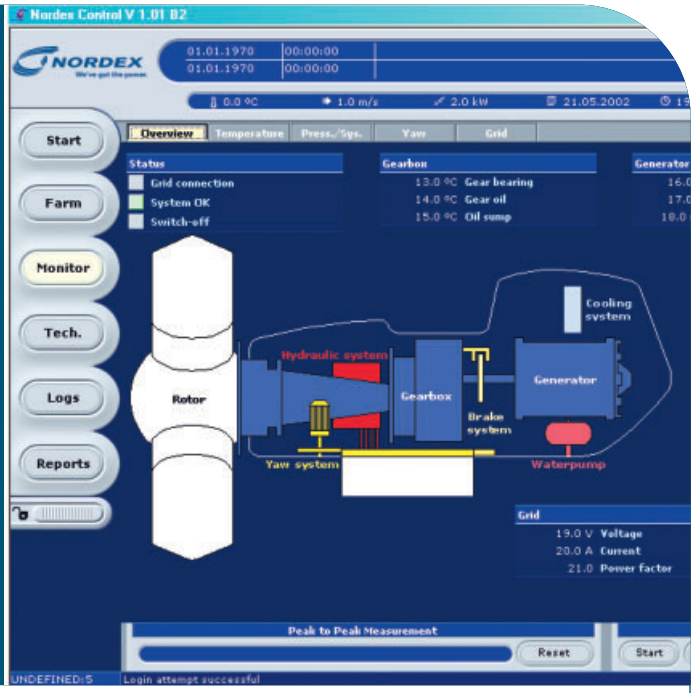
N60/1300 KW

Nordex N60

Long-term experience
all over the world.

NORDEX
We've got the power.

Visualisation of a turbine in the NC2-control system.

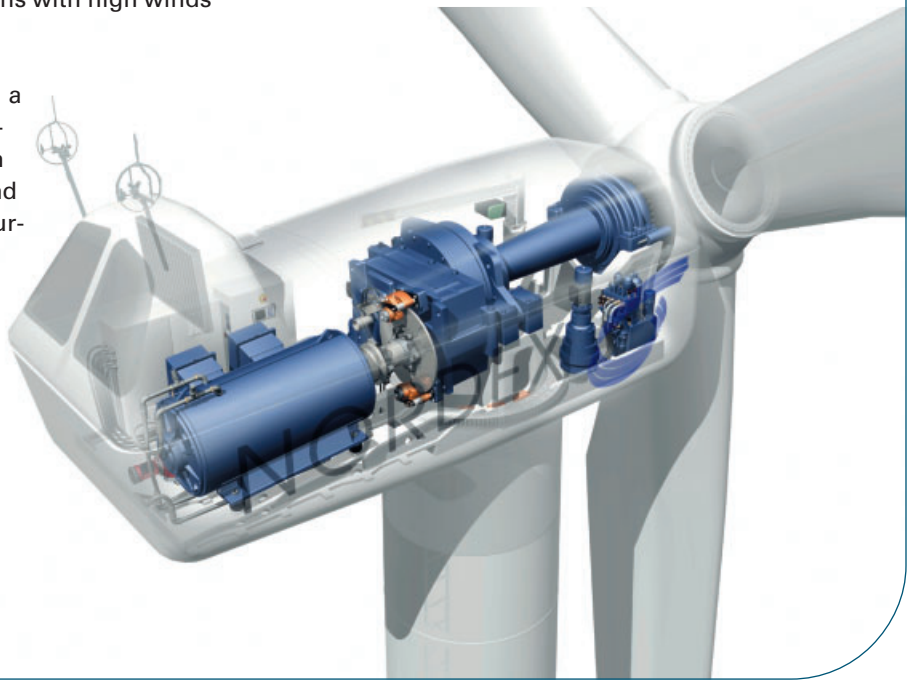


THE N60/1300 KW: ROBUST, COMPACT AND INTERNATIONALLY WELL-TESTED.

The Nordex N60/1300 kW is our top-selling wind turbine. The machine is equipped with stall regulation and produces a nominal output of 1.3 MW. With a rotor diameter of 60 metres, it can be operated at wind speeds between 3 m/s and 25 m/s. The Nordex N60 has been optimised for regions with high winds (class I).

We supply the Nordex N60 as a 50 Hz and 60 Hz machine as standard, in the hot climate version (HCV turbine) for desert regions and in the cold climate version (CCV turbine) for permafrost regions.

The Nordex N60 is supplied with the Nordex-Control automation software to control and visualise all relevant data. Our wind turbines are designed for a service life of at least 20 years. And the ISO 9001 certification stands for the tested quality of our products.



Remote monitoring in Rostock.

Your benefit at a glance:

- Location-specific control for individual turbines or windfarms
- Security due to redundant systems
- 24-hour remote monitoring
- Autonomous safety systems (emergency off in the event of power cut)

RELIABILITY, SERVICE, ENVIRONMENTAL SUSTAINABILITY: NORDEX ALWAYS OFFERS THAT BIT MORE.

The machine offers low-maintenance due to

- User-friendly rotor lock and easy checking and monitoring of the elastomer bearings in the drive train
- The controls at the bottom of the tower and the nacelle and wide-ranging remote query possibilities

It is environment-friendly due to

- The enclosed grease and oil-collecting pans
- The hydraulics with all lines in the area of the oil pan – meaning that no oil can pollute the environment

It is noise friendly due to

- Helical gearing of all gearwheels reduces the noise level within the gearbox
- As the generator, gearing and many other components are attached in such a way that vibrations are either not transmitted or are damped. In this way noises are immediately reduced at source

It is reliable

- As more than 20 years of Nordex experience with wind energy have gone into their development
- As the N60 is certified for class I sites, i. e. for windy regions
- As it has a long product cycle time and is a mature series product
- As all components are of a guaranteed high quality due to our choice of certified and reputable sub-suppliers
- As resonances are avoided or minimised by design measures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THE N60: A MACHINE EQUIPPED WITH TREND-SETTING TECHNOLOGY.

