

ABB LARGE MOTORS AND GENERATORS

Marine generators

Proven generators for reliable power on board

For more information, please contact
your local ABB representative or visit

<http://new.abb.com/motors-generators/generators>



- ABB's motors and generators for marine applications deliver high levels of performance and reliability in demanding conditions
- ABB offers a full range of induction and synchronous motors and generators for marine applications

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**We provide motors and generators,
services and expertise to save
energy and improve customers'
processes over the total life cycle
of our products, and beyond.**



Full range of synchronous generators for marine applications

Whatever your marine generator needs – low or high voltage, power plant or auxiliary power – ABB has a proven, safe solution.



We are the leader in diesel and gas engine applications with over 45,000 MVA of power supplied, enabling us to deliver the optimum product on time and in budget.

ABB produces 50,000 marine motors and generators annually. We offer a full range of synchronous generators optimized to meet the highest marine requirements. Our low voltage standard series extends from 14 kVA up to 2600 kVA, and is complemented by modular generators covering the range 500 – 5000 kVA. Our high voltage generators are rated up to 63 MVA with voltages up to 15 kV. Our offering also includes DC grid generators and shaft generators.

From the Arctic to the Tropics

ABB has extensive experience in working with the marine sector – from system designers, integrators and OEMs, to shipyards, ship owners and operators. A huge installed base of ABB generators is operating reliably in a wide range of vessel types, including cruisers, car and train ferries, ice breakers, multi-purpose tankers, LNG tankers, FPSOs, ice-going vessels, supply vessels, drilling rigs, and more. Our customers rely on ABB's full life cycle support and proven track record of on-time delivery.

Reliability and safety come first

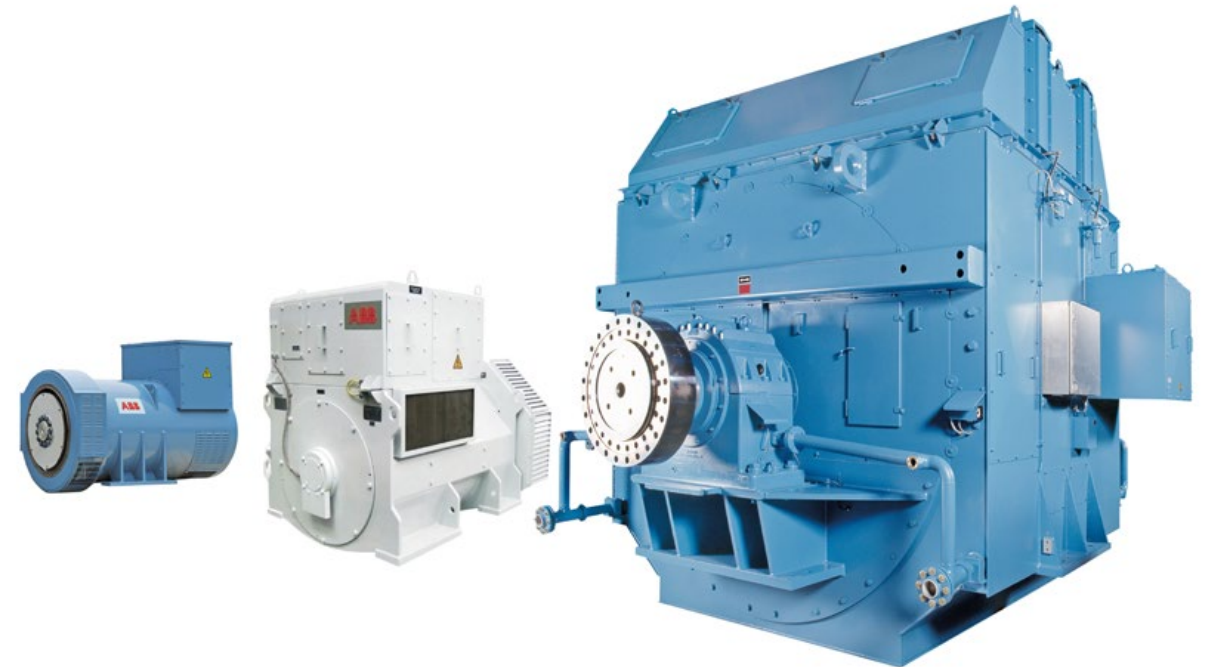
At sea there is no room for failure. ABB generators feature vacuum pressure impregnation (VPI) of the windings, a technology which has proven itself for over 30 years in tens of thousands of motors and generators operating successfully all over the world. Our advanced insulation system exceeds strict marine requirements for on-board equipment and gives the windings superior strength to withstand vibration, and mechanical and electrical stresses. Together with our vast experience in a wide range of bearing constructions and special inclination testing, this results in high availability and trouble-free operation.

