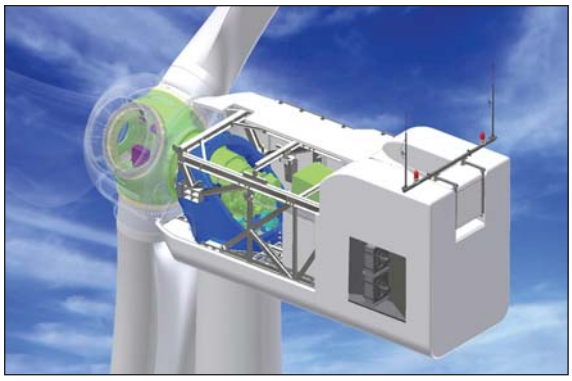
Capabilities:

- Extensive certification support
- Fully established component supply chain
- Workshop blueprints available
- Hot/cold climate wind turbines
- Highly efficient AMSC Windtec rotor blades for manufacturing

Windtec®
Powered by AMSC®

AMSC Windtec® Wind Turbine Designs for Models WT3000df, WT3000fc and WT3000sg

The models WT3000df (double fed induction generator), WT3000fc (full-scale conversion) and WT3000sg (SuperGEAR™) are fully designed by AMSC Windtec GmbH (Windtec) and are in the process of certification. The 3.0 MW wind turbines utilize a state of the art pitch system design and are available both for hot and cold climate operation, 50 or 60 Hz grid frequency and different hub heights depending on the type class.



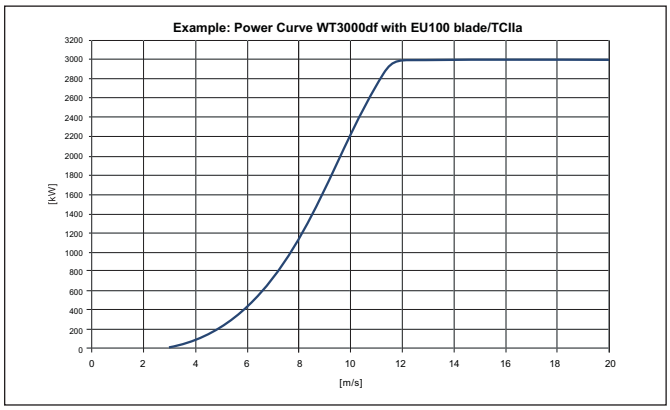
Additionally, Windtec offers an excellent component supply chain to get high quality components and localization support. Windtec offers customers highly efficient rotor blades for manufacturing and supports you in every stage and area of our business relationship.

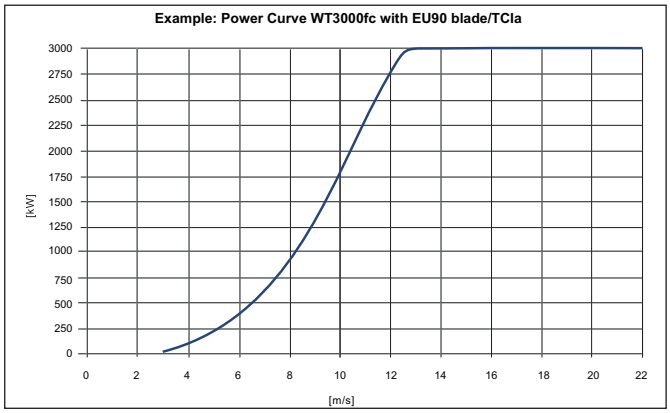
Generator and Power Electronics

The WT3000df design is equipped with a 6 pole double fed three-phase induction generator. The WT3000fc design uses a permanent magnet synchronous generator (PMSG) and a full scale converter. The advanced power electronics (IGBT converter) ensures that the generator works with high efficiency over the entire speed range. The WT3000sg uses a medium voltage synchronous generator directly connected to the grid without use of any type of power electronics.

Wind Turbine Models WT3000df/fc/sg – Highly Reliable and Cost Effective

As an engineering company, Windtec focuses on system development and integration. Our goal is to offer global solutions with the lowest possible cost of energy and highest possible reliability. At Windtec, we fully believe that the 3.0 MW turbine models are an excellent result of such a strategy and will provide our customers with significant advantages on the global wind market.





