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techmag

Technology from ebm-papst

SPECIAL ISSUE: CORRECT VALUES



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Correct Values



"It is only with the heart that one can see rightly. What is essential is invisible to the eye." You could almost imagine Antoine de Saint-Exupéry had the ventilation and air conditioning industry in mind as well when he wrote those words for the Little Prince.

Nowadays a lot of regulations have to be observed when choosing the correct fan and installing air handling units. Not without good reason, as air handling units should be designed to operate to the benefit of users and above all the environment. This is also the only way to enable buildings to be used in a sustainable way, minimise CO_2 emissions, save energy and avoid health hazards. Standards, directives and test criteria today provide equipment manufacturers and planners with a whole range of guidelines to help them select the right components and systems. But caution is still called for!

The quotation from the "Little Prince" is particularly fitting at this point with its message about not trusting anything blindly but rather listening to the "heart" and – one might add – to the head as well.

This techmag special issue is intended to provide assistance for selecting fans and comes with a promise from ebm-papst.

You can only be sure of always taking the right decisions if you have the correct values to work with. And values can only be correct if they have been measured. So the motto is: Measurement takes precedence over calculation. We at ebm-papst consider it of the utmost importance to provide correct and verifiable performance data for our fans. In practical terms this means absolute planning reliability. And in the final analysis you and your customers will find that everything really is as it seems. We play our part by promising to provide the correct values.

I hope you will find plenty of useful information in this publication to help you take the right decisions in your planning work and when selecting fans. Because the correct values form the basis for the true values – namely trust, reliability and a lasting partnership.

And that is what the name ebm-papst stands for!



Rainer Hundsdörfer,
Chairman of the Board of Directors
of the ebm-papst Group





Measurement is best

Precise documentation and reliable production

The choice of fan is crucial to the reliability and efficiency of air handling units. In this respect, equipment manufacturers have to be able to rely on the documentation provided by the fan manufacturer and on the assurances made with regard to product properties. But where does this product data come from? And how reliable is it?

Documentation All the performance data provided by ebm-papst, both in catalogues and the Product Selector, the user-friendly fan selection software, are obtained by taking extensive individual measurements. This involves fitting the test specimens on chamber test rigs set up in accordance with ISO 5801 and performing aeroacoustic measurements. On completion of measurement, the data are validated to guarantee that all the specifications in the documentation actually represent the correct values. So customers can fully rely on the information given when selecting fans.

Production In addition to accurate product documentation, a suitable fan production process is required to ensure that the products actually exhibit the properties described. For this purpose, monitoring and checking mechanisms are integrated into the production sequence to reliably detect any tolerance deviations. In practice the products then exhibit exactly the properties specified in the documentation. At the end of the production process every ebm-papst fan is tested for proper operation.

Thanks to all the effort invested in precise documentation and reliable production, customers can be sure of obtaining the correct values from ebm-papst. Consequently every fan supplied for use as an air handling unit component can always be trusted to deliver the performance required.



Fig. 1a: Centrifugal fan set up on test stand with free inlet, noise measurement microphones on suction side

Precision measurement

Modern chamber test rig guarantees accurate values

At ebm-papst, use is made of an aeroacoustic fan test stand for the simultaneous recording of air performance data and noise values. For this purpose the fans are installed in the test chamber with free inlet and free outlet in accordance with installation type A (Fig.1a). The chamber or combination test rig consists of two low-reflection half chambers with high-impedance floor conforming to accuracy class 1 for acoustic measurements.

On the combination test rig it is possible to conduct air performance measurements at an air flow of up to 100,000 m³/h with a static pressure increase of up to 3,000 Pa (Fig. 1b). The characteristic curve of the fan is determined on the combination test rig by operating the test specimen at a constant speed and gradually throttling the air flow. The noise, air flow, static pressure increase, speed and reaction torque required to determine

Physical quantity	Measuring range / unit	Measurement accuracy
Pressure increase psf	0 to 3,000 Pa	0.5 % of measured value
Air flow q_v	100 to 100,000 m³/h	1 % of measured value
Air power Pu	kW	1.2 % of measured value
Power input Pe	0 to 30 kW	0.5 % of measured value
Torque M	0 to 200 Nm	1 % of measured value
Total efficiency e	%	1.3 % points
Speed N	0 to 99,999 rpm	1 rpm
Air density	approx. 1.2 kg/m³	0.1 % of measured value
Sound power level L_wA	as of 30 dB(A)	1 dB(A)

Test stand design and tests as per ISO 5801 – Industrial fans, performance testing using standardised test stands
DIN EN ISO 3744, DIN EN ISO 3745, ISO 13347-3 – Acoustics

Fig. 1b: Measurement quantities and accuracy levels attained by aeroacoustic test stand

What the inspection authorities demand of a test stand

As a certified manufacturer, ebm-papst fully conforms to the following criteria as specified for test stands by the guidelines of the AHU manufacturers' association: "An expert report/test report for fans will be accepted if testing was performed in accordance with the latest standard DIN EN ISO 5801:12-2010 (ISO 5801:2007 incl. corr. 1:2008) by a named test body on a suction-side chamber test rig and the component is manufactured without any modifications."



Fig. 2: Inspection authority certificate for test stand

the power consumption are recorded in the various operating statuses. A fan characteristic curve is made up of at least 10 operating points. This measurement is then repeated at different speeds. The characteristic curves determined in this way yield the so-called fan map (Fig. 2).

Accurate measurement results To ensure consistently precise, reproducible measurements, the test facilities and test equipment are subjected to regular checking. The routine monitoring of test equipment by Quality Assurance with measurement quantities traceable to national and international standards (German Calibration Service DKD, Germany's national metrology institute PTB) is standard practice at ebm-papst. Determination of the air flow and regular leak testing are based on ISO 5801. Since the middle of 2014, calibration of the air flow measuring instruments and traceability to the national standard of the PTB have been part of the quality assurance process. The applicable range is from 100 m³/h to 40,000 m³/h with a reference measuring instrument accuracy of ± 0.5 % of the measured value. Internal validation provides both assurance for the company and information for customers. The documentation is available for viewing at all times.

The inspection authorities (TÜV Süd) have confirmed that the test stand satisfies all the requirements of DIN EN ISO 5801 in an air flow range of 500 m³/h to 39,000 m³/h with a pressure increase of up to 1,000 Pa (Fig. 2). Acceptance testing for the acoustic properties of the combination test stand was performed by the Fraunhofer Institute, Stuttgart. The institute confirmed the Class 1 rating for the ebm-papst noise measurement chamber.

To sum up At ebm-papst the product documentation for all fans is based on measurements taken on certified precision chamber test rigs. Constant internal monitoring of the test facilities used and the values obtained guarantees the consistently high levels of product quality and fan dependability you can always rely on.

