DESIGNED TO PERFORM.

GAMMA GENERATION – THE NORDEX EFFICIENCY CLASS.

N80/2500
N90/2500
N100/2500
N117/2400

NORDEX
We've got the power.

CONTENTS

NORDEX – A PROFILE

Dependable power plants for a clean environment.

Economic prosperity, progress and environmental protection – for Nordex these go hand in hand. Since 1985, we have been developing increasingly effective wind turbines that help meet the growing global demand for energy while reducing the impact on the environment.

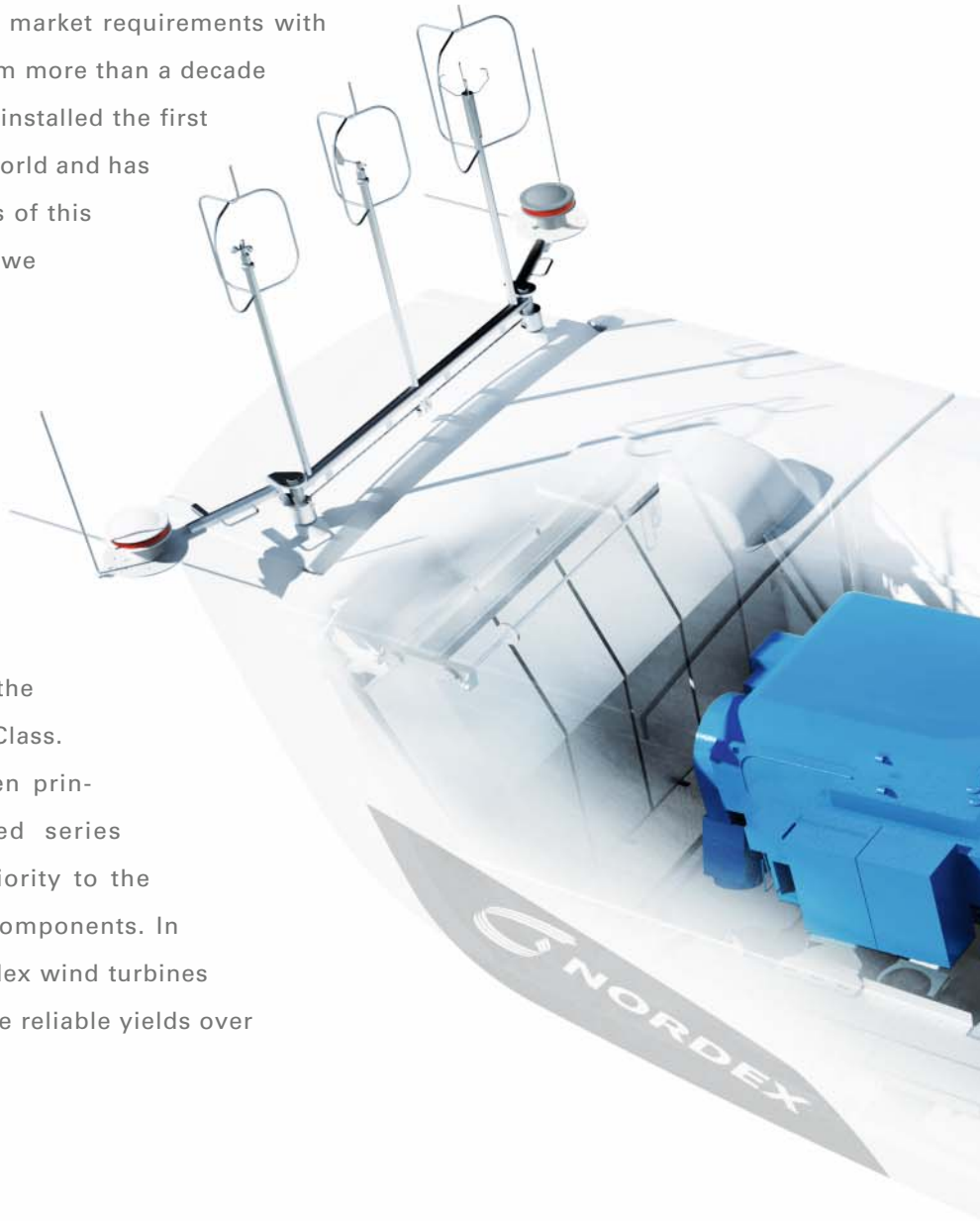
As an internationally expanding company, Nordex has a footprint in all the core markets. Our factories in Germany, China and the United States serve the markets in the core regions of Europe, Asia and the Americas. We can provide our customers with tailor-made all-round solutions – from planning a wind farm, through turnkey installation down to service. The "Nordex Academy" provides a high level of training to all our staff, guaranteeing superior know-how as a supplier of sophisticated products and services.

