

Compact fans for DC fans - Specials

Version 2016-01

ebmpapst

The engineer's choice



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.



GreenTech means
ecologically improving
every new product.

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

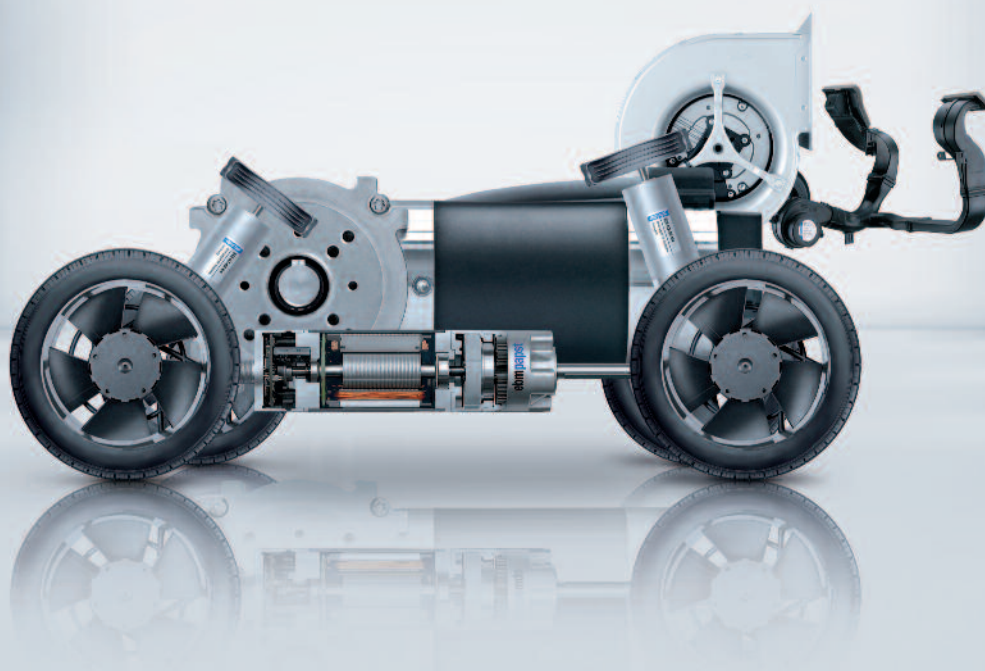


All products with power consumption between 125 W and 500 kW are subject to the European "Energy-related Products Directive" (ErP) for improving energy efficiency, with the first stage applicable from 2013 and the second as of 2015. Thanks to ground-breaking GreenTech EC technology, all of our fans and 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	
	<ul style="list-style-type: none"> Material: Housing: GRP[®] (PBT) Impeller: GRP[®] (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 	<ul style="list-style-type: none"> Possible special versions: (See chapter DC fans - specials) <ul style="list-style-type: none"> - 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

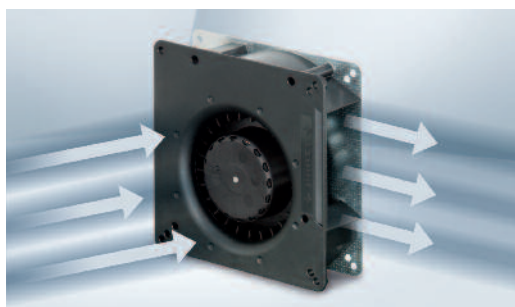
The air flow in axial fans with an impeller that is similar to a propeller is conducted largely parallel to the axis of rotation, in other words in the axial direction. Axial fans with free air delivery at zero static pressure have the lowest power input that rises with increasing back pressure. Axial 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

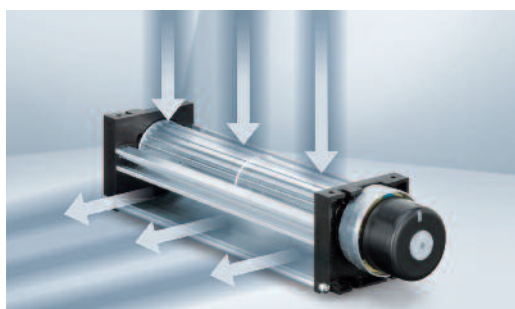
At first glance diagonal fans only differ slightly from axial fans. Intake is axial, whereas exhaust is diagonal. Due to the conical shape of the wheel and housing, the air is pressurized more in the diagonal fan. In direct comparison with axial fans of the same size and comparable performance, these 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, $\Delta T = 5K$ means that the average cooling airflow leaving the device to be cooled may be only $5^\circ C$ 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. $\Delta T = 20K$), 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:

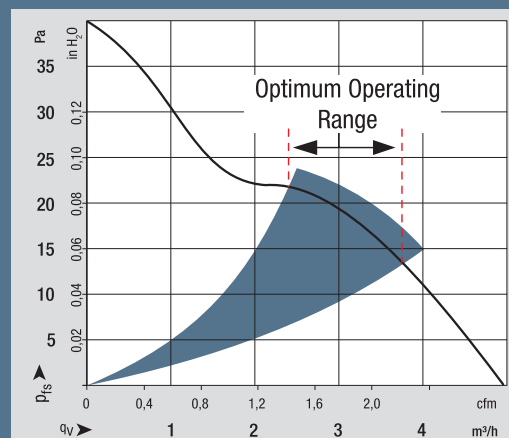
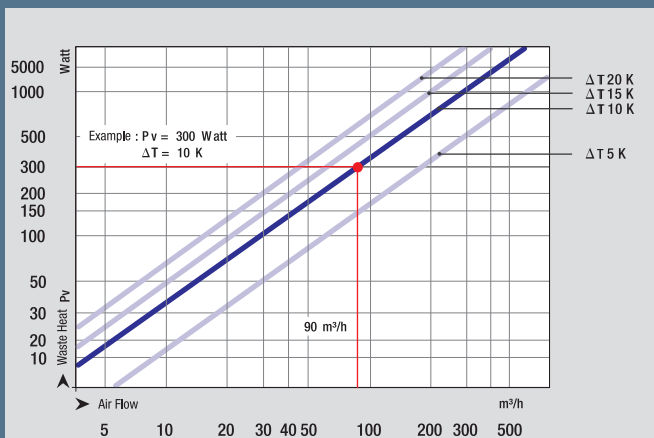
$$q_V = \frac{P_V}{C_{PL} \cdot \rho_L \cdot \Delta T}$$

4. Optimum operating range

But the fan you are looking for must also be able to deliver a suitable static pressure increase Δp_f , 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

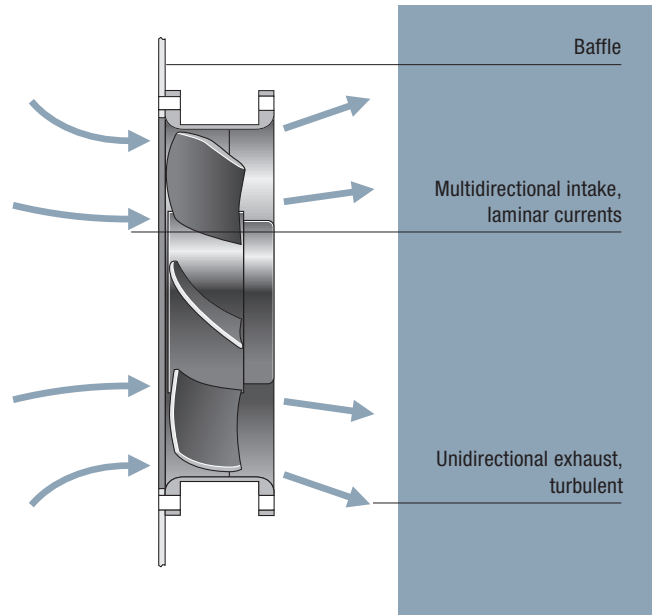
P_V = amount of heat to be dissipated in [W]
 C_{PL} = specific heat capacity of air in [J/kg/K]
 $C_{PL} = 1010$ [J/kg/K]

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

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



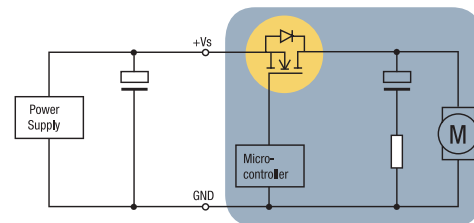
Special features of S-Force fans

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 μ F; 12.5 mm x 30 mm or

50 ZLH 680 μ F 12.5 mm x 30 mm

48 VDC:

100 YXG 470 μ F; 16 mm x 35.5 mm or

100 ZLH 470 μ F 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 μ F / 50 V, 16 mm x 25 mm

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

48 VDC: 680 μ F / 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	Silencers sleeve bearings	Ball bearings	Input power	Nominal speed	Temperature range	Service life L_{10} (40 °C)	Service life L_{10} (T_{max})	Life expectancy L_{10IPC} (40 °C) (see page 1)	Curve
Bel(A)	Watts	rpm	°C	Hours	Hours	Hours	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)

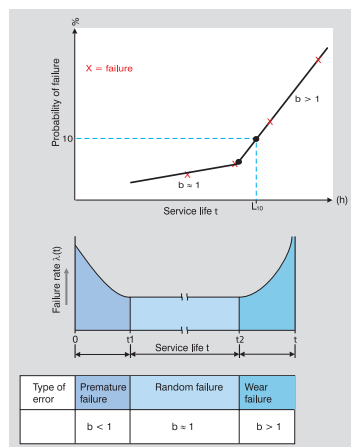
The new third service life column states the life expectancy L_{10IPC} . This information is based on the international standard IPC 9591. Again here, the foundations for the service life values are our service life endurance tests at high ambient temperatures. The service life at temperatures below 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:

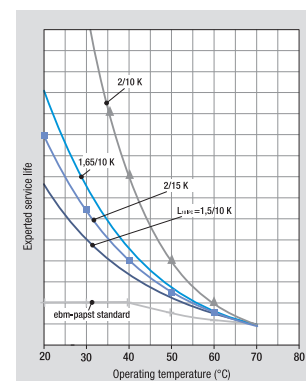
The life span calculations have been carried out to the best of our knowledge and are based on experience gained by ebm-papst. The specified L_{10} (40 °C), L_{10} (T_{max}) and L_{10IPC} (40 °C) values all allow statements to be made about the theoretical calculated service life under certain assumptions. 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 [m³/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 $\rho = 1.2 \text{ kg/m}^3$ 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 $\Delta p_2 = \Delta p_1 (\rho_2 / \rho_1)$.

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 $\rho = 1.2 \text{ kg/m}^3$ 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 L₁₀ 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

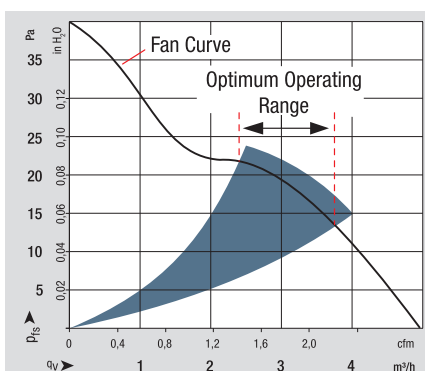
Air flow	Pressure
1 cfm = 1.7 m³/h	1 Pa = 1x10 ⁻⁵ bar
1 l/s = 3.6 m³/h	1 inch H ₂ O = 249 Pa
1 l/min = 0.06 m³/h	1 mm H ₂ O = 9.81 Pa

Subject to technical changes.

We do not support aerospace applications with our products. German and international patents (registered designs and utility models).

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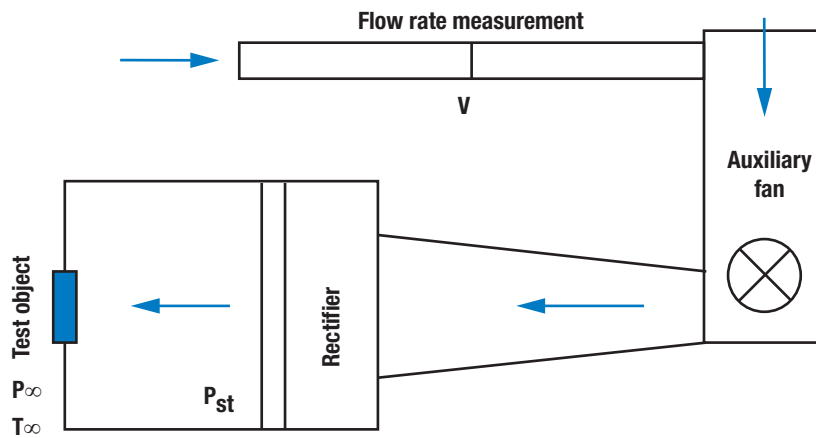
PAPST, SINTEC, VARIOFAN and Vario-Pro are registered trademarks of ebm-papst St. Georgen GmbH & Co. KG.



Standard test equipment to determine the fan characteristics

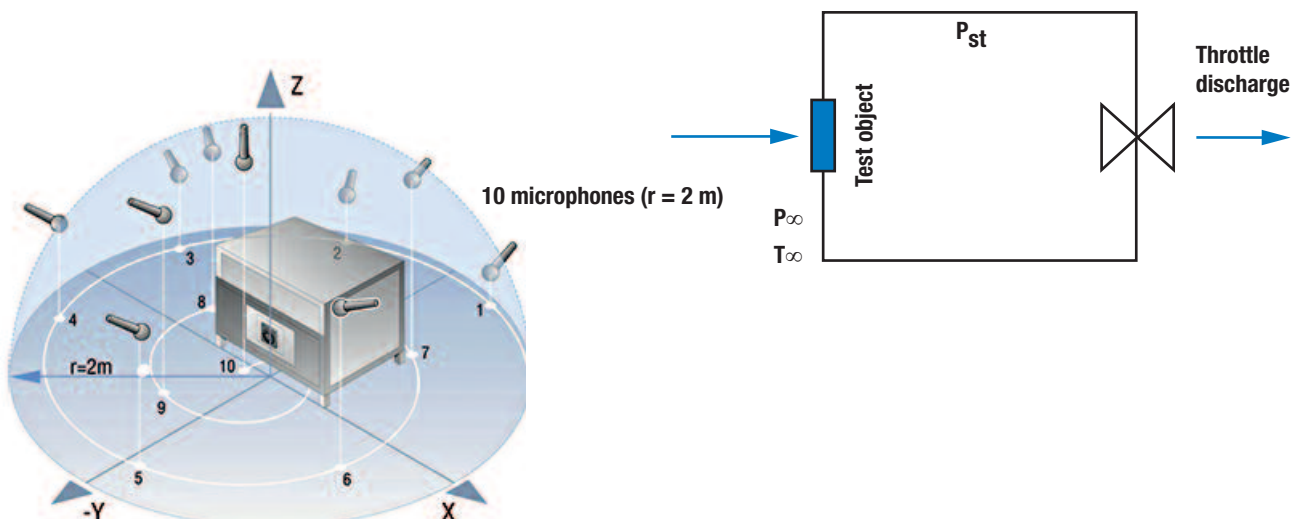
Pressure/air flow

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



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

4 1 2 F M

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
S	Circuit board and winding (IP 20), optional stainless steel ball bearing
T	Speed signal (additional wires for hall signal, obsolete technology)
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)

4 3 1 2 G M

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
S	Circuit board and winding (IP 20), optional stainless steel ball bearing
T	Speed signal (additional wires for hall signal, obsolete technology)
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

Type code

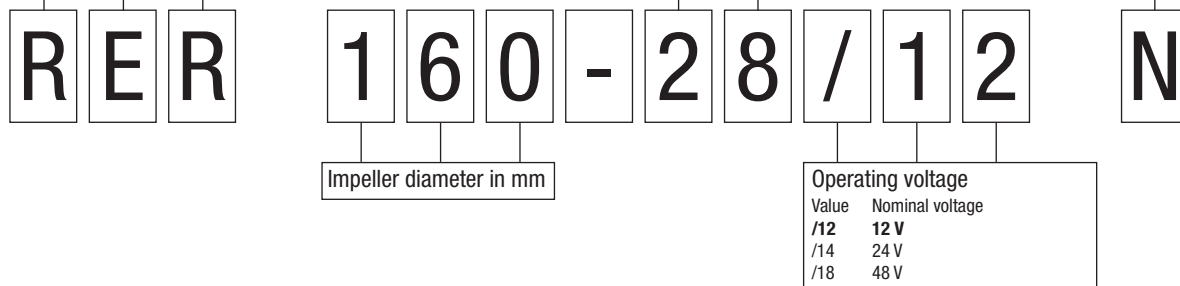
DC centrifugal fan e.g. RER 160-28/12 N

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

Fan impeller blade height

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

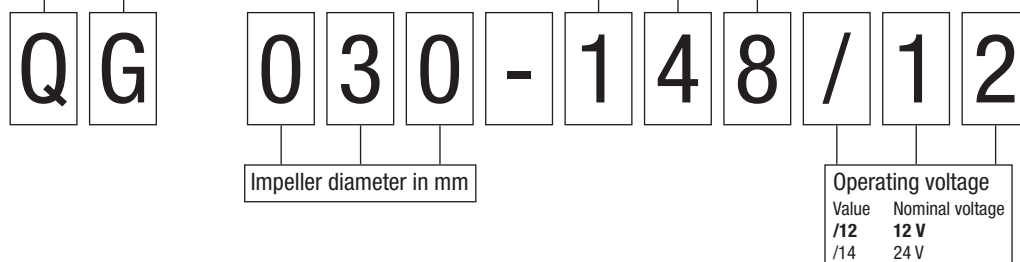


Crossflow blower e.g. QG 030-148/12

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



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)			Operating voltage				Options (various versions possible)	
Value	Edge dim. (W x H)	Installation depth (D)	Value	Nominal voltage	Frequency	Version		
1	Ø 98.5 mm	130 mm	0	115 / 230 V	50 / 60 Hz	Wide voltage range input (85-265 V AC)	A	Analog speed control input (input voltage: 0...5 / 0...10 V DC)
3	92 x 92 mm	38 mm	1	115 V	50 Hz		D	Reinforced flange corners with through-holes (series 44xx F)
4	119 x 119 mm	25 / 32 / 38 mm	2	230 V	50 Hz		E	Constant speed control regardless of operating voltage
6	Ø 172	51 mm					F	Economy fan with round flange
8	80 x 80 mm	32 mm					G	Flat construction / frequency-modulated signal
							H	Sleeve bearing
							HH	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
							S	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

