# Product Data Sheet

**9295420228**
VWS0184FULDZ
2218F/2TDH5P-228

ebmpapst
The engineer's choice



GREEN TECH

**2218F/2TDH5P-228**

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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

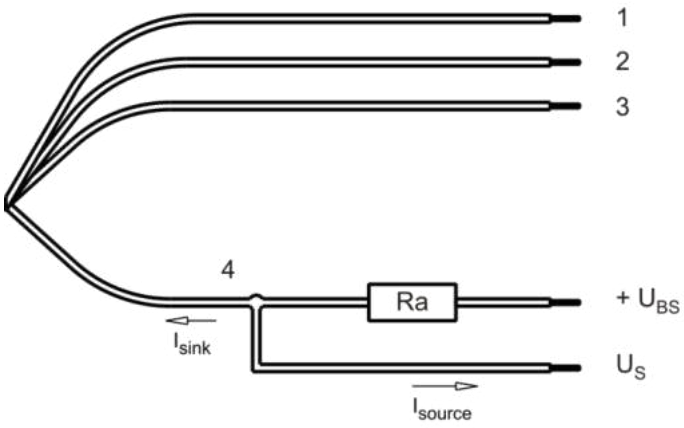
### 2.1 General

| | | |
|---|---|---|
| Width | 200 mm | |
| Height | 200 mm | |
| Depth | 51 mm | |
| Diameter | 220 mm | |
| Mass | 1,06 kg | |
| Housing material | Metal | |
| Impeller material | Plastic | |
| Rotor protrusion max. | 2,2 mm | |

### 2.2 Connections

| | | |
|---|---|---|
| Electrical connection | Wires - Plug | |
| Lead wire length<br>Tolerance | L = 755 mm<br>+- 10 mm | |
| Tube length<br>Tolerance | S = 10 mm<br>+- 2,0 mm | |
| Plug | See drawing | |
| Contact | See drawing | |






| Wire | Color | Operation | Plug connection | Wire size | Insulation diameter |
|---|---|---|---|---|---|
| 1 | red | + UB | Pin 4 | AWG 18 | 2,2 mm |
| 2 | blue | - GND | Pin 1 | AWG 18 | 2,2 mm |
| 3 | violet | PWM | Pin 2 | AWG 20 | 2,05 mm |
| 4 | white | Tacho | Pin 3 | AWG 20 | 2,05 mm |

