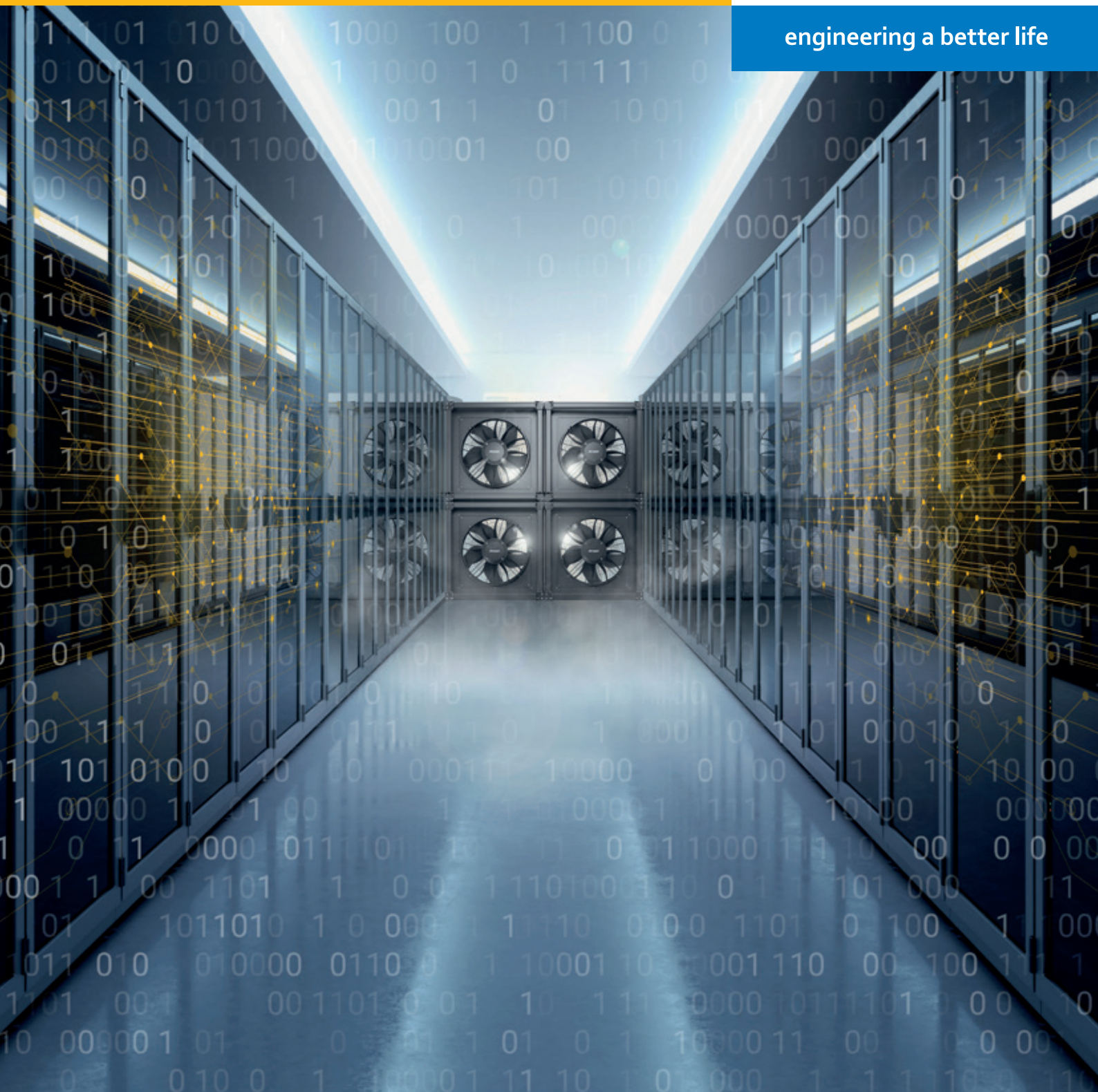


Discover ebm-papst
in the *data center*.

ebmpapst

engineering a better life



About ebm-papst.

As the leading supplier of ventilation and drive technology, ebm-papst is a highly respected engineering partner in many industries. With over 20,000 different products, we can provide the right solution for just about any challenge. As the logical next stage in the development of our high-efficiency GreenTech EC technology, we believe that sustainably oriented industrial digitization offers the greatest future prospects for our customers. With GreenIntelligence, ebm-papst already offers intelligently interconnected complete solutions that are unrivaled worldwide and save energy costs and emissions.

ebmpapst

engineering a better life

Six reasons that make us the ideal partner:

Our systems expertise: as experts in advanced motor technology, electronics and aerodynamics, we provide system solutions from a single source.

Our spirit of invention: our 600 engineers and technicians will develop a solution that precisely fits your needs.

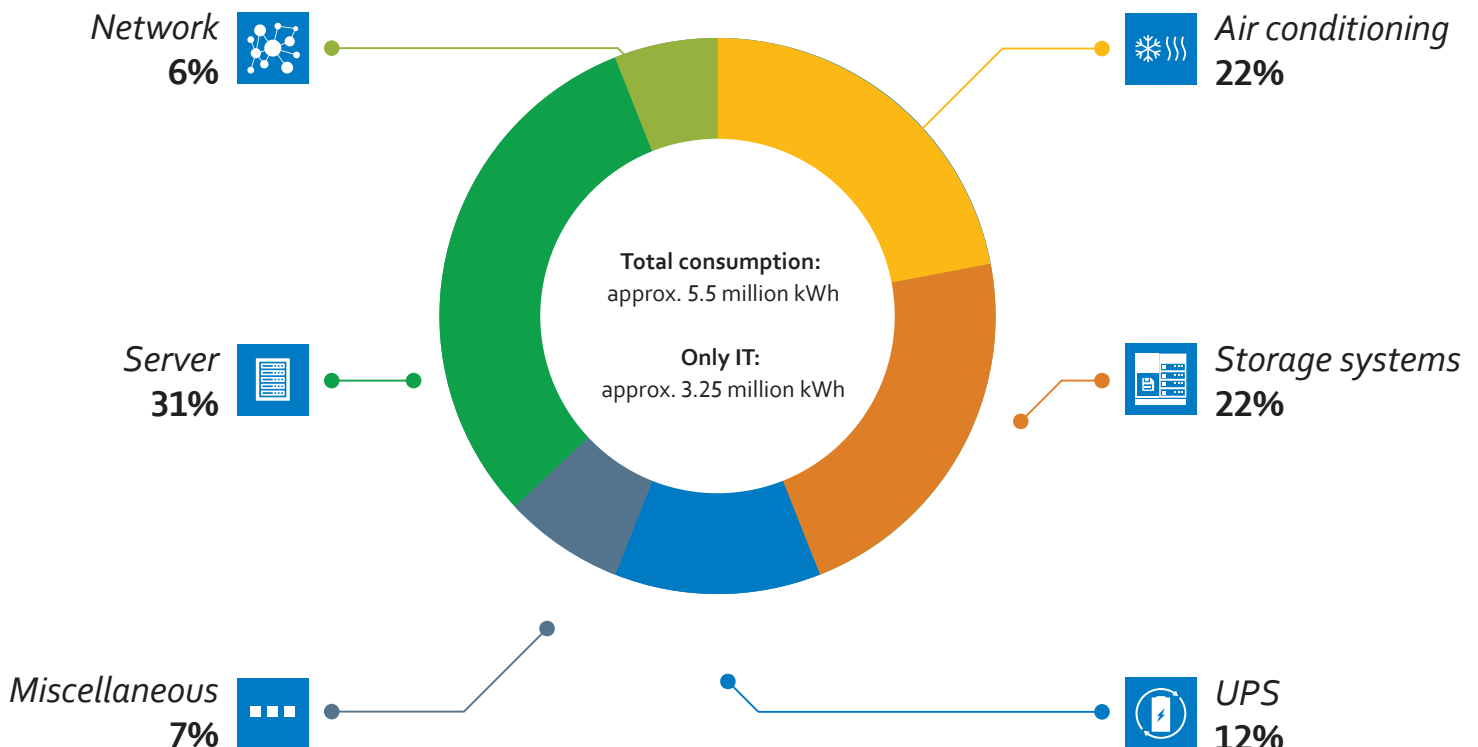
Our lead in technology: with our EC technology and GreenIntelligence, we combine the highest energy efficiency with the advantages of IoT and digital networking.

Closeness to our customers: at 51 sales offices worldwide.

Our standard of quality: our quality management is uncompromising, at every step in every process.

Sustainability as a way of life: we assume responsibility with our energy-saving products, environmentally-friendly processes, and social commitment.

Distribution of the current consumption of a typical data center of approx. 1,000 m²





Towards a more sustainable future **through digital technology.**

Our GreenIntelligence philosophy combines two of our most important convictions: That we not only want to work economically, but also in a resource-friendly and environmentally friendly way, and that the possibilities of digitalization give us the tools we need to achieve this goal. Digital technology enables practical sustainability – in our work and for our customers. We are taking responsibility with our energy-saving products, environmentally friendly processes, and social commitment.

Making engineers *happy*.

Why do our customers look so happy? Because when it comes to the Internet of Things and the digital transformation, we provide them with a clear competitive edge with GreenIntelligence. As intelligent control and interconnection of fans, drives, and systems makes applications more powerful, processes more efficient, and sustainably reduces energy costs and emissions.

With our comprehensive range of services, we accompany you and your projects through every step in the process, from your application's planning to its deployment. Make use of our experts' product expertise to offer your customers smart and forward-looking features. Or use our digital tools for an optimum choice of products. This will make your processes more efficient and get your products to market faster.

Now you know why ebm-papst makes engineers happy.



Count on *sustainable solutions.*

Our intelligent technologies combine high-efficiency ventilation and drive technology with sophisticated sensors and high-performance electronics. From data acquisition and transfer, including server and cloud connectivity, to data analysis with application-specific algorithms: from us you get everything from a single source. The possibilities for your applications are virtually unlimited.

Together, we will develop the solution that sustainably lowers costs, saves energy, and reduces emissions, whether that's demand-based operation, simple remote monitoring, or predictive maintenance. In this way, we can extend the service life of products and systems, reduce current consumption by up to 70%, and

help shrink your carbon footprint. Finally, we also improve conditions in living and working environments and help to increase the quality of indoor air.

This is in keeping with our GreenIntelligence philosophy, in which economical thinking, intelligent ideas, and sustainable solutions go hand in hand: products and solutions that save energy ensure more environmentally friendly processes, which are also extremely pleasing from an economic point of view.

Here is how much GreenIntelligence there is in the data center

- Intelligently connectible solutions
- Data acquisition and processing based on sensors and electronics
- Data transfer including interfaces, protocols, and server and cloud connectivity
- Analyzing data with our own software, algorithms, and product expertise
- Continuous development of new technologies and solutions
- Digital tools for optimal product selection, e.g. FanScout and on-line portal
- Interconnection possible via Modbus, WiFi, Ethernet, Bluetooth, or NFC



Digitalization *and connectivity.*

Being able to evaluate information in real time and simultaneously draw on data and experience gained from over 50 years of motor technology, electronics, and aerodynamics provides the basis for being able to give you the crucial competitive advantage as a customer. With the help of our intelligent products, we support you during the digital transformation: from reactive and proactive service to preventive and predictive maintenance!



1. Visualization

Keep an eye on your data at all times from anywhere.



2. Preventive maintenance

The aim of preventative maintenance is to prevent failures and the associated downtimes. In keeping with Industry 4.0, the fan is equipped with a certain fundamental level of intelligence that enables it to inform the user about the next maintenance work as a preventive measure. In conjunction with optional vibration detection, the preventive maintenance feature ensures that critical vibration velocities can be detected and suppressed. This results in a longer service life for the entire system and thus a lower TCO.



3. Predictive maintenance

Predictive maintenance relies on high-precision sensors combined with integrated intelligence to be able to find out exactly about the actual condition of the fan. Based on this data, precise information about the remaining service life is possible depending on the relevant usage behavior.