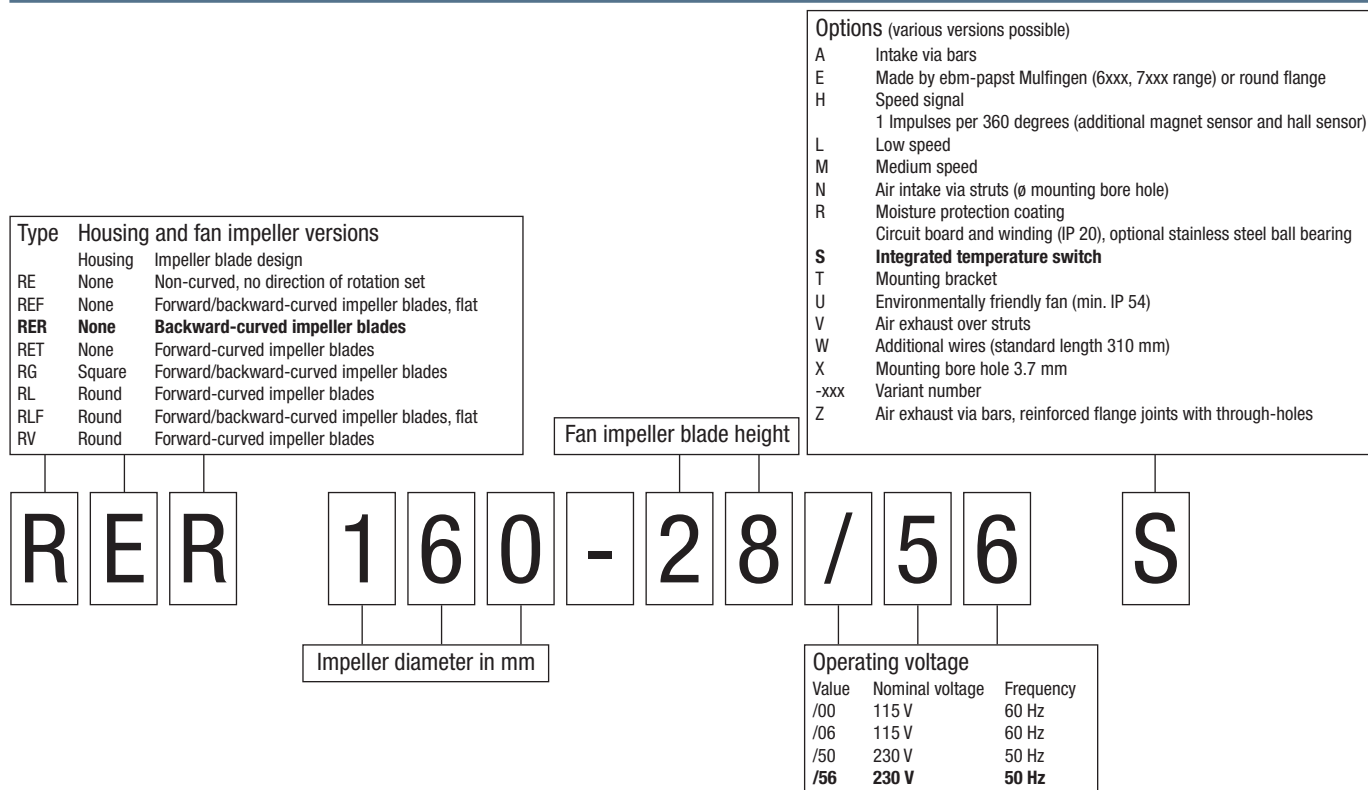
AC axial fan e.g. 3950 L

Housing dimensions (W x H x D)			Operating voltage			Options (various versions possible)	
Value	Edge dim. (W x H)	Installat. depth (D)	Value	Nominal voltage	Frequency		
3	92 x 92 mm	25 / 38 mm	0	115 V	60 Hz	A	Intake via bars
4	119 x 119 mm	25 / 32 / 38 mm	2	115 V	60 Hz	E	Made by ebm-papst Mulfingen (6xxx, 7xxx range) or round flange
5	127 x 127 mm	38 mm	3	115 V	60 Hz	H	Speed signal
5	135 x 135 mm	38 mm	4	115 V	50 Hz		1 Impulses per 360 degrees (additional magnet sensor and hall sensor)
5	140 x 140 mm	51 mm	5	230 V	50 Hz	L	Low speed
6	Ø 172 mm	51 / 52 mm	6	115 V / 230 V	50 Hz / 60 Hz	M	Medium speed
7	Ø 150 mm	55 mm	7	230 V	50 Hz	N	Air intake via struts (Ø mounting bore hole)
7	Ø 150 x 172 mm	38 mm	8	230 V	60 Hz	R	Moisture protection coating
8	80 x 80 mm	38 mm	9	230 V	60 Hz		Circuit board and winding (IP 20), optional stainless steel ball bearing
9	119 x 119 mm	25 mm				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.

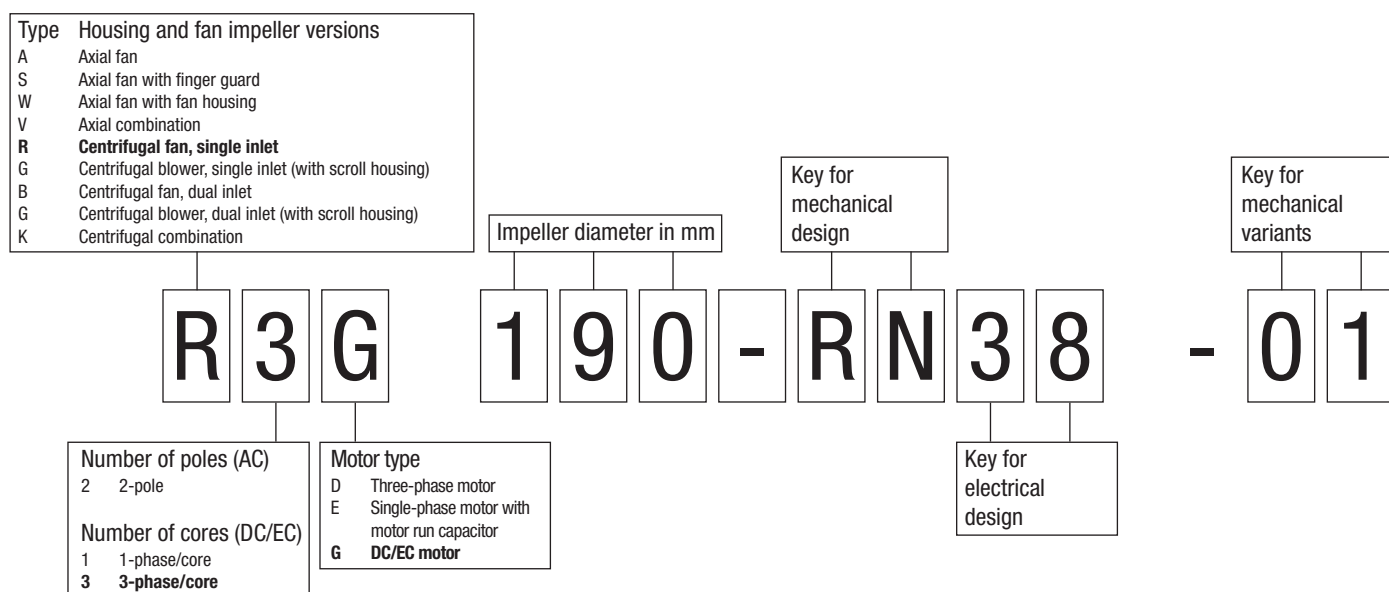
Type code

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



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:

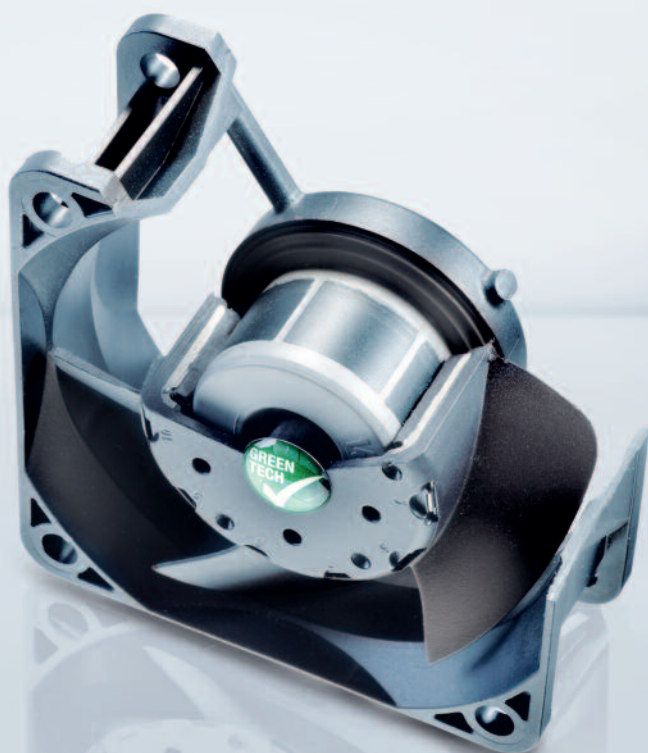


All measurements are given in mm.

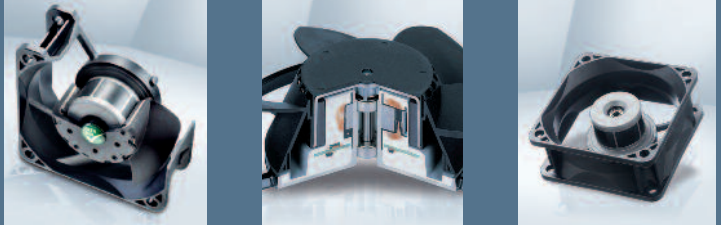


DC fans - specials

Speed signal	168
Alarm signal	172
Vario-Pro / Speed setting / Control input	177
Protected fans, degree of protection: IP 54 / IP 68	181



Technical information



Cooling capacity and efficiency

Greater power density, increasing miniaturization and extreme electronic component density are placing increased demands on the cooling capacity and efficiency of fans. Therefore, intelligent and space-saving integration of the fan in the device configuration is very important:

- Tailor-made cooling adapted to the situation as and when required.
- Programmable cooling by defining speed profiles.
- Transparency of function thanks to complete, interactive monitoring in all operating conditions.

Standard fans in electronics cooling have proven themselves a million times over.

With a constant speed and an appropriate sound level, they continuously provide the air flow required for extreme cases. But these extreme situations occur seldom – if at all – during operation. What is needed is an intelligent fan that adapts automatically to the level of cooling required at the time.

ebm-papst provides intelligent cooling concepts that are optimally adapted to practical requirements. For example:

1. Speed adjustment via temperature sensor

ebm-papst answers with a complete range of DC fans with temperature-controlled speed adjustment via a temperature sensor, available in a variety of standard dimensions.

Installation is very simple. Either an external temperature sensor in the form of an exposed wire that can be placed anywhere, or an internal sensor located directly in the fan hub in the air flow provides continuous and undissipated thermal information to the control electronics for speed adjustment. A range of temperature sensors can be found on page 178.

2. DC fans with separate control input

Open or closed-loop speed control is also possible with DC fans that have a separate control input. So a control voltage or a pulse-width modulated signal can be used to vary the speed. These options are used primarily in devices that have the appropriate standard interfaces and require varied fans depending on the load.

DC fans - specials

Technical information



3. Speed signal

DC fans with speed signal.

The integrated "electronic tachometer" continuously provides an actual speed signal for external evaluation. A very simple signal evaluation on the customer side informs the user of the current fan speed at all times. The speed signal is provided by a separate wire.

4. Alarm signal

For applications that require monitored fan operation with an alarm signal, ebm-papst offers a number of alarm signals variants. Depending on the type of fan in question, the signal will either be static, already evaluated, or a continuous, interface-compatible, high or low signal. The alarm signal is provided by a separate wire.

5. Turbo drives

Fans with three-phase EC drives and microprocessor-controlled motor electronics. The torque of these three-phase motors, which is virtually independent of the rotor position, allows the fan to run very smoothly. The speed of these fans can be controlled over a very wide speed range by means of PWM, analog voltage, or temperature. Optionally, the fans can be supplied with reversible direction of rotation and active brake operation.

6. Vario-Pro fans

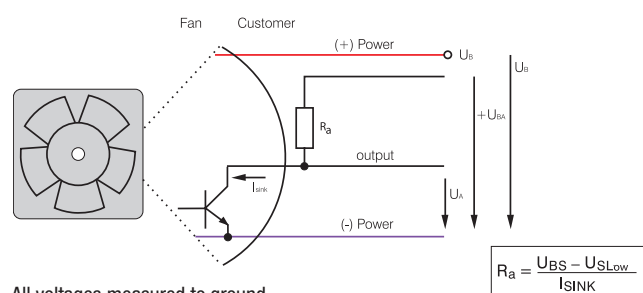
This high-end fan concept by ebm-papst with programmed intelligence and customer-specific integrated functions makes your electronics cooling even more versatile and competitive. Vario-Pro provides greater economy for all demanding cooling tasks – especially those that require greater safety, more flexibility, and intelligent features like an alarm function, speed control, etc.

The key to the success of Vario-Pro is: Tailor-made software instead of permanently installed hardware, because software modules programmed for motor control and application intelligence do the work that used to be performed by analog components in the past. This central control unit of the Vario-Pro comprises a microcontroller and an EEPROM, where all its features are stored.

7. Protection against environmental conditions

Some applications place particular demands on the fans' resistance to environmental conditions, such as dust, moisture, water, and salt. ebm-papst offers solutions for adapting fans to these conditions.

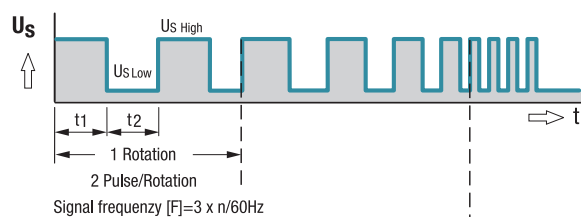
- Speed-proportional, square-wave signal for external monitoring of the fan motor speed
- 2, 3, or 6 pulses per revolution
- Open-collector signal output
- Extremely wide operating voltage range
- Easy adaptation to user interface
- Connection via separate cable
- The sensor signal also serves as a major comparison variable for setting and maintaining the setpoint speed for interactive or controlled cooling with one or more interconnected fans.



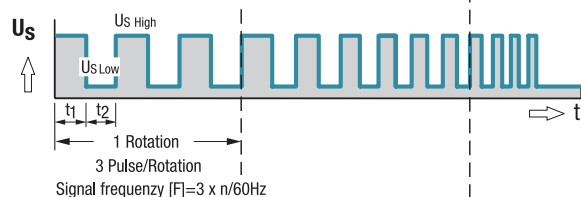
All voltages measured to ground.
External load resistor R_a / U_S / U_{BS} required.