## 3 Operating Data

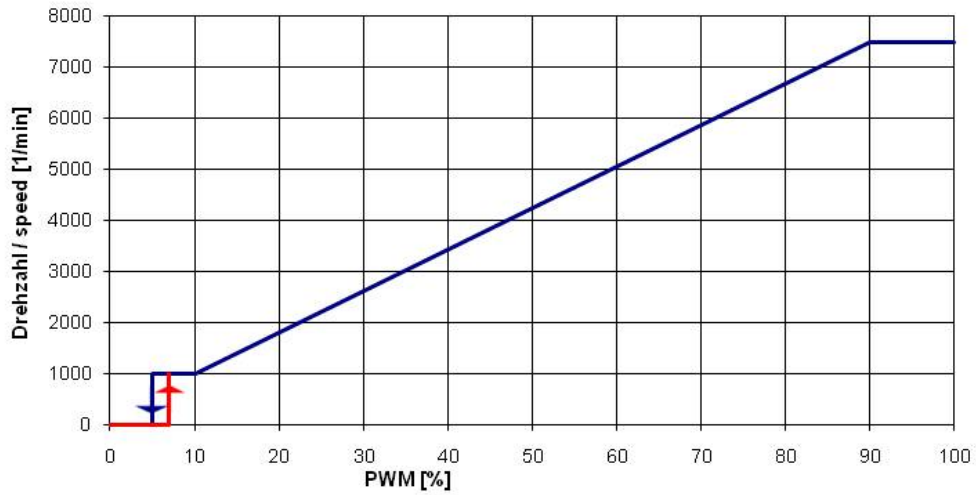
### 3.1 Electrical Interface - Input

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

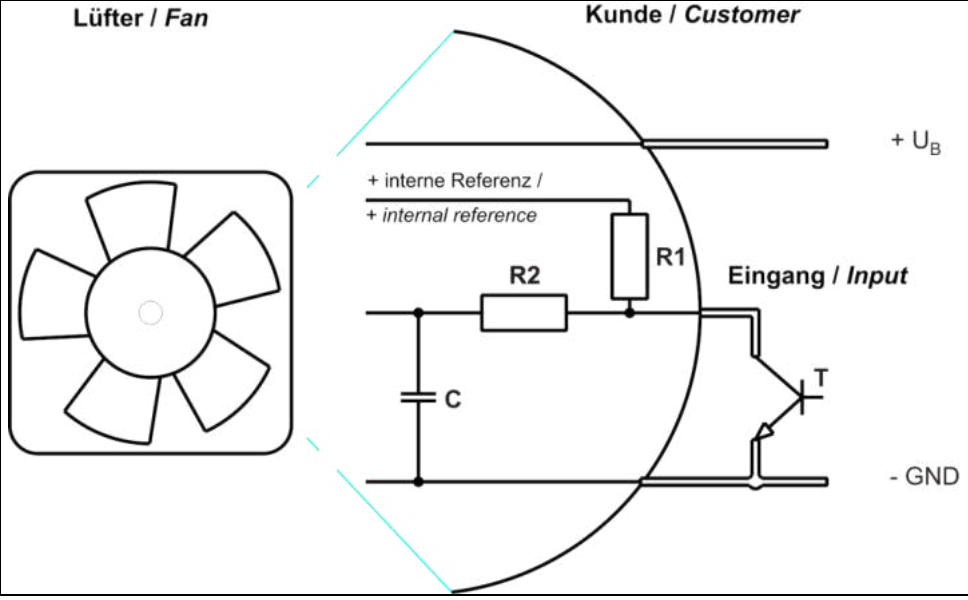
**Features**

| | | |
|---|---|---|
| Inpute type | Open collector | |
| PWM - Frequency | | 1 kHz - 10 kHz<br>typical: 2 kHz |

**Characteristics**




**Schematics**




The shown pull-up resistor R1 to the internal reference voltage (+5V) has 4.7kOhm.

**Transistor requirements:**
Vce max. >= 12V; Isink max. >=5mA; Vce sat. <= 0,15V

**Speed control:**
By pulse width modulation (PWM) 0...100%
Open collector in relation to signal-ground.

**Information to the curve:**
0 % - <7% PWM: 0 1/min
7 % PWM: 1.000 1/min (Fan on, comming from 0% PWM)
7 % - 10% PWM: 1.000 1/min (corresponding to min. speed)
10 % - 90% PWM: linear increasing curve
90 % - 100% PWM: 7.500 1/min (corresponding to max. speed)
7 % - >5 % PWM: linear decreasing curve (comming from 100% PWM)
5 % PWM: 800 1/min or 0 1/min (Fan off, comming from 100% PWM)