Application specific engineering

ABB marine generators are optimized using advanced techniques including 3D design. Vibration levels are efficiently reduced with the help of FEM (finite element method) simulations, with the results made available to the engine supplier for use in their own design. Our long-standing working relationships with engine manufacturers and gen-set builders have given us the experience and tools needed to analyze the impacts of external torsional and baseframe vibrations. Our engineering can meet all performance design challenges – including reactance tuning and voltage drop withstand needed with other gen-sets and motors in island operating mode – ensuring reliable power production when it is most needed. Significant investments in R&D ensure that we will maintain our position as a technology leader.

Quality built in

Quality in ABB generators originates from our design, manufacturing processes and the materials we use. We source our purchases from reliable suppliers only and perform thorough testing in all phases of manufacturing. Our generators are built to IEC 60034 and they comply with all international classification standards like LRS, DNV GL, BV, NK, KRS, RS, CCS, ABS, US Coast Guard and RINA. In addition to our own quality program using tools like FMEA, we follow the requirements of the ISO 9001, ISO 14001 and OHSAS 18001 quality, environmental and occupational health and safety standards. ABB's global organization and network of partners means you can count on us to provide the life cycle service and support you need – wherever in the world you need it – to minimize downtime and keep your business running.



Low voltage standard marine generators

ABB low voltage (LV) standard marine generators are specifically designed for marine diesel gen-sets in main, auxiliary or emergency power generation.

They cover the power range 560-2400 kVA in frame sizes 400 and 450 with typical voltages of 380-480 V.

Application specific generators – short delivery times

ABB standard 4-pole generators have proven themselves in demanding marine applications. They enable short delivery times without compromising reliability. These open air cooled self-excited brushless generators feature a permanent magnet pole in the exciter stator, a built-in AVR and other optional accessories. There are two different mounting and bearing configurations and the large terminal box can accommodate a variety of optional accessories. The direction of the cable connection can also be selected.

Proven technology

The excitation power in synchronous generators is typically supplied by an auxiliary winding. In the proven ABB brushless excitation system the secure voltage build up is ensured by a Permanent Magnet Insertion in the exciter stator.

Vacuum pressure impregnation (VPI) is used for both stator and rotor to protect from harsh environmental conditions.

| Low voltage (LV) standard marine generators | |
|---|--|
| Power range | 650 - 2400 KVA |
| Voltage level | 380 – 440 V at 50 Hz 415 – 480 V at 60 Hz |
| Speed range | 1500 or 1800 rpm (50 or 60 Hz, 4 pole) |
| Frame sizes | 400 – 450 |

- Power factor: 0.8
- Insulation class/Temperature rise: H/F or H/H
- Ambient Temperature: 0 ... +45°C (up to 60°C with power derating)
- Mounting: IM2105, single bearing, SAE flange, coupling disc IM1001, double bearings, one shaft extension
- Cooling / Protection: IC0A1 / IP23 (IP 44 on request)
- Bearings: Re-greasable bearings
- Main connections: Large terminal box for easy access to the terminals and AVR, room for optional CTs
- Automatic voltage regulator: Analog type (digital as option)

Low voltage modular marine generators

ABB low voltage (LV) modular marine generators are tailor-made for diesel gen-sets on board ships or offshore platforms.

They cover the power range 500-5000 kVA in frame sizes 400-630 with typical voltages of 400-690 V.

Tailored solutions on time

ABB has the experience to deliver tailor-made generators for demanding marine applications on time and in budget. We can offer different bearing solutions for specific tilting requirements using either antifriction or sleeve bearings in single or double bearing arrangements. The direction of the cable connection, special feet heights and a variety of optional accessories can also be selected for modular generators.