Signal output voltage

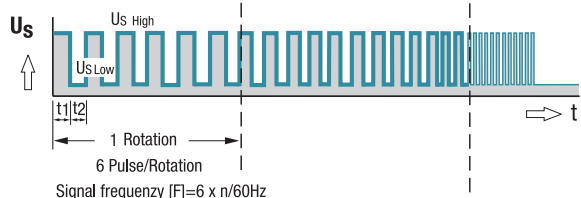
Standard signal for all models (exceptions see below)



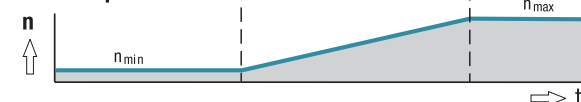
For multi options control input and 4100 NH7 and NH8



All TD Fans e.g. 6300 TD



Fan speed

[illegible]

Available on request:

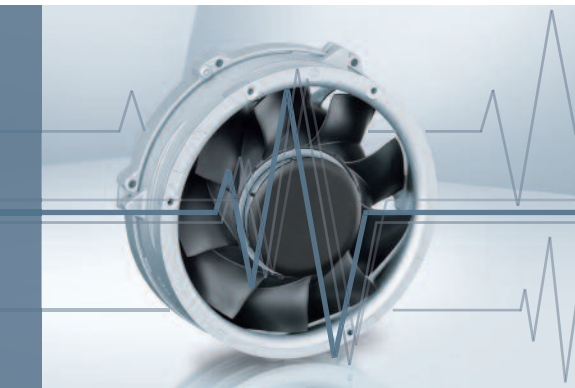
- Electrically isolated speed signal circuit
- Varying voltage potentials for power and logic circuit

Signal data	Speed signal U _S Low	Condition: I _{sink}	Speed signal U _S High	Condition: I _{source}	Tach operating voltage U _{BS} max.	Admissible sink current I _{sink} max.	Pulses per revolution	Fan description Basic type
Type	VDC	mA	VDC	mA	VDC	mA		Page
5112 N	≤ 0.4	2	≤ 15	0	5	20	2	66
5114 N / 5118 N	≤ 0.4	2	≤ 60	0	60	20	2	66
5300	≤ 0.4	2	≤ 60	0	60	4	2	67
5300 TD	≤ 0.4	2	≤ 60	0	60	20	6	68
7112 N / 7118 N	≤ 0.4	2	≤ 60	0	60	20	2	69
7114 N	≤ 0.4	2	≤ 30	0	30	20	2	69
7200 N	≤ 0.4	2	≤ 15	0	15	20	2	70
6400	≤ 0.4	2	≤ 60	0	60	20	2	71
6300 TD	≤ 0.4	2	≤ 60	0	60	20	6	75
6300 N	≤ 0.4	2	≤ 60	0	60	20	6	76
6300 NTD	≤ 0.4	2	≤ 60	0	60	20	6	77
6300	≤ 0.4	2	≤ 60	0	60	20	2	78
DV 6300 TD	≤ 0.4	2	≤ 60	0	60	20	6	80
2200 FTD	≤ 0.4	2	≤ 60	0	60	20	6	81
RL 48	≤ 0.4	2	≤ 30	0	30	4	2	97
RL 65	≤ 0.4	2	≤ 30	0	30	4	2	98
RL 90 N	≤ 0.4	2	≤ 30	0	30	4	2	99
RLF 100	≤ 0.4	2	≤ 30	0	30	4	2	100
RG 90 N	≤ 0.4	2	≤ 30	0	30	4	2	101
RG 125 N	≤ 0.4	2	≤ 30	0	30	4	2	102
RG 140 N	≤ 0.4	3	≤ 60	0	60	4	2	103
RG 160 N	≤ 0.4	2	≤ 30	0	30	20	2	104
RG 160 NTD	≤ 0.4	2	≤ 60	0	60	20	6	105
RG 190 TD	≤ 0.4	2	≤ 60	0	60	20	6	106
RG 220 TD	≤ 0.4	2	≤ 60	0	60	20	6	107
RG 225 TD	≤ 0.4	2	≤ 60	0	60	20	6	108
RET 97 TD	≤ 0.4	2	≤ 60	0	60	20	6	109
REF 100	≤ 0.4	2	≤ 30	0	30	4	2	110
RER 120 TD	≤ 0.4	2	≤ 60	0	60	20	6	112
RER 133 TD	≤ 0.4	2	≤ 60	0	60	20	6	117
RER 160 NTD	≤ 0.4	2	≤ 60	0	60	20	6	119
REF 175 TD	≤ 0.4	2	≤ 60	0	60	20	6	120
RER 175 TD	≤ 0.4	2	≤ 60	0	60	20	6	121
RER 190 TD	≤ 0.4	2	≤ 60	0	60	20	6	122
RER 220 TD	≤ 0.4	2	≤ 60	0	60	20	6	128
RER 225 TD	≤ 0.4	2	≤ 60	0	60	20	6	129
Subject to change								

Note:

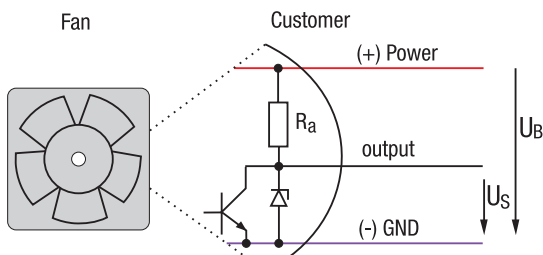
Fans that come with these fan specials could have variations with respect to the temperature range, voltage range, and power consumption compared to standard fans without specials.

Speed signal /12



- Speed-proportional, square-wave signal for external monitoring of the fan motor speed
- 2, 3, or 6 pulses per revolution
- TTL-compatible
- Integrated pull-up resistor
- Connection via separate cable
- The sensor signal also serves as a major comparison variable for setting and maintaining the setpoint speed for interactive or controlled cooling with one or more interconnected fans.

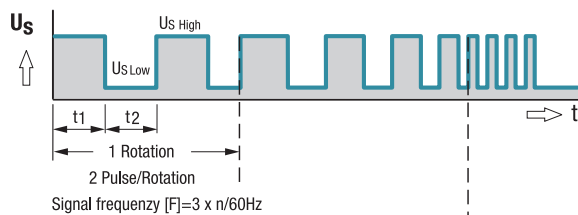
Electrical hookup



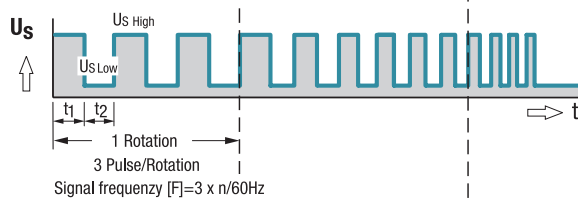
All voltages measured to ground.

Signal output voltage

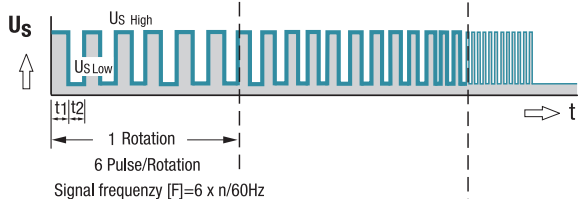
Standard signal for all models (exceptions see below)



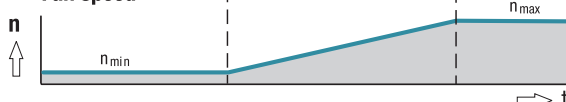
For multi options control input and 4100 NH7 and NH8



All TD Fans e.g. 6300 TD



Fan speed



Signal data	Speed signal $U_{S \text{ Low}}$	Condition: I_{sink}	Speed signal $U_{S \text{ High}}$	Condition: I_{source}	Admissible sink current $I_{\text{sink max}}$	Fan description Basic type
Type	VDC	mA	VDC	mA	mA	Page
614 N/12 GM	≤ 0.4	1	2.5–5.5	1	1	39
618 N/12 N	≤ 0.4	1	2.5–5.5	1	1	39
8412 N/12 H	≤ 0.4	1	2.5–5.5	1	1	44
4412 F/12 GM	≤ 0.4	1	2.5–5.5	1	1	53
4418 F/12	≤ 0.4	1	2.5–5.5	1	1	53
4312 /12 M	≤ 0.4	1	2.5–5.5	1	1	56
4314 /12	≤ 0.4	1	2.5–5.5	1	1	56
4182 N/12 X	≤ 0.4	1	2.5–5.5	1	1	60
Subject to change						

Note:

With these fan options, deviations in regard to temperature range, voltage range and power consumption are possible compared with standard fan data.

Available on request:

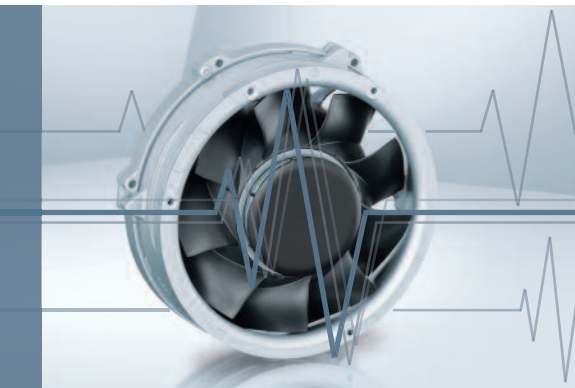
- Electrically isolated speed signal circuit
- Varying voltage potentials for power and logic circuit

Signal data		Speed signal U _S Low	Condition: I _{sink}	Speed signal U _S High	Condition: I _{source}	Admissible sink current I _{sink} max.	Fan description Basic type
Type	VDC	mA	VDC	mA	mA	Page	
7214 N/12	≤ 0.4	2	2.5–5.5	1	≤ 20	70	
6424/12 H	≤ 0.4	2	2.5–5.5	1	≤ 20	71	
DV 6424/12	≤ 0.4	2	4.5–5.25	2	≤ 12	73	
DV 6448/12	≤ 0.4	2	4.5–5.25	2	≤ 12	73	
RG 125-19/12 N/12	≤ 0.4	1	2.5–5.5	1	≤ 1	103	
RG 160-28/12 N/12	≤ 0.4	2	2.5–5.5	1	≤ 5	104	
RG 160-28/18 N/12	≤ 0.4	2	2.5–5.5	1	≤ 20	104	
RER 125-19/12 N/12	≤ 0.4	1	2.5–5.5	1	≤ 1	116	
RER 160-28/12 N/12	≤ 0.4	2	2.5–5.5	1	≤ 5	118	
RER 160-28/18 N/12	≤ 0.4	2	2.5–5.5	1	≤ 20	118	
Subject to change							

Note:

Fans that come with these fan specials could have variations with respect to the temperature range, voltage range, and power consumption compared to standard fans without specials.

Alarm signal /17



- Alarm signal for speed monitoring
- Signal output via open collector
- The fan emits a continuous high signal during trouble-free operation within the permissible voltage range.
- Low signal when speed limit is not reached
- After elimination of the fault, the fan returns to its setpoint speed; the alarm signal reverts to high.

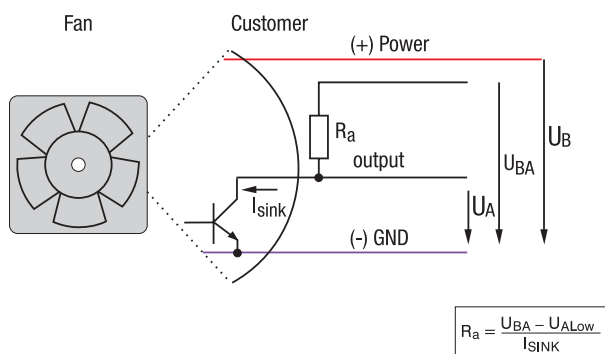
Alarm signal data	Alarm output voltage U_A Low		Condition: $I_{sink} =$	Alarm output voltage U_A High		Condition: I_{source}	Alarm operating voltage U_{BA} max.	Max. permissible sink current	Alarm startup delay time t_6	Condition:	Speed limit n_G	Fan description Basic type
	VDC	mA		VDC	mA							
Type	VDC	mA		VDC	mA		VDC	mA	s		min^{-1}	Page
8318 /17	≤ 0.4	$n < n_G$	2	≤ 60	$n > n_G$	0	60	20	≤ 15	*	1500 ± 100	46
8318 /17 H	≤ 0.4	$n < n_G$	2	≤ 60	$n > n_G$	0	60	20	≤ 15	*	1500 ± 100	46
4318 /17	≤ 0.4	$n < n_G$	2	≤ 60	$n > n_G$	0	60	20	≤ 15	*	850 ± 100	56
4184 N /17 X	≤ 0.4	$n < n_G$	2	≤ 60	$n > n_G$	0	60	20	≤ 15	*	1500 ± 100	60

Subject to change

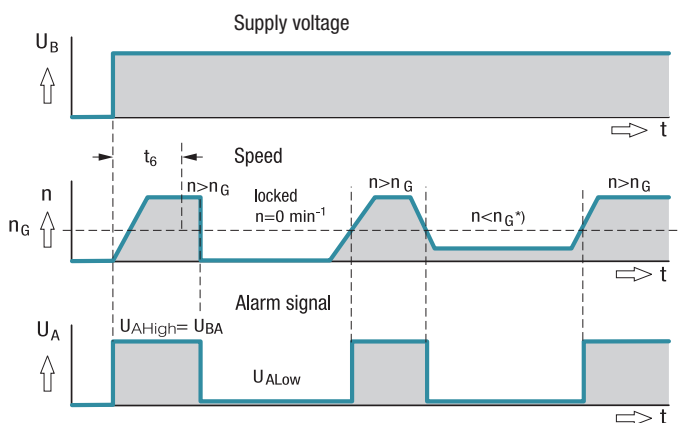
Note:

Fans that come with these fan specials could have variations with respect to the temperature range, voltage range, and power consumption compared to standard fans without specials.

Electrical hookup



All voltages measured to ground.
External load resistor R_a from U_A to U_{BA} required.



Available on request:

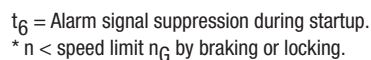
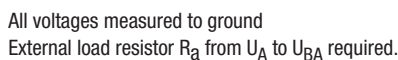
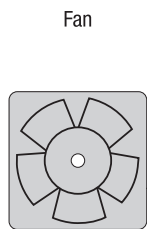
- Integrated signal storage for subsequent recognition of short-term faults (latch).
 - Alarm circuit open collector or TTL.
 - Electrically isolated for maximum device safety
- Defects in the power circuit do not affect the alarm circuit.

Alarm signal data	Alarm output voltage U_A Low	Condition:	Condition: $I_{\text{sink}} =$	Alarm output voltage U_A High	Condition:	Condition: I_{source}	Alarm operating voltage U_{BA} max.	Max. permissible sink current	Alarm startup delay time t_G	Condition:	Speed limit n_G	Fan description Basic type
Type	VDC		mA	VDC		mA	VDC	mA	s		min^{-1}	Page
4312/17 MT VARIOFAN	≤ 0.4	$n < n_G$	2	≤ 60	$n > n_G$	0	60	20	≤ 15	*	1500 ± 100	57
4312/17 T VARIOFAN	≤ 0.4	$n < n_G$	2	≤ 60	$n > n_G$	0	60	20	≤ 15	*	1500 ± 100	57
4314/17 T VARIOFAN	≤ 0.4	$n < n_G$	2	≤ 60	$n > n_G$	0	60	20	≤ 15	*	1150 ± 100	57
4318/17 T VARIOFAN	≤ 0.4	$n < n_G$	2	≤ 60	$n > n_G$	0	60	20	≤ 15	*	850 ± 100	57
7214 N/17	≤ 0.4	$n < n_G$	2	≤ 60	$n > n_G$	0	60	15	≤ 15	*	1330 ± 60	70
Subject to change										* After switching on U_B		

Note:

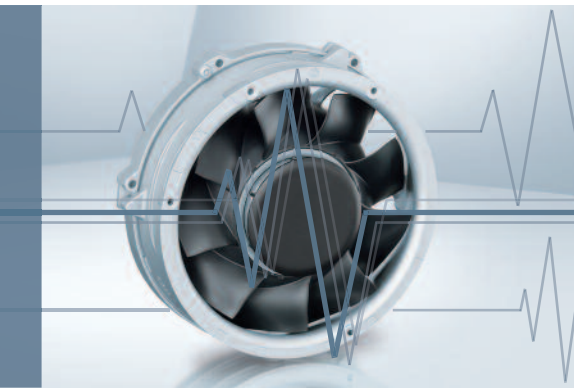
Fans that come with these fan specials could have variations with respect to the temperature range, voltage range, and power consumption compared to standard fans without specials.

- Alarm signal for speed monitoring
- Signal output via open collector
- The fan emits a continuous low signal during trouble-free operation within the permissible voltage range.
- High signal when speed limit is not reached
- After elimination of the fault, the fan returns to its setpoint speed; the alarm signal reverts to low.



Alarm signal /37

Go / NoGo alarm



- Alarm signal for speed monitoring
- Signal output via open collector
- The fan emits a continuous high signal during trouble-free operation within the permissible voltage range.
- Low signal when speed limit is not reached
- After elimination of the fault, the fan returns to its setpoint speed; the alarm signal reverts to high.

Alarm signal data		Alarm output voltage U_A Low	Condition:	Condition: $I_{\text{sink}} =$	Alarm output voltage U_A High	Condition:	Condition: I_{source}	Alarm operating voltage U_{BA} max.	Max. permissible Sink current I_{sink}	Alarm delay time t_d	Condition:	Speed limit n_G	Fan description Basic type
Type	VDC			mA	VDC		mA	VDC	mA	s		min^{-1}	Page
8412 N/37 GMLV	≤ 0.4	$n \leq n_G$		2	≤ 28	$n > n_G$	0	28	10	< 1	*	0	45
3412 N/37 GV	≤ 0.4	$n \leq n_G$		2	≤ 28	$n > n_G$	0	28	10	< 1	*	0	49

Subject to change

* After switching on U_B

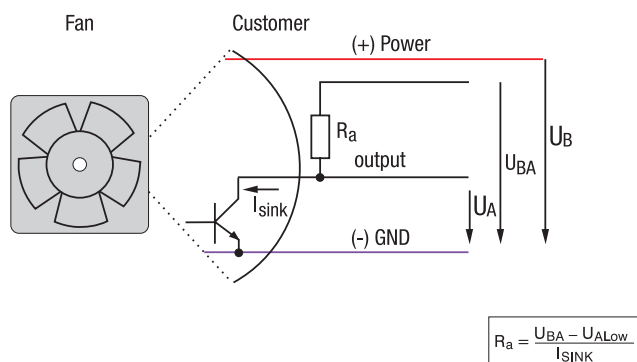
Note:

Fans that come with these fan specials could have variations with respect to the temperature range, voltage range, and power consumption compared to standard fans without specials.

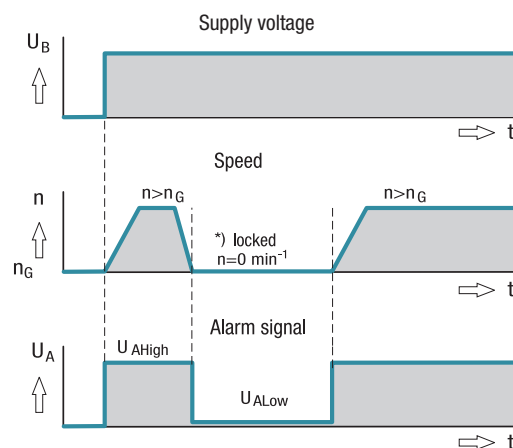
Available on request:

- Alarm circuit TTL compatible.

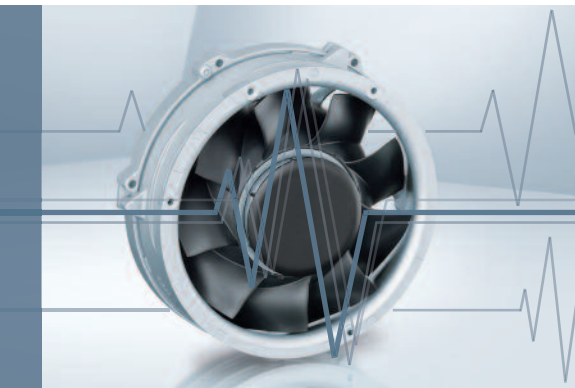
Electrical hookup



All voltages measured to ground
External load resistor R_A from U_A to U_{BA} required.