### 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.

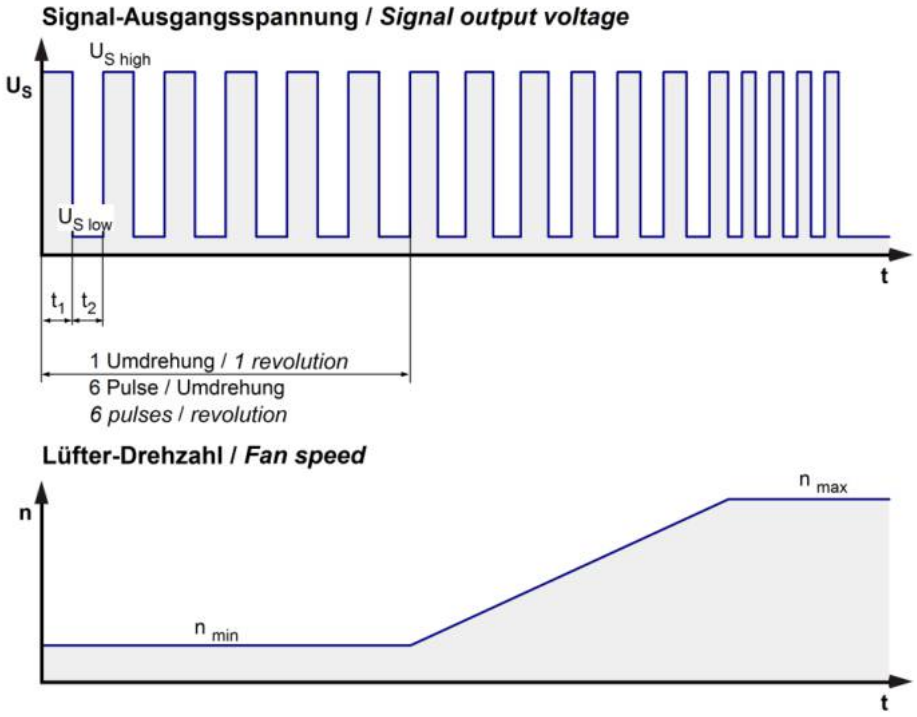
$\Delta p = 0$: corresp. to free air flow (see chapter aerodynamics)
I: corresp. to arithm. mean current value

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

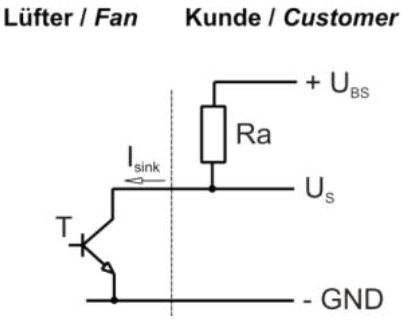
| Features | Condition | Symbol | Values | | |
|---|---|---|---|---|---|
| Voltage range | | U | 52 V | | 56 V |
| Nominal voltage | | $U_N$ | | 54 V | |
| Power consumption<br>Tolerance | $\Delta p = 0$<br>PWM 0010 | P | 158 W<br>+- 12 % | 162 W<br>+- 10 % | 160 W<br>+- 10 % |
| Current consumption<br>Tolerance | $\Delta p = 0$<br>PWM 0010 | I | 3.000 mA<br>+- 10 % | 3.000 mA<br>+- 10 % | 2.900 mA<br>+- 10 % |
| Speed<br>Tolerance | $\Delta p = 0$<br>PWM 0010 | n | 7.500 1/min<br>+- 5 % | 7.500 1/min<br>+- 3 % | 7.500 1/min<br>+- 3 % |
| Starting current consumption | | | | <= 3.500 mA | |