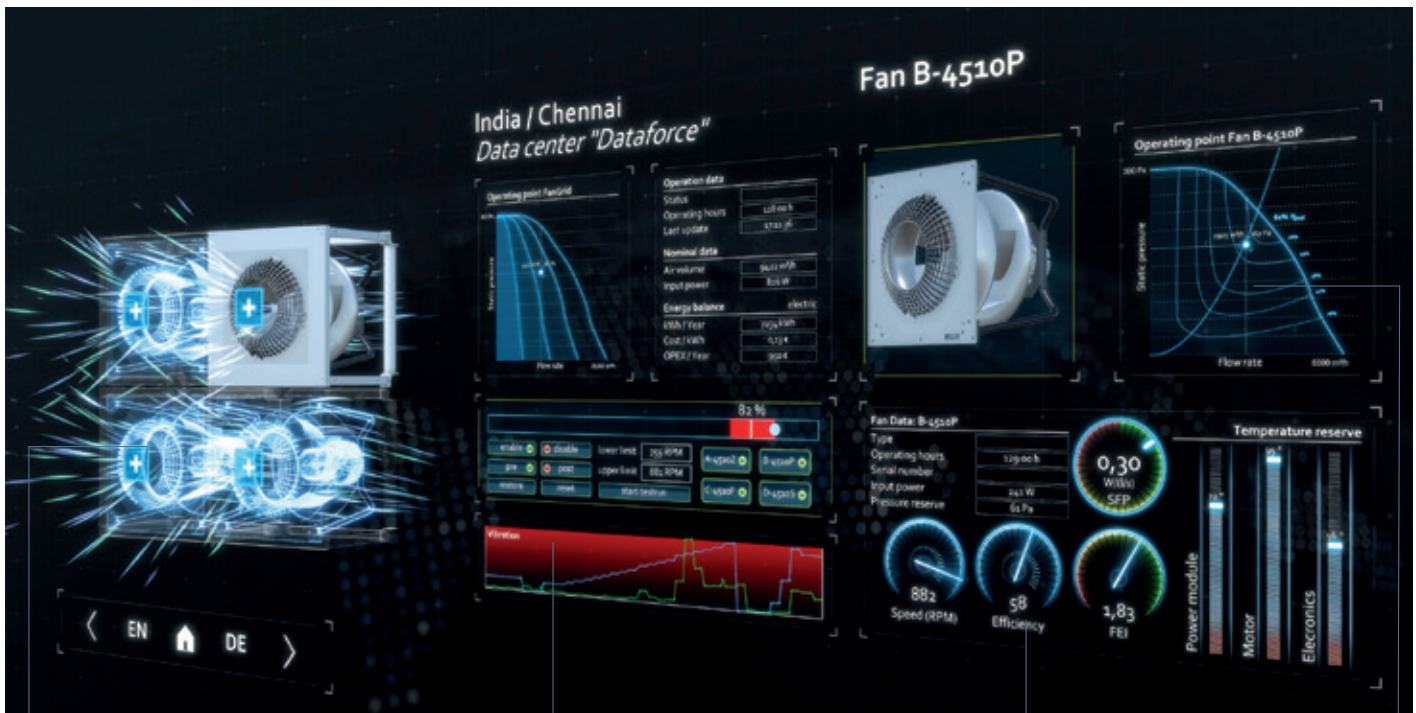


GreenIntelligence. *The next level of green*

- + Intelligently connectible solutions
- + Data insight thanks to attaching sensors and other data sources
- + Open protocols and multi-cloud connectivity
- + Data analysis and AI-controlled solution optimization
- + Rapid development of new technologies and solutions
- + Digital tools for optimal product selection, e.g. FanScout and online portal

Visualization

Keep an eye on your data at all times from anywhere.



Standard parameters

- The most important fan parameters such as various temperature values, speed, and power consumption are available at any time for further processing.

Time savings during commissioning

- An optional controller enables FanGrids to be put into operation easily with the help of auto-addressing and then controlled.

Independent control

- Controlling the required air flows or pressures precisely – no problem at all with optional sensors!

Increased operational reliability

- **Optional:** Monitoring of vibration velocities using high-precision vibration sensors. Impermissible vibration velocities can be suppressed automatically.

Preventive maintenance



Depending on the installation situation, increased vibration levels may occur in the resonant range in the end device for a wide variety of reasons. Improper transportation/handling or an imbalance caused by soiling of the impeller may play a role here.

If the fan is operated frequently at excessive vibration levels, the bearings can be damaged and premature failures occur. Although these vibrations can be measured during commissioning of the system, they cannot be easily eliminated. ebm-papst EC fans can optionally detect these resonances using vibration sensors installed internally and prevent operation in these critical areas. After the commissioning routine has been performed for the first time, the integrated software detects critical vibration velocity ranges and suggests these speed ranges for suppression. If desired, all settings can be adapted manually using MODBUS-RTU.



Resonance detection

- + Increased functionality**
 - Easy condition monitoring
 - Test start-up during commissioning
 - Specification of limit values and suppression of critical speed ranges
- + Intuitive operation**
 - Full control over all settings and activities
 - Hardware and software from a single supplier
- + Longer service life and lower maintenance costs**
 - Speed remains in uncritical resonant range
 - Warning and/or shutdown in the event of continuous imbalance

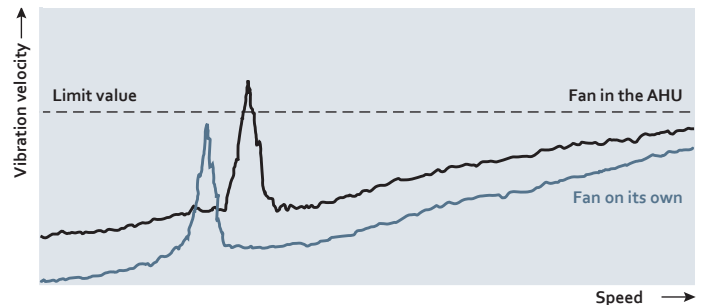


Fig. 1: Fan installed in end device

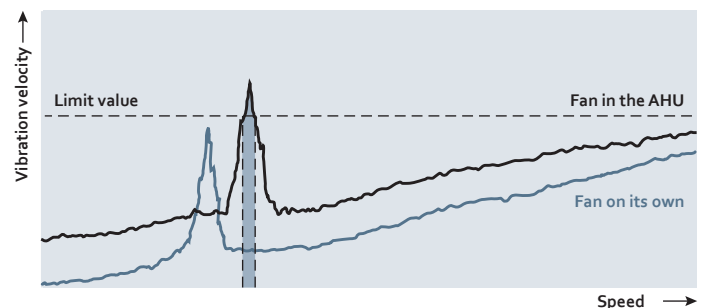


Fig. 2: Vibration behavior with speed range that has been omitted

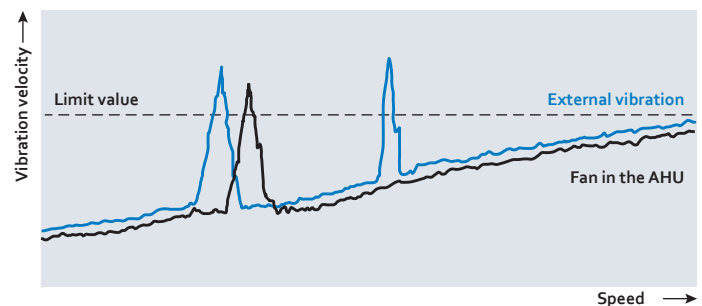
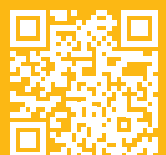


Fig. 3: Fan in end device with additional external vibration source, e.g. compressor

Would you like to find out more?

Further information can be found at:
ebmpapst.com/monitoring



Predictive maintenance



Objective:

- Ensuring the availability of critical infrastructures
- Reduction of downtimes due to servicing
- Maximum reliability through effective monitoring

Implementation:

- Generation, use, and interpretation of sensor data from all relevant fan components
- Sending of an automatic fault message so that service assignments can be planned as required

Your advantages:

- Avoidance of unnecessary downtimes thanks to timely reactions
- Reduction of maintenance costs to a minimum using improved planning of service assignments
- Long-term improvement of the quality and performance of the application by analyzing the data

Creating transparency



Reducing costs



Minimizing downtimes



Harmonic minimization

External passive filters.

Passive current harmonics filter

These filters are an inexpensive solution for reducing current distortion reactive power. To ensure smooth operation, they have to be coordinated to the respective variable frequency drive topology, though. In the field, this can lead to project delays or even failure of individual components for technical reasons. Thanks to cooperation with leading filter manufacturers, ebm-papst can provide predefined passive filters for all electronics in the range from 4 kW to 12 kW.

These were optimized and tested for use with our EC fans and can be ordered as a complete product. No further designs, tests, approvals, or other field tests are necessary. This eliminates a potential source for project delays, which increases planning reliability.



External passive filter

- + 5%–9% THD(I) at rated output
- + Coordinated for use with ebm-papst EC fans
- + Up to 12 kW per filter
- + All from a single supplier
- + Scalability
- + No project delay

Apparent solution for reducing apparent power:

To optimize the resulting THD(I) value of a poor or non-adapted filter to the target values of a specification, sometimes “solutions” are offered which only offer benefits at first glance:

$$THDi = \sqrt{\sum_{n=2}^{40} \left(\frac{I_n}{I_1}\right)^2}$$

Instead of reducing I_{n1} , attempts are sometimes made to increase I_1 (for example by connecting additional capacitors in parallel)

- Mathematically correct, but not an advantage in practice, as the performance factor falls
- Harmonic minimization added value (see P. 11/12) is lost

Do you need external passive filter solutions?

We work together with leading filter manufacturers to be able to offer you external passive filters suited to our fans and your application.

You can obtain further information from your personal contact person.

Harmonic minimization

3-phase active PFC.

EC fans are used on a large scale to ensure that the heat generated in data centers is dissipated efficiently. In order to avoid overdimensioning the power supply and to meet the corresponding requirements with regard to current and voltage harmonics, ebm-papst has developed the 3-phase active PFC fan.

The approach of the 3-phase active PFC fan technology from ebm-papst is to prevent current harmonics from occurring at all instead of filtering them out afterwards with additional components, which involves a lot of effort.

Integrated active PFC

- + THD(I) $\leq 5\%$ over a broad power range
- + Minimal current harmonics, even in partial-load operation
- + Parallel connection of multiple fans is no problem
- + Perfect interaction of efficient centrifugal fans and electronics with active PFC
- + One product and one supplier
- + No additional wiring work required "plug & play"
- + Industry leading power factor of up to 0.998



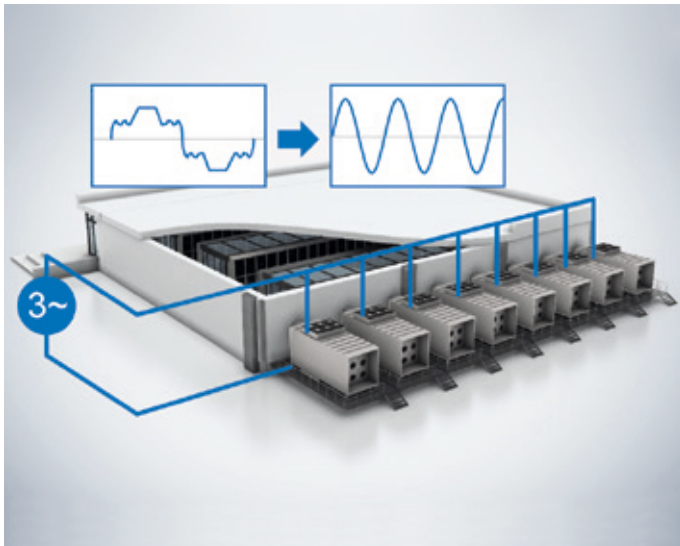
	Third-party provider passive filter	ebm-papst passive filter	Third-party provider external active filters	ebm-papst integrated active filter
Responsibility for system design	Customer	ebm-papst	Customer	ebm-papst
THD(I) at full load	> 5%	> 5%	< 5%	< 2%
THD(I) at partial load	>> 5%	>> 5%	> 5%	< 5%*
Plug & play	-	+	-	++
Power consumption per filter	Unknown/not specially designed for EC fans	4–12 kW	min. 60 kW**	up to 3.2kW
Installation space	- -	- -	-	+
Wiring work	- -	- -	-	++
Installation work	-	-	- -	++
Delivery and consultation	Third-party provider	ebm-papst	Third-party provider	ebm-papst

*for almost the entire control range.

