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WTN 500

CERTIFIED WINDTECHNOLOGY

General

The wind power plant WTN 500 is a pitch-controlled turbine with completely variable speed for operation parallel to the public grid. The rated output of the plant is 500 kilowatt; the rotor diameter is **48 meters**. The rotor has three blades and is arranged in upwind position to the tower. Yawing into the wind is achieved by two electrically driven yaw systems. For the tower you can choose between a **50 m tubular tower** and a **65 m lattice tower**.

The mechanical concept of the nacelle is based on a three-point-fixing of the main bearing together with the main gear unit and a two-generator system.

The WTN 500 operates with variable speed. The rated power of both asynchronous generators comes to 280 kilowatts each. Two frequency converters are installed to feed the electrical power to the grid.

The primary brake and safety system is the independent pitch of each rotor blade. Each blade is driven by help of a gear-motor-unit to the desired pitch position. At all stops the rotor blades are pitched independently into brake position. During grid outages this is guaranteed through a spring package.

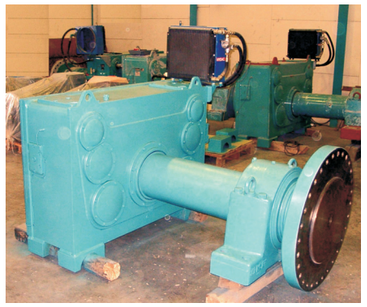
The disk brakes are used only at emergency stop or as brakes to hold the rotor for services. They are operated pneumatically. The turbine is designed corresponding to type class 2A according to IEC TC 88.

Rotor

The rotor consists of three low noise and power optimized rotor blades with a self-supporting structure of epoxy resin, reinforced by glass fibre. Through the application of glass fibre fabric, a high strength is obtained. The lightning protection is integrated in the blade.

Pitch system

Each rotor blade has its own pitch drive with a maintenance-free servo-motor, a gear unit and a spring storage unit. To reach the best output, the rotor blades work independently, but altogether they are synchronized electronically. In case of grid failures a spring unit serves as energy storage for the movement of the rotor blade back to the sail position. It is connected directly to the blade bearing and drives the rotor blade in the neutral sail position within a few seconds.



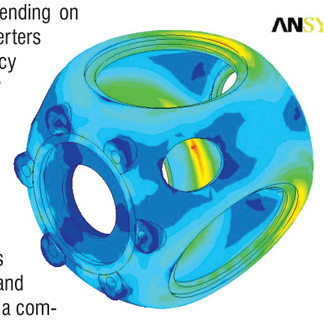
Drive unit

The rotor blades are connected with a two-rowed four-point contact bearing to the casted hub, that is optimized by FEM-analysis. Through the forged flanged shaft the rotation is transmitted to the main gear. The three-point-fixing of the main drive unit takes up all axial forces in the main bearing at the front of the flanged shaft, while the radial forces are transmitted to the nacelle frame by the bearings mounted to both sides of the main gear. The connection between the main gearing and the nacelle frame is realized by bushings. Their rubber elements damp the sound of the gearbox from the frame and guarantee a quiet and noiseless operation of the whole wind turbine.

Electrical system

The electrical energy is produced by two squirrel cage induction generators with a rated output of 280 kW each. By means of a flexible and isolated coupling they are connected to the shaft of the gearbox.
For each generator a frequency converter is installed, which allows an independently energy delivery. Depending on the wind speed one or both converters will be in operation. The frequency converter reaches high grid quality with the integrated filters to eliminate interferences like harmonics and there is no extra compensation required for reactive power.

SECURE WINDTECHNOLOGY



Control system

An extensive sensor technology is installed to control all functional and safety procedures permanently by a computer-aided management system. The interaction of pitch and frequency converter of the variable speed controlled plant guarantees the highest utilization from the wind energy.

A control unit suited inside the tower respectively next to it allows all operations, protected by passwords, from downstairs. Via modem or ISDN it is also possible to control the operations by a remote supervision.

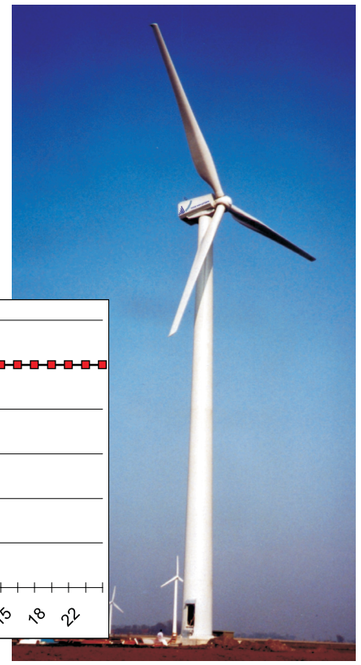
Safety concept

The primary brake and safety system is the independent blade pitch of the rotor. The pitch control does not only optimize the power output; it limits also the rated power to avoid undesirable overloads. Any information to the control system, which influences the safety of the plant, is answered by an immediate reaction of the pitch control.

