SIMPLY COMPACT · HIGHLY EFFICIENT · HIGHEST PERFORMANCE

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COPRA. COMPACT AND EFFICIENT. THE PERFECT MATCH.

The space-saving centrifugal fan system.



PUTTING AN END TO COMPROMISE.

COPRA combines high system efficiency, high compactness and high power density for the best overall performance.

The new COPRA system comprising motor, impeller and electronics combines three properties in a way that previously seemed almost impossible: maximum compactness, outstanding system efficiency and high power density. Its short motor does not obstruct the airflow and, together with the newly developed aerodynamic impeller design, it delivers maximum efficiency – at full load and even more so under partial load.

In addition, the significantly higher power density compared to conventional free-running fans promises maximum airflow with the greatest possible efficiency for every size. And with its low installation losses, the new aluminum impeller demonstrates its advantages to the full, even in confined installation conditions. This makes COPRA fans the ideal solution in HVAC systems, in data centers and in many other areas.

Why only improve, when you can reinvent?

For good reasons, free-running or hybrid radial fans have largely replaced fans with scroll housings in air-conditioning applications. Even though the latter have some positive physical characteristics, free-running fans take up less space, and drive losses due to belts, bearings or couplings are not an issue. Planners are particularly focused on lower pressures. In addition, the European Ecodesign Directive prescribes variable-speed drives. This favors direct-drive solutions.

In terms of physics, free-running impellers can only achieve a pressure increase or energy conversion via two factors: a swirl added to the flow and a maximum delay in the relative flow in the impeller's blade channel. A swirl in the flow at the exit from the impeller is unavoidable and necessary for energy conversion.

However, this swirl also represents a loss in air-conditioning applications. As a result, fan concepts of this kind can achieve maximum aerodynamic system efficiencies of around 70%. We have achieved these maximum free-running static efficiencies with COPRA.

The only way to gain more static efficiency from the energy of the flow swirl at the impeller exit is to use guide vanes, specifically a direct-driven hybrid fan with multiple discharge scrolls. However, this is typically less compact in design. Taking the above aspects into account, we have achieved the maximum aerodynamic efficiency levels with the greatest compactness in the development of the COPRA system.



Consolidated characteristics: overview of sizes.



The chart shows an overview of sizes 250 mm to 710 mm with up to 8 kW motor power at the maximum speed of the respective size. The ranges with the best overall static fan efficiencies (operating range with best efficiency) are highlighted.

COPRA CORE 1,3 - 8 kw COPRA PLUG 1,3 - 8 kw

- Internal-rotor motor PM/EC technology with efficiency up to IE6
- Integrated electronics
- Air volume up to 28,000 m³/h
- Static pressures up to 2,000 Pa
- With frame structure for modular integration into ventilation and air-conditioning systems (only COPRA P)

Impeller

- Aluminum, welded; 3-dimensional backward curved blade design
- Impeller diameters: 250, 280, 315, 355, 400, 450, 500, 560, 630, 710 mm
- Maximum static pressure 1,700 Pa / ~6.8" wg
- Maximum circumferential speed at impeller outer diameter: ~70 m/s
- Conical backplate

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COPRA CORE



COPRA PLUG

Motor

- 1.3 kW, 4.5 kW, 8 kW (in stage 1)
- 208-230 V 50/60 Hz
- 380-460 V 50/60 Hz
- No use of rare earth magnets
- Operating temperature range: -20 to +40

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A PERFECT COMBINATION.

Maximum airflow, maximum efficiency: With COPRA, motor and impeller are optimally matched.

No mutual aerodynamic interference: In the new COPRA, a perfect combination of impeller and motor across all sizes ensures maximum airflow with the highest possible efficiency. The available space for motor and impeller is to best advantage in every application. Aerodynamically, the new impeller is one of the best currently available. It also enables a perfect symbiosis with the new motor form factor. Since the new internal-rotor motor is very short and its motor hub does not protrude into the impeller, it does not obstruct the impeller airflow. And at the same time, the overall system is highly compact.

Unique: maximum aerodynamic efficiency levels with ultra compactness.

Conventional plug fans with external-rotor motors are practically impossible to improve in terms of system efficiency and compactness. The greatest optimization potential for fan systems lies in adapting the characteristics of the drive required for the application in terms of the geometry and specifications – without aerodynamic disturbance or the need for additional cooling. It is precisely this goal – the perfect motor/impeller combination – that we have pursued and achieved in the development of COPRA. We have perfectly matched the motor and impeller geometrically and with regard to the necessary power, speed and speed range, aerodynamics, pressure increase, and corresponding torque. We have eliminated any mutual aerodynamic interference.



The impeller.

The new aluminum impeller with its advanced geometry can compete aerodynamically with the best impellers. Its threedimensionally curved blade surfaces provide the necessary width to achieve a physical balance of forces between the flow lines and flow surfaces. It avoids an unfavorable crossflow within the impeller. To achieve the best aerodynamic properties at the respective flow surfaces for the pressure increase in the blade region, we also implemented the blades with a profiled design (hollow profile). The profile cross-sections are designed as airfoils, in order to optimize the flow on the suction and pressure sides of the blades at every position within the impeller.

The motor.

Maximum efficiency and high effectiveness are the most important requirements for the drive. Here the COPRA motor sets the benchmark. At the same time, it has to be as compact as possible in combination with the impeller – and without negatively affecting the aerodynamics. For centrifugal fans with an impeller in a free-running arrangement, this means: The motor must be as short as possible. We have achieved all this with the PM/EC motor in COPRA. It achieves an efficiency class of up to IE6. Moreover, the COPRA motor does not require direct cooling by air circulation or a separate cooling system. The integrated cooling of the motor electronics is sufficient. In any case, the motor's high efficiency means it requires less cooling. This makes the motor and system extremely reliable in operation.

The impossible made possible: compact and efficient without impeller obstruction.

The size and shape of an external-rotor motor have an immense impact on the aerodynamic efficiency of a fan. The problem here is obstruction of the impeller airflow. With COPRA, it has been possible to avoid impeller obstruction and still achieve an extremely compact, highly efficient centrifugal fan system with an internal rotor. Solutions that are compact but compromise on efficiency are now a thing of the past. COPRA therefore unlocks completely new potential for saving energy and costs.

Partly because of how they were historically developed, the design of external-rotor motors is better suited to axial flow fans than centrifugal fans. Nevertheless, despite the aerody-namic disadvantage of obstructing the airflow in the impeller, they have also become widely used for centrifugal fans. However, especially with compact EC motors, the motor protruding into the impeller significantly reduces system efficiency. the impeller significantly reduces system efficiency. the impeller significantly reduces system efficiency. the impeller significantly reduces system efficiency.

into the impeller significantly reduces system efficiency.So using an EC external-rotor motor in a free-running fan is
always a compromise between efficiency and overall length.Pulling the motor out of the impeller – withdrawing it into a
cone-shaped impeller or backplate – does reduce impeller
obstruction, because the fan hub no longer protrudes intoSo using an EC external-rotor motor in a free-running fan is
always a compromise between efficiency and overall length.
This is why COPRA, with its very short internal-rotor motor,
consistently proves to be the ideal, compromise-free and
therefore highly economical system solution.



Fan solution with external-rotor motor and obstruction of the airflow in the impeller.

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Fan solution with COPRA technology, without obstructing the airflow in the impeller.

CREATING SPACE WHERE THERE IS NONE.

In short: the ideal system for tight installation spaces.

Shortest axial length with maximum efficiency: In the new COPRA, it has been possible to make the internal rotor motor so short that it does not obstruct the impeller's airflow as is the case in conventional fan solutions. This creates ideal conditions for particularly economical operation even in tight installation spaces.

At the same time, the new motor/impeller concept ensures very low installation losses. So there are hardly any unexpected, disadvantageous interactions between fan and application. A major reason for this is the modified overall geometry of the impeller.

No more compromise: short axial length plus high efficiency.

For fans with external-rotor motors (shown on the left), pulling the motor out of the impeller provides high efficiency, but makes the system longer. An advantage is that minimal cooling is required for the external-rotor motor due to the airflow around the rotor. For systems with an external rotor located in the impeller (center image), the opposite is true: The system is compact and the motor is cooled in the airstream, but unavoidable turbulence in the impeller considerably reduces the aerodynamic efficiency. COPRA (shown on the right) resolves both compromises: The short motor, which does not protrude into the impeller, makes the system extremely compact and does not generate any disturbing turbulence. It also has integrated cooling for the electronics. The result: best efficiency with maximum compactness of the system.

With its outstanding compactness, COPRA is ideal for use in specific applications in data centers, or in fan grids in ventilation and air-conditioning systems, where installations can often be made a crucial few centimeters shorter. This results in valuable material cost savings.

COPRA: the perfect system for tight installation spaces.

Apart from the pure catalog data, COPRA also shows its advantages in tight installation spaces. The usual problem here is that the fan is not running under ideal conditions, and efficiency drops due to the limited gap between the fan and the chamber walls. In this case, the actual values can differ significantly from the catalog data measured in the laboratory.

COPRA, by contrast, shows its strengths particularly under such difficult installation conditions. The technical reasons for this are found in the modified overall geometry of the impeller. They include its three-dimensional properties with large flow surfaces resulting in relatively low flow velocities, as well as the conical backplate and different diameters on the backplate and cover plate.

Compared to conventional EC fans, for example, COPRA attains the maximum achievable aerodynamic static pressure increase and static efficiency. The specific performance, i.e. the relationship between the power consumption for given diameters and speeds, and the volume of air moved, has been optimized.









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In this example, we compare an Evo series fan with the COPRA system under otherwise identical conditions. With an installation ratio of factor 1.5 to the outer wall, in relation to the impeller diameter, COPRA achieves significantly better values, especially to the right of the optimum.

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THE BEST PERFORMANCE FOR EVERYONE.

Excellent system efficiency and maximum power density.

Small dimensions, big power: The new COPRA achieves static system efficiencies of around 70 percent and more with the greatest compactness. At the same time, it offers significantly higher power density than a conventional plug fan. This ensures maximum airflow with the greatest possible efficiency for every size.

In many cases, COPRA reaches the operating point with the next smaller size or achieves higher efficiency with the same size. When operating under partial load, it offers the highest system efficiency compared to conventional EC fan technology. In sum: outstanding system efficiency.

Highest aerodynamic efficiency levels with greatest compactness.

COPRA provides the best part-load performance.

In most applications, fans do not run under full load. They run under partial load as required. Whether for specific applications in ventilation and air-conditioning – for example redundant operation in fan grids - or in data centers: COPRA shines with outstanding efficiencies - not only at maximum load, but also in the partial load range. And this is true in comparison with both compact and efficiency-optimized fans. The difference becomes particularly evident where fans with a pulled-out motor cannot be used due to a lack of space in the axial direction:

System Efficiency Part Load 80 % 70 η_{sed} 60 Ĕ COPRA System 50 Conventional Plug Fan static System with pulled out motor 40 Conventional Plug Fan compact design 30 20 50 80 90 100 20 30 40 60 70 Volume Flow % From Max. Value

A comparison of the new COPRA with the best conventional fans with external-rotor motor shows that COPRA achieves the highest system efficiency under partial load compared to conventional EC fan technology.

COPRA scores twice: outstanding system efficiency and highest power density.

In a system efficiency comparison, COPRA is convincing. This can be seen when comparing our impeller from the well-known Evo series in size 500 with COPRA in size 450. An important point is that today's systems are being optimized more and more, with the result that pressures are falling ever lower.

Compared to the RLM EVO with IE5 PM motor technology, in the example described you can select a smaller fan size with COPRA in around half of all cases - and with at least the same efficiency.

In a comparison of free-running fans, COPRA had to achieve the decisive advantage of high compactness with the highest efficiencies. Therefore, the development goal was to maximize its specific performance with the highest possible static efficiencies. In other words, the aim was to achieve the highest possible airflow for the fan's size and speed at the highest efficiencies, i.e. maximum airflows at the respective pressure level.

As a fan solution for specific tasks, COPRA can therefore be sized smaller than other solutions available on the market. Furthermore, the system runs at lower speeds than other solutions of the same size. And this is achieved with maximum efficiencies, lower power consumption, reduced space requirements, less noise, and also lower speeds

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Pre

2000

1800

1600

1400

1200

1000

800

600

200

0

Ра

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2 400

Static



0

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Volume flowrate q_v cfm 6000 1200 3600 8.0 COPRA 0450-4,5 kW, Optimum RLM Evo 0450-...M, 2,8 kW, Optimum 7,2 —— RLM Evo 0500-...M. 4.3 kW. Optimum 5,6 🕺 å 65 % pressure 2.4 static 0.8 2000 4000 6000 8000 10000 12000 Volume Flow q_v m∛ł

Plug Fans Comparison Optimum

In many cases, COPRA reaches the operating point with the next smaller size or achieves higher efficiency with the same size.



Plug Fans New COPRA System with higher power density

With COPRA, specific performance has been be maximized with the highest possible static efficiencies.

LOW NOISE MEETS LIGHTWEIGHT. WORLDWIDE.

The compelling advantages of geometry and material.

Whether data centers or HVAC systems, wind power or retrofit: COPRA offers decisive advantages in many applications. Planners, plant engineers and operators will appreciate its compactness, efficiency, power density and hence its high cost-effectiveness. The system's low noise level, the material, and worldwide availability are further reasons to choose COPRA.

Low noise.

With its special blade and impeller geometry, COPRA generates less noise thanks to better flow conditions. Its psychoacoustically more comfortable frequency range is also an important advantage, especially for HVAC applications in residential and office buildings. Another plus: COPRA's PM internal-rotor motor generates significantly less noise compared to external-rotor motor concepts. This, too, has a positive effect on the overall system's sound power level.

In particular, the profiled blade sections (hollow profiles) implemented with three-dimensional geometry make a significant contribution to these excellent characteristics.

Sound power level comparison outlet



For many years, our customers have appreciated the Evo impeller's low noise emissions. But it gets even quieter: Typically, the higher noise values on the pressure side are often the most decisive factor. Compared to the Evo impeller, we have achieved further improvements with COPRA in applications with predominantly high airflows



In COPRA, the impeller is made of high-quality aluminum too. The material enables hollow-profile blades and hence optimal aerodynamic geometries – while also maximizing stability. The low system inertia of the impeller allows more dynamic adjustment of the speed. At the same time, the impeller is particularly lightweight, easy to handle and also corrosion-resistant. Plus: Compared to the use of plastic throughout, the wall thicknesses are thinner. Imbalances also have less of an effect. As a result, both the center of gravity and the vibration characteristics are better in challenging installation situations. This has a positive impact on the service life of the motor and fan. Another factor that is becoming increasingly important: Aluminum, unlike plastic, is virtually 100 percent recyclable – ensuring a better environmental footprint.



Well positioned worldwide: one series for all requirements.

As a company, we are established worldwide and manufacture wherever our customers are. But COPRA also meets all the requisite conditions for global use. Because where you would otherwise have to configure two different series, this one series can cover all requirements worldwide – and each features unique compactness and efficiency. As a plant engineer, you no longer need additional series that could have an impact on efficiency or axial length. So your stock-keeping is much simpler.

Furthermore, COPRA is equally suitable for all regions of the world, and is available globally with a uniform quality standard. A local technical presence is assured worldwide. In addition, official certifications have been obtained worldwide.



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CREATED FOR THE DATA AGE.

Data center applications: Why COPRA perfectly meets the requirements.

Few applications generate as much heat as a data center. To dissipate the heat, speed-controlled centrifugal fan solutions with the best possible price/performance ratio are generally the desired solution. Maximum reliability and service life as well as excellent efficiency - especially at medium operating speeds - are also among the most important requirements. Added to this are low vibration, minimized noise, and not least an excellent spare parts service.

COPRA in data centers: fits where others won't fit

Advantages of COPRA in data centers:

- High compactness and short axial length with outstanding efficiency for maximum economy.
- · Stepless controllability with maximum possible energy savings including under partial load.
- High reliability and long service life with maintenance-free operation.
- Ideal for new installations as well as retrofit projects.
- a single series. This saves time and money.
- · Low noise emissions ensure peace and quiet.

COPRA fulfills all of these data center requirements practically perfectly. But in view of the usually tight available space, there is another decisive advantage: the ideal combination of high compactness, best efficiency and high power density. This synergy makes COPRA an unsurpassed and at the same time highly economical solution for data center cooling. Whether as direct server rack cooling or as cooling for the entire data center with a central fan unit, whether with individual fans or with a fan grid.

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Worldwide availability – one fits all: It is sufficient to specify, stock and configure



VERSATILITY IS ITS STRENGTH.

COPRA: the ideal fan for any HVAC system.

Because of its high efficiency, the new COPRA is a real economic factor. In view of its low operating costs, it is suitable for simple plug-&-play installation in new HVAC systems as well as for the modernization of existing systems. Particularly in retrofit scenarios, replacing fans can bring significant cost savings.



Retrofit: Replacing fans with COPRA pays off.

Replacing old, power-hungry and maintenance-intensive fans with economical devices featuring a flow-optimized design brings many advantages. From lower operating costs and CO2 emission savings to higher operational reliability and short payback times. Provided, of course, that you first carefully consider the overall system. After all, fans account for up to 70% of the operating costs in a ventilation and air-conditioning system. Take advantage of the resulting savings potential – with the new COPRA.

An important point: The question of the "best" and most economical solution when choosing fans depends on individual factors and can only be answered based on a professional system analysis. In retrofit projects, fitters appreciate the minimal installation and maintenance work required, as well as the ease of fitting COPRA fans into often confined spaces. Free-running fans or hybrid fans with multi-spiral baffle plate technology are therefore often the preferred choice.

The advantages of COPRA for ventilation and air-conditioning systems at a glance.

High system efficiency

• Excellent part-load performance

• Small installation depth

High power density

The ideal plug fan for fan grids.

COPRA is ideally suited to multiple wall configurations in the form of several fans arranged next to and above each other. Although in principle free-running fans also need sufficient installation space to achieve high system efficiencies, this is often neglected in the design of fan grids. Unwanted air turbulence causes further installation losses. COPRA is convincing for multiple wall configurations not only because of its compactness in axial length, but also because of its smallest possible diameters with high airflows.

And there is another plus point: Fan grids are operated at reduced power to ensure a capacity reserve for redundancy operation. This is where COPRA's excellent part-load performance is a benefit. Whether as a single fan or as part of a fan grid: With COPRA, you are making a good choice in both cases because of its compactness in combination with high system efficiency and high power density.



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- Almost no installation losses
- Low noise
- Less installation effort
- Low weight





We will find the best individually tailored solution for you.

Whatever the application, size or requirements: Together with you, we will configure the right solution for you. So that you are equipped for the future and always benefit from the greatest possible energy savings and conformity with the standards of tomorrow. Talk to us – we can provide you with individual, detailed advice.

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