



# PMM 1500 – 12000 kW

## 0 – 600 rpm



### Built for a wide range of rugged marine applications

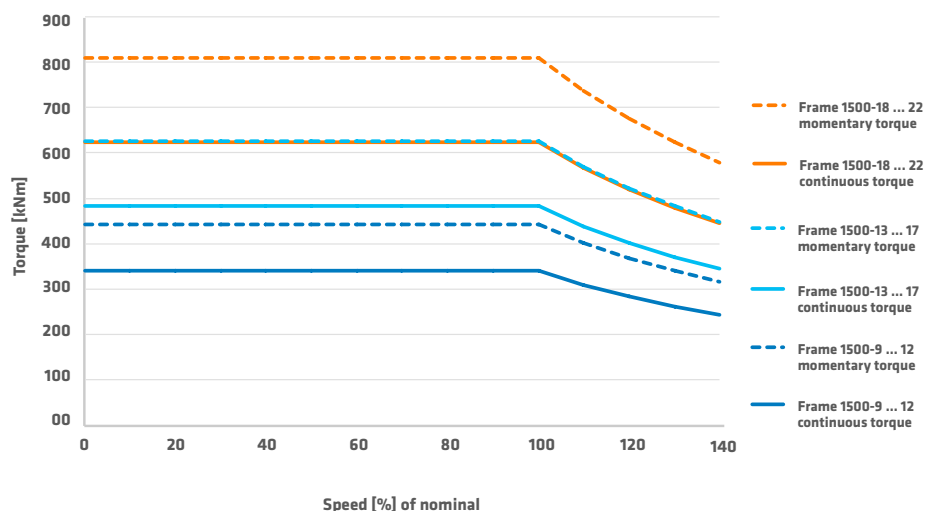
The Switch PMM is a brushless permanent magnet synchronous machine designed and built according to international standards such as IEC. It can be delivered with various certificates issued by worldwide classification societies, including LR, BV and DNV. The machine can be used either as a generator, for instance, a shaft generator, or as a motor, for example, for the main propulsion.

The Switch PMM can be tailored to meet every customer's special requirements with regard to speed range, cooling, voltage and other specifications. Excellent scalability in axial length results in the widest possible torque range. The production facility for these machines is certified according to ISO 9001 international quality standard.

### Operational range

The machine is designed to meet specific operational speed range requirements.

Frame 1500 continuous and momentary torque vs. speed



### Technical data

	Frame 1500-9	Frame 1500-10	Frame 1500-11	Frame 1500-12	Frame 1500-13
Max. continuous torque [kNm]	255	283	312	340	368
Shaft height [mm]					
Speed range [rpm]					
Output power at 100 rpm [kW] <sup>1</sup>	2590	2870	3170	3450	3740
Current at 100 rpm [A] <sup>2</sup>	2350	2610	2880	3140	3400
Efficiency at 100 rpm [%]	96.9	96.9	96.9	97.0	97.0
Max. momentary torque [% of nominal]					
Machine weight without/with shaft or bearings [t]	24.0/27.9	24.7/28.6	25.3/29.3	26.0/30.0	27.7/33.6
Rotor weight without/with shaft or bearings [t]	2.4/5.4	2.65/5.66	2.9/5.9	3.15/6.15	3.35/7.35
Rotor inertia without/with shaft or bearings [kgm <sup>2</sup> ]	2200/2250	2400/2450	2500/2550	2700/2750	3000/3800
Protection class <sup>3</sup>					
Cooling type	IC8A6W7 (				
Number of poles					
Nominal voltage [V] <sup>4</sup>					
Max. ambient temperature [°C]					
Max. cooling liquid temperature [°C]					
Insulation class <sup>5</sup>					
Thermal class					
Cooling fan power [kW]	2 x 3.5	2 x 3.5	2 x 3.5	2 x 6.4	2 x 6.4
Cooling liquid flow rate, max. [m <sup>3</sup> /h]	10.1	11.2	12.4	13.1	14.2

<sup>1</sup>Generator mode <sup>2</sup>Nominal voltage 690 V <sup>3</sup>Higher class optional <sup>4</sup>Medium voltage optional <sup>5</sup>H-class optional

