

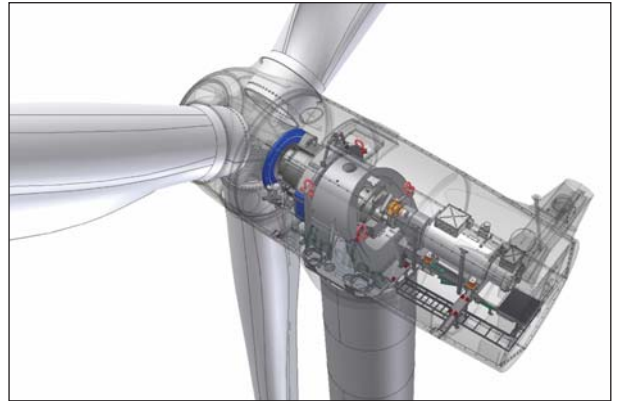


Windtec™ Wind Turbine Designs WT1650df

Capabilities:

- Certified turbines
- Excellent component supply chain
- Workshop blueprints available
- Hot and cold climate turbines
- Highly efficient Windtec WT82 rotor blade available for technology transfer

The wind turbine model WT1650df (double fed induction generator) is fully designed by AMSC Windtec GmbH (Windtec) and is certified by Germanischer Lloyd. The 1.65 MW turbine utilizes state of the art pitch system designs. It is available for hot or cold climate operation, 50 Hz or 60 Hz, with 65m, 70m or 80m hub heights, depending on the type class. To guarantee high quality components for the first reference wind turbine and series production, Windtec offers an excellent component supply chain. Windtec offers customers the workshop blueprints for the WT82 rotor blade and supports you in every stage and area of our business relationship.



Unique Pitch System Design

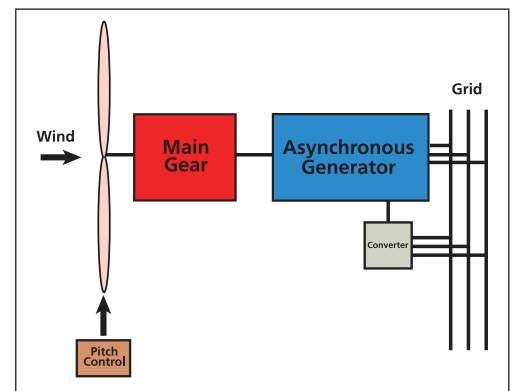
At wind speeds exceeding the limiting speed, the pitch mechanism in the WT1650df model is designed to quickly and smoothly adjust the angle of the rotor blades to suit the wind. If there is an overall pitch drive fault, the integrated SafetyLOCK™ system always allows the blades to turn into a feathering position.

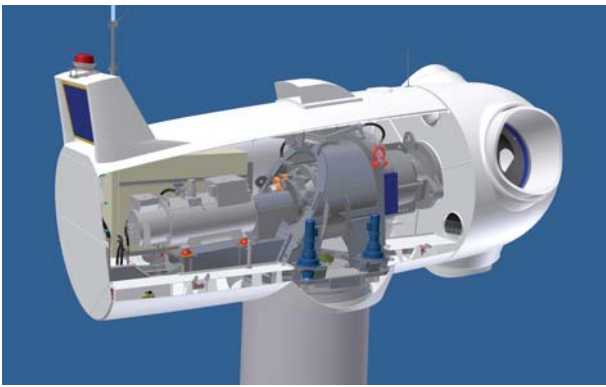
Generator and Power Electronics

The WT1650df wind turbine is equipped with a double fed three-phase induction generator. The advanced power electronics (IGBT converter) ensure that the generator works with high efficiency over the entire speed range.

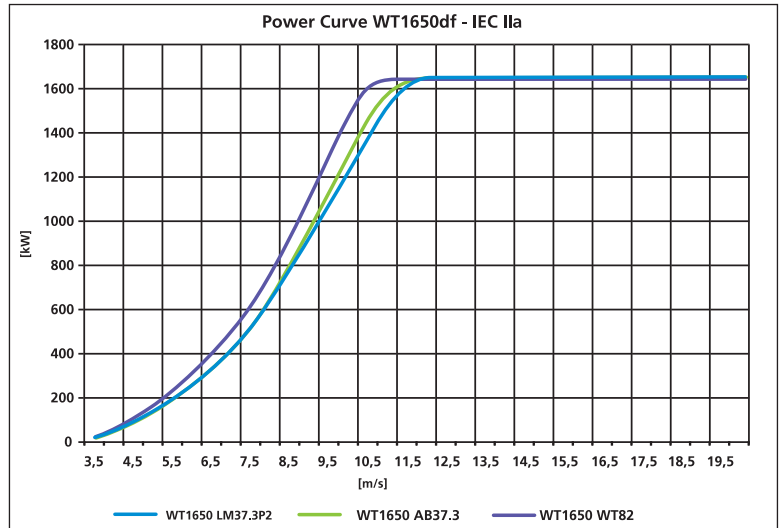
Model WT1650df with Double Fed Drive Train Technology

- Conventional technology for 10 years
- Proven state of the art technology over thousands of commissioned wind turbines worldwide
- Cost efficient to manufacture
- Windtec WT82 highly efficient rotor blade available for license for self-manufacture





Windtec WT1650df combines groundbreaking technology and state of the art design.



Technical Data

General	Type Class II		Type Class I
	60Hz	50Hz	
Transmission ratio:	115.00	98.74	tbd
Shaft angle in the gearbox:	4.5°		
Hub height:	70m and 80m	65m and 70m	
Hub type/material:	rigid/cast iron		
Mainframe type:	welded structure		
Type of construction:	conical tubular steel tower		
Rotor diameter:	77m	70m	
Optional rotor diameter:	82m, blade type Windtec WT82	—	
Blade manufacturer:	LM Glasfiber/Aeroblade	Euros	
Material:	Epoxy glass fibre		

Operating data

Cut-in wind speed:	3.5 m/s		
Rated wind speed:	12.0 m/s	17.5 m/s	
Cut-out wind speed:	20.0 m/s	25.0 m/s	
Survival wind speed:	59.5 m/s	70.0 m/s	

Generator and power electronics

Generator type:	double fed induction generator		
Rated driving power:	1775 kW		
Rated generator speed:	2096 rpm	1800 rpm	2096 rpm
Poles:	4		
Cooling:	water jacket		
Converter type:	IGBT, 4 quadrants		
Power factor:	0.95 ind to 0.95 cap		

Drive train specification

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

Temperature range

NORMAL	Ambient Temperature range during operation:	-10°C to 40°C
	Ambient survival temperature range:	-20°C to 50°C
COLD Climate	Ambient temperature range during operation:	-30°C to 40°C
	Ambient survival temperature range:	-40°C to 40°C
HOT Climate	Ambient temperature range during operation:	0°C to 45°C
	Ambient survival temperature range:	0°C to 50°C

Braking system

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

Yaw system

Type of yaw bearing:	slide bearing
Drive unit:	gear motor
Number of drive units:	4
Brake:	friction in the slide bearing plus motor brake



Subsidiary of American Superconductor Corporation

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