** only suitable for particularly large installations.

Harmonic minimization

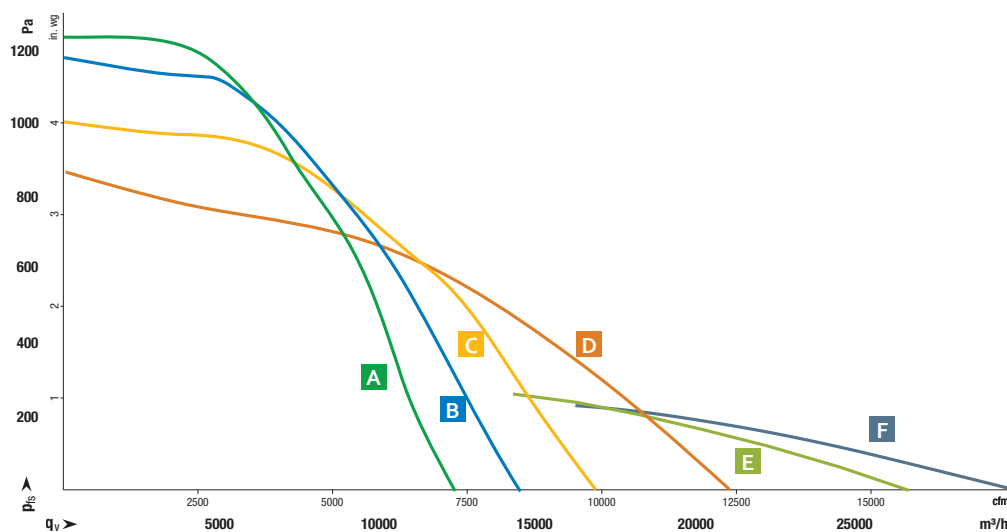
3-phase active PFC.



Minimizing disruptive harmonics

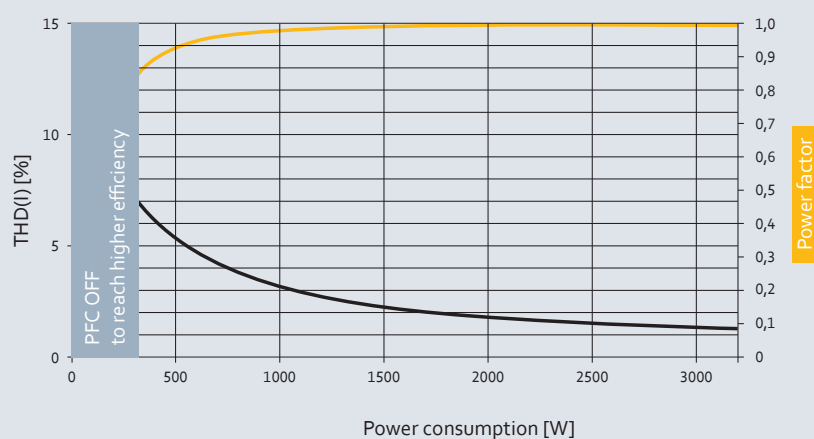
When operating speed-controlled drives, regardless of whether it's an AC/PM motor with variable frequency drive or EC drives, current harmonics are produced in principle. In conjunction with an insufficiently dimensioned power supply, these current harmonics can lead to problems in critical infrastructures. To reduce these current harmonics, appropriate measures must be introduced for the appropriate application.

Good news: all external measures are now no longer required. To prevent disruptive harmonics from occurring in the first place, ebm-papst has developed a solution in which the harmonic filter is already integrated: the 3-phase active PFC (power factor correction). Infrastructure components for energy and emergency power supply, e.g. transformers or emergency power generators, can be designed to be smaller and thus more cost-effective. This is a topic of particular importance in connection with FanGrid applications or precision air-conditioning units in data centers.



Characteristic curve	Type	Size	Nominal voltage range	Frequency	Speed n	Power consumption P_{ed}	Input current I	Permitted ambient temperature*	Weight
			V AC	Hz	rpm	W	A	°C	kg
A	K3G 450-PA21-C1	450	3-380-480	50/60	2,200	3,190	4.6	-25 to +40	42
B	K3G 500-PA26-C1	500	3-380-480	50/60	1,810	3,100	4.5	-25 to +40	42
C	K3G 560-PB22-C1	560	3-380-480	50/60	1,470	3,060	4.4	-25 to +40	61
D	K3G 630-FB28-C1	630	3-380-480	50/60	1,300	2,950	4.2	-25 to +40	62
E	W3G 800-LU40-C3	800	3-380-480	50/60	1,000	2,100	3.0	-25 to +60	48
F	W3G 910-LU39-C3	910	3-380-480	50/60	900	2,000	2.9	-25 to +60	53

*Other temperature ranges and data sheets on request. Subject to change.



Current harmonics

The result: $THD(I) \leq 5\%$ over a broad power range.

THD(I) stands for Total Harmonic Distortion of Current and indicates the amount of current distortion. The value is defined as the quotient (in %) of the rms value of the harmonic currents relative to the fundamental.

More information in the white paper:

Scan the code or visit ebmpapst.com/activepfc



Potential for savings when designing a data center

In order to illustrate the potential for savings due to ebm-papst 3-phase active PFC fans, the costs of the industry standard solution were compared to the costs of the 3-phase active PFC fans when designing a data center. In one case, a data center with an IT load of 3 MW was designed with 220 standard fans for cooling, while, in a second case, use was made of the same number of 3-phase active PFC fans. On account of higher THDU and THD(I) values with the standard solution it was necessary to greatly overdimension the transformer and the emergency power generators in comparison with the 3-phase active PFC fans in order to avoid exceeding the permissible limit value framework for voltage harmonics.

By altering the design of the data center it proved possible to significantly cut the costs. The table below compares the costs for both solutions. It becomes apparent that the additional expense for the 3-phase active PFC fans is more than offset by being able to downsize the transformers and generators. In the final analysis this resulted in a total saving of €832,500 corresponding to around 38% lower costs.

Factors not taken into account in the calculation

The increased amount of space required for an overdimensioned system and the associated construction costs and, if necessary, rental costs were not taken into account in the calculation. In the case of 3-phase active PFC fans, smaller dimensioning of cables and switchgear is possible. So in real terms the cost savings are even higher!

Item number	Active PFC	Industry standard
System costs	€ 1,417,595	€ 1,417,595
Active PFC fans	+ € 66,000	-
Transformer	+ € 125,000	+ € 187,500
Alternator	€ -280,000	+ € 608,000
Total	€ 1,380,595	€ 2,213,095
Saving in €		€ 832,500
Saving in %		37.6 %

Do you need further data about our active PFC fans?

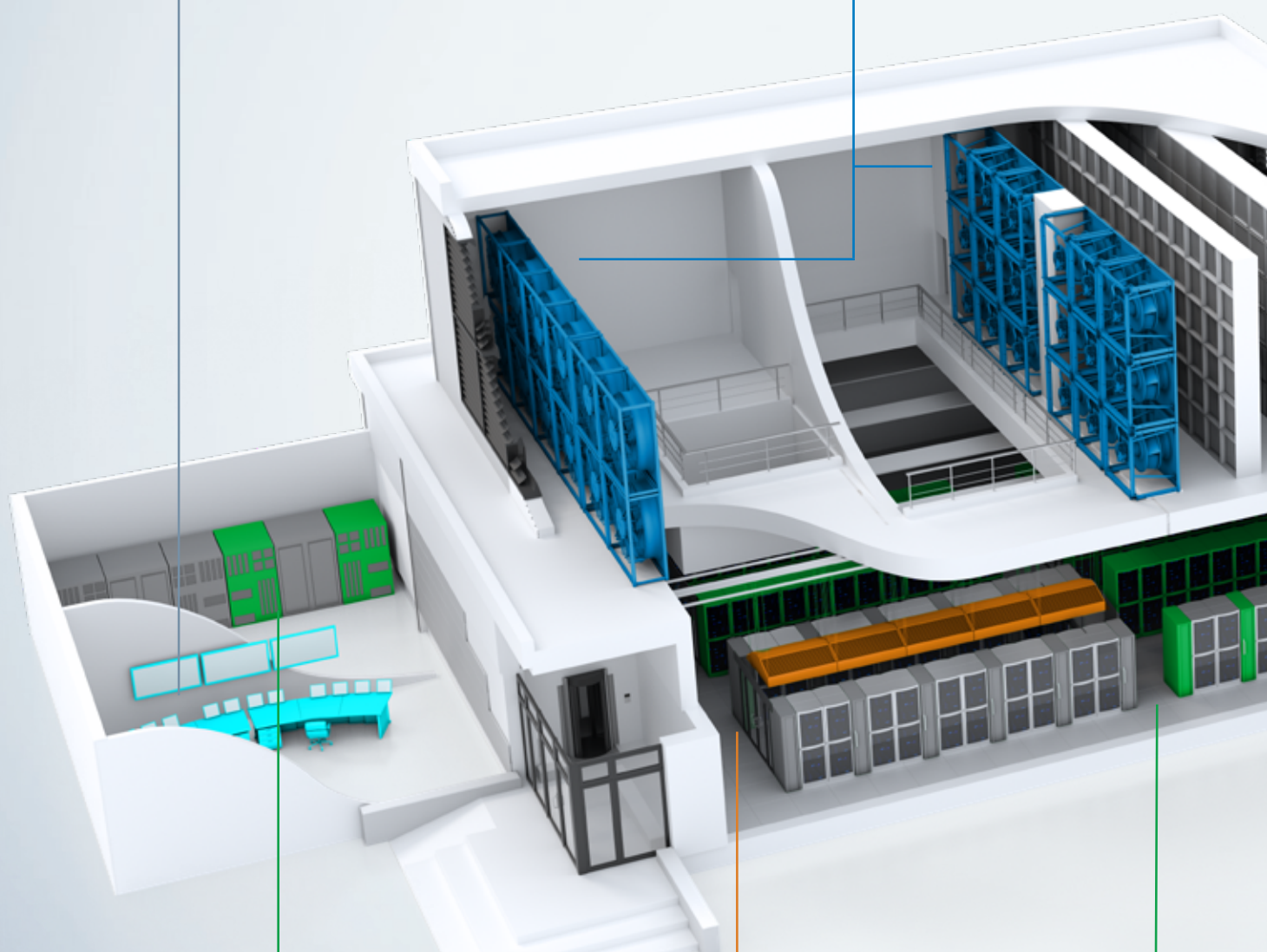
You can obtain further information from your personal contact person.

Overview of a data center

Use of EC fans in a data center.

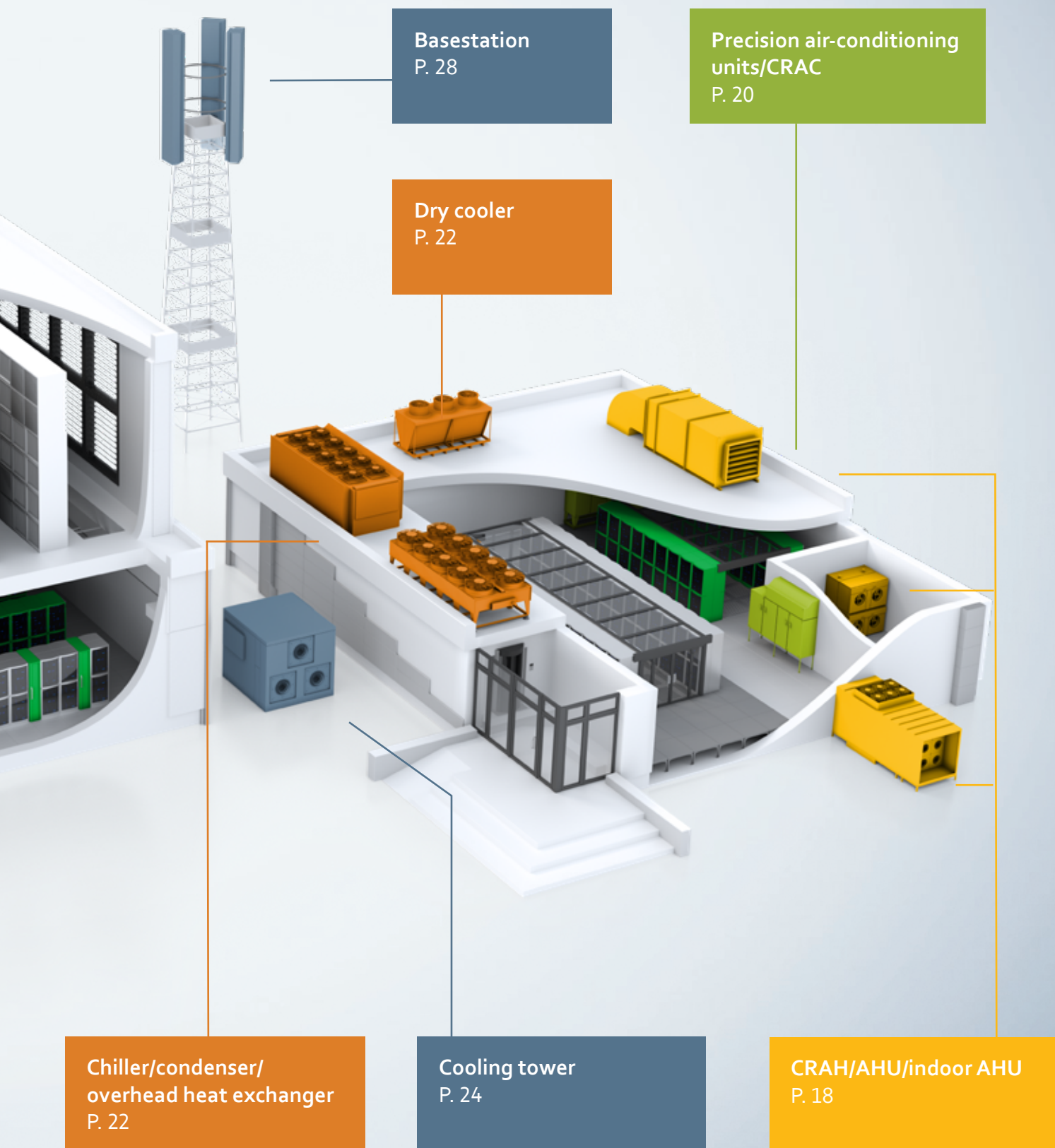
Data center infrastructure
management (DCiM)
P. 30