Features	Main benefits	Features
Excitation with Neodymium magnets	<ul style="list-style-type: none"> <li>- Excellent efficiency, especially at part loads</li> <li>- Brushless, no slip rings needed, no wearing parts</li> <li>- No external exciters needed</li> <li>- No automatic voltage regulator (AVR) needed</li> <li>- Low rotor weight and inertia</li> <li>- In generator mode, possible to start from blackout</li> <li>- Very low vibration levels</li> </ul>	Control with frequency converter
Redundancy	<ul style="list-style-type: none"> <li>- At part loads, possibility to use one drive/winding system to increase efficiency and reduce fuel use</li> </ul>	Form-wound, mica-insulated winding impregnated with global VPI
Protection class IP54	<ul style="list-style-type: none"> <li>- Closed system, no external particles or dirt can enter the machine</li> </ul>	Flexible design Bearing/shaft connection

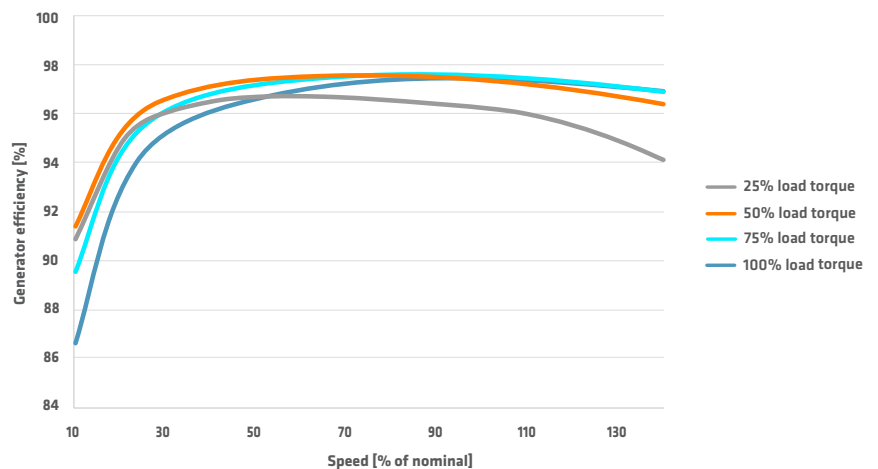
Frame 1500-14	Frame 1500-15	Frame 1500-16	Frame 1500-17	Frame 1500-18	Frame 1500-19	Frame 1500-20	Frame 1500-21	Frame 1500-22
397	425	453	482	510	538	567	595	623
1500								
0 ... 600								
4040	4330	4610	4910	5190	5480	5780	6060	6350
3670	3940	4190	4460	4720	4980	5260	5510	5780
97.1	97.2	97.2	97.2	97.2	97.3	97.3	97.3	97.3
130								
28.5/34.3	29.2/35.0	29.7/35.7	30.5/36.4	32.3/39.8	33.0/40.5	33.7/41.2	34.3/41.9	35.0/42.6
3.65/7.65	3.95/7.95	4.25/8.25	4.6/8.6	4.9/9.9	5.25/10.25	5.6/10.6	5.95/10.95	6.3/11.3
3200/3280	3400/3480	3600/3680	3800/3880	4050/4170	4250/4370	4450/4570	4650/4770	4850/4970
IP44								
Forced air-cooling with external air-to-liquid heat-exchanger)								
32								
450/500/690								
45								
38								
F								
B								
2 x 6.4	2 x 6.4	2 x 6.4	2 x 8.7	2 x 8.7	2 x 8.7	2 x 12.8	2 x 12.8	2 x 12.8
14.8	15.3	16.3	17.3	18.3	18.6	19.6	20.6	21.6

**Main benefits**

- 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 propeller or other
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- Best possible protection against mechanical vibrations, chemical corrosion and electrical surges
  - Proven technology
  - Easily scalable up to medium voltages
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- Modular design allows customization
  - Adjustable mechanical interfaces
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- Complete machine includes shaft and bearings