Proven technology

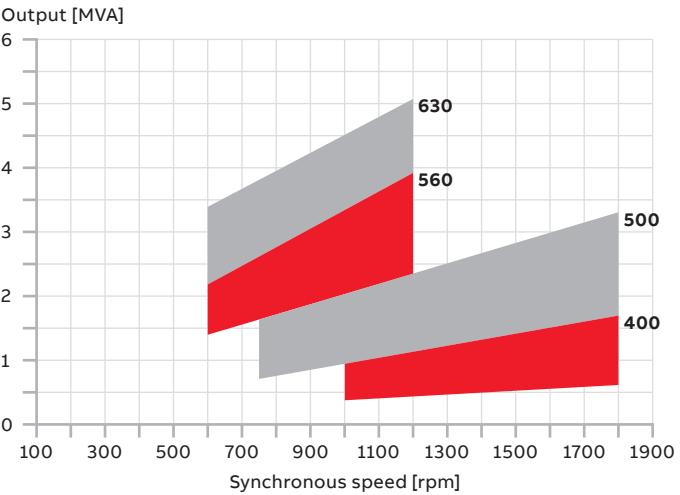
The excitation power in modern synchronous generators is typically supplied by an auxiliary winding. A separate PMG is also available as the excitation power source. In the proven ABB brushless excitation system the secure voltage build up is ensured by a Permanent Magnet Insertion in the exciter stator.

Vacuum pressure impregnation (VPI) is used for both stator and rotor to protect from harsh environmental conditions. Special form wound windings – normally used in high voltage generators – are also available for ABB modular LV generators as an option.



Power range at different speeds, LV modular marine generators

For outputs at 400 V/50 Hz and 450 V or 690 V/60 Hz, temperature rise class F, inlet cooling air 50°C, typical power factor 0.80



| Low voltage (LV) modular marine generators | |
|--|---|
| Power range | 500 – 5000 kVA |
| Voltage level | 400 V at 50 Hz 450 V or 690 V at 60 Hz |
| Speed range | 600 – 1800 rpm (4 – 10 poles) |
| Frame sizes | 400 – 630 |

- Power factor: 0.8
- Insulation class/Temperature rise: H/F or H/H
- Ambient Temperature: 0 ... +45°C (up to 60°C with power derating)
- Mounting: IM1101, IM1305, IM2401, designed to match the engine
- Cooling/Protection: IC0A1/IP23 (open air cooled) or IC8A1W7/IP44, (closed circuit water cooled, max +38°C) emergency cooling as an open machine
- Bearings: Antifriction or sleeve bearing, single or double bearing
- Main connections: Terminal space integrated into generator top module, including transformers for measurement and protection, main cable entry from either side
- Automatic voltage regulator: Several types of digital or analog AVRs available, integrated into the top module or delivered as a separate item

High voltage marine generators

ABB high voltage (HV) marine generators are custom designed for diesel gen-sets on board ships or offshore platforms.

They cover the power range up to 63 MVA in frame sizes 500 - 2500 with voltages up to 15 kV (50/60 Hz).

Over 2000 state-of-the-art HV synchronous generators are operating on a wide range of vessel types, including cruisers, car and train ferries, ice-breakers, multi-purpose tankers, LNG tankers, FPSOs, ice-going vessels, supply vessels and drilling rigs.

Customized solutions on time

We have the experience to deliver highly customized ABB generators for demanding marine applications on time and in budget. We can offer different bearing solutions for specific tilting requirements using either sleeve or antifriction bearings in rigid flange mounted or pedestal bearing constructions.

When supplied for gen-set use, the generators are always dimensioned according to customer specifications. The reactance levels are matched with the short-circuit capability of the switchboard and voltage variations requirements.

