Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!

Contact us

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Email & Skype: info@chipsmall.com Web: www.chipsmall.com
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Compact fans for AC, DC and EC

Version 2016-01

ebmpapst

The engineer's choice

GREEN TECH

Trendsetter in fan technology

Uncompromising quality made by ebm-papst

Among the best.
Trendsetting with innovative technologies. Listening to customers' needs. Developing new ideas to meet requirements and realizing them with pioneering spirit. This philosophy has made ebm-papst the leading technology pioneer in the world of fans.

A brand in that decades of application expertise gained from large-volume fan production and because we are in a position to produce highly efficient quality products. Our intelligent solutions for electronics cooling make sure that you are always one step ahead of the competition thanks to innovative, reliable, top-quality technology. Of course they are readily available at fair market prices.
And if required, tailor-made right down to the last detail. In other words, if you need fans that do not yet actually exist, contact us.

Insist on ebm-papst.

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ebm-papst company profile

The entire world of ventilation and drive engineering. This is the world of ebm-papst. More than 12,000 people – in Germany and throughout the world – develop, produce and sell our motors and fans. Our global presence and unique range of products, based on a quality standard that surpasses all others, have made us the world market leader in motors and fans. Our daily work is determined by a keen awareness of our customer's needs and constant striving to arrive at the perfect application solution for a wide variety of different industries.
Those who know us know the high standards we apply to our work and know our creed: to be as close to our customers as possible and to simply be the best in terms of innovation and reliability.

Our history – Our drive

Rooted in ebm, PAPST and mvl, the three leading innovators in the development and production of motors and fans, ebm-papst has established itself as the world market leader. Now as ever, our legendary inventive spirit shines through in products that set standards in many industries worldwide. We are proud to say that, despite difficult competition, our performance has always been exemplary and outstanding in business, in our personal relationship with our customers, and of course with respect to technology and engineering. For decades, we have contributed to the world of air technology and drive engineering with both small revolutions and large milestones. To maintain this advantage in skills and knowledge to reach maximum quality and thus the highest degree of customer satisfaction, our employees around the world put their passion and dedication to work for you.

Passionately involved in R&D

Our catalogs only show you the results of our constant work in R&D: products of highest quality and reliability. After all, it is our passion to constantly try something new and improve what we have. We take advantage of the latest development methods and state-of-the-art technology, and invest heavily in R&D facilities. Best of all, though, we rely on excellently trained and skilled engineers and technicians to be at your service in R&D and Sales & Distribution.

Producing and safeguarding high-quality products and services

This is our promise without any compromise. Whether produced in one of our six factories in Germany or one of our eleven international production sites, our products always have the same high level of quality. This quality control is something you can definitely rely on throughout all the stages of the process, from customer service, development, and material selection, to the best certified suppliers, parts production, and final delivery. Furthermore, our products have to pass the most rigorous tests under all realistic operating conditions: continuous stress test, salt spray test, vibration test, or precision noise measuring, just to mention a few. And the product gets clearance for serial production only after all the desired characteristics have been determined to be just right. Environmental care is another priority with ebm-papst. This is why we have developed our product line in EC technology, which makes for very low power consumption. Our manufacturing philosophy is focused completely on environmental care in production, recycling, waste, and wastewater disposal.

Global Domestic

In order to be the world specialist for customized solutions, you need strong partners. Global Domestic – being present all over the world and being a national company in each individual country – is how we have established ourselves in all important markets on this globe with our successful subsidiaries. And so you will always find ebm-papst close to home, speaking your language, and knowing the demands of your markets. Besides, our worldwide production alliance serves as a basis for competitive pricing. Our global services and logistic services ensure short response times, IT networking, and just-in-time delivery.

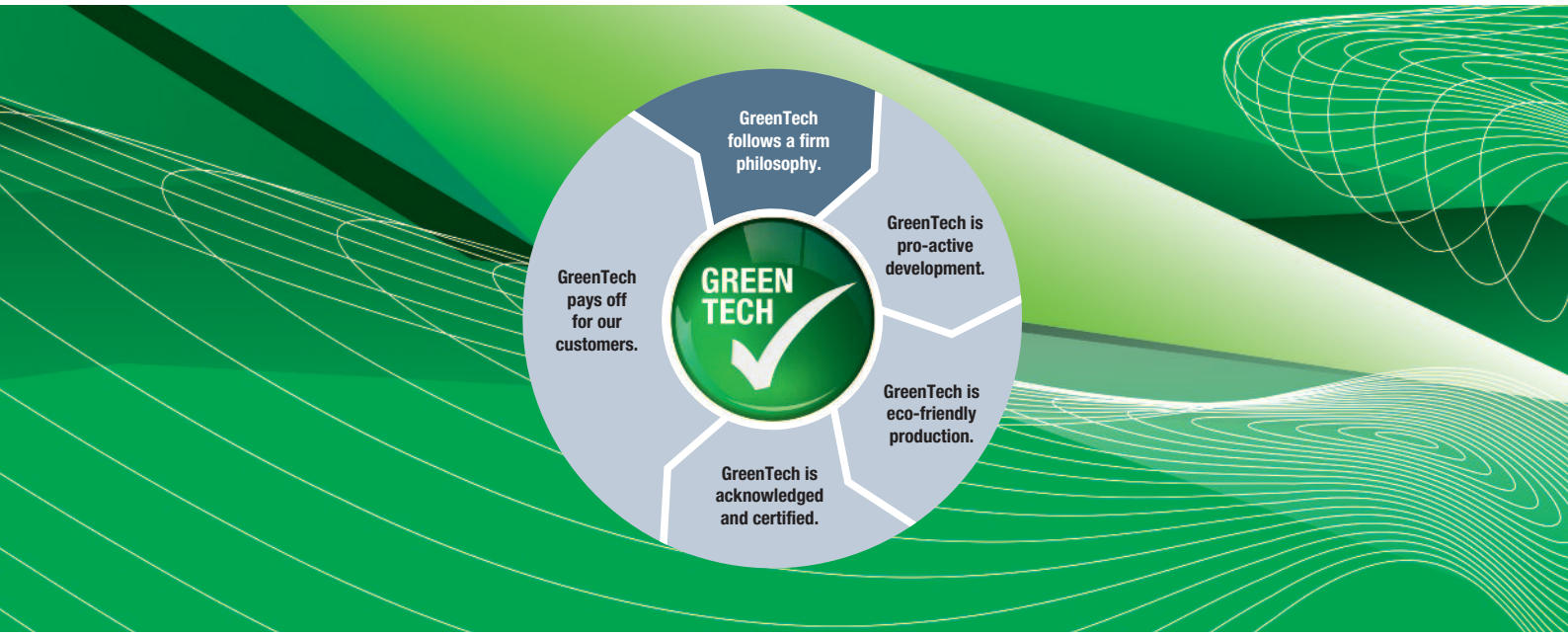
All our efforts are documented in a comprehensive quality management system, both for products and services. Being certified as complying with the tough requirements of the international standards DIN EN ISO 9001, ISO/TS 16949-2 and of standard DIN EN ISO 14001 is just one seal of approval we have received for our constant efforts to provide only the best quality products and services.

Sustainability is at the core of our thinking and action. As a matter of principle!

Environmental compatibility and sustainability have always been at the core of our thinking and action. Which is why we have been dedicated for decades to the simple but firm principle of one of our company founders, Gerhard Sturm: "Every new product we develop must be economically and ecologically superior to its predecessor." We use the name GreenTech to express our company philosophy.

GreenTech is proactive development.
Even in the design phase, the materials and processes we use are optimized for the greatest possible environmental sustainability, energy balance, and wherever possible, recyclability. We continually improve the material and performance of our products, as well as the flow and noise characteristics. At the same time, we reduce energy consumption significantly. Close cooperation with universities and scientific institutes and a professorship we sponsor in the field of power engineering and regenerative energies allow us to profit from the latest research findings in these disciplines while preparing highly qualified young academics for the future at the same time.

GreenTech is eco-friendly production.
GreenTech also stands for maximum energy efficiency in our production processes. Here, the intelligent use of industrial waste heat and groundwater cooling, photovoltaics, and of course, our own cooling and ventilation technology, play a very important role. For example, our most modern plant consumes 91% less energy than currently specified and required. This way our products contribute to protecting the the environment, from their origin to their recyclable packaging.



