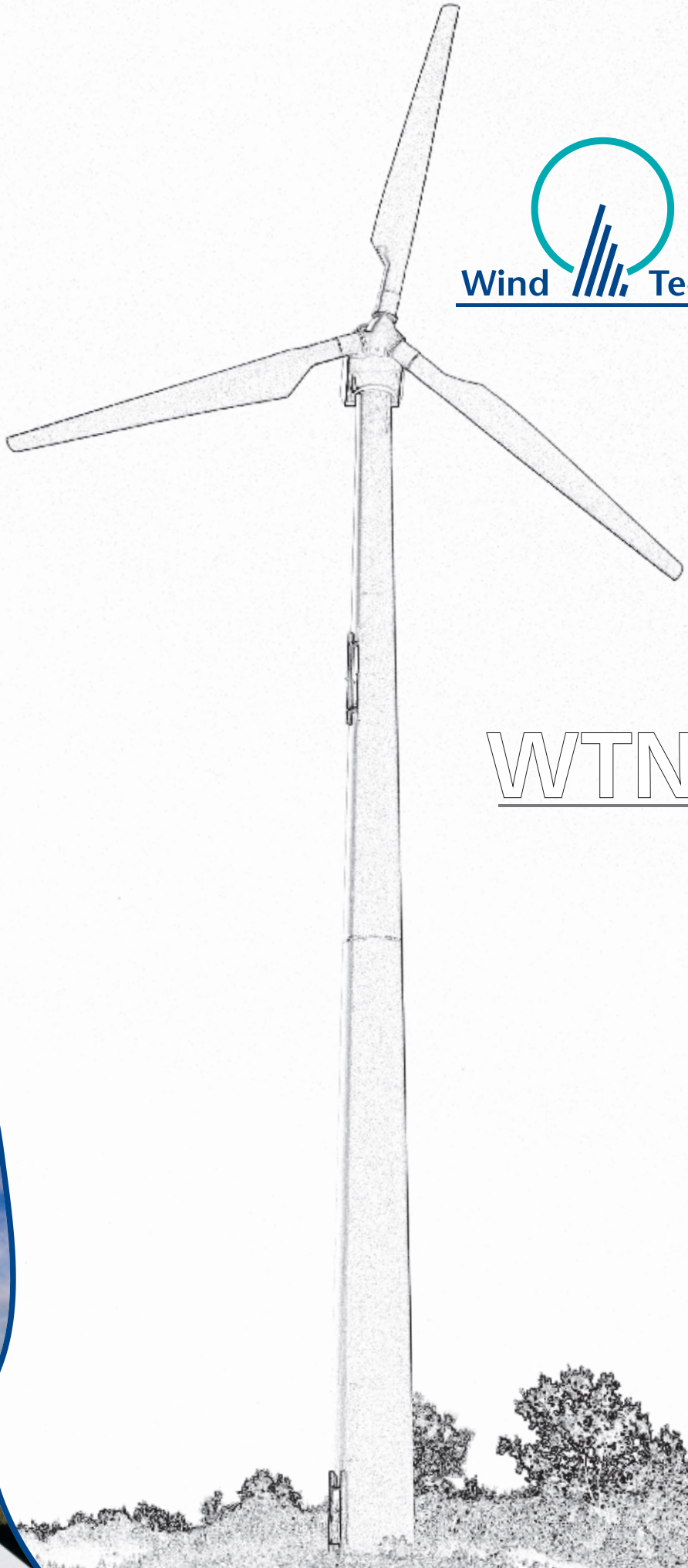
Wind Technik Nord

WTN 250



CERTIFIED WINDTECHNOLOGY

Blade / Rotor

The WTN 250 class turbines are 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 in our own production of reinforced prepreg epoxy 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 wind survival ability. With a blade length of 13,4 m and a diameter of up to 30 m the rotor of the WTN 250 class have a swept area of up to 707 m^2. 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 made possible by oval holes in the blade flanges.

Main shaft

The main shaft is a single 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 term greased bearings are the basis for a nearly noiseless operation of the main shaft. The placement of the main bearings 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 class with a gear ratio of 1:37.8. The gear box is as standard equipped with an oil cooler, additionally it is fitted with a heating system to maintain oil viscosity.