### 3.3 Electrical Interface - Output

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




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



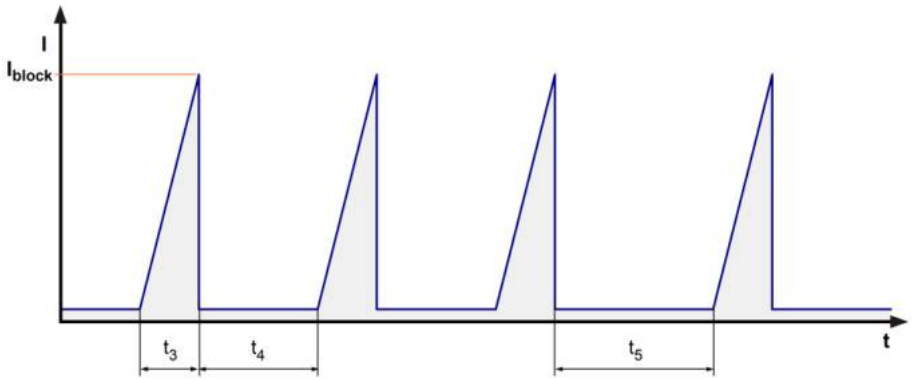

| Features | | Note | Values |
|---|---|---|---|
| Tacho operating voltage | $U_{BS}$ | | <= 60 V |
| Tacho signal Low | $U_{S\,low}$ | I sink: 2 mA | <=0,4 V |
| Tacho signal High | $U_{S\,high}$ | I source: 0 mA | <=60 V |
| Maximum sink current | $I_{sink}$ | | <= 20 mA |
| External resistor | | External resistor Ra from UBS to US required. All voltages measured to GND. | |
| Tacho frequency | | (6 x n) / 60 | 750 Hz @ 7.500 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 $U_N$ | None | |
| Locked rotor protection | Auto restart | |
| Locked rotor current at $U_N$ | $I_{block}$ approx. 2.500 mA | |
| Clock signal at locked rotor<br>Extended Downtime | $t_3$ / $t_4$ typical: 3,0 s / 10,0 s<br>$t_5$: 40 s after 4 start-up tests | |
| Internal fuse | Littelfuse NANO2 > Very Fast-Acting > 451/453 Series<br>12A / 75V (Art.No.: 0451012.MRL) | |
| Voltage control *) | Fan turns on at $U_B$ > 34 V or < 78 V<br>Fan turns off at $U_B$ < 32 V or > 80 V | |

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




### 3.5 Data According ErP Directive

| | |
|---|---|
| Installation / Efficency category | A / static |
| Speed control | integrated |
| Specific ratio | 1,00463 |
| Target overall efficiency 2015 | 30,2 % |
| Overall efficiency | 50,0 % |
| Efficiency grade | 40 |
| Power input | 278 W |
| Speed | 7.540 1/min |

All values measured in optimum energy efficiency point.

Productiondatecode is printed on the fan label.