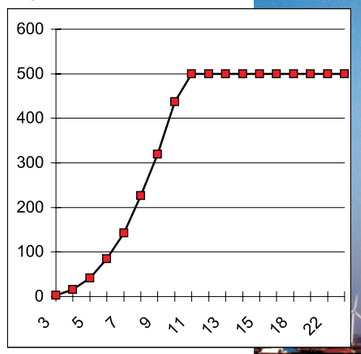
In case of grid failures, the pre-stressed spring packages cause an automatic pitch of the blades into the safe sail position. The rotor remains without brakes and thereby relieves the driving unit. A disk brake on the high-speed shaft of the gearbox is operated pneumatically when the emergency switch is engaged. It can also be operated by a handle as a brake system for maintenance.

Service life

All components of the WTN 500 are designed for a technical service life of 20 years. The installation of standardized, tested components and the operating system, controlled by torque, guarantee the safe function and optimum energy output in the long run of lifetime.



Calculated powercurve



TECHNICAL DATA

WTN 500 - 50 m hub height (tubular tower)
WTN 500 - 65 m hub height (lattice tower)

1. General	
Nominal Output:	500 kW
Rotor shaft arrangement:	horizontal
Effect limitation:	pitch
Mode of operation:	grid connected
Hub height:	50 m (tubular) / 65 m (lattice)
Survival windspeed:	59,5 m/s (50 m) - 52,5 m/s (65 m)
Calculated lifetime:	20 years

2. Power data (10 min-mean windspeed in hub height)	
Cut in windspeed:	3 m/s
Rated windspeed:	12 m/s
Power at 10 m/s	437 kW
Cut out windspeed:	25 m/s
Max. shaft power:	660 kW
Specific output:	276 W/m²

3. Rotor	
Diameter:	48 m
Swept area:	1.810 m²
Number of blades:	3
Kind of hub:	rigid
Arrangement of rotor:	upwind
rotor speed range:	10 - 30 rpm
Lambda:	5,5
Pitch angle:	2 - 88°
Conus angle:	0 °
Nacelle angle:	4 °

4. Blade	
Type:	WTN 23,1 - Profile: FX77/79xxx
Material:	GfK / EP
Lenght of blade:	23,1 m
Weight:	2.100 kg

5. Gear	
Type:	helical spur gear
Ratio:	1 : 50,3
Nominal torque:	190 kNm

6. Yaw system	
Kind (active/passive):	active
Actuation:	electrical
Yaw speed:	0,5 ° / s
Absorbation system:	motorbrake

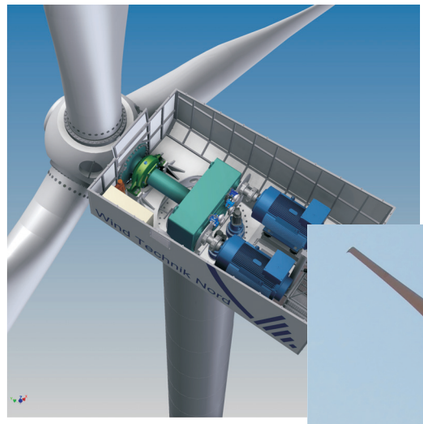
7. Generator	
Quantity:	2 units
Type:	asynchronous, squirreled-cage
Rated output:	280 kW
Rated speed:	1.500 rpm
Voltage:	690 V
Frequency:	50 Hz
Nominal slip:	0,9 %
Protection:	IP 54
Grid connection:	full size inverter

8. Tower (material: steel)	
Kind & lenght	tubular 48,5 m / lattice 63,5
Safety ladder:	with climbing support

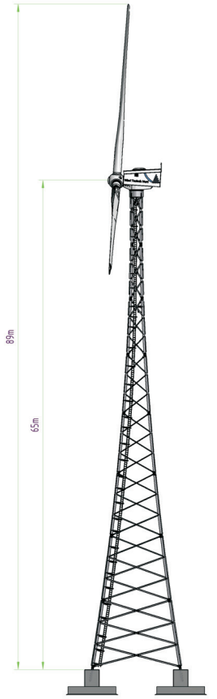
9. Control system	
Power regulation:	pitch, electrical activation
Operating system:	WP 3100
Remote control system:	yes, via telephone line
Automatically start:	after loss of grid and after cut out wind

10. Brakes	
Aerodynamic brake:	pitch system (3x)
-Activation:	electrical
Mechanical brakes:	yes
- Arrangement:	behind gearbox
- Brake type:	disc brake
- Activation:	mechanical

11. Masses	
Rotor assembly:	11.800 kg
Nacelle assembly:	24.500 kg
Tower:	54.000 kg / 61.500 kg
Total:	90.500 kg / 98.000 kg



WTN 500/65



WTN 500/50