norwin
wind turbine technologies

MID-SIZED WIND TURBINES
29-STALL-200 KW

TECHNICAL DATA
NORWIN 29-STALL-200 kW

Nominal electric power:	200 kW
Power regulation:	Stall
Rotor diameter:	29.1 m (95.4 ft)
Rotor speed:	37.6 rpm at full load
Rotor:	Three blades placed upwind of tower
Swept area:	664 m² (7145 ft²)
Tilt angle:	5°
Coning angle:	0°
Blades make:	LM 13.4 m
Pitch angle:	App.: -2.3° (Will be adjusted during running in)
Air brake:	Turnable blade tips
Mechanical brake:	A fail-safe type disk brake on the high-speed shaft of the gearbox
Brake torque:	2.0 times of nominal torque or soft brake system (1 times of nominal torque) by normal braking sequences
RPM max. value:	1600 (50 Hz) or 1920 (60 Hz), observed on the high-speed shaft
Generator:	Closed, asynchronous, 4-pole, single wound, induction, IP54
Generator speed:	1500 (50 Hz) or 1800 (60 Hz) rpm at sync. speed
Loss in generator:	App.: 3% at full load
Generator cut-in:	Thyristor controlled gradual cut-in
Grid connection:	50 Hz - 400 V or 60 Hz - 480 V
Yaw motors:	2 pcs. active drives, electrical
Yaw brakes:	3 pcs. active hydraulic operated brakes
Yaw bearing:	Slide bearing)
Tower type:	Conical steel tower
Hub height:	30 m (98.4 ft) or 40 m (131.2 ft)
Controller:	PLC and microprocessor based
Cut-in wind speed:	4 m/s (9 mph)
Cut-out wind speed:	25 m/s (60 mph), based on 5-min. average
Survival wind speed:	67 m/s (150 mph)
Approximate masses:	
Nacelle excl. rotor:	7.63 tons
Complete rotor:	5.30 tons
Nacelle total:	12.93 tons
Tower 30 m:	13.25 tons
Tower 40 m:	20.70 tons
Maximum noise level:	98 dBA

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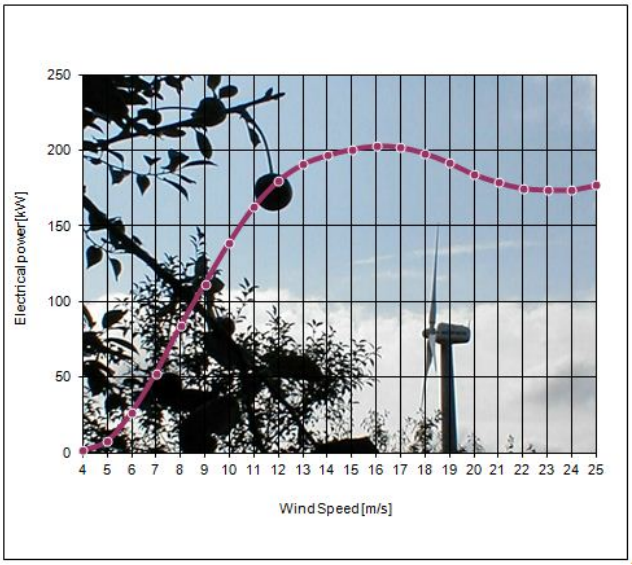
POWER CURVE AND ENERGY PRODUCTION
NORWIN 29-STALL-200 kW

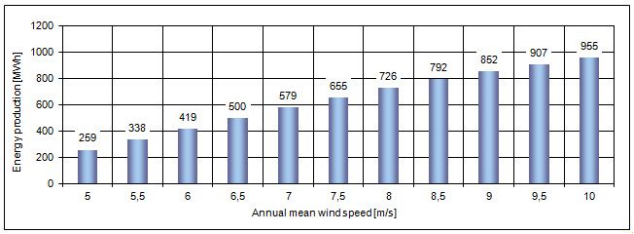


The power curve is for our 200 kW turbine, with a rotor diameter of 29 m, single generator and featuring Stall Regulation.

Wind speed [m/s]	Elect. power [kW]
4	1
5	7
6	26
7	53
8	84
9	112
10	139
11	163
12	180
13	191
14	197
15	201
16	203
17	202
18	198
19	192
20	184
21	179
22	175
23	174
24	174
25	177

The power curve is valid for standard conditions: 15 deg. air temperature, 1013 HPa air pressure and 1.225 kg/m3 air density, clean blades and undisturbed horizontal inflow. (In the stall range, at wind speeds above 16 m/s, the power curve may deviate some from the one stated below).

The annual energy production is calculated for different annual mean wind speed in hub height.



A Rayleigh wind speed distribution and 100 % availability is assumed.

Norwin 29-Stall-200 kW

”When simplicity makes sense” is the keyword for the Norwin 200 kW turbines. The origin of the turbine goes back to 1984 when the first turbine of this family was installed. Since then several hundreds have been installed on three continents. Some turbines have been in operation for more than 23 years – without experiencing major problems – and are still running. All the time, it has been of utmost importance to Norwin’s continuous development of the turbine that simplicity is in focus to keep maintenance costs down.

Stall Control – keeping costs down

Stall control is a passive way of limiting the power from the turbine in strong winds. For a turbine this size, it is important to keep production and maintenance cost at a minimum. Stall control is less

expensive and simpler to maintain as compared to e.g. pitch control. This is why Norwin uses stall control.

Nacelle – room for two

The nacelle of the Norwin 200 kW turbine puts an end to cramped crawling about on exterior ladders and bridges on smaller turbines. The nacelle easily holds two persons and work can be performed whatever the weather. The main frame of the nacelle is designed as a T-construction giving an ideal distribution of forces and allowing a light and very rigid construction.

Rotor – heart of the matter

The turbine’s great effectiveness is partly based on its blades. Supplied by LM Windpower, the 13.4 m blades with a rotor diameter of 29 m ensure high quality and safe operation for many years.

Brakes

The blades have integrated air brakes, which are of the turnable tip type. Further, the turbine is equipped with a second safety brake system - a ‘fail safe’ spring type disk brake that is activated instantly in case of emergency.

Yawing system – protection from battering conditions

The yaw system is designed as a sliding system utilizing three integrated yaw brakes and two active yaw drives. Each yaw drive consists of an electrical motor, a powerful gear with pinion wheel engaging the large cogged ring bolted to the exterior of the top of the tower. Yawing is initiated by a wind vane via the control system.

Main shaft and bearings – easy maintenance

The high-strength steel main shaft is supported in the main frame by two double spherical roller bearings. In

contrast to integrated systems, the system ensures that the gearbox absorbs torque from the rotor only.

Gearbox – long experienced supplier

The powerful 3-stage helical gear from Winergy is “hollow shaft” mounted directly onto the main shaft ensuring automatic centering.

Induction generator

The closed asynchronous induction generator from ABB is a component that has proven its value and stability in many turbines. The closed type generator is cooled on the outer surface meaning the windings are not exposed to humidity and contamination. A double flexible clutch is mounted to protect both the generator and gear box from torque peaks and misalignment of shafts.

Electronic supervision of operation and production

A remote monitoring system can be supplied with the turbine and ensures maximum security, productivity and longevity.

The controller of the turbine is placed at the bottom of the tower for easy access.

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