GreenTech is acknowledged and certified.
Our entire production chain can stand up to critical scrutiny by environmental specialists and the public.
This supports our position as Germany's most sustainable company 2013, as does the DEKRA Award 2012 we received in the category "Umwelt Herausforderung Energiewende" (Environment Challenge: Transition to more sustainable energy systems), to name only a few of a large number of examples. The environmental advantage gained in the performance of the products developed from our GreenTech philosophy can also be measured in our compliance with the most stringent energy and environmental standards. In many instances, our products are already well below the thresholds energy legislation will impose a few years from now.

GreenTech is a good investment for our customers.
Innovative EC technology from ebm-papst is at the heart of GreenTech. As the core element of our most efficient motors and fans, this technology allows efficiencies of up to 90%, saves energy at a very high level, extends the service life significantly, and makes our products maintenance-free. Not only do these values benefit the environment, but every cent also pays off for the user! All ebm-papst products, even those with applications that are not (yet) ready for GreenTech EC technology, have an attractive link between economy and ecology that holds great promise for the future.

Expertise and technology

Drive know-how

For the past 60 years, all conceivable types and applications of drive engineering have played an essential role at ebm-papst. A commitment that is the foundation for the development of optimum drive solutions regardless of the type of fan and its use. DC and EC fans are generally equipped with electronically commutated external rotor motors. In order to save as much space as possible, commutation electronic components are integrated in the hub of the fan. Our AC fans are driven mainly by shaded-pole or capacitor motors based on the external rotor principle. In the 3900 and 9900 range of particularly slim fans, internal rotor motors are used.

Smooth operation

Our aerodynamically optimized design and high mechanical precision produces outstanding noise properties in series production. The "soft" commutation electronics of DC and EC fans produce a very smooth operation. By avoiding steep switching edges when the individual coils are switched, this reduces the structure-borne noise from the motor. Computer-aided measurements and series of analyses performed in a state-of-the-art sound measuring chamber are conducted on each fan model from the very beginning.

Long service life

The bearing system plays a vital role both in the long service life and the smooth operation of device fans. The Sintec compact bearing provides most of the device fans with a proven bearing system. Constant low noise during the entire operating time and considerably lower shock sensitivity are the outstanding features of this bearing technology. In addition, with regard to temperature endurance, Sintec compact bearings can be used without problems in most applications.

Despite the slightly greater noise and shock sensitivity of ball bearings, this bearing technology should be given preference for fans exposed to extreme thermal and adverse application conditions (e.g. extreme environmental conditions, critical installation position, etc.). The service life data provided in this catalog is based on extensive service life tests and mathematically / scientifically proven service life calculations. Our product descriptions are updated continuously with all relevant data obtained from long-term tests.

Aerodynamics

With the aid of state-of-the-art computer programs, we are able to optimize the fan impellers and the inner shape of the housing. Air output and available motor performance are matched exactly to the size of fan. This guarantees the low noise that is typical for ebm-papst, even at high back pressure.

Sturdy construction – in metal or plastic

Fans of all-metal construction: sturdy and resistant. The housing is made of an aluminum alloy. The metal surfaces that are subject to corrosion are permanently protected by an impact- and abrasion-resistant electrophoretic baked enamel. This particular version is very recyclable. Fans with fiberglass-reinforced plastic housing and impeller: Excellent stability and low weight distinguish this highly efficient fan design. Combinations of metal housing and plastic impeller combine the advantages of both types of design.

Product images

The dimensioned drawings and product photos that appear in the catalog are for orientation purposes and may differ in some details from the actual product design.

Product liability

Motors and fans from ebm-papst are components intended for proper installation. The customer bears responsibility for the overall end product.

Safety is included

It goes without saying that all ebm-papst fans conform to the approval requirements of the VDE (Association of German Electrical Engineers)and the standards and regulations of UL and CSA. All fans conform to the European Standard EN 60335 or EN 60950 plus those of the UL (Underwriters Laboratories) and CSA (Canadian Standards Association). With few exceptions, our DC fans are designed to meet the requirements of protection class 3 / protection class voltage. AC fans for protection class 1. ebm-papst fans meet the highest requirements of electrical safety. All design variants feature reverse polarity and locked-rotor protection.

Quality in detail

It is the important details that reveal the meaning of the words "made by ebm-papst": Consistent adherence to development and design processes and a goal-oriented commitment to quality along the entire process chain are the foundation for the above-average service life of our fans. 100,000 hours and above are no longer an exception.
The no-compromise ebm-papst quality assurance spans over all process levels – from the choice of materials and the use of carefully selected, certified suppliers, from the production of parts up to the final assembly. These details combine to result in reliable fan products with an above-average service life.

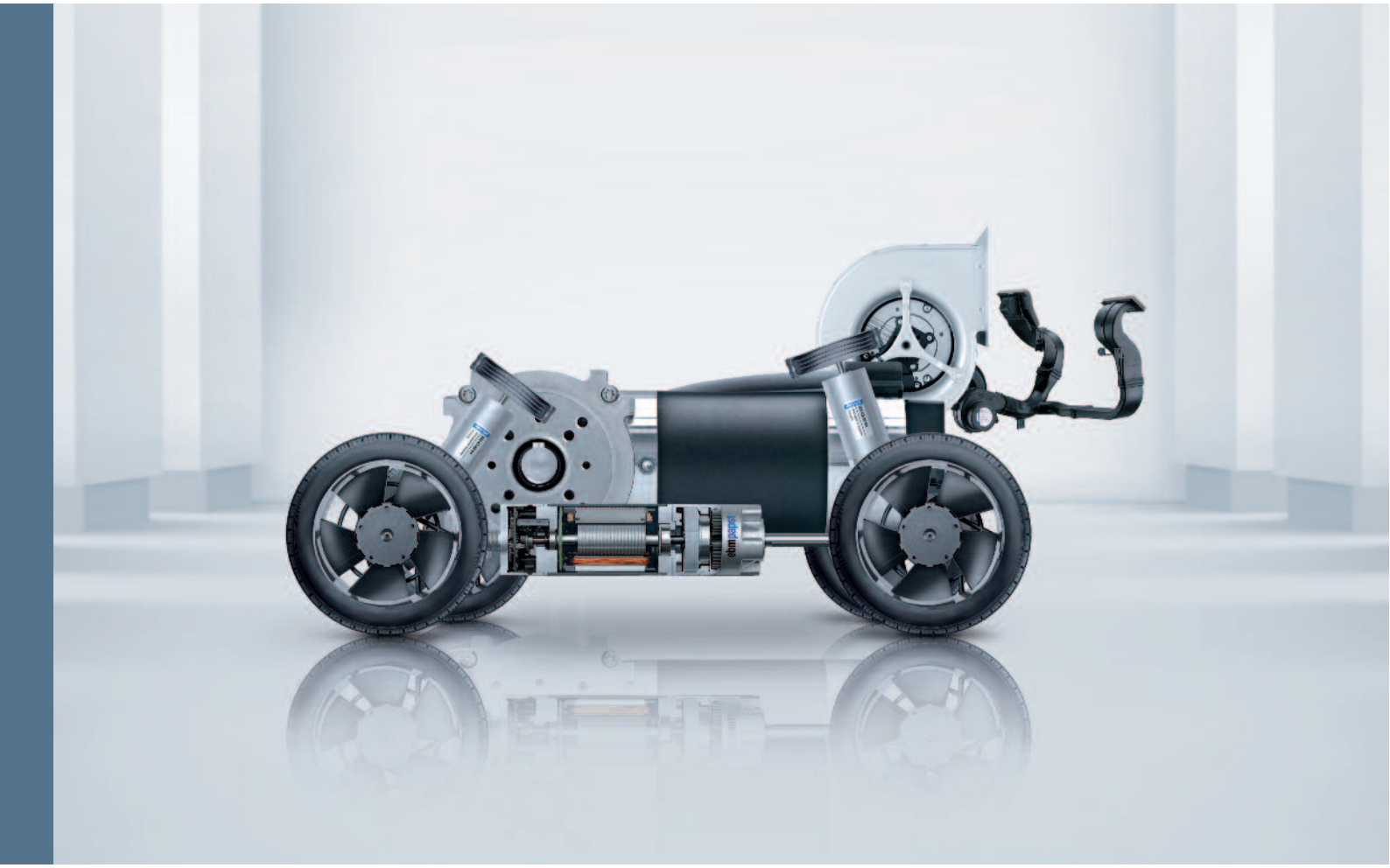
ErP Directive

All products with power consumption between 125 W and 500 kW are subject to the European "Energy-related Products Directive" (ErP) for improving energy efficiency, with the first stage applicable from 2013 and the second as of 2015. Thanks to ground-breaking GreenTech EC technology, all of our fans and motors in these performance classes already exceed the ErP Directive today.

