



DIRECT DRIVE PERMANENT MAGNET GENERATORS

MINI-HYDRO

Introduction

Ansaldo Sistemi Industriali supplies direct drive permanent magnet generator solutions allowing the plant to operate under varying conditions of flow and/or head over a range of values that are unattainable with a traditional fixed speed system maximizing turbine output. Our customised solutions satisfy a wide range of plant requirements, in terms of power and positioning. This water cooled solution is extremely compact (avoiding any footprint problems in case of revamping) with a very low noise level that allows the installation of hydro plants in residential areas.

Main characteristics

The permanent magnet generator can be directly coupled to the turbines, eliminating the need for a gearbox. The significant absence of rotor losses and the design flexibility associated with the use of sintered magnets allow us to manufacture high polarity machines that are compact and efficient.



These generators are easier to control and more reliable than traditional induction and synchronous generators because they do not require any intermediate transmission devices and excitation systems. The rotation speed is coordinated in real time by several system parameters according to the available flow and/or head.

Eco-friendly solution

This solution is completely environmentally friendly: bearing lubrication uses biodegradable material which does not pollute the stream in the event of accidental leakage.

The inverter

Our Active-Front-End inverters in low voltage solutions up to 1,5-2 MW and our medium voltage packages at 3 and 6 kV (for higher power ratings and/or for weak power grids) guarantee optimum performance and perfect synchronization with the power grid.

Scope of supply

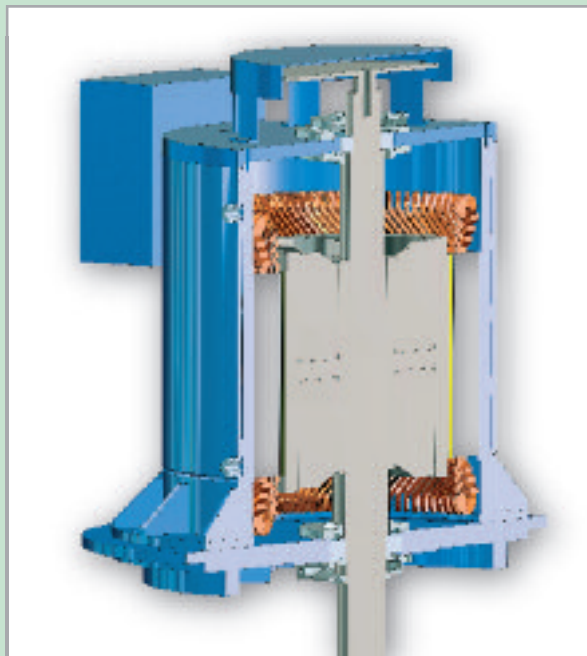
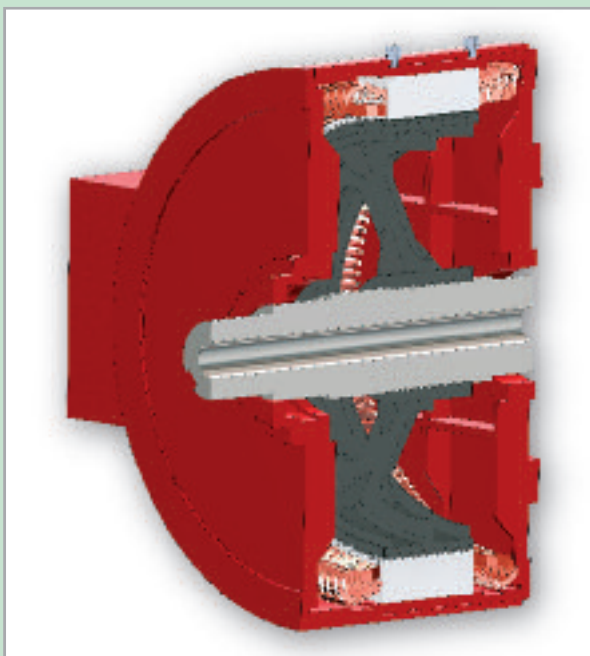
Ansaldo Sistemi Industriali's scope of supply includes turn key LV and MV electrical solutions including the grid connection. The direct drive permanent magnet generator and the complete automation system provide real-time control of your plant. Breaking chopper is available on demand.

ADVANTAGE	IMPACT
High polarity and low speed	Direct coupling - reduce noise level
Water jacket cooling	Ambient conditions independent reduce noise level
Compact dimensions and weights	Space saving and easier revamping
Direct coupling	No gear-box very low mechanical troubles and maintenance
Variable speed optimized on Maximum Power Point	Wide operation range with simpler mechanical construction of the turbine
Sensorless control of PMG	Cheaper and reliable solution
Static converter manages reactive power	Unit power factor
High global efficiency	Improved ROI

Technical Data

Power rating	100 - 5000 kW
Voltage	400 / 690 / 3300 V
Frequency	15 - 150 Hz
Mass	300 - 10000 kg
Frame size	225 - 1000 mm
Pole number	4 - 80

Always tailor-made to meet site specific requirements.
 Bio-compatible cooling fluid / lubricating grease on request.
 Hollow shaft construction on request.
 Water cooling standard.

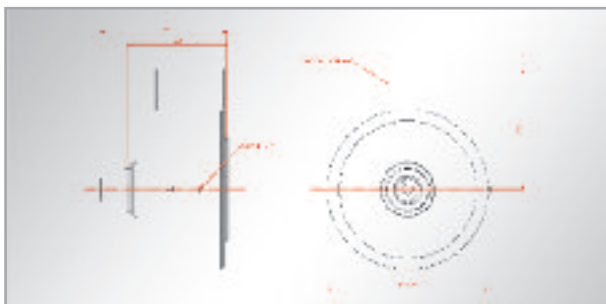


**Case Study:
KAPLAN TURBINE TILT AXIS**

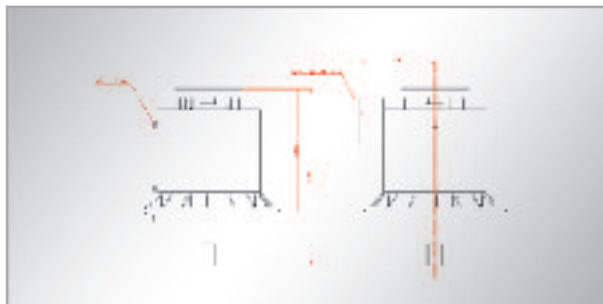
Rated power	305 kW
Rated speed	230 rpm
Max. torque	13 kNm
Rated voltage	400 V
Rated current	470 A
Rated efficiency	98.2 %
Cooling method	IC70W
Mounting arrangement	IM 3091
Mass	4200 kg

**Case Study:
PELTON TURBINE VERTICAL AXIS**

Rated power	530 kW
Rated speed	630 rpm
Max torque	8 kNm
Rated voltage	690 V
Rated current	605 A
Rated efficiency	97.4 %
Cooling method	IC70W
Mounting arrangement	IM 3011
Mass	4000 kg



SPEED [rpm]	POWER [kW]	EFFICIENCY [%]
230	305	98.2
230	205	98.1
200	220	98.1
200	190	98.0
190	150	97.9



SPEED [rpm]	POWER [kW]	EFFICIENCY [%]
630	530	97.4
600	475	97.4
600	415	97.6
570	425	97.4
550	290	97.6