The core competence of Nordex focuses on wind turbines in the power range up to 2.5 MW. In the Gamma Generation, the Efficiency Class, we offer different types of machines on the basis of a common technical platform. This means that Nordex customers can rely on having the ideal product for every location.

THE EFFICIENCY CLASS
Experience puts us one step ahead.

The Efficiency Class combines the latest findings from research and development and today's market requirements with know-how and experience from more than a decade of operation. In 2000, Nordex installed the first 2.5 MW series turbine in the world and has put more than 1,500 machines of this type on grid since then. So we know what we're talking about when we say that our turbines offer high quality, mature technology and dependable performance even in extreme locations.

Nordex continuously adds to the development of the Efficiency Class. Yet we remain true to proven principles, use tried and tested series engineering and give top priority to the dependability of all system components. In this way, we ensure that Nordex wind turbines are capital goods that generate reliable yields over a period of at least 20 years.

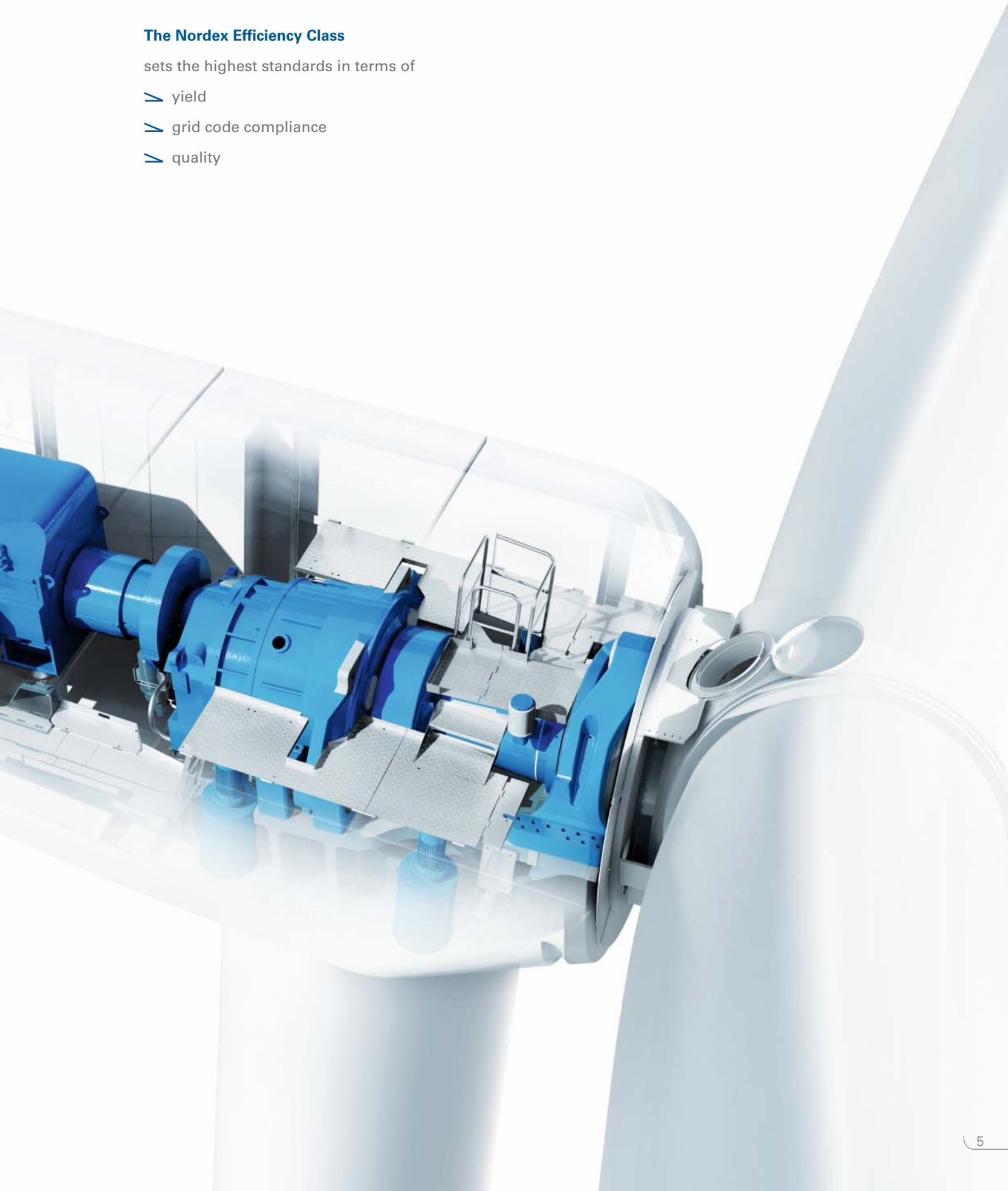


The Efficiency Class combines proven, reliable technology with enhanced details.

The Nordex Efficiency Class

sets the highest standards in terms of

- yield
- grid code compliance
- quality



YIELD
Maximum wind yield at any location.

Today, ongoing technical developments make it more worthwhile than ever to invest in a wind turbine of the Efficiency Class.

Efficiency packages for higher power curves

Intelligent operations management is essential for a maximum wind yield. For this reason the interactive Nordex Control™ system controls, regulates and monitors the turbines in the Efficiency Class. Modern automation and information technologies are merged to form a powerful turbine control system. In order to increase the yield further, our product experts and engineers have developed and implemented efficiency packages. So Nordex customers benefit from a higher power curve for greater profitability in their project.

The perfect machine for every type of wind

The Efficiency Class now gets even more out of every location: Nordex has raised the wind class suitability of the N90/2500 and the N100/2500. This was possible because our engineers have aligned the core components with each other even more closely. For strong-wind locations Nordex now offers the N90/2500 in addition to the N80/2500. For regions with medium winds we supply the N100/2500, which can also be used in areas with light wind. The N117/2400, with its giant blades, has been specifically designed for this type of site.

The Nordex Efficiency Class also includes a 140-metre hybrid tower.

Robust technology for cold regions