Go / NoGo alarm



- Alarm signal for speed monitoring
- Signal output via open collector
- The fan emits a continuous low signal during trouble-free operation within the permissible voltage range.
- High signal when speed limit is not reached
- After elimination of the fault, the fan returns to its setpoint speed; the alarm signal reverts to low.

Alarm signal data	Alarm output voltage U_A Low	Condition:	Condition: $I_{sink} =$	Alarm output voltage U_A High	Condition:	Condition: I_{source}	Alarm operating voltage U_{BA} max.	Max. permissible Sink current I_{sink}	Alarm delay time t_d	Condition:	Speed limit n_G	Fan description Basic type
	VDC		mA	VDC		mA	VDC	mA	s		min ⁻¹	Page
412/39	≤0.5	$n > n_G$	2	≤28	$n = n_G$	0	28	10	<1	*	0	33
612 F/39 H	≤0.5	$n > n_G$	2	≤28	$n = n_G$	0	28	10	<1	*	0	36
614 N/39 M	≤0.5	$n > n_G$	2	≤28	$n = n_G$	0	28	10	<1	*	0	39
618 N/39 N	≤0.5	$n > n_G$	2	≤28	$n = n_G$	0	28	10	<1	*	0	39
3412 N/39 H	≤0.5	$n > n_G$	2	≤28	$n = n_G$	0	28	10	<1	*	0	48
3414 N/39 HH	≤0.5	$n > n_G$	2	≤28	$n = n_G$	0	28	10	<1	*	0	48
4412 F/39 GL	≤0.5	$n > n_G$	2	≤28	$n = n_G$	0	28	10	<1	*	0	53
4412 F/39 M	≤0.5	$n > n_G$	2	≤28	$n = n_G$	0	28	10	<1	*	0	53
4414 F/39	≤0.5	$n > n_G$	2	≤28	$n = n_G$	0	28	10	<1	*	0	53
4414 FN/39 H	≤0.4	$n > n_G$	2	≤30	$n = n_G$	0	30	4	<1	*	0	55

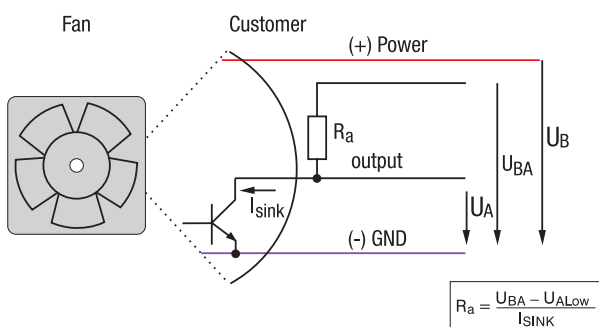
Subject to change

* After switching on U_B

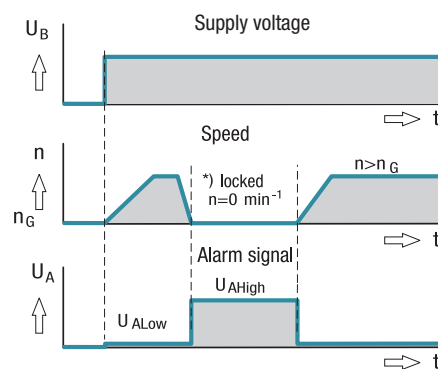
Note:

Fans that come with these fan specials could have variations with respect to the temperature range, voltage range, and power consumption compared to standard fans without specials.

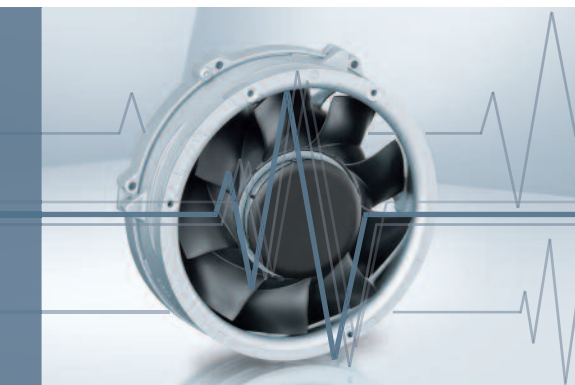
Electrical hookup



All voltages measured to ground
External load resistor R_a from U_A to U_{BA} required.



* Speed limit $n_G = 0$ rpm



- "Software instead of hardware" aptly describes the unique fan concept. Fans come equipped with tailor-made intelligence for cooling electronics.
- The main advantages are flexible configuration based on software, faster availability, sampling from the factory, and the ability to supply customer-specific solutions in any quantity.

Vario-Pro features

External speed setting

- Speed setting via temperature, PWM or analog control voltage
See page 178 (Speed setting)
- Description of speed curve with up to 14 selectable interpolation points.
Linear interpolation between the points.
- 0 rpm speed possible
- Sensor break detection: If the sensor signal is lost, the fan will operate at any programmable speed.

Alarm and tachometer functions

- Optional alarm and/or tachometer function
- Selectable alarm speed limit (with hysteresis) and alarm delay time
- Storing of the alarm signal
- Delay only when starting or permanently active
- "High" or "low" output signal for alarm
- Optional alarm if temperature sensor fails
- Optional alarm in case of overtemperature

Motor management

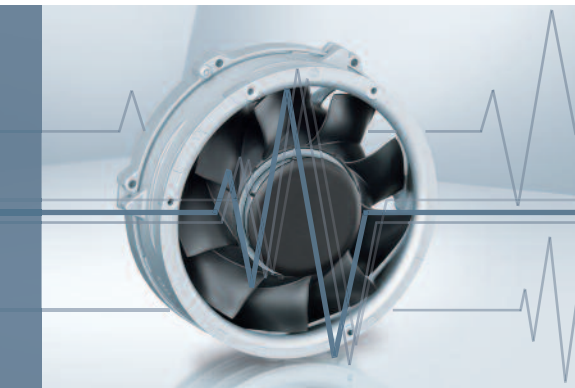
- High control accuracy due to digital motor management
- Increased operating efficiency due to optimum coordination of motor hardware and software

Fan series	Page
620	37
8400 N	44
8300	46
8200 J	47
3400 N	48
3300 N	50
3200 J	51
3250 J	52
4400 FN	55
4300	56
4100 N	60
4100 NH...NH6	61

Fan series	Page
4100 NH 7-8	62
DV 4100	63
5200 N	64
DV 5200	65
5100 N	66
5300	67
7100 N	69
7200 N	70
6400	71
DV 6400	73
6300 N	76
6300 NTD	77

Fan series	Page
6300	78
DV 6300 TD	80
RL 90 N	99
RLF 100	100
RG 90 N	101
RG 125 N	102
RG 140	103
RG 160 N	104
REF 100	110
RER 101 N	111
RER 125 N	116
RER 160 N	118

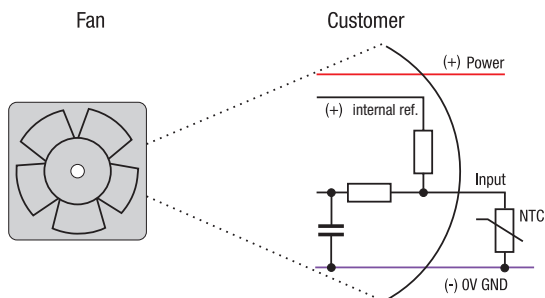
Speed setting via temperature sensor



- The control variable is a temperature sensor that is either integrated in the fan or connected to an additional control cable.

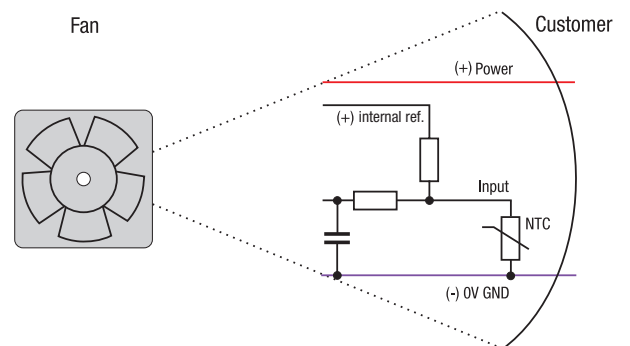
External temperature sensor type T

- Ext. NTC resistor type LZ370 (p. 257) is required (not included in the standard scope of delivery)

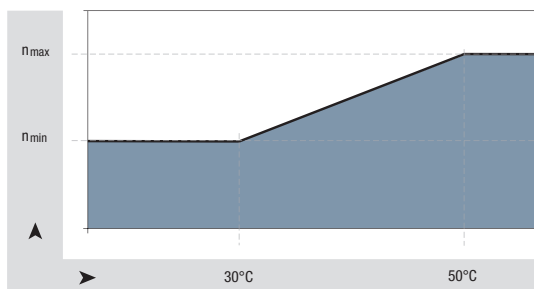


Internal temperature sensor type I

- NTC integrated in the fan hub



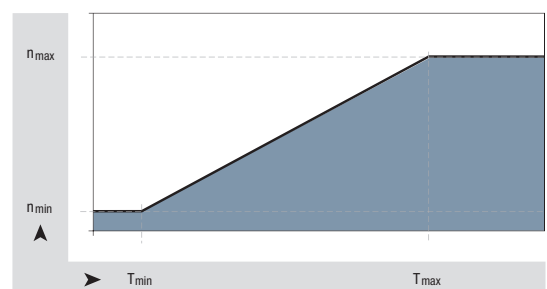
Standard speed/temperature curve for type T and type I



$$n_{\min} \approx \frac{1}{2} n_{\max}$$

$$T_{\min} \approx 30^{\circ}\text{C}; T_{\max} = 50^{\circ}\text{C}$$

Optionally available with selectable temperature/speed curve

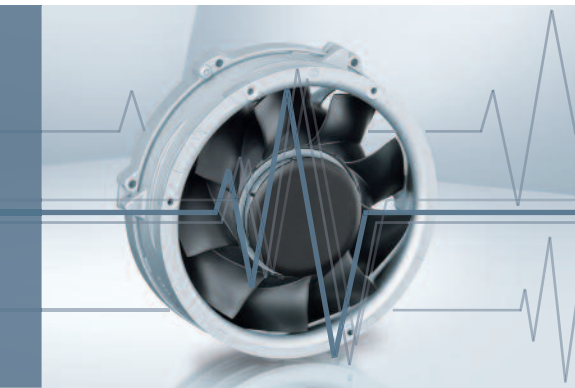


$$n_{\min} \approx 800 \frac{1}{\text{min}} \quad n_{\max} \text{ based on model}$$

$$T_{\min} \approx 5^{\circ}\text{C} \quad T_{\max} \leq 85^{\circ}\text{C, based on model}$$

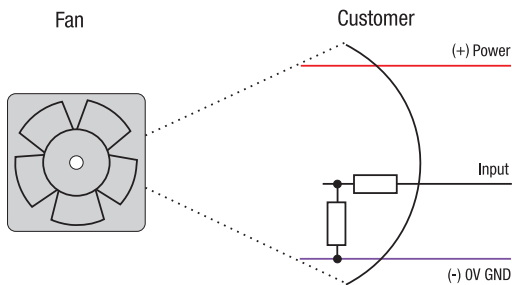
Speed setting via control voltage or PWM signal

- The control variable is a PWM signal or analog control voltage.



Speed setting via analog control voltage type A

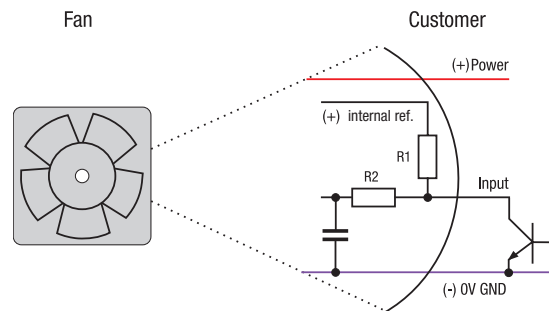
- Standard control range 0 ... 10 V



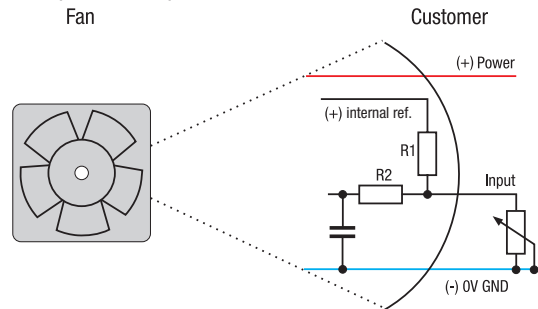
Typical input resistance > 10 k

Speed setting via PWM type P

- Standard PWM signal in two versions
 - a) PWM frequency, mainly 1 ... 10 kHz (0-100%), Open-collector input
 - b) Four-wire interface according to Intel specifications for 12 VDC fans, PWM frequency 25 kHz, incl. speed signal /2



- Optional with potentiometer

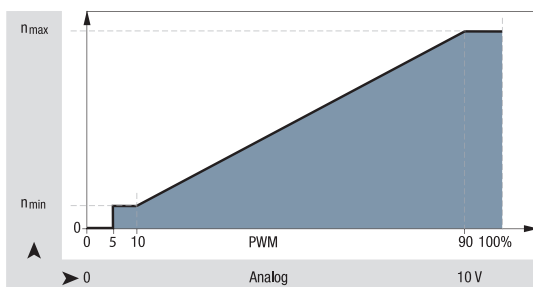


Internal reference = + 5 V

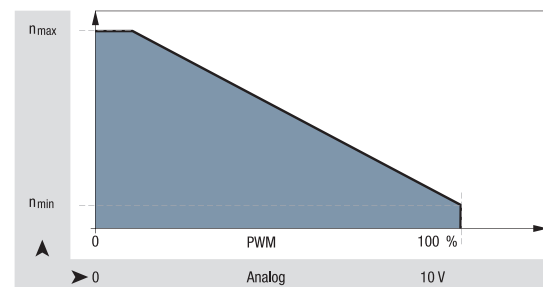
R1 typical 4.7...10 kΩ

R2 typical 100 kΩ

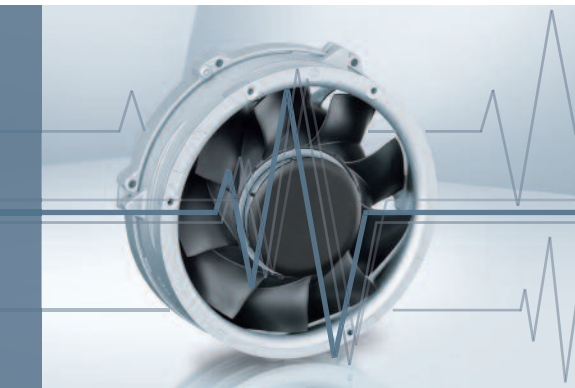
Standard P / A curve



Optionally available with selectable P / A speed curve

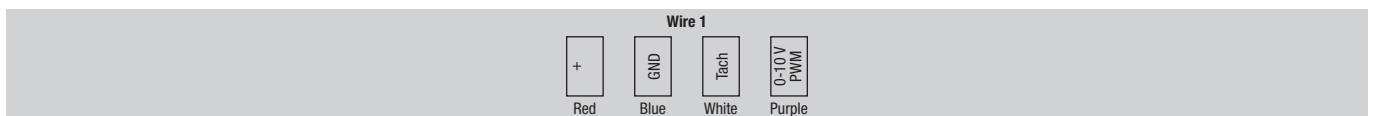
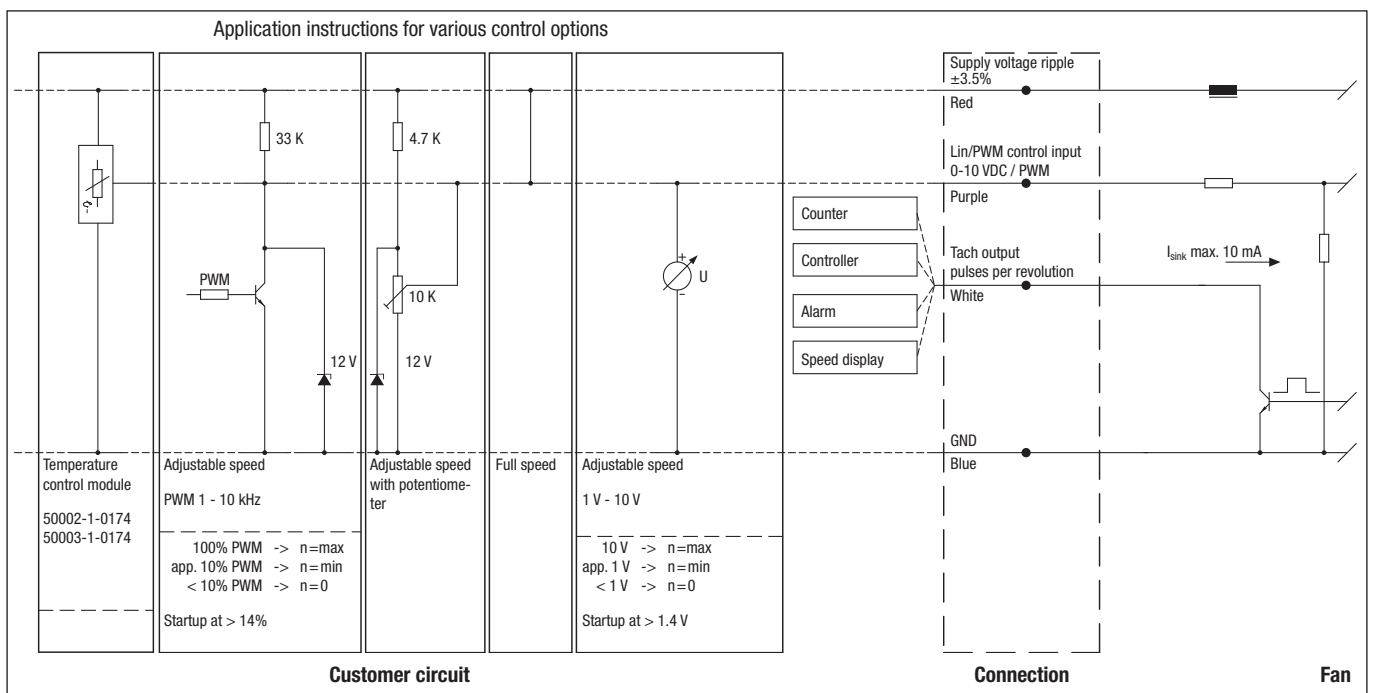


Speed setting via Control input



- Customer can operate input either with PWM signal, analog voltage, external temperature control module, or resistor.
- The control signal speed characteristics of the fan differ from the standard curve of the A and P inputs (see p. 179).
- To reach the maximum speed, the control cable must be connected to the U_B .
- The control input is usually combined with an open collector tachometer (type /2, see page 168).

