



Global Leader


 **HYUNDAI**
HEAVY INDUSTRIES CO.,LTD.

HQ 2000

Wind Turbine Generator System

General Specification for HQ2000

April 15, 2010

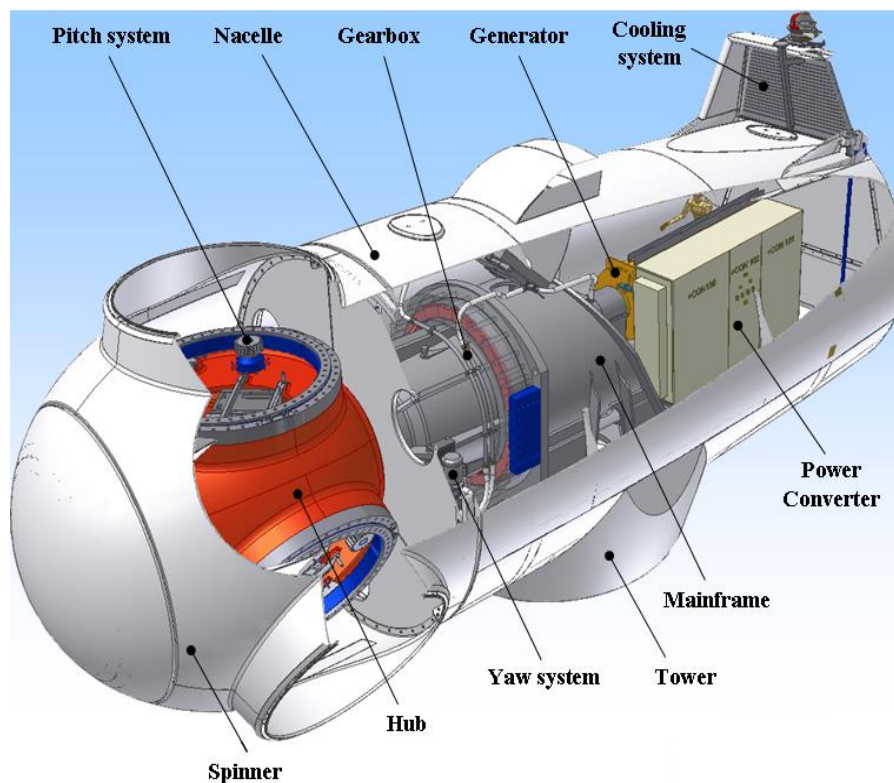
 **Hyundai Heavy Industries Co., Ltd**
Electro Electric Systems
<http://www.hyundai-elec.co.kr>

1. General description

The HQ2000 is a pitch regulated upwind wind turbine with active yaw and a three-blade rotor.

The HQ 2000 has a rotor diameter from 80 to 93m and various hub heights with a generator rated at 2.0MW. With these feathered rated power will be maintained even in high wind speeds, regardless of air temperature and air density, and the wind turbine is able to operate the rotor at variable speed. And variable speed ensures a steady electric power production from the turbine. The variable speed system consists of a doubly fed induction generator with wound rotor, slip rings and power converter. A power converter is connected to the rotor to control the generator at variable speed.

Overview





2. Technical Data

Operating data

- Type model HQ 2000 / 93
- Cut-in wind speed 3.0 m/s
- Rated wind speed 10.5 m/s
- Cut-out wind speed 20.0 m/s
- Survival wind speed 52.5 m/s
- Calculation guideline Germanischer Lloyd
- Type class TC IIIB
- System life 20 years

- Type model HQ 2000 / 86
- Cut-in wind speed 3.5 m/s
- Rated wind speed 11.0 m/s
- Cut-out wind speed 25.0 m/s
- Survival wind speed 59.5 m/s
- Calculation guideline Germanischer Lloyd
- Type class TC IIA
- System life 20 years

- Type model HQ 2000 / 76
- Cut-in wind speed 4 m/s
- Rated wind speed 13.0 m/s
- Cut-out wind speed 25.0 m/s
- Survival wind speed 70 m/s
- Calculation guideline Germanischer Lloyd
- Type class TC IA
- System life 20 years



Temperature range

Normal climate Version

- Ambient temperature out of operation -20 to 50°C
- Ambient temperature in operation -10 to 40°C

Cold climate Version(different bill of material)

- Ambient temperature out of operation -40 to 40°C
- Ambient temperature in operation -30 to 40°C

Hot climate Version(different bill of material)

- Ambient temperature out of operation -5 to 50°C
- Ambient temperature in operation 0 to 50°C

Blade

- Blade type WT80, WT86, WT93
- Blade length 39m, 42m, 45.3m
- Diameter of blade root connection 2110 mm
- Material epoxy, glass fiber
- Lightning conductor integrated