FanGrid supply air/
circulation air/exhaust air
P. 16



Axial fans for overhead
heat exchangers
P. 23

InRow cooling, server
rack, 19-inch racks
from P. 26



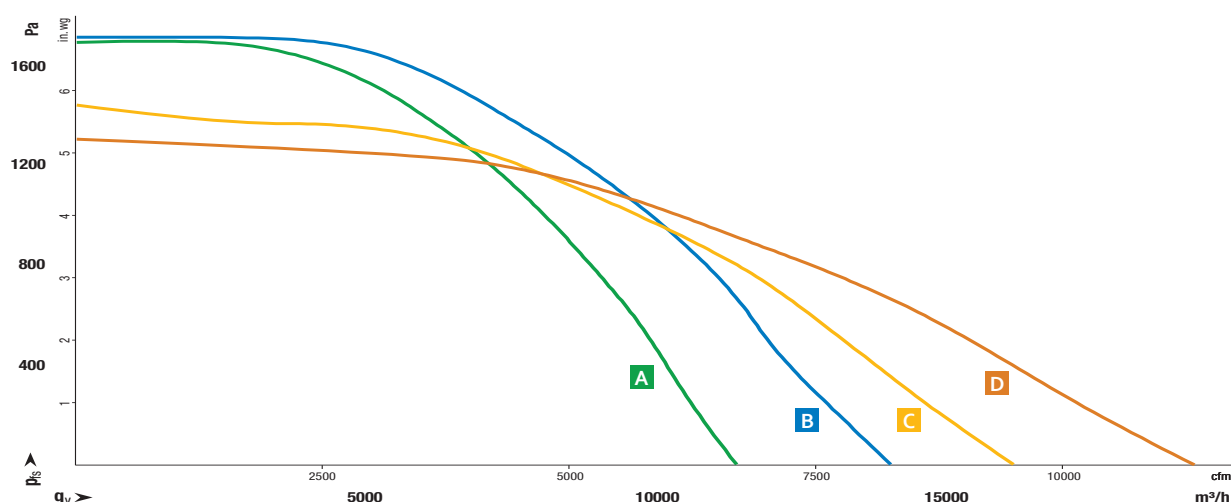
FanGrid supply air/circulation air/exhaust air

Modular solutions for high air performance levels.

These days, ventilation technology has moved beyond using large individual fans to generate high air performance levels and is moving increasingly towards leveraging several centrifugal and axial fans that operate in parallel inside "FanGrids". This type of arrangement is very flexible and efficient. The redundancy also ensures high operational reliability: if one fan fails, the other fans compensate for the lacking air volume. The GreenTech EC fans used by ebm-papst also help to significantly reduce operating costs.

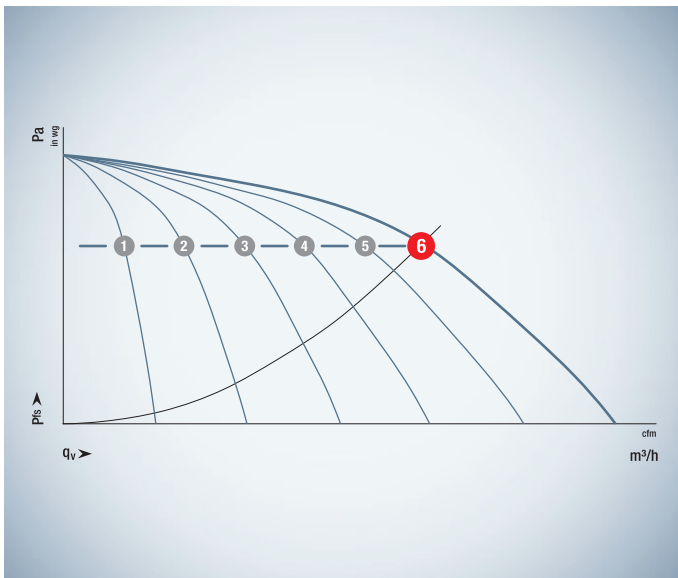
An important factor that tends to be overlooked in practice is the risk of installation losses. If fans are installed too closely together, they tend to influence one another. The rule of thumb is that the greater the volume of air that the fan has to convey, the further apart the fans should be.

The dimensions of the FanGrid module with cube design are very generous and large enough to prevent installation losses. The following applies when operating several fans in parallel: the sum of the air flows from the individual fans equals the total air flow desired.



Characteristic curve	Type	Size	Nominal voltage range	Frequency	Speed n	Power consumption P_{ed}	Input current I	Permitted ambient temperature*	Weight
			V AC	Hz	rpm	W	A	°C	kg
A	K3G 400-PA27-W5	400	3-380-480	50/60	2,800	3,650	5.5	-40 to +40	55
B	K3G 450-PA31-W5	450	3-380-480	50/60	2,480	4,450	6.8	-40 to +45	65
C	K3G 500-PB24-W5	500	3-380-480	50/60	2,000	3,900	6.0	-40 to +45	76
D	K3G 560-PB31-W5	560	3-380-480	50/60	1,700	4,250	6.5	-40 to +40	88

* Other temperature ranges and data sheets on request. Subject to change.

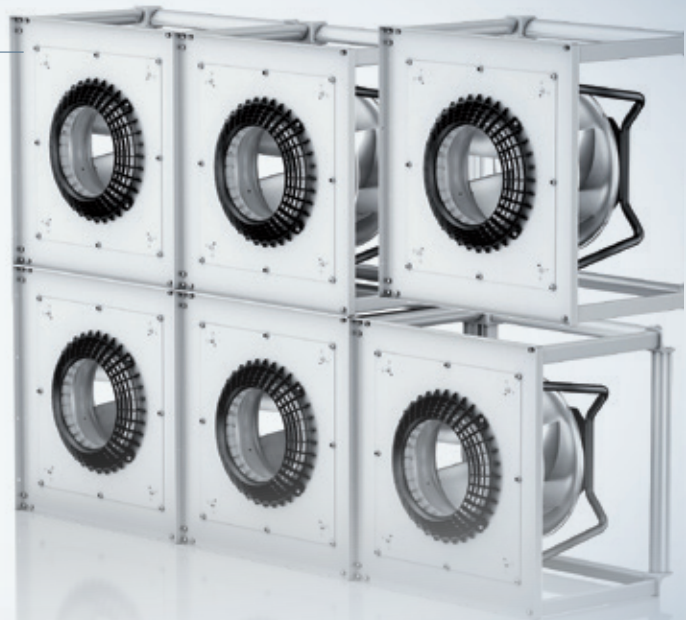


Parallel operation of several fans

In FanGrids, multiple small fans operate in parallel, rather than having one large fan. This provides redundancy, ensuring fail-safe operation. What's more, multiple, adjustable fans can adapt more easily to the actual air performance that is required, meaning that they increase the efficiency levels at every operating point. As optimum design is particularly important when planning FanGrids, ebm-papst is always pleased to offer customers the appropriate assistance.

Our modular cube system

- + Simple handling**
 - Easy to transport and assemble
 - Connecting elements can be purchased separately
 - Customized assembly and scalability
 - Mount up to five modules one on top of the other
- + Innovative design**
 - High-strength, lightweight material
 - Customized cube sizes possible
 - Aerodynamically optimized design to prevent installation losses
- + Immense power range**
 - Power range up to ∞ m³/h



Preventive maintenance

These fans are optionally also available with preventive maintenance functions (P. 8).
If you have any questions, please contact your ebm-papst contact person.



Predictive maintenance

These fans are optionally also available with predictive maintenance functions (P. 9).
If you have any questions, please contact your ebm-papst contact person.

Would you like to find out more?

Further information can be found at:
ebmpapst.com/modularity



CRAH/AHU/indoor AHU

Computer room air handlers and air handling units.



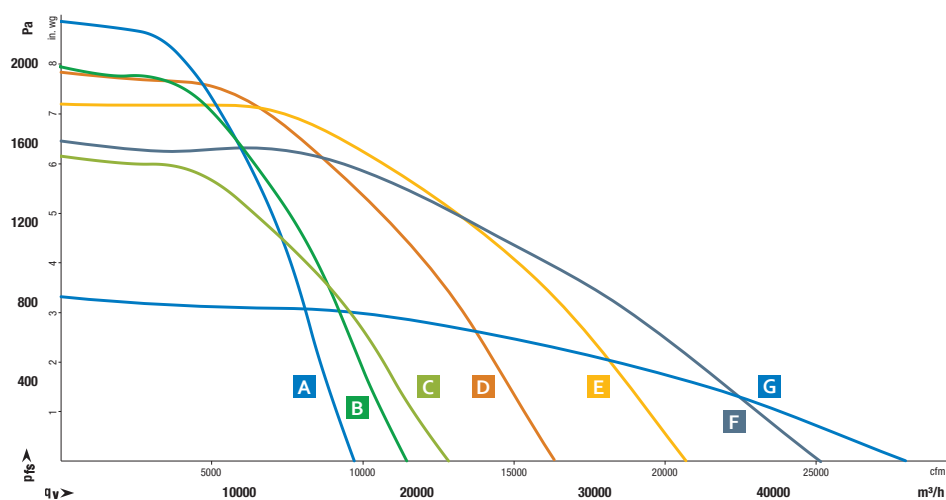
Planning reliability for equipment manufacturers

The real installation situation in CRAHs and AHUs was included in the development of RadiPac fans. In particular, we optimized the impeller's outflow characteristics and reduced the deflection losses in the air handling unit. Thanks to a wide optimum efficiency range and a high static overall efficiency level, the fans operate with low power consumption in a wide range of operating ranges.

The advantages of fans from ebm-papst in CRAHs and AHUs:

- High power density
- Unrivalled compactness
- Perfectly coordinated components
- High efficiency thanks to enhanced ventilation technology and new EC motors
- Extremely quiet operation thanks to optimized flow through the impeller
- Infinitely variable control
- Compliance with ErP specifications

Characteristic curve map for RadiPac



As the impeller, motor, and electronics are optimally matched, the highest static overall efficiency levels on the market are achieved.

Characteristic curve	Type	Size	Nominal voltage range	Frequency	Speed n	Power consumption P _{ed}	Input current I	Permitted ambient temperature	Weight
			V AC	Hz	rpm	W	A	°C	kg
A	K3G 450-PB29-L1	450	3~380-480	50/60	2,800	6,800	10.3	-40 to +40	49
B	K3G 500-PC16-L1	500	3~380-480	50/60	2,400	7,000	10.7	-40 to +40	50
C	K3G 560-PC10-L1	560	3~380-480	50/60	1,860	5,950	9.2	-40 to +40	65
D	K3G 630-PW04-01	630	3~380-480	50/60	1,950	9,780	15.2	-40 to +40	115
E	K3G 710-PW06-01	710	3~380-480	50/60	1,680	11,450	17.7	-40 to +40	154
F	K3G 800-PW07-01	800	3~380-480	50/60	1,370	11,300	17.5	-40 to +40	158
G	K3G A00-PV03-01	1000	3~380-480	50/60	750	6,340	9.8	-40 to +40	169

* Other temperature ranges and data sheets on request. Subject to change.