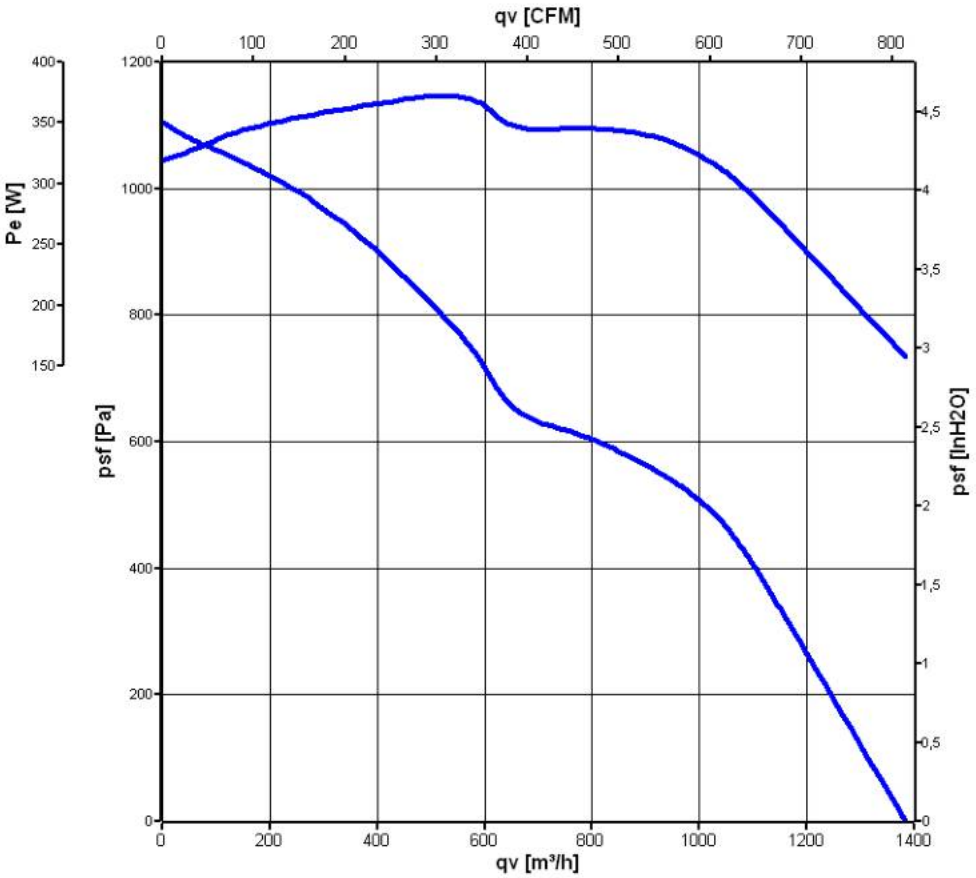
### 3.6 Aerodynamics

| | |
|---|---|
| Measurement conditions: | Measured with a double chamber intake rig acc. to DIN EN ISO 5801.<br>Normal air density = 1,2 kg/m3; Temperature 23°C +/- 3°C;<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. 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:

| | | | |
|---|---|---|---|
| 7.500 1/min at free air flow | PWM 100 %; f: 2 kHz | | |

| | | |
|---|---|---|
| Max. free-air flow (Δp = 0 / $\dot{V}$ = max.) | 1.383 m3/h | |
| Max. static pressure (Δp = max. / $\dot{V}$ =0) | 1.100 Pa | |



### 3.7 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:

| | | | |
|---|---|---|---|
| 7.500 1/min at free air flow | PWM 100 %; f: 2 kHz | | |

| | | |
|---|---|---|
| Optimal operating point | 1.125 m3/h @ 334 Pa | |
| Sound power level at the optimal operating point | 8,6 bel(A) | |
| Sound pressure level at free air flow, measured in rubber bands | 75 dB(A) | |

## 4 Environment

### 4.1 General

| | | |
|---|---|---|
| Min. permitted ambient temperature TU min. | -20 °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

| | | |
|---|---|---|
| Humidity requirements | humid heat, constant; according to DIN EN 60068-2-78, 14 days | |
| Water exposure | None | |
| Dust requirements | None | |
| Salt fog requirements | None | |

Permitted application area:
The product is intended for use in sheltered rooms with controlled temperature and controlled humidity. Directly exposure to water must be avoided.

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.

### 4.3 Mechanical Requirements

Please require severity levels and specification parameters from the responsible development departments.

**Note according EMI:**

Class A is in some sectors not fulfilled.

## 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°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. | 1000 VAC / 1 Min.<br><br>1700 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 / 1,5 mm | |
| Protection class | I | |

