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WTN 250

CERTIFIED WINDTECHNOLOGY

Blade / Rotor

The WTN 250 is equipped with a 3-blade up wind stall regulated rotor, with an improved overall efficiency. A special placing on the frame reduces the effect of moments of rotation. The blades are made of reinforced polyester and are equipped with "fail-safe" tip-brakes, which are activated simultaneously by centrifugal forces. The projected area of the blades is relative small, which contributes to a high survival wind speed. With a blade length of 13,4 m and a diameter of 30 m the rotor of the WTN 250 has a swept area of 707 m². The rotor speed is 40 rpm.

Hub

The hub is made of casted steel GGG 40.3 and mounted to the rotor shaft-flange. Correction of the pitch angel of the blades is possible by oval holes in the blade flanges.

Main shaft

The main shaft is a forged piece and made of high-grade alloyed steel. It is mounted in two bearings, able to transfer all forces and moments to frame and gear.

Main bearings

Two long-time grease lubricated bearings are the basis for a nearly noiseless operation of the main shaft. The places the main bearings are fitted to the frame are machined.

Gearbox

A heavy three-stage helical gear transforms the 40 revolutions of the rotor to the 1500-rpm of the generator. This gear is specially designed for the WTN 250 with a gear ratio of 1 : 37.8. An oil cooler is separately placed.

Coupling

The power of the rotor, transformed in the gearbox, is transmitted to the generator by an elastic coupling. With this method no vibrations will reach the bearings of the generator, and a longer lifetime is expected.

Brakes and emergency brake system

The turbine is equipped with two (2) independent fail-safe systems.
As mentioned before, the blades are equipped with a simultaneously activated safety tip-brake, and on top of these blades braking mechanisms, the WTG is equipped with a disc brake.

The disk braking mechanism is supplied through two hydraulic fail-safe brake callipers, which are activated through a loss of supply (grid) voltage. The tip-brakes are in normal operation hold in position by a hydraulic cylinder. In emergency situations a hydraulic valve is activated by centrifugal forces, and both brake systems are engaged, independent of each other.

Generator

The generator is a pole-changing asynchronous machine with a nominal output of 250 kW at 1500 rpm respectively 50 kW at 1000 rpm. It is operating on 400V AC level. A ventilator is cooling the outside of the machine.

Yaw-System

The yaw-system is representing the main advantage in modern wind technology and makes the WTN 250 superior, compared with other conventional engineering in the wind industry.

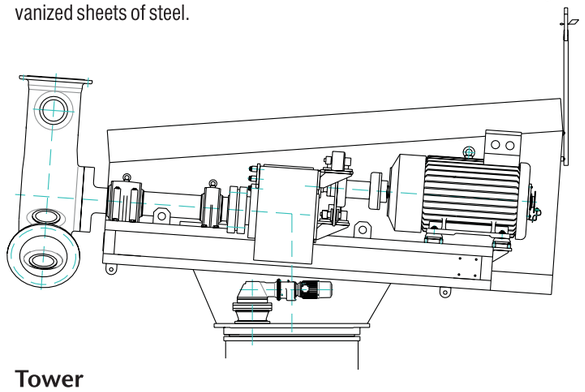
The taken solution, designed and well tested, is to arrange two gears in that way, that any space in the system is eliminated. These yaw gear system incorporate both, a damping system to decrease forces induced by the turning forces of the rotor, and a brake system, while the yaw motors are stopped.

This system is ideally suited for WTG`s installed in multiples (wind farm applications) where the shadow effect of upwind placed WTG`s is blame for exposures to dynamic turning loads.
Another features of this yaw system are the automatic untwisting of the cables, and an additional twisted cable switch for more safety.

SECURE WINDTECHNOLOGY

Nacelle

The hot dip galvanized nacelle frame is constructed of welded steel beams that support the main shaft, gear, generator etc. The yaw ring is fitted to the bottom of the frame and allows the connection to the tower. The nacelle can be reached by a ladder inside the tower. The cover is made of galvanized sheets of steel.



Tower

The lattice tower is a new design especially made to reach all destinations around the world by low costs. All parts of the turbine are suitable in a 40ft container.
It has a height of 50m so that the rotor of the turbine is reaching a lower turbulence area. This will increase the output and the service life of the WTG.
The microprocessor control system is placed at the bottom of the tower in a special housing. A lockable door prevents unauthorized access.

The WTG comes equipped with safety belt and safety line, which provides a safety climbing while installation and maintenance.

