



PMM 1000M

0-250 rpm

Designed and built for shaft generator and propulsion motor applications

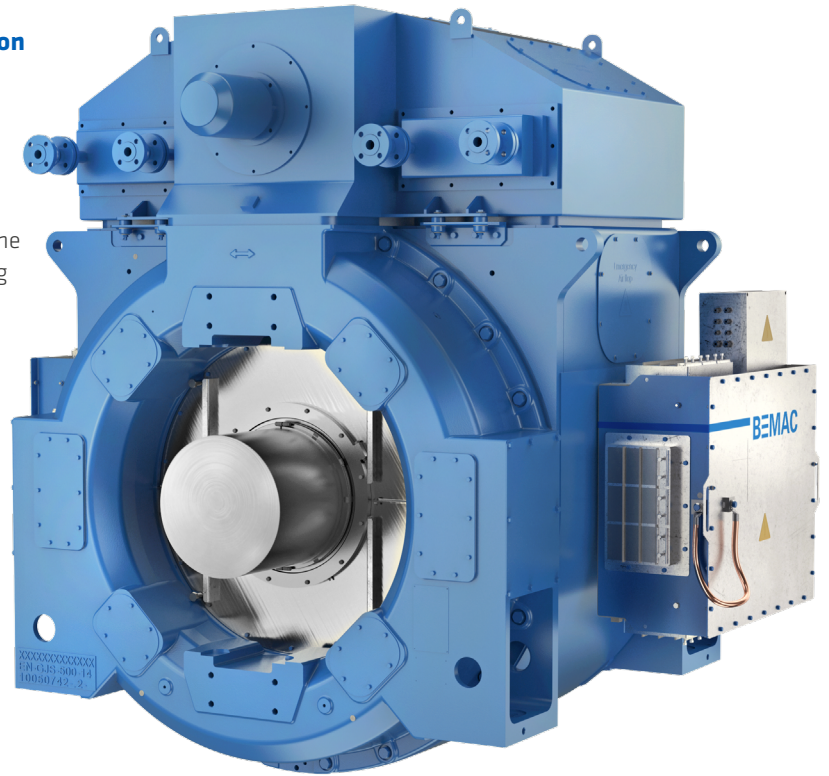
For various vessel types, such as container vessels, LNG carriers, product tankers and more.

- 100% designed for marine applications
- Brushless permanent magnet (PM) synchronous machine
- High efficiency, reducing fuel consumption and lowering emissions
- Compact and lightweight design
- Easy to install
- Low operating costs
- Built according to international standards
- Certificates from leading classification societies worldwide

Always tailored to application-specific requirements by adjusting:

- Speed range
- Cooling
- Voltage
- Machine length based on torque
- Other key parameters

Each machine is comprehensively tested in our own testing facilities before delivery.



Technical data ¹

Frame	1000M					1000M								
	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Max. continuous torque [kNm]	73	85	97	109	121	133	145	157	170	182	194	206	218	230
Shaft center height [mm]	1,000					1,000								
Continuous speed range [rpm]	0-250					0-250								
Stator winding type	2-layer form-wound diamond coil winding with mica insulation					2-layer form-wound diamond coil winding with mica insulation								
Max. momentary torque [% of nominal]	130					130								
Machine mass excluding shaft or bearings [t]	9.4	10.0	10.5	11.1	11.7	12.2	12.8	13.3	13.9	14.4	15.0	15.6	16.1	16.7
Rotor mass excluding shaft or bearings [t]	1.4	1.5	1.7	1.8	1.9	2.1	2.2	2.4	2.5	2.7	2.8	3	3.1	3.3
Rotor inertia excluding shaft or bearings [kgm ²]	410	458	506	554	601	649	697	745	792	857	921	985	1,049	1,113
Protection class ²	IP44					IP44								
Cooling type	IC8A6W7 (Forced air cooling with external air-to-liquid heat exchanger)					IC8A6W7 (Forced air cooling with external air-to-liquid heat exchanger)								
Number of poles	24					24								
Nominal voltage [V] ³	450/500/690					450/500/690								
Max. ambient temperature [°C]	45					45								
Max. cooling liquid temperature [°C]	38					38								
Insulation class ⁴	155					155								
Thermal class	155					155								