Tailor-made to meet your special requirements

Practical applications: fans that are customized and smart

ebm-papst has always developed customer-specific smart fans that meet the exact requirements of the application. We provide a wide range of standard fan types, in many sizes and designs; with smart motor features, monitoring and control functions, as well as special designs for use under extreme conditions. They are all based on the standard type fans that you will find in this catalog. Special fan types for your application can be produced in economical batch sizes. Our expert engineers will assist you in selecting the right configuration.



Innovation at its best:
Vario-Pro® with "intelligence inside". Its programmed intelligence thanks to customer-specifically configured software modules makes the cooling of electronics even more economical and flexible. For example, temperature-dependent speed profiles are possible with a number of freely selectable interpolation points. External speed settings and a variety of combinable alarm and tachometer functions can also be programmed. The digital motor management achieves high control accuracy.

Higher degree of protection for every type of application
ebm-papst provides, on request, many fan series in versions that meet to the requirements of degree of protection IP 54 and IP 68: Their stator and all electrical components are fully encapsulated. Stainless steel ball bearings can be used for operation in particularly aggressive media and use under extreme environmental conditions, thus providing additional reliability.

Almost anything is possible
Regardless of your cooling and ventilation tasks, we will develop the right solution. And the most economical one. Based on the fans listed in this catalog, more than 4000 different versions are available.

Temperature-controlled fans
Fans with temperature-controlled speed have particularly quiet cooling characteristics. Thanks to integrated IC technology, they adapt their speed to the current cooling requirements. The result is a drastic reduction of noise in most operating conditions. A temperature sensor provides the fan with thermal information: either externally via an exposed wire or integrated into the hub of the fan.

Speed setting via interfaces
With a wide range of DC fans with separate control input, ebm-papst provides an alternative to the NTC-controlled types of fans. They are especially suitable for systems and units that already have standard interfaces for varying speed via internal switching and control circuits. The main applications are units that require load-dependent, individual speed profiles or systems with minimum standby cooling requirements and varied speed increase at varying power peaks.

Electronic tachometer
Do you want to be informed about the current fan speed at all times? ebm-papst has fans with an integrated "electronic tachometer". It registers the actual value of the fan speed. Via an integrated sensor, the fan generates speed-dependent signals that can be used directly. Depending on the number of poles of the motor, 2, 3, or 6 pulses per revolution are generated.

Alarm signal for greater safety
If your application requires monitored fan operation, in addition to speed monitoring, ebm-papst also provides a multitude of varying alarm signals. Depending on the type of fan in question, the signal will either be static, already evaluated, or interface-compatible. The alarm signal output provides reliable long-term monitoring and a status signal if critical operating conditions arise.

S-Force
The new standard!
When you need to provide extremely fast, powerful and efficient cooling for electronic components of all kinds, the generation of S-Force high-performance fans finishes first: in air performance, pressure increase, and technology. Extremely efficient drives and optimized aerodynamics form the core technology of the S-Force fans, which we offer in both an axial and brand-new centrifugal model.

S-Panther
S-Panther power delivered quietly. Wherever there is need for power and reduced noise, fans from the S-Panther range are the right solution. A strong pressure saddle curve at optimum air flow provides the power of a real big cat, an S-Panther.

Optional special versions

(see chapter DC fans - specials)

In the catalog, a text box in the upper right corner provides information on the special designs that are technically possible in the fan series.
Please note that these special versions are not possible for all voltages and speeds, and not in all combinations. The special versions are designed for specific customers and projects and are usually not available off the shelf.

max. 44 m³/h

DC axial fans

☐ 60 x 25 mm

- **Material:** Housing: GRP[1] (PBT) Impeller: GRP[1] (PA)
- **Direction of air flow:** Exhaust over struts
- **Direction of rotation:** Clockwise, seen on rotor
- **Connection:** Via single wires AWG 22, TR 64
- **Highlights:** Developed for applications with demanding environmental requirements
- **Mass:** 70 g

- **Possible special versions:**
  (See chapter DC fans - specials)
  - Speed signal
  - Go- / NoGo-alarm
  - Alarm with limit speed
  - External temperature sensor
  - PWM control input
  - Analog control input
  - Humidity protection
  - Salt fog protection
  - Degree of protection: IP 54 / IP 68

Possible special designs are depicted on the catalog page.

Speed signal /2, /12
The fan uses a separate wire to output information about its speed, and thus about the speed of the rotor. For technical details, please refer to page 168 and the following.

Go- / NoGo alarm /37, /39
The fan uses a separate wire to output a static signal when it is stationary, thus providing information about whether or not the rotor is turning. For technical details, please refer to page 175 and the following.

Alarm with speed limit /17, /19
When one of the speeds defined in the fan electronics is undershot, the fan outputs a static signal providing information that the set speed limit was undershot. For technical details, please refer to page 172 and the following.

External temperature sensor
An NTC resistor (negative temperature coefficient) is attached to the fan via a separate wire and the fan changes its speed depending on the temperature on the NTC. For technical details, please refer to page 178.

Internal temperature sensor
In this case, the NTC is integrated into the fan and the fan changes its speed depending on the temperature at the NTC. For technical details, please refer to page 178.

PWM control input
The speed of the fan can be changed via a pulse-width-modulated signal. This signal is applied to a specially provided wire. For technical details, please refer to page 179.

Analog control input
The speed of the fan can be changed via a control voltage. This control voltage is applied to a specially provided wire. For technical details, please refer to page 179.

Multi-option control input
The fan has a control input that the user can trigger either using a PWM signal, an analog signal, or a resistor. For technical details, please refer to page 180.

Moisture protection
Protection for the fan electronics against moisture and condensation. For technical details, please refer to page 181.

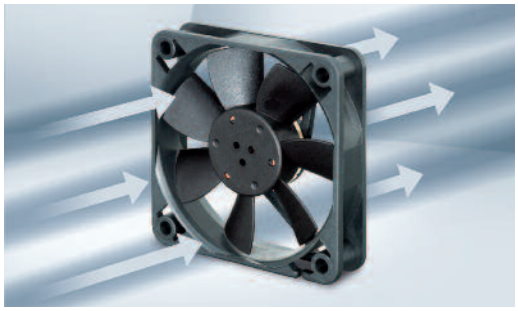
Degree of protection IP 54* / IP 68*
Protection of motor and circuit board against splashed water and moisture. For technical details, please refer to page 181.

Salt spray protection
Protection of fan against the damaging effects of salt spray. For technical details, please refer to page 181.

Direction of rotation
On many variants, the direction of rotation can be changed via a control input.

* IP = International degree of protection marking
For AC fans max. IP 65 available.

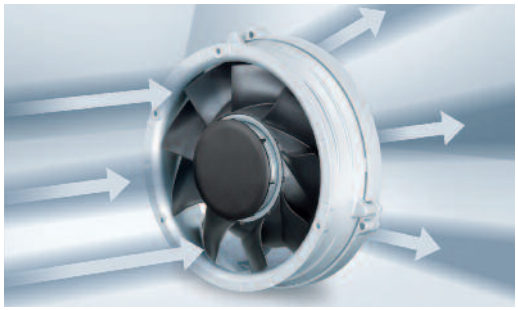
Types of fans and their function



Axial fans:

High air flow with medium to relatively high pressure increase

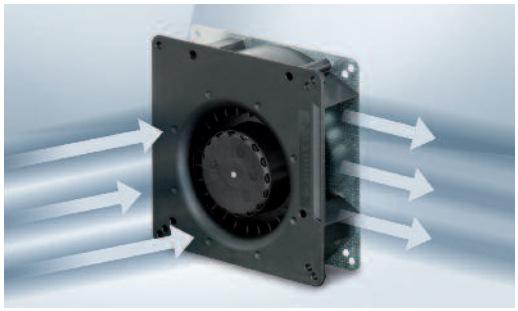
The air flow in axial fans with an impeller that is similar to a propeller is conducted largely parallel to the axis of rotation, in other words in the axial direction. Axial fans with free air delivery at zero static pressure have the lowest power input that rises with increasing back pressure. Axial fans for cooling of electronic equipment are mostly equipped with external housing. The electric motor is integrated in the fan hub. This compact design allows space-saving accommodation of all devices. The flange is equipped with mounting holes.



