wt2000df and wt2000fc

Optimized power curves for maximum efficiency

AMSC's Windtec Solutions include wind turbine designs that enable our partners to launch best-in-class wind turbines quickly, effectively and profitably. The wt2000df (doubly-fed) and wt2000fc (full-scale conversion) models offer some of the most efficient power curves in the global wind market due to optimized integrated electric systems and blade designs at lowest costs. In addition, the wt2000 wind turbine fulfills the most demanding grid code requirements and offers real-time information through continuous monitoring.

Optimized for top efficiency
The wt2000's platform's optimized integrated electric systems and blade designs result in one of the most efficient power curves in the 2MW class today. The wt2000df features a doubly-fed, three-phase induction generator. The wt2000fc uses a synchronous generator (PMSG/SG) and full-scale converter. The IGBT-based converter with advanced power electronics ensures that the generator works with high efficiency over the entire range of wind speeds.

Compliance with GL guidelines and international grid codes
The wt2000df and wt2000fc wind turbines fulfill and are certified for the most recent GL guideline (2010) as well as the most demanding international grid code requirements like low voltage ride-through (LVRT).

Real-time information with continuous monitoring and alarm handling
AMSC's advanced wtCMS condition monitoring system provides continuous monitoring of the key system components. This gives operators real-time information about the turbine status as well as detailed and comprehensive analysis tools to optimize maintenance activities. The fully integrated system allows intelligent measurement, turbine control interaction and the analysis of monitoring and performance data. In addition, wtSCADA remote operation and wtDataCenter analyzing packages are available to provide a harmonized control system with supervisory control and data acquisition to actively monitor, analyze and operate entire wind farms. wtWPC wind park controller allows to operate the entire wind farm like a conventional power plant.

Suits various climate conditions
The 2.0 MW designs are available for 50 Hz or 60 Hz and for variable climate conditions, with 70 m, 80 m, 90 m or 100 m hub heights.

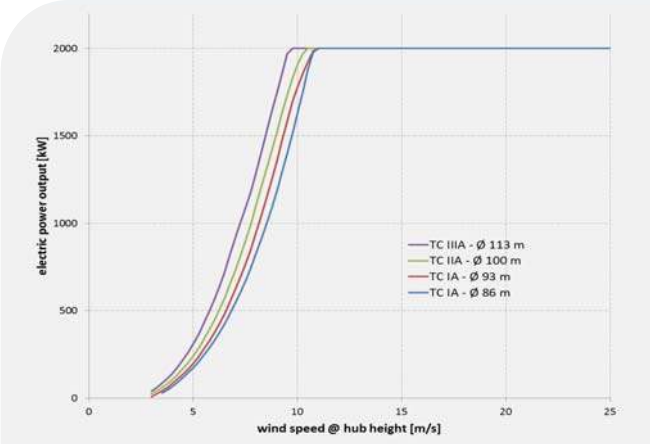
Windtec Solutions™

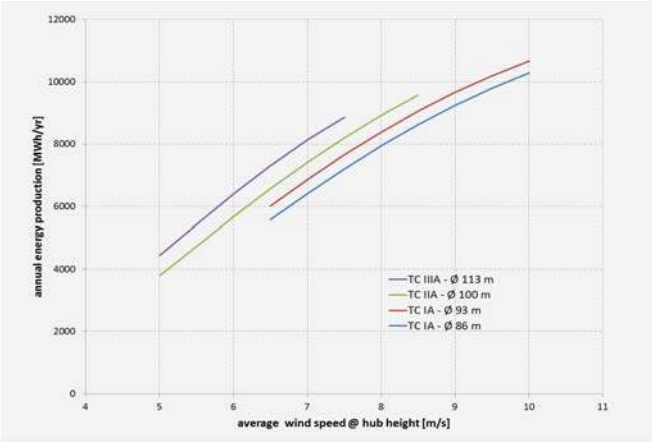
- **Available for licensing including technology transfer and local supply chain development**
- Customized wind turbine designs
- Reliable operation
- Excellent component supply chain and localization support
- Manufacturing documentation for blades included

The wt2000df and wt2000fc are fully designed by AMSC® and certified according to Germanischer Lloyd guideline (2010). Comprehensive certification support is available.

Wind Turbine Designs – wt2000df/fc

Windtec Solutions™





GENERAL	TC IA		TC IIA		TC IIIA	
Type:	wt2000df	wt2000fc	wt2000df	wt2000fc	wt2000df	wt2000fc
Grid frequency:	50 Hz / 60 Hz		50 Hz / 60 Hz		50 Hz / 60 Hz	
Tilt angle rotor axis:	4.5°		4.5°		4.5°	
Hub height:	70 m / 80 m / or upon request		80 m / 90 m / 100 m / or upon request		90 m / 100 m / or upon request	
Hub / mainframe material:	cast iron		cast iron		cast iron	
Type of tower construction:	tubular steel, concrete, hybrid		tubular steel, concrete, hybrid		tubular steel, concrete, hybrid	
Rotor diameter:	86 m / 93 m		100 m		113 m	
Lightning conductor:	integrated		integrated		integrated	
OPERATING DATA						
Cut-in wind speed:	3 - 3.5 m/s		3 m/s		3 m/s	
Rated wind speed:	11 - 11.5 m/s		11 m/s		11 m/s	
Cut-out wind speed:	25 m/s		25 m/s		20 m/s	
GENERATOR AND POWER ELECTRONICS						
Generator type:	double-fed induction	synchronous / asynchronous	double-fed induction	synchronous / asynchronous	double-fed induction	synchronous / asynchronous
Rated power:	2000 kW		2000 kW		2000 kW	
Cooling:	water cooling		water cooling		water cooling	
Converter type:	converter 4-quadrant		converter 4-quadrant		converter 4-quadrant	
Generator rated power:	± 0.95 at 690V ph-ph		± 0.95 at 690V ph-ph		± 0.95 at 690V ph-ph	
DRIVE TRAIN SPECIFICATION						
Drive train type:	integrated main bearing - gear solution		integrated main bearing - gear solution		integrated main bearing - gear solution	
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:	active disk brake		active disc brake		active 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	
Brake:	active brake plus motor brake		active brake plus motor brake		active brake plus motor brake	
AMBIENT TEMPERATURE RANGE						
Normal climate:	Normal operation:	-10°C to +40°C		-10°C to +40°C		-10°C to +40°C
	Normal survival:	-20°C to +50°C		-20°C to +50°C		-20°C to +50°C
Cold climate:	Cold operation:	-30°C to +40°C		-30°C to +40°C		-30°C to +40°C
	Cold survival:	-40°C to +50°C		-40°C to +50°C		-40°C to +50°C
Hot climate:	Hot operation:	0°C to +50°C		0°C to +50°C		0°C to +50°C
	Hot survival:	-5°C to +50°C		-5°C to +50°C		-5°C to +50°C

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...better energy

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