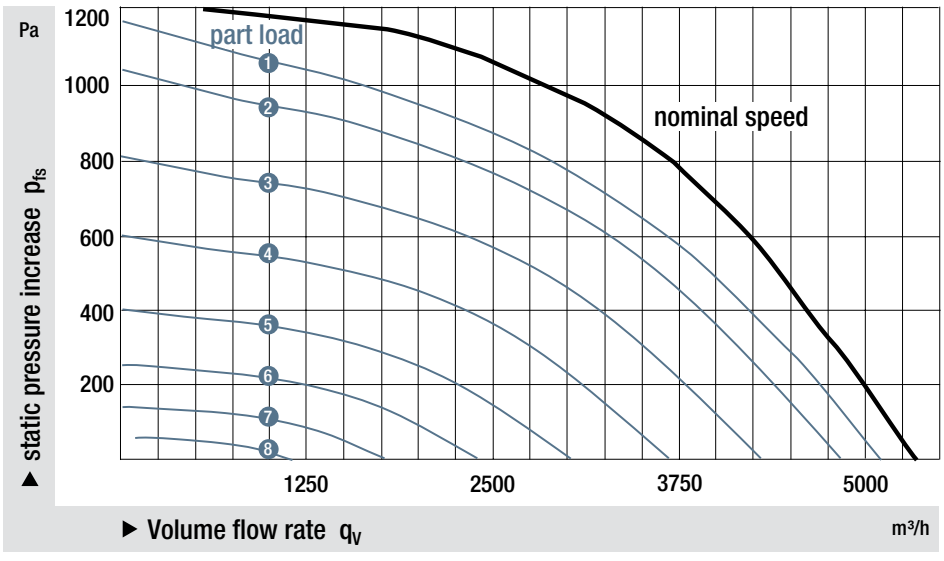


Fig. 2

The fan

Combination of impeller, motor and control system

For ebm-papst a fan is more than just an impeller. An ebm-papst fan is an optimised assembly made up of at least the following:

- Precision impeller with inlet nozzle
- GreenTech EC motor
- Control electronics

Put to the test A chamber test rig is used to take measurements on the minimum fan configuration described above. After testing the measurement results are entered into the product documentation.

The ebm-papst centrifugal fan from the RadiPac product range for use in AHUs is fitted with extra mechanical components in addition to the basic features mentioned to create a complete ready-to-install fan unit. "Spider" and "Cube" versions of the mechanical assembly are available. The spider type is the best alternative for smaller sizes as this unit can simply be screwed to the device wall. The cube design is the ideal choice for large and heavy fans. It is mounted on vibration-absorbing elements on the bottom of the device.

The name **RadiPac** is a combination of **Radi**al referring to the centrifugal fan and **Pac**kage meaning an assembly. The complete RadiPac package is a ready-to-install, optimally designed functional unit which is easy to handle, easy to fit and easy to operate. Simplicity itself: The all-in-one solution – Plug & Play.

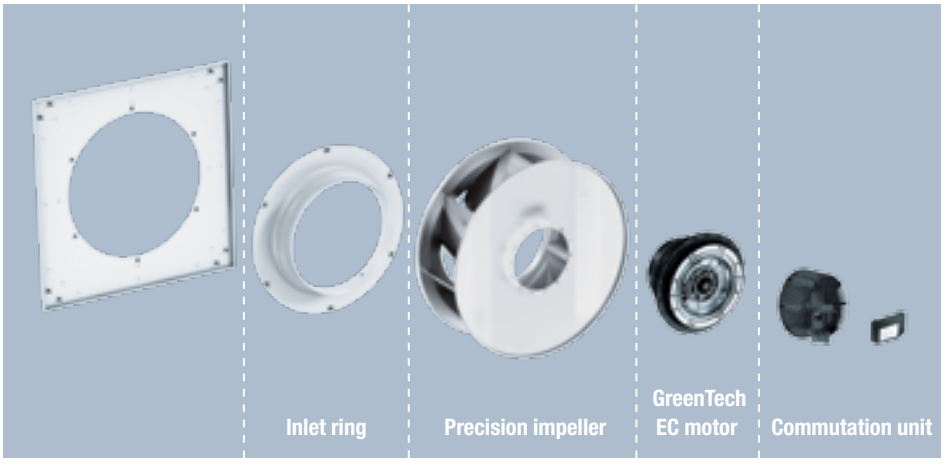


Fig. 1: Fan components



Nominal data		Characteristic curve	Nominal voltage range	Frequency	Speed[1]	Max. power input[1]	Max. input current[1]	Perm. ambient temperature	Technical equipment and connection diagram		
Type	**Motor**		**VAC**	**Hz**	**rpm**	**W**	**A**	**°C**		**Centrifugal fan**	**kg**
***3G 560**	M3G 150-IF	Ⓐ	3-phase 380-480	50/60	1610	3,530	5.40	-25 to +40	S.XX/M3)	R3G	30.5

Subject to change

(1) Nominal data at operating point with maximum load and 400 VAC

Fig. 1a: Catalogue nominal data (source: RadiPac catalogue)

Documentation and fan selection

Reliable data

Selection of the right fan on the basis of an application-specific operating point is only possible with reliable data and is generally performed with the aid of appropriate product selection software. The properties of the RadiPac centrifugal fans are documented in product data sheets and printed catalogues (Fig. 1a, b, c) as well as in a product selection program, the Product Selector. At ebm-papst, the origin of the fan performance data contained in the software can always be traced back to measurements as described above. The required air flow and the static pressure increase which the fan subsequently has to achieve in practical use are the minimum criteria employed for the selection process.

Optimised software Because the required operating points are not always identical to the measured operating points, there is a need for interpolation between the measured values. Use is often made for this purpose of the familiar affinity laws for flow machines. These are sufficiently accurate in cases where fans merely consist of a flow machine, in other words an impeller. As we already know however (Page 8), ebm-papst fans also include a motor and control electronics. These two assemblies do not conform to the fan affinity laws, but rather exhibit completely different performance characteristics, particularly in the partial load range. The selection software has been appropriately optimised to obtain a highly