Diagonal fans:

High air flow at relatively high pressure increase

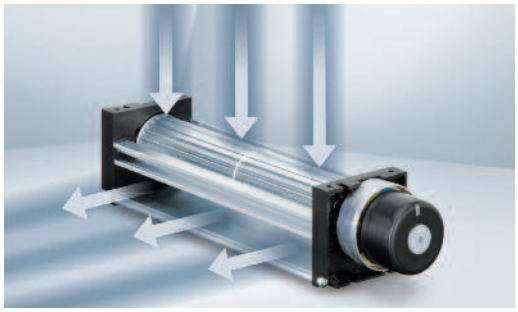
At first glance diagonal fans only differ slightly from axial fans. Intake is axial, whereas exhaust is diagonal. Due to the conical shape of the wheel and housing, the air is pressurized more in the diagonal fan. In direct comparison with axial fans of the same size and comparable performance, these fans are distinguished by the lower operating noise at high pressures.



Centrifugal fans:

High pressure increase at limited flow rate

Generally, many cooling tasks can be performed excellently by axial and/or diagonal fans. But if the cooling airflow has to be deflected at an angle of 90°, for example, or if even greater pressure increase is necessary, centrifugal fans are more effective. For your application, ebm-papst offers not only complete centrifugal fans, but also motor/impeller combinations without external housing.



Tangential fans:

High air flow with low pressure increase

Tangential fans are used especially to produce a wide airflow distribution through devices. The air flows through the roller-shaped impellers twice in the radial direction: in the intake area from the outside to the inside and in the outflow area from the inside to the outside. Whirls form in the roller due to the vanes, which guarantee a steady flow of air through the impeller.

Selecting the correct fan

1. Dissipated energy

A large amount of the energy consumed by electrical and electronic devices is converted to heat. So when selecting the correct fan, it is important to determine the dissipated energy that must be removed. The electrical power consumption of the unit to be cooled often represents a suitable value for this purpose.

2. Admissible temperature increase

The air flow that the selected fan is required to generate, is determined by the dissipated energy and the admissible heating (ΔT) of the cooling airflow (from entry to exit of the device to be cooled). The maximum admissible ΔT depends greatly on the temperature sensitivity of the individual parts of the device.

For example, ΔT = 5K means that the average cooling airflow leaving the device to be cooled may be only 5°C warmer than the ambient temperature. This requires a lot of air. A lower air flow rate is sufficient if a higher temperature difference (e.g. ΔT = 20K), can be tolerated.

3. Required cooling airflow

- In the diagram below, a horizontal line is drawn from the dissipated energy to intersect with the selected ΔT line.
- Read down from this point to obtain the required value for the cooling airflow. The diagram is based on the following formula:

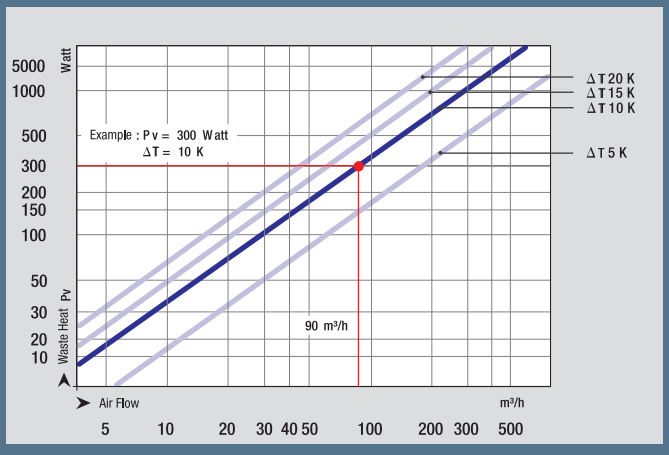
$$q_V = \frac{P_V}{C_{PL} \cdot \rho_L \cdot \Delta T}$$

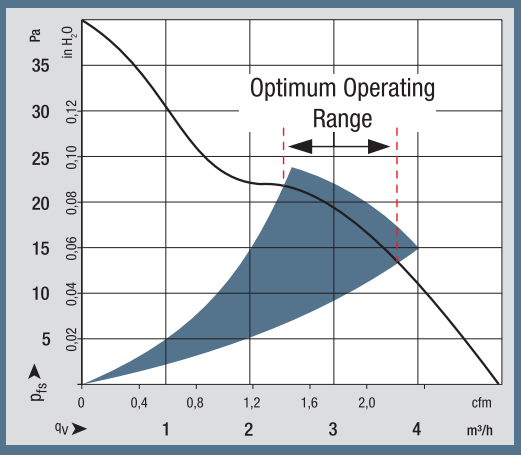
4. Optimum operating range

But the fan you are looking for must also be able to deliver a suitable static pressure increase Δpf, in order to force the cooling air through the device. So a fan must be selected that provides the required air flow performance within its optimum operating range (see also the air performance curves under technical data).

5. Fan selection

If more than one fan meets your requirements, the sound level, space requirements, economy, and ambient conditions will assist in making the final choice.





Definitions

P_V = amount of heat to be dissipated in [W]
C_{PL} = specific heat capacity of air in [J/kg/K]
C_{PL} = 1010 [J/kg/K]

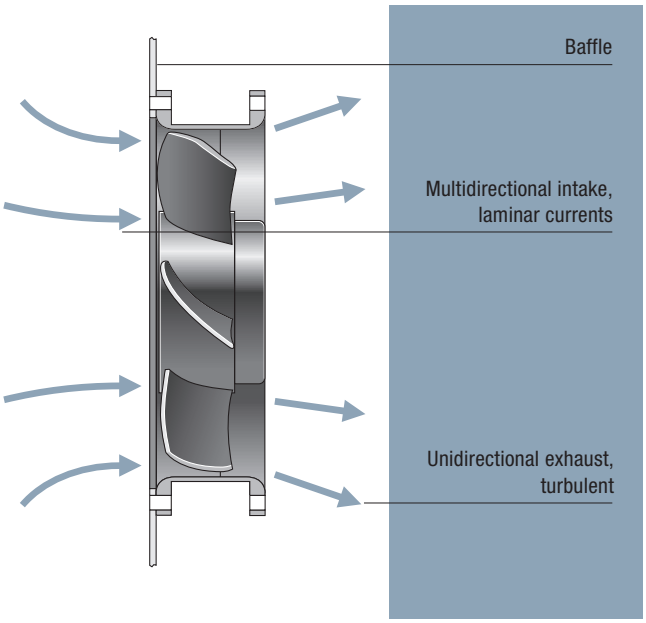
ρ_L = air density in [kg/m³]
ρ_L = 1,2 kg/m³
$\Delta T = T_1 - T_2$ temperature difference in [K] between inlet and outlet

ebmpapst

Fan installation

Intake or exhaust side installation

Under ideal conditions, the operating point is represented as the intersection between the fan and loss curves, regardless of whether the fan is positioned at the air intake or exhaust side of the device. In addition to ensuring the required flow rate, several other aspects must be considered for determining an appropriate fan concept. The intake air currents of a fan are mainly laminar, comprising nearly the entire suction area. By contrast, the exhaust air of a fan is generally turbulent and flows in a preferred direction, such as axial for an axial fan.
The turbulence of the exhaust intensifies the heat transfer from components within the air currents, so that installing the fan on the air intake side of the device is recommended for cooling and heating.
Installing the fan at the device intake is also advantageous because the fan will not be subjected to the dissipated heat of the device.
Therefore, it operates at low ambient temperatures and has a greater life expectancy.