Many good wind locations can be found in regions with extremely low temperatures. This is why there is also a cold-climate version of the turbines in the Efficiency Class. Should the customer require it, in future an innovative rotor-blade anti-icing system, developed in-house, can be included in the cold-climate package.

Service – simple, fast and safe

Thanks to the service-friendly design of the turbines, Nordex has reduced maintenance time to the minimum. Service can be carried out under a closed roof regardless of the weather conditions. All the components are directly accessible as they are located on uninterrupted working levels and can be easily, safely and inexpensively maintained with the aid of the internal crane. In addition, reliable turbine operation is supported by low-maintenance and maintenance-free components.

Round-the-clock performance checks

To ensure maximum availability, Nordex keeps a permanent eye on its customers' wind turbines. In the event of divergence from normal operation, Nordex Remote Monitoring immediately intervenes. In addition to this, the optional Condition Monitoring System checks the state of wear-critical components, thereby supporting preventive maintenance.

High in the sky for a better yield

Wind conditions differ from region to region. At inland locations in particular, the wind quality improves in line with altitude. However, some locations are subject to height restrictions. This is why Nordex offers the machines in the Efficiency Class on modular tubular steel or hybrid towers with heights ranging from 60 to 140 metres.

GRID CODE COMPLIANCE
Active support for every grid.

The turbines in the Efficiency Class are characterised by excellent control capabilities for maintaining the voltage and stabilising the frequency of the public grid. They meet all the requirements for the German system service bonus (known as the SDL-Bonus).* Their fault-ride-through capability enables them to bridge any dips in voltage effortlessly. The Nordex wind farm management system also makes it possible for the grid operator to directly control the rated and reactive power of the wind farm in the grid.

With these features, the turbines are certified for the grids of the most demanding international markets. They can also be flexibly adapted to new and complex connection requirements. This makes for a seamless integration into the local grid.

Always striving to progress

Our aim is to offer the highest electricity quality on the market. Nordex has this in mind when the grid connection technology is intensively tested and further developed both in the field and on the test bench. This is why our wind turbines have long been recognised for an electricity quality and a dependability of supply that equal that of conventional power plants.

* The requirements for the SDL bonus are regulated in Germany in the System Service Ordinance (SDLWindV). They number among the strictest grid guidelines in Europe.