Rotor

- Number of rotor blades 3
- Rotor axis horizontal
- Position relative to tower upwind
- Direction of rotation (looking downwind) clockwise
- Power control method Pitch control
- Sweep angle 0 deg
- Cone angle -2 deg
- Aerodynamic brake full feathering



Gearbox unit

- Type description 1st , 2nd step planetary
3rd step parallel
- Transmission ratio (60Hz-grid) 1: 83.83 (± 1 %)
- Mechanical power 2000 kW
- Bending strength (Fatigue)..... $S_F > 1.5$
- Surface durability (Fatigue)..... $S_H > 1.2$
- Application factor (Fatigue)..... 1.3
- Bending strength (Ultimate)..... $S_F > 1.4$
- Surface durability (Ultimate)..... $S_H > 1.0$
- Application factor (Ultimate)..... 1.0
- Maximum brake torque 22 kNm
- Lubrication oil pump
- Connection gear with generator flexible coupling

Pitch drive system

- Maximum pitch control speed limit 9 deg/s
- Type of pitch bearing Double row
ball bearing

Supporting machine parts

- Hub type rigid
- Hub Material cast iron
- Mainframe material Cast iron

Parking brake system

- Type of construction Gear / servomotor
- Mechanical brake disc brake
- Activation Passive



Generator and power electronics

- Generator type DFIG
- Converter type IGBT, 4 quadrants
- Rated power 2000 kW
- Rated voltage 3Φ / 690 VAC /
50/60 Hz
- Power factor 0.9_{ind} to 0.9_{cap}
adjustable
- Torque control field vector control

Control system

- Control device PLC
- Remote monitoring yes
- SCADA system yes

Yaw drive system

- Type of wind direction alignment active
- Type of yaw bearing slide bearing
- Drive unit planetary gear motor
- Number of drive units 4
- Brake friction in the slide
bearing plus motor
brake

Nacelle cover

- Type of construction closed
- Material Polyester resin/
Glass fiber

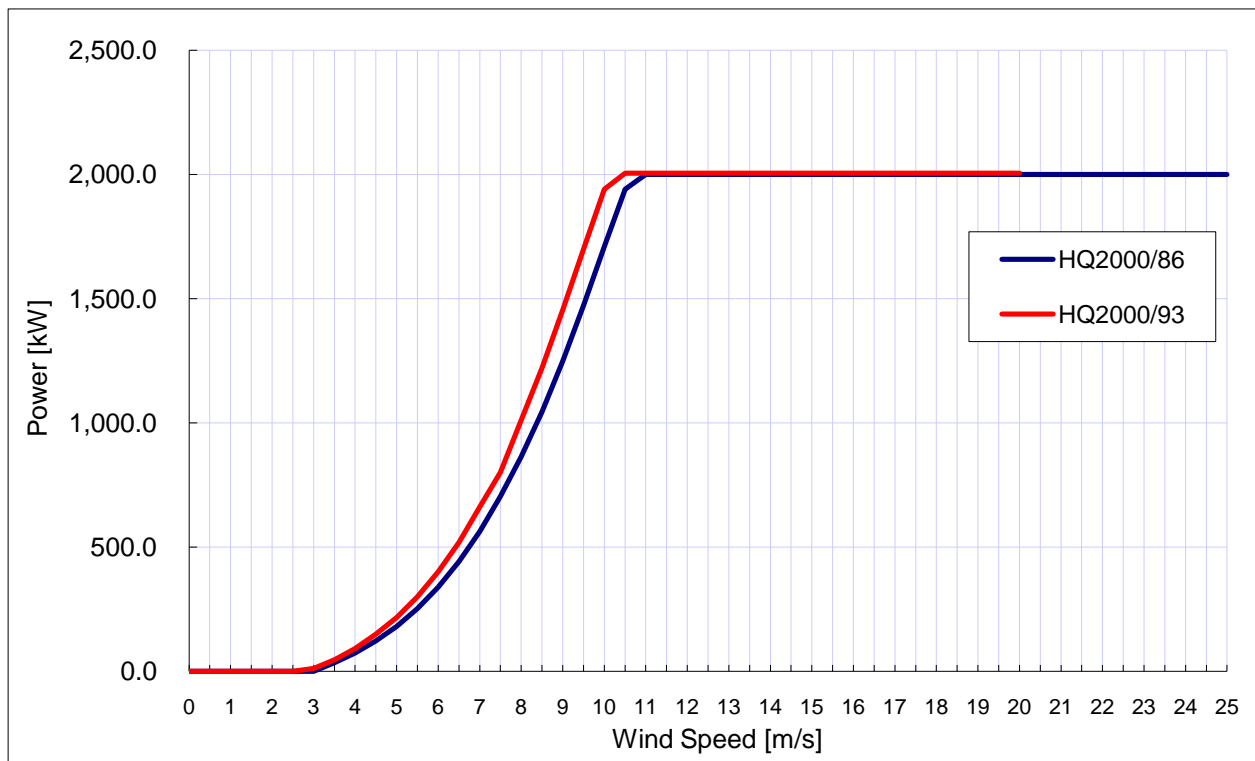
Tower

- Type of construction conical tubular
- Hub height 80/100m total
- Corrosion protection Protective paint