¹Numbers shown here are subject to change depending on project-specific requirements

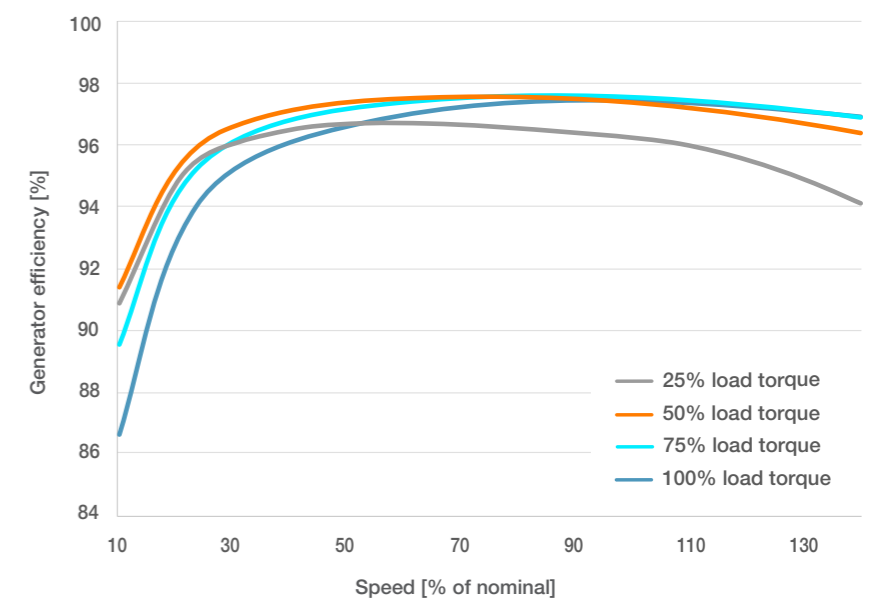
²Higher class optional, ³Medium voltage optional, ⁴180 class optional

Features	Main benefits
Excitation with Neodymium magnets	<ul style="list-style-type: none"> - Excellent efficiency, especially at part loads - Brushless, no slip rings needed, no wearing parts - No external exciters needed - No automatic voltage regulator (AVR) needed - Low rotor weight and inertia - In generator mode, possible to start from blackout - Very low vibration levels
Form-wound, mica-insulated winding impregnated with global VPI	<ul style="list-style-type: none"> - Best possible protection against mechanical vibrations, chemical corrosion and electrical surges - Proven technology with a solid track record in marine - Easily scalable up to medium voltages
Control with frequency converter	<ul style="list-style-type: none"> - Variable speed operation, decouples the machine rotation speed from grid's voltage and frequency - Maximized system efficiency - In shaft generator applications, both PTI and PTO modes available - Full torque available starting from zero speed - Momentary overloading for clearing ice loads, foreign parts on the propeller or other
IP44 protection class	<ul style="list-style-type: none"> - Closed system, no external particles or dirt can enter the machine
Compact machine	<ul style="list-style-type: none"> - Design optimized for each delivery project using proven technology and product platform - Short machine because external rotor excitation is unnecessary

Features	Main benefits
Redundancy	<ul style="list-style-type: none"> - With dual winding machine, possibility to safely operate the machine with reduced power in case of converter failure - Possible to operate the machine on reduced power with one cooling fan out of order
Rotor	<ul style="list-style-type: none"> - In shaft generator applications, it is possible to decouple the rotor from the propulsion shaft line in less than 3 hours - Low-inertia design compared to other generator technologies and even permanent magnet solutions
Flexible design	<ul style="list-style-type: none"> - Variable machine torque by varying length (number of substacks) - Modular design allows customization - Cable interfaces in different directions in terminal boxes - Interchangeable main and star-point terminal boxes - Optional terminal boxes on the machine end
Easy and fast installation	<ul style="list-style-type: none"> - Common bearings with propulsion shaft line - Rotor inserted in stator for transport - Easily accessible terminal boxes - HEX rubber bellow expansion joints - New eccentricity adjustment method with dial indicators
Low operating expenses	<ul style="list-style-type: none"> - High efficiency, lower fuel consumption - Simple, robust and reliable machine - Less maintenance - No bearings, rotor windings, slip rings, exciters or automatic voltage regulators (AVRs)