Information on installation

When a fan is operated for the first time in an application, the user may have noticed that the air flow in the device was lower than expected. What is the reason for this?

- The values stated in this catalog were determined under optimum, constant, and comparable measurement conditions.
- Ideal installation conditions under which free air intake and exhaust are present are seldom feasible in practice. Quite frequently, the fans have to be installed in close proximity to other components or cabinet panels. As a consequence, the intake and exhaust currents may be restricted, causing the air flow to diminish and the sound level to increase. Fans are particularly sensitive to obstructions that are positioned directly in front of the output cross section, and they often cause an increase in tonal noise.

Our advice: The distance between the fan and adjacent components should be at least equal to the installation depth of the fan.

Accident prevention

The turning rotor and the high speeds that are sometimes involved mean that our fan products carry an inherent risk of injury. They may only be operated after correct installation and with suitable protective equipment (e.g. with a finger guard). More information can be found in the Internet at: **www.ebmpapst.com/safety**

Connection instructions for S-Force fans

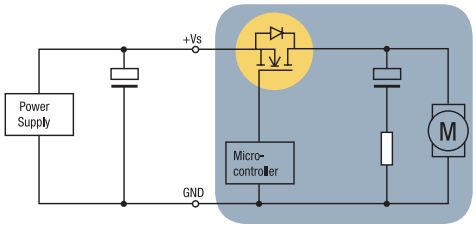
Special features of S-Force fans

The S-Force series is the most powerful product series. S-Force stands for the highest innovation in motor technology, fluid mechanics and electronics. The one-of-a-kind power density of the products requires special attention to the application at the customer's facility.

Service life

Due to the high currents in the fans, the load on the electrolyte capacitors is greater, which reduces the service life of the capacitor. As a larger or additional capacitor cannot be housed in the fan, the capacitor must be housed in the supply line.

If the power supply of the application has a corresponding capacitor, in some cases it may be possible to omit the external capacitor.



Recommended measure: additional external capacitor (must be installed as close to the fan as possible < 30 cm).

Fan	Capacitor required
S-Force axial	
8200 / 3200 JH3-JH4	no
4100 NH3 / NH4 / NH5 / NH6	no
4100 NH7 / NH8	yes
5300 / 5300 TD	no
6300 / 6300 TD / DV 6300	no
2200 FTD	no
S-Force centrifugal	
RET 97 TD	yes
RER 120 TD	yes
RER 133 TD	no
RER 160 NTDHH / RG 160 NTDHH	yes
REF 175 TD	no
RER 175 TD	no
RER 190 TD / RG 190 TD	no
RER 220 TD / RG 220 TD	no
RER 225 TDM / RG 225 TDM	no
RER 225 TD / RG 225 TD	no

Recommended capacitors

We recommend using the following capacitors from Rubycon:

24 VDC:

50 ZL 680 µF; 12.5 mm x 30 mm or

50 ZLH 680 µF 12.5 mm x 30 mm

48 VDC:

100 YXG 470 µF; 16 mm x 35.5 mm or

100 ZLH 470 µF 16 mm x 31.5 mm

Other capacitors with equal or greater capacitance and equal or lower serial resistance can also be used.

ebm-papst St. Georgen has the following capacitors in stock:

24 VDC: 1000 µF / 50 V, 16 mm x 25 mm

Art. no.: 992 0354 000 (LZ 354)

48 VDC: 680 µF / 100 V, 18 mm x 40 mm

Art. no.: 992 0355 000 (LZ 355)

Service life

Service life data from ebm-papst St. Georgen

Our fans catalog gives three different values for the service life of each product. The first column usually states the service life L_{10} at 40 °C. the second column usually states the service life L_{10} at T_{max}. Exceptions are marked in the column headings. The third column states the new value, life expectancy L_{10IPC} (40 °C).

Sound power level	Sinter, sleeve bearings ■ Ball bearings	Input power	Nominal speed	Temperature range	Service life L_{10} (40 °C) ebm-papst Standard	Service life L_{10} (T_{max}) ebm-papst Standard	Life expectancy L_{10IPC} (40 °C) see page 17	Curve
Bel(A)	□ / ■	Watts	rpm	°C	Hours	Hours		
5,2	■	1,8	5 900	-20...+70	85 000 / 42 500	142 500		①
5,4	■	1,5	6 300	-20...+70	85 000 / 42 500	142 500		②

Example of the service life figures on the catalog page.

Service life L_{10} (40 °C) and L_{10} (T_{max})

The values given in the first two columns have been derived from intensive, in-house service life endurance tests in which our products are operated in various positions at 40 °C and 70 °C until they fail. A fan is deemed to have failed when it deviates from its defined air flow and speed values, or when the operating noise becomes noticeable. Such tests can take several years before a representative number of failures has been registered, and even today, some fans are still in the process of endurance testing, even though the test began early in the 1980s. These fans are proof of the legendary "made by ebm-papst" reliability.

Test results are presented in a diagram and the service life of the product L_{10} at the temperature tested is determined based on the Weibull distribution.

These tests have given us years of experience in the way various design parameters and temperatures can affect the service life of a product. Data for service life at various temperatures for new products can be stated with a very high degree of precision based on tests, product specifications, and commonalities in the design of the product.

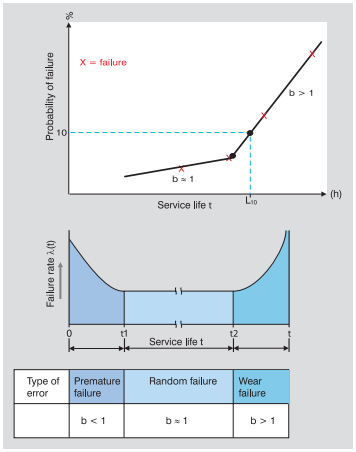
Life expectancy L_{10IPC} (40 °C)

The new third service life column states the life expectancy L_{10IPC}. This information is based on the international standard IPC 9591. Again here, the foundations for the service life values are our service life endurance tests at high ambient temperatures. The service life at temperatures below the test temperatures is calculated using fixed factors. This method produces much higher service life values, especially at room temperature (see diagram on right).

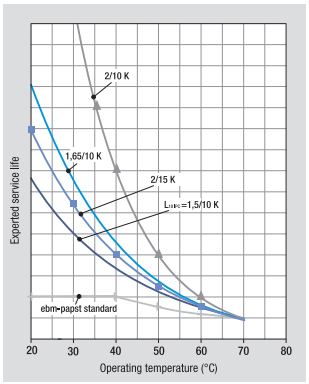
Summary:

The life span calculations have been carried out to the best of our knowledge and are based on experience gained by ebm-papst. The specified L_{10} (40 °C), L_{10} (T_{max}) and L_{10IPC} (40 °C) values all allow statements to be made about the theoretical calculated service life under certain assumptions. The values determined here are extrapolations from our own service life tests and from statistical variables. In the respective customer applications, there may be different influencing factors that cannot be included in the calculations due to their complexity. The service life information is explicitly not a guarantee of service life, but strictly a theoretical quality figure.

Fans in an endurance test cabinet at ebm-papst St. Georgen.
1500 fans are operated in temperature cabinets until they fail.



Bathtub curve and Weibull distribution.



Example of the influence of factors from various manufacturers on the life expectancy.

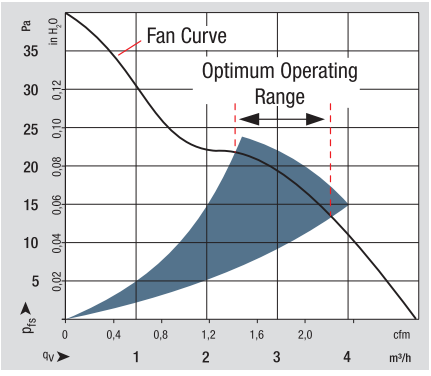
Definitions

Nominal voltage [volts]
The voltage at which the nominal values (the table values listed in this catalog) were determined. The fan operation for DC fans is not limited to the nominal voltage. Fan speed and fan performance can vary according to the admissible voltage range that is specified on the nameplate of each fan. Please note that this is not a pulsed or modulated DC voltage.