3. Calculated Power Curve

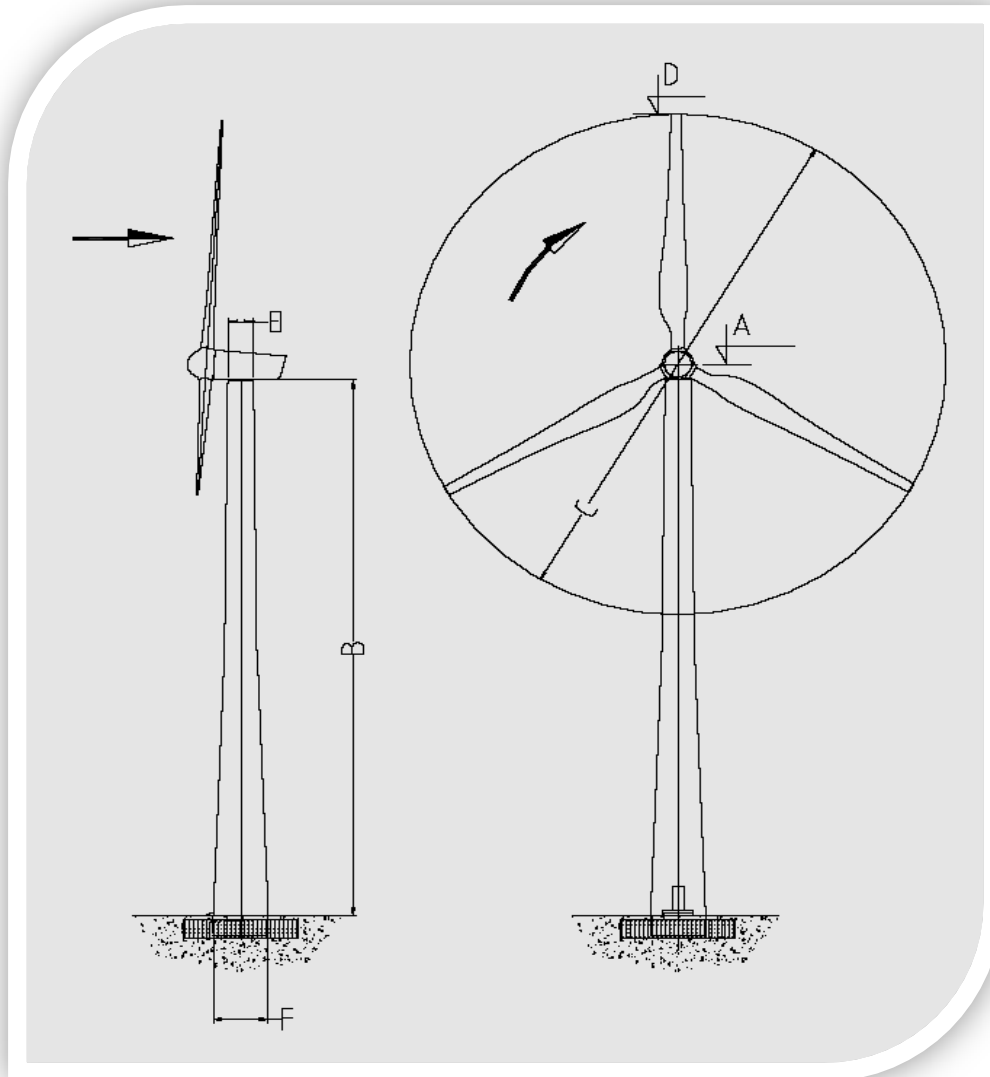
The power data presented in this document are based on simulation data. That is, the power data are calculated using model information of the wind turbine generator. Thus, the presented data are best-knowledge predictions. They cannot replace power performance testing.

Power curves are acquired by static calculations at an air density of 1.225 kg/m³.





4. Outline dimension



	Dimensions					
	A	B	C	D	E	F
HQ2000 / WT93	80.0	78.0	93.3	126.6	2.96	4.3
HQ2000 / WT93	100.0	98.0	93.3	146.6	2.96	4.3
HQ2000 / WT86	80.0	78.0	85.7	123.3	2.96	4.3
HQ2000 / WT86	100.0	98.0	85.7	143.3	2.96	4.3