Technical Data WT3000

General	TC I				TC II				TC III			
	WT3000df		WT3000fc	WT3000sg	WT3000df		WT3000fc	WT3000sg	WT3000df		WT3000fc	WT3000sg
	50Hz	60Hz	50|60Hz	50Hz	50Hz	60Hz	50|60Hz	50Hz	50Hz	60Hz	50|60Hz	50Hz
Transmission ratio:	76.4	93	93	variable	84.5	102.8	102.8	variable	96.6	117.5	117.5	variable
Tilt angle in the gearbox:	4.5°				4.5°				4.5°			
Hub height:	80m				80m | 110m				80m | 110m			
Hub type | material:	rigid|cast iron				rigid|cast iron				rigid|cast iron			
Mainframe type:	cast iron				cast iron				cast iron			
Type of tower construction:	conical tubular steel				conical tubular steel				conical tubular steel			
Rotor diameter:	91.3m				100m-104m (tbd)				112m-115m (tbd)			
Lightning conductor:	integrated				integrated				integrated			

Operating data

Cut-in wind speed:	3.5m/s		4.0m/s		3.5m/s				3.5m/s			
Rated wind speed:	13.0m/s				12.5m/s				12.0m/s			
Cut-out wind speed:	25.0m/s				25.0m/s				25.0m/s			

Generator and power electronics

Generator type:	asynchronous		permanent magnet synchronous	synchronous	asynchronous		permanent magnet synchronous	synchronous	asynchronous		permanent magnet synchronous	synchronous
Rated driving power:	3,000 kW				3,000 kW				3,000 kW			
Rated generator speed:	1200 rpm	1460 rpm	1460 rpm	1000 rpm	1200 rpm	1460 rpm	1460 rpm	1000 rpm	1200 rpm	1460 rpm	1460 rpm	1000 rpm
Number of Poles:	6				6				6			
Cooling:	water to water or air to water				water to water or air to water				water to water or air to water			
Converter type:	IGBT, 4 quadrants		IGBT, 4 quadrants-full scale	–	IGBT, 4 quadrants		IGBT, 4 quadrants-full scale	–	IGBT, 4 quadrants		IGBT, 4 quadrants-full scale	–
Voltage:	low voltage			medium voltage	low voltage			medium voltage	low voltage			medium voltage
Power factor:	0.9 ind to 0.9 cap				0.9 ind to 0.9 cap				0.9 ind to 0.9 cap			

Drive train specification

Type of gearing:	Planetary/parallel shaft gear	Planetary/parallel shaft gear	Planetary/parallel shaft gear
Gear lubrication:	forced lubrication	forced lubrication	forced lubrication
Connection gear/generator:	flexible coupling	flexible coupling	flexible coupling

Braking system

Operational brake:	individual blade pitching	individual blade pitching	individual blade pitching
Type of construction:	gear/servomotor	gear/servomotor	gear/servomotor
Mechanical brake:	disc brake	disc brake	disc brake

Yaw system

Type of yaw bearing:	single row ball bearing	single row ball bearing	single row ball bearing
Drive unit:	gear motor	gear motor	gear motor
Number of drive units:	5	5	5
Brake:	active brake and motor brake	active brake and motor brake	active brake and motor brake

Temperature range

		TC I	TC II	TC III
NORMAL	Ambient temperature range during operation:	-10°C to 40°C	-10°C to 40°C	-10°C to 40°C
	Ambient survival temperature range:	-20°C to 50°C	-20°C to 50°C	-20°C to 50°C
COLD Climate	Ambient temperature range during operation:	-30°C to 40°C	-30°C to 40°C	-30°C to 40°C
	Ambient survival temperature range:	-40°C to 50°C	-40°C to 50°C	-40°C to 50°C
HOT Climate	Ambient temperature range during operation:	0°C to 50°C	0°C to 50°C	0°C to 50°C
	Ambient survival temperature range:	-5°C to 50°C	-5°C to 50°C	-5°C to 50°C

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Subsidiary of American Superconductor Corporation

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