1 General

Fan type	Blower without chassis with intake nozzle	
Rotating direction looking at rotor	Clockwise	
Airflow direction	Air in axially, Air out radially	
Bearing system	Ball bearing	
Mounting position - shaft	Any	

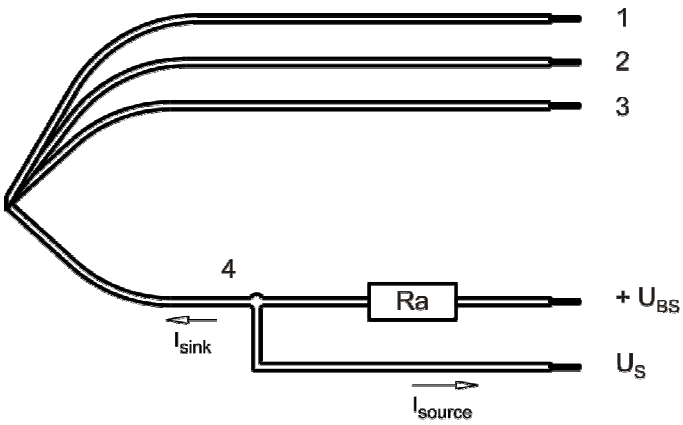
2 Mechanics

2.1 General

Depth	69,0 mm	
Diameter	190 mm	
Mass	0,82 kg	
Housing material		
Impeller material	Plastic	

2.2 Connections

Electrical connection	Wires	
Lead wire length Tolerance	L = 425 mm +- 10,0 mm	
Tube length Tolerance	S = 115 mm +- 5 mm	



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

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

Lead wire 1 - 2: AWG20
Lead wire 3 - 4: AWG22 (Insulation diameter 1,35mm)