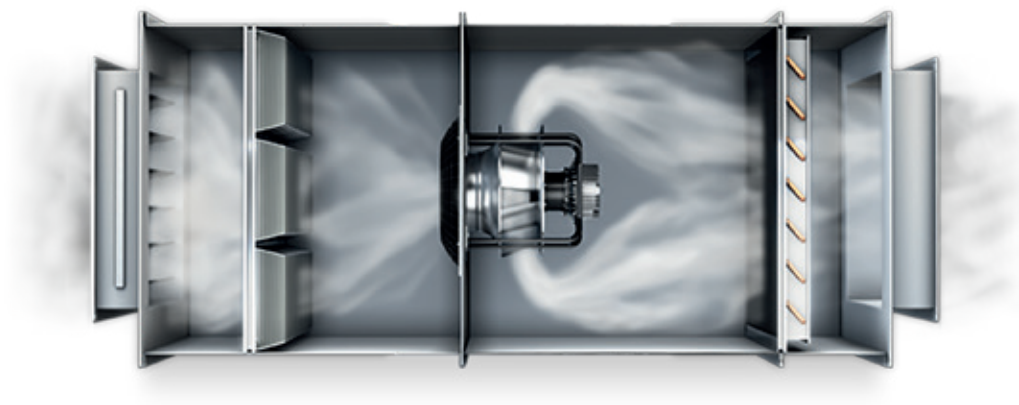
Preventive maintenance

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Predictive maintenance

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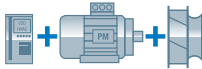
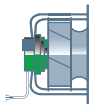
System concept instead of individual components

The RadiPac series for use in air handling units contains not just the high-performance impeller with inlet ring, the GreenTech EC motor, and the control electronics, but also mechanical components.

This creates a compact fan unit that is available to the user in a ready-for-installation manner. In contrast to other solutions – for example with asynchronous or PM motors – the user does not have to deal with the individual components motor, variable frequency drive, and impellers that they have to purchase, install, connect, and coordinate.

With the certified product selector, the operating conditions to be expected in the specific application can be represented in a realistic manner. This is because the measured performance data of the fan forms the database stored for selection. The corresponding measurements were taken on a TÜV-certified aeroacoustic fan test bench, which enables the performance data and noise values to be recorded at the same time.

⇒ Wire to air data, TÜV-certified

		AC fan with VFD/PM fan with VFD	ebm-papst EC fan
			
Shielded cables	Shielded cables are required to comply with the legally prescribed limit values for interference emission.		
Grounding	The motor and RCD components must be grounded centrally to comply with legal EMC regulations.		
Motor protection	An additional circuit breaker for the motor is always required.		
Sinusoidal filter	In order to protect the motor windings and bearings against the effects of high-frequency interferences, appropriate filters must be used (all-pole sinusoidal filters). These interferences are generated in the power electronics in conjunction with the cable lengths.		
VFD	Today, AC and PM fans are often controlled using variable frequency drives. However, the operation of variable frequency drives makes things more complex. When creating a cost calculation, do not overlook the complexity of coordinating components with one another. The variable frequency drive must be coordinated to the fan.		

The best solution is the systematic approach:

The motor winding design is perfectly coordinated to the integrated commutation and control electronics, as well as aerodynamics. The system as a unit complies with the required guidelines, standards, and approvals. Additional components such as a VFD, electronic filters, shielded cables between VFD and fan, or external motor circuit switches are not required.

Precision air-conditioning units/CRAC

Computer room air conditioning.



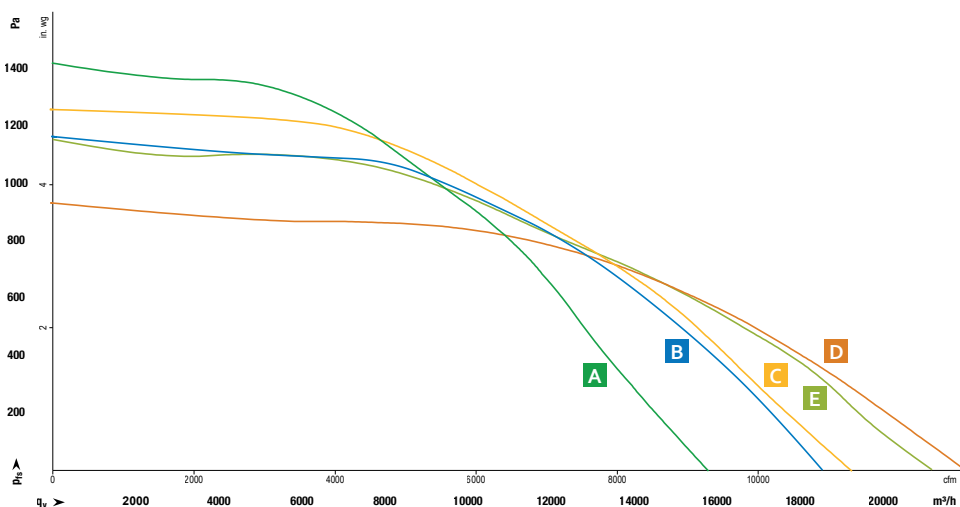
Steady conditions protect valuable data

An indispensable part of precision air-conditioning units: the RadiCal centrifugal fan. It has been optimized specifically to ensure that air is conveyed efficiently through these precision air-conditioning units in continuous operation. With the same compact size, it delivers significantly higher air performance than its predecessor, permitting optimum use of the limited space available in precision air-conditioning units – with considerably better efficiency and acoustics.

All the advantages at a glance

- Overall efficiency optimized to the application
- Compact dimensions
- Very low noise emissions
- Fast availability
- 3- active PFC version optionally available
- Resonance detection optionally available

Characteristic curve map for RadiCal



ebm-papst centrifugal fans: benchmark in precision air conditioning.

Characteristic curve	Type	Size	Nominal voltage range	Frequency	Speed n	Power consumption P_{ed}	Input current I	Permitted ambient temperature*	Weight
			V AC	Hz	rpm	W	A	°C	kg
A	R3G 500-PB24-03	500	3-380-480	50/60	2,000	3,900	6.0	-40 to +45	26
B	R3G 560-FA28-03	560	3-380-480	50/60	1,780	3,350	5.1	-40 to +40	21
C	R3G 560-PB31-03	560	3-380-480	50/60	1,700	4,250	6.5	-40 to +40	27
D	R3G 630-FC04-03	630	3-380-480	50/60	1,470	4,050	6.1	-40 to +40	34
E	R3G 630-PC08 03	630	3-380-480	50/60	1,500	4,250	6.5	-40 to +40	36

* Other temperature ranges and data sheets on request. Subject to change.



Preventive maintenance

These fans are optionally also available with preventive maintenance functions (P. 8).
If you have any questions, please contact your ebm-papst contact person.



Predictive maintenance

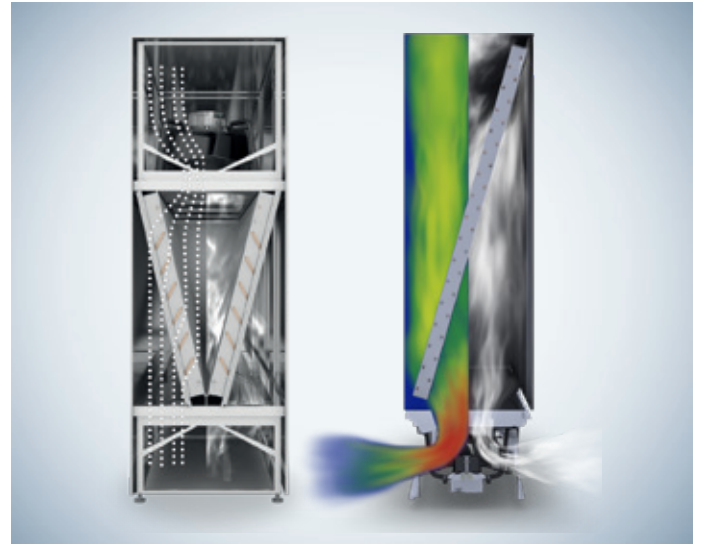
These fans are optionally also available with predictive maintenance functions (P. 10).
If you have any questions, please contact your ebm-papst contact person.

RadiCal and RadiPac.

Depending on requirements, you can choose from a wide range of high-efficiency centrifugal fans, an impeller made of metal or plastic:

In RadiCal centrifugal fans, the impeller is made of plastic. It has been optimized specifically to ensure that air is conveyed efficiently through these precision air-conditioning units in continuous operation. With its very compact dimensions, it achieves top air performance levels, permitting optimum use of the limited space available in precision air-conditioning units – with excellent efficiency and acoustics.

Our size 310 to 1,000 RadiPac fans use a highly efficient aluminum impeller with blades with a large profile. The entire series was designed for maximum efficiency with a low noise level at the same time. Sustainable production and resource conservation was also given high importance.



- + Unbeatably compact**
 - Impeller mounted directly on motor rotor
- + High efficiency**
 - Profiled blade geometry for maximum efficiency
 - Low copper and iron losses
 - Synchronous running prevents slip losses
 - Use of permanent magnets prevents magnetic hysteresis losses in the rotor
- + Quiet operation**
 - Aerodynamically optimized air flow for reduced noise
 - Economical operation
 - Optimized commutation enables partial-load operation down to 1:10
 - High efficiency even in partial-load operation
- + Low noise emissions**
 - Commutation and stator design ensure quiet magnetization of the main field
 - High, acoustically imperceptible cycle frequency
- + Long service life**
 - Maintenance-free bearings
 - Brushless commutation
- + Safe operation**
 - Insulated bearing system to prevent bearing currents



Would you like to find out more?

You can find further information at:
ebmpapst.com/radical
ebmpapst.com/radipac

Dry cooler/chiller/condenser/ overhead heat exchanger *It doesn't get cooler than this.*



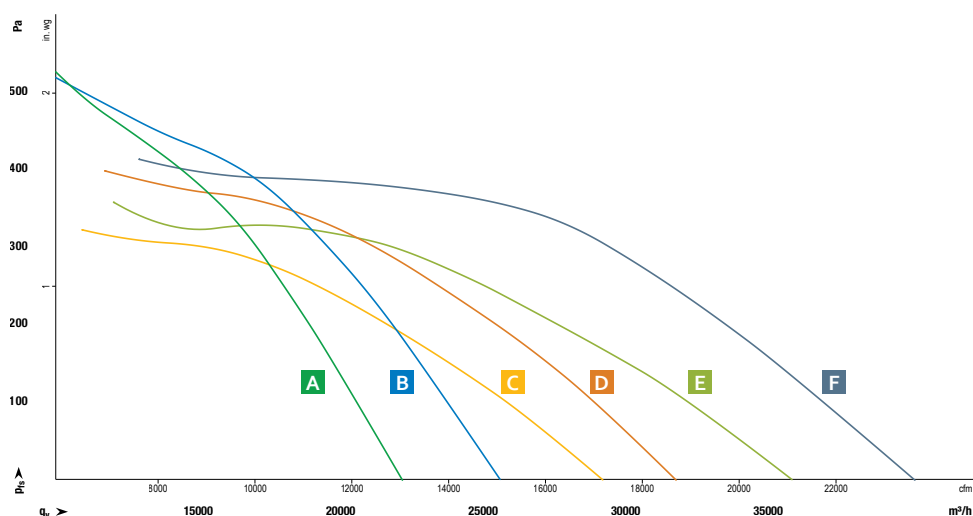
Increased power, greater efficiency, more potential applications

The innovative AxiBlade range sets the benchmark for large axial fans when it comes to energy efficiency and noise characteristics.

The advantages of fans from ebm-papst in condensers and chillers

- Maximum efficiency and power density in a compact installation space
- Benchmark in terms of noise characteristics
- Aerodynamically perfected complete system
- Robust design for outdoor use
- Long service life

Characteristics curve map for AxiBlade



The unique modular concept of the new AxiBlade guarantees it works optimally at every operating point – with the highest static overall efficiency on the market and up to 8 dB(A) lower noise emissions compared to the predecessor product. This means far greater efficiency and power density with the same installation space for every application. Say "Yes!" to the new benchmark in air conditioning and refrigeration.