Control panel

All functions of the wind turbine are controlled by means of a proven microprocessor. While the turbine is operating and connected to the grid, the computer stores a number of operational data. If the WTG is erected in a wind farm, the turbines can be linked up to a computer management system. This design makes it possible to retrieve data and actual performance date from the wind turbines, and allows remote operation of the machines. If no management system is utilized, the same data can be read on the display mounted on the computer, that is continuously checking all sensors and the safety system:

- *Grid control of: Voltage, Frequency, Phase equality*
- *Over speed control on rotor that activates disc brake*
- *Thermal sensor in generator*
- *Vibration sensor*
- *Automatic untwisting of cables*
- *Thermal relay for yaw gear motor*
- *Automatic stop for worn brake pads*
- *Automatic start-up in the event of grid failure*
- *Self-diagnostic in case of failure. Display indicates failure code.*
- *Generator speed*
- *Rotor speed*
- *Yawing*
- *Over speed*

The control system also ensures gradual grid hook-up via thyristors on all three phases. The phase compensation is included in the main panel and allows a Cos. phi above 0,9. All electrical components are protected against lightning.

TECHNICAL DATA

WTN 250 – 50 m hub height

1. General	
Nominal Output:	250 kW
Rotor shaft arrangement:	horizontal
Effect limitation:	Stall
Mode of operation:	Grid connected
Hub height:	50 m
50 year extreme operating gust:	52,5 m/s
Calculated lifetime:	20 years

2. Power data (10 min-mean windspeed in hub height)	
Cut in windspeed:	4 m/s
Rated windspeed:	14 m/s
Power at 10 m/s	175,5 kW
Cut off windspeed:	25 m/s
Max. shaft power:	300 kW
Specified output:	354 W/m²

3. Rotor	
Diameter:	30 m
Swept area:	707 m²
Number of blades:	3
Kind of hub:	rigid
Arrangement of rotor:	upwind
Rotor speed:	26 / 40 rpm
Lambda:	5,5
Blade pitch angle:	-0,5°
Conus angle:	0 °
Nacelle angle:	4 °

4. Blade	
Type:	LM 13
Material:	Glass fibre
Length of blade:	13,39 m
Chord root / tip:	1,259 m / 0,300 m

5. Gear	
Type:	Spur gear
Ratio:	1 : 37,777
Stages:	3

6. Yaw system	
Kind (active / passive):	active
Actuation:	electrical
Yaw speed:	1,5 ° / s
Absorbation system:	Friction safety clutch

7. Generator	
Type:	asynchronous
Rated output:	50 / 250 kW
Rated speed:	1.010 / 1.511 rpm
Voltage:	415 V ±10%
Frequency:	50 Hz ±5%
Protection:	IP 54
Insulation:	Class F
Grid connection:	Thyristors

8. Tower	
Kind, material / length	Lattice, steel / 48,4 m
Safety ladder:	yes

9. Control system	
Kind of output control:	Stall regulation
Operating system:	IC 1000
Remote control system:	yes, via telephone line
Automatically start:	after loss of grid and after cut out wind

10. Brakes	
Aerodynamic brakes:	Tip brakes
-Activation:	hydraulic
Mechanical brakes:	yes
- Arrangement:	behind gearbox
- Brake type:	Disc brake
- Activation:	mechanical

11. Masses	
Rotor (with hub):	3.900 kg
Nacelle (without rotor):	10.500 kg
Tower:	52.500 kg
Total without foundation:	66.900 kg

ECONOMIC WINDTECHNOLOGY

WTN 250

The wind power plant is a product of development, which is based on 20 years of constant experience in wind turbine design and production. It is designed by using well-tested and dependable construction elements in combination with modern technical know-how, to arrive the best possible results transferring wind into electrical energy.
Utilizing the same reliable, rugged construction of the past along with all updates in the technology, this turbine is designed for an environment as seen in wind farms with high wind speeds, thus ensuring maximum production and output. The optimal availability and production capacity together with the high manufacturing quality from the production line, along with a favorable price/efficiency relationship makes the turbine to be short-term economical investment.

Sites for erection

Sites for erection of the WTN 250 can be, as single unit for local production for large-scale consumers and for installation in wind farms as power station connected to the main grid.
In both cases the local regulations and rules for parallel production and connection to the grid will be followed. The optimal output and minimum expenditures can be reached by entering into a service and maintenance agreement.

Security

To get the approval and certification for a wind turbine, it is necessary to go through very complicated and extensive procedures by officials and test organizations. Hereby the owner will obtain the maximum of technical security.