3 Operating Data

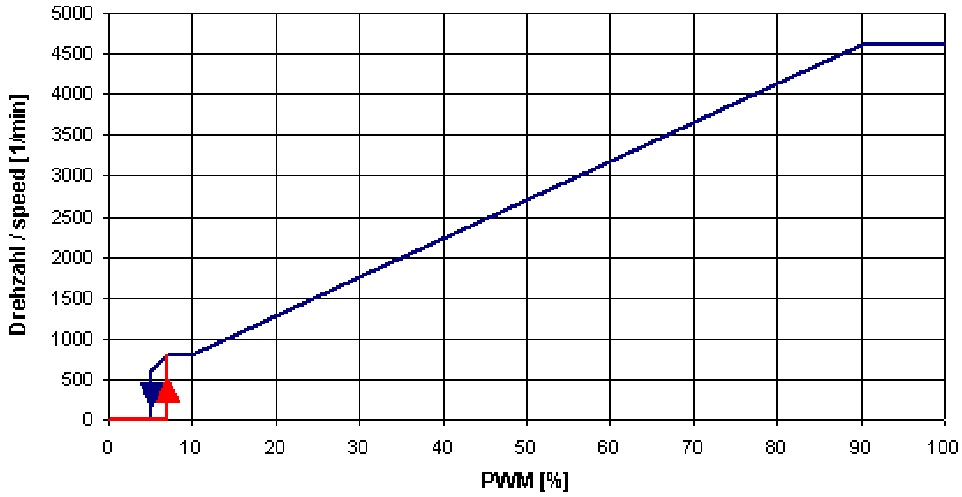
3.1 Electrical Interface - Input

Control input	PWM

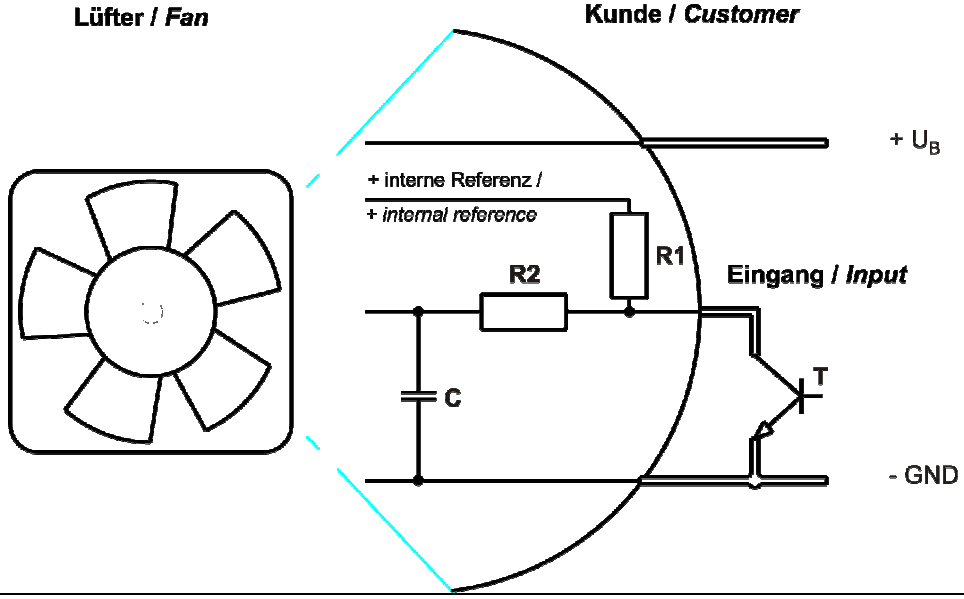
Features

PWM - Frequency		1 kHz - 10 kHz typical: 2 kHz

Characteristics



Schematics



Transistor requirements:
Vce max.= <12 V; I sink max. = < 5 mA
Vce sat.= <0,15 V

Speed control:

By Puls width modulation (PWM) 0 ... 100%
Open collector in relation to signal-ground
f = 2kHz +-20%

Information to the curve:

0 % - 7% PWM:	0 1/min
7 % - 10% PWM:	800 1/min (corresponding to min. speed)
10 % - 90% PWM:	linear increasing curve
90 % - 100% PWM:	4.600 1/min (corresponding to max. speed)
7 % PWM:	800 1/min (Fan on, comming from 0% PWM)
5 % PWM:	600 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℃ +/ - 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.

Measurement setup:	Measured between two steel plates
Steel plate:	195 mm x 195 mm
Intake nozzle:	D: 125,5 mm; R: 10 mm
Distance between bottom and top plate:	80 mm
Overlapping impeller / nozzle:	2 mm

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

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

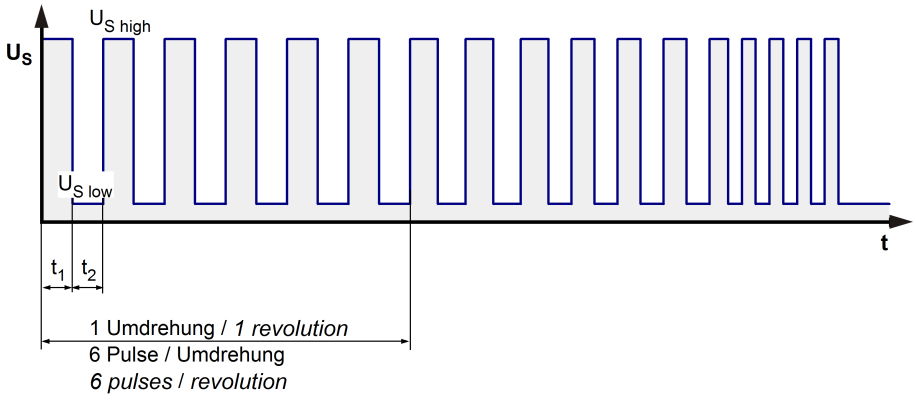
The data at 5V are no FK features and need not be tested.