Nordex makes sure that the machines in the Efficiency Class always comply with the latest grid requirements.

QUALITY
Top-quality engineering – simply routine for us.

Thanks to their sophisticated design, the wind turbines in the Efficiency Class are certified quality products. In the early development phase the Nordex Engineering department checks the strains on materials and components using computer-aided calculation routines, such as the finite element method. These are followed by extensive tests in the Nordex Test Centre and in the field.

Extreme tests for hardware and software

In the Nordex Test Centre our engineers inspect the components and systems of the prototypes under simulated wind and weather conditions. By subjecting them to strains in excess of the usual specification, among other things by means of long-term, extreme climate and vibration tests, Nordex ensures that they meet all quality criteria and thus that a high-quality and technically mature product goes into series production.

Quality-assured rotor blades

Nordex sets especially high standards when it comes to the materials used for our rotor blades, which can be up to 58 metres in length. Automated production processes and the monitoring of the entire production process using the latest measuring and testing methods ensure that each rotor blade works reliably.

Highest industry standards

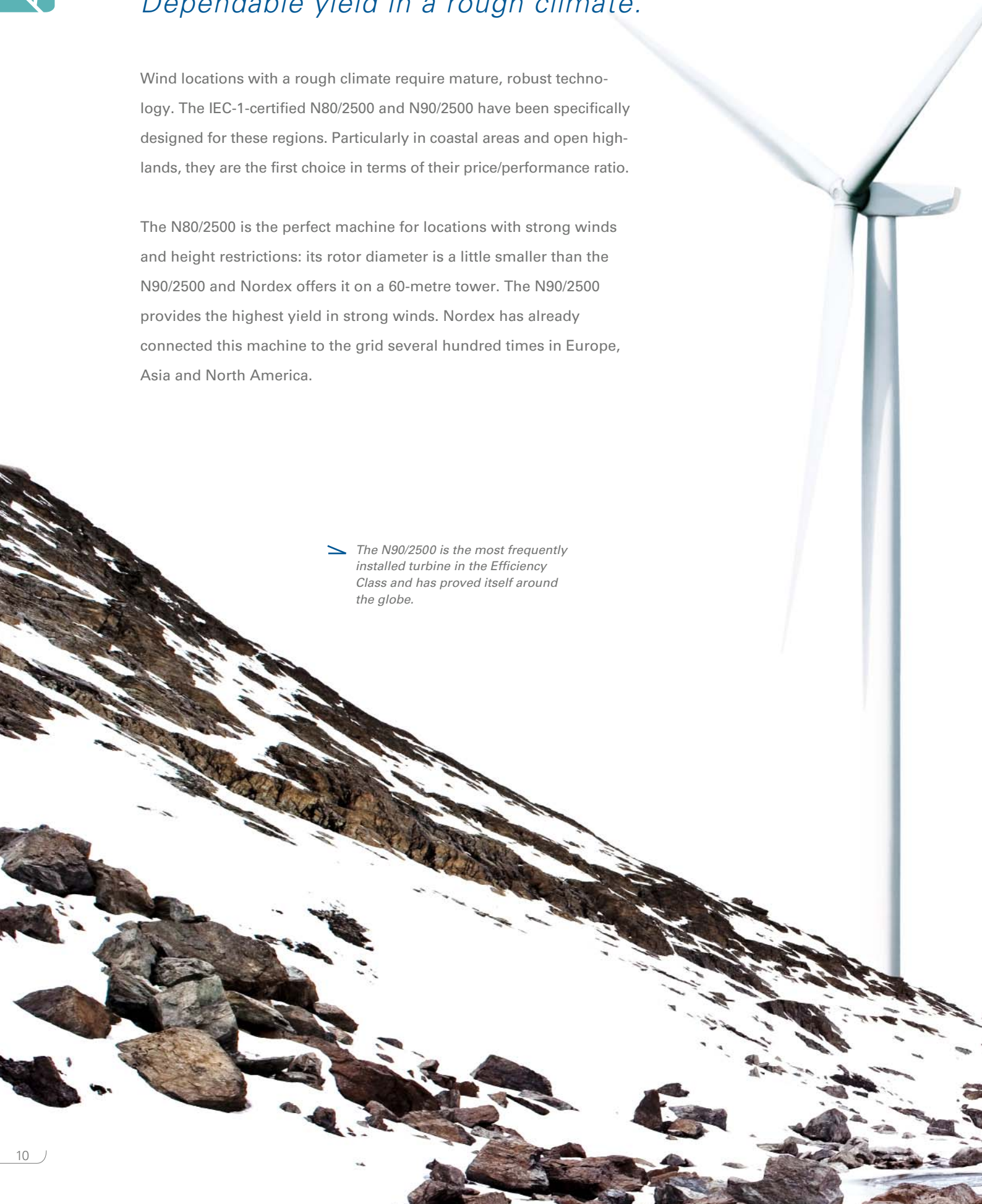
Nordex manufactures the nacelle and hub module in line. This means that the company not only sets the highest industrial standards, but focuses on optimum product quality. Many steps in the assembly process are performed in the protected production hall - a key prerequisite also for the efficient installation of the turbines at the wind farm.

