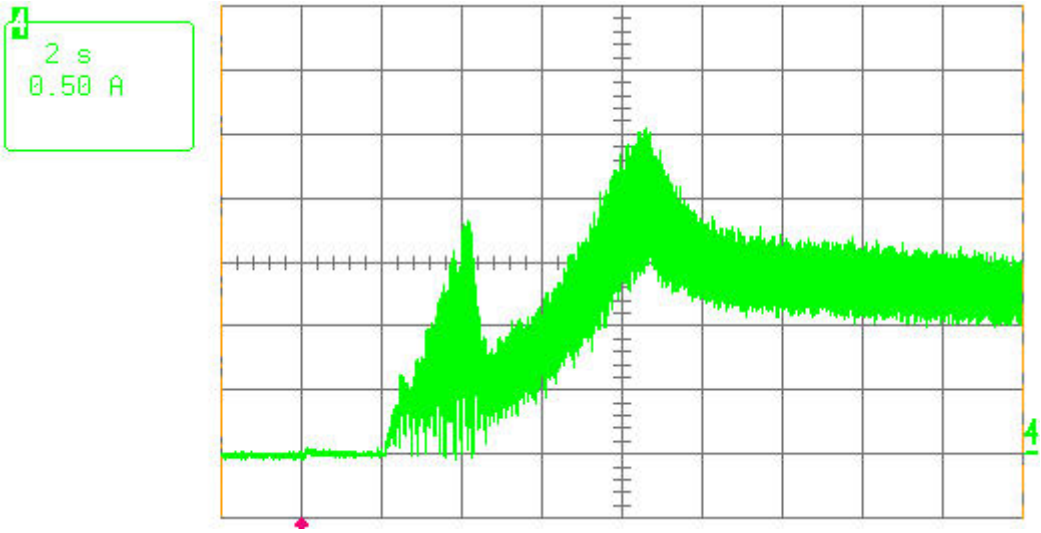



**Locked rotor signal t5: 40s**

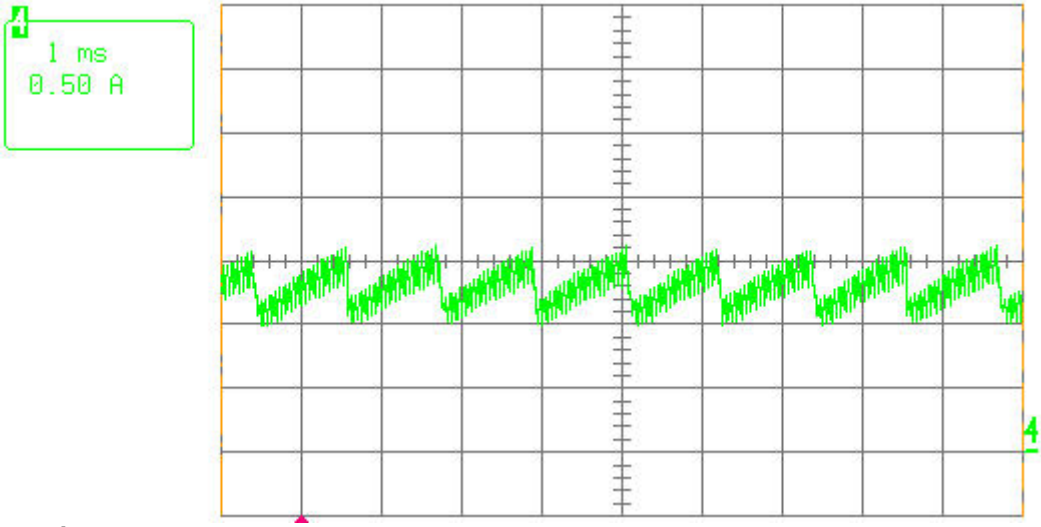
**The first timeout t4 is 3s, after that t4 is 10s.**
**After 4 failed start-ups there is an extended timeout of 40s.**