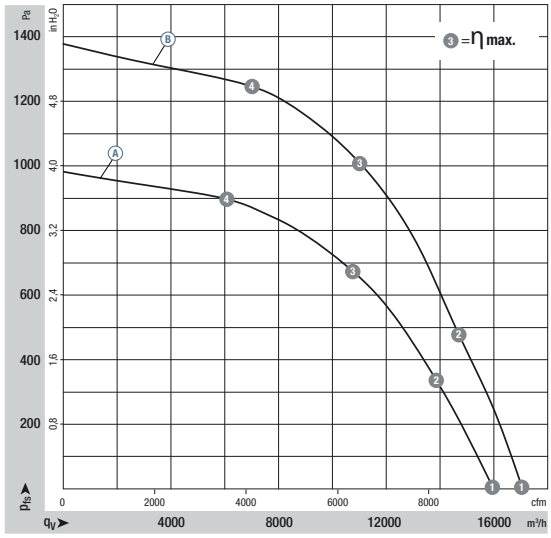
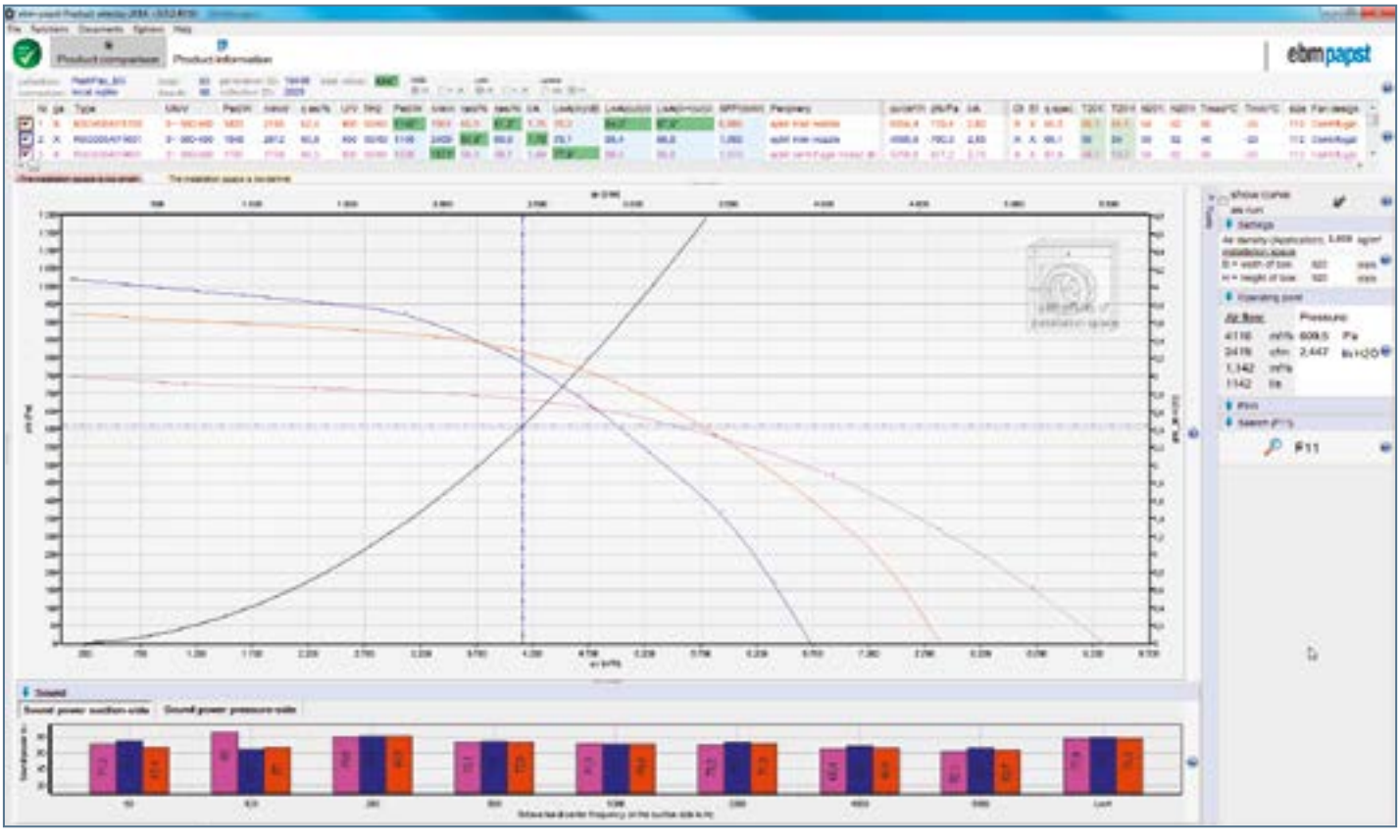


Fig. 1b: Catalogue characteristic curves (source: RadiPac catalogue)

Fig. 1c

		n min⁻¹	P_{ed} W	I A	L_{WA} dB(A)
A	1	1610	2247	3,48	94
A	2	1610	2951	4,55	88
A	3	1610	3530	5,40	82
A	4	1610	3241	4,97	86
B	1	1750	2938	4,47	95
B	2	1750	3704	5,59	89
B	3	1750	4600	7,10	84
B	4	1750	4271	6,42	87



accurate forecast of the operating behaviour of the fan unit at any conceivable operating point.

Product Selector The Product Selector from ebm-papst provides a particularly user-friendly means of finding the right fan. The selection program makes it possible to check fans at various operating points and determine the performance data. It additionally permits dynamic comparisons closely resembling actual operating conditions. The influence of temperature, altitude and installation space can also be incorporated. If there are several fans in the specified performance range, the aerodynamic and acoustic data displayed can be used to help select the most suitable model. Another option available is calculation of the life cycle costs for the fans selected. The performance data are also output at the specified operating point with suction and pressure side sound power level values over the octave band. The software can be incorporated into customer

Fig. 2: Validation test on a total of 38 different fan models from ebm-papst

EXAMPLE:

Family of characteristics for a model from the Product Selector (K3G310-AX69-01, Test_Id. 159632, 159973)

1 … 15 REFERENCE POINTS:

Selected operating points for measuring the actual power consumption

Nominal speed —
Reduced speed —

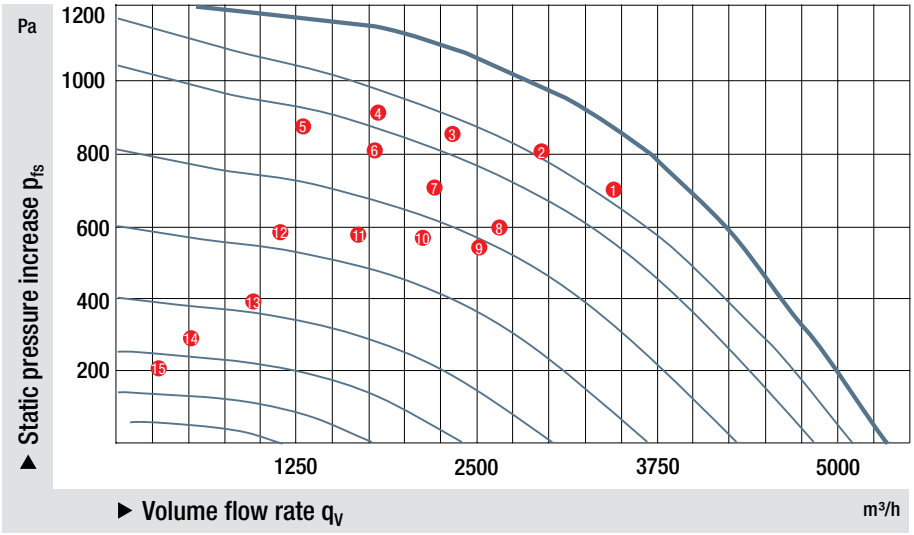




Fig. 3

device configuration programs by way of a DLL interface.