An eye for detail: in the laboratory Nordex checks the materials for the rotor blade.

SOLUTIONS FOR STRONG WIND
Dependable yield in a rough climate.

Wind locations with a rough climate require mature, robust technology. The IEC-1-certified N80/2500 and N90/2500 have been specifically designed for these regions. Particularly in coastal areas and open highlands, they are the first choice in terms of their price/performance ratio.

The N80/2500 is the perfect machine for locations with strong winds and height restrictions: its rotor diameter is a little smaller than the N90/2500 and Nordex offers it on a 60-metre tower. The N90/2500 provides the highest yield in strong winds. Nordex has already connected this machine to the grid several hundred times in Europe, Asia and North America.



The N90/2500 is the most frequently installed turbine in the Efficiency Class and has proved itself around the globe.

FACTS AND FIGURES

	N80/2500 IEC I	N90/2500 IEC I
Operating data		
Rated power	2,500 kW	2,500 kW
Cut-in wind speed	3 m/s	3 m/s
Cut-out wind speed	25 m/s	25 m/s
Rotor		
Diameter	80 m	90 m
Swept area	5,026 m²	6,362 m²
Speed	10.8 - 18.9 rpm	10.3 - 18.1 rpm
Tip speed	80 m/s	75 m/s
Speed control	Variable via microprocessor	Variable via microprocessor
Overspeed control	Pitch angle	Pitch angle
Gearbox		
Construction	Combined spur/planetary gear or differential gearbox	Combined spur/planetary gear or differential gearbox
Generator		
Construction	Double-fed asynchronous generator	Double-fed asynchronous generator
Cooling system	Liquid/air cooling	Liquid/air cooling
Voltage	660 V	660 V
Grid frequency	50/60 Hz	50/60 Hz
Control		
Control center	PLC controlled	PLC controlled
Grid connection	Via IGBT converter	Via IGBT converter
Distance control	Remote controlled surveillance system	Remote controlled surveillance system
Brake system		
Main brake	Pitch angle	Pitch angle
Secondary brake	Disk brake	Disk brake
Lightning protection	Fully compliant with EN 62305	Fully compliant with EN 62305
Tower		
Construction	Tubular steel tower	Tubular steel tower
Rotor hub height/Certification	60 m/IEC 1a	65 m/IEC 1a 80 m/IEC 1a

Please see the Nordex website at www.nordex-online.com for the latest technical data.

SOLUTIONS FOR MEDIUM WIND
Profitable at varied locations.

For projects with moderate wind speeds Nordex offers the N100/2500 turbine. The N100/2500 is one of the machines with the highest yield at IEC 2 locations. For even more efficiency Nordex has raised the cut-out wind speed from 20 to 25 m/s.

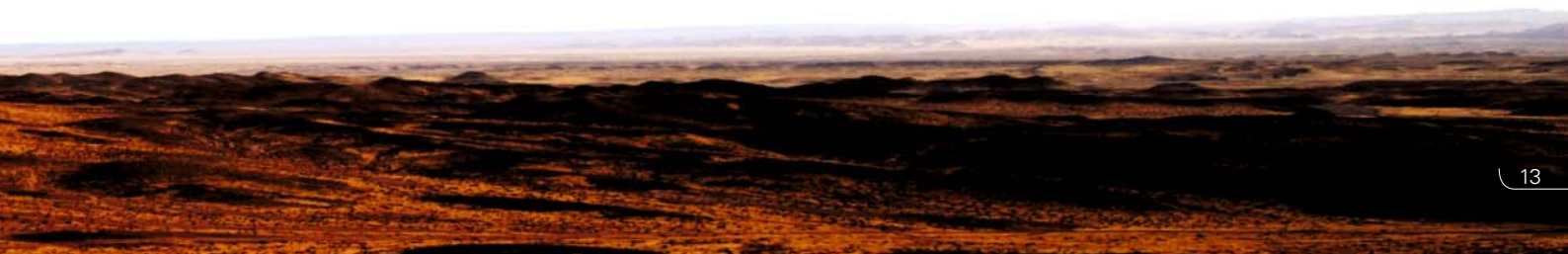
Thanks to its robust technology, the N100/2500 is ideal for wind farms in the widely different climatic conditions prevailing around the world.