Features	Condition	Symbol	Values		
Voltage range		U	36 V		72,0 V
Nominal voltage		U_N		48,0 V	
Power consumption Tolerance	$\Delta p = 0$ PWM 0010	P	120 W +- 10,0 %	192,0 W +- 10,0 %	199 W +- 10,0 %
Current consumption Tolerance	$\Delta p = 0$ PWM0010	I	3.340 mA +- 10,0 %	4.000 mA +- 10,0 %	2.770 mA +- 10,0 %
Speed Tolerance	$\Delta p = 0$ PWM 0010	n	3.950 1/min +- 10,0 %	4.600 1/min +- 7,5 %	4.600 1/min +- 7,5 %

3.3 Electrical Interface - Output

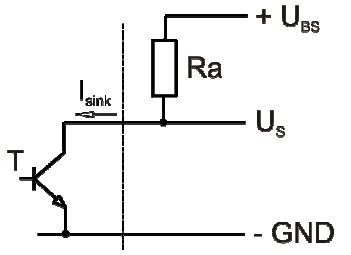
Tacho type	/2 (open collector)

Signal-Ausgangsspannung / *Signal output voltage*

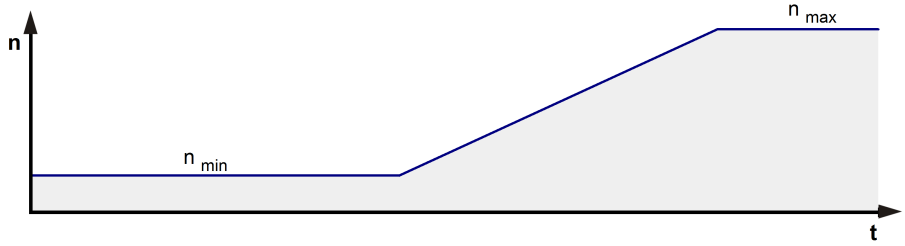


$$Ra = \frac{U_{BS} - U_{S\,low}}{I_{sink}}$$

Lüfter / *Fan* **Kunde / *Customer***



Lüfter-Drehzahl / *Fan speed*



Features		Note	Values
Tacho operating voltage	U_{BS}		<= 60,0 V
Tacho signal Low	$U_{S\,low}$	I sink: 2 mA	<=0,4 V
Tacho signal High	$U_{S\,high}$	I source: 0 mA	<=60,0 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	460 Hz
Tacho isolated from motor		No	
Slew rate			=> 0,5 V/us

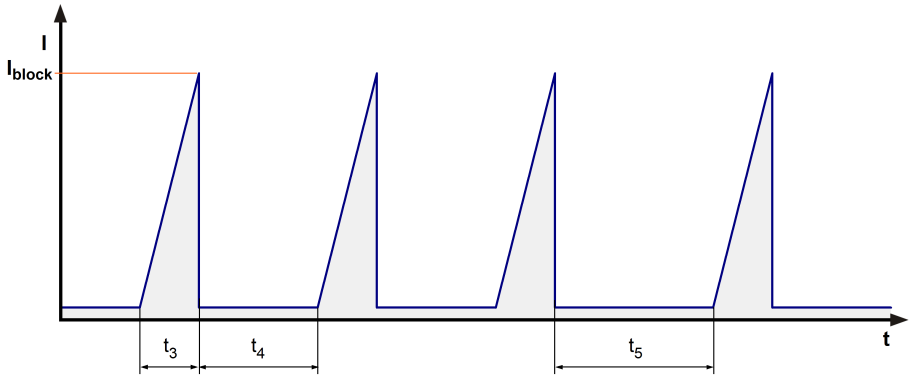
n = revolutions per minute (1/min)

Please note:
At zero speed the tacho signal is at a static HIGH. It will be also HIGH when the fan is still spinning, but the speed control signal is set to zero speed already.
The tacho signal is only activated after the start-up is completed.

3.4 Electrical Features

Electronic function	Speed-Controlled	
Reversed polarity protection Max. residual current at U_N	P-CH FET I_F <= 5 mA	

Locked rotor protection	Auto restart	
Locked rotor current at U_N	I_{block} approx. 1.400 mA	
Clock signal at locked rotor	t_3 / t_4 typical: 2,8 s / 10,0 s	



Locked rotor signal t5:

After 4 failed start-ups there is an extended timeout of 40,0s.