Speed setting via multi-option control input type 0



Wire	Connection	Color	Assignment/function	Wire	Connection	Color	Assignment/function
1	+	Red	Supply voltage ripple ±3.5%	1	Tach	White	Tach output: 3 Impulse/revolution
	GND	Blue	GND		0-10 V / PWM	Purple	Control input (impedance 100 kV)

Protected fans

against environmental conditions

- Capable of satisfying special requirements for a broad range of applications
- Resistance of fans to environmental conditions such as dust, splashing water, humidity, spray water, and salt spray.
- Competent solutions to adapt fans to environmental conditions.



Moisture protection

A coat of paint over the motor and circuit board protect the fans against spray water and condensation.

Degree of protection IP 54 / IP 68*

In the degree of protection IP 54, the motor and circuit boards are coated and therefore protected against spray water and moisture.

The degree of protection IP 68 is important for ebm-papst products, as it ensures a high degree of protection for the encapsulated motor and electronics against foreign bodies and water, while protecting the user against potential hazards upon contact. Degrees of protection higher than IP 68 are possible on request.

Solutions that are available and are used may differ depending on the fan size. We would be glad to develop solutions tailored to the demands of your application.

Salt spray protection

Salt spray represents one of the most difficult requirements for product durability. ebm-papst has the technology to protect fans and blowers from salt spray reliably and for the long term.

Stainless steel bearings

Special bearings made of stainless steel provide additional protection.

Degree of protection – IP code*

Protection against foreign bodies and accidental contact (first digit)		Water protection (second digit)	
X	No protection	X	No protection
1	Protection against foreign objects > 50 mm (back of the hand)	1	Protection against dripping water or condensation
2	Protection against foreign objects > 12 mm (finger)	2	Protection against dripping water, fans tilted 15° from vertical
3	Protection against foreign objects > 2.5 mm (tool)	3	Protection against sprayed water up to 60° from vertical
4	Protection against foreign objects > 1 mm (wire)	4	Protection against sprayed water from all sides
5	Protection against dust in harmful quantities	5	Protection against low-pressure water jets
6	Dust-proof	6	Protection against high-pressure water jets
		7	Protection against temporary submersion (15 cm - 1 m)
		8	Protection against continuous submersion

* IP = International degree of protection marking

For AC-fans max. IP 65 available



Accessories



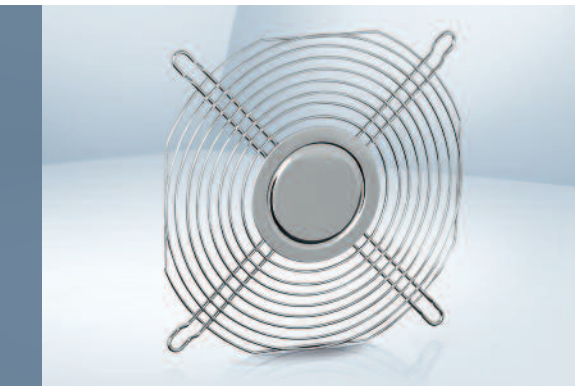
Finger guards	242
Filter fan guards	250
Inlet rings	252
Connection cables / Accessories	255
Connection diagrams	258

ebm-papst offers a comprehensive selection of accessories for optimum fan operation, from temperature sensors for speed-controlled fans, to finger guards for all variants, to cables, filters, and screens, to spacers and installation parts. Even in the case of very special parts, you can be sure: We will assist you every way possible. The sales experts at ebm-papst will be happy to assist you with your question concerning fan installation and use.

From selection to accessories:

Insist on the efficient and reliable service provided by ebm-papst.

Finger guards



- **Material:** Galvanized or nickel-plated steel wire
- **Note:** Finger guard according to DIN EN ISO 13857 (previously EN 294). Additional finger guards that do not satisfy DIN EN ISO 13857 available on request. Our finger guards are designed specifically to be used with ebm-papst fans. They combine the highest degree of safety with minimum effect on the operating noise. Please note that the safety-related clearances cannot be guaranteed when finger guards made by other manufacturers are used.

Fan series	Part no.
400	LZ29-1
420 J	LZ29-1
500	LZ31
600	LZ28-1
3000	LZ23-1
8000	LZ32-4 / LZ22-2
9000	LZ30-4 / LZ 30 / LZ 30-3
4000	LZ30-4 / LZ 30 / LZ 30-3

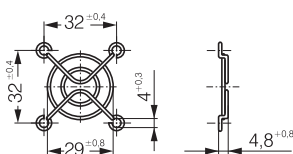
Fan series	Part no.
5100	LZ25
5600	LZ25
5200	LZ35
5300	LZ53
5900	LZ35
7000	LZ36
6300	LZ37
6400	LZ38

Fan series	Part no.	Side
2200 F	LZ22	
DV 4100	LZ30-4	Intake/outlet
DV 5200	LZ35	Intake/outlet
DV 6300 TD	LZ37	Intake side
DV 6300 TD	LZ52	Outlet side
DV 6400	LZ38	Intake side
DV 6400	LZ39	Outlet side

Subject to change

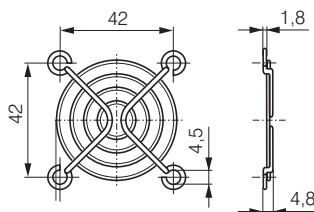
LZ29-1

Fan size 40 x 40



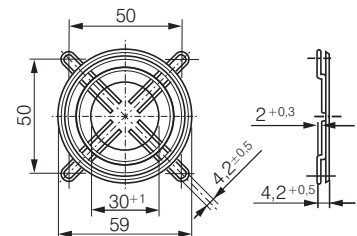
LZ31

Fan size 50 x 50



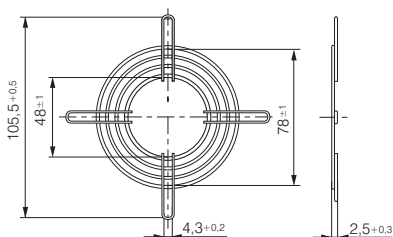
LZ28-1

Fan size 60 x 60



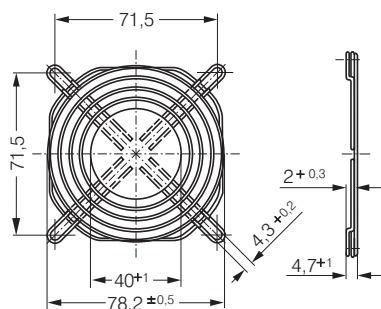
LZ22-2

Fan size 80 x 80



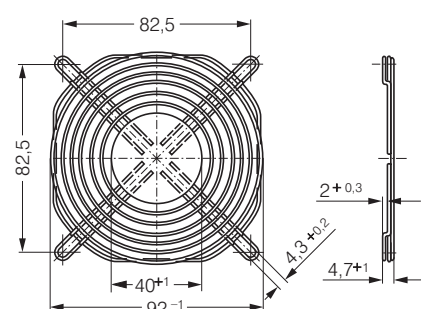
LZ32-4

Fan size 80 x 80



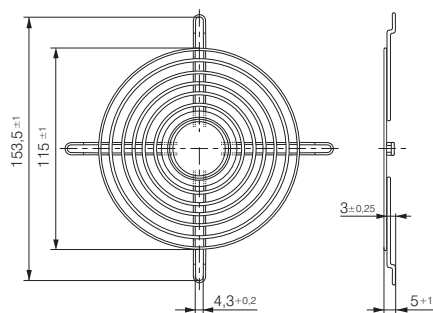
LZ23-1

Fan size 92 x 92



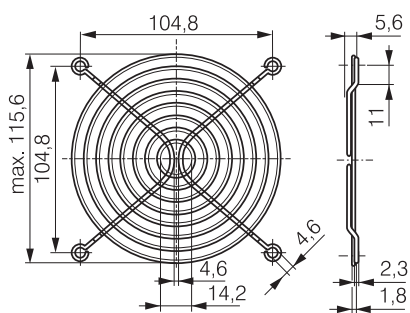
LZ30

Fan size 119 x 119



LZ30-3

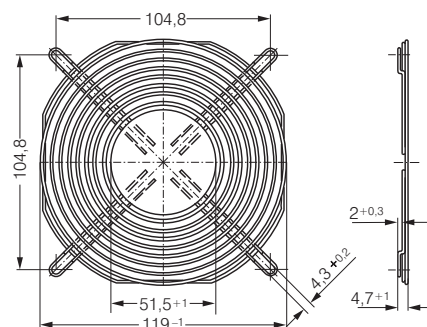
Fan size 119 x 119



Also called LZ 30
for North America only.

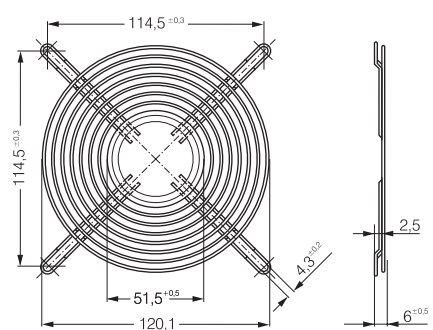
LZ30-4

Fan size 119 x 119



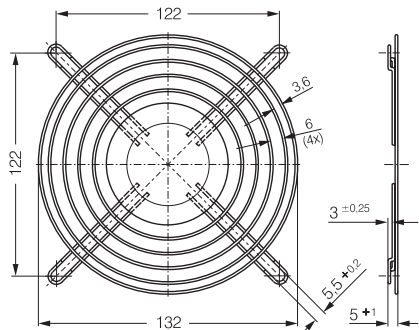
LZ35

Fan size 127 x 127



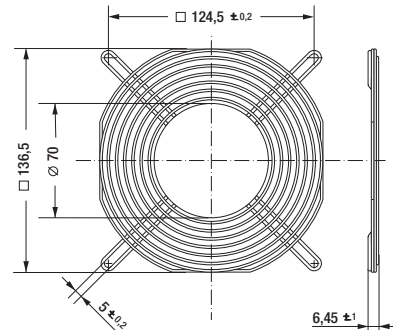
LZ25

Fan size 135 x 135



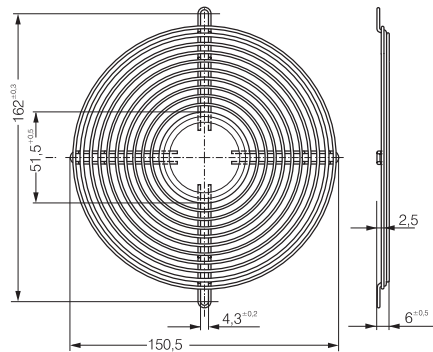
LZ53

Fan size 140 x 140



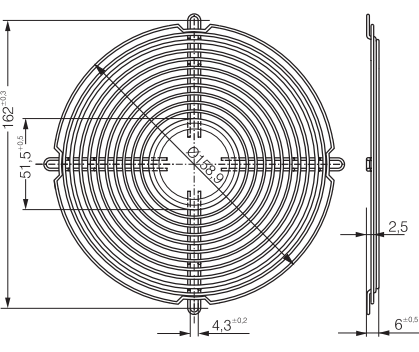
LZ36

Fan size 150 x 172



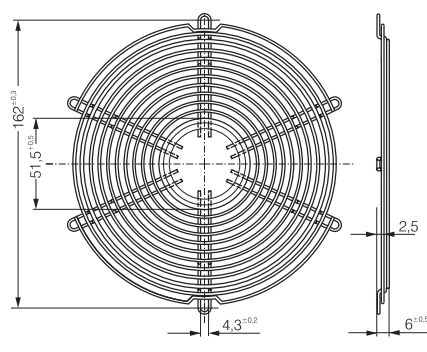
LZ37

Fan size 172 x 51



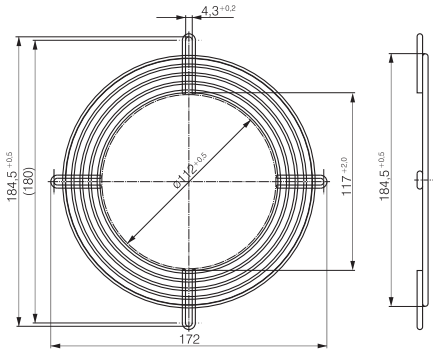
LZ38

Fan size 172 x 51



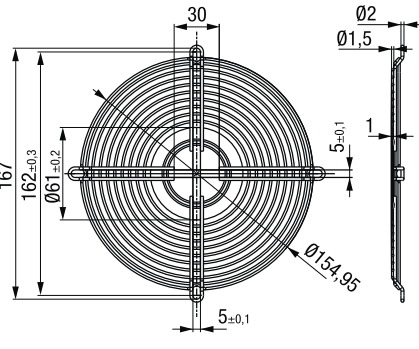
LZ39

Fan size 172 x 51



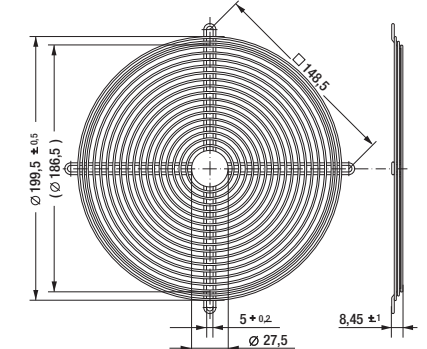
LZ52

Fan size 172 x 51

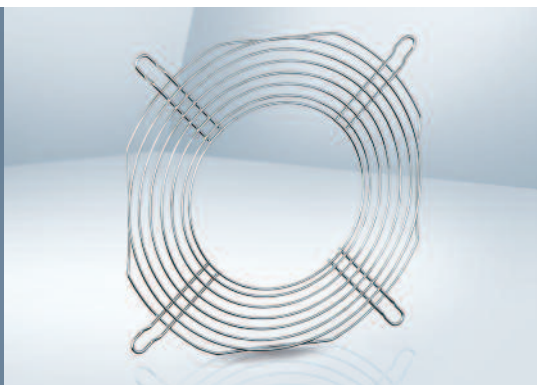


LZ22

Fan size 200 x 51



Finger guards



- **Material:** Galvanized or nickel-plated steel wire
- **Note:** Finger guard according to DIN EN ISO 13857 (previously EN 294).
The finger guard detailed on this page are intended specifically for the ACmaxx / GreenTech EC tubeaxial fan ranges and are mounted on the outlet side.