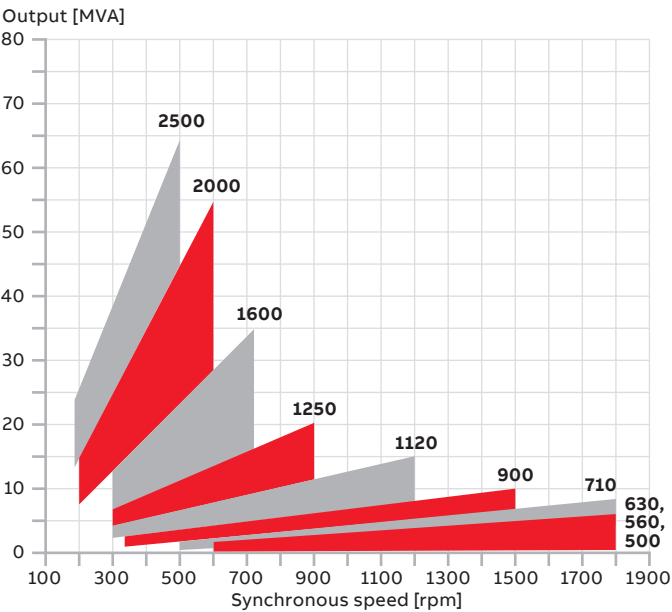
Proven technology

The high voltage generators use the special ABB shunt boost excitation system, which takes the excitation power from the line voltage through a voltage transformer (also used for measurement). In a short circuit the excitation power is taken from the current transformers. Permanent magnet insertion is used in the exciter to ensure the secure voltage build up. A separate PMG is also available as the excitation power source.

Both the stator and rigid salient pole rotor use reliable ABB form wound windings and vacuum pressure impregnation to withstand all mechanical and electrical stresses during operation and to protect from harsh environmental conditions. The HV generators also feature an additional protective varnish as standard.

Maximum outputs at different speeds, HV marine generators

For outputs at 6 kV/50 Hz, temperature rise class F, inlet cooling air 50°C, typical power factor 0.80



| High voltage (HV) marine generators | |
|-------------------------------------|-------------------------------|
| Power range | up to 63 MVA |
| Voltage level | up to 15 kV, 50/60 Hz |
| Speed range | 200 – 1800 rpm (4 – 30 poles) |
| Frame sizes | 500 – 2500 |

- Power factor: 0.8
- Insulation class/Temperature rise: F/F
- Ambient Temperature: 0 ... +45°C
- Mounting: IM1101, IM 1305, IM7301
- Cooling/Protection: IC8A1W7/IP 44 (closed circuit water cooled, max +38°C), emergency cooling as an open machine
- Bearings: Sleeve or antifriction bearings
- Main connections: Terminal space integrated into generator top module, including transformers for excitation and protection, main cable entry from either side
- Automatic voltage regulator: Several digital type AVRs available, mounted on a plate or in the cabinet



Shaft generators

ABB supplies shaft generators for installation directly in the main shaft or for connection via a gearbox. Every shaft generator is tailored for an optimal match with the vessel design.

Variable speed shaft generators cover the power range up to 10 MW. Power ranges for fixed speed shaft generators are shown on the previous pages.

ABB shaft generator solutions are fully marine certified. Based on our extensive experience in supplying equipment for marine applications, the generators are optimized to meet the needs of the individual vessel. Robust designs and high quality construction ensure they will operate reliably, whether they are installed in a new vessel or used as a replacement or upgrade in an existing one.

Solutions are available for fixed speed operation (from low to high voltage) and for variable speed, using either a low or medium voltage frequency converter. ABB variable speed shaft generators can be used either as a generator (PTO, power take off) or motor (PTI, power take in). In PTO mode the shaft generator is an efficient way of producing power for use on board, and helps to reduce fuel costs and emissions. In PTI mode the shaft generator is operated as a motor to boost the main engine power. PTH (power to home) solutions are also possible, with the shaft generator used as an alternative propulsion motor to the main engine.

Generators for direct installation in the main shaft can be supplied with the rotor completely assembled on the shaft, or we can supply the poles separately for installation at the shipyard. In either case, our shaft generators are designed to ensure that assembly and installation are fast and easy.

All shaft generators are designed, manufactured and tested according to our strict quality assurance procedures, and we follow international standards and classification society requirements.

| Variable speed shaft generators | | |
|---------------------------------|-----------------|------------------------|
| | Directly driven | Driven through gearbox |
| Typical max power | Up to 10 MW | Up to 7 MW |
| Voltage levels | Low and medium | Low and medium |
| Typical speed range | Up to 150 rpm | Up to 1800 rpm |
| Type | SM/PM/IM | SM/ PM/IM |
| Frame sizes | 1120 - 2500 | 400 - 1000 |