**Locked rotor current at 24 V**




**Start-up current at 24 V**




**Running current at 24 V**

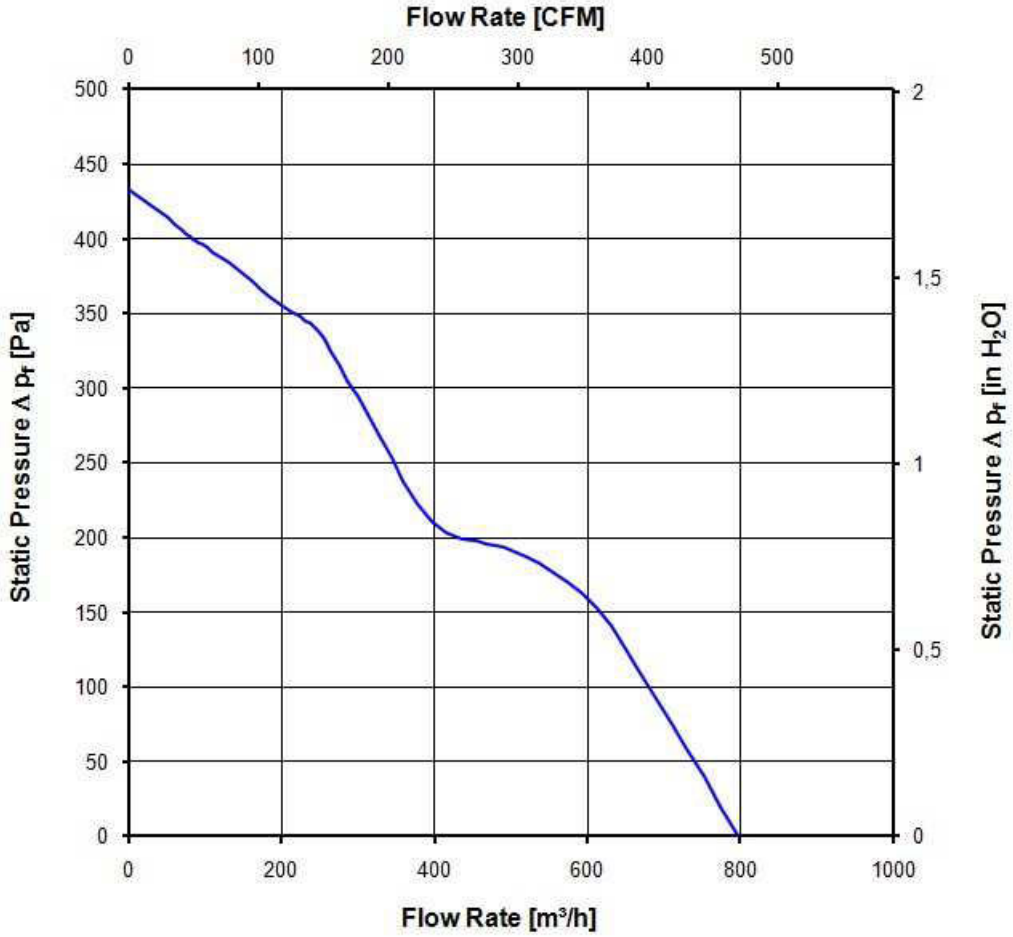
### 3.5 Aerodynamics

| | |
|---|---|
| Measurement conditions: | Measured with a double chamber intake rig acc. to DIN EN ISO 5801.<br>Normal air density = 1,2 kg/m3; Temperature 23℃ +/ - 3℃;<br>In the intake and outlet area should not be any solid obstruction within 0,5 m. Motor shaft horizontal.<br>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 (Δp = 0 / V̇ = max.) | 800 m3/h | |
| Max. static pressure (Δp = max. / V̇ =0) | 430 Pa | |



### 3.6 Sound Data

| | |
|---|---|
| Measurement conditions: | Sound pressure level: 1 meter distance between microphone and the air intake.<br>Sound power level: Acc. to DIN 45635 part 38 (ISO 10302)<br>Measured in a semianchoic chamber with a background noise level of Lp(A) < 5 dB(A)<br>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 m3/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 ℃ | |
| Max. permitted ambient temperature TU max. | 70 ℃ | |
| Min. permitted storage temperature TL min. | -40 ℃ | |
| Max. permitted storage temperature TL max. | 80 ℃ | |

### 4.2 Climatic Requirements

| | | |
|---|---|---|
| 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 | |
| Water exposure | Splash water check IPX4; according to DIN EN 60529 VDE 0470, not certified | |
| Dust requirements | Dust check IP5X; according to DIN EN 60529 VDE 0470, not certified | |
| 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.

### 4.3 Mechanical Requirements

| severity level | mobile use | | |
|---|---|---|---|
| 1 | storage / transportation | Random vibration not in use<br>IEC 60068-2-64<br>Frequency range / ASD<br><br>$G_{RMS}$<br>Axes of vibration<br>Test duration | <br>Random vibration<br>5 - 20 Hz : 1,0 $m^2 / s^3$<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 | <br>Bump<br>half sine<br>18 G<br>6 ms<br>100 in each direction<br>600 |
| | mobile use | Random vibration in use<br>IEC 60068-2-64<br>Frequency range / ASD<br><br><br>$G_{RMS}$<br>Axes of vibration<br>Test duration | <br>Random vibration<br>5 - 20 Hz : 2,0 $m^2 / s^3$<br>20- 150 Hz : - 3 dB / Oct<br>0,83 G<br>3<br>3 x 5 h |
| | mobile use | 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 | <br>Shock<br>half sine<br>30 G<br>6 ms<br>10 in each direction<br>60 |
| | mobile 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 | <br>Bump<br>half sine<br>5 G<br>11 ms<br>100 in each direction<br>600 |

## 5 Safety

### 5.1 Electrical Safety

| | | |
|---|---|---|
| Dielectric strength<br>DIN EN 60950 (VDE 0805) and DIN EN 60335 (VDE 0700)<br>A.) Type test<br>Measuring conditions: After 48h of storage at 95% R.H. and 25℃.<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℃ measured with U=500 VDC for 1 min. | RI > 10 MOhm | |
| Clearance / creepage distance | 1,0 mm / 1,2 mm | |
| Protection class | III | |

