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Bombardier Arena
Västerås.

Fan walls optimized energy consumption and improved the indoor climate.

Bombardier Arena was built almost thirty years ago and the arena is one of Västerås largest sports and event venues. The flexibility of the arena makes it an optimal space for both small and large events. The arena has three halls with a floor space of 3,000 sqm and it can quickly be transformed from sports hall to concert hall, dinner hall or exhibition hall. Bombardier Arena also conducts an intensive daily activity, including school sports, bandy and handball.

As in many other arenas and sports facilities, ventilation is of great importance to visitors' well-being. Effective control and optimization of ventilation is also important from an energy saving point of view. At night time and during other times when an arena is not used, great savings can be made by minimizing ventilation. The possibility of fan control has previously not been available at Bombardier Arena, where two large supply and exhaust air fans have been responsible for the air supply for many years. This has earlier created problems when, for example, concerts were held on the weekends in the arena's largest hall, because the ventilation needed to be started already on friday and could not be reduced until Monday when the arena staff came back to work. It is easy to understand that it is not energy efficient, but today the situation is different.

The ventilation system has now been optimized both from an energy saving point of view and climate-wise after the old fans at the end of 2018 have been replaced by two fan walls from ebm-papst which each have sixteen stackable cube fans. With completely new possibilities for efficient ventilation control, the climate will be improved for the visitors thanks to the fact that the air flow can be varied, and there is also a significant energy saving potential.

Mälarenergi Energy Services has been the main contractor for the modernization of the ventilation system and the project started with an energy investigation which showed that a significant reduction in energy consumption was fully possible. Mälarenergi's employees have extensive experience of successful energy saving projects at

Bombardier Arena
Västerås.

large companies, tenant-owner associations, real estate companies, congress halls and arenas. For many years, energy mapping and energy service agreements have been offered. On average, the energy consumption of customers has been reduced by 25-30% and in some cases by as much as 50-60%.

Energy mapping initiates many customer assignments
Many customer assignments are initiated with energy investigations that can be of varying degrees. At Bombardier Arena, such an investigation was made about the ventilation system in order for the arena owner to get an idea of the energy saving potential.

As the main contractor for the ventilation project at Bombardier Arena, Mälarenergi Energitjänster has had a broad responsibility and close contacts with various partners. One of these partners is Kadesjös Ingenjörsbyrå in Västerås. Kadesjös celebrates the 75th anniversary in 2020 and is a comprehensive consulting company within construction and plumbing design with about 60 employees. Customers can be found both in Sweden and abroad and the assignments are wide-ranging. From homes and offices to complex process buildings, hospitals and infrastructure facilities.

Within the company there is also long experience of designing and responsible for the layout of ventilation systems. For Kadesjös, it was a bit special to get responsibility for drawing in the new fan solution at the Bombardier Arena. It was Kadesjös who designed and designed the arena in the late 1980's!

Based on the energy investigation, and an ongoing discussion that fan walls could be a suitable solution, Kadesjö started to work. They produced the requirements that were set on flow and pressure, specified dimensions for available installation spaces, drew in how the fan walls would be placed and also documented the possibilities that existed to be able to control the cube fans.

- Finding a good solution for fan control has had high priority in this project as good control options are a prerequisite for achieving the energy savings target in combination with a good indoor climate. ebm-papst has invested heavily in creating a flexible fan wall concept with fans that have integrated control electronics and we have good experience with the company's products. We therefore contacted Rasmus Carlsson on ebm-papst to get a suggestion for fan walls that responded to the requirements, says Jonas at Kadesjös.

It was during 2016 that ebm-papst launched the stackable and very flexible fan wall solution in Sweden. Since then, fan walls have been installed in, for example, a large office complex in Solna, at Skaraborg's Hospital and at Kemicentrum in Lund. Common to all the projects is the desire for energy efficiency, redundancy and efficient control.

- The interest in our fan wall concept is constantly growing and we were of course happy when we were chosen as a supplier to the Bombardier Arena. A fan wall has many advantages. Modernizations are simplified as it often avoids the rebuilding that is required when a large fan is to be installed. In addition, it becomes possible to obtain extremely large airflows with low noise and energy consumption. Then there is an important safety aspect. The day a large fan breaks, it can result in major problems in environments where there is a requirement for a continuous air flow. If a fan in the fan wall fails, it is easy to compensate for the loss by temporarily increasing the speed of the other fans. The possibilities for control that exist with the fan wall also mean that the air flow can easily be adapted to the current air flow requirement which can vary just as it does at the Bombardier Arena, says sales engineer Rasmus Carlsson at ebm-papst in Järfälla.

Easy installation while the old fans were still running
Rasmus proposed the MXFG50RP-2250 cube fan, which has direct-driven EC-motor, the sound-reducing inlet grille FlowGrid, a power of 5.7 kW, an air flow capacity of 18,160 m3 / h (at 0 Pa) and which can be controlled via MODBUS and control signal 0 -10 VDC / PWM. Kadesjö and Mälarenergi agreed in the decision and ebm-papst fan walls were installed in late autumn 2018 and were put into operation in early November. It became a smooth installation with downtime in just one day, despite the fact that the fan walls had a different location than the fans that would be replaced. While installing the new fan walls, some of the duct could be kept open and the older fans in operation.

The months after the installation of the fan walls, the project to optimize the control of the fans is still on going. One goal is to adapt the airflow to the needs that exist in different parts of the arena as efficiently as possible. Further on, an evaluation will also be made of how well the fan walls helped to reach the energy savings targets set by Mälarenergi in their energy investigation.

Kemicentrum
Lund.

Safe ventilation and energy-efficient solutions with fan walls from ebm-papst.

At Kemicentrum in Lund, large AC fans have been replaced by four fan walls with ebm-papst stackable cube fans
Kemicentrum in Lund is one of the Nordic region's largest centers for education and research in chemistry. Here you will find all the chemistry subjects at Lund University of Technology and the Faculty of Science at Lund University. The chemical center has over 1,000 employees and many more students at the three cross-border institutions; Chemical Department, Department of Chemical Engineering and Department of Food Technology. Kemicentrum was built in the 1960's when the work environment requirements were not as high as today. This applies primarily to ventilation in the laboratories. Just over ten years ago, however, extensive rebuilding and modernization were initiated in several stages until 2010.

Recently, further modernizations have been carried out with the goal of optimizing ventilation, but also for achieving even greater energy savings. One of the alterations made has been to replace large AC fans in one of Kemicentrum's buildings with four fan walls built according to ebm-papst fan wall concept. In two of the fan walls there are nine pieces of ebm-papst stackable MXFG cube fans (a total of eighteen cube fans) and two other fan walls consist of six cube fans each. The fans have EC motors and are standard equipped with the air-inlet grille FlowGrid. Because the EC motors have MODBUS inputs and can be controlled with the EC-Control program, there is the possibility of addressing multiple fans in a fan wall. Opportunity is also available for other control solutions, and in Kemicentrum the control comes from a central control and monitoring system.

The Kemicentrum building complex consists of five different buildings with a total area of approximately 50,000 square meters. House 1 was completed in 1965 and was Kemicentrum's first building. With its length of 270 meters, House 1 is the largest house in the complex, and the building got an extra floor in the form of a very large fan room. It's also here that ebm-papst fan walls are installed.

Kemicentrum
Lund.

Laboratory environment that places high demands on air flow
The fan walls with nine cube fans each have a maximum airflow capacity of 26 m3 / second, and at the fan walls with six cube fans the maximum capacity is 17 m3 / second. House 1 has an area of approximately 15,000 sq.m. and includes research and training facilities for chemical engineering, materials chemistry and chemical education. Over the years, much has been done to give employees, students and researchers a comfortable indoor climate and a good working environment, as well as to save energy. The airflow in parts of the building is controlled by, for example, presence detectors in the supply air. The building's air conditioning system has for many years had two parallel connected exhaust and extract air units in the fan room. The requirement has been that one unit should be able to cope with the minimum air flow and a forced air flow for the protection ventilation of the large number of fume hoods found in the laboratories. Should the pressure in the duct system drop below a minimum allowed value, a low air flow alarm will be activated in the protection-ventilated units and the fume hood should be immediately shut off.

The special conditions for the ventilation in House 1 has been a challenge in the planning and construction of the air handling system. Uno Nilsson at Akademiska Hus worked as a technical engineer at Kemicentrum until 2006. He then became a technical manager before he gained a position as an operating engineer in the spring of 2016, focusing on energy efficiency and energy-efficient solutions for the ventilation system.

- The large AC fans previously fitted to the unit had fan motors with a power of 75 kW. At the same time we made the calculations of the energy efficiency that would be achieved with a motor change, we started looking at alternative solutions. One reason was that the energy gain with a motor change would not be particularly high. We also wanted to investigate whether there were alternative fan solutions that could both improve energy efficiency and other benefits operationally, says Uno Nilsson.

Akademiska Hus will reduce energy consumption by 50%
Kemicentrum is owned and managed by Akademiska Hus, one of Sweden's largest real estate companies with a property value of approximately SEK 75 billion. Akademiska Hus builds, develops and manages environments for education and research. The buildings are located in resorts across the country and here, there are 300,000 people studying, researching and working each day. Akademiska Hus's ambition is to be at the forefront of sustainability issues and energy savings. The goal is that the amount of energy delivered will decrease by 50 percent by 2025 (with the consumption from year 2000 as a starting point). Around the country, work is continuously being done to reduce energy consumption and Kemicentrum is no exception.
- We are continuously working on trying to save energy and to achieve the tough energy saving goals that we've set up for the year 2025, and we must constantly look for new energy-efficient solutions. I am convinced that the investments we have made in a number of fan walls will reduce energy consumption, but so far we have not been able to calculate how much the total savings will be in the end. We also see other benefits, among other things, a reduced noise level and increased security as we are not dependent on a few large fans as before. We have also had new opportunities to optimize the fan operation according to the requirements for ventilation at different times during the day. When the need is lower, it is easy to turn off some fans in the fan walls from the overall level. We will also make savings in terms of lower maintenance costs, explains Uno Nilsson.

ebm-papst fan wall concept has become a big market success, and it is ebm-papst sales engineer Jan Sörensen in Hässleholm who helped to develop the fan wall solutions for Kemicentrum.
-It is both challenging and fun to work with Akademiska Hus employees as they have high skills in energy savings and a clear goal for the savings to be achieved. With the fan wall we can both help save energy and increase redundancy in a property with high demands on ventilation, and that is a big strength. As Uno mentions, the security aspect is important. The day a big fan breaks, it quickly becomes a problem in environments where demands are made for continuous air flow. Should a fan in any of the fan walls have a problem, it is easy to compensate for the loss by temporarily increasing the speed of the other fans. Being very easy to install a fan wall is also a big plus. Just stack the fan cubes on top of each other, connect the cables and plug in the power, says Jan Sörensen.

In the work of developing the fan wall, ebm-papst has attempted to cover a number of applications where demands are made for large air flows and a high degree of redundancy. Laboratory and research environments such as those at Kemicentrum are typical examples of such an area. Other examples include data centers, hospitals, the food industry, the chemical industry and also large office buildings.

Skaraborgs Hospital
Skövde.

"The fan wall is extremely smooth, cost effective and energy efficient"

Skaraborgs Hospital (SkaS) is an emergency hospital with facilities in Skövde, Lidköping, Falköping and Mariestad. The hospital has approximately 4,200 employees and is part of the Västra Götaland region. Skaraborgs Hospital in Skövde is the largest unit within Skaraborgs Hospital. The facility in Skövde were planned and built during the late 60's until the mid 70's. In total there are about 25 buildings with a total area of approximately 165,000 square meters. The age of the hospital has begun to take its toll and there is a great deal of need for refurbishment and modernization. Many modernization projects have been launched in recent years and the hospital has also been expanded.

A large part of the modernization focuses on reducing energy costs and efforts are being made towards the energy targets set by the Västra Götaland region by 2030. Energy consumption should then have been reduced by 50% compared with 1995 and as part of achieving the goal, major renovations of the hospital's ventilation system will take place. In one of the projects, two very large axial fans for supply air in some of the buildings have been replaced with a fan wall from ebm-papst. The fan wall consists of 15 stackable fan cubes, with the size of 800 x 800 mm per cube. The modules include RadiPac AirFoil fans with EC motor (Ø 500 mm). When ebm-papst was developing the concept of the fan wall, great emphasis was placed on applications requiring large air flows and safe fan operation. Hospital buildings are a good example of such an area. Other examples include data centers, food industries and large office buildings.

Västfastigheter is the property manager of Västra Götaland region and manages approximately 1,700,000 square meters of premises. Management responsibility includes the region's real estate in health-care. Västfastigheter has one of its offices in Skövde as well as an operating unit at Skaraborgs Hospital in Skövde. Joakim Fagerholm is an Energy Engineer at Västfastigheter in Skövde and explains why it was so important to replace the huge old axial fans.
- They were old and endured and there were great difficulties finding replacement parts. In addition, they did not fit in with the long-term strategy we are working on to reduce the energy consumption. The fact that we had to adjust the fan blades that we could initially angle also made the fan drive less optimal. There were different options for solutions that we discussed when it came to a fan change, but it was our contact with ebm-papst that made us realize the benefits of a fan wall.

Skaraborgs Hospital
Skövde.

Flexibility makes it easy to find the most optimal solution
Johan Nyhlén, sales engineer at ebm-papst's office in Gothenburg, has noted an increasing interest in the flexible fan wall concept. It can be used in both suction and pressure chambers and each fan cube can be installed separately when the capacity of an entire fan wall is not required. At Skaraborgs Hospital in Skövde, the old axial fans stood for a significant supply air capacity. Every second, the fans moved 45 cubic meters of air and required the fan wall to deliver at least the same air flow.
- I think this project very well illustrates the benefits of the fan wall. It's easy to install and just stack the number of modules required to accommodate a certain capacity. The fact that the modules often can be stacked on top of each other in the existing fan room also means a lot for cost-effectiveness. Redevelopments are often expensive and the fact that it is not needed in this project helps to simplify the installations considerably, says Johan.

The fact that the fan wall is a smooth fan solution is also confirmed by Joakim Fagerholm.
- I would like to say that it is extremely smooth! Just as Johan says, the fan wall was placed in the same space as the old axial fans. The only difference was that we moved the fan wall about ten meters. For us it is important that we can move air at the lowest possible cost, and then it is of course an advantage that we do not need to make redevelopments when we modernize.

The work of dismantling the old axial fans and installing the new fan wall has been carried out by Bravida in Skövde, which has a framework agreement with Västfastigheter. Bravida is also involved in many other installation and ventilation projects at the hospital.

The fan wall is a step towards a long-term energy saving goal
It's as easy to build the fan wall by stacking the modules as it is to remove modules if the capacity requirement changes after, for example, rebuilding. Joakim Fagerholm sees that opportunity as another important advantage.
- With the more modern fans there is a great opportunity to optimize fan solutions with speed control, but with the fan wall we get another opportunity for optimization. It is easy to change the number of modules and we will use that opportunity in the future if the need for supply air were to change. If the need decreases, we will just remove some of the modules that we may be able to use elsewhere in the hospital.

The RadiPac Airfoil fans with EC integral motors built into the fan cubes have an aerodynamically optimized fan wheel that delivers very high efficiency, even air flow with minimal turbulence and low noise intensity. The modules are also fitted with partitions, cables and FlowGrid as standard. FlowGrid is a sound-damping air-inlet grille that stabilizes air currents at the fans inlet. The EC motors offer different control options via, among other things, MODBUS for addressing multiple fans in a fan wall. The fan wall can also be controlled with analog inputs and has built-in power supply for sensors. The hospital also utilizes the ability to control when you always want a constant pressure in the air ducts.

Västfastigheter have very ambitious goals when it comes to energy saving and the ambition is to classify many of the properties. The work on energy efficiency has been successful, and Västfastigheter is investing heavily in a nationwide comparison of energy consumption in the county and regional offices. Efforts to reduce energy consumption are ongoing to achieve the goal of reducing energy consumption by 50% in real estate by 2030.
- We are good at energizing our properties, but it is always important to find new ways to lay one step ahead and one good example of that is the installation of the fan wall. Shortly after the installation, we could measure that energy consumption had halved, which means we will save 350,000 kilowatt hours a year. We are grateful for the help we received from ebm-papst to find a completely new type of fan solution. In order to meet our targets for reducing energy consumption by 2030, we need to constantly move forward and make use of new technological advances. ebm-papst's fan wall is a good example of that, concludes Joakim Fagerholm.

Real Estate Company Fabege
Solna.

Energy-efficient fan wall improves air exchange in office buildings

In early 2014, the Swedish Environment Institute IVL presented a report on the importance of air turnover for the perceived air quality in office environments. In May 2015, the industry organization Entreprenörföretagen also presented a survey showing that one third of all workers in Sweden want to improve ventilation at their workplace. Nearly 70 percent also state that they are performing poorly due to poor ventilation. One reason why the ventilation may need to be improved is that the activity in a property has changed and that the ventilation system is not dimensioned for new requirements. In existing office buildings where you want to increase the air flow, it can lead to complicated and costly projects. A ventilation project in Solna Business Park is a good example that is necessarily not always the case.

They have chosen a different solution where an older fan (11 kW) has been replaced with a number of plug fans mounted in a fan wall. The solution has improved the ventilation without increasing the cost of energy. The installation of the fan wall has taken place in an existing ventilation unit with limited space and without requiring major reconstruction. The same change has been made both on the supply air and exhaust air side of the unit.

Solna Business Park is an established area of several office buildings where the listed real estate company Fabege is a large property owner. The company is working on a long-term sustainability philosophy and has reduced carbon dioxide emissions by 90% over ten years. The average energy consumption for heating Fabege's properties is 50% lower than the industry average and the company uses 96% renewable energy.

A different solution in an existing ventilation unit

Fabege also works long term when it comes to capturing customer needs and developing and adapting office space. One of the country's leading IT companies is one of Fabege's tenants in an

Real Estate Company Fabege
Solna.

office building in Solna Business Park with a total area of approximately 10,000 square meters. In the part provided by the IT company, there was a desire to increase air flow when more people would get their workplace in the premises.

Anders Persson, Operations Manager at Fabege, says that the indoor environment is a very important part of the work and that customer requests often require different solutions. This was also the case when the air exchange was to be improved in the IT company's premises.

- Indoor climate is one of the most important issues for us who work with property management and operation. We are passionate about creating a work environment where our customers' operations can be developed. That is why we invest heavily in customer dialogue and on constantly developing office space in line with our customers wishes. In this particular project there was a desire to increase air flow and to do so even though the technical conditions were limited. There was simply no room for any major interventions and rebuildings. That Axela, along with ebm-papst, developed a solution in the form of a fan wall, I think is impressive. The solution has given the desired improvement in air exchange without increasing energy costs, says Anders Persson.

The company Axela has for many years been working on rebuilding and office adaptations in Solna Business Park. One of Axela's business areas is the design and installation of air treatment plants. Leif Strandberg has been working on ventilation issues at Axela since the early 80's and finding a solution to improve air flow in the current office space became a challenge despite the long experience.
- The starting point was that we had a direct driven fan that was just over eight years old. The question was how we could modernize the existing ventilation unit so that the requirements for increased air flow could be met, but without increasing energy costs or higher noise levels. We simply knew what we wanted, but not how the solution would look like it was when we started a dialogue with ebm-papst, explains Leif Strandberg.

Plug fans with pre-mounted silencers

Klas Alner, sales engineer at ebm-papst's Ventilation Retrofit department at the time (current position Business Developer), proposed a solution in cooperation with Axela, where four direct driven plug fans (type MXPC50RD-2200 with 5.5 kW power each) would be mounted as a fan wall in the existing unit in Fabege's office building. According to Klas this could show a number of advantages.
- The need to get more air into, for example, an office building can be met in several ways. One alternative is to draw new ventilation channels, but it is expensive. Another option is to replace a fan with another fan with higher power. The disadvantage then is that the costs can increase as well as the noise level when the pressure increases. What I did in this project was to try to find an optimal solution for the need for more air without increasing the energy costs or noise levels. The solution finally became an installation of four plug fans mounted in the old unit, says Klas Alner.

Leif Strandberg points to some of the benefits of the new fan wall.
- The solution has several important advantages. The most important thing is that we received the desired increase in air flow, just over ten percent, and at the nearest unchanged energy cost. Another big advantage is that, with the fan wall, we have a total power of 22 kW, but without the fans having to run so hard to get more air in the rooms and it is obviously positive for the noise level. In addition, the fans have pre-mounted silencers, and we have also removed a number of baffles, which causes the pressure to drop. By removing the baffles we can get more air without the sound changing.

The pre-mounted silencer FlowGrid is an air-inlet grille that makes ebm-papst's already silent low-energy fans even quieter. FlowGrid stabilizes air currents at the fan inlet, which reduces the noise levels. Turbulence and air vents in the airflow at the inlet to a fan can often cause unnecessary loud noise, but these problems are eliminated with this solution that does not affect the fan's efficiency.

Problems with low-frequency noise from ventilation systems have been noted in recent years, as the noise in, for example, office environments can be perceived as inconvenient even though measured noise levels are approved according to the regulations. With Flowgrid, ebm-papst has developed a solution that can help improve the sound level in the indoor climate. Measurements made in the laboratory environment show that Flowgrid can reduce the overall sound power level and also the sound pressure level (the noise that occurs when the air vents hit the fan blades) with several decibels.

Shopping Center Domino
Norrköping.

Major energy savings when ventilation system was modernized with EC-fans

There are many examples that energy efficiency can be significant when modernizing ventilation systems with ebm-papst EC fans. A little different project that resulted in major energy savings is the one at shopping center Domino in Norrköping. Here, ebm-papst's largest unit fan was installed in a double-mounting at two locations in the fan chamber, reducing the power from 65 kW (supplied by two older belt-driven fans) down to 22 kW.

By replacing a pair of older belt driven fans with four of ebm-papst's energy efficient EC fans, energy consumption has decreased from just over 270,000 kWh to about 170,000 kWh per year. Domino is a two-storey shopping center in central Norrköping. The shopping center was opened in 1995 and celebrated its 20th anniversary in 2015, but the property is considerably older than that and the old fans replaced had been in operation since the 60s / 70s. There are more than 35 stores as well as offices located in Domino and in 2010 it was acquired by Diligentia. Diligentia managed more than 115 properties at the turn of the year 2014/2015 to a value of approximately SEK 36 billion. To constantly develop the properties is a cornerstone of Diligentia's business concept and it is also something that the visitors at Domino noted. Much has been refreshed in the shopping center and perhaps the visitors has also noticed that the ventilation solution has given a better indoor climate.

Utilizes the ability to control and adjust ventilation to the needs
Modernizing ventilation systems in a shopping center can often be a constructional challenge, since older fan assemblies are often placed in narrow spaces high up in the properties. One reason is also the size of the fans. Large shopping centers require large air flows and fans with high air flow capacity. The installation of ebm-paps's unit fans is facilitated by the fact that the deviated stand is not mounted on delivery. The fan without stand has a weight of about two hundred kilos.

For the project, the MXAC80RDK-1370 model was selected as an exhaust air unit fan for horizontal or vertical mounting. The fan is

Shopping Center Domino
Norrköping.

used, for example, for incorporation in existing units during renovation and has an energy efficient EC engine with integrated drive and control electronics ready for speed control with 0-10 V signal. In this project, however, the fans are controlled by a Duc type Abelko with MODBUS / RS-485.

- The ability to efficiently control the fans allows Diligentia to optimize operation so that ventilation is adapted to the needs of the shopping center. Before opening and during the evenings, ventilation does not need to go full speed and it also contributes to a higher energy saving, says Pasi Kehusmaa, Operations Manager at Galleria Domino.

Trisec Energi in Norrköping is responsible for the fan installations at Domino, and the company enjoys both the architectural challenges and helping the customers with energy efficiency. The business started in 2008 and the company was initially focused on control and regulation projects. Over the years, the services have been extended to include ventilation, electricity, service and maintenance. The modernization of Domino's ventilation system is a typical challenge that fits Trisec.

- We gladly take on big and demanding projects like Domino, but we also work with smaller projects as well. Certainly it can be quite complicated to transport a fan weighing a few hundred kilos up the stairs and getting it in place, but there are always solutions to the problem, although like in this project it may require demolition of walls. What drives us is the opportunity of helping our customers with energy savings and we do also spend a lot of time calculating energy savings potential, says Jonas Stenbäck, CEO at Trisec Energy.

"We always find a solution together with ebm-papst and an example in this project is that we opened up the outlet"
The calculation made by Trisec for Domino showed that the modernization with four EC fans would provide an annual economic energy saving of almost 160,000 SEK (At a price of 1 SEK / kWh).
A significant amount also means a short pay-off time for the investment. Pasi Kehusmaa reports that an initial tracking gas measurement was carried out before the decision was taken to complete the project.

- Through the measurement, we received a detailed picture of the actual air flow which was crucial for making the correct fitting of the new fans. It was also important for our calculations because it enabled us to verify the potential energy savings, explains Pasi Kehusmaa.
Choosing the right fan is crucial for a modernization project to also become a good energy saving project. Trisec Energi and ebm-papst have been working closely together for several years and it is a cooperation that is valued by both parties.

- It is important for us that we can bounce ideas with our sales contact at ebm-papst. Together we always have the attitude that nothing is impossible and that a solution can always be found. An example of the Domino project is that we used ebm-papst's solution to open up the outlet properly. The advantages are that it gives a lower outlet rate and lower flow losses. Additionally, the sound reduction is an added advantage when setting high comfort requirements, such as in a shopping center, says Jonas Stenbäck.

Klas Alner, sales engineer at ebm-papst's Ventilation Retrofit department at the time (current position Business Developer) considers the project in Domino to be very interesting, not least in the way it has been implemented.
- The operatating engineers at Trisec and Diligentia have invested a lot in every part of the project, which was of great importance for the successful results and the energy savings achieved. With a trace gas measurement it is possible to accurately dimension fans. Although such measurement costs a lot, it is often well-invested money. It's also a good thing that Trisec took advantage of the big benefits of opening up the outlets, Klas Alner concludes.

University Hospital (US)
Linköping.

Successful energy trimming at the University Hospital in Linköping

Modernizing projects using ebm-papst's plug fans with EC technology often results in major energy savings. At a fan change at the University Hospital in Linköping (US), Veolia FM has demonstrated that there is an even greater potential for energy saving by removing the sound baffles, also called energy trimming. The project has been so successful that the same measure will be carried out on more of the hospitals fans.

The University Hospital in Linköping, also known as the US, has nearly 600 hospital beds and over 5,000 employees. The hospital offers citizens a safe and secure care with top-level expertise in several areas and is considered to be the best in the country when it comes to emergency care, image diagnosis, eye surgery and childhood diabetes. Recently, major redevelopments and newbuildings have taken place to create the future university hospital under the collective name "Future US". The new buildings will have an area of 63,000 square meters and will be ready in 2021. The goal is that energy use should be less than half of the current requirements according to the building regulations set up by Boverket (Swedish national board of Housing, Building and Planning).

For many years, the hospital has been working intensively and successfully for energy optimization and reducing energy consumption. The ambition to significantly reduce energy costs also includes many other properties of the Region Östergötland. The projects are led by Veolia FM AB. Veolia FM is part of Veolia Nordic AB, which has approximately 1,200 employees in about 70 offices around the Nordic region. Veolia FM, which is the Swedish operating company in real estate and hospitals, offers a wide range of real estate technical support services and has over the years built a leading excellence in energy optimization. At the hospital, Veolia FM has a location organization that continuously works with constant energy improvements. All energy saving projects are carried out taking into account the energy saving objectives set for the future. One of the long-term goals is to reduce energy consumption with 50% by the year 2050.

Can you trim a plug fan by removing the sound baffles?
Already in 1937, Veolia's first hospital engagement took place in the Nordic region. Since then, many new services have been developed that support the healthcare sector's core business. Veolia FM also has the services and solutions required to take broad responsibility in the energy field. Some examples include energy supply, uninterruptible power, greenhouse gas emissions, and energy savings through efficiency improvements.

At the University Hospital (US), it has resulted in several fan changes in a number of the hospital's facilities, using ebm-papst plug fans with EC technology. One of the buildings is House 454, where there is an infection department on floor nine. While replacing the older belt-driven fan with an EC fan, an idea was raised that it would be possible to achieve additional energy savings by "trimming" the plug fan. The author of the idea was Tobias Ring, an operating technician

University Hospital (US)
Linköping.

at Veolias location organization at the University Hospital, where he works extensively with energy and energy optimization of the existing facilities. Calculations of energy efficient measures are part of his duties and a great deal of interest in possible energy savings led to the idea of energy-trimming ebm-papst's plug fan by disassembling the sound baffles.

- We knew before we could make energy savings of nearly 40% through the actual fan change alone. What I was curious about was if there was an additional savings potential by removing the baffles and increasing the distance between those left. By increasing the distance from 10 to 30 cm, the area would increase from 38% to 70%. We decided to try the idea and, in due course, it is only to be noted that it was a great success. We will definitely continue with energy trimming!, says Tobias Ring.

"Through energy trimming we saved additional 14% of energy"
Stina Helenius at Veolia FM is Tobias colleague and has a role as project manager / energy specialist. She works both at the University Hospital and in a regionwide department with energy efficiency, optimization and improvement of existing systems. Since there are large properties and a lot of surface that Veolia FM operates in the region of Östergötland there is a lot to do. And in such a large hospital as the US there are many fan assemblies with a large combined energy potential.

- We have made an inventory of all fans in the hospital with an assessment of what should and can be done from an energy perspective. The measurements Tobias made by the fan in House 454 showed that we would make a big savings by switching to ebm-papst EC fan. The fact that Tobias then came to the idea of disassembling sound baffles showed that there is an additional energy potential. The result was a saving of about 14% and that is impressive, says Stina.

Stina says that it is the low noise level of the fans that made it possible to focus on energy trimming.
- Since ebm-papst EC fans are so quiet, we felt it might be worth testing Tobias suggestion. After the baffles have been removed, the resistance decreases, which reduces pressure. Therefore, the fan does not have to run as hard, which also gives us a significant energy saving in addition to the one we would have received by a regular fan change.
Because the energy trimming was a test neither Tobias nor Stina knew what the result would be.
- We were both surprised that the savings were so great. Because there are many fans in the hospital, energy trimming can give a significant energy saving effect. We have since been using energy trimming on another plug fan and soon it's time for the third. The fact that our clients in the Region Östergötland are happy about the successful result it also makes us inspired to find more trimming projects, says Stina Helenius.

Klas Alner, sales engineer at ebm-papst's Ventilation Retrofit department at the time (current position Business Developer) has been working closely with Veolia FM in Linköping for several years. He is also surprised that the savings were so great after the removal of sound baffles, but he is not surprised that it was the team from Veolia FM at the US that realized the innovative idea.
- I think this project shows how much commitment and interest in energy saving means for successful energy saving projects. Energy skills and experience are of course important, but curiosity and ability to think outside the box can often be what is needed to give that extra energy-saving effect, says Klas Alner.

The fact that ebm-papst's EC fans are energy efficient is shown by the energy saving US would have had even if no energy trimming was performed. Nevertheless, there is more that can be done and it does not always have to be about the removal of sound baffles. Optimizing fan selection, intelligent fan control, and smart installation concepts through, for example, fan walls are other examples.

Klas and his colleagues at ebm-papst are happy to show you wise solutions and the additional energy-saving measures that can be implemented when making fan changes.
- We like to act as an adviser and ball shelf in both small and large projects. Although our customers have a lot of knowledge about fans, we may be able to add ideas and experience from different projects that will show alternative opportunities for energy savings. The project at US shows that there are such opportunities that many may not think of, concludes Klas Alner.

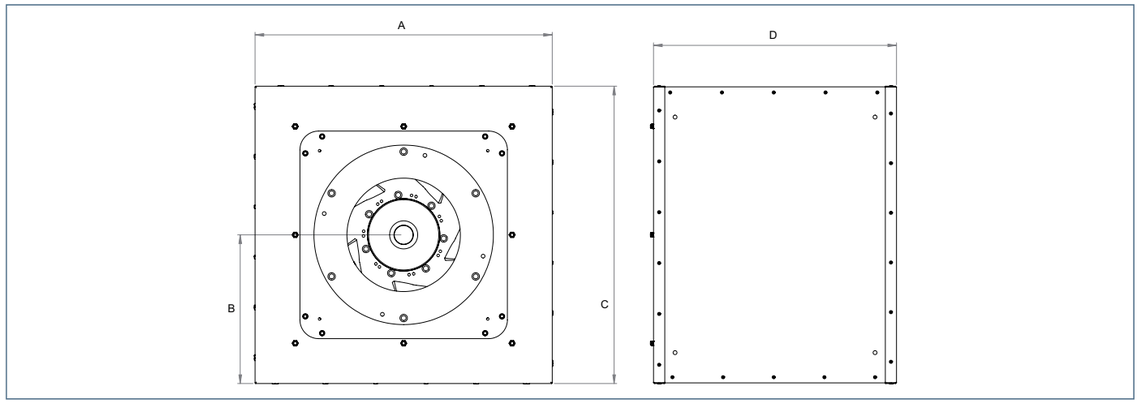
MXFG - Fan cube
Ø 310 - 500 mm

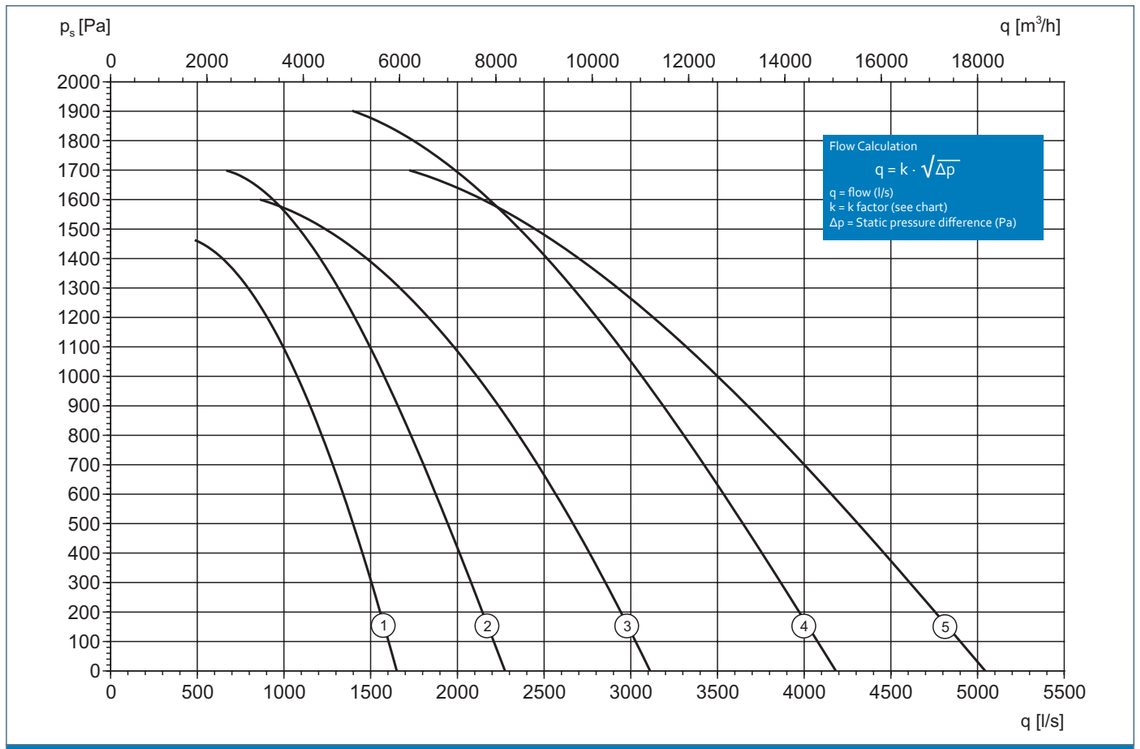
A scalable product for easy transportation and installation. Suitable for applications were redundancy is wanted or required. MXFG is delivered with the air-inlet grille FlowGrid as standard and is currently available in two sizes. The MXFG can also be customized using other EC fans and with customized dimensions; to fit existing AHU and operating point.

- Direct driven fan with high-performance impeller and GreenTech EC motor
- Very high efficiency and low noise level with fan type RadiPac Airfoil
- Complete module, easy deployment and installation
- Easy to assemble with the included mounting kit and cable rail
- Robust construction and maintenance-free operation
- Very quiet, optimized air flow through the fan wheel
- Insulated sides / partitions
- Inlet cone with pressure tap
- Control cabinets are sold separately (1 per 6 cubes)
- Control signal 0-10 VDC / PWM and MODBUS
- Output 10 VDC max 10 mA / 20 VDC max 50 mA
- Complies with ErP 2015

Description	Nominal voltage	Power	Current draw	Curve	Inlet ring k-factor	Dimensions			
	VAC	kW	A	Curve	l/s	A	B	C	D
MXFG31RP-4000	3~400	2,95	4,6	1	32,2	595	351,53	595	495
MXFG35RP-3230	3~400	2,68	4,1	2	41,1	595	351,53	595	495
MXFG40RP-2750	3~400	3,35	5,2	3	52,2	595	351,53	595	495
MXFG45RP-2600	3~400	5,25	8	4	66,7	795	397,5	795	650
MXFG50RP-2250	3~400	5,70	9	5	78,1	795	397,5	795	650

MXFG - Fan cube
Ø 310 - 500 mm





MXFG31 - MXFG50

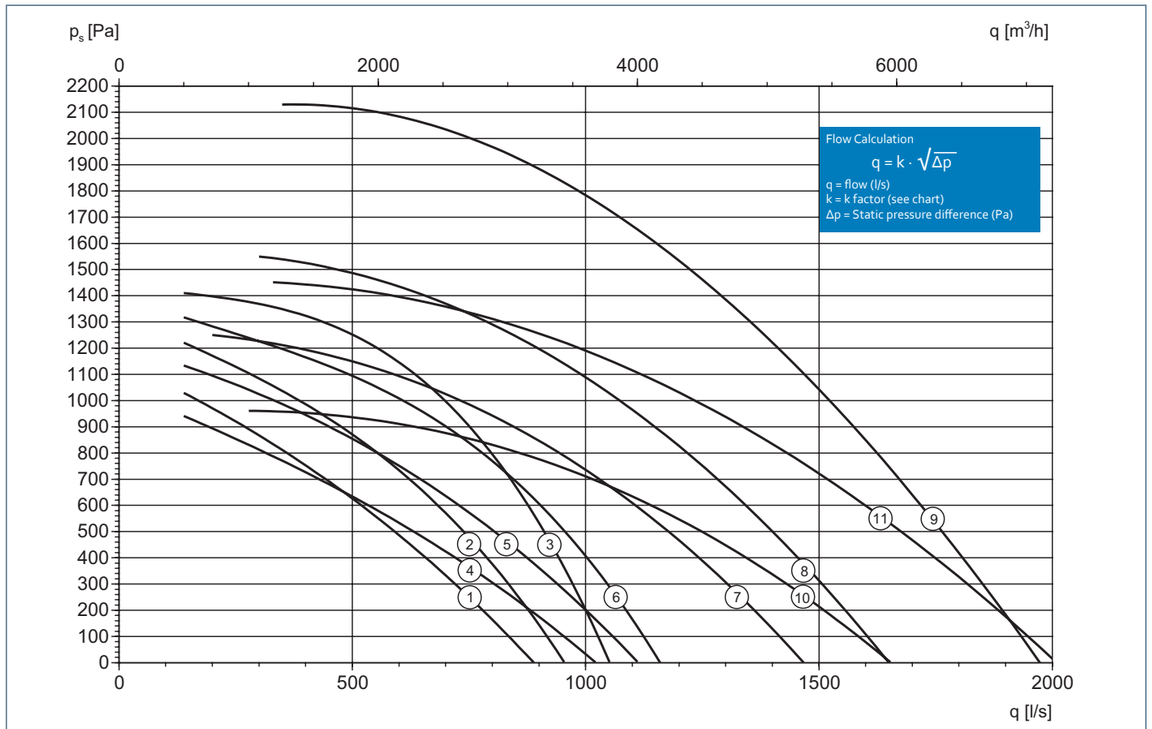
MXPC II - Plug fan
Ø 250 - 350 mm

A new improved design with higher mechanical stiffness developed for the new AirFoil impeller. MXPC II is made for floor mounting installation with rubber dampers and gasket on the inlet side for a smooth operation, suitable for installation in suction and pressure chamber.

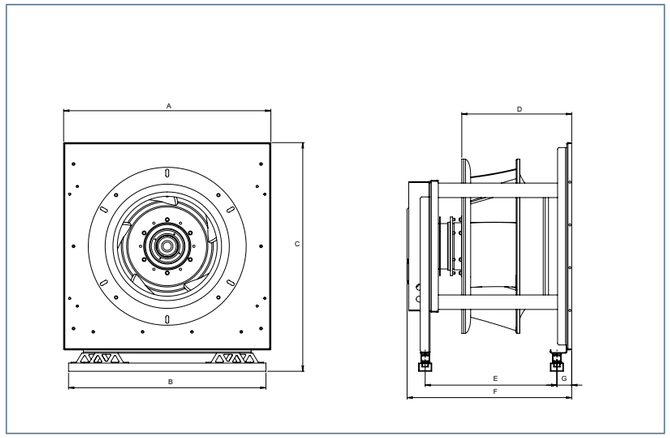
- Direct driven fan with high-performance impeller and GreenTech EC motor
- Very high efficiency and low noise level with fan type RadiPac Airfoil
- Robust construction and maintenance-free operation
- Very quiet, optimized air flow through the fan wheel
- Easy commissioning
- Inlet cone with pressure tap
- Rubber dampers and inlet gasket included
- Integrated drive and control electronics
- Control signal 0-10 VDC / PWM and MODBUS
- Output 10 VDC max 10 mA
- Complies with ErP 2015

Description	Nominal voltage	Power	Current draw	Curve	Inlet ring k-factor	Dimensions						
	VAC	kW	A	Curve	l/s	A	B	C	D	E	F	F
MXPC25RP-3080 (MXPC II)	1~230	0,5	2,3	1	21,1	400	410	465	166	174	250	45
MXPC25RP-3450 (MXPC II)	1~230	0,75	3,3	2	21,1	400	410	465	166	174	266	45
MXPC25RP-4000 (MXPC II)	3~400	1,8	1,8	3	21,1	400	410	465	166	174	266	45
MXPC28RP-2670 (MXPC II)	1~230	0,5	2,3	4	21,4	400	410	465	177	182	258	45
MXPC28RP-3000 (MXPC II)	1~230	0,75	3,3	5	21,4	400	410	465	177	182	274	45
MXPC28RP-3400 (MXPC II)	3~400	1,05	1,6	6	21,4	400	410	465	177	197	289	45
MXPC31RP-3010 (MXPC II)	3~400	1,23	1,9	7	32,2	400	410	465	239	287,5	425	45
MXPC31RP-3410 (MXPC II)	3~400	1,8	2,8	8	32,2	400	410	465	239	283	383	45
MXPC31RP-4000 (MXPC II)	3~400	2,95	4,6	9	32,2	400	410	465	239	283	383	45
MXPC35RP-2400 (MXPC II)	3~400	1,1	1,7	10	41,1	500	470	565	270	294,5	424	45
MXPC35RP-2870 (MXPC II)	3~400	1,9	3	11	41,1	500	470	565	270	314	414	45
MXPC35RP-3230 (MXPC II)	3~400	2,68	4,1	12	41,1	500	470	565	270	324	434	45

MXPC II - Plug fan
Ø 250 - 350 mm



MXPC25 - MXPC35 (MXPC II)



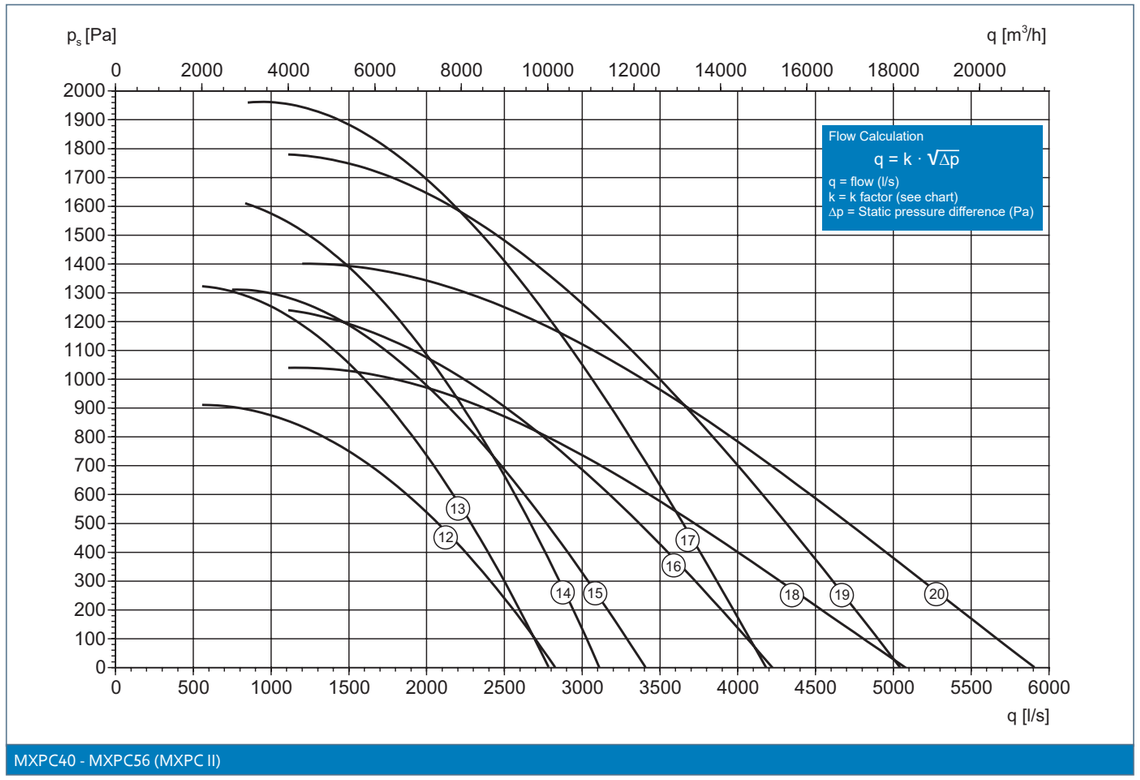
MXPC II - Plug fan
Ø 400 - 560 mm

A new improved design with higher mechanical stiffness developed for the new AirFoil impeller. MXPC II is made for floor mounting installation with rubber dampers and gasket on the inlet side for a smooth operation, suitable for installation in suction and pressure chamber.

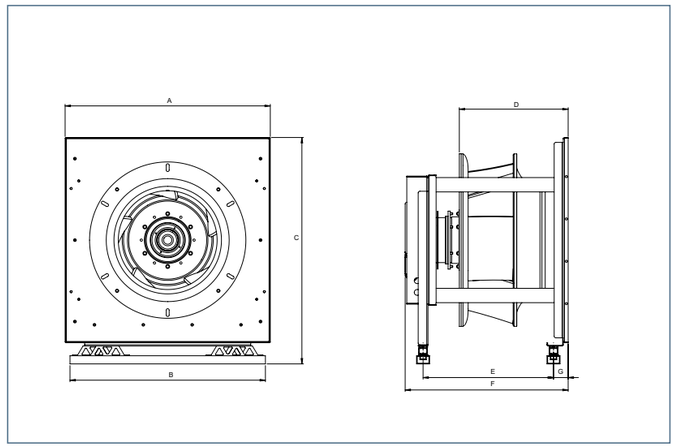
- Direct driven fan with high-performance impeller and GreenTech EC motor
- Very high efficiency and low noise level with fan type RadiPac Airfoil
- Robust construction and maintenance-free operation
- Very quiet, optimized air flow through the fan wheel
- Easy commissioning
- Inlet cone with pressure tap
- Rubber dampers and inlet gasket included
- Integrated drive and control electronics
- Control signal 0-10 VDC / PWM and MODBUS
- Output 10 VDC max 10 mA
- Complies with ErP 2015

Description	Nominal voltage	Power	Current draw	Curve	Inlet ring k-factor	Dimensions						
	VAC	kW	A	Curve	l/s	A	B	C	D	E	F	F
MXPC40RP-2450 (MXPC II)	3~400	2,5	3,8	13	52,2	500	470	565	299	362	462	45
MXPC40RP-2750 (MXPC II)	3~400	3,35	5,2	14	52,2	500	470	565	300	356	453	45
MXPC45RP-1790 (MXPC II)	3~400	1,74	2,7	15	66,7	630	600	695	334	400,5	501	45
MXPC45RP-2140 (MXPC II)	3~400	2,9	4,5	16	66,7	630	600	695	335	394,5	492	45
MXPC45RP-2600 (MXPC II)	3~400	5,25	8	17	66,7	630	600	695	335	429,5	571	45
MXPC50RP-1910 (MXPC II)	3~400	3,45	5,3	18	78,1	630	600	695	363	426	523	45
MXPC50RP-2250 (MXPC II)	3~400	5,7	9	19	78,1	630	600	695	363	461	602	45
MXPC56RP-1540 (MXPC II)	3~400	3,3	5,1	20	96,7	760	730	825	401	491,5	589	45
MXPC56RP-1760 (MXPC II)	3~400	5,0	7,7	21	96,7	760	730	825	401	531	672	45

MXPC II - Plug fan
Ø 400 - 560 mm



MXPC40 - MXPC56 (MXPC II)



MXAC - Exhaust Air Unit fan
Ø 250 - 400 mm

Built highly customized to fit in to almost any fan-box in an exhaust or HEX system within its performance range. As an option delivered with pressure and temperature controller. Built both in vertical and horizontal versions. There are a wide range of different sizes and some versions come with a choice of having rectangular or square flexible outlet.

- Direct driven fan with GreenTech EC motor for exhaust air units
- High-efficient and silent fan wheel with backward curved blades, hood of semicircle type built in optimized half scroll housing
- Compact and flexible construction
- Vibration-damping stand that can be customized
- Permanent magnetized EC outer rotor motor with high efficiency
- Integrated drive and control electronics
- Control signal 0-10 VDC
- Inlet cone with pressure tap
- Pressure and temperature control is available as an accessory
- Complies with ErP 2015

Vertical versions with door for easy maintenance is avilable online, please visit our website www.ebmpapst.se

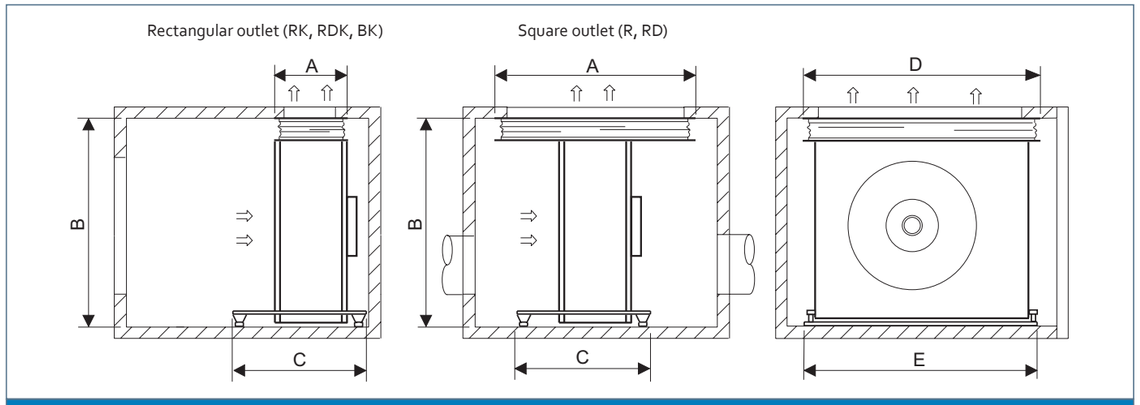
R, RD
Vertical version

RK, RDK, BK
Horisontal version

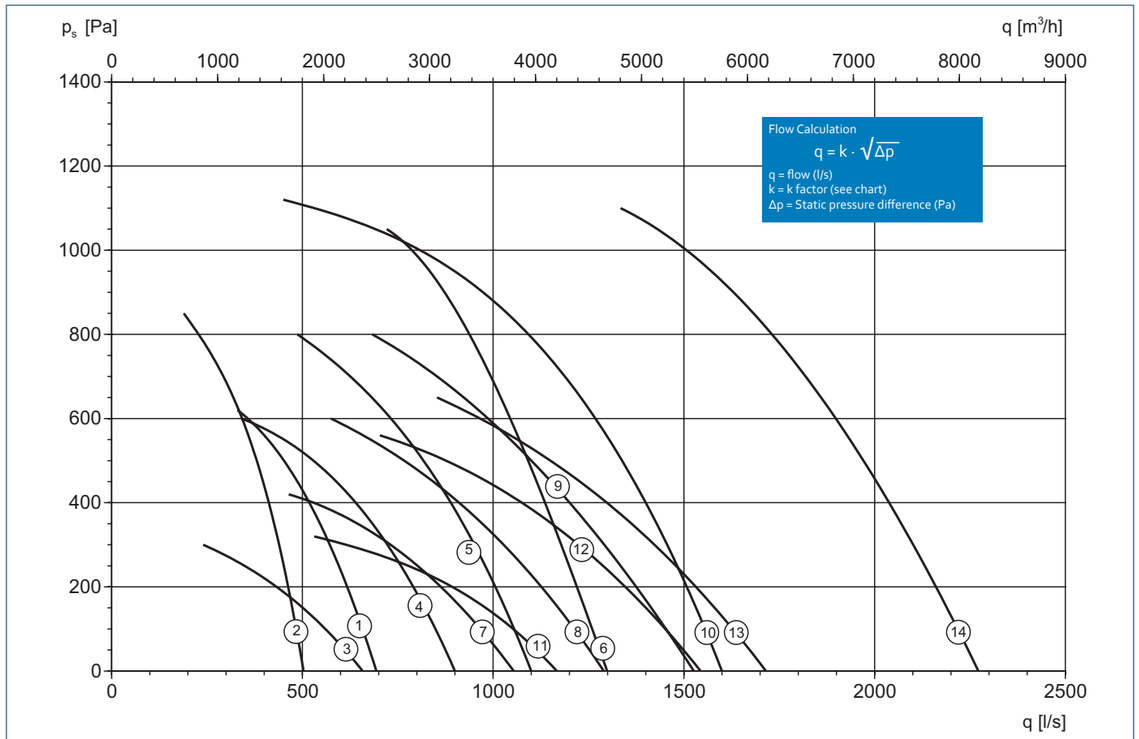
Description	Nominal voltage	Power	Current draw	Curve	Inlet ring k-factor	Dimensions				
	VAC	kW	A	Curve	l/s	A*	B	C	D	E
MXAC25RD(K)-3000	1~230	0,45	2,8	1	19,4	238 (430)	462...492	280	430	530
MXAC25RK-3400 RadiCal	1~230	0,39	2,5	2	18,9	182	462...492	240	430	550
MXAC31R(K)-1525 RadiCal	1~230	0,15	1,2	3	25,8	250 (485)	533...563	410	480	530
MXAC31R(K)-2180 RadiCal	1~230	0,45	2,0	4	25,8	250 (485)	533...563	410	480	530
MXAC31RK-2560 RadiCal	1~230	0,72	3,2	5	25,8	277	533...563	300	480	530
MXAC31BK-3170	3~400	1,65	2,5	6	32,2	241	533...563	300	480	530
MXAC35R(K)-1635 Radical	1~230	0,37	1,7	7	35,6	280 (540)	575...605	355	540	700
MXAC35R(K)-1955 RadiCal	1~230	0,64	2,8	8	35,6	288 (540)	575...605	355	540	700
MXAC35R(K)-2240 RadiCal	3~400	0,93	1,7	9	35,6	288 (540)	575...605	355	540	700
MXAC35BK-2650	3~400	1,73	2,6	10	41,1	288	575...605	355	540	700
MXAC40R(K)-1270 Radical	1~230	0,33	1,5	11	47,8	303 (600)	602...632	360	600	760
MXAC40R(K)-1690 Radical	1~230	0,76	3,3	12	47,8	303 (600)	602...632	360	600	760
MXAC40R(K)-1840 Radical	3~400	0,96	1,8	13	47,8	303 (600)	602...632	360	600	760
MXAC40BK-2550	3~400	2,84	14,2	14	52.2	335	602...632	360	600	760

* Measures in parentheses refer to rectangular outlet (R, RD).

MXAC - Exhaust Air Unit fan
Ø 250 - 400 mm



Drawing MXAC for vertical version. For measurements of horisontal version visit our website: www.ebmpapst.se.



MXAC25 - MXAC40

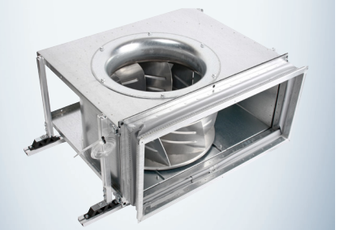
MXAC - Exhaust Air Unit fan
Ø 450 - 800 mm

Built highly customized to fit in to almost any fan-box in an exhaust or HEX system within its performance range. As an option delivered with pressure and temperature controller. Built both in vertical and horizontal versions. There are a wide range of different sizes and some versions come with a choice of having rectangular or square flexible outlet.

- Direct driven fan with GreenTech EC motor for exhaust air units
- High-efficient and silent fan wheel with backward curved blades, hood of semicircle type built in optimized half scroll housing
- Compact and flexible construction
- Vibration-damping stand that can be customized
- Permanent magnetized EC outer rotor motor with high efficiency
- Integrated drive and control electronics
- Control signal 0-10 VDC
- Inlet cone with pressure tap
- Pressure and temperature control is available as an accessory
- Complies with ErP 2015

Larger models with higher performance are available online, please visit our website: www.ebmpapst.se

R, RD
Vertical version

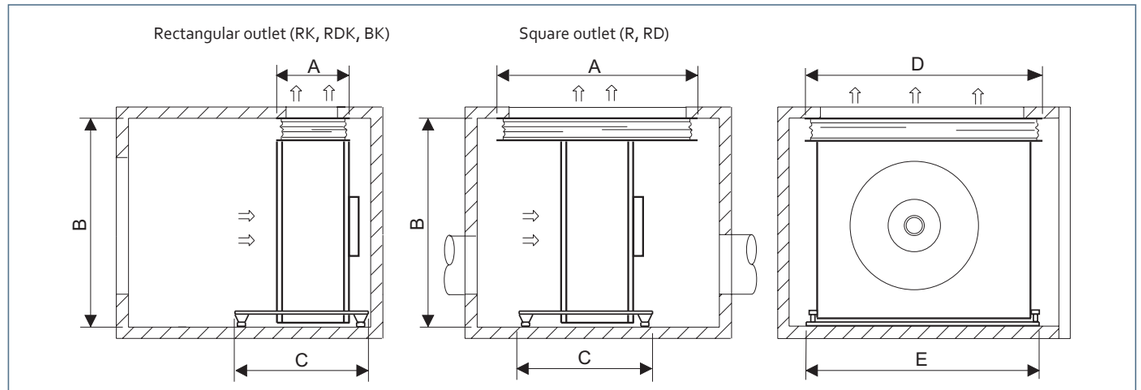


RK, RDK, BK
Horisontal version

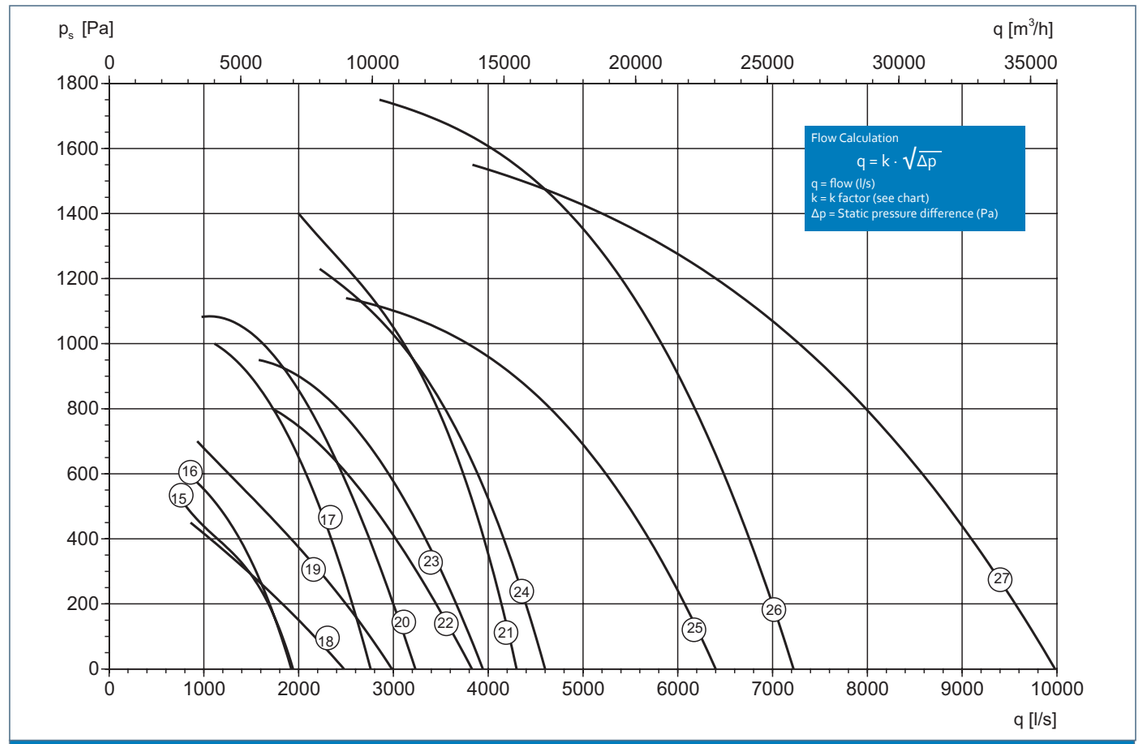
Description	Nominal voltage	Power	Current draw	Curve	Inlet ring k-factor	Dimensions				
	VAC	kW	A	Curve	l/s	A*	B	C	D	E
MXAC45R(K)-1440 Radical	1~230	0,75	3,3	15	59,4	346 (670)	661...691	420	670	830
MXAC45R(K)-1550 Radical	3~400	0,97	1,7	16	59,4	346 (670)	661...691	470	670	830
MXAC45BK-2040	3~400	2,38	3,6	17	66,7	363	661...691	470	670	830
MXAC50R(K)-1100 RadiCal	1~230	0,75	3,3	18	72,0	349 (752)	702...732	495	752	910
MXAC50R(K)-1350 RadiCal	3~400	1,32	2,1	19	72,0	349 (752)	702...732	495	752	910
MXAC50R(K)-1700 RadiCal	3~400	2,68	4,2	20	72,0	365 (752)	702...732	495	752	910
MXAC50RD(K)-2200	3~400	5,18	8,0	21	78,0	446 (822)	757...787	595	822	922
MXAC56R(K)-1540 Radical	3~400	2,36	3,7	22	112,5	399 (827)	777...807	750	827	943
MXAC56R(K)-1650 Radical	3~400	2,90	4,4	23	112,5	399 (827)	777...807	750	827	943
MXAC56RD(K)-1720	3~400	4,70	7,3	24	96,7	510 (920)	859...889	750	920	1060
MXAC63RDK-1450	3~400	6,14	9,9	25	122	550	954...984	762	1035	1175
MXAC63RDK-1850	3~400	11,0	17,0	26	122	754	1170..1210	1200	1029	1033
MXAC80RDK-1370	3~400	11,6	17,8	27	193	802	1400..1410	1200	1470	1470

* Measures in parentheses refer to rectangular outlet (R, RD).

MXAC - Exhaust Air Unit fan
Ø 450 - 800 mm



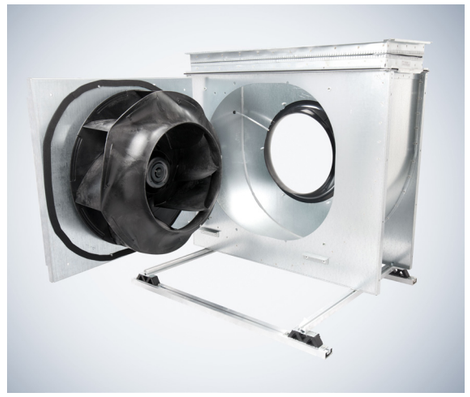
Drawing MXAC for vertical version. For measurements of horisontal version visit our website: www.ebmpapst.se.



MXAC45 - MXAC63

MXKC - Duct fan
Ø 310 - 560 mm

This product is like the MXAC but with a swing-out door and connection to a duct. This is especially useful when you need to clean the impeller regularly. Only for vertical installation.

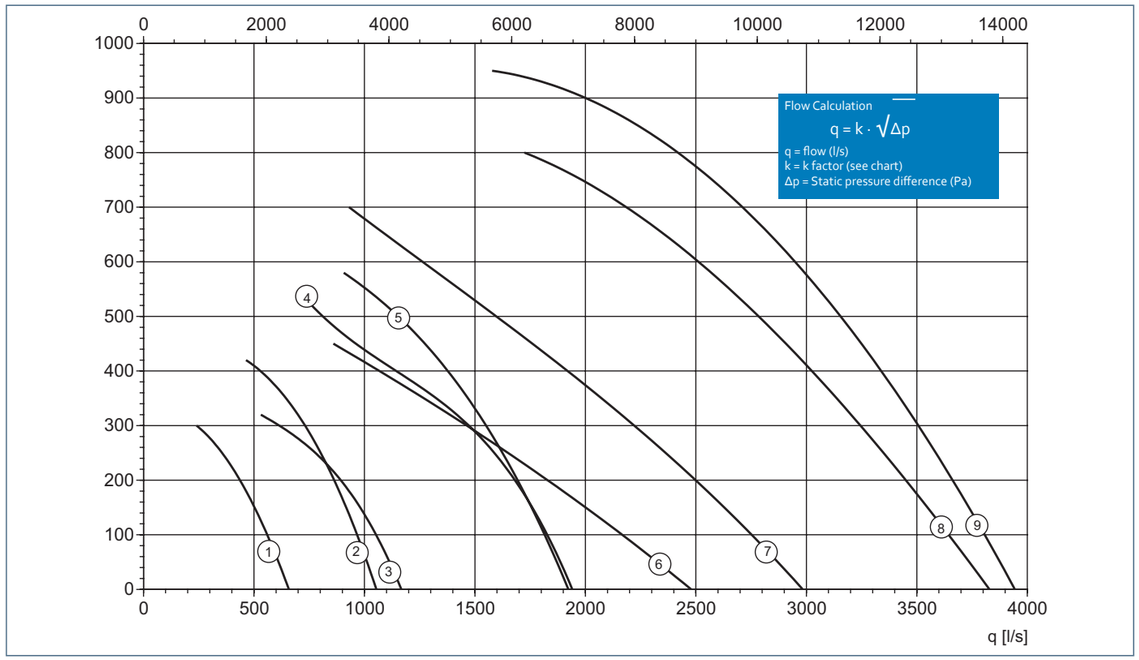


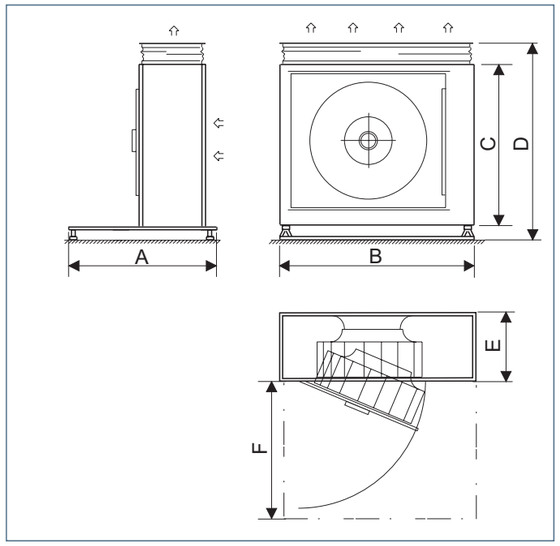
- Direct driven fan with GreenTech EC motor for connection to a duct
- High-efficient and silent fan wheel with backward curved blades, hood of semi-circle type
- Permanent magnetized EC outer rotor motor with high efficiency
- Suitable for installation in suction chambers and in some ventilation units
- Fan wheel and motor on openable door for easy cleaning and duct access
- Inlet and outlet intake duct connections are supplied as accessories
- Inlet cone with pressure tap
- Pressure and temperature control is supplied as an accessory
- Vibration damped stand
- Integrated drive and control electronics
- Control signal 0-10 VDC
- Complies with ErP 2015

If the swing-out door for easy maintenance is not needed, please see our MXAC series (with smaller and larger sizes available).

Description	Nominal voltage	Power	Current draw	Curve	Inlet ring k-factor	Dimensions					
	VAC	kW	A	Curve	l/s	A*	B	C	D	E	F
MXKC31R-1525 Radical	1~230	0,15	1,2	1	25,8	465	540	470	651...681	225	440
MXKC35R-1635 Radical	1~230	0,37	1,65	2	35,6	515	600	520	701...731	283	476
MXKC40R-1270 Radical	1~230	0,33	1,46	3	47,8	565	670	598	779...809	303	542
MXKC45R-1440 Radical	1~230	0,75	3,3	4	59,4	615	750	639	820...850	340	616
MXKC45R-1550 Radical	3~400	0,97	1,7	5	59,4	615	750	639	820...850	340	616
MXKC50R-1100 RadiCal	1~230	0,75	3,3	6	72,0	665	825	700	881...911	354	647
MXKC50R-1350 RadiCal	3~400	1,32	2,1	7	72	665	825	700	881...911	354	647
MXKC56R-1540 Radical	3~400	2,36	3,65	8	112,5	765	920	784	965...995	394	733
MXKC56R-1650 Radical	3~400	2,9	4,43	9	112,5	765	920	784	965...995	394	733

MXKC - Duct fan
Ø 310 - 560 mm





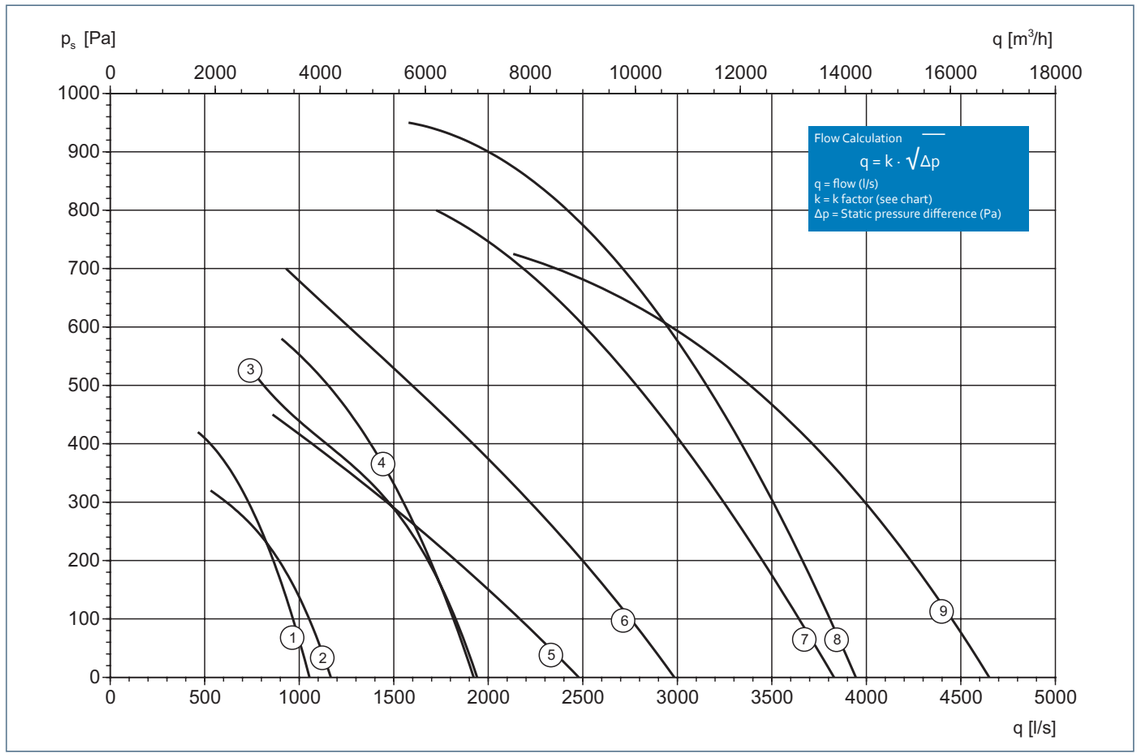
MXIC - Insulated duct fan
Ø 350 - 630 mm

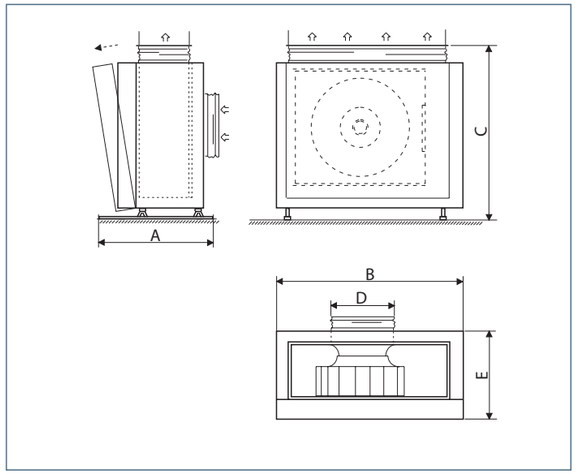
This product is insulated with 50 mm cleantech material that is fireproof for 30 min (EI30) with a swingout door. MXIC is very useful when you desire a low noise level in for example suction chambers in residential buildings. From smallest MXIC35R-1635 (0,37kW) to MXIC63R-1300 (2,75kW) there are a total of nine models. Only for vertical installation.

- Fire-insulated (EI30) direct driven fan with GreenTech EC motor for duct connection
- High-efficient and silent fan wheel with backward curved blades
- Permanent magnetized EC outer rotor motor with high efficiency
- Fan wheel and motor on swingout door for easy cleaning and duct access
- Vibration damped stand
- Round duct connection on the inlet, rectangular duct connection on the outlet
- Safety switch
- Integrated drive and control electronics
- Control signal 0-10 VDC
- Inlet cone with pressure tap
- Pressure and temperature control is supplied as an accessory
- Complies with ErP 2015

Description	Nominal voltage	Power	Current draw	Curve	Inlet ring k-factor	Dimensions				
	VAC	kW	A	Curve	l/s	A*	B	C	D	E
MXIC35R-1635 Radical	1~230	0,37	1,65	1	35,6	700	704	781...811	400	346
MXIC40R-1270 Radical	1~230	0,33	1,46	2	47,8	700	770	861...891	400	346
MXIC45R-1440 Radical	1~230	0,75	3,3	3	59,4	800	852	901...931	500	471
MXIC45R-1550 Radical	3~400	0,97	1,7	4	59,4	800	852	901...931	500	471
MXIC50R-1100 RadiCal	1~230	0,75	3,3	5	72,0	800	930	961...991	500	502
MXIC50R-1350 RadiCal	3~400	1,32	2,1	6	72,0	800	930	960...991	500	502
MXIC56R-1540 Radical	3~400	2,36	3.65	7	112,5	800	1020	1045...1075	630	480
MXIC56R-1650 Radical	3~400	2,9	4.43	8	112,5	800	1020	1045...1075	630	480
MXIC63R-1300 Radical	3~400	2,8	4,3	9	143,0	800	1130	1121...1151	630	525

MXIC - Insulated duct fan
Ø 350 - 630 mm





MXRC - Roof fan
Ø 130 - 630 mm

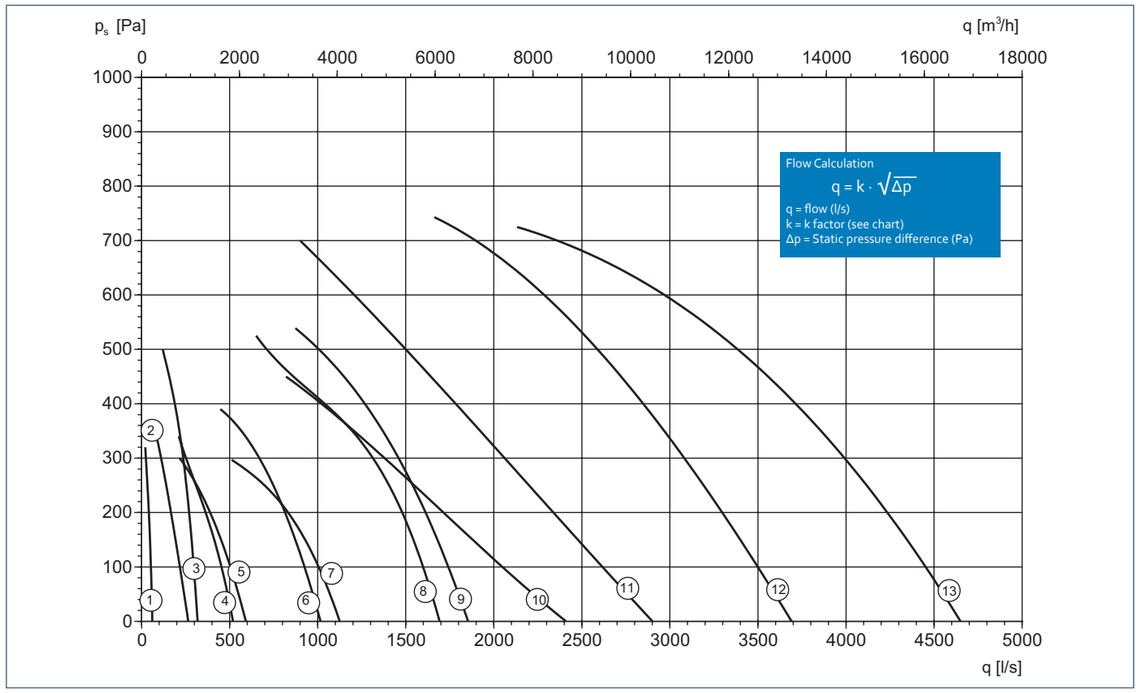
Insulated roof fan with energy saving GreenTech EC-technology motor. The fan is easy to open for cleaning and service. The fan is equipped with the high efficient and low noice impeller RadiCal.

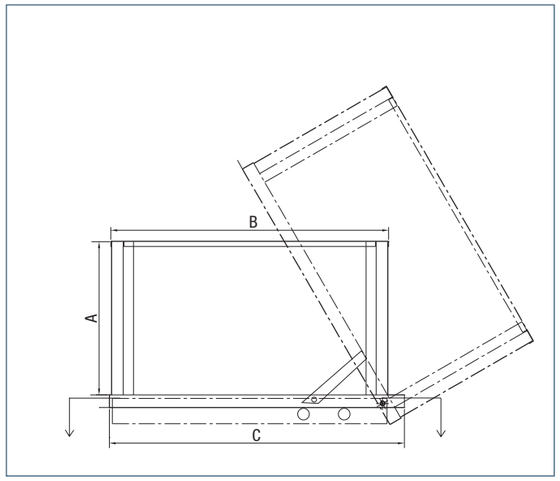
- Sound-proof, direct driven fan with GreenTech EC motor for roof mounting
- Permanent magnetized EC outer rotor motor with high efficiency
- High-efficient and silent fan wheel with backward curved blades
- Bottom frame with smooth underside simplifies assembly on existing roof / roofing
- Easy cleaning with dismountable side panels
- Easy to disassemble for easy transport up to roof
- Foldable bottom frame included
- Connection dimensions adapted to standard roofing ducts
- Black side panels as standard, optionally available in other colors to fit the roof environment
- Can be delivered complete with auxiliary control for pressure and temperature including pressure and temperature sensors
- Can be delivered with auxiliary control with MODBUS interface.
- Can be supplied with AC motor that manages 200 ° C for one hour
- Inlet cone with pressure tap and pressure hose connected to external taps for easy adjustment
- Integrated drive and control electronics
- Control signal 0-10 VDC
- Complies with ErP 2015

Side panels are available in the following colours:
- Black (standard)
- Aluzink
- Brick
- Optional color according to NCS

Description	Nominal voltage	Power	Current draw	Curve	nlet ring k-factor	Dimensions		
	VAC	kW	A	Curve	l/s	A	B	C
MXRC13R-3770 Radical	1~230	0,027	0,27	1	-	310	432	424
MXRC22R-A0000A	1~230	0,085	0,7	2	15,0	310	432	424
MXRC25R-A0000A	1~230	0,17	1,4	3	16,7	310	432	424
MXRC28R-A0000A	1~230	0,17	1,4	4	21,4	310	432	424
MXRC31R-A0000A	1~230	0,15	1,2	5	25,8	423	600	632
MXRC35R-A0000A	1~230	0,50	2,2	6	35,6	423	600	632
MXRC40R-A0000A	1~230	0,50	2,2	7	47,8	455	700	732
MXRC45R-A0000A	1~230	0,75	3,3	8	59,4	560	792	832
MXRC45R-A0001A	3~400	0,97	1,7	9	59,4	560	800	832
MXRC50R-A0000A	1~230	0,75	3,3	10	72,0	593	992	1052
MXRC50R-A0001A	3~400	1,32	2,1	11	72,0	593	992	1052
MXRC56R-A0000A	3~400	2,36	3,65	12	112,5	638	1000	1052
MXRC63R-A0000A	3~400	2,70	4,3	13	143,0	638	1000	1052

MXRC - Roof fan
Ø 130 - 630 mm





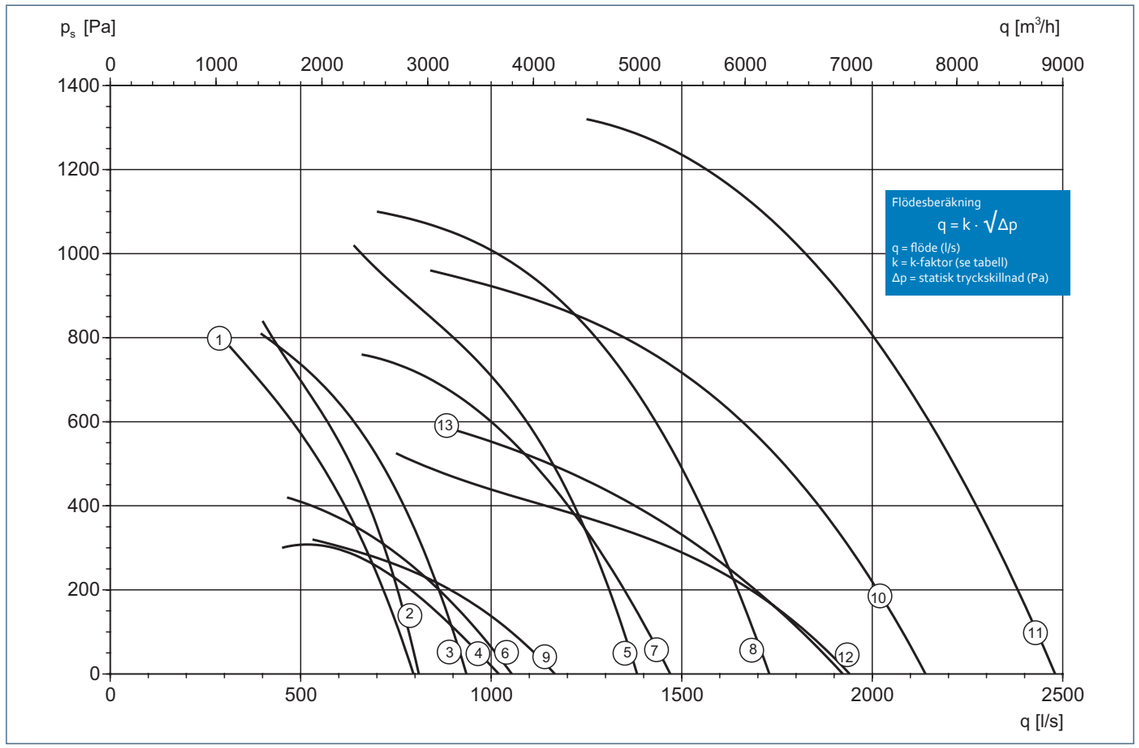
MXMC - Module fan
Ø 250 - 450 mm

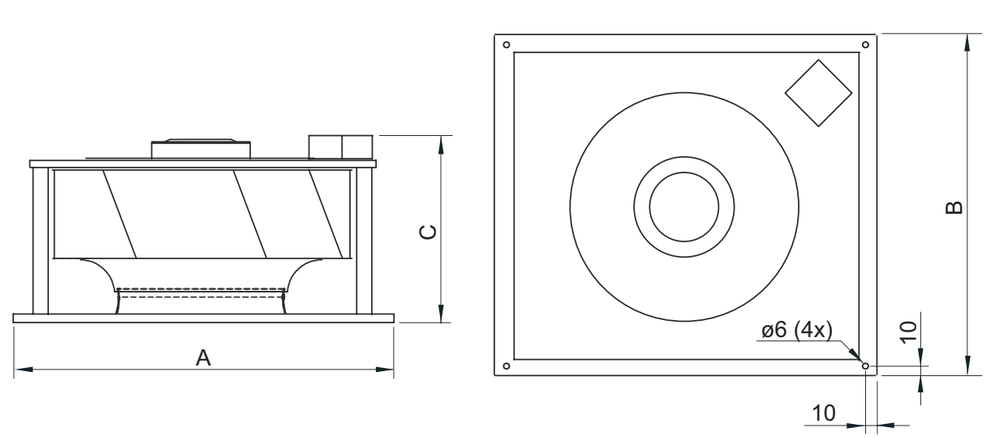
This product is especially made for installation inside chimneys with natural ventilation. MXMC can also be used in an existing chamber or box. Built both in vertical and horizontal versions.

- Direct driven fan with GreenTech EC motor
- High-efficient and silent fan wheel with backward curved blades
- Compact and robust construction
- Permanent magnetized EC outer rotor motor with high efficiency
- Integrated drive and control electronics
- Control signal 0-10 VDC
- Inlet cone with pressure tap
- Can be delivered complete with auxiliary control for pressure and temperature including pressure and temperature sensors
- Complies with ErP 2015

Description	Nominal voltage	Power	Current draw	Curve	Inlet ring k-factor	Dimensions		
	VAC	kW	A	Curve	l/s	A	B	C
MXMC25RD-3000	1~230	0,45	2,8	1	19,4	400	400	245
MXMC25RD-3450	1~230	0,7	3	2	19,4	400	400	265
MXMC28RD-2800	1~230	0,72	2,93	3	25,8	450	350	293
MXMC28RD-3100	3~400	0,94	1,6	4	25,8	450	350	293
MXMC31RD-2850	1~230	1,27	5,6	5	32,2	520	420	310
MXMC35R-1635 RadiCal	1~230	0,37	1,65	6	35,6	480	480	292
MXMC35RD-2140	3~400	1,0	1,7	7	41,1	500	500	323
MXMC35RD-2600	3~400	1,7	2,6	8	41,1	500	500	344
MXMC40R-1270 RadiCal	1~230	0,33	1,46	9	47,8	545	545	310
MXMC40RD-2180	3~400	1,85	2,9	10	52,2	500	500	390
MXMC40RD-2550	3~400	3,0	4,6	11	52,2	500	500	395
MXMC45R-1440 Radical	1~230	0,75	3,3	12	59,4	545	545	355
MXMC45R-1550 RadiCal	3~400	0,97	1,7	13	59.4	545	545	355

MXMC - Module fan
Ø 250 - 450 mm





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