

## Product note

# High power 4-pole generators from 50 to 85 MVA for mid-size steam and gas turbines

ABB – the global leader in large 4-pole generators – has updated its proven AMS product family to cover powers over 80 MVA. The 4-pole solution enables the turbine speed range to be optimized to increase system efficiency and lower the running cost. Higher power from a small footprint means fewer gensets and a low capital investment.

### Advanced 4-pole technology

Turbine OEMs, packagers and end users are demanding higher power outputs. This is due to more stringent grid codes and the need to cut project costs by using fewer larger units instead of several small ones.

When de-rating is needed, such as for high power applications in hot environments using air-to-air cooling, a 2-pole configuration was previously the only technical solution available. With ABB's advanced 4 pole technology it is now feasible to increase not only the actual maximum power levels, but also the power in hot ambient environments.

Both steam and gas turbine manufacturers are seeking to increase speed in order to operate their turbines in a more optimal range and boost efficiency. With a gearbox setup, OEMs can freely select the turbine speed and optimize the design for the lowest cost and highest efficiency. A 4-pole generator offers the best way to achieve these goals.

### ABB 4-pole solution offers clear benefits

Compared to a 2-pole configuration, the main benefits of a 4-pole solution are compact size, lower cost of the generator-gear package, shorter delivery time, better efficiency and simplified maintenance. Overall length is reduced, offering a significantly smaller footprint, and weight is cut by approximately 20%.



For turbine OEMs, using a 4-pole generator solution enables the speed range to be optimized in order to increase the system efficiency. The result is a very quiet and compact turbine package, with lower running and maintenance costs and up to 40% lower cooling water and lubrication media requirements. In many cases high power 4-pole generators also deliver higher efficiencies at partial loads, due to their lower non-load losses.

Our new maximum power level means that the number of turbine units needed can be reduced. This minimizes space requirements and the total investment cost.

Power plants are increasingly being run in a frequent start-stop mode, posing higher stresses on generators – especially 2-pole units, that need to run over the critical speed area. The more rigid 4-pole solution offers better reliability to cope with these stresses.

Long maintenance intervals mean that ABB generators can fit into the turbine service plan – so no extra stoppages are needed for separate generator servicing. This provides real savings in applications with continuous operation and long operating times.

# Proven designs from the global technology leader

**ABB generators are built to the strictest manufacturing standards for the highest efficiency, performance and reliability. Experienced technical support is available in all project phases from quotation to commissioning, with local support worldwide.**

**With a track record of over 50,000 MVA in large 4-pole generators supplied all over the world, ABB can deliver the optimum product on time and in budget.**

Modular ABB generators offer easy configurability for different applications. ABB can supply the complete generator package with fully matching control units for protection and supervision.

Quality in ABB generators originates from the design, manufacturing processes and materials. Purchases are sourced from reliable suppliers only, and thorough testing is done in all phases of manufacturing.