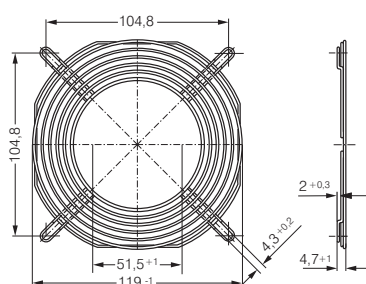
Fan series	Part no.	Side
AC 8300 H	LZ32-4	Intake
AC 8300 H	LZ32-7	Outlet
AC 3200 J	LZ23-1	Intake
AC 3200 J	LZ23-6	Outlet
AC 4400 FN	LZ30-4	Intake
AC 4400 FN	LZ30-9	Outlet
AC 4300	LZ30-4	Intake
AC 4300	LZ30-9	Outlet

Fan series	Part no.	Side
ACi 4400	LZ30	Intake
ACi 4400	LZ30	Outlet
AC 6200 N	LZ37	Intake
AC 6200 N	LZ37-2	Outlet

* Outlet-side guards on request

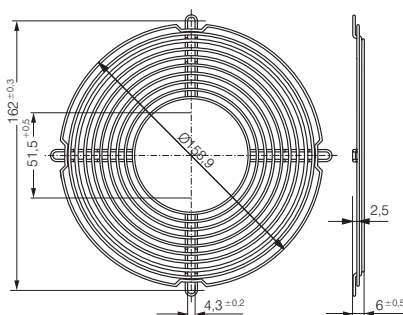
LZ30-9

Fan size 119 X 119



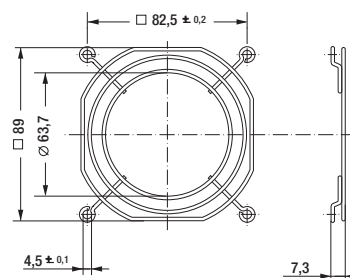
LZ37-2

Fan size Ø 172 X 51



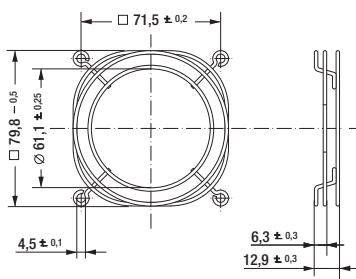
LZ23-6

Fan size 92 x 92



LZ32-7

Fan size 80 x 80



Finger guards



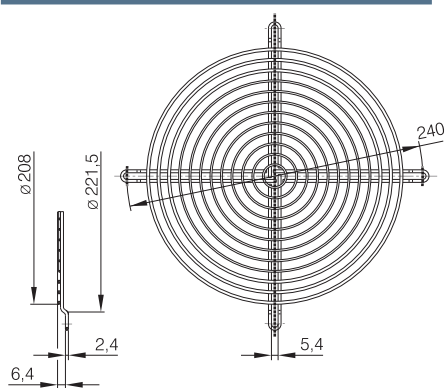
- **Material:** Steel wire, plastic-coated, with silver-metallic gloss

Fan series	Part no.
W3G 200	78128-2-4039

Fan series	Part no.
W1G 250	09418-2-4039
W3G 250	09418-2-4039

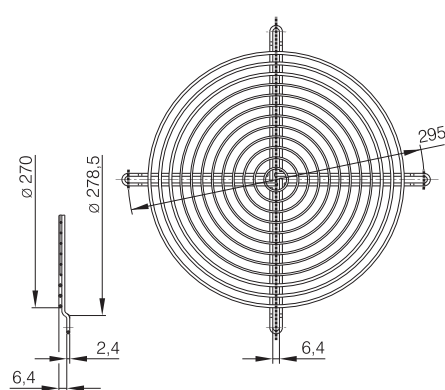
78128-2-4039

Fan size 200

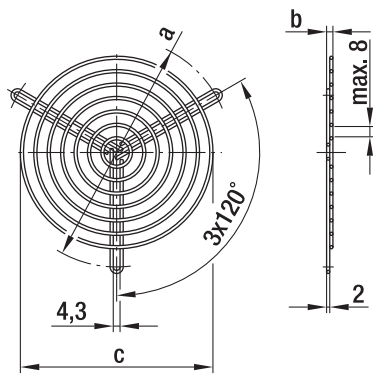


09418-2-4039

Fan size 250



Finger guards

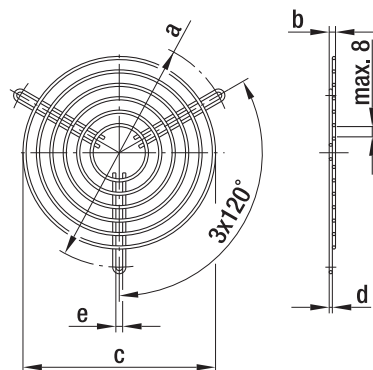


– **Material:** Steel wire

Finger guards for centrifugal blowers with dual inlet

Part no.	Fan size	a	b	c	Coating
83319-2-4039	097 ⁽¹⁾	96.0	3.5	71.0	Phosphated, plastic-coated in RAL no. 9005
09485-2-4039	097 ⁽²⁾	114.0	3.5	88.0	Phosphated, plastic-coated in RAL no. 9005
09500-2-4039	133 / 146	145.0	4.0	122.0	Phosphated, plastic-coated in RAL no. 9005

Subject to change (1) for D2E097-CH (2) for D2E097-B*



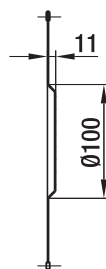
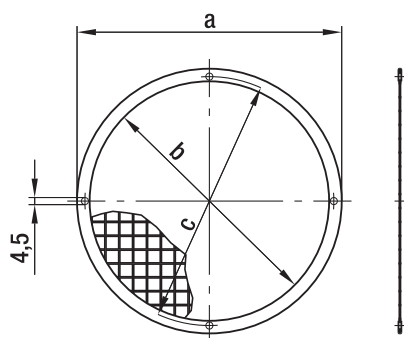
– **Material:** Phosphated steel wire, plastic-coated, silver-metallic gloss

Finger guards for centrifugal blowers with dual inlet (versions with EW motor)

Part no.	Fan size	a	b	c	d	e
35000-2-4039	160	182.0	12.0	144.0	2.4	4.5

Subject to change

Finger guards



- **Material:** Welded screens made of hot-dip galvanized steel, border made of tin (0.4 mm thick)

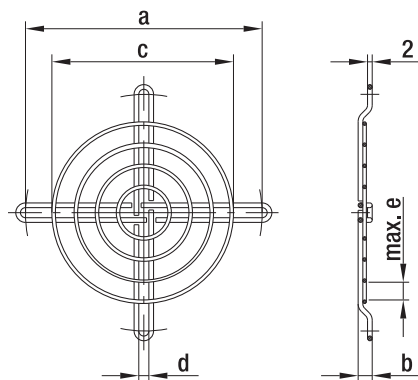
⁽⁴⁾ Fan size 160

Finger guards for centrifugal blowers with single inlet

Part no.	Fan size	a	b	c
09489-2-4039	085 ⁽³⁾	90.0	74.0	84.0
09490-2-4039	108	126.0	110.0	118.0
09494-2-4039	120	140.0	124.0	132.0
09492-2-4039	140 / 146	168.0	152.0	158.0
09503-2-4039	160 ⁽⁴⁾	183.0	170.0	175.0

Subject to change

(3) 3 drilled holes staggered by 120°



- **Material:** Steel wire

Finger guards for centrifugal blowers with single inlet

Part no.	Fan size	a	b	c	d	e	Coating
09603-2-4039	076 / 085	101.0	6.0	79.0	4.3	8.0	Plastic coated, silver-metallic gloss
98214-2-4039	108	120.0	3.5	88.0	4.3	8.0	Plastic coated, silver-metallic gloss
25028-2-4039	140 / 146	162.0	8.5	139.0	4.3	8.0	Galvanized, chromated in blue
17729-2-4039	160	175.0	3.5	139.0	4.6	7.0	Galvanized, chromated in blue

Subject to change

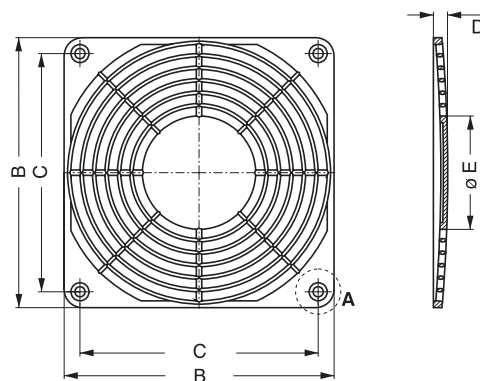
Finger guards



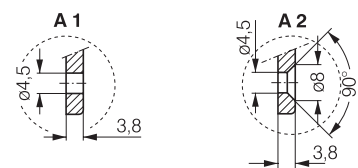
- **Material:** Fiberglass-reinforced plastic
- **Note:** Finger guard according to DIN EN ISO 13857 (previously EN 294).
Plastic guards may not be used for the following models:
8200 JH3 / JH4
3200 JH3 / JH4
4100 NH5 - NH8

Part no.	Mounting	B	C	D	E	Part no.	Mounting	B	C	D	E
LZ28-3	A3	60 ^{-0.5}	50.0 ^{±0.2}	3.0	24	LZ30-5	A2	119 ^{-0.5}	105 ^{±0.2}	6.5	50
LZ32-2	A1	80 ^{-0.5}	71.5 ^{±0.2}	7.0	34	LZ30-6	A4	119 ^{-0.5}	105 ^{±0.2}	6.5	50
LZ32-3	A3	80 ^{-0.5}	71.5 ^{±0.2}	7.0	34	LZ33-1	A2	127 ^{-0.5}	113.5 ^{±0.2}	6.5	50
LZ23-2	A1	92.5 ^{-0.5}	82.5 ^{±0.2}	6.5	46	LZ33-2	A4	127 ^{-0.5}	113.5 ^{±0.2}	6.5	50
LZ23-3	A3	92.5 ^{-0.5}	82.5 ^{±0.2}	6.5	46	Subject to change					

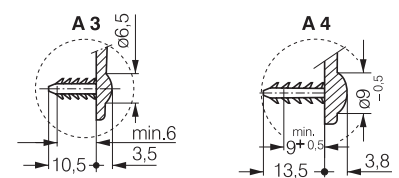
LZ28-3	Fan size 60 x 60
LZ32-2 / LZ32-3	Fan size 80 x 80
LZ23-2 / LZ23-3	Fan size 92 x 92
LZ30-5 / LZ30-6	Fan size 119 x 119
LZ33-1 / LZ33-2	Fan size 127 x 127



Screw connection

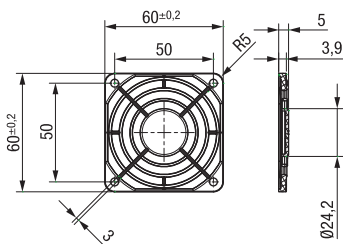


Barbed inserts

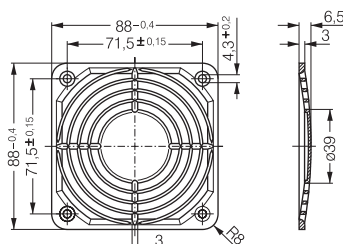


Only suitable for bore hole diameter
4.3 - 4.7.

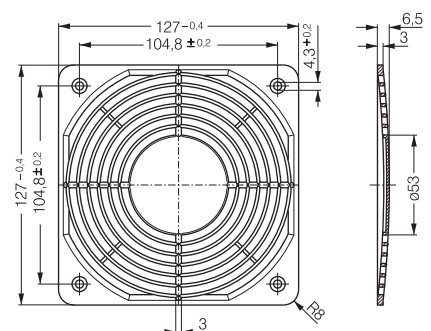
LZ28-3	Fan size 60 x 60
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LZ32P	Fan size 80 x 80
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LZ30P	Fan size 119 x 119
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Finger guards

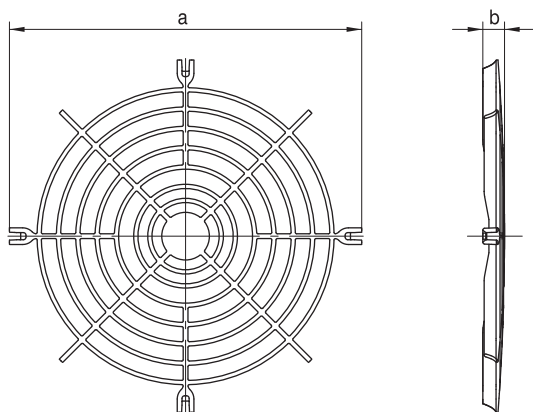
For compact centrifugal modules



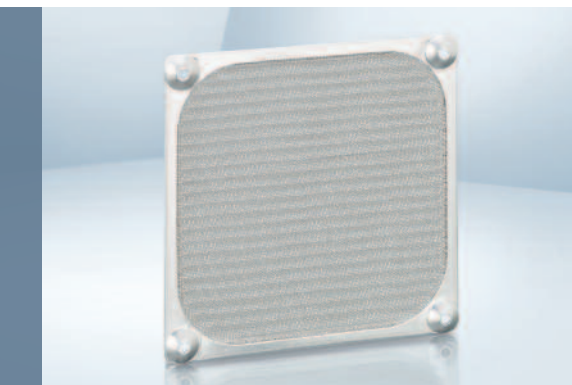
- **Material:** PA plastic, fiberglass-reinforced
- **Highlights:** Flame protection class in line with UL 94V-0

Fan series	Part no.	a	b
RG 190	LZ46-1	133	9.0
RG 220	LZ47-1	166	8.7
RG 225	LZ48-1	158	8.7

Subject to change

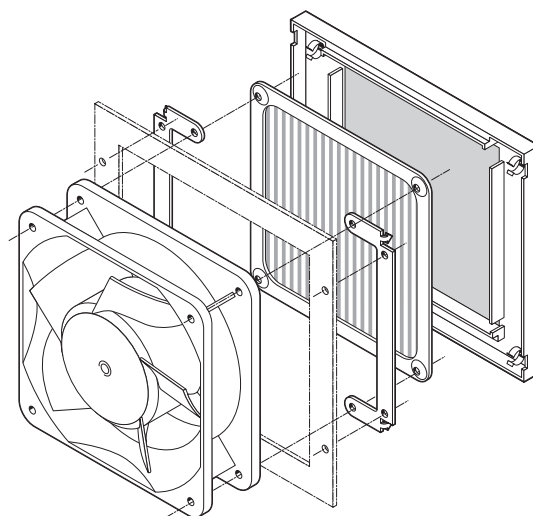


Filter fan guards



- **Material:** Filter guard LZ40 N: black, fiberglass-reinforced plastic with inserted wire mesh LZ60.
Coarse filter LZ60: stainless steel wire mesh
Mounting lug LZ40-1 for mounting

DC fan series	AC fan series
4400 F	AC 4300
4400 FN	9900
4300	4000 N
4400	4000 Z
4100 N	Subject to change



LZ40N	Filter guard	LZ40-1	Mounting lug	LZ60	Coarse filter

Filter fan guards



- **Material:** Guard cover: Injection-molded polycarbonate (PC) with mat surface.
Mounting plate: wire mesh with black powder coating
Filter pad: white, synthetically bonded fibers
- **Note:**
Filter fan guards suitable for fitting on axial fan series in sizes:
60 mm, 80 mm, 92 mm, 119 mm, Ø 172 mm. All filter units fit directly on the existing mounting holes of the fans.
Filter fan guards consisting of 3 parts: external guard cover, internal mounting plate, and replaceable filter pad.
The filter pad can be replaced quickly and easily via a quick release on the guard cover.
The filter pads can be replaced even while the fan is running, as protection is provided by the welded wire mesh.

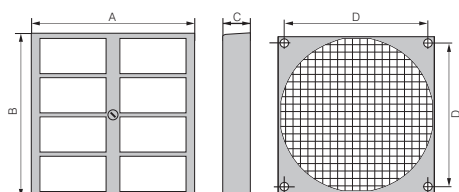
Part no.	Fan size	A	B	C	D	Part no. Replacement filter*
FF60	60 x 60 mm	65	65	13.5	50.0	RF 60
FF80	80 x 80 mm	85	85	14.0	71.5	RF 80
FF92	92 x 92 mm	125	105	17.5	82.5	RF 92
FF119	119 x 119 mm	162	136	18.5	104.5	RF 119
FF172	Ø 172 mm	226	190	19.5	162.0	RF 172

Subject to change

* Replacement filter available only in packages of 5.

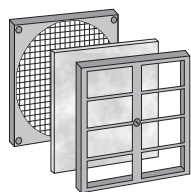
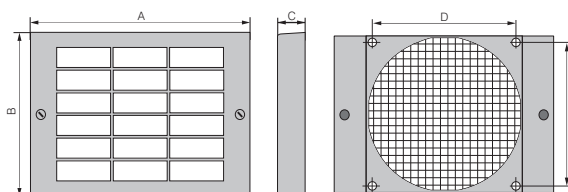
FF60 / FF80

Fan size: 60 x 60 mm
80 x 80 mm



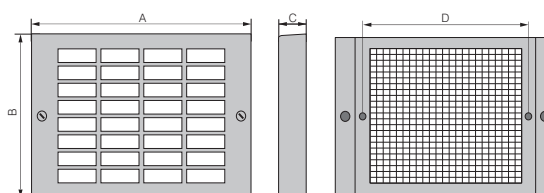
FF92 / FF 119

Fan size: 92 x 92 mm
119 x 119 mm



FF 172

Fan size: Ø 172 mm



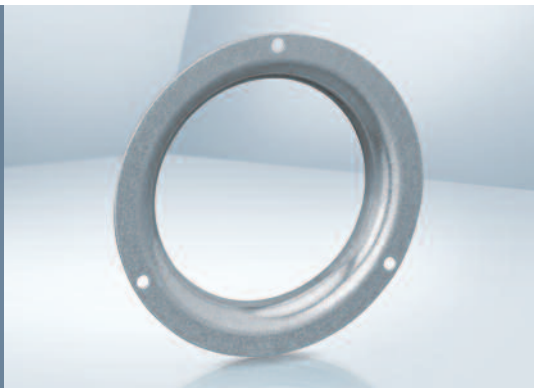
Filter performance

The filter fan guard filters 75% of dust particles with a size of 5-10 microns and can withstand temperatures of up to 100 °C. Filter class G3 according to DIN EN 779. Flame-retardant according to DIN 53438, class F1. When a clean filter is installed, a reduction of air flow of 20-30% is possible.