The N100/2500 is one of the machines with the highest yield at IEC 2 locations.

FACTS AND FIGURES

	N100/2500 IEC II
Operating data	
Rated power	2,500 kW
Cut-in wind speed	3 m/s
Cut-out wind speed	25 m/s
Rotor	
Diameter	99.8 m
Swept area	7,823 m²
Speed	9.6 - 14.8 rpm
Tip speed	77 m/s
Speed control	Variable via microprocessor
Overspeed control	Pitch angle
Gearbox	
Construction	Combined spur/planetary gear or differential gearbox
Generator	
Construction	Double-fed asynchronous generator
Cooling system	Liquid/air cooling
Voltage	660 V
Grid frequency	50/60 Hz
Control	
Control center	PLC controlled
Grid connection	Via IGBT converter
Distance control	Remote controlled surveillance system
Brake system	
Main brake	Pitch angle
Secondary brake	Disk brake
Lightning protection	Fully compliant with EN 62305
Tower	
Construction	Tubular steel tower
Rotor hub height/Certification	75 m/IEC 2a 80 m/IEC 2a 100 m/IEC 2a

Please see the Nordex website at www.nordex-online.com for the latest technical data.



SOLUTIONS FOR LIGHT WIND
Maximum economic efficiency.

In order to make IEC 3 locations economically viable, project operators need a turbine that can exploit even low winds to the maximum. In the Efficiency Class two machines meet these requirements: the N100/2500 and the N117/2400. With a rotor sweep of 10,715 square metres, the N117/2400 is the IEC 3 turbine with the highest yield in its category. The maximum acoustic power level is 105 decibels, which means that the machine can be installed nearer to residential areas and that a wind farm can be optimally laid out in the available space.

With a capacity factor of 40 percent, the N117/2400 is the most profitable solution for light wind sites.

The rotor diameter of nearly 117 metres makes the N117/2400 the specialist for regions with lower winds.

FACTS AND FIGURES

	N100/2500 IEC III	N117/2400 IEC III
Operating data		
Rated power	2,500 kW	2,400 kW
Cut-in wind speed	3 m/s	3 m/s
Cut-out wind speed	20 m/s	20 m/s
Rotor		
Diameter	99.8 m	116.8 m
Swept area	7,823 m²	10,715 m²
Speed	9.6 - 14.8 rpm	7.5 - 13.2 rpm
Tip speed	77 m/s	72 m/s
Speed control	Variable via microprocessor	Variable via microprocessor
Overspeed control	Pitch angle	Pitch angle
Gearbox		
Construction	Combined spur/planetary gear or differential gearbox	Combined spur/planetary gear or differential gearbox
Generator		
Construction	Double-fed asynchronous generator	Double-fed asynchronous generator
Cooling system	Liquid/air cooling	Liquid/air cooling
Voltage	660 V	660 V
Grid frequency	50/60 Hz	50/60 Hz
Control		
Control center	PLC controlled	PLC controlled
Grid connection	Via IGBT converter	Via IGBT converter
Distance control	Remote controlled surveillance system	Remote controlled surveillance system
Brake system		
Main brake	Pitch angle	Pitch angle
Secondary brake	Disk brake	Disk brake
Lightning protection	Fully compliant with EN 62305	Fully compliant with EN 62305
Tower		
Construction	Tubular steel tower, hybrid tower (140 m)	Tubular steel tower, hybrid tower (140 m)
Rotor hub height/Certification	80 m/IEC 3a 100 m/IEC 3a, DIBt 2 140 m/IEC 3a, DIBt 2	91 m/IEC 3a, DIBt 2 140 m/IEC 3a, DIBt 2

Please see the Nordex website at www.nordex-online.com for the latest technical data.

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