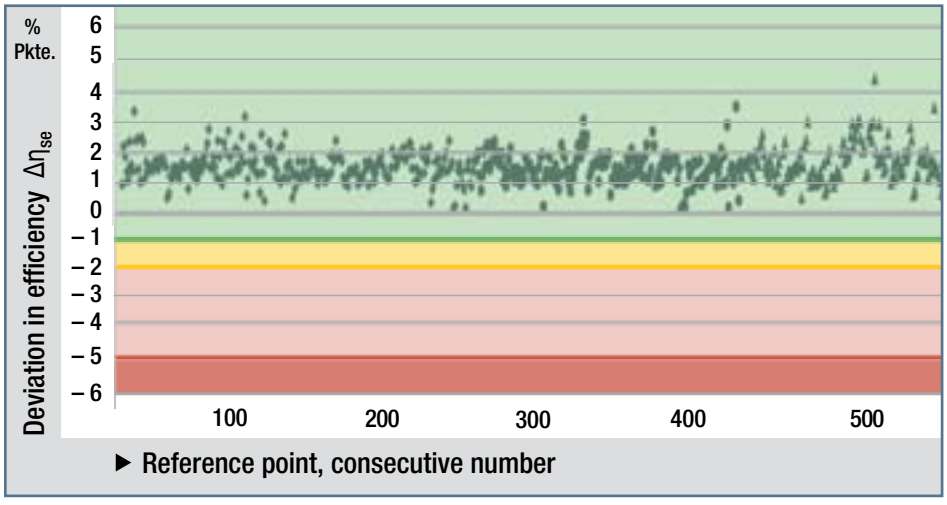
Certified accuracy The performance data output is extremely accurate, as confirmed (Fig. 3) by the inspection authorities (TÜV Süd). Validation measurements performed on all 38 models in the RadiPac product range show that on average the efficiency level indicated by the Product Selector tends to be slightly too low! What procedure was employed for the validation measurements? 15 reference points (Fig. 2) were chosen for each fan in the RadiPac product range. These were measured on the certified chamber test rig and the performance data were then compared to the data from the Product Selector. This revealed that the calculated values from the Product Selector are almost identical to the values actually measured. In accordance with AHU guideline 01, the best possible accuracy class 0 is thus obtained for RadiPac fans (Fig. 4). In other words, ebm-papst RadiPac fans in as-delivered condition tend to exhibit a higher level of efficiency than that indicated by the Product Selector. This guarantees true planning reliability for customers. ○

Fig. 4: In reality, fans from ebm-papst tend to have a higher efficiency level than shown in the product documentation

ACCURACY CLASSES
AHU guideline 01, 2013, German association of air handling unit manufacturers

Class 0
Class 1
Class 2

(based on DIN 24166, refer to Page 14 Fig. 1)



Customers agree: You can rely on ebm-papst!

The following customer comments confirm just how important accurate fan data is for air handling units.

HOWATHERM

"We as manufacturers of energy-efficient air handling units demand particularly high standards with regard to the performance data of drive systems. So we check the components we use on our own test stand as part of the prototype measurement process. We have found that drive systems from ebm-papst yield convincing results in comparison with the stated values. The deviation between the calculated data and the measured performance was within a narrow tolerance band of just 1 to 4 %. An extremely positive aspect is that the figures from ebm-papst turned out to be lower than what we actually measured. That doesn't happen very often."



Dr.-Ing. Christoph Kaup
Managing Partner of HOWATHERM Klimatechnik GmbH

AL-KO
QUALITY FOR LIFE

"The accuracy of the fan data is of the utmost importance to us and our customers, providing as it does the only basis for clear and reliable information on the power consumption and noise emission level of the ventilation system as a whole. As our air handling units have Eurovent certification, we guarantee our customers compliance with the tightest tolerances in our technical data. We can only be sure of performing our calculations accurately if we receive extremely precise data on the fan concerned from the manufacturer. The quality of the information provided by ebm-papst is outstanding."



Martin Törpe
Product Management
AL-KO THERM GMBH

WOLF

"The air conditioner manufacturing company Wolf and ebm-papst have enjoyed a long-standing and successful working relationship. The reliable, infinitely variable EC fans are a crucial factor in convincing our customers when it comes to hygiene, air conduction and low power consumption. This common goal will also form the basis for our future cooperation. The performance data and design programs are reliable instruments for the planning and production of modern air conditioning devices."



Dipl. Ing. (FH) R. Riebesecker
A/C + Ventilation Product Management
Wolf GmbH

Production

Accuracy classes are a measure of manufacturing accuracy

At ebm-papst, the focus of attention is on making top quality fans. Documented performance data and the correct choice of fan are only part of the story. It is also crucial to ensure that the fan is constructed in such a way that it actually attains the specified performance level in operation, regardless of the production date. A certain amount of tolerance is inevitable with any technical product, for example on account of dimensional deviations in components and assemblies (e.g. enamelled wire diameters or electronic components). Tolerance limits can be set and action can be taken to ensure that these are not exceeded. This is the job of a company's Quality Assurance department. And the greater the possible deviations and the resultant performance deficits, the greater the safety allowance required when selecting fans. DIN 24166 – "Fans; Technical delivery conditions" therefore defines accuracy classes and permits deviations from the documented performance characteristics. The so-called limiting deviations are divided into Classes 0 to 3. The standard allows accuracy class 3 for fans smaller than 10 kW for example (Fig. 1).

Top class RadiPac At the end of the production process, all RadiPac fans are checked in the as-delivered condition for any performance deviations. This quality assurance procedure involves recording all the electrical performance data and confirming compliance with the permissible manufacturing tolerances. Based on a size 500 RadiPac fan, analysis shows that ebm-papst attains accuracy class 1 (Fig. 2). For air handling unit manufacturers, this means that the figures given for the fan in the catalogue and Product Selector must not differ from the actual drive performance by more than 3 % and from the total efficiency by more than 2 %.