Coupling

The power of the rotor, transformed in the gearbox, is transmitted to the generator by a fibre 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 additional to this blade 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 voltage. During normal operation the tip-brakes are held in position by a hydraulic cylinder. In emergency situations a hydraulic valve is activated by centrifugal forces, and both brake systems are in function, 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 modern wind technology and makes the WTN 250 class superior, compared with other conventional engineering in the wind industry.

The used solution is designed and well tested. The two yaw gears are arranged in such a way, that any space in the gear system is eliminated. This yaw gear system incorporates 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.

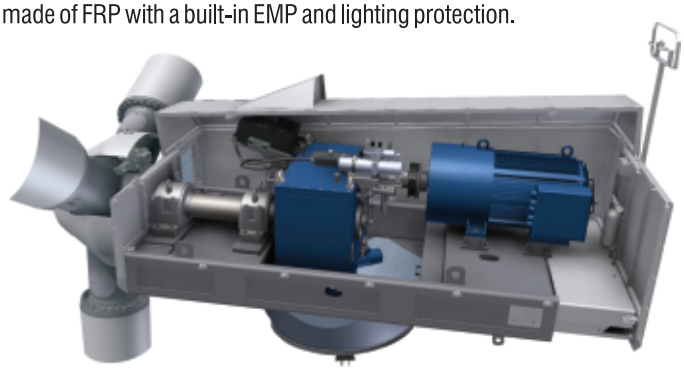
SECURE WINDTECHNOLOGY

This system is ideally suited for WTG`s installed in multiples (wind farm applications) where the shadow effect of upwind placed WTG`s is to blame for exposure 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.

Nacelle

The hot dip galvanised 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 nacelle cover is made of FRP with a built-in EMP and lighting protection.



Tower

The lattice tower is designed especially to reach all destinations with low infrastructure around the world at low costs. All parts of the turbine are suitable to fit in a standard 40ft shipping container. Alternatively an edged and bolted tubular tower is available.

The highest tower has a hub 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.

However – there are sites where only small heights are allowed so that there is still a 30m and a 40m welded tubular tower available.

The WTG control system is placed at the bottom of the tower or in a special housing. A lockable door prevents unauthorized access.

The turbines comes equipped with a wide variety of safety equipment adjusted to the customers' requirements such as safety belt and safety line, which provides a secure climbing during installation and maintenance.

Control panel

All functions of the wind turbine are controlled by means of a certified WTG control system. While the turbine is operating and connected to the grid, the control system stores a number of operational data. Those are linked up to a computer management system. This design makes it possible to retrieve data and actual live performance from the wind turbines. This is known as a SCADA system and allows remote operation of the machines. If no SCADA management system is utilized, the same data can be read on the display mounted on the control panel that is continuously monitoring 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 / 60 Hz Version – 30 m - 50 m hub height

1. General	
Nominal Output:	200 / 225 / 250 kW
Rotor shaft arrangement:	horizontal
Effect limitation:	Stall
Mode of operation:	Grid connected
Hub height:	30 m - 50 m
50 year extreme gust:	59,5 resp. 52,5 m/s
Calculated lifetime:	25 years
Lightning protaction	Class 1

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	151,8 kW
Cut off windspeed:	25 m/s
Max. shaft power:	300 kW
Specified output:	378 W/m²

3. Rotor	
Diameter:	29 m or 30 m
Swept area:	661 m² or 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:	-2 °
Conus angle:	0 °
Nacelle angle:	4 °

4. Blade	
Type:	WTN 13,4
Material:	Glassfiber
Length of blade:	13,39 m
Chord root / tip:	1,259 m / 0,03 m

5. Gear	
Type:	Spur gear
Ratio:	1 : 30,23 resp. 37,96
Stages:	3

6. Yaw system	
Kind (active / passive):	active
Actuation:	electrical
Yaw speed:	1,2 °/ s
Absorbation system:	Friction safety clutch

7. Generator	
Kind:	asynchronous, pole-changeable
Rated output:	50 / 250 kW
Rated speed:	1.515 or 1.212 rpm
Voltage:	400 V ±10%
Frequency:	50 Hz or 60 Hz ±5%
Protection:	IP 55
Insulation:	Class F
Grid connection:	via Thyristors

8. Tower				
Kind:	Lattice	Edged	Tubular	Tubular
Material:	Steel	Steel	Steel	Steel
Length:	48,4 m	45 m	38,7 m	28,7 m
Safety ladder:	yes	yes	yes	yes