3.5 Data According ErP Directive

Installation / Efficency category	A / static
Speed control	integrated
Specific ratio	1,00552
Target overall efficiency 2015	44,8 %
Overall efficiency	45,3 %
Efficiency grade	62
Power input	229 W
Speed	4.550 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/m3; Temperature 23℃ +/ - 3℃; 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.

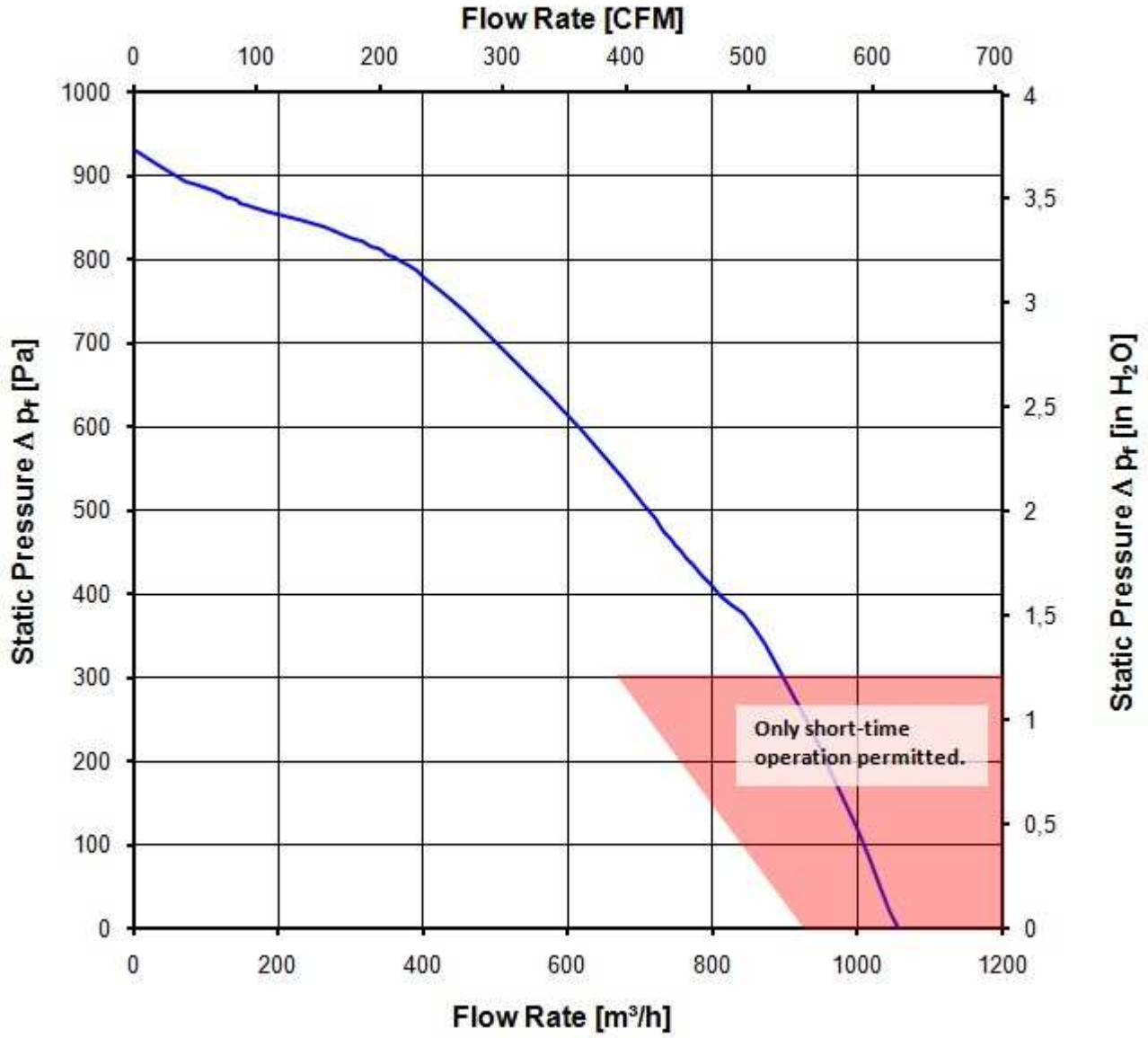
Measurement setup:	Measured between two steel plates
Steel plate:	195 mm x 195 mm
Intake nozzle:	D: 125,5 mm; R: 10 mm
Distance between bottom and top plate:	80 mm
Overlapping impeller / nozzle:	2 mm

a.) Operation condition:

4.600 1/min at free air flow	PWM 100 %; f: 2 kHz		

Max. free-air flow (Δp = 0 / $\dot{V}$ = max.)	1.065,0 m3/h	
Max. static pressure (Δp = max. / $\dot{V}$ =0)	960 Pa	

Attention!
Fan performance curve with limited operating range: At n >= 4.000 1/min is only continuous duty operation from delta P >= 300 Pa permitted!
(See as well sec. 2.2 and 4.1)


Flow Rate [CFM]
0
100
200
300
400
500
600
700
1000
900
800
700
600
500
400
300
200
100
0
4
3,5
3
2,5
2
1,5
1
0,5
0
Static Pressure Δ pf [Pa]
Static Pressure Δ pf [in H2O]
Only short-time operation permitted.
0
200
400
600
800
1000
1200
Flow Rate [m³/h]

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 Lp(A) < 5 dB(A) For further measurement conditions see chapter aerodynamics.

a.) Operation condition:

4.600 1/min at free air flow	PWM 100 %; f: 2 kHz		

Optimal operating point	595,0 m3/h @ 550 Pa	
Sound power level at the optimal operating point	8,2 bel(A)	
Sound pressure level at free air flow, measured in rubber bands		

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	

Attention!
Max. permitted operating temperature: At n >= 4.000 1/min and delta P >= 300 Pa is only short-time operation at indoor temperature permitted!
(See as well sec. 2.2 and 3.5)

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.

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

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℃. 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. 1700 VDC / 1 Sec.	
Isolation resistance 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 / 1,5 mm	
Protection class	I	