Characteristic curve									
	Type	Size	Nominal voltage range	Frequency	Speed n	Power consumption P_{ed}	Input current I	Permitted ambient temperature*	Weight
			V AC	Hz	rpm	W	A	°C	kg
A	W3G 630-NU33-03	630	3~380-480	50/60	1,800	3,600	5.5	-40 to +60	39
B	W3G 710-NU31-03	710	3~380-480	50/60	1,680	3,800	5.8	-40 to +60	40
C	W3G 800-LU21-03	800	3~380-480	50/60	1,090	2,650	4.0	-40 to +60	47
D	W3G 800-LV05-03	800	3~380-480	50/60	1,190	3,500	5.3	-40 to +60	51
E	W3G 910-LV12-03	910	3~380-480	50/60	1,070	3,250	5.0	-40 to +60	55
F	W3G 910-OV04-E1	910	3~380-480	50/60	1,190	4,400	6.7	-40 to +45	57

* Other temperature ranges and data sheets on request. Subject to change



Preventive maintenance

These fans are optionally also available with preventive maintenance functions (P. 8).
If you have any questions, please contact your ebm-papst contact person.



Predictive maintenance

These fans are optionally also available with predictive maintenance functions (P. 9).
If you have any questions, please contact your ebm-papst contact person.

AxiBlade:

Your ebm-papst solution.

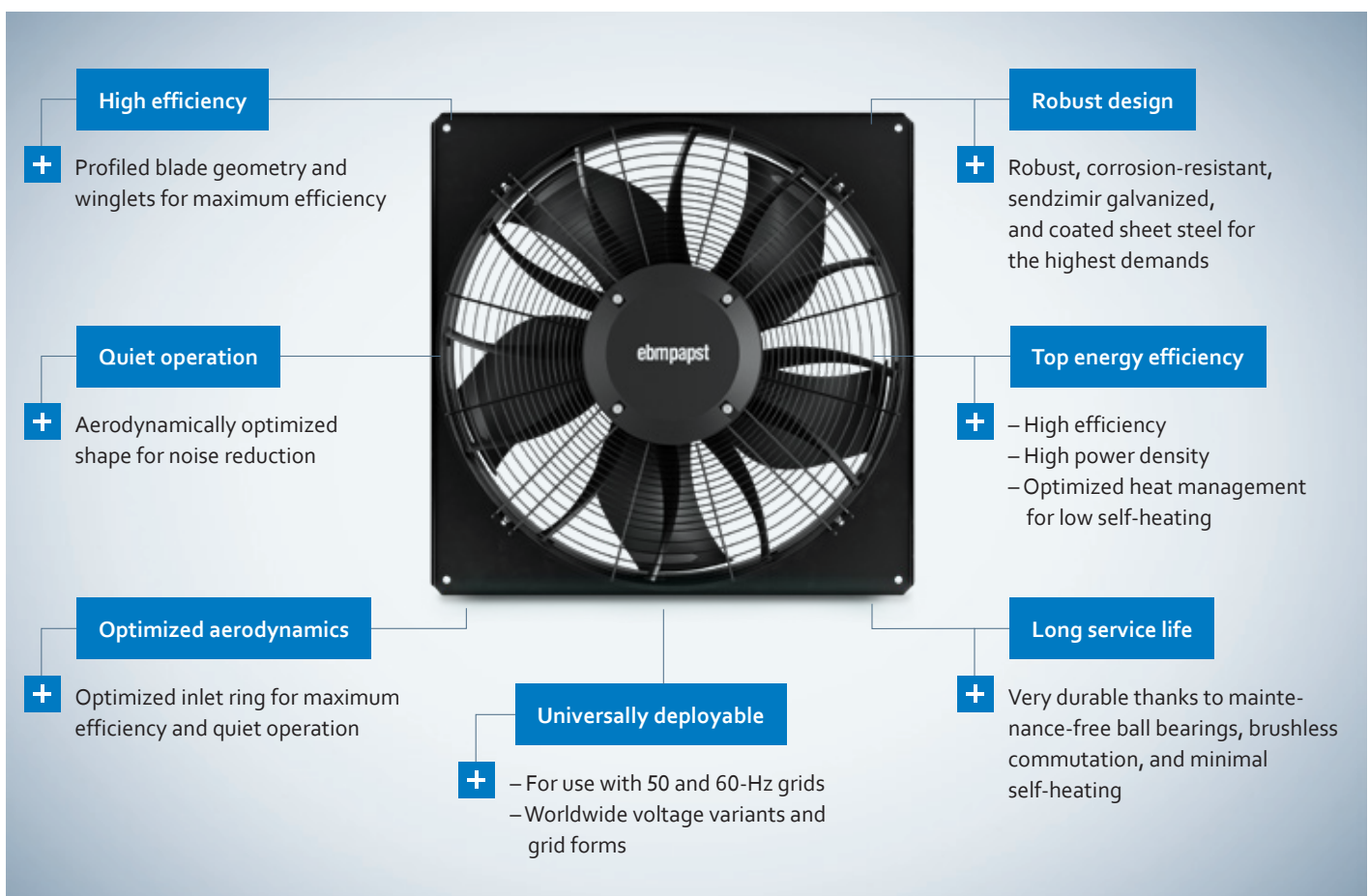
Maximum flexibility

AxiBlade fans specially developed for the data center field can optionally be installed on the intake or outlet side.

For all applications, the AxiBlade series's modular system provides the ideal efficiency and noise levels for meeting your requirements.

Depending on the application and back pressure in question, it is possible to combine different drives as well as innovative peripheral components, such as diffusers or the FlowGrid air-inlet guard.

You can contact us regarding your special requirements at any time; we will develop a solution together with you!



AxiBlade – the right solution for every requirement.

Maximum flexibility and modularity with regard to the product design, in order to guarantee the best possible performance in the end device at all times.



Cooling tower

More efficiency thanks to EC technology.



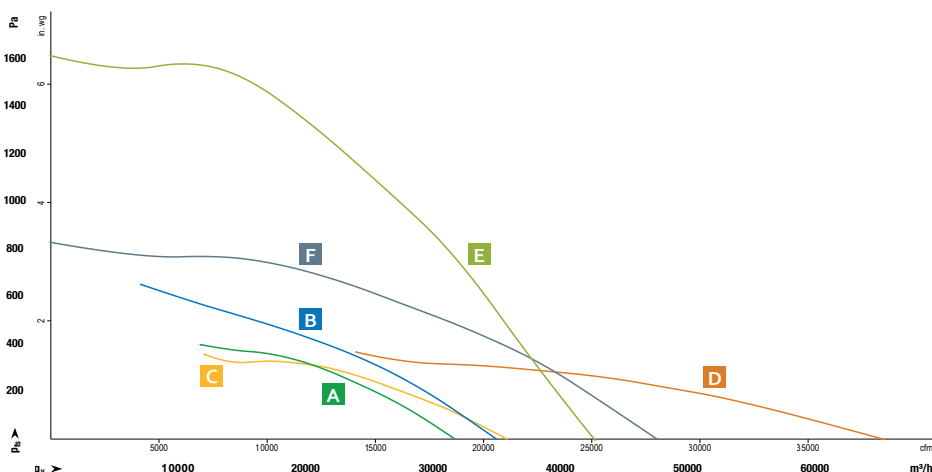
The effective answer to exacting demands

Fans are among the most important key components of cooling towers. They play a crucial role in effectively dissipating the heat generated by cooling the data center to the ambient air and thus guarantee a pleasant climate.

The advantages of fans from ebm-papst in cooling towers

- Can be used even in the toughest environmental conditions, such as high humidity and rapid changes in temperature
- Robust design with sophisticated system technology
- Quiet operation with high air flows
- Maximum efficiency values
- Long service life
- Can be used in both exhaust and intake operation

Characteristic curve map for RadiCal



The latest generation of centrifugal and axial fans improved the efficiency and air performance considerably again compared to existing systems.

Characteristic curve										
	Type	Size	Nominal voltage range	Frequency	Speed n	Power consumption P _{ed}	Input current I	Permitted ambient temperature*	Weight	
		mm	V AC	Hz	rpm	W	A	°C	kg	
A	axial	W3G 800-LV05-36	800	3~380-480	50/60	1,190	3,500	5.3	-40 to +60	52
B	axial	W3G 800-FL10-36	800	3~380-480	50/60	2,100	5,300	8.1	-40 to +50	51
C	axial	W3G 910-LV12-36	910	3~380-480	50/60	1,070	3,250	5.0	-40 to +60	56
D	axial	W3G Z50-EF10-36	1,250	3~380-480	50/60	840	6,000	9.3	-40 to +60	193
E	centrifugal	K3G 800-PW07-35	800	3~380-480	50/60	1,370	11,300	17.5	-25 to +40	157
F	centrifugal	K3G A00-PV03-35	1,000	3~380-480	50/60	750	6,340	9.8	-40 to +40	168

* Other temperature ranges and data sheets on request. Subject to change.



Preventive maintenance

These fans are optionally also available with preventive maintenance functions (P. 8). If you have any questions, please contact your ebm-papst contact person.



Predictive maintenance

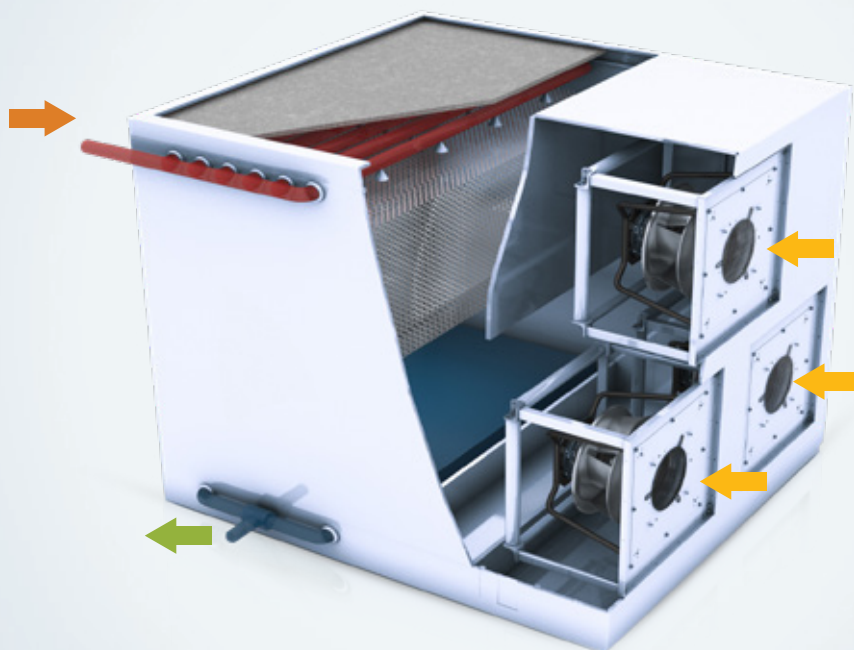
These fans are optionally also available with predictive maintenance functions (P. 9). If you have any questions, please contact your ebm-papst contact person.

+ Withstands the toughest mechanical stresses

Shock tests are conducted during development primarily in accordance with standards DIN EN 60068-2-27 and DIN EN 60068-2-29, whereas vibration loads are primarily aligned with the standards DIN EN 600-2-64 and DIN EN 61373.

+ Maximum corrosion resistance

Long-term internal tests form the basis for protecting all device components against corrosion. Our fans have to be able to withstand long periods in highly corrosive environments before they are intended for use in cooling tower applications.



+ Highly Accelerated Lifetime Test (HALT)

Under test conditions with a temperature range between -100°C and +200°C with a rate of rise of 70 K/min and simultaneous vibration loads of 50 g RMS, the HALT reveals weaknesses during the development phase. This enables all of these weaknesses to be detected and eliminated before the market launch.

+ Temperature change rain test

The fans are directly exposed to water and temperatures of -10°C to +60°C over a period of many months.

Outstanding quality

Once a fan solution has successfully passed all the intensive checks, it is given H2+C environmental classification by ebm-papst. Together with great reliability, robustness, and efficiency of the products, this is the best indication that the devices are excellently designed and ideally suited to long-term operation in cooling towers.

Would you like to find out more?

Further information can be found at:
ebmpapst.com/coolingtower



InRow cooling



Keep cool, big data

As with an axial compact fan, the DiaForce size 120 also draws in and blows out air in an axial direction. Compared to a centrifugal fan, this design is advantageous when integrating it into the application. But the real revolutionary part happens between the intake and outlet, more specifically in the unique geometry of the impeller and housing.