**Rigid salient pole rotor with high inertia.**

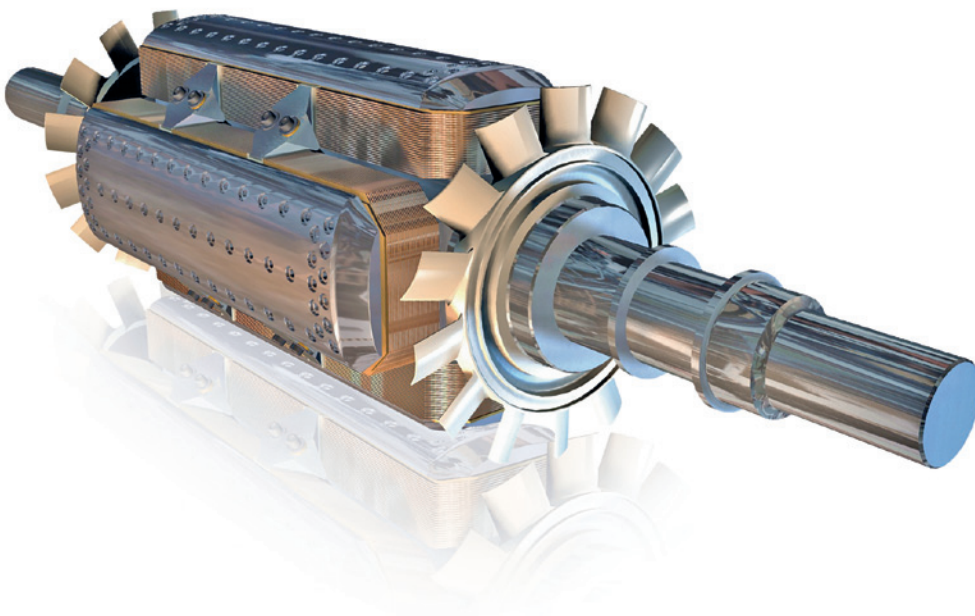
## **Rigid rotor design**

The solid, salient pole rotor design operates below the first critical speed – unlike a cylindrical 2-pole rotor that has to successfully pass it. As a result, there are no forbidden speed areas in the operating range, which enhances the low vibration characteristics. The high inertia rotor ensures excellent speed stability for the turbine drivetrain system. The design does not require damper windings, a factor that promotes high reliability and a long lifetime. Maximized rotor coil surfaces, together with symmetrical air flow that avoids any hot spots, produce highly efficient and evenly distributed cooling.

## **Grid code compliance**

ABB can deliver the complete intelligent generator control panel (GCP) including protection and the state-of-the-art ABB Unitrol 1020 AVR. Together with the flexible design and high rotor inertia, this means that ABB generators can easily comply with different country specific grid codes. Optimized rotor and stator dynamics enable the generator to support the grid voltage. The additional short-circuit power capacity and the LVRT (Low Voltage Ride Through) capability to ride over disturbances, such as short circuits, is achieved by optimizing the generator for each project.

With their small footprint and compliance with new, more stringent grid code requirements, ABB generators are ideal for replacement projects, where a short 4-pole unit can replace a longer 2-pole product.



# Optimized turbine package with low total cost of ownership

## Complete package from ABB

ABB can deliver the complete generator package for your turbine, including the generator control panel. ABB's flexible main terminal box solution provides plenty of space for equipment. The ABB state-of-the-art Unitrol 1020 AVR includes an advanced synchronization function.

ABB can also provide the base frame design as well as the gearbox installation.

### Major benefits:

- Enables a compact power system with low CAPEX
- Reduced space, weight, vibration and noise levels
- Complete and fully matching generator package
- High partial load efficiency, max. point > 98%
- Long maintenance interval
- Lower operating cost
- Short lead times

Complete generator control panel, including state-of-the-art Unitrol 1020 AVR.



## Low total cost of ownership

By keeping total investment and running costs down, and reducing the risk and cost of not running, ABB generators offer a low total cost of ownership. Payback times can be short, helping operators to maximize profits.

**Cost of investment (CAPEX).** Offering more power per kilogram in a compact and flexible configuration, these generators minimize space requirements. ABB can offer the complete generator delivery with fully matching control units for easy installation and commissioning.

**Cost of running.** Smooth running minimizes the stress on the drivetrain, extending the maintenance interval and lifetime. High efficiency together with low cooling power and lubrication requirements help to keep the cost of running low.

**Cost of not running.** Proven technology means high availability. The generators are designed for a long lifetime, even in the most challenging conditions. Easy servicing, local support around the world and short lead times for spares make for a low cost of not running.

### Main features

Power	5 to 85 MVA
Voltage	3 to 15 kV
Frequency	50 & 60 Hz
Ambient temp.	-50°C to +60°C (-58°F to +140°F)
Hazardous area	Ex(n), Ex(p), Class I Div 2/Zone 2
Protection	IP20 to IP56
Cooling forms	IC01, IC21, IC31, IC616, IC81W, IC86W
Standards	IEC, NEMA, BS, VDE, CSA, API, GOST

ABB is the world's leading supplier of electric motors and generators. With more than a century of manufacturing behind us, we now have 45 production plants in 13 different countries to serve today's global markets.

# Proven ABB generators enable reliable power production with the lowest life time cost

## Your reliable partner

ABB is a leader in power and automation technologies that enable utility and industry customers to improve their performance while lowering environmental impact. The ABB group of companies operates in around 100 countries and employs about 150,000 people.

ABB is the technology and market leader in motors and generators for all industrial and marine applications. We have supplied tens of thousands of large motors and generators to customers all over the world, based on more than 120 years of experience in the widest range of solutions.

ABB's global engineering, manufacturing and service network enables our customers to offer reliable and efficient power generation wherever they operate.

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