5.2 Approval Tests

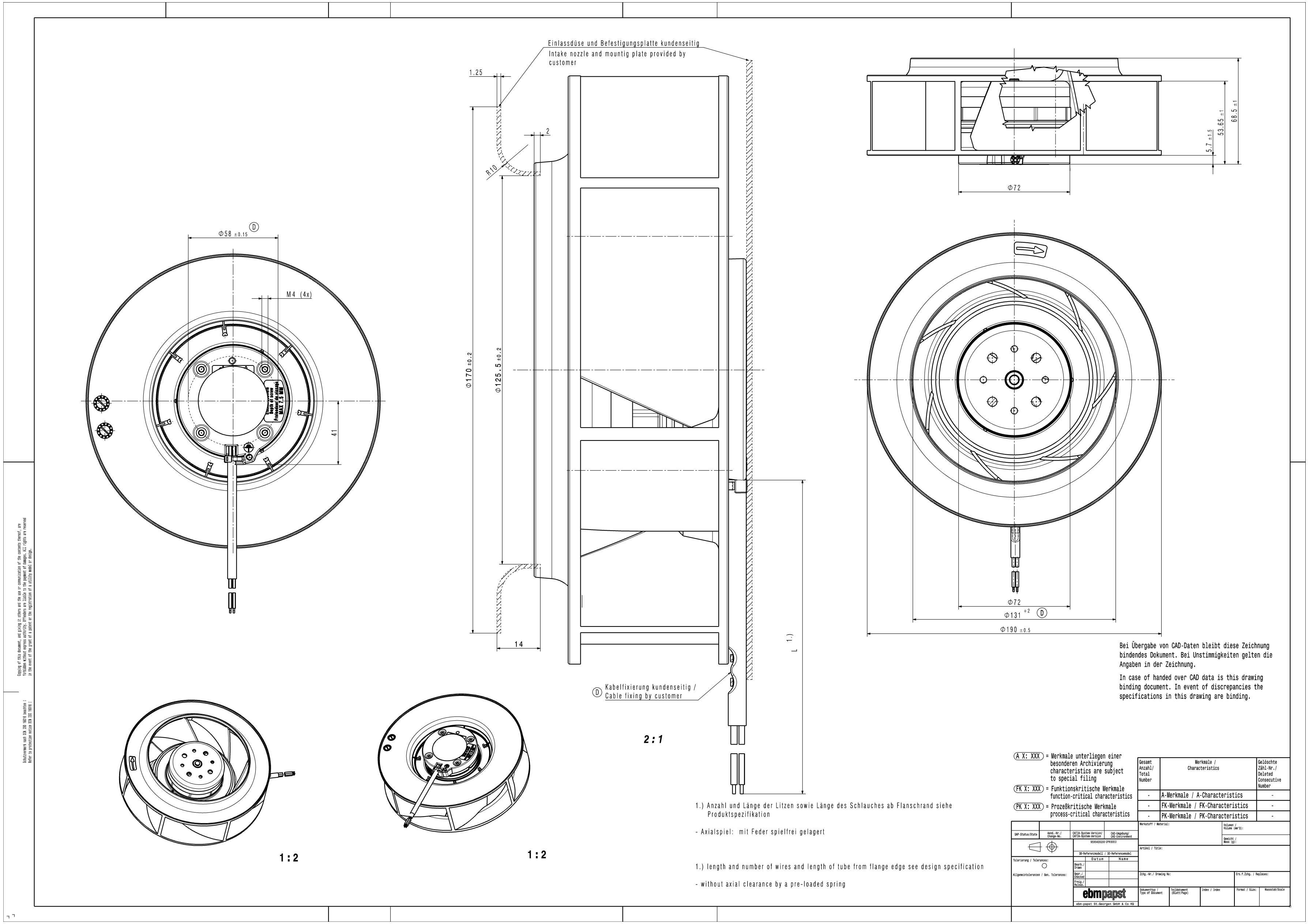
CE	EC Declaration of Conformity	No
EAC	Eurasian Conformity	Yes
UL	Underwriters Laboratories	Yes / UL507, Electric Fans
VDE	Association for Electrical, Electronic and Information Technologies	Yes / Approval acc. to EN 60950 (VDE 0805) - Information technology equipment
CSA	Canadian Standards Association	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.: 65 ℃

6 Reliability

6.1 General

Life expectancy L10 at TU = 40 ℃	42.500 h	
Life expectancy L10 at TU max.	22.500 h	
Life expectancy L10 acc. to IPC 9591 at TU = 40 ℃	72.5 00 h	



Einlassdüse und Befestigungsplatte kundenseitig
Intake nozzle and mountig plate provided by customer
1.25
2
R10
Φ170 ±0.2
Φ125.5 ±0.2
14
Φ58 ±0.15 D
M4 (4x)
41
D Kabelfixierung kundenseitig / Cable fixing by customer
L 1.)
2:1
1:2
1:2
5.7 ±1.5
53.65 ±1
68.5 ±1
Φ72
Φ72
Φ131 +2 D
Φ190 ±0.5
Bei Übergabe von CAD-Daten bleibt diese Zeichnung bindendes Dokument. Bei Unstimmigkeiten gelten die Angaben in der Zeichnung.
In case of handed over CAD data is this drawing binding document. In event of discrepancies the specifications in this drawing are binding.
1.) Anzahl und Länge der Litzen sowie Länge des Schlauches ab Flanschrand siehe Produktspezifikation
- Axialspiel: mit Feder spielfrei gelagert
1.) length and number of wires and length of tube from flange edge see design specification
- without axial clearance by a pre-loaded spring
A X: XXX = Merkmale unterliegen einer besonderen Archivierung characteristics are subject to special filing
FK X: XXX = Funktionskritische Merkmale function-critical characteristics
PK X: XXX = Prozeßkritische Merkmale process-critical characteristics
Gesamt Anzahl/ Total Number
Merkmale / Characteristics
Gelöschte Zähl-Nr./ Deleted Consecutive Number
A-Merkmale / A-Characteristics
FK-Merkmale / FK-Characteristics
PK-Merkmale / PK-Characteristics
ebmpapst