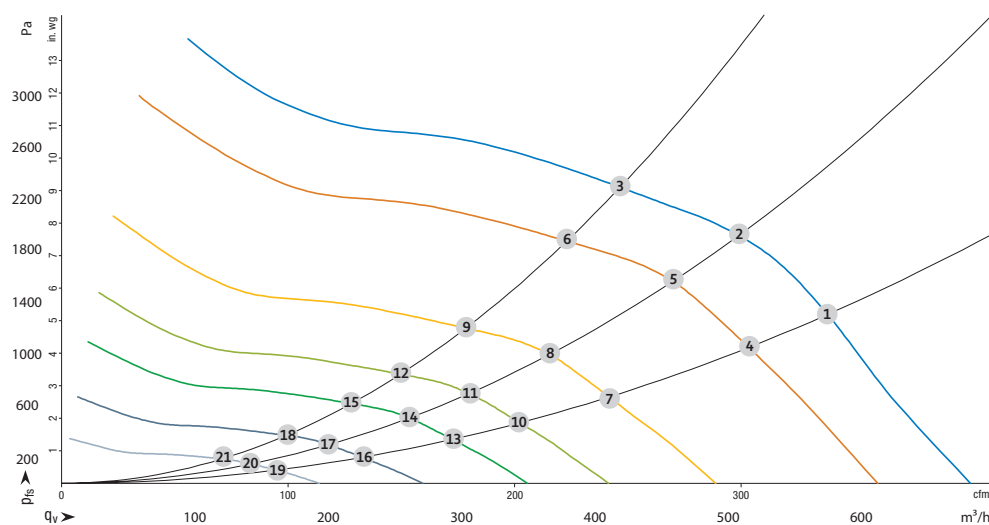
All the advantages at a glance

- More pressure thanks to diagonal characteristics
- Less noise thanks to aerodynamic optimization
- Option to add integrated FanCheck diagnostic tool

Nominal data		Airflow*	Airflow*	Nominal voltage	Voltage range	Sintec sleeve bearings/ball bearings	Power consumption*	Nominal speed*	Perm. temperature range
Type		m³/h	cfm	V DC	V DC	■/■	W	rpm	°C
VKC0120DULDS		680	400	48	36 to 60	■	395	17,200	-20 to +70

* Values during free air operation
Data sheets are available upon request. Subject to change.

Characteristic curve map for DiaForce



Benchmark for diagonal compact fans in InRow cooling applications

OP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
n (rpm)	17,200	17,140	17,140	15,500	15,500	15,500	12,480	12,480	12,480	10,490	10,490	10,500	9,000	9,000	9,000	7,000	7,000	7,000	5,000	5,000	5,000
Pe (W)	490	516	516	357	380	384	192	205	206	120	126	128	82	86	88	45	46	47	22	22	23
LwA(dB(A))	92	91	92	90	88	89	85	84	85	81	80	80	77	76	76	72	70	70	63	62	62



Electronics and interfaces

- Safe operation – thanks to locked-rotor protection
- Speed control with multi-option control input



GreenTech DC motor

- Unrivalled compactness and strength
- Reliable operation
- Minimal vibration
- Sustainable design



Flow-optimized housing

- Powerful
- Noise reduction
- Simple installation

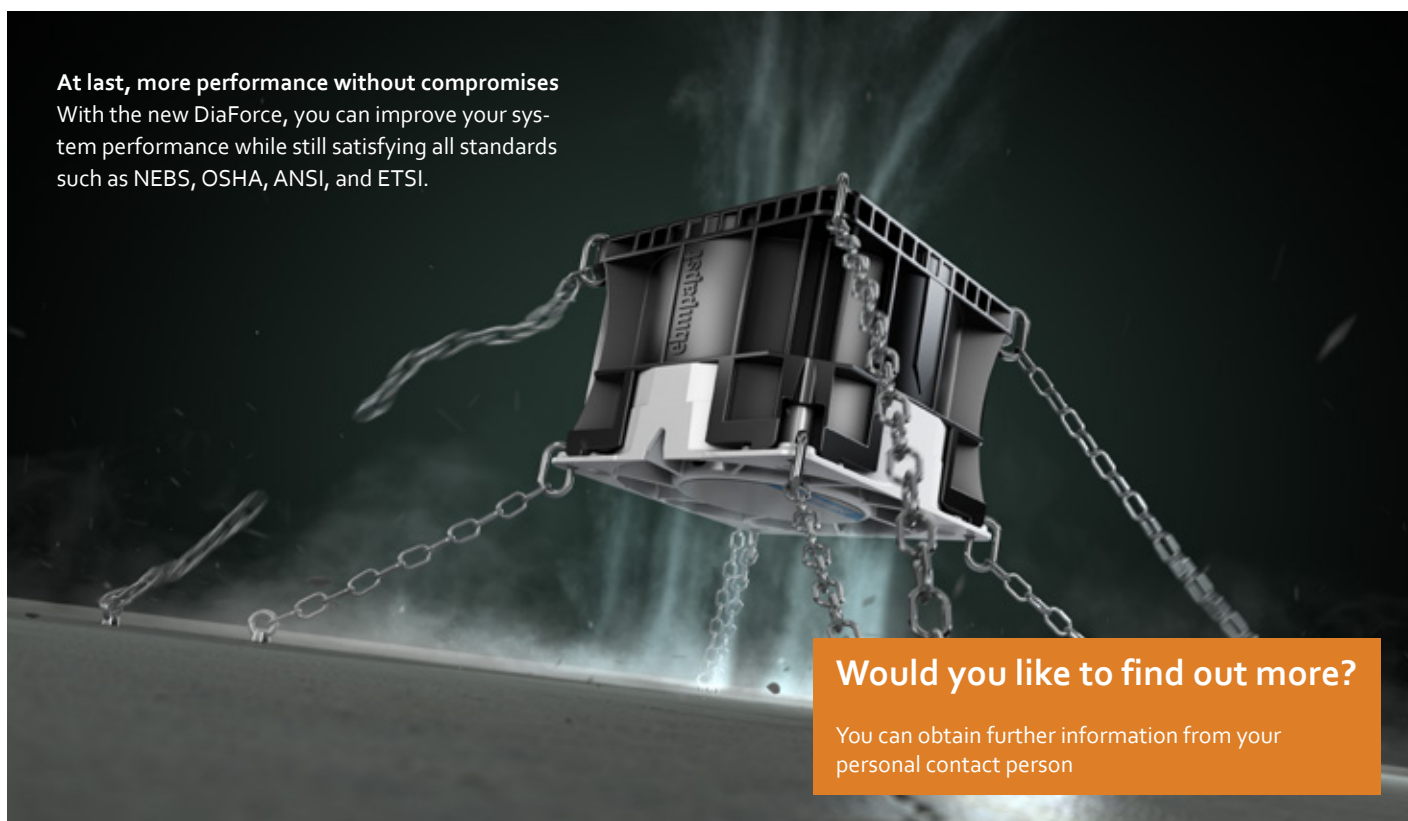


Innovative high-performance impeller

- High pressure increase
- Low noise emissions
- High efficiency

At last, more performance without compromises

With the new DiaForce, you can improve your system performance while still satisfying all standards such as NEBS, OSHA, ANSI, and ETSI.



Would you like to find out more?

You can obtain further information from your personal contact person

Server rack, 19-inch racks and basestation

AxiForce and AxiTwin.

The multi-tool for your application

Our new AxiForce series impresses with its performance, efficiency, and a great deal of functions that offer you the greatest possible degree of freedom and flexibility in your day-to-day work.

Powerful, robust, flexible, efficient, and quiet. This is what AxiForce stands for. The AxiForce is available in sizes 80, 120, and 172.

Optionally, the Go/NoGo alarm and a speed limit alarm are available across the assemblies. Temperature sensors for speed control, an analog control input, salt spray resistance, and optional IP protection up to IP68 are also available. The AxiForce has various approvals including UL507, CSA 22.2, VDE, and CCC.

All the advantages at a glance



Performance

- Noise advantage
- Powerful air performance curve
- Benchmark
- Top efficiency



Technology

- New aerodynamic design of housing and fan impeller
- The latest powerful and efficient motor technology
- Powerful electronics



Flexibility

- Speed signal
- Go/NoGo alarm
- Alarm with speed limit
- Control inputs
- Salt spray protection
- Degree of protection up to IP68



Specialist for 19-inch racks

The AxiTwin was specially developed for 19-inch racks, making it the best choice for this application.

In the AxiTwin, two individual fans connected to a spacer ring work together by rotating in opposite directions. This enables the rear fan

to convert the residual swirl from the front fan into air flow particularly efficiently and increases efficiency compared to individual solutions. As a result, the solution offers a high level of efficiency with minimum space requirements.



- + Electronic functions**
 - Open-collector speed signal
 - PWM control input
- + Technology**
 - Completely new design
 - Counter-rotating impellers
 - 2 independent drives / redundancy
- + Flexibility**
 - Speed signal
 - Go/NoGo alarm
 - Alarm with speed limit
 - Analog control input
 - Moisture protection

Would you like to find out more?

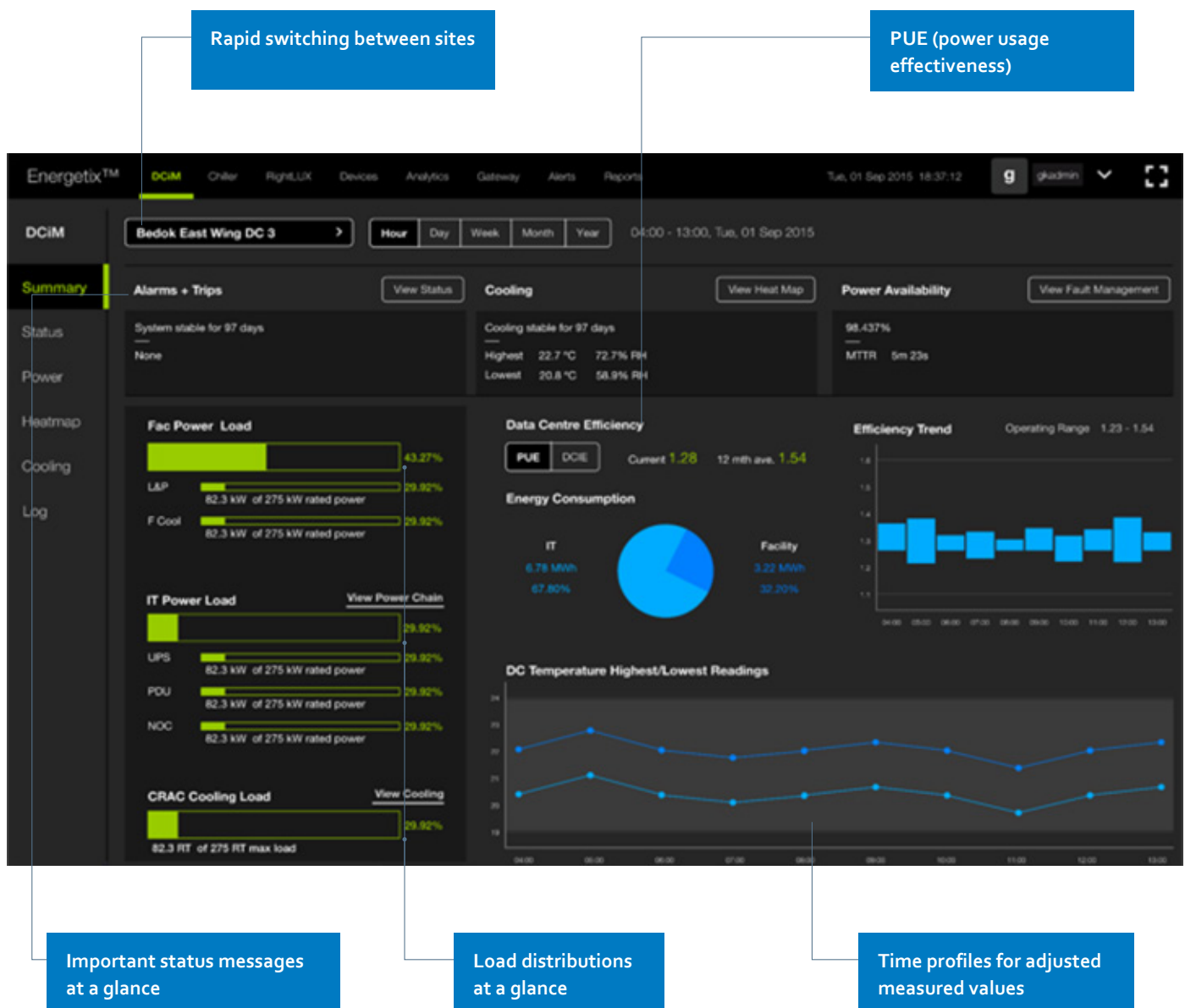
You can obtain further information from your personal contact person

Data center infrastructure management (DCiM).