Frequency [Hz]
ebm-papst AC fans are made for operating frequencies of 50 Hz or 60 Hz. Their technical data changes accordingly.

Air flow [m^3/h, cfm]
The air performance of the fan in free air operation, i.e. the fan blows into the free space without static pressure increase.

Fan curves
The fan curves are determined in accordance with DIN ISO 5801 specifications on a dual-chamber test stand with intake side measurement. This measurement technique closely approximates the operating conditions experienced in typical applications for fans and yields realistic performance curves. The curves apply to an air density of ρ =1.2 kg/m^3 corresponding to an air pressure of 1013 mbar at 20 °C. Variations in air density affect pressure



generation, but not the flow rate. The pressure generated at other air densities can be estimated with the formula $\Delta\rho 2 = \Delta\rho 1\ (\rho 2 / \rho 1)$.
The nominal speed values, air flow and power consumption listed in the table were measured in free air operation with horizontal shaft at an ambient temperature of 20 +5 °C, air density ρ =1.2 kg/m^3 after a warmup period of 5 min.

Optimum operating range
The optimum operating range is always indicated in the colored area in the air performance diagrams. In this range the fans operate best with respect to efficiency and sound level. Within this optimum operating range the sound level only fluctuates slightly.

Noise [dB(A), Bel(A)]

1. Sound pressure level – dB(A)
Noise ratings of the fan in free air operation, i.e. at maximum flow rate.

2. Sound power level 1 Bel(A) = 10 dB(A)
Extent of the overall sound radiation of the fan. The sound power level is determined in the optimum operating range.

PAPST Sintec® sleeve bearings
A particularly economical bearing system with excellent advantages:
– Very precise, large sintered bearings
– Low running noise
– High service life expectancy
– Resistant to shock and vibration

Ball bearings
Precision ball bearings for particularly high ambient temperatures and high service life expectancy.

Power consumption [watts]
Input performance of the fan motor when operating free blowing at nominal voltage. Depending on the operating condition in the application, the power consumption may be higher.

Temperature range [°C]
The admissible ambient temperature range within which the fan can be expected to run continuously.

Service life [h]

Service life L_{10} at 40 °C and T_{max}
Standard figures for service life at ebm-papst. These two temperatures are based on intensive, in-house endurance tests and on experience from more than 60 years developing fans.

Life expectancy L_{10IPC} (40 °C)
Information calculated in line with the standard IPC 9591. Data based on the internal life expectancy at 70 °C, more optimistically extrapolated to 40 °C.

We expressly state that none of the information or data in this catalog is to be construed as a guarantee or warranty of properties.

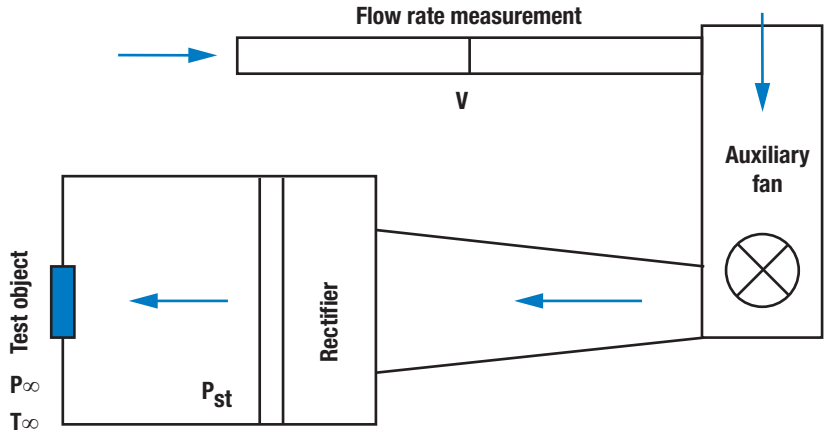
Unit conversion

Air flow	Pressure
1 cfm = 1.7 m^3/h	1 Pa = 1x10^{-5} bar
1 l/s = 3.6 m^3/h	1 inch H_2O = 249 Pa
1 l/min = 0.06 m^3/h	1 mm H_2O = 9.81 Pa

Standard test equipment to determine the fan characteristics

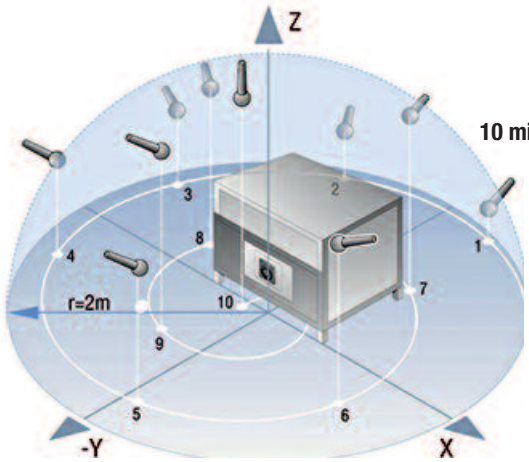
Pressure/air flow

Blow-down test facility acc. to ISO 5801

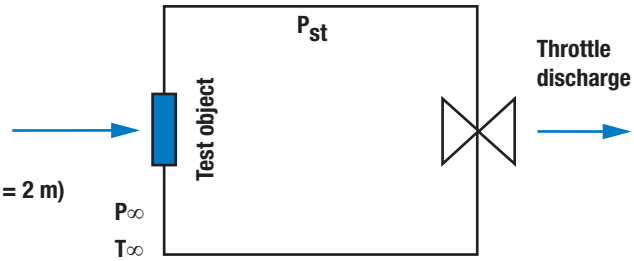


Sound power level pressure/air flow:

Outlet side regulated test rig in semi-anechoic chamber according to ISO 10302

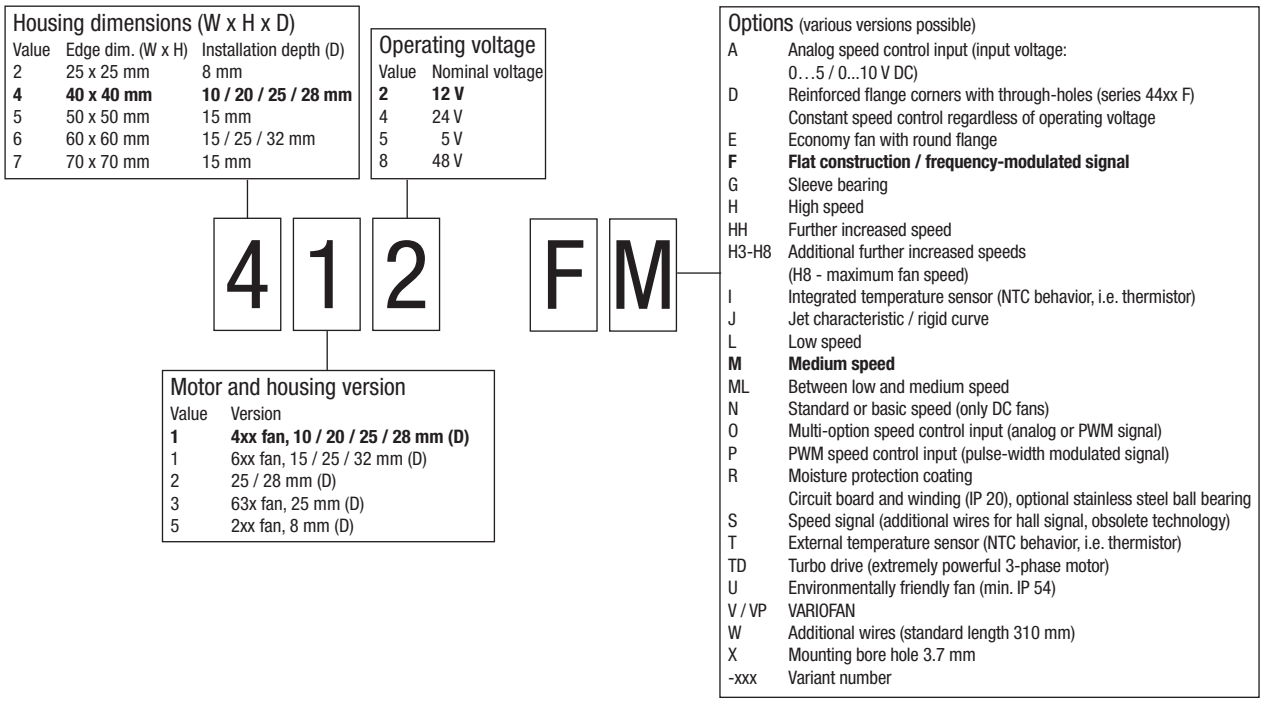


10 microphones (r = 2 m)