Inlet rings

For centrifugal fans

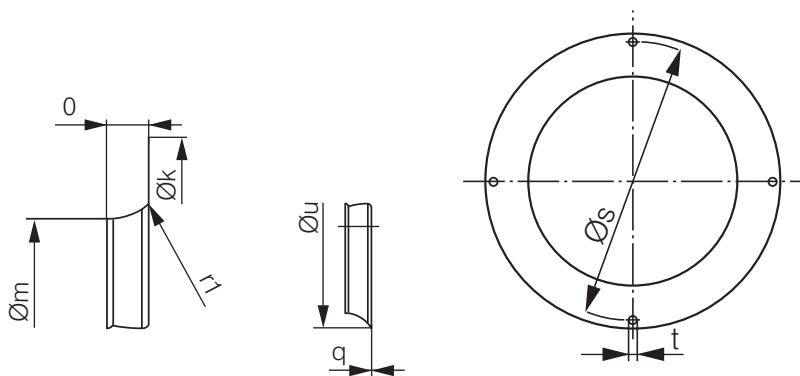
– **Material:** Galvanized sheet steel



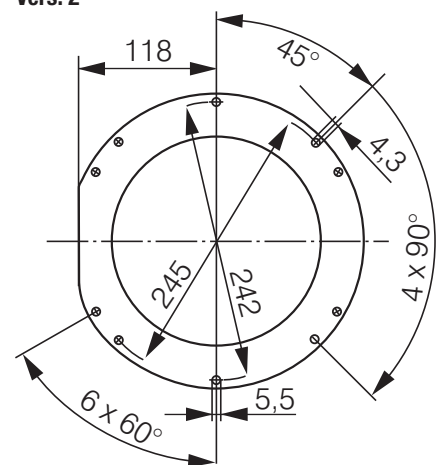
Fan	Part no.	k	m	o	q	r ₁	s	t	u	Vers.
RET 97 (S)	LZ 1000-097	116,0	80,0	10,0	0,80	10,0	108,0	3x4,5	–	1
RER 120 (K)	LZ 1000-120	146,0	94,4	18,0	0,80	16,0	134,0	4x4,5	126,0	1
RER 133 (K)	LZ 1000-133	129,0	87,0	13,0	1,00	8,0	118,0	4x4,5	103,0	1
RER 160 (S)	LZ 1000-160	142,0	100,0	9,0	1,00	8,0	132,0	4x4,5	–	1
RER 175 / 190 (K)	LZ 1000-175	170,0	125,5	14,0	1,25	10,0	158,0	4x4,5	146,0	1
RER 220 (K)	LZ 1000-220	252,0	155,0	21,0	0,80	22,0	–	–	199,0	2
RER 225 (K)	LZ 1000-225	223,0	146,0	28,0	1,50	25,0	210,0	4x4,5	196,0	1

(P) = plastic, (S) = galvanized sheet steel

Vers. 1

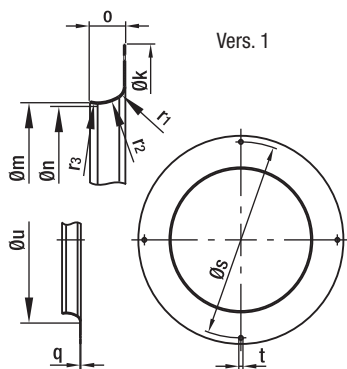


Vers. 2



Inlet rings

For centrifugal fans



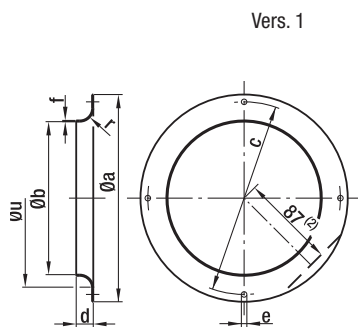
– **Material:** Galvanized sheet steel

Inlet rings for backward curved centrifugal fans

Part no.	Fan size ⁽¹⁾	Vers.	k	m	n	o	q	r ₁	r ₂	r ₃	s	t	u
96120-2-4013	120 (P)	1	146.0	94.4	—	18.0	0.80	16.0	—	—	134.0	4x4.5	126.0

Subject to change

(1) Fan size with key for impeller material: (P) = plastic, (S) = sheet steel, (A) = aluminum



– **Material:** Galvanized sheet steel

Inlet rings for forward curved centrifugal fans

Part no.	Fan size	Vers.	a	b	c	d	e	f	r	u
09560-2-4013	085 ⁽¹⁾	1	92.0	63.4	84.0	6.0	3x4.2	0.80	6.8	—
09563-2-4013	097 ⁽¹⁾	1	116.0	80.0	108.0	10.0	3x4.5	0.80	10.0	—
09566-2-4013	108	1	129.0	87.0	118.0	13.0	4x4.5	1.00	8.0	—
09569-2-4013	120	1	142.0	100.0	132.0	9.0	4x4.5	1.00	8.0	—
09572-2-4013	133	1	150.0	112.0	142.0	12.0	4x4.5	1.00	10.0	—
09576-2-4013	140 / 146	1	170.0	125.5	158.0	14.0	4x4.5	1.25	10.0	—
09588-2-4013	160	1 ⁽²⁾	185.0	130.0	175.0	17.0	4x4.5	0.75	12.0	—

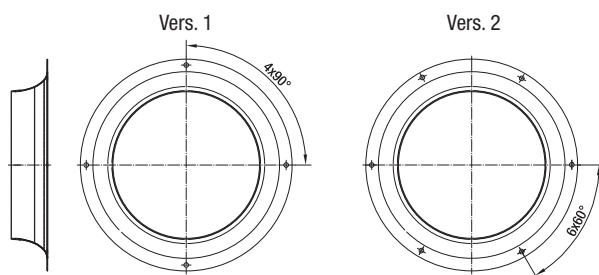
Subject to change

(1) 3 drilled holes staggered by 120°

(2) only for 09588-2-4013

Inlet rings / air filter

For centrifugal fans

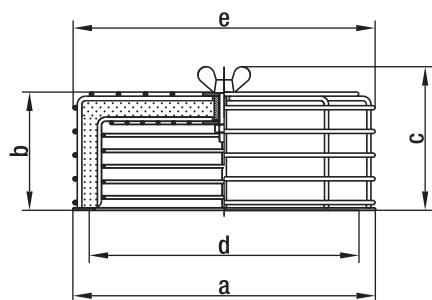


Material: Galvanized sheet steel

Inlet rings without measuring device for backward curved centrifugal fans

Part no.	Fan size	Vers.	Dimensions
09576-2-4013	190	1	See corresponding product page
09609-2-4013	220	2	See corresponding product page
96358-2-4013	225	1	See corresponding product page
96359-2-4013	250	1	See corresponding product page
28000-2-4013	280	1	See corresponding product page
31000-2-4013	310	1	See corresponding product page

Subject to change



- **Material:** Steel wire or sheet steel, plastic coated in RAL no. 9005, black
- **Filter:** Viledon filter type R: PSB / 29 OS (according to DIN 24185)
Separation capacity: < 86%
Efficiency: < 20%
Dust binding capacity: 650 g/m²

Air filters for centrifugal blowers (with die-cast aluminum housing)

Part no.	Fan size	a	b	c	d	e	Replacement filter
95777-1-5171	108 / 120	142.0	66.0	83.0	118-132	145.0	95779-1-5171
95778-1-5171	140 / 146 / 160	185.0	74.0	91.0	158-175	185.0	95780-1-5171

Subject to change

Cables

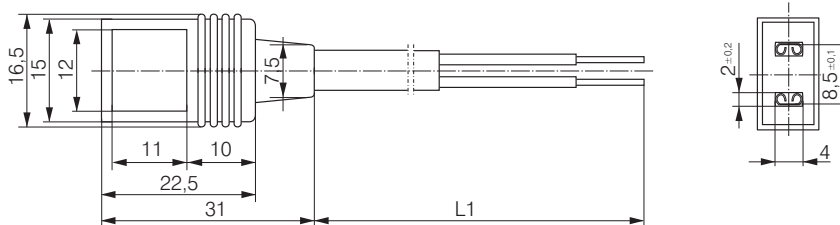
- Cable with molded plug connection in varying lengths.
- Wire end with wire end ferrules, crimped ferrules, or tin-plated.
- Straight or angled plug.
- For all fan types with flat plug 2.8 / 3.0 x 0.5.



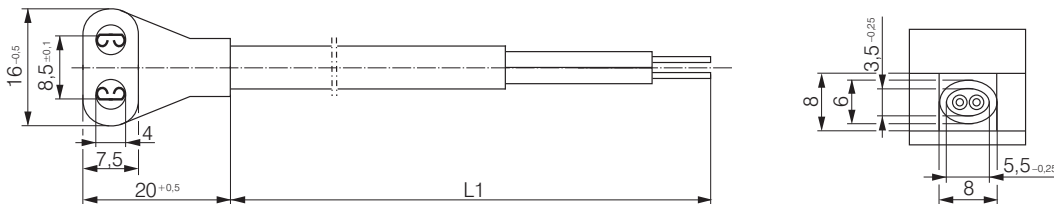
Part no.	L1 (mm)	Wires	Plug	Wire end	Flat push-on receptacle	Application
LZ120	610	0.5 mm ²	G	C	2.8 x 0.5	AC
LZ120-4	2 000	0.5 mm ²	G	A	2.8 x 0.5	AC
LZ120-5	380	0.5 mm ²	W	B	2.8 x 0.5	DC
LZ120-6	610	0.5 mm ²	W	B	2.8 x 0.5	DC
LZ120-11	2 000	0.5 mm ²	G	A	2.8 x 0.5	DC
LZ120-16	800	0.5 mm ²	G	B	2.8 x 0.5	AC
LZ120-18	4 000	0.5 mm ²	G	A	2.8 x 0.5	AC
LZ126	1 000	0.5 mm ²	G	C	2.8 x 0.5	AC
LZ127	1 600	0.5 mm ²	G	B	2.8 x 0.5	AC
LZ130-1	610	0.82 mm ²	G	C	2.8 x 0.5	AC *
LZ140	610	0.73 mm ²	G	B	2.8 x 0.8	AC

* UL-approved

Cable Straight plug (G)

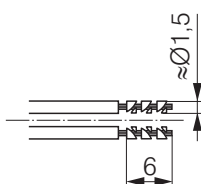


Cable Angled plug (W)



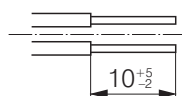
Wire end ferrules

Wire end A



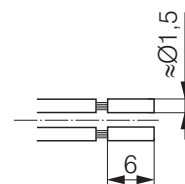
Tin-plated

Wire end B

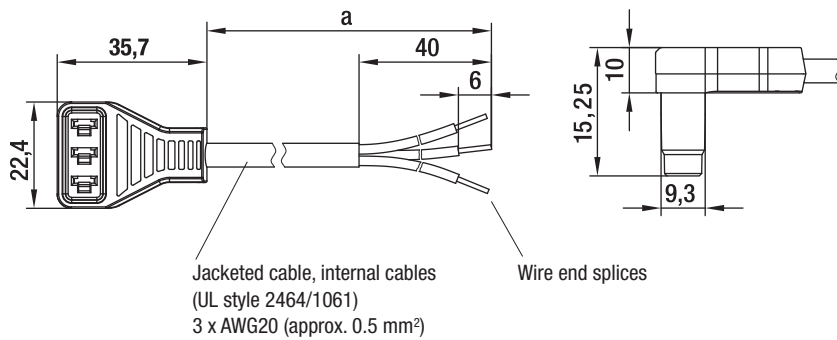


Wire end ferrules

Wire end C



Cable (ESM) / Handheld Programmer



- **Design:** Cable conforms to UL standards sealed plug. Customized cables on request.

Cables for energy-saving motors 115/230 VAC

Part no.	a
13060-4-1040	450
13061-4-1040	1500
Subject to change	



- Easy speed programming
- Battery operated
- User-friendly navigation menu
- Protective cover with folding stand

For Energy Saving Motor (ESM) based products

Part no.

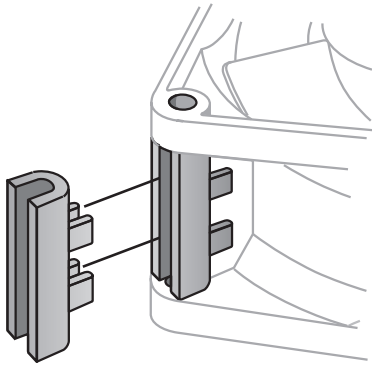
CBC 000-AF08-01

Subject to change

Makes quick work of programming the two ESM adjustable operating speeds. Eliminates the need for a PC, software adapter and second cable. Especially for use in production or by sales representatives. Automatic shut-off function for extended battery life. Mini USB plug for downloading software updates. Batteries, programming cable, and operating instructions included in scope of delivery.

Accessories

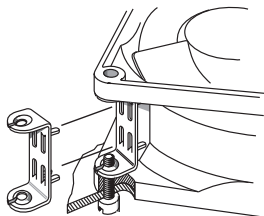
In addition to the accessories and installation parts listed here, ebm-papst also supplies a number of additional, sometimes very special parts for fans. Our company sales team is happy to offer you their expert assistance with all your questions regarding the installation and use of our fans.



Fan series	Part no.
8300	LZ212 / LZ260
8400 N	LZ261
3400 N	LZ261
9000	LZ210
4000	LZ210
4300	LZ212 / LZ260

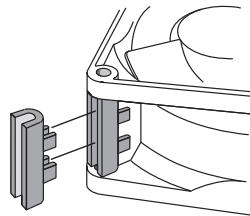
Fan series	Part no.
5100	LZ210
5600	LZ210
5200	LZ210
5900	LZ210
7000	LZ210
VARIOFAN	LZ370

LZ212



Screw clip of rustproof spring steel.
For mounting fans with threaded pin
3.5 DIN EN ISO 1478 (7970).

LZ260/LZ261



Spacer of fiberglass-reinforced plastic.
For mounting with screws through both fan
mounting flanges.

LZ210



Screw clip of hardened steel.
For mounting fans with threaded pin 6-32 UNC
or 3.5 DIN 7970.

LZ370

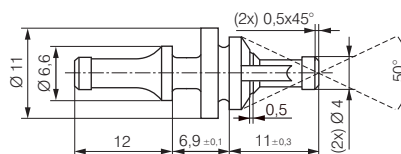


Required performance data:

R_{25}	= 100 K Ω \pm 5% @25°C
B-value	= 4190 \pm 2%
P_{max}	= 0,25 W

Temperature sensor for speed-controlled fan
operation. Temperature range 30...50 °C.

LZ550

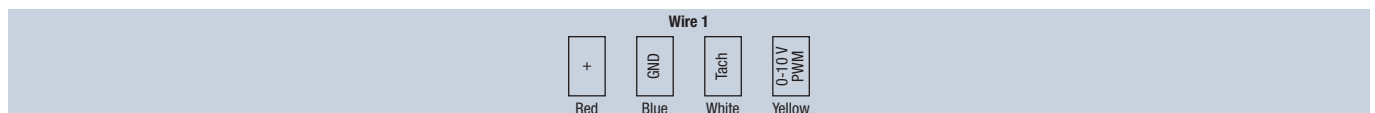
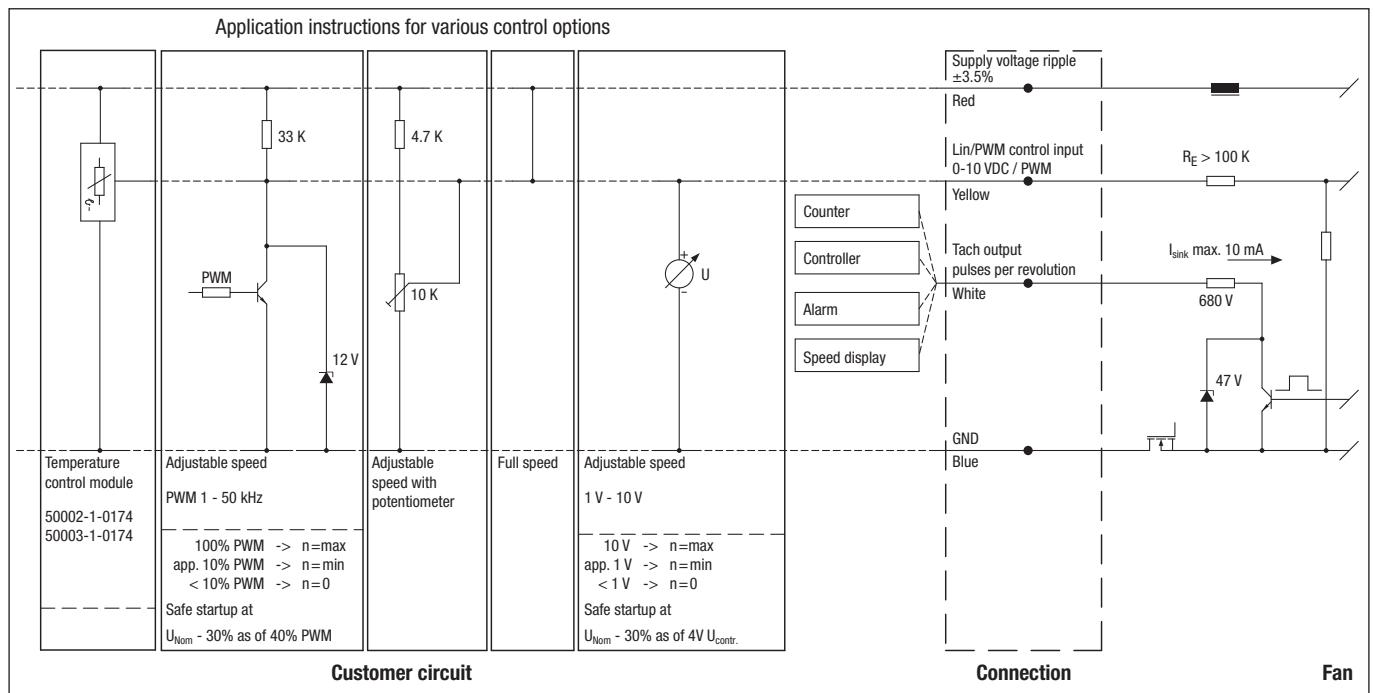


Rubber anti-vibration mounts
for fans with a hole \varnothing of 4.3 \pm 0.2 mm and
flange thickness of 3 to 5.5 mm.
For a carrier plate with a hole \varnothing of 6.5 \pm 0.15
mm and plate thickness of 1 to 2 mm.