Planning reliability Comparison of the product documentation and the actual product delivered reveals that in practice the power consumption of the fan will be lower and the total efficiency level higher than the documented figures. Consequently there is no risk of any unpleasant surprises when the air handling system goes into operation and there is also no need for any precautionary over-dimensioning of the fan. ○

Fig. 1: Accuracy class as per DIN 24166 (ISO 13348)*

Performance characteristics	Limiting deviation in class			
	0 (AN1)	1 (AN2)	2 (AN3)	3 (AN4)
Air flow q_v	±1 %	±2.5 %	±5 %	±10 %
Static pressure increase Δp_{stat}	±1 %	±2.5 %	±5 %	±10 %
Drive performance P_{ed}	±2 %	+3 %	+8 %	+16 %
Static efficiency η_{stat}	-1 %	-2 %	-5 %	– (–12 %)
Sound power level db(A)	+3dB(A) (+2dB(A))	+3dB(A)	+4dB(A)	+6dB(A)

* – ISO 13348 with other designations and slightly different values

Fig. 2: The accuracy classes define production-related deviations from fan performance data. Accordingly the RadiPac product range attains Class 1. Analysis is based on performance measurements on 6,953 fans.

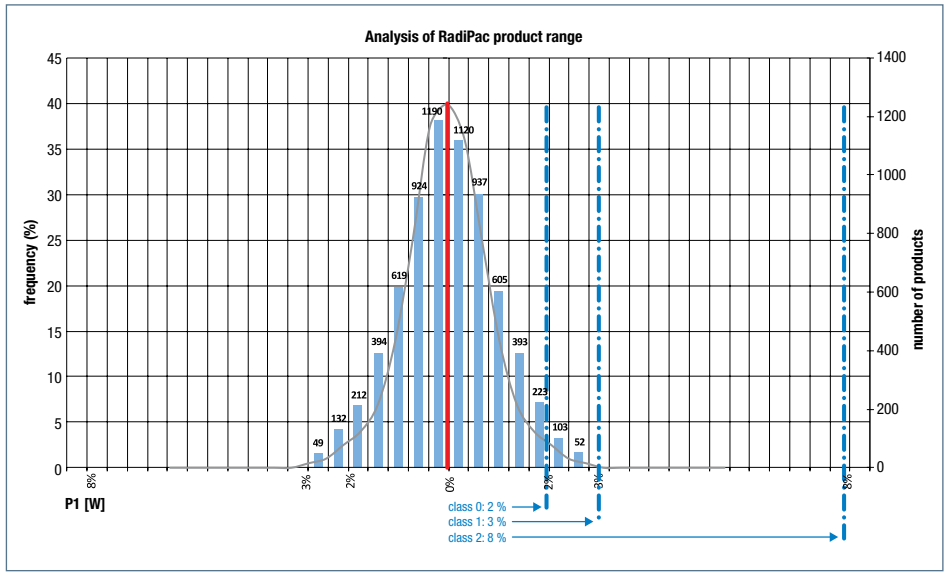



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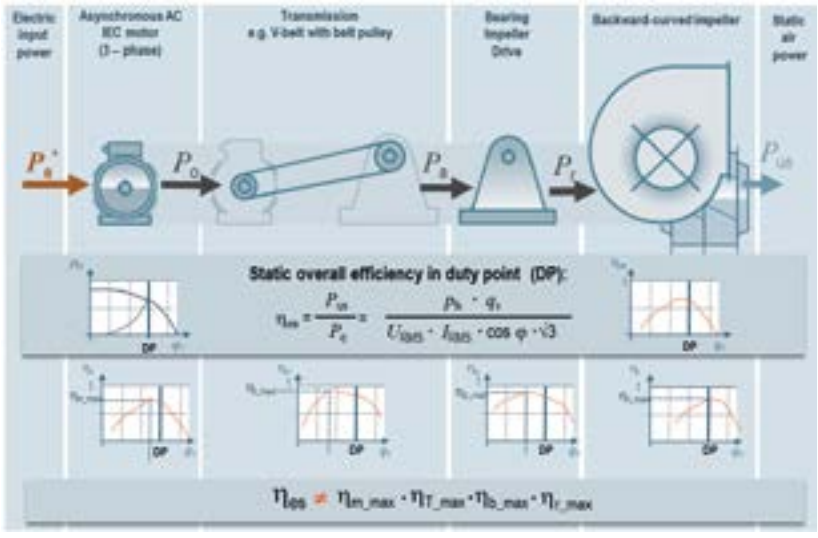


Fig. 1: Multiplication of the individual efficiency levels of all fan components yields an incorrect total efficiency value

Comparison of fans

RadiPac values as compared to calculated values

The true efficiency of a fan when measured is not equal to the product of the maximum individual efficiency levels of the motor, drive unit, control system and impeller. But why is that?

Correct determination For a retrofit project, enquiries are made about various fans and the performance data of the fans offered are then compared. It is important to remember that performance specifications based on calculations are generally not realistic. They tend to be far too optimistic because the maximum efficiency levels of the individual components (motor, drive unit, control system and fan impeller) are usually taken from catalogues for calculation purposes. It cannot however be assumed that each component will actually achieve maximum efficiency under realistic conditions. Multiplying the optimum individual efficiency levels yields a far more favourable total efficiency than is possible at the actual operating point (Fig. 1). As a result of this error, the values obtained from calculation of the power consumption will be far better than in actual operation. To ensure that realistic values are acquired, ISO 12759:2010 "Fans – Efficiency classification for fans" expressly recommends working with measured values when planning.

As good as it gets ebm-papst can always be relied on to provide the correct values because what we measure and supply is the minimum configuration of a complete, ready-to-install fan assembly consisting of high-performance impeller, EC motor and control electronics. As these components are optimally matched, it is possible to achieve static total efficiency levels well in excess of 60 %. These levels have been measured and entered in the Product Selector. Far higher figures quoted by other suppliers are always open to question.

Ecodesign

The ecodesign directive for fans (EU 327/2011) specifies minimum efficiency requirements for fans driven by electric motors. The requirements first came into force in 2013 and will become more stringent as of 01.01.2015.
They apply to all fans with an input power between 125 W and 500 kW and a drive performance range of 125 W to 500 kW. A specified efficiency level has to be attained based on the type of fan concerned. Calculation of the minimum efficiency values is described in this directive.
All GreenTech EC fans in the ebm-papst RadiPac product range now already surpass the requirements applicable as of 2015.

Minimum efficiency requirements for RadiPac EC centrifugal fans as per the 2015 ecodesign directive

Power consumption	Minimum efficiency
in kW	in %
0.125 kW	42 %
0.5 kW	48.3 %
1 kW	51.5%
3 kW	56.5 %
5 kW	58.5 %
10 kW	62 %

In addition to optimum efficiency, a RadiPac with GreenTech EC motor offers a whole range of advantages over other fans for air handling systems.