Typical efficiencies of The Switch PMM at various speeds and load levels

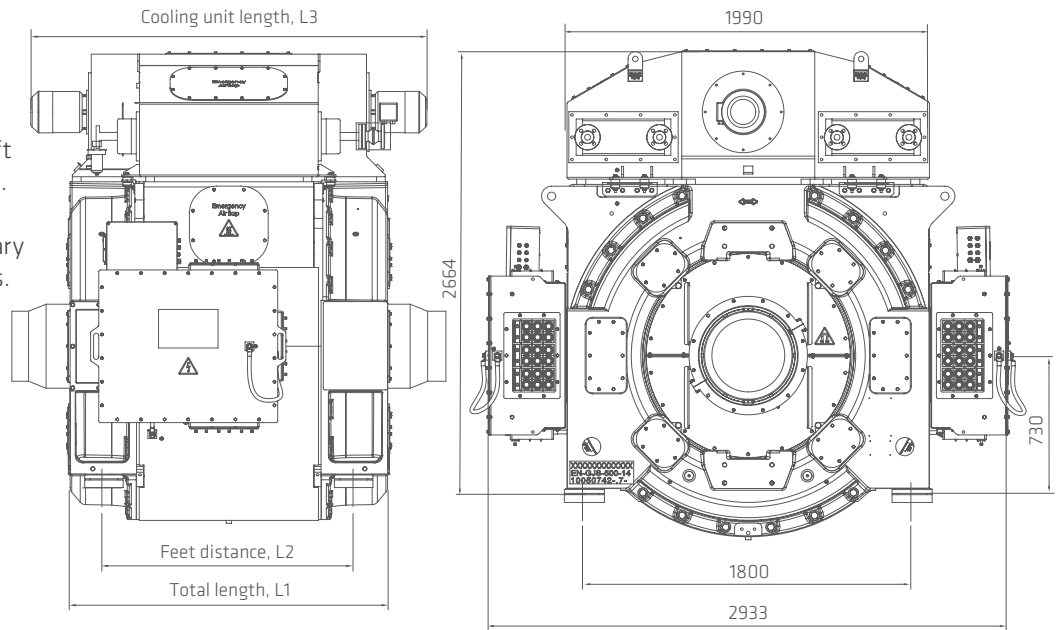
This chart illustrates typical efficiencies vs speed at different load levels, taking into account external cooling fan power consumption.



The exact efficiency value depends on the nominal speed of the application.

Technical drawings

The dimensions below are for a shaft generator without bearings or shaft. Ask about dimensions for the propulsion motor version, as they vary according to customer requirements.



Machine dimensions

Frame	1000M						
	6	7	8	9	10	11	12
Total length, L1 [mm]	1,383	1,461	1,540	1,618	1,697	1,775	1,854
Feet distance, L2 [mm]	956	1,034	1,113	1,191	1,270	1,348	1,427
Cooling unit length, L3 [mm]	1,792	1,871	1,949	2,028	2,106	2,185	2,263

Frame	1000M						
	13	14	15	16	17	18	19
Total length, L1 [mm]	1,932	2,011	2,089	2,168	2,246	2,325	2,403
Feet distance, L2 [mm]	1,505	1,584	1,662	1,741	1,819	1,898	1,976
Cooling unit length, L3 [mm]	2,342	2,420	2,499	2,577	2,656	2,734	2,812

Direct-drive propulsion

The Switch permanent magnet machine (PMM) can be used as a direct-drive propulsion motor in a standard configuration with its own bearings. Alternatively, it can be used as a novel concept, utilizing the common bearings between the propulsion shaft and the motor. A tandem setup is also possible on request.