Connection diagrams EC E)

Technical features (nominal voltage 24 / 48 VDC):

- Control input 0-10 VDC / PWM
- Tach output
- Reverse polarity and locked-rotor protection
- Motor current limitation
- Voltage-dependent derating
- Thermal overload protection electronics
- Soft startup

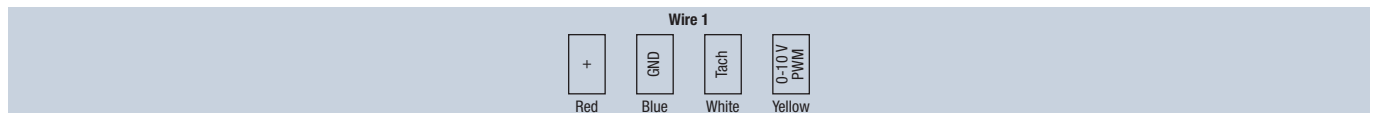
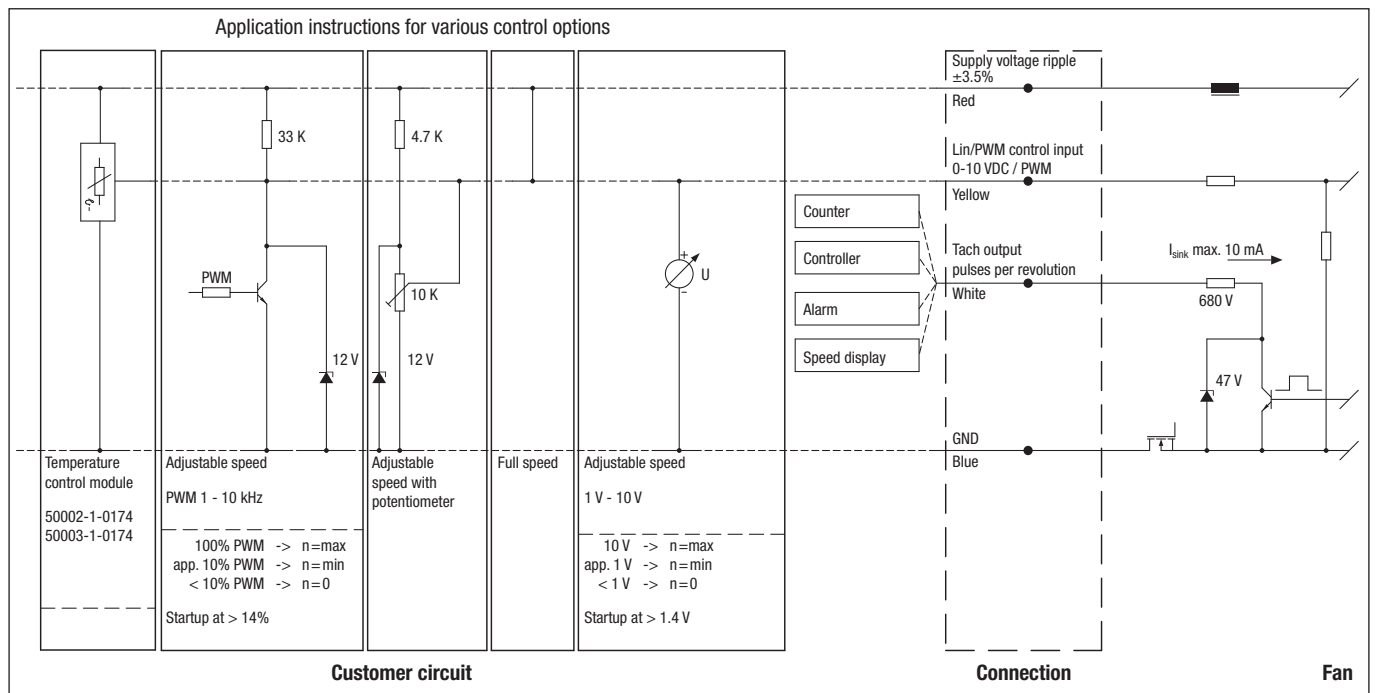


Wire	Connection	Color	Assignment/function	Wire	Connection	Color	Assignment/function
1	+	Red	Supply voltage ripple $\pm 3.5\%$	1	Tach	White	Tach output:
	GND	Blue	GND		0-10 V / PWM	Yellow	Control input

Connection diagrams EC G)

Technical features (nominal voltage 24 / 48 VDC):

- Control input 0-10 VDC / PWM
- Tach output
- Reverse polarity and locked-rotor protection



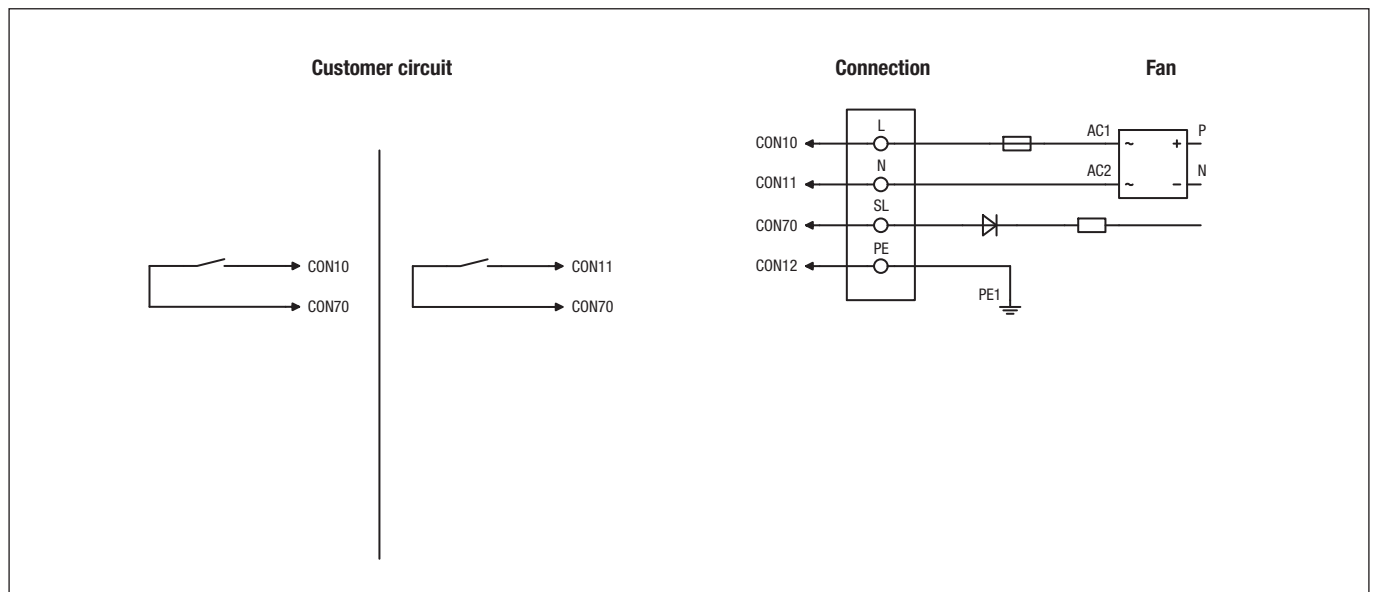
Wire	Connection	Color	Assignment/function
1	+	Red	Supply voltage ripple ±3.5%
	GND	Blue	GND

Wire	Connection	Color	Assignment/function
1	Tach	White	Tach output: 2 pulses/revolution (M1G045/M1G055) 3 pulses/revolution (M1G074/M1G084)
	0-10 V / PWM	Yellow	Control input (impedance 100 kV)

Connection diagrams EC H3)

Technical features (M3G 055 with 2 speed stages):

- Speed setting input (230V)
- Thermal overload protection electronics / motor
- Motor current limitation
- Locked-rotor protection
- Soft startup

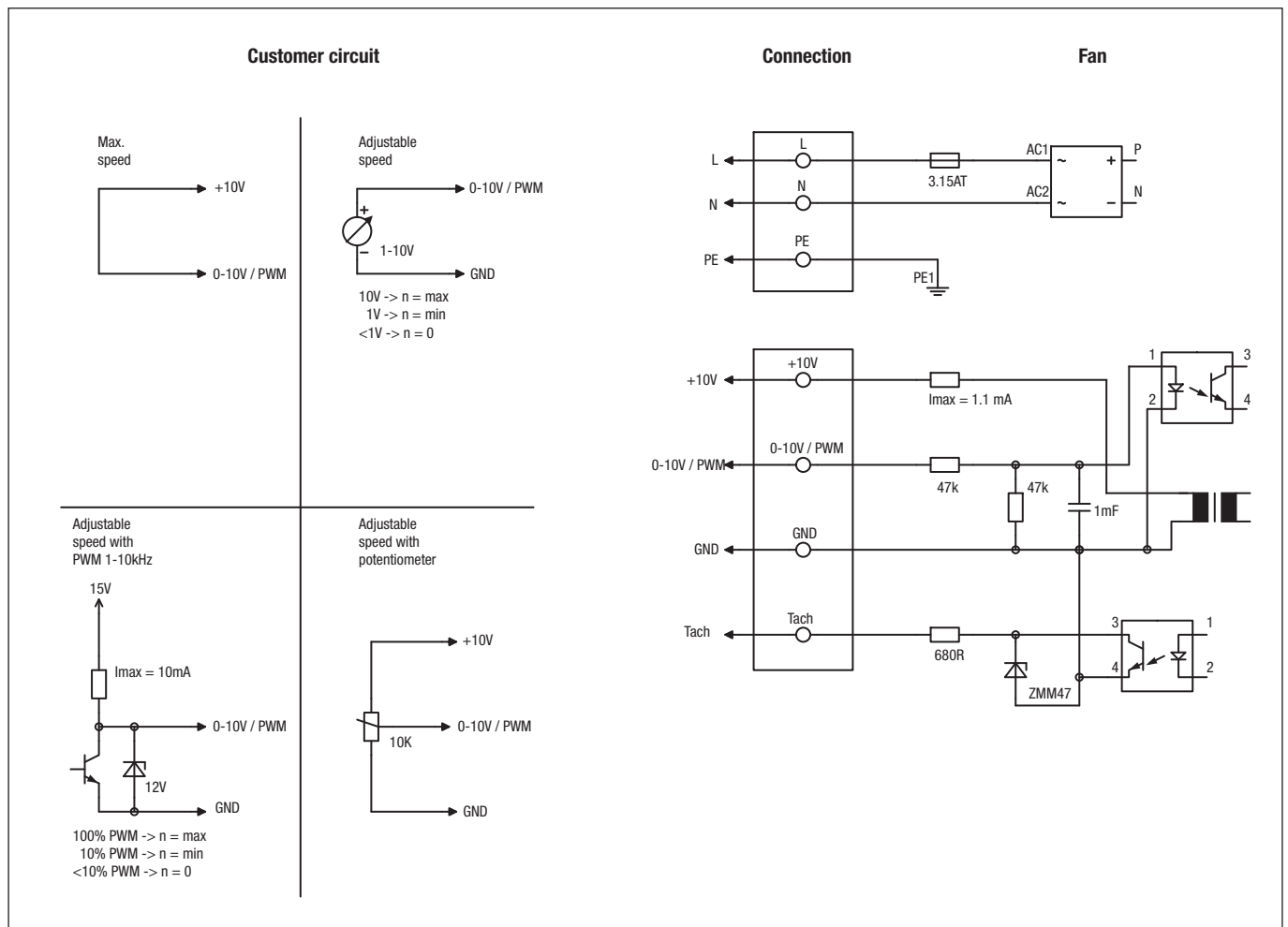


Wire	Connection	Color	Function / assignment
CON10	L	Black	Power supply 230 VAC, 50 - 60 Hz, see type plate for voltage range
CON11	N	Blue	Neutral conductor
CON12	PE	Green/yellow	Ground conductor
CON70	SL	brown	Speed selection: switch open = speed 1; switch closed = speed 2

Connection diagrams EC H4)

Technical features (M3G 055 speed-controlled):

- Output 10 VDC Max. 1.1 mA
- Tach output
- Thermal overload protection electronics / motor
- Motor current limitation
- Soft startup
- Locked-rotor protection
- Control input 0-10 VDC / PWM
- Control interface with SELV potential safely disconnected from the mains



Connection	Color	Function / assignment
L	Black	Power supply 115/230 VAC, 50 - 60 Hz, see type plate for voltage range
N	Blue	Neutral conductor
PE	Green/yellow	Ground conductor
+10V/max.1.1mA	Red	Voltage output +10 V / 1.1 mA, electrically isolated, not short-circuit-proof
Tach	White	Tach output: Open collector, 1 pulse per revolution, electrically isolated
0-10V / PWM	Yellow	Control input 0-10 V or PWM, electrically isolated
GND	Blue	GND - Connection for control interface

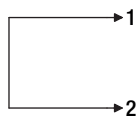
Connection diagrams EC J5)

Technical features (nominal voltage 24 / 48 VDC):

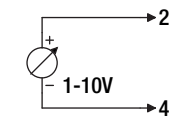
- Control input 0-10 VDC / PWM
- Tach output
- Reverse polarity and locked-rotor protection
- Motor current limitation
- Line undervoltage detection
- Soft startup

Application instructions for various control options

max.
speed

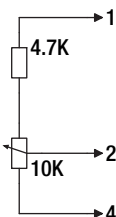


Speed setting

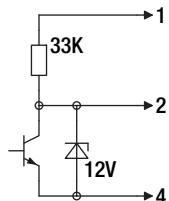


10V -> n = max
1V -> n = min
<1V -> n = 0
safe start-up at
Unom -30%
as of 4V Ucontr.

Speed setting with
potentiometer

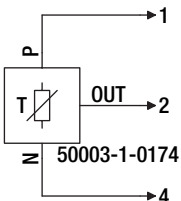


Speed setting with
PWM 1-10kHz



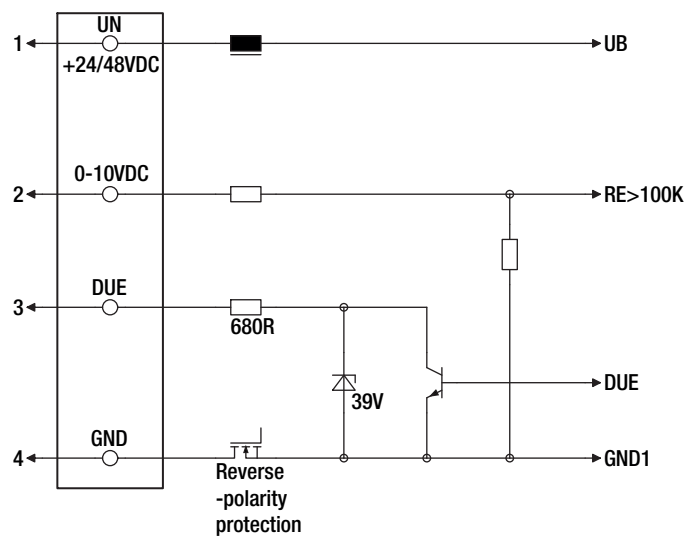
100% PWM -> n = max
10% PWM -> n = min
<10% PWM -> n = 0
safe start-up at
Unom -30%
as of 40% PWM

Setting of values via
temperature controller



T < 10°C -> n = 0
T > 45°C -> n = max

Customer circuit



Connection

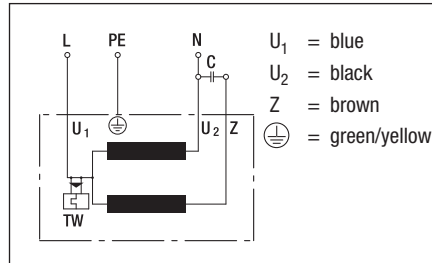
Fan

Wire	Connection	Color	Assignment/function
1	UN +24/48 VDC	Red	Power supply 24/48 VDC, supply voltage ripple $\pm 3.5\%$
2	0-10 VDC	Yellow	Control input Re >100 K
3	Tach	White	Tach output, 3 pulses per revolution, Isink max. = 10 mA
4	GND	Blue	Reference ground

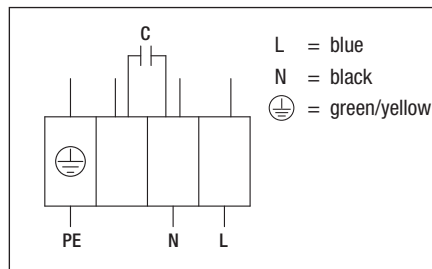
Connection diagrams AC

A1) / A3) / C2)

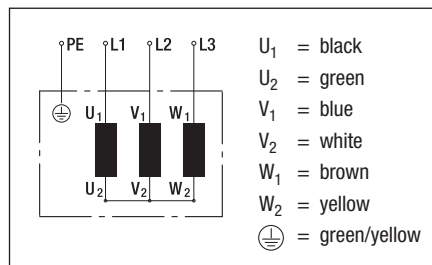
A1) Single-phase capacitor motor (1~ 115/230 VAC power line) with thermal overload protector wired internally



A3) Single-phase capacitor motor (1~ 115/230 VAC power line) with thermal overload protector wired internally

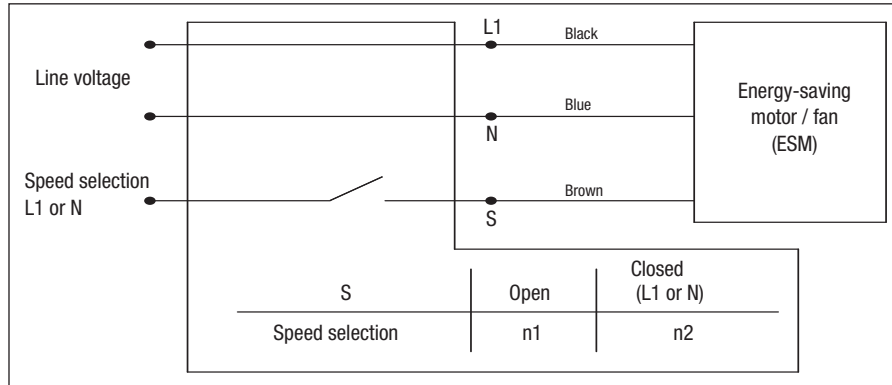


C2) Star connection (3~ 400 VAC power line) without thermal overload protector



Connection diagrams AC J7)

J7) Energy-saving motor (ESM) (1~ 115/230 VAC power line)



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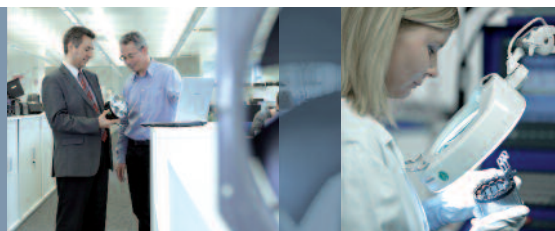
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