Installation – simple and safe

The high-performance impeller is mounted directly on the rotor of the external rotor motor. This saves space and permits balancing of the entire rotating unit in one clamping operation (Fig. 2). The electronics and motor are combined in a single unit (Fig. 3). Thanks to the integrated control electronics there is no need for an external frequency converter, which makes installation easy. As the motor and electronics in the motor system are perfectly matched and in close proximity to one another, additional electronic filters and shielded cables are also superfluous and no external motor protection circuit breaker is required. Air handling units can be commissioned without the need for any costly adjustment, earthing or shielding work. In other words "Plug & Play" for ventilation technology.

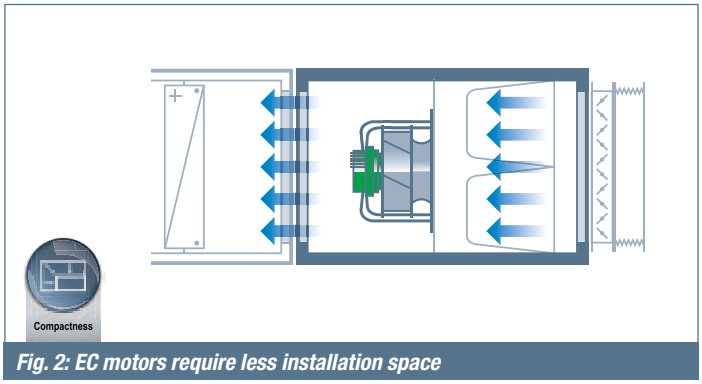


Fig. 2: EC motors require less installation space

Resource preservation

The GreenTech EC motor helps to preserve resources without any supply risks. The efficiency of the mains-powered permanently excited synchronous motor with electronic commutation (also known as BLDC or PM motor) far surpasses efficiency class IE4 – and manages to do so without using any potentially problematic rare earth magnets. On account of their design, other permanent magnet motors of the internal rotor type and offering comparable efficiency require rare earth magnets. And so RadiPac is THE compact, efficient, user-friendly, sustainable all-in-one fan solution for air handling units (Fig. 3).

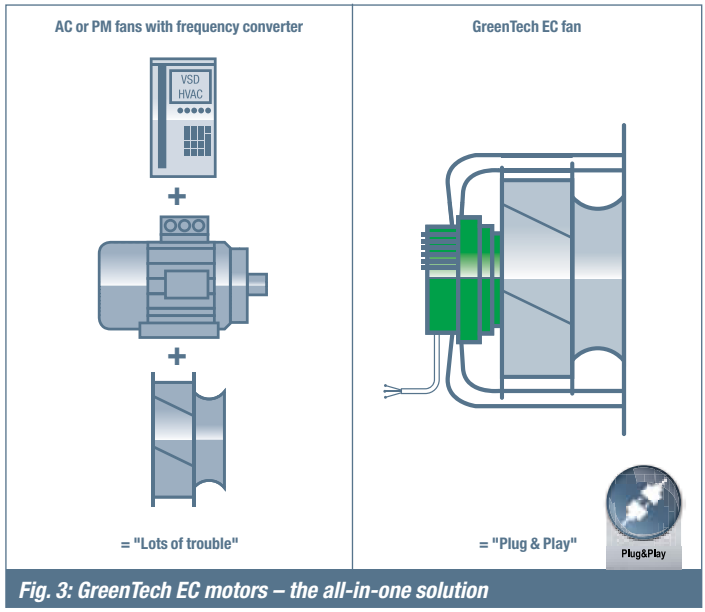


Fig. 3: GreenTech EC motors – the all-in-one solution



Operation geared to requirements

Fans in AHUs generally operate in the partial load range

An office complex with a glass facade, a summer's day with temperatures of 35 °C in the shade, full of people, maximum demand for ventilation and cooling and no maintenance or servicing due for a long time yet - that would be one way of describing the maximum requirements for an air handling system. In commercial, municipal and industrial applications, maximum load situations only ever occur on a few days in the course of a working year (Fig. 1). But the necessary cooling and heating performance and minimum air exchange rates still have to be reliably provided even then. The maximum load situation is thus the crucial factor for dimensioning of the air handling system and fans – but it is not the most important when viewed over the entire operating period!

Operating point and efficiency An information brochure* issued by the German energy agency dena contains the following recommendation: "In the short term, the time of day, production fluctuations and weather conditions may cause the operating point to change. Over the medium term, changes may come about due to seasonal influences or the degree of manufacturing capacity utilisation and in the long term as a result of increasing filter resistance etc. Under such circumstances it would be wrong to set the design operating point

*dena guide "Ventilation Technology for Industry and Commerce"



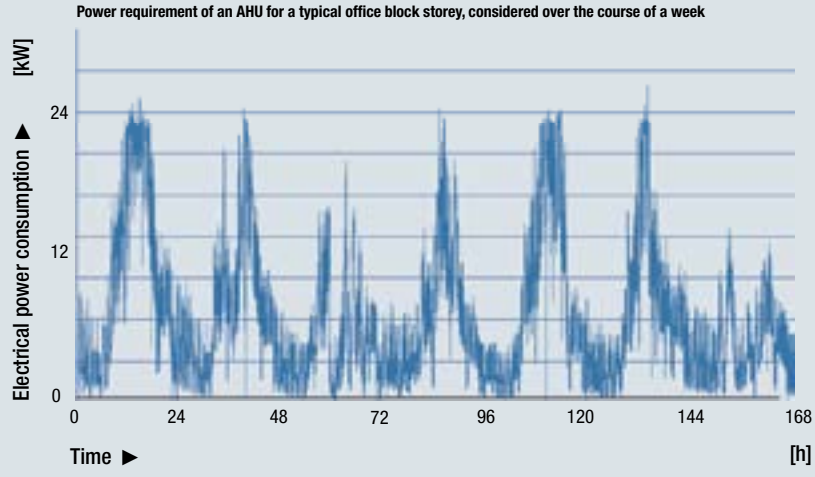


Fig. 1: Power consumption of an AHU over the course of a week

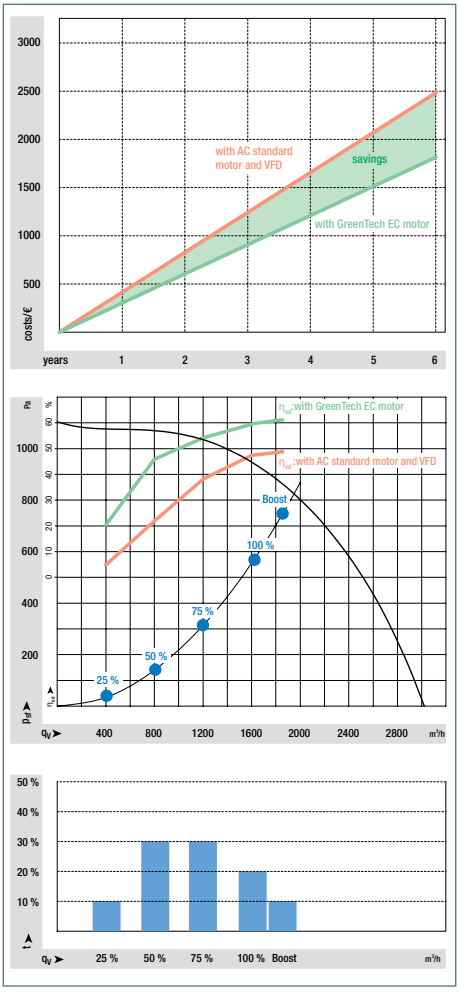


Fig. 3a, b, c: As compared to an AC standard motor with converter and the same power rating, the GreenTech EC motor is roughly 28 % more efficient for the load profile under consideration