Rotor
The rotor blades are made of high-quality glass fibre reinforced plastic (GRP). The blade tips are pivotable and can be swivelled 85 degrees relative to the main blade, in this position acting as aerodynamic brakes. Lightning receptors are integrated into the blade tips, diverting a lightning strike to the hub.

Main shaft
The main shaft is forged from high-quality tempered and quenched steel. The shaft is connected to the gearbox by a shrink fit coupling.

Gearbox
The gearbox is a three-stage design, with the first stage as a high torque planetary stage and the second and third stages as spur stages. The planetary gear makes the construction very compact, yet allowing for the high torque from the rotor to be transferred with a high gear ratio.

Generator
The generator is a water-cooled squirrel-cage asynchronous type. The generator is connected to the gearbox by a flexible coupling. The solid rubber mounting decouples the generator from the nacelle frame and thus reduces the transfer of machine noises.

Cooling and filtration
Gearbox and generator of the N60 have a combined cooling system. Corresponding to the different temperature levels, first the gearbox oil and then the generator is cooled in the cooling circuit. The water/air cooler is placed in the upper part of the nacelle and is flown through by fresh air.

Braking system
The primary brake system is the aerodynamic blade tip brake. The secondary mechanical brake is a disc brake. Both systems are able to decelerate the wind turbine from any state in order to reach a safe status.

Hydraulic system
The hydraulic system provides the oil pressure for the operation of the blades, tips, yaw brakes, the rotor brake and the hood.

Nacelle
The nacelle consists of the cast main frame and the nacelle cover. The nacelle cover is made of high-quality glass fibre-reinforced plastic (GRP). The nacelle roof is opened hydraulically.

Yaw system
The wind direction is continuously monitored by two wind vanes at hub height. When the wind direction changes the nacelle is yawed actively.

Tower
The tubular steel tower is designed and certified as a modular tower. For the design of tower internals (ladder, platforms, safety equipment) especially the requirements of EN 50308 have been considered. Both internal and external transformer installation is possible.

Controller
The wind turbines have two anemometers each. One anemometer is used for controlling the turbine, the second anemometer is monitor the first one. On a control screen placed at the switchboard, all operational data can be monitored and checked and a number of functions, such as starting, stopping and yawing, can be controlled. In addition, the wind turbines are equipped with a remote monitoring system. The data and signal transfer only requires an ISDN connection.

Lightning protection
The lightning and overvoltage protection of the wind turbine is based on the lightning protection zone concept and is according to IEC 61024 and DIN VDE 0185.

FACTS AND FIGURES.

	N60/1300 kW
Rotor	
Number of blades	3
Rotor speed	12.8/19.2 rpm
Rotor diameter	60 m
Swept area	2,828 m²
Power regulation	Stall
Cut-in wind speed	Approx. 3–4 m/s
Cut-out wind speed	25 m/s
Rated power at	Approx. 15 m/s
Survival wind speed	70 m/s – IEC
Brake	Pivotable blade trips
Weight	Approx. 21,500 kg
Blades	
Blade length	29 m
Material	GRP
Weight	Approx. 5,000 kg
Gearbox	
Type	Combined 3-stage gearbox
Gear ratio	50 Hz: 1 : 78.3 / 60 Hz: 1 : 94.4
Weight	Approx. 10,900 kg
Oil quantity	280 l
Oil change	Semi-annual check, change as required
Main shaft bearing	Cylindrical roller bearing
Generator	
Power	250/1,300 kW
Voltage	690 V
Type	Asynchronous, 6/4 pole, liquid-cooled
Speed	50 Hz: 1,000/1,500 rpm, 60 Hz: 1,200/1,800 rpm
Insulation class	IP 54
Weight	Approx. 5,500 kg

	N60/1300 kW
Yaw system	
Yaw bearing	Ball bearing
Brake	Disc brake
Yaw drive	Three asynchronous motors with built-in brakes
Speed	< 0.6 °/s
Control system	
Type	PLC, Remote Field Controller (RFC)
Grid connection	Thyristor controlled
Scope of monitoring	Remote monitoring of more than 300 different parameters, e. g. temperature sensors, hydraulic sensors, wind sensor set
Recording	Production data, event lists with filter function, long and short-term trends
Visualisation	Panel PC in control cabinet, web-based
Brakes	
Design	Two independent systems, fail-safe, various brake sequences, soft-braking function
Aerodynamic	Pivotable blade tips
Mechanical	Hydraulic disc brake
Tower	
Type	Modular steel tower, cylindrical, upper segment conical
Hub heights	Tubular tower 46 m, certificate IEC 1a, Tubular tower 60 m, certificate DIBt 3, IEC 1a Tubular tower 69 m, certificate DIBt 3

POWERCURVE N60/1300 KW

Windspeed [m/s]	Power [kW]	Cp
4	29	0.262
5	73	0.337
6	131	0.350
7	241	0.404
8	376	0.424
9	536	0.424
10	704	0.406
11	871	0.378
12	1016	0.339
13	1124	0.295
14	1247	0.262
15	1301	0.223
16	1344	0.189
17	1364	0.160
18	1322	0.131
19	1319	0.111
20	1314	0.095
21	1312	0.082
22	1307	0.071
23	1299	0.062
24	1292	0.054
25	1292	0.048

Rounded values based on measurements of DEWI (April 1999) and aerodynamical calculations

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