

Technical note

High voltage generators for diesel and gas engines

Design principles

ABB is a leading supplier of generators for all marine and industrial applications. We have been manufacturing generators for more than 120 years and have extensive application experience with tens of thousands of installations all over the world. ABB offers reliable and efficient power generation with worldwide support.



Design standards

The electrical design is based on the relevant IEC or NEMA standards and mechanical design on the relevant ISO standards. In marine or offshore applications the additional design criteria of the applicable classification society are followed. These societies include ABS, BV, CCS, CR, DNV, GL, KR, LR, NK, RINA and RS.

Efficiency

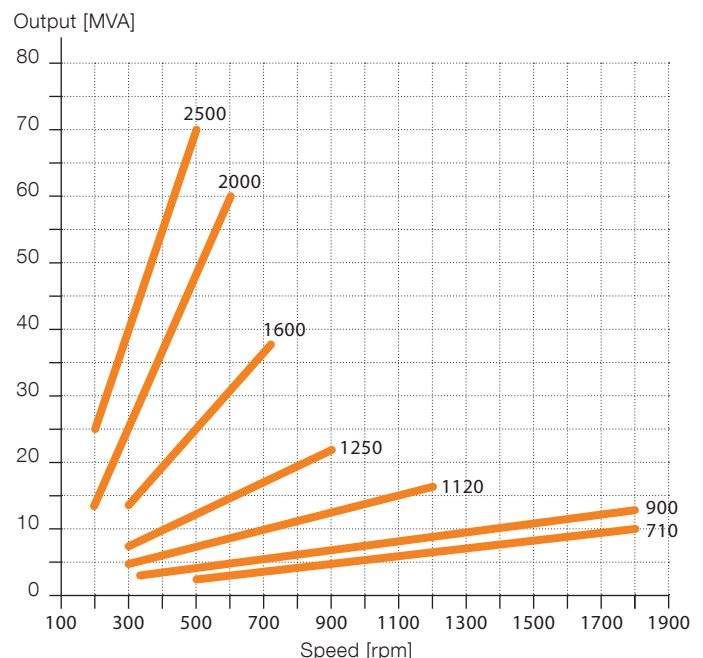
Our generators are designed for high efficiency, with losses minimized through the effective use of materials, state-of-the-art insulation and optimization of rotors, stators and fan designs. This benefits users like power plant operators as high efficiency helps to save money, cuts operating costs and means more electricity for the same investment.

Vibration tolerance

Generators coupled to reciprocating engines are always exposed to engine induced vibration, especially when the generator and engine are built on a common base frame. We use sophisticated design tools to analyze the impacts of external torsional and linear vibrations on the generator.

Maximum outputs at different speeds

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



This work is based on information from engine or generator set builders about the natural frequencies or global vibration modes – like base frame horizontal and vertical bending or torsion along the longitudinal axis – to help ensure troublefree operation. The generators withstand linear vibration up to the limits specified in the relevant ISO standard (typically 10–20 mm/s), which significantly exceeds the vibration originating from the generator itself (max 2.3 mm/s during final testing).

Recommended protections

The generators are built to withstand abnormal situations such as unbalanced load, overcurrent or overload in accordance with the relevant IEC or NEMA standards.

However, in order to avoid damage to the generator in situations where the permissible values are exceeded, the following protections are recommended:

- thermal overload in stator winding
- network short-circuit
- stator interwinding short-circuit
- stator earth fault
- overvoltage
- unbalance load or shorted turns in same phase
- underexcitation or loss of synchronism
- undervoltage and intermittent loss of voltage
- monitoring of temperature detectors

Modular design combined with a high degree of standardization means shorter manufacturing times. This benefits customers in terms of faster lead times.

Mounting

All our synchronous generators are designed for horizontal mounting. They are supplied as integral units, even up to the highest sizes and outputs. They therefore require no further assembly on site, which means that installation times are substantially reduced. The most common mounting arrangements are:

IM code	Description
IM1001	– two end-shield bearings, cylindrical shaft end, feet down
IM1101	– two end-shield bearings, cylindrical shaft end, raised feet
IM2001	– two end-shield bearings, cylindrical shaft, flange at D-end
IM7201	– two pedestal bearings, cylindrical shaft end, feet down
IM7301	– two pedestal bearings, cylindrical shaft end, raised feet

Frame construction

The smaller generators feature a three part modular frame consisting of the stator housing and two end housings. The end housings are precision machined and finally bolted or welded to the stator housing, ensuring perfect alignment and sufficient rigidity to withstand engine induced vibrations. End-shield type bearings are mounted on the end housings. The larger generators are built in a self-supporting full frame and equipped with integral pedestal bearings.

Corrosion protection

Our generators are designed and built to withstand the applicable environmental conditions. Screws, washers, all surfaces made of steel, aluminum alloy and all insulation materials are treated in accordance with the chosen paint system. Selection of a suitable paint system gives reliable anti-corrosion protection even under the most severe environmental conditions. For moderate indoor conditions the standard finish is a two-pack epoxy paint that is moisture-proof in accordance with the relevant standards. Solvent free paints are used wherever possible in order to minimize environmental impacts.

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