WES80 TECHNICAL SPECIFICATIONS

GENERAL

Supplier/manufacturer	WES BV
Life expectancy	20 years
Service/maintenance	Twice a year
Nominal power	80 kW
Cut in wind speed	< 3 m/sec. (6.7mph)
Cut out wind speed	25 m/sec. (56mph)
Nominal wind speed	13 m/sec. (29mph)
Survival wind speed	60 m/sec. (134mph)
Passive power regulation	Pitching (blade-angle adjustment)
Active power regulation	Fully variable back-to-back IGBT system
Noise emission at 8 m/s	45dB(a) at 100m
Operating temperatures	From -20°C up to +40°C

APPLIED STANDARDS

Degree of protection	IP55
Standards	NEN1010 (electrical) EN50308 (safety) EN6096 (wind turbines) UL1741 (anti islanding) IIEC61346-2000 (cabinet)
CE-mark	yes

ELECTRICAL

Grid voltage	400V ±10%
Grid frequency	50/60Hz ±3Hz
# Phases	3 phase + neutral
Specific power	315 W/m2
Converter type	Back-to-back IGBT converter

ROTOR

Number of blades	2
Diameter	18 m
Position	Upwind
Direction	clockwise
Angle of the main shaft	7^0 with horizon
Swept area	254 m2
Speed	variable 60 -120 rotations per minute
Power regulation	Passive pitching (blade-angle adjustment)
Min. blade-angle	1.0
Flapping angle	180 -164^0

BLADES

Blade length	7,8 m
Weight (1 blade)	100kg
Chord	500 – 625mm
Twist	5^0
Mounted	Flexible

GEARBOX

Brand	Flender (Siemens)
Number of stages	2
Weight	820kg (incl. oil)
Ratio	1:20

GENERATOR

Brand	ABB
Type	a-synchronous
Nominal power	80 kW
Number of poles	4
Nominal voltage	230/400 volt
Frequency	Variable: 40 - 80 Hz.
Weight	400kg
Protection	IP 55

TOWER

Type	Tubular
Number of sections	3
Tower height	18, 24, 30, 39m
Material	Hot dip galvanised steel
location ladder	External
Type	Lattice
Tower height	31 m
Material	Hot dip galvanised steel
Location ladder	External

CONTROLLER

Control by	IPC (Beckhoff)
Remote monitoring	Yes
Data logging	Optional

YAW-SYSTEM

Yaw system	active
Signal from	wind vane
Driven by	Electro motor with worm-wheel reduction
Power yaw-motor	0,55 kW
Yaw speed	$1,2^0$/sec.
Yaw bearing	Single ball bearing; externally geared (Rothe Erde)
Yaw-brakes	Constant friction-brakes; 4 pcs.

SAFETY

First safety system activated by:	Passive blade pitching • rotor speed (110 rpm)
Second safety system activatied by	Yawing out of the wind and electric brake • rotor speed (>120 rpm) • excessive vibrations

- failure anemometer or wind vane
- failure in one of IPC's
- grid failure
- too high generator or inverter temperature
- fault in yawing system

Blocking system

rotor blocking system	pin in high speed shaft; for service purposes
activation	manual

WEIGHTS

Rotor incl. blades	1.100 kg
Nacelle excluding rotor	2.200 kg
Control cabinet	400 kg
Tower	7.820 kg (30 m. tower)

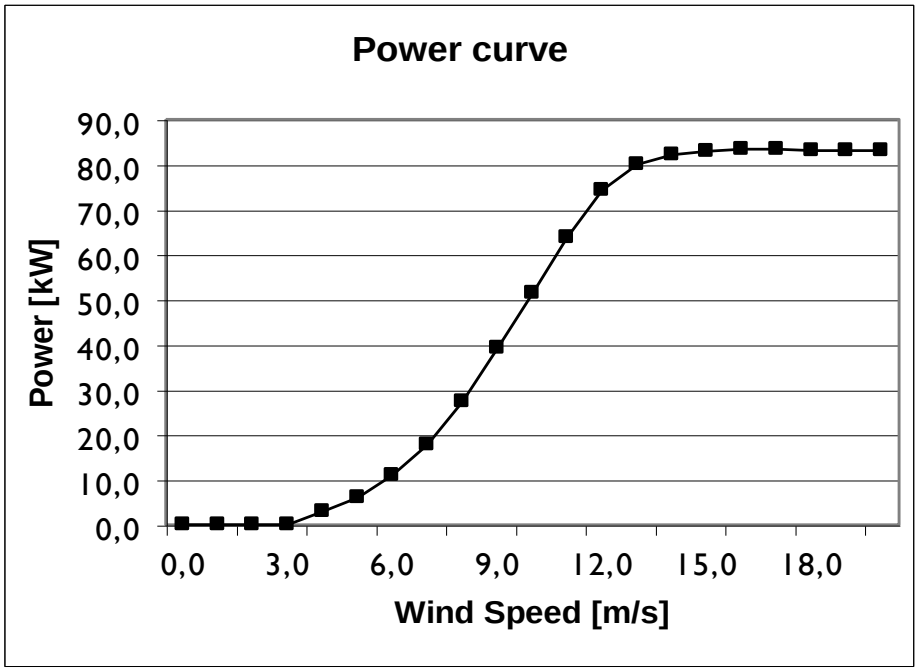
MATERIAL SPECIFICATIONS

Blades	Carbon and glass fible reinforced epoxy
Nacelle/rotor	Steel
Covers	Polyester
Tower	Steel (hot dip galvanised)
Foundation	Concrete Block with steel anchor

Measured actual power:

The curve data are valid for standard atmospheric conditions of 15° C air temperature, 1013 mbar air pressure and 1.225 kg/m^3 air density, clean rotor blades and horizontal undisturbed air flow.

Wind speed [m/s]	Energy [kW]
0,0	0,0
1,0	0,0
2,0	0,0
3,0	0,0
4,0	2,9
5,0	6,0
6,0	11,0
7,0	17,7
8,0	27,3
9,0	39,2
10,0	51,4
11,0	63,8
12,0	74,2
13,0	79,9
14,0	82,2
15,0	82,9
16,0	83,3
17,0	83,3
18,0	83,0
19,0	83,0
20,0	83,0



Measured production

The annual energy production data for different annual mean wind speeds at hub height are calculated from the above power curve data assuming a Rayleigh wind speed distribution, 100% availability and no reductions due array losses, grid losses, or other external factors effecting the production.

Wind speed [m/s]	Energy [MWh]
4,5	74
5,0	101
5,5	130
6,0	161
6,5	193
7,0	225
7,5	256
8,0	285
8,5	313