9. Control system	
Kind of output control:	Stall regulation
Operating system:	Mita / Phoenix contact
Remote control system:	via VPN / GSM
Scada system:	optional
Automatically start:	after loss of grid and after cut out wind

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

11. Masses		
Rotor (with hub):	3.550 kg + 650 kg (30 m)	
Nacelle (without rotor):	9.750 kg	
Tower:	*50 m lattice*	*46 m edged*
	22.700 kg	32.000 kg
Total without foundation:	36.500 kg	45.700 kg
Tower:	*40 m tubular*	*30 m tubular*
	21.000 kg	11.500 kg
Total without foundation:	34.700 kg	25.200 kg

ECONOMIC WINDTECHNOLOGY

WTN 250 class Turbines

The WTN wind turbines are a product of development, which is based on over 25 years of constant on hand experience in wind turbine design and production. The WTN 250 class turbine is manufactured in combination of using highly dependable components under strict scrutiny of certification. This combination of profound knowledge and modern technical know-how ensures 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 all type of wind farms, 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 favourable price/efficiency relationship makes the turbine to be a short-term economical investment.

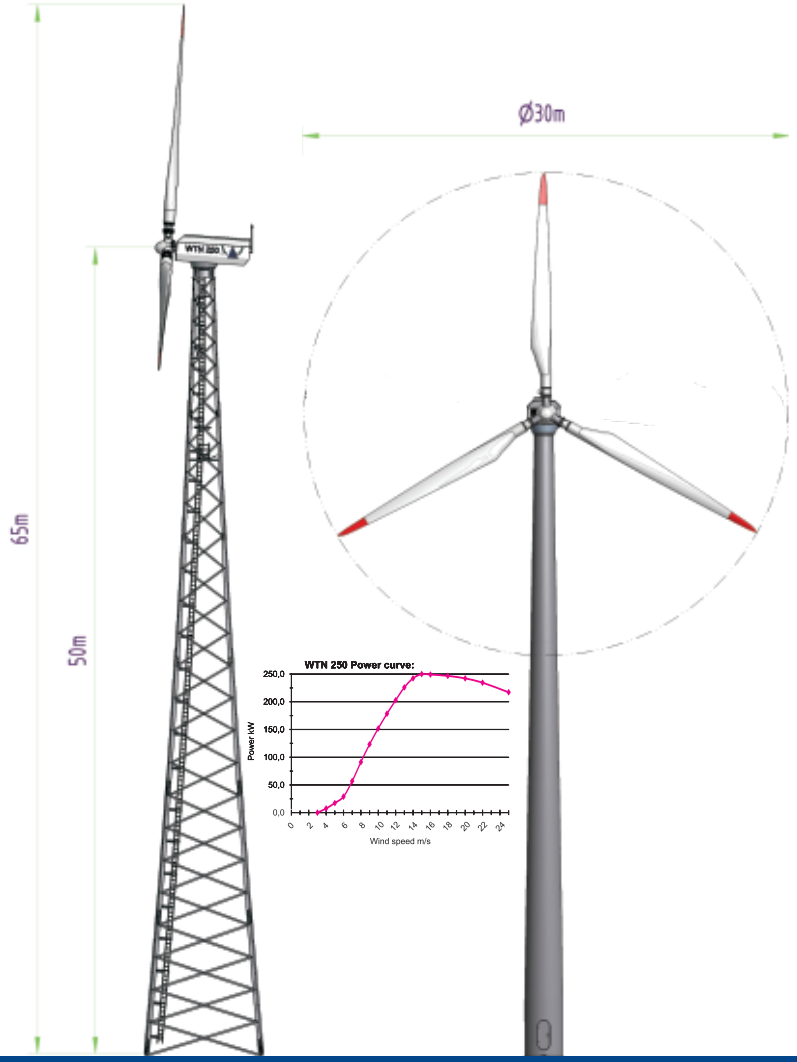
Sites for erection

Sites for erection of the WTN 250 class can be, as single unit for local production for large-scale consumers and for installation in wind parks 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.

Certification

To get the approval and a GL 2010 type certification for a wind turbine, it is necessary to go through very complex and most stringent testing procedures set out by officials and accredited testing/certification organisations. Hereby the customer will gain from the maximum achievable technical security assurance approved by a third party.



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