

Vestas[®]

V164
7.0 MW

Wind. It means the world to us.[™]

Lowering the cost of energy offshore

A new era for offshore wind power

We stand on the threshold of a revolution in wind power, as the potential of the offshore wind power market is fully recognised. With the right equipment and strategy, huge returns on investment are achievable. The challenges associated with harvesting offshore wind are clear – the large scale of projects, the distance from shore, the depths of installation and safety. That's why we at Vestas, having pioneered the offshore industry since its dawn, have developed a new generation of turbines 100 per cent dedicated to offshore environments.

Technology geared towards profitability

With the launch of the 164-7.0 MW Vestas introduces design choices to drive your profitability to new levels in offshore wind.

- Maximising the amount of energy capture, not only with the huge rotor diameter of 164m, but also through an optimal rotor to generator ratio
- Reducing operations and maintenance costs by enabling customers to run fewer, larger turbines
- Reducing the scale and risk of investment required, as fewer turbines also means fewer foundations and less cabling
- Maximising your return on investment thanks to the 25 year structural design life of the V164-7.0 MW - outstanding by industry standards. This gives you a longer period to generate energy, and adds to your business case certainty.

V164-7.0 MW

takes offshore to
the next level

Wind. It means the world to us.™
Wind is all we do. We are relentlessly committed to the success of wind as a source of energy for the world, providing everything you need to succeed in your wind power ambitions.



Predictable, competitive cashflow... **together!**

Working together to maximise the value of your investment

At Vestas, the design and planning of a new wind power project always begins the same way – by listening to you, the customer, and understanding your commercial needs and how to turn them into reality.

Although the cost of the turbines typically represents approximately one third of the total capital expenditure for an offshore project, logistical decisions – such as weight, size, service access, etc. – impacts on other costs along the value chain. That's why we consider all the factors at an overall project level, rather than simply at an individual turbine level.

Business case certainty is key. Using our three decades of industry experience, we've combined proven technology and innovative engineering to design the ultimate offshore turbine.

Previous offshore turbine types have been adapted from onshore equivalents. The V164-7.0 MW is taking the full step and has been designed from the first nut to the last bolt with challenging offshore conditions in mind.

By raising the bar for the industry, we've created the most convincing financial proposition ever for offshore energy investment.

A technical revolution tailored for success

The V164-7.0 MW signifies a quantum leap forward in rotor size and energy capture. The 164m² rotor diameter offers you a swept area of more than 21,000m² - the equivalent of almost three football pitches. When it comes to profitability the bigger the swept area, the bigger the revenue.

The size of the swept area does not do it alone

In addition, we have optimised the rotor-to-generator ratio to maximise the yield, taking into account variables like:

- Wind speed
- Water depth
- Wind power plant size
- Grid capacity
- Foundation type

The V164-7.0 MW also includes various specific strategies to mitigate the risk:

- The turbine features failure-tolerant modes to run with reduced output in the event of unexpected issues arising
- Aircraft-inspired 'redundant component' policy, to avoid unnecessary interventions between scheduled servicing and ensure normal output
- We use a medium-speed gearbox for reliable operations
- All equipment and components are evolutions of proven existing technology

The resulting cash flow will make you a true leader at sea and place you at the forefront of the offshore energy revolution.



Reliable, predictable, lifetime performance

The V164-7.0 MW has been designed with two guiding principles in mind: firstly, this new generation of offshore turbines is intended to require as little maintenance as possible. Secondly, when servicing is required, it should be as safe, quick and cost efficient as possible.

This means the parts we manufacture are sturdy and engineered to the highest degree of precision, resulting in fewer unscheduled visits and less downtime. For every offshore wind power plant, we tailor a maintenance programme to suit the site's specific needs, from full-scope service agreements guaranteeing availability, to more flexible support deals. The choice is yours.

The right people and knowledge

From day one we nurture a relationship of trust and transparency with our partners. Through this relationship we channel our incomparable turbine knowledge to make your wind power plant achieve its ultimate performance. Teams of researchers, technicians and engineers spend every day working to ensure your wind power plant is as reliable and efficient as possible.

When maintenance needs arise, our global supply network ensures we supply the right tools, parts and people – on time, every time. We aim to provide maximum output for the longest period possible, increasing your profits with every day of optimum performance. This is because your investment means as much to us as it does to you.

Shrinking the onshore/offshore price gap

By narrowing the cost gap between onshore and offshore energy production, we are opening the planet's most wind-rich areas for commercial enterprise and furthering our goal of elevating wind power to the same global status as fossil fuels.

1. Partnerships with customers
2. Accurate energy output predictions
3. Cutting-edge components
4. Efficient installation
5. Failure-tolerant technology
6. Streamlined operations and maintenance

These are the six steps which underline our dedication towards making the V164-7.0 MW the new standard-bearer for offshore wind projects – Making you a leader at sea.



V164-7.0 MW

some impressive data

POWER REGULATION

pitch regulated with variable speed

OPERATING DATA

Rated power	7.0 MW
Cut-in wind speed	4 m/s
Operational rotor speed	4.8 - 12.1 rpm
Nominal rotor speed	10.5 rpm
Operational temperature range	-10 - +25°C
Extreme temperature range	-15 - +35°C

DESIGN PARