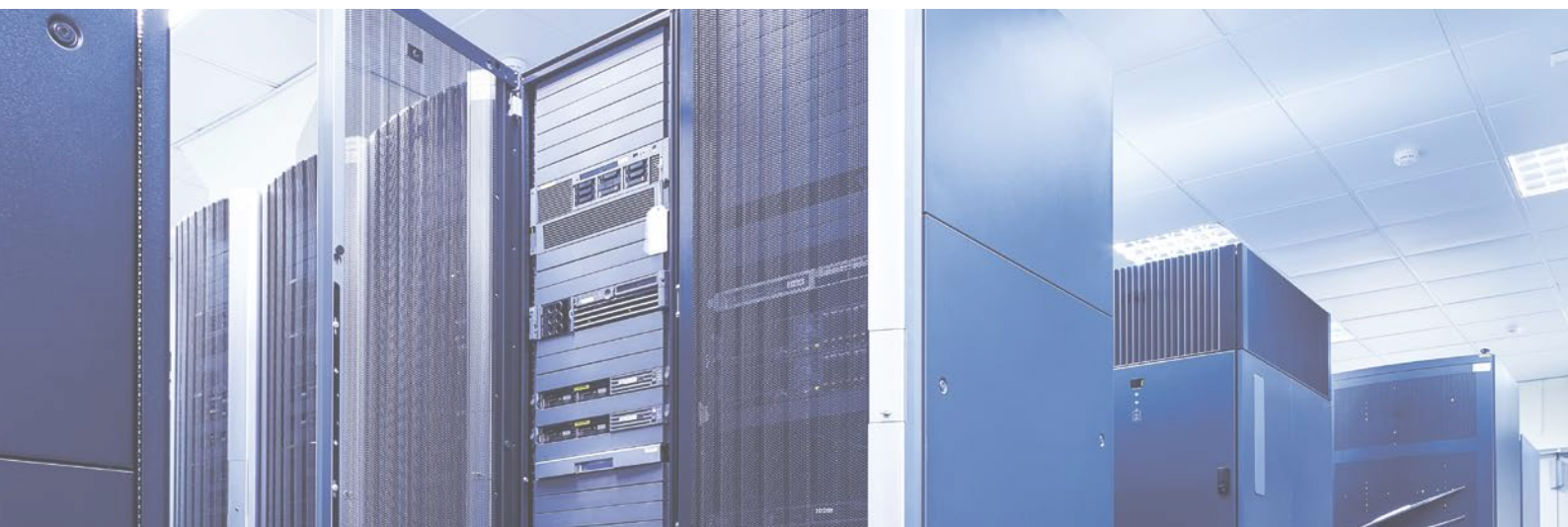


Movement by Perfection



The Royal League in ventilation, control and drive technology

# Fans and control technology for data centers

Reliable, energy-saving, networked

## Welcome to the technology leader

### Top technology made by ZIEHL-ABEGG

The workshops in the pit lane at the Formula 1 race track in Abu Dhabi, the premises of the broadcaster RTL in Cologne, large wind-driven power stations, modern animal stalls, office buildings and shopping centres – ZIEHL-ABEGG fans provide ventilation, cooling and air conditioning in almost all application areas. Air technology from the Künzelsau-based company is even used in clean rooms and operating theatres. ZIEHL-ABEGG is a trend-setter in product development according to the principles of bionics. With the help of retrofit concepts, older systems can also be made state of the art.

The Künzelsau-based company ZIEHL-ABEGG SE has developed and built truly efficient, durable and robust electric motors for over 100 years. Drive technology is another area in which the company uses its innovative products to successfully deliver a wide range of applications in everything from lifts to medical technology. The efficiency of the electric in-wheel hub motor for city buses is the highest in the world.

More than half of the company's 3,700 employees work in southern Germany. This is also home to the world's largest combined measuring and test bench for fans, which is able to simultaneously measure sound and efficiency. Annual research and development expenditure amounts to some seven per cent of turnover. These framework conditions have enabled ZIEHL-ABEGG to set global standards in the efficiency and sound characteristics of motors and fans over a number of decades.

The high-tech company was founded by Emil Ziehl in 1910 as a manufacturer of electric motors. ZIEHL-ABEGG SE is not listed on the stock market and is entirely family-owned.

### Global production network

ZIEHL-ABEGG undertakes production on a global level at 18 locations. As an OEM supplier in all areas, this enables the company from southern Germany to ensure customer proximity. The hallmarks of ZIEHL-ABEGG are very substantial vertical integration, customised solutions and a high capacity for innovation.



ZA v blue

# ZIEHL-ABEGG

## Die Königsklasse

*der Lufttechnik,  
Regeltechnik und Antriebstechnik*

**Mehr  
Volumen**  
bei kleinerer  
Baugröße



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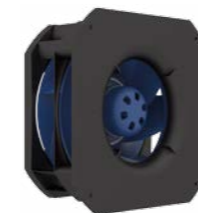
# Highest efficiency for cooling your data center

Energy costs are the primary operating costs of data centers. An average of 15 per cent of the energy consumption of a data center is accounted for by ventilation alone, i.e. by fans. ZIEHL-ABEGG fans and control technology optimise the energy efficiency of the ventilation systems and contribute to ensuring that the PUE (power usage effectiveness) value is as low as possible.

Thanks to optimised aerodynamics, innovative materials, efficient EC motor technology and the perfect coordination of the overall system, ZIEHL-ABEGG is able to set standards in air technology.

## 1 Rack and in-row cooling systems

Rack and in-row cooling systems are used to provide local cooling for the computer racks.



### ZApilot

Fan system for easy installation

- Efficiency up to 10% higher than conventional market standards
- Volume flow rate up to 1,600 m<sup>3</sup>/h, free-blowing
- Static pressure increase up to 1,000 Pa

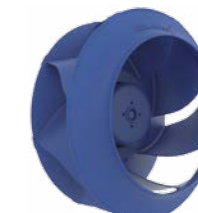


### FE2owlet with plastic nozzle

- Small axial fans with integrated nozzle
- Optimised air movement
- Integrated cable solution and contact protection
- Volume flow rate up to 4,400 m<sup>3</sup>/h, free-blowing
- Static pressure increase up to 140 Pa

## 2 Precision air handling units

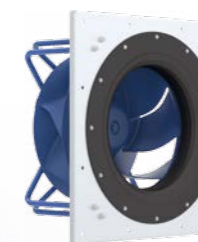
Precision air handling units are used to cool the computer room. Cutting-edge devices aim to provide the highest possible volume flow rate together with reduced pressure loss.



### ZAvblue

Increased volume flow rate with identical size

- High system efficiency
- Low acoustic power level
- Volume flow rate up to 19,000 m<sup>3</sup>/h, free-blowing
- Static pressure increase up to 800 Pa



### GR module

For easy planning, assembly and replacement of centrifugal fans.

- Optimally coordinated nozzle and suspensions
- Optimised performance and handling

## 3 Chillers

The use of chillers is a conventional solution for emitting heat to the external environment. The large axial fans that are deployed are mostly used in continuous service and therefore need to be as energy efficient as possible.



### FE2owlet

Particularly quiet and energy efficient fan

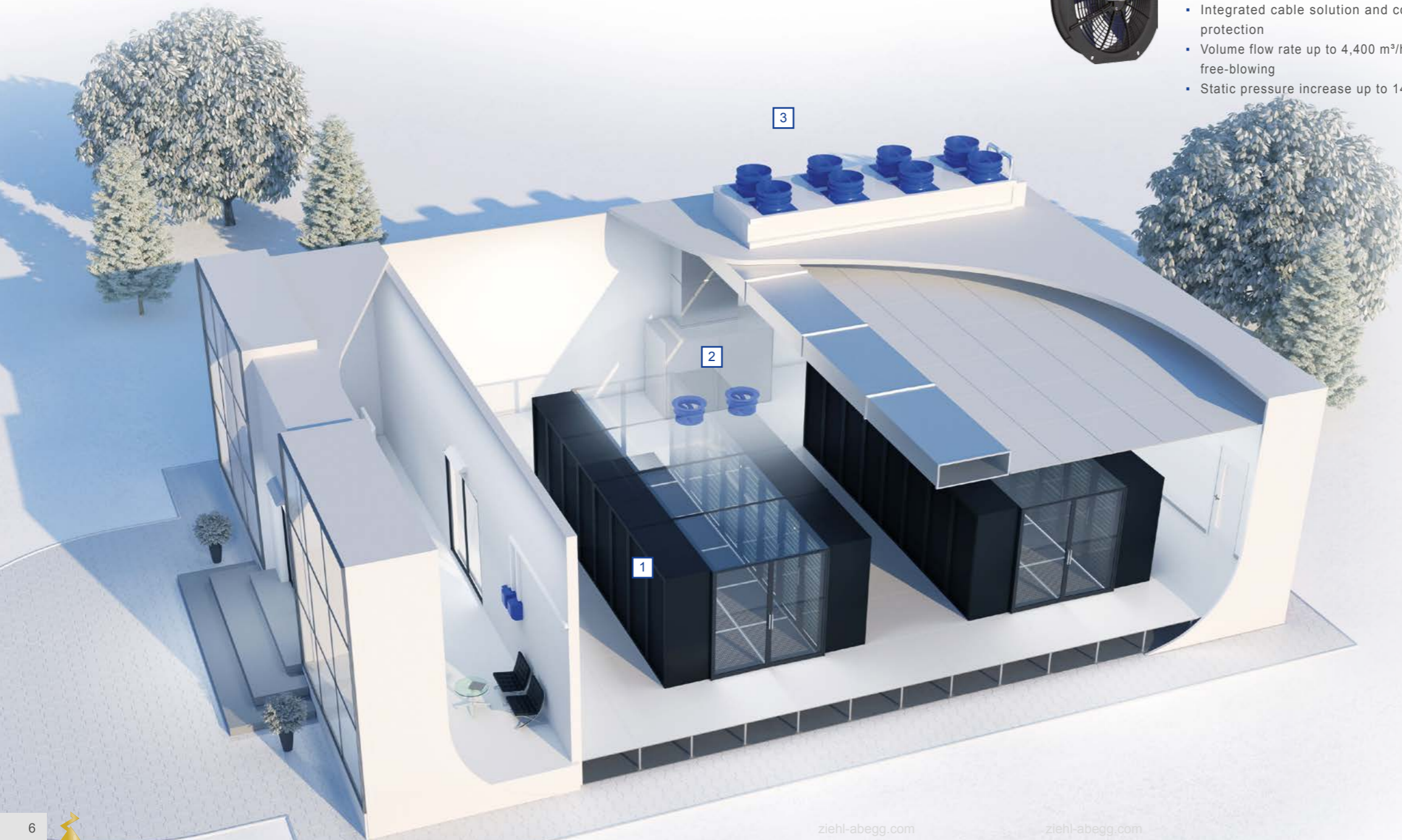
- Bionic blade profile
- Minimal noise generation
- Volume flow rates up to 52,000 m<sup>3</sup>/h and static pressure increase up to 418 Pa



### ZApilot, ZApilot+

Integrated axial fan system with optimised full nozzle, guide vane, motor suspension and diffusor.

- High energy efficiency and air handling capacity
- Minimal noise generation
- High corrosion protection
- Volume flow rates up to 36,500 m<sup>3</sup>/h
- Static pressure increase up to 475 Pa



# Modular solution for free cooling

Free cooling uses outside air to cool the data center and avoids the use of compressors as far as possible. This helps achieve a large energy saving. The fans that are used need to generate large volume flow rates and are often installed, controlled and monitored in a large group. ECblue fans and control technology from ZIEHL-ABEGG meet the corresponding requirements perfectly. The fans have a high level of energy efficiency, can be mounted in a modular fashion, are easy to control and can be quickly replaced as necessary. Our control technology provides the right solution for easy networking and monitoring of the fans.

## 1 Axial fans and modules

In the context of free cooling, axial fans are frequently deployed in fan walls and chillers. A large volume flow rate and relatively low pressure loss are required.



### ZAplus, ZAplus+

Integrated axial fan system with optimised full nozzle, guide vane, motor suspension and diffusor.

- High energy efficiency and air handling capacity
- Minimal noise generation
- High corrosion protection
- Volume flow rates up to 36,500 m<sup>3</sup>/h
- Static pressure increase up to 475 Pa

## 2 Centrifugal fans and modules

In the context of free cooling, centrifugal fans are deployed in those locations where the pressure loss is increased due to filters, heat exchangers and duct systems. Centrifugal fan modules are often assembled in fan walls.



### ZAcube

Fan module system with built-in optimiser for maximum efficiency with reduced acoustics

- Stackable
- Volume flow rate up to approx. 17,500 m<sup>3</sup>/h
- Static pressure increase up to 2,100 Pa



### GR modules and ER modules

Fan modules for easy planning, assembly and replacement

- Optimally coordinated nozzle and suspensions
- Optimised performance and handling

## 3 Control technology

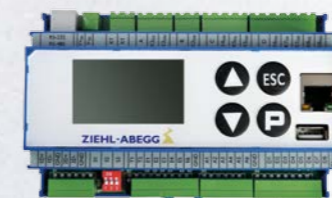
Control technology is an important component in the cooling system of a data center. ZIEHL-ABEGG provides a comprehensive product portfolio for energy-saving control and convenient networking and monitoring of fans.



### Frequency inverters

Energy efficient control of fans with AC or PM motors

- Rotational speed control via analogue input or via MODBUS
- Potential-free fault indication contact
- Integrated motor protection function
- Soft motor start



### Controllers: UNIcon

Networking and control of fans via MODBUS

- 2 to 6 integrated PID controllers
- Numerous analogue and digital I/Os for input signal and alarm function
- Graphic user interface for PC via Ethernet (MODBUS TCP)



# Save energy with EC technology from ZIEHL-ABEGG



ECblue motor

## EC technology

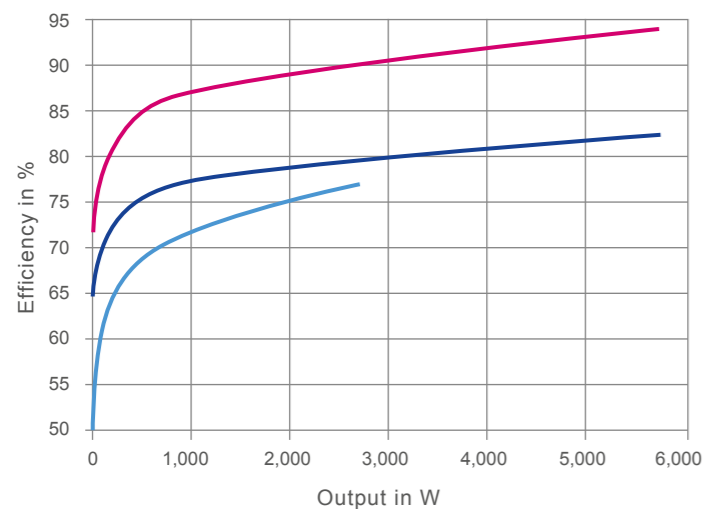
The ECblue motor offers maximum efficiency with minimal energy consumption.

In modern data centers, EC technology and frequency inverters are almost part of the standard solution. In the case of existing data centers, it is also worth checking whether it would make sense to perform a retrofit.

## Innovative drive technology

Innovative drive technology ensures optimum efficiency of the motors with minimal consumption. ZIEHL-ABEGG EC technology and frequency inverters guarantee highly efficient RPM control of the fans and are optimally tailored to the aerodynamics. This helps save a great deal of energy and improves the PUE value.

## Efficiency comparison with AC motor



- ECblue motor
- AC motor 3~
- AC motor 1~

## Major characteristics of the ECblue motor family

- Integrated motor protection
- Continuous RPM control
- Highest efficiencies, even in partial load range
- Active temperature management
- Power factor correction
- Easy parametrisation and data read-out
- EMC interference emission according to EN 61000-6-3 (household appliances)
- Interference immunity according to EN 61000-6-2
- Suitable for connection to various bus systems, e.g. MODBUS, LON, ProfiBus

## Characteristics and special features

- Compact and space-saving construction due to external rotor design
- Proven drive concept for wear-free permanent solenoid synchronous motor

# Frequency inverters for optimum performance and energy-saving control

## Saves valuable energy by controlling motors according to demand

With the new PMcontrol and PMIcontrol frequency inverters, saving energy just became even easier.

The frequency inverters are developed especially for the standard motors and perfectly tailored to ZIEHL-ABEGG fans.

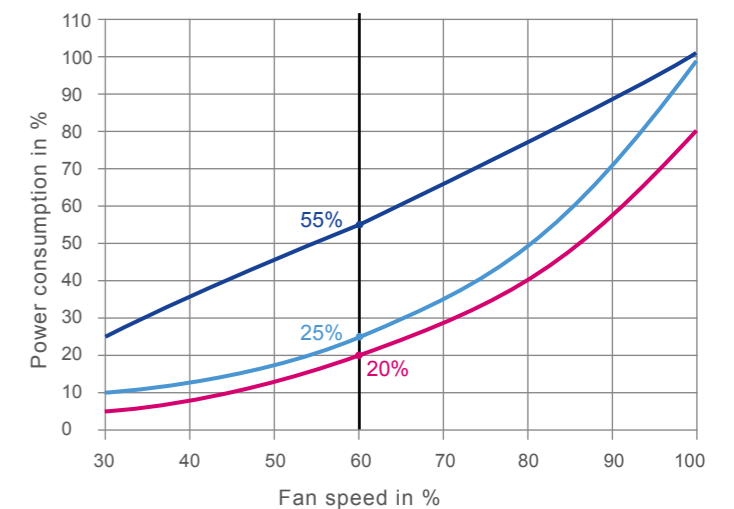
## PMcontrol and PMIcontrol frequency inverters

- Analogue input for external rotational speed control, e.g.: 0 – 10 V, 0 – 20 mA, PWM
- Digital input for enabling on/off
- Potential-free fault indication contact
- Integrated motor protection function
- Soft motor start
- Integrated MODBUS connection (slave)



PMIcontrol

## Power consumption comparison with speed control



- ECblue
- AC motor – voltage-controlled
- AC motor – frequency inverter



# Easy networking and control

Easy control for large fan groups, networking for centralised monitoring and diagnosis: ZIEHL-ABEGG offers a wide range of controllers and communication modules.

## UNIcon control module

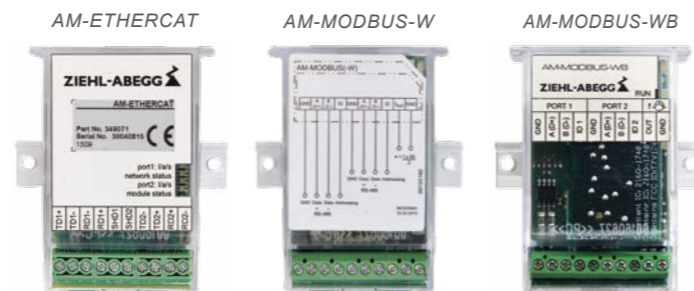
UNIcon universal control modules can be combined with all ZIEHL-ABEGG sensors. UNIcon universal control modules with the integrated MODBUS master function enable easy, automatic addressing and control.

- Up to 32 fans or frequency inverters can be connected and controlled via MODBUS RTU
- 2 PID controllers integrated
- Analogue inputs for sensor connection
- Integrated real-time clock with timer



## Add-on modules

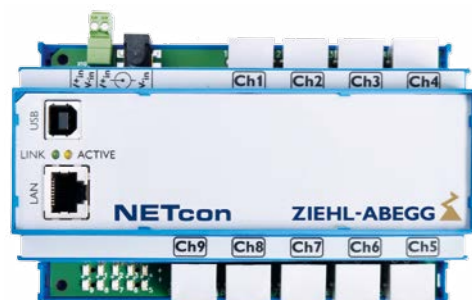
The add-on modules make it possible to connect a ZIEHL-ABEGG fan and frequency inverter to various bus systems, such as MODBUS RTU, Ethernet and Bluetooth. In this way, the fans can be conveniently configured and monitored.



## MODBUS gateway NETcon DIG-9NE

The gateway enables communication with numerous MODBUS RTU-capable fans and controllers via Ethernet (MODBUS TCP).

- Gateway between MODBUS RTU (to fans) and MODBUS TCP/IP (to control device)
- 9 RS485 channels that can each connect to up to 63 MODBUS RTU nodes, i.e. 567 total MODBUS RTU addresses possible
- Supports MODBUS auto-addressing
- 9 traffic LEDs display the status of the 9 channels
- RJ45 sockets for MODBUS RTU channels, easy connection to connection box via Ethernet cable



## UNIcon CXG-327 (A)NE-R premium control module

The UNIcon CXG-327 features a graphic user interface for the PC-based configuration and remote monitoring of ECblue motors and fans via Ethernet (MODBUS TCP).

- Control and monitor up to 124 ECblue motors or fans via MODBUS
- Auto-addressing of the MODBUS participants
- 6 PID controllers integrated
- Comprehensive I/Os for sensor connection and alarm function
- Communication with superordinate control via Ethernet
- Graphic user interface for configuration and remote monitoring on PC/laptop
- Save error log file up to 4 GB via USB stick



# Reliability

Constant availability is an essential factor for a data center. The fans must therefore be absolutely reliable in terms of their operation.

With an MTBF (mean time between failure) of over a million hours, ZIEHL-ABEGG fans are among the most reliable ones in the world.

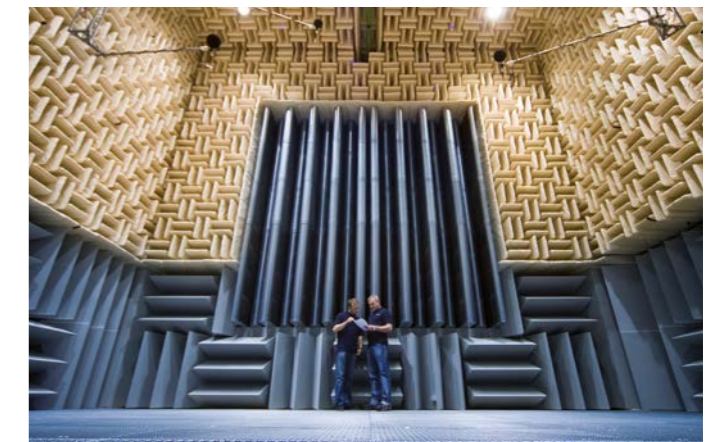
## Outdoor, indoor endurance tests

In outdoor and indoor endurance tests in our special endurance test rooms, our products are checked for their wear resistance by means of higher loads at an accelerated pace. These tests can be done in continuous operation or in coordinated switching cycles depending on the application. Last but not least, our outdoor endurance tests ensure the reliability under difficult weather conditions.



## Precise measurements of acoustics and air handling capacity

The world's largest and most modern fan air and noise test facility to date is where fan units are tested and all possible device combinations measured. Large 2.5 m air channels can be used here to measure air flows up to 100,000 m<sup>3</sup>/h and pressures up to 3,000 Pa.



## Tests under extreme conditions

Biting cold, tropical heat and the whole climatic range in between. When used around the world in a range of climate zones, ZIEHL-ABEGG products are exposed to everything that nature can throw at them. The external influences affect the ageing of the materials used, the electronics and the surface quality. Targeted stress tests are used to simulate climate conditions and investigate their effect on the products.



# Retrofit – an alternative concept for more air with less energy

## Reference 1 Retrofit – supply air system for semiconductor production

This project involved improving the energy efficiency of a supply air system in semiconductor production. Initially, the supply air was conveyed using 3 axial medium pressure fans from a well-known manufacturer, which were controlled by frequency converters.



27 centrifugal fans with EC motors were installed on a wall construction as a multiple fan arrangement.

## Reference 2 Retrofit – coolers for data center

This modernisation project for one of the largest data center operators in Germany including optimising the energy efficiency of the existing fans on the coolers. A total of 64 directly grid-driven axial fans were replaced with efficient EC technology.



64 axial fans featuring AC technology were replaced with efficient ZPlus units.

### Summary of improvements:

- Annual energy saving of 143,480 kWh
- Annual cost saving of €20,100 (at €0.14 per kWh)
- Amortisation time: 2.5 years
- Total acoustic benefit of 21 dB(A)
- Reduction of rating from 165 kW to 140.4 kW
- Energy saving of 29.8%
- Increase of system availability due to newly available redundancy if a fan should fail
- Improved flow conditions thanks to homogeneous throughflow
- Handling advantages thanks to compact centrifugal fans
- Easy retrofit capability of a MODBUS system for improved monitoring of individual components

### Summary of improvements:

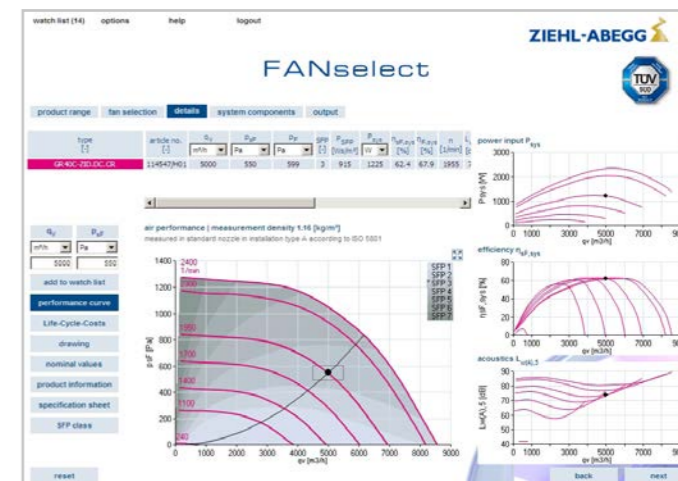
- Annual energy saving of 128,000 kWh
- Annual cost saving of €19,200 (at €0.15 per kWh)
- Amortisation time: 2.9 years
- Acoustic improvement of 2 dB(A) per fan
- Reduction of power consumption by 37%
- 57% reserve for volume flow rate available (for increased cooling performance in the summer months)
- The energy efficient alternative solution ZPlus+ reaches the operating point of the old fans even at low speeds
- Very quick and easy conversion due to compatible basic dimensions of the wall ring plate

# FANselect – the easy selection tool for choosing the right fan

## Quick and convenient product selection

FANselect, the selection software for fans from ZIEHL-ABEGG, allows you to quickly and conveniently identify the right axial or centrifugal fan for your requirements. Each product in FANselect is based on performance data from the ZIEHL-ABEGG InVent Technology Centre, known to be the most accurate measurement data in the ventilation technology sector. The most accurate measurement data combined with a specially developed calculation algorithm allows for high-precision fan selection.

After entering your respective framework conditions, you are only a few clicks away from a selection of products that are ideal for deployment in your use case. It is also possible to compare different fans with one another based on their technical and economic properties. A special feature is the integrated LCC (lifecycle costs) module that makes it possible to calculate the operating costs.



FANselect is available worldwide: [www.fanselect.net](http://www.fanselect.net)

### TÜV certificate

FANselect is the only selection software for fans in the world that has been certified by TÜV. The TÜV certificate for FANselect extends to most of the product portfolio available in FANselect. Furthermore, in FANselect it is not just the impeller data that is TÜV-certified, as with some other companies in the market, but the entire device.



### Benefits

- Comprehensive product selection software
- Available online worldwide
- TÜV-certified calculation algorithms
- Available as web version, standalone version and calculation DLL for integration into customer software
- Enables fan dimensioning in installed state, even for modular system solutions
- In addition to centrifugal fans, also contains a comprehensive axial fan product portfolio
- All data based on measurements





# The Royal League