FlexiConnect

FlexiConnect can be used to display and control data such as capacity utilization, status messages, or current consumption in real time.

Thanks to connected sensors, it is therefore possible to increase energy efficiency, reduce CO2 emissions, and therefore make a contribution to sustainability.



Example process for a project:

1 You send us an inquiry

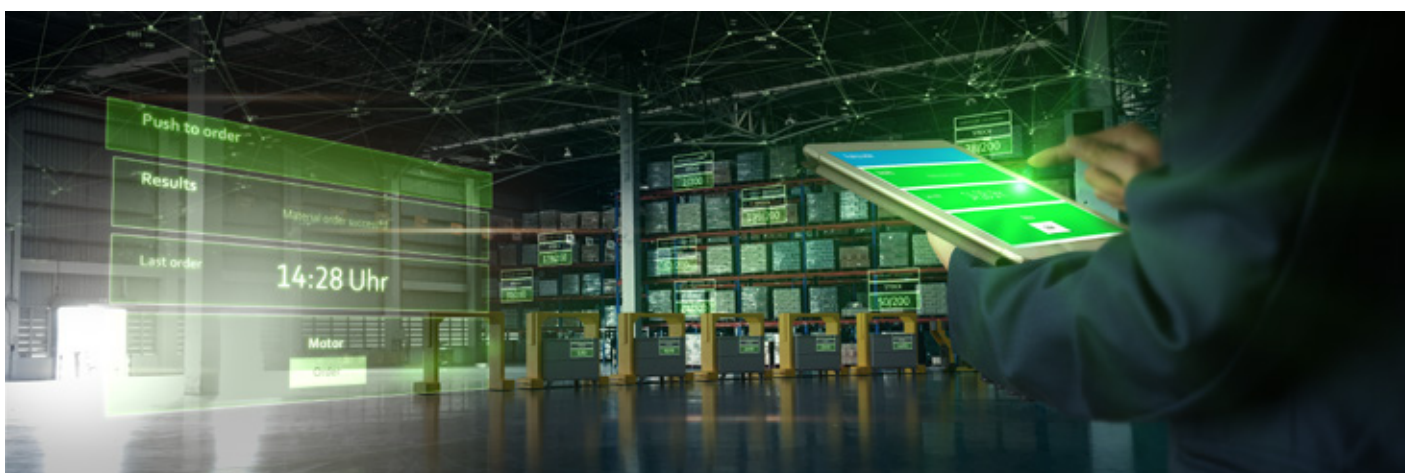
- We discuss your wishes and objectives together (What should be provided?)
- An inventory is then carried out:
 - What hardware is available?
 - If additional hardware is required and can it be installed easily?
 - Is there a list of data points for each device?
 - Are building and electrical plans available (where should what hardware be installed)?
- Complete overview of all data points is created.

2 Hardware procurement/configuration

- Hardware is configured and/or new hardware adapted.
- The “digital twin” is set up based on the wishes and goals and the required users are created.

3 Rollout

- The configured hardware is sent to you, distributed based on the previously defined sites, and connected.
- Remote functional test of components
- Training of key users



Your benefits

Reduction in energy costs

Energy savings of up to 20% due to effective operation of data centers with real-time information and data analyses

Central management

Manage several data centers or IT server rooms via a single web application

Modular & scalable

Scaling from one server room to data centers at several locations is no problem

Data analysis

Gain strategic insights into data center operation through the use of (meta)data

Hardware agnostic

Many protocol standards can be easily integrated (Modbus (TCP), BACnet, EnOcean, LoRaWAN, REST)

Machine learning/artificial intelligence

Optional AI to further advance data centers with extremely low energy efficiency

Improved productivity

Provision of relevant and prompt information for various user groups via mobile devices, web, and dashboards; access controls enable different user groups to view different data

MODBUS Display & Control

with auto-addressing.

Checks made easy!

The MODBUS Display & Control, or MDC for short, not only displays its own operating state but also the connected fans' operating states. It is operated and parameterized using its keyboard. The device also has two RS485 interfaces.

While the RS485 MODBUS master interface communicates with fans compatible with ebm-papst MODBUS, the slave RS485 establishes a connection with a higher-level external system, such as the building management system (BMS).

MODBUS Display & Control

Item number		CCC000AH0101 (CN1116)
Permitted ambient temperature	°C	-20 to 60
Power supply (nominal)	V DC	10-24 V
Max. humidity	% RH	90
Width	mm	123
Length	mm	132
Height	mm	27
Weight	g	204



The MDC provides auto-addressing for easy installation and commissioning, and supports four different operating modes:

Monitor mode

Displays MODBUS data from fans, such as speed, power, motor temperature, temperature of the electronics, set value in percent, operating hours, and warnings.

Monitor and Control mode

Displays the same as Monitor mode plus 0–100% fan speed control with one or a combination of the following:

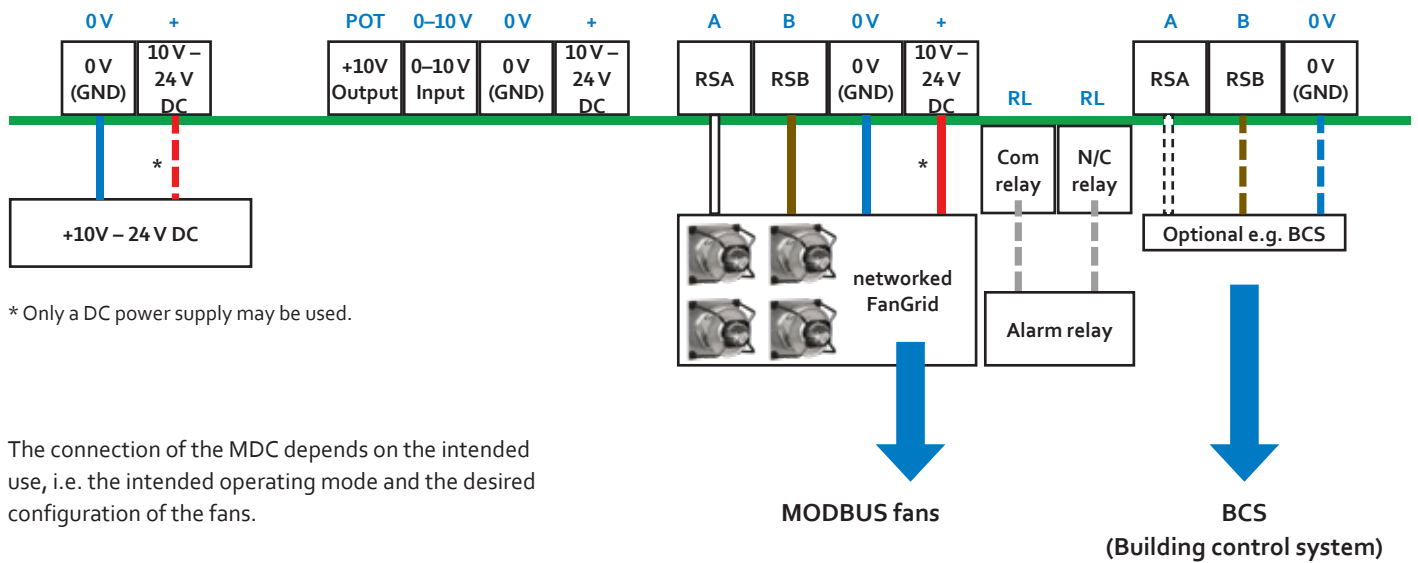
- 0–10 V control signal input
- BMS system connected to the RS485 slave
- MDC keyboard

Constant Volume/Constant Pressure Control mode

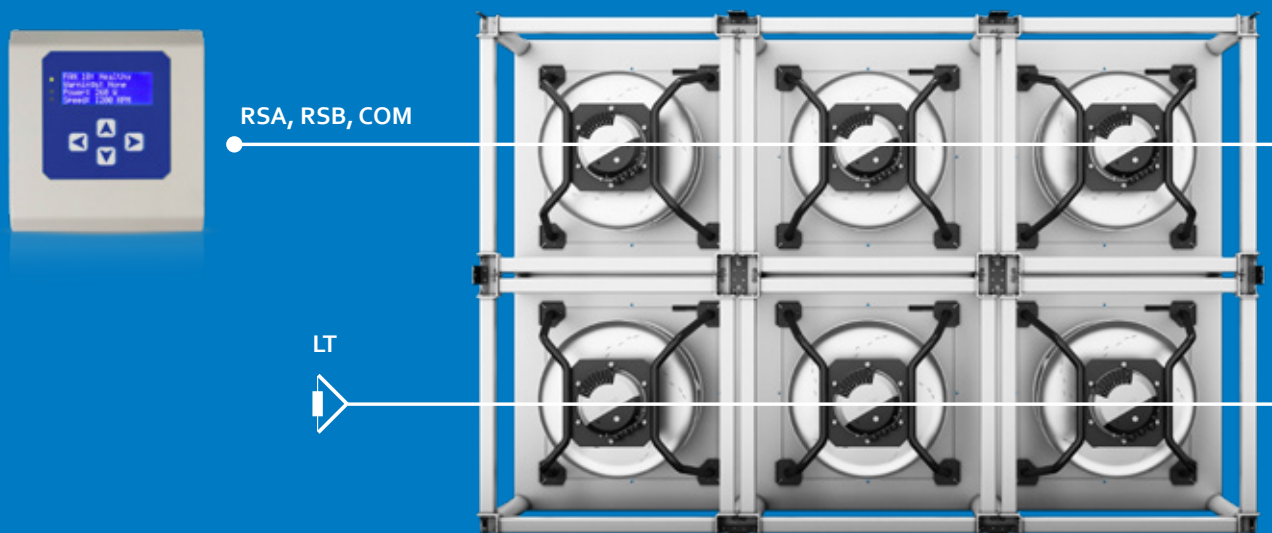
Displays the same as Monitor mode, but requires an external 0–10 V differential pressure sensor to maintain a constant volume or constant pressure. The set value requirement is specified using the keyboard or via the RS485 slave port.

MODBUS Relay mode

Here, the MDC becomes a pure messenger between the fans and a BMS system. This enables direct access to all MODBUS registers on all connected fans.



Only with MODBUS Display & Control is the group connection of the FanGrids complete and you have full control.



FanGrids made to measure: the ebm-papst FanScout.

Clear facts, true values: ebm-papst FanScout, the reliable way to find the right fan.

With just a few mouse clicks, our FanScout software directs you to the product that meets your needs best. Find the best solution on the basis of factors such as operating characteristics, air performance, operating time, and installation space, and determine life cycle costs in advance. Your individual contact partner at ebm-papst will be glad to provide a tailored product collection for the FanScout.

Functions and advantages of software:

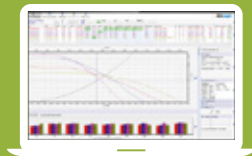
- Operating point can be positioned anywhere in the characteristics map
- Dynamic display of operating data at the operating points
- Comparison of different fan classes
- Display of operating and nominal data
- Display of characteristic curves for conditions such as a constant efficiency level
- Calculation of life cycle costs



Get your *customized FanGrid solution* in just a few short steps.

Your route to obtaining a FanGrid module:

1.



Use our FanScout software to help you determine the type and number of fans that you require for your FanGrid solution.

2.



Once you're happy with the operating point and life cycle costs, you can place your order.

3.



You can order the FanGrid modules as a complete assembly kit or in individual components. You'll find the corresponding item numbers in this brochure from page 16 onwards.

Starting with your chosen fan size, choose the parts that you need. This is also where you'll find the right type of assembly material for connecting the FanGrid modules. Make sure to note down the corresponding item numbers for these as well, along with the required quantities.

4.



The final step is to reach out to your ebm-papst contact person and provide them with your item numbers and the quantity of the individual components. All done!

You can find our explanatory video with more information and the inquiry form at ebmpapst.com/fanorder

www.ebmpapst.com

ebmpapst

engineering a better life

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