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

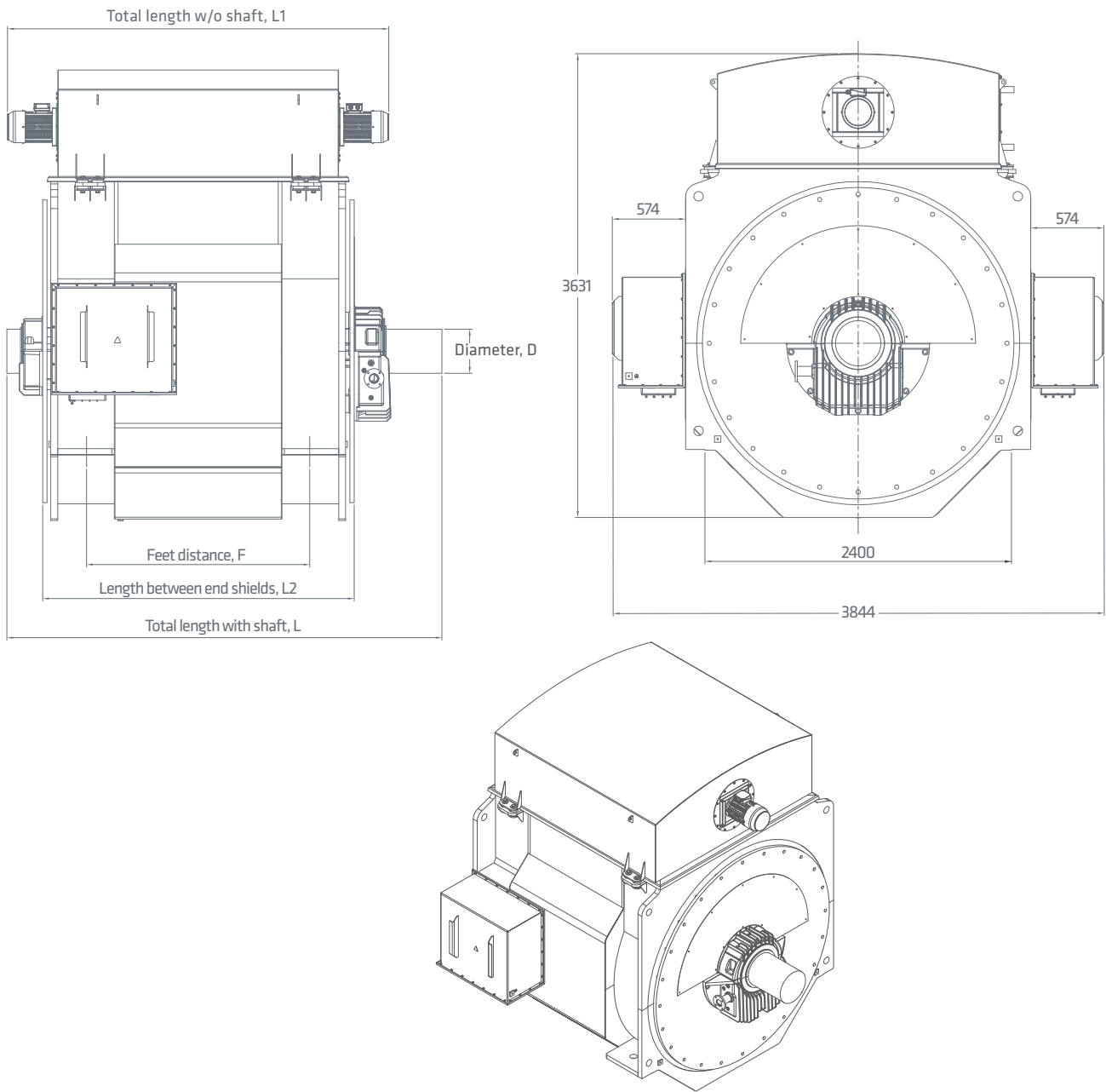
This chart illustrates typical efficiencies vs speed at different loading levels, which also takes the external cooling fan power consumption into account.



Exact efficiency value depends on the nominal speed of the application.

**Technical drawings**

Interface dimensions can be tailored according to customer specifications.



Machine dimensions	L	L2	F	D
<b>With shaft</b>				
Frame 1500-18 ... 22	3872	2840	2000	400 m6
Frame 1500-13 ... 17	3472	2440	1800	400 m6
Frame 1500-9... 12	3072	2040	1400	400 m6
<b>Without shaft</b>	<b>L1</b>			
Frame 1500-18 ... 22	3472	2840	2000	-
Frame 1500-13 ... 17	3072	2440	1800	-
Frame 1500-9... 12	2672	2040	1400	-