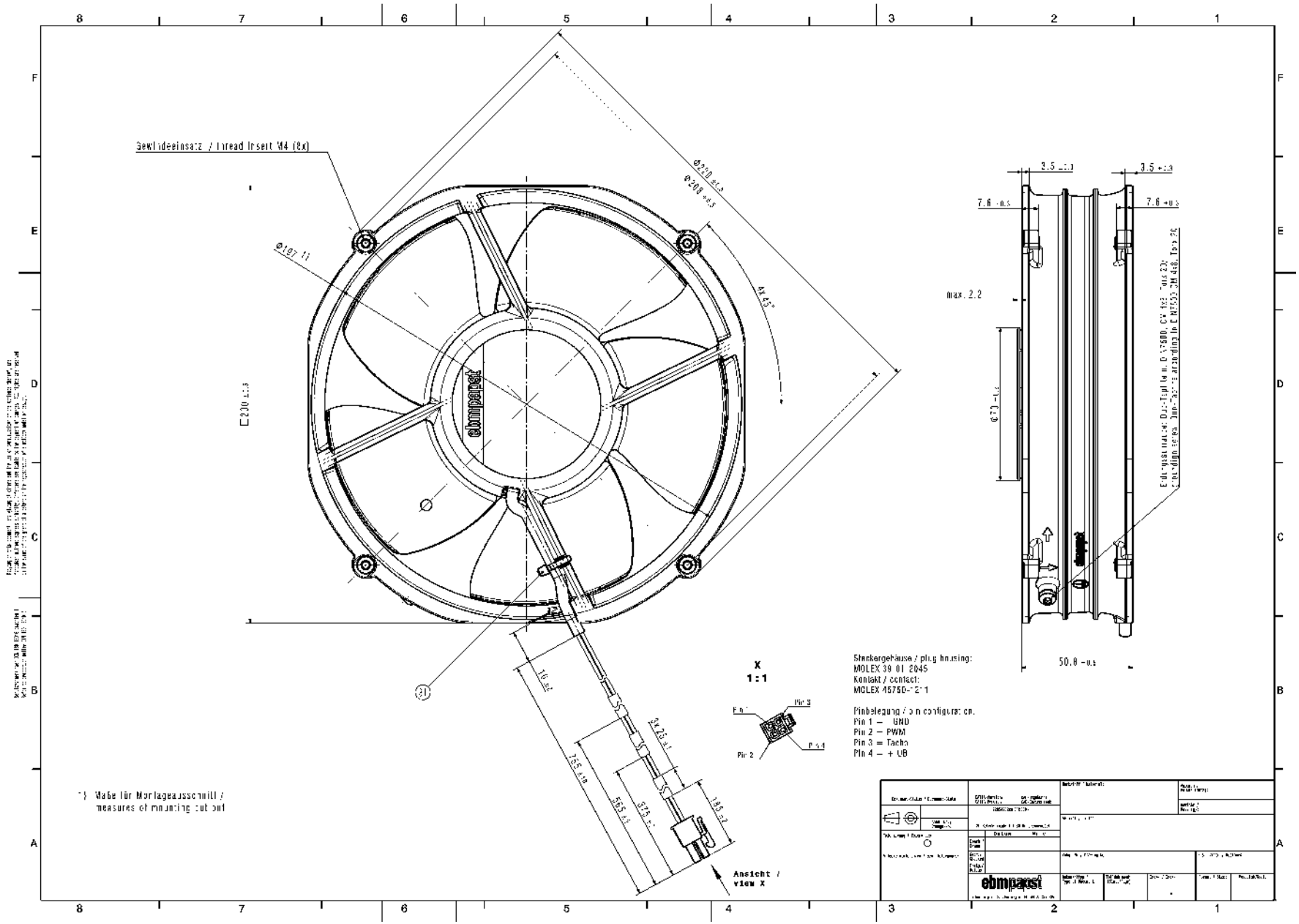
### 5.2 Approval Tests

| | | |
|---|---|---|
| CE | EC Declaration of Conformity | No |
| EAC | Eurasian Conformity | Yes |
| UL | Underwriters Laboratories | Yes / UL507, Electric Fans E38324 |
| VDE | Association for Electrical, Electronic and Information Technologies | No |
| CSA | Canadian Standards Association | Yes / CSA audited by UL according to 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 | 60.000 h | |
| Life expectancy L10 acc. to IPC 9591 at TU = 40 °C | 102.500 h | |


Gewindeeinsatz / thread insert M4 (8x)
ø210 ±0.3
ø200 ±0.5
ø197.11
□230 ±0.3
45°
3.5 ±0.3
3.5 ±0.3
7.6 ±0.5
7.6 ±0.5
max. 2.2
50.8 ±0.5
X
1:1
Pin 3
Pin 4
Pin 2
Ansicht / view X
Steckergehäuse / plug housing:
MOLEX 39 01 2045
Kontakt / contact:
MOLEX 45750-2211
Pinbelegung / pin configuration:
Pin 1 = GND
Pin 2 = PWM
Pin 3 = Tacho
Pin 4 = + VB
*) Maße für Montageausschnitt / measures of mounting cut out
ebmpapst