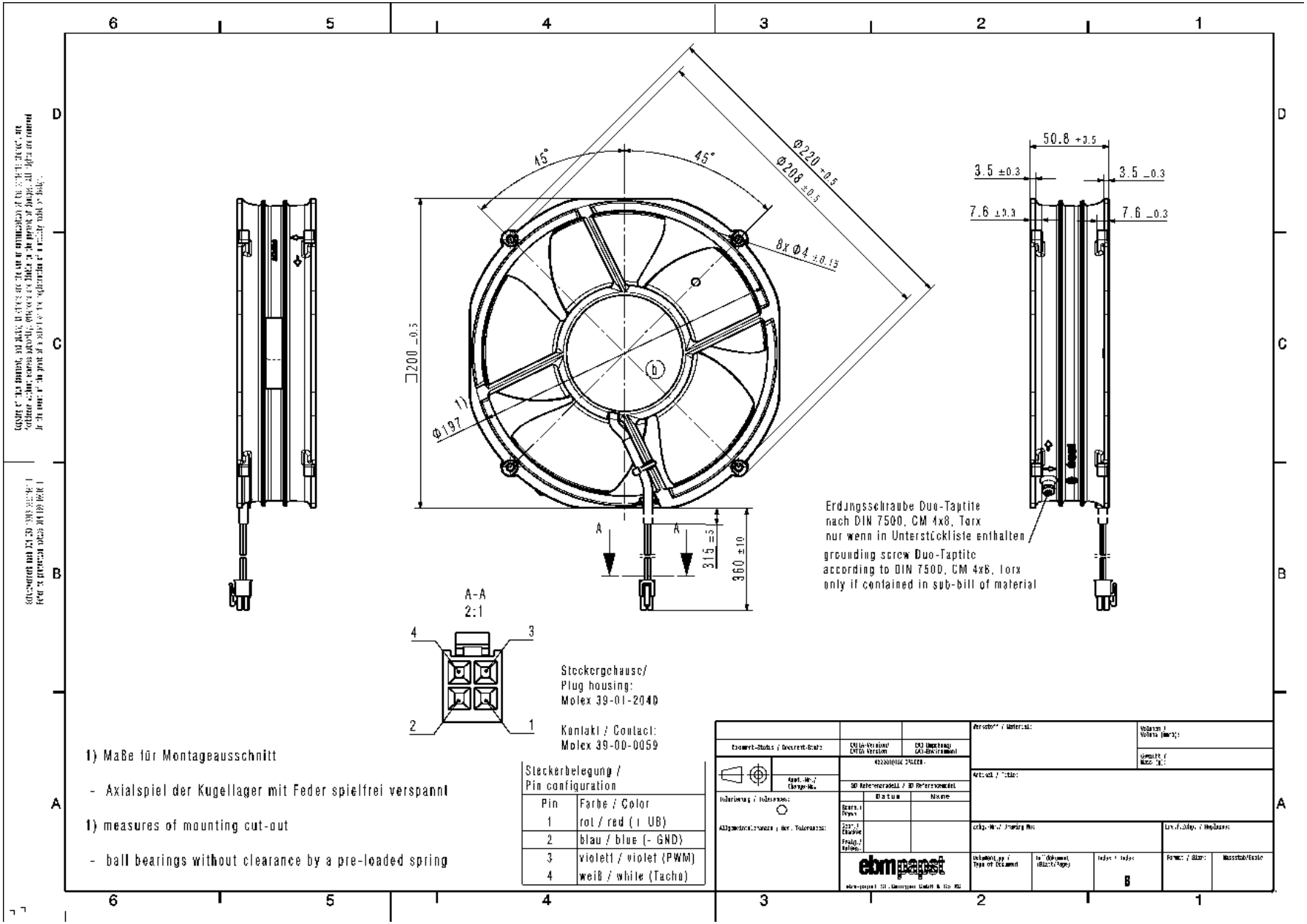
### 5.2 Approval Tests

| | | |
|---|---|---|
| CE | EC Declaration of Conformity | Yes |
| EAC | Eurasian Conformity | Yes |
| UL | Underwriters Laboratories | Yes / UL audited by CSA according to 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 | Not applicable |

## 6 Reliability

### 6.1 General

| | | |
|---|---|---|
| Life expectancy L10 at TU = 40 ℃ | 90.000 h | |
| Life expectancy L10 acc. to IPC 9591 at TU = 40 ℃ | 152. 500 h | |




Steckergehäuse/
Plug housing:
Molex 39-01-2040

Kontakt / Contact:
Molex 39-00-0059

1) Maße für Montageausschnitt

- Axialspiel der Kugellager mit Feder spielfrei verspannt

1) measures of mounting cut-out

- ball bearings without clearance by a pre-loaded spring

| Steckerbelegung / Pin configuration | |
|---|---|
| Pin | Farbe / Color |
| 1 | rot / red (+ UB) |
| 2 | blau / blue (- GND) |
| 3 | violett / violet (PWM) |
| 4 | weiß / white (Tacho) |

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B