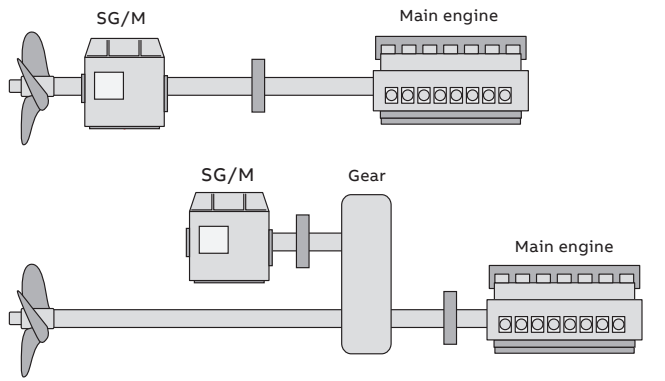
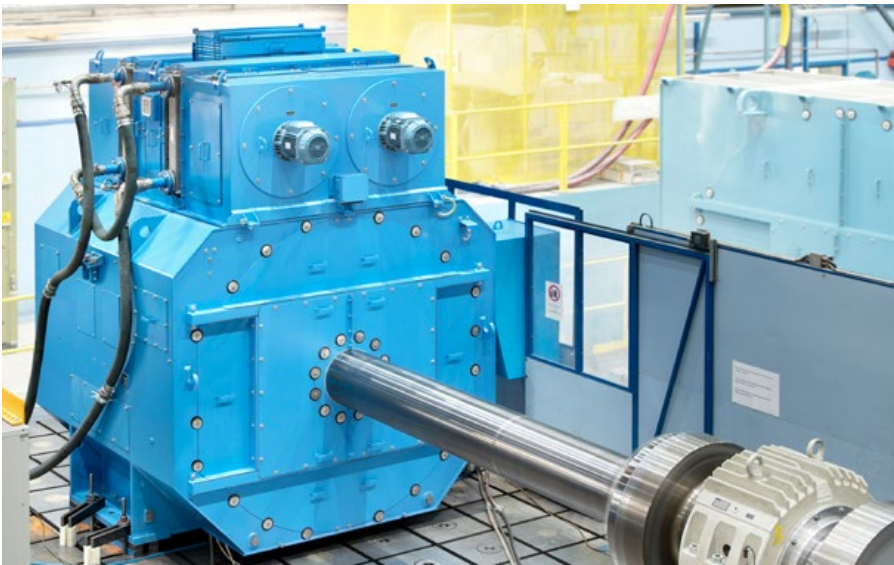


ABB supplies shaft generators for direct installation in the main shaft, between the main engine and propeller, and for connection through a gearbox.

High voltage marine generator

Shaft generator



Life cycle services and support

From pre-purchase to migration and upgrades

ABB offers a complete portfolio of services to ensure trouble-free operation and long product lifetimes. These services cover the entire life cycle. Local support is provided through a global network of ABB service centers and certified partners.



Pre-purchase



ABB's front-end sales organization can help customers to quickly and efficiently select, configure and optimize the right generator for their application.

Installation and commissioning



Professional installation and commissioning by ABB's certified engineers represent an investment in availability and reliability over the entire life cycle.

Engineering and consulting



ABB's experts provide energy efficiency and reliability appraisals, advanced condition and performance assessments and technical studies.

Condition Monitoring and Diagnosis



ABB's unique services deliver early warnings of developing problems before failures occur. The required data can be collected by an engineer during a site visit or by means of remote monitoring solutions. Integration into the ABB Ability™ platform means the data can be transmitted to the cloud and accessed and analyzed remotely, allowing even greater insight into the health of the equipment. The services focus on critical areas like the bearings, rotor winding, stator winding insulation and overall mechanical condition.

Maintenance and field services



ABB offers life cycle management plans and preventive maintenance products. The recommended four-level maintenance program covers the entire product lifetime.

Spare parts



Spare parts and support are offered throughout the life cycle of ABB products. In addition to individual spares, tailored spare part packages are also available.

Repair and refurbishment



Support for all ABB generators and other brands is provided by ABB's global service organization. Specialist teams can also deliver emergency support.

Migration and upgrades



Life cycle audits determine the optimum upgrades and migration paths. Upgrades range from individual components to direct replacement generators.

Training



Product and service training courses take a practical approach. The training ranges from standard courses to specially tailored programs to suit customer requirements.

Specialized support



Specialized support is offered through ABB's global service organization. Local units provide major and minor repairs as well as overhauls and reconditioning.

Service contracts



Service contracts are tailored to the customer's needs. The contracts combine ABB's entire service portfolio and 120 years of experience to deploy the optimal service practices.

Additional information

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