(least favourable conditions and maximum performance requirement) at the point with the best efficiency level. It is better to have the operating point for the most frequent operating situation set here. The ideal solution is to perform optimisation on the basis of the expected load and select the characteristic curve with the lowest annual energy costs."

So the key is to have a technology which provides more or less infinitely variable adaptation of the air flow to the actual requirement. This ability is already integrated into the RadiPac for operation in air handling units. Its capacity for adjustment over a broad speed range ensures excellent efficiency and helps to cut operating costs. This is illustrated by comparing an AC fan with frequency converter to a GreenTech EC fan (Fig. 2). For the load profile shown (Fig. 3a, b, c), the efficiency of the EC fan is around 28 % higher. In addition to reduced power consumption, other benefits include far lower assembly and installation costs, less weight and a space-saving design.

Correct values in partial load operation Partial load is thus of considerable importance when planning and operating air handling systems with a view to keeping running costs to a minimum. RadiPac EC centrifugal fans provide an ideal solution. The certified Product Selector makes it possible to realistically simulate these operating conditions because its database contains the measured performance data of the fan. Absolute planning reliability is thus guaranteed.

Authentic operating conditions Category A measurements with free inlet and free outlet are definitive for the data given in the product catalogues and Product Selector and permit direct fan comparisons (Fig. 4a). The fans

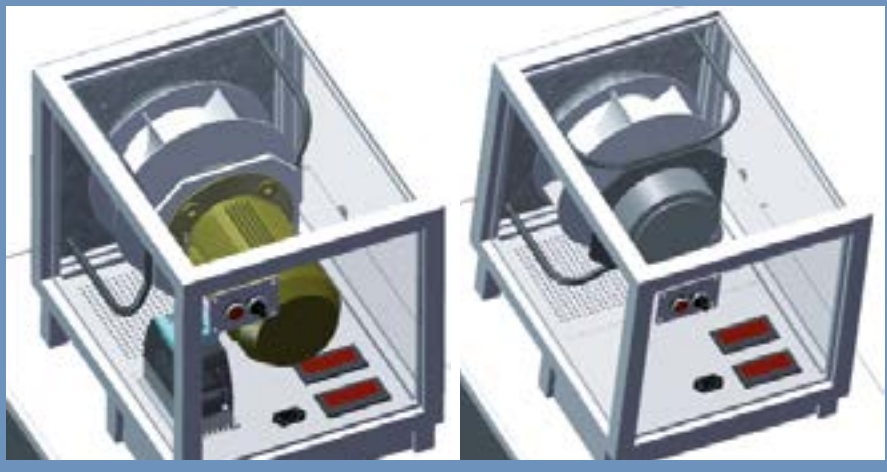


Fig. 2: System comparison between an IEC-E2 motor with frequency converter, sine filter and protective circuitry and a GreenTech EC motor from ebm-papst

in an air handling unit operate in more or less confined spaces. This leads to a reduction in air performance which has to be taken into consideration when selecting the right fan (Fig. 4b).

ebm-papst's documented values are based on customer requirements and the possible operating conditions involved. When choosing fans, the Product Selector makes it possible to incorporate various factors of influence, including the location of the air handling system or the available fan installation space. This permits a reliable assessment of energy efficiency, as well as operating and life cycle costs, because here again a whole range of correct values provide the foundation. The realistic consumption and performance figures supplied by ebm-papst help to ensure that the forecast performance values are actually achieved in practice (Fig. 4c). Selection of the correct fan is thus guaranteed.

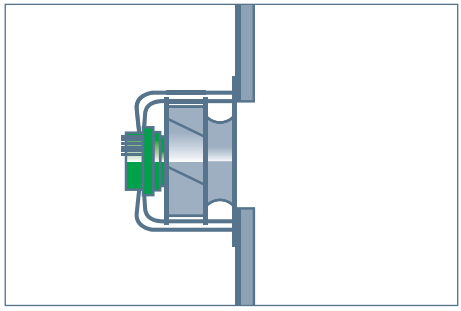


Fig. 4a

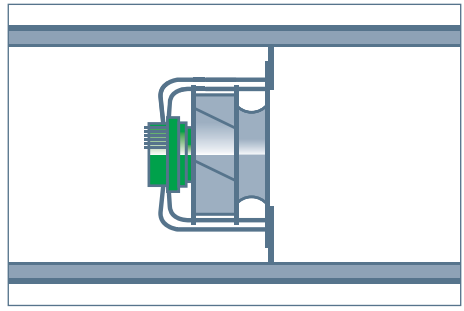


Fig. 4b

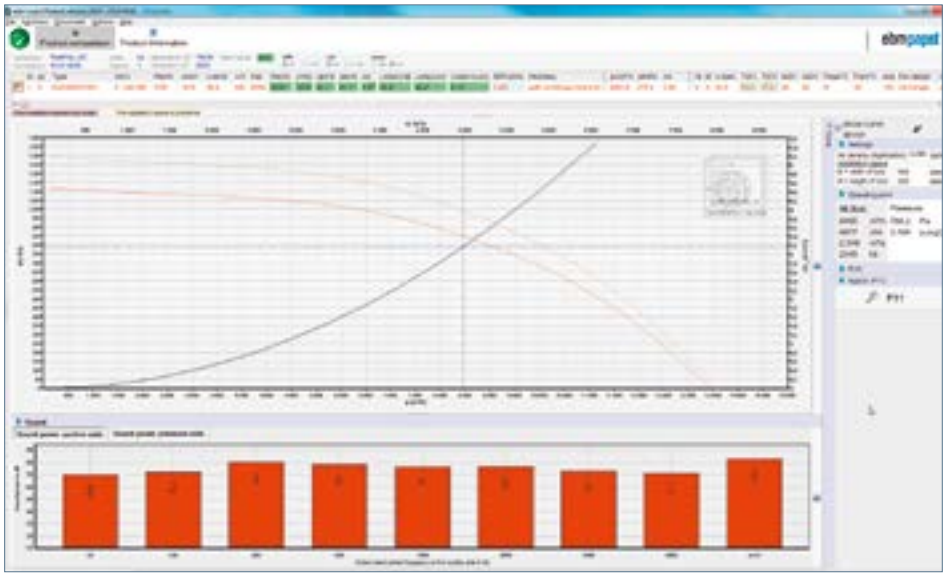


Fig. 4c: In the Product Selector the "installation situation" can be represented by selecting the size of the air handling units



Continuous enhancement

RadiPac now even more efficient

Further enhancement of the RadiPac was the next logical step for ebm-papst. Following optimisation of the EC motors used in the RadiPac fans, the introduction of an improved fan is now in the pipeline. Something to look forward to!

Nothing wrong with checking – but trust is even better Reliability and trust are vital to any partnership. Customers must be able to rely entirely on their suppliers - and ebm-papst is well aware of this responsibility. Both the fans and the associated documentation are quality products in which planners and operators of air handling units can always place their trust.

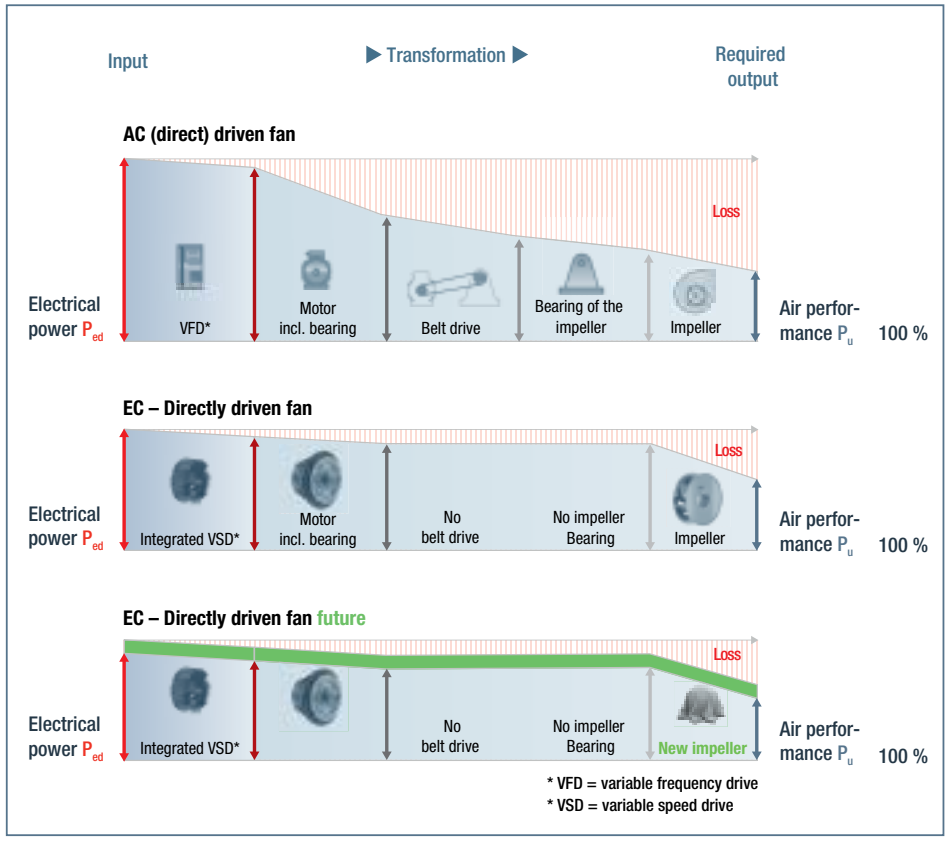


Fig. 1: The new RadiPac generation

499 RadiPacs for a model project in China

A ventilation concept guaranteed to meet with applause

The new Grand Theatre in Jinan in China is the pride of the city – not least in terms of sustainability. Helping to achieve this are 499 extremely efficient and quiet-running RadiPac fans from ebm-papst which supply the giant complex containing an opera house, concert hall, hotels and offices with all the fresh air it needs.

ebm-papst was the ideal partner for the air handling unit manufacturers Tsinghua Tongfang Co. who are committed to sustainable solutions. The 710 and 630 mm RadiPac fans employed offer maximum energy efficiency and reliability coupled with minimal maintenance and ease of installation. They are also powerful enough to convey the air through the extensive ducting system at high pressure and quiet enough to not spoil the visitors' enjoyment.

Thanks to the use of officially certified ebm-papst measurement technology there was also no doubt that the envisaged system efficiency of the fan units would actually be attained in practice.



Technical data		
ebm-papst product	2 x	**K3G710-AQ01-01**
	2 x	**K3G630-AQ01-01**
Air flow	m^3/h	20,000
Fan static pressure	P_a	550
Power consumption	kW	2 x 2.8
No. of units		218
No. of fans		499

The crux of the matter:
Model projects such as that in Jinan have to live up to their good name. This demands solutions which both incorporate successful existing concepts and represent the latest state of the art – just like our RadiPacs with GreenTech EC technology.



Unique air handling solution for exclusive shopping mall

A change of atmosphere in the shopping centre

Sandton City is one of Johannesburg's largest and most exclusive shopping centres. In the course of its modernisation, a new air handling concept was developed employing 140 RadiPac fans from ebm-papst.

The modular Viking air handling units had to be adapted to the particular conditions and different installation situations encountered. This involved the development of five differently dimensioned units with three modular sections each. An ideal air supply is provided by RadiPac fans with a diameter of 400 mm. These were installed in the form of a vertical wall in a typical fan array and can be individually regulated to suit the installation location and the required air supply by way of a 0-10 V control signal.

The manufacturing process was extremely straightforward, as all the RadiPacs are of a standard size with identical impellers and motors. Maintenance work is also reduced to a minimum by not having to adjust any belt drives.



Technical data		
ebm-papst product	11 x	**K3G400-AQ23-01**
Air flow	m^3/h	64,800
Fan static pressure	P_a	1,100
Power consumption	kW	11 x 2.45 (1,700 m above sea level)
No. of units		18
No. of fans		140

The crux of the matter:
The Viking solution shows just how important it is to have highly efficient motor technology, optimised aerodynamics and intelligent control electronics all working in perfect harmony. This is the key to creating concepts which set new standards.





Discover ebm-papst.

Ralf Mühleck, Project Engineer at ebm-papst

We at ebm-papst develop fans for air conditioning systems designed to guarantee maximum measurement accuracy and a reliable planning basis for customers. Our perfectly coordinated complete system not only offers outstanding performance but also provides reliable information on the total efficiency level. Because it is the result which counts.

Find out more at
entdecken.ebmpapst.com/gebaeudeklimatisierung

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The engineer's choice

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