Type code

3-digit DC axial fan e.g. 412 FM



Housing dimensions (W x H x D)

Value	Edge dim. (W x H)	Installation depth (D)
2	25 x 25 mm	8 mm
4	**40 x 40 mm**	**10 / 20 / 25 / 28 mm**
5	50 x 50 mm	15 mm
6	60 x 60 mm	15 / 25 / 32 mm
7	70 x 70 mm	15 mm

Operating voltage

Value	Nominal voltage
2	**12 V**
4	24 V
5	5 V
8	48 V

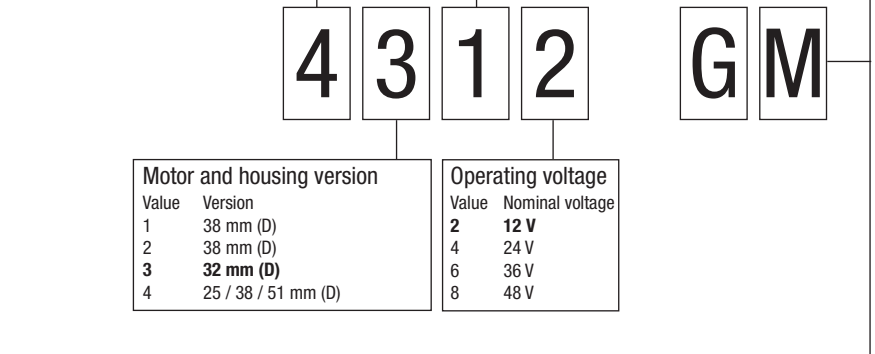
Motor and housing version

Value	Version
1	**4xx fan, 10 / 20 / 25 / 28 mm (D)**
1	6xx fan, 15 / 25 / 32 mm (D)
2	25 / 28 mm (D)
3	63x fan, 25 mm (D)
5	2xx fan, 8 mm (D)

Options (various versions possible)

A	Analog speed control input (input voltage: 0…5 / 0...10 V DC)
D	Reinforced flange corners with through-holes (series 44xx F) Constant speed control regardless of operating voltage
E	Economy fan with round flange
F	**Flat construction / frequency-modulated signal**
G	Sleeve bearing
H	High speed
HH	Further increased speed
H3-H8	Additional further increased speeds (H8 - maximum fan speed)
I	Integrated temperature sensor (NTC behavior, i.e. thermistor)
J	Jet characteristic / rigid curve
L	Low speed
M	**Medium speed**
ML	Between low and medium speed
N	Standard or basic speed (only DC fans)
O	Multi-option speed control input (analog or PWM signal)
P	PWM speed control input (pulse-width modulated signal)
R	Moisture protection coating Circuit board and winding (IP 20), optional stainless steel ball bearing
S	Speed signal (additional wires for hall signal, obsolete technology)
T	External temperature sensor (NTC behavior, i.e. thermistor)
TD	Turbo drive (extremely powerful 3-phase motor)
U	Environmentally friendly fan (min. IP 54)
V / VP	VARIOFAN
W	Additional wires (standard length 310 mm)
X	Mounting bore hole 3.7 mm
-xxx	Variant number

4-digit DC axial fan, e.g. 4312 GM



Housing dimensions (W x H x D)

Value	Edge dimensions (W x H)	Installation depth (D)
2	Ø 220 x 200 mm	51 mm
3	92 x 92 mm	25 / 32 / 38 mm
4	**119 x 119 mm**	**25 / 32 / 38 mm**
5	127 x 127 mm	38 mm
5	135 x 135 mm	38 mm
5	140 x 140 mm	51 mm
6	Ø 172 mm	51 mm
6	Ø 172 x 150 / 160 mm	51 mm
7	Ø 150 mm	38 / 55 mm
8	80 x 80 mm	25 / 32 / 38 mm

Connection type and direction of rotation

Value	Connection type	Direction of rotation
1	**Wires, length = 310 mm**	
5	Wires, length = 310 mm	
6	Plug, 2.8 x 0.8 mm	Counterclockwise (CCW)
7	Plug, 2.8 x 0.8 mm	Clockwise (CW)
8	Plug, 2.8 x 0.5 mm	Counterclockwise (CCW)
9	Plug, 2.8 x 0.5 mm	Clockwise (CW)

Motor and housing version

Value	Version
1	38 mm (D)
2	38 mm (D)
3	**32 mm (D)**
4	25 / 38 / 51 mm (D)

Operating voltage

Value	Nominal voltage
2	**12 V**
4	24 V
6	36 V
8	48 V

Options (various versions possible)

A	Analog speed control input (input voltage: 0…5 / 0...10 V DC)
D	Reinforced flange corners with through-holes (series 44xx F) Constant speed control regardless of operating voltage
DV	Diagonal Venturi fan
E	Economy fan with round flange
F	Flat construction / frequency-modulated signal
G	**Sleeve bearing**
H	High speed
HH	Further increased speed
H3-H8	Additional further increased speeds (H8 - maximum fan speed)
I	Integrated temperature sensor (NTC behavior, i.e. thermistor)
J	Jet characteristic / rigid curve
L	Low speed
M	**Medium speed**
ML	Between low and medium speed
N	Standard or basic speed (only DC fans)
O	Multi-option speed control input (analog or PWM signal)
P	PWM speed control input (pulse-width modulated signal)
R	Moisture protection coating Circuit board and winding (IP 20), optional stainless steel ball bearing
S	Speed signal (additional wires for hall signal, obsolete technology)
T	External temperature sensor (NTC behavior, i.e. thermistor)
TD	Turbo drive (extremely powerful 3-phase motor)
U	Environmentally friendly fan (min. IP 54)
V / VP	VARIOFAN
W	Additional wires (standard length 310 mm)
X	Mounting bore hole 3.7 mm
-xxx	Variant number

All measurements are given in mm.

Type code

DC centrifugal fan e.g. RER 160-28/12 N

Type	Housing and fan impeller versions	
	Housing	Impeller blade design
RE	None	Non-curved, no direction of rotation set
REF	None	Forward/backward-curved impeller blades, flat
RER	**None**	**Backward-curved impeller blades**
RET	None	Forward-curved impeller blades
RG	Square	Forward/backward-curved impeller blades
RL	Round	Forward-curved impeller blades
RLF	Round	Forward/backward-curved impeller blades, flat
RV	Round	Forward-curved impeller blades

Options (various versions possible)	
A	Analog speed control input (input voltage: 0…5 / 0...10 V DC)
D	Reinforced flange corners with through-holes (series 44xx F) Constant speed control regardless of operating voltage
E	Economy fan with round flange
F	Flat construction / frequency-modulated signal
G	Sleeve bearing
H	High speed
HH	Further increased speed
H3-H8	Additional further increased speeds (H8 - maximum fan speed)
I	Integrated temperature sensor (NTC behavior, i.e. thermistor)
J	Jet characteristic / rigid curve
L	Low speed
M	Medium speed
ML	Between low and medium speed
N	**Standard or basic speed (only DC fans)**
O	Multi-option speed control input (analog or PWM signal)
P	PWM speed control input (pulse-width modulated signal)
R	Moisture protection coating Circuit board and winding (IP 20), optional stainless steel ball bearing
S	Speed signal (additional wires for hall signal, obsolete technology)
T	External temperature sensor (NTC behavior, i.e. thermistor)
TD	Turbo drive (extremely powerful 3-phase motor)
U	Environmentally friendly fan (min. IP 54)
V / VP	VARIOFAN
W	Additional wires (standard length 310 mm)
X	Mounting bore hole 3.7 mm
-xxx	Variant number

R	E	R		1	6	0	-	2	8	/	1	2		N
Type				Impeller diameter in mm				Fan impeller blade height		Operating voltage				Options

Operating voltage	
Value	Nominal voltage
/12	**12 V**
/14	24 V
/18	48 V

Crossflow blower e.g. QG 030-148/12

Type	Housing and fan impeller versions	
	Housing	Impeller blade design
QG	**Round**	**Compressor drum**

Housing dimensions (W x H)			
Value	Edge dim. (W x H)	Impeller length	Total length
148	**48 x 50 mm**	**148 mm**	**201 mm**
198	48 x 50 mm	198 mm	258 mm
303	48 x 50 mm	303 mm	363 mm
353	48 x 50 mm	353 mm	413 mm

Q	G		0	3	0	-	1	4	8	/	1	2
Type			Impeller diameter in mm				Housing dimensions (W x H)			Operating voltage		

Operating voltage	
Value	Nominal voltage
/12	**12 V**
/14	24 V

All measurements are given in mm.

Type code

4-digit GreenTech EC tubeaxial fans axial fan e.g. ACi 4420 HH

Housing dimensions (W x H x D)

Value	Edge dim. (W x H)	Installation depth (D)
1	Ø 98.5 mm	130 mm
3	92 x 92 mm	38 mm
4	**119 x 119 mm**	**25 / 32 / 38 mm**
6	Ø 172	51 mm
8	80 x 80 mm	32 mm

Operating voltage

Value	Nominal voltage	Frequency	Version
0	115 / 230 V	50 / 60 Hz	Wide voltage range input (85-265 V AC)
1	115 V	50 Hz	
2	**230 V**	**50 Hz**	

Basic design

Value	Version
AC	DC basic fan with integrated AC/DC power supply
ACi	**EC technology (electronics completely integrated)**

Motor and housing version

Value	Version
0	130 mm (D)
1	51 mm (D)
2	38 / 51 mm (D)
3	32 mm (D)
4	**25 / 38 mm (D)**

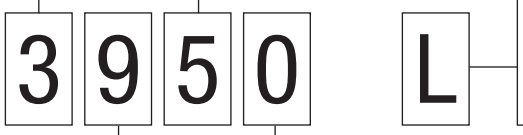
Bearing type and insulation class

Value	Bearing type	Insulation class
0	**Ball bearing**	**E**

Options (various versions possible)

A	Analog speed control input (input voltage: 0…5 / 0...10 V DC)
D	Reinforced flange corners with through-holes (series 44xx F) Constant speed control regardless of operating voltage
E	Economy fan with round flange
F	Flat construction / frequency-modulated signal
G	Sleeve bearing
H	High speed
HH	**Further increased speed**
H3-H8	Additional further increased speeds (H8 - maximum fan speed)
I	Integrated temperature sensor (NTC behavior, i.e. thermistor)
J	Jet characteristic / rigid curve
L	Low speed
M	Medium speed
ML	Between low and medium speed
N	Standard or basic speed (only DC fans)
O	Multi-option speed control input (analog or PWM signal)
P	PWM speed control input (pulse-width modulated signal)
R	Moisture protection coating Circuit board and winding (IP 20), optional stainless steel ball bearing
S	Speed signal (additional wires for hall signal, obsolete technology)
T	External temperature sensor (NTC behavior, i.e. thermistor)
TD	Turbo drive (extremely powerful 3-phase motor)
U	Environmentally friendly fan (min. IP 54)
V / VP	VARIOFAN
W	Additional wires (standard length 310 mm)
X	Mounting bore hole 3.7 mm
-xxx	Variant number

AC axial fan e.g. 3950 L



Housing dimensions (W x H x D)

Value	Edge dim. (W x H)	Installat. depth (D)
3	**92 x 92 mm**	**25 / 38 mm**
4	119 x 119 mm	25 / 32 / 38 mm
5	127 x 127 mm	38 mm
5	135 x 135 mm	38 mm
5	140 x 140 mm	51 mm
6	Ø 172 mm	51 / 52 mm
7	Ø 150 mm	55 mm
7	Ø 150 x 172 mm	38 mm
8	80 x 80 mm	38 mm
9	119 x 119 mm	25 mm

Operating voltage

Value	Nominal voltage	Frequency
0	115 V	60 Hz
2	115 V	60 Hz
3	115 V	60 Hz
4	115 V	50 Hz
5	**230 V**	**50 Hz**
6	115 V / 230 V	50 Hz / 60 Hz
7	230 V	50 Hz
8	230 V	60 Hz
9	230 V	60 Hz

Motor and housing version

Value	Version
4	Shaded-pole motor, 55 mm (D) medium speed
5	Shaded-pole motor, 38 mm (D) medium / high speed
6	Shaded-pole motor, 38 mm (D) high speed
7	Shaded-pole motor, 38 mm (D) with mounting bracket
8	Shaded-pole motor, slow / medium speed
9	**Shaded-pole motor, 25 / 38 mm (D)**

Bearing type and insulation class

Value	Bearing type	Insulation class
0	**Sleeve bearing**	**E**
5	Ball bearing	E
6	Ball bearing	F
8	Ball bearing	E

Options (various versions possible)

A	Intake via bars
E	Made by ebm-papst Mulfingen (6xxx, 7xxx range) or round flange
H	Speed signal 1 Impulses per 360 degrees (additional magnet sensor and hall sensor)
L	**Low speed**
M	Medium speed
N	Air intake via struts (ø mounting bore hole)
R	Moisture protection coating Circuit board and winding (IP 20), optional stainless steel ball bearing
S	Integrated temperature switch
T	Mounting bracket
U	Environmentally friendly fan (min. IP 54)
V	Air exhaust over struts
W	Additional wires (standard length 310 mm)
X	Mounting bore hole 3.7 mm
-xxx	Variant number
Z	Air exhaust over struts, reinforced flange corners with through-holes

All measurements are given in mm.

Type code

AC centrifugal fan e.g. RER 160-28/56 S

Type	Housing and fan impeller versions	
	Housing	Impeller blade design
RE	None	Non-curved, no direction of rotation set
REF	None	Forward/backward-curved impeller blades, flat
RER	**None**	**Backward-curved impeller blades**
RET	None	Forward-curved impeller blades
RG	Square	Forward/backward-curved impeller blades
RL	Round	Forward-curved impeller blades
RLF	Round	Forward/backward-curved impeller blades, flat
RV	Round	Forward-curved impeller blades

Options (various versions possible)

A	Intake via bars
E	Made by ebm-papst Mulfingen (6xxx, 7xxx range) or round flange
H	Speed signal 1 Impulses per 360 degrees (additional magnet sensor and hall sensor)
L	Low speed
M	Medium speed
N	Air intake via struts (ø mounting bore hole)
R	Moisture protection coating Circuit board and winding (IP 20), optional stainless steel ball bearing
S	**Integrated temperature switch**
T	Mounting bracket
U	Environmentally friendly fan (min. IP 54)
V	Air exhaust over struts
W	Additional wires (standard length 310 mm)
X	Mounting bore hole 3.7 mm
-xxx	Variant number
Z	Air exhaust via bars, reinforced flange joints with through-holes

Fan impeller blade height

R E R 1 6 0 - 2 8 / 5 6 S

Impeller diameter in mm

Operating voltage

Value	Nominal voltage	Frequency
/00	115 V	60 Hz
/06	115 V	60 Hz
/50	230 V	50 Hz
/56	**230 V**	**50 Hz**

DC centrifugal fan e.g. R3G 190-RN 38-01

Note: This type code specifies fans from ebm-papst Mulfingen and can be used to clearly identify and order them:

Type	Housing and fan impeller versions
A	Axial fan
S	Axial fan with finger guard
W	Axial fan with fan housing
V	Axial combination
R	**Centrifugal fan, single inlet**
G	Centrifugal blower, single inlet (with scroll housing)
B	Centrifugal fan, dual inlet
G	Centrifugal blower, dual inlet (with scroll housing)
K	Centrifugal combination

Impeller diameter in mm

Key for mechanical design

Key for mechanical variants

R 3 G 1 9 0 - R N 3 8 - 0 1

Number of poles (AC)

2	2-pole

Number of cores (DC/EC)

1	1-phase/core
3	**3-phase/core**

Motor type

D	Three-phase motor
E	Single-phase motor with motor run capacitor
G	**DC/EC motor**

Key for electrical design

All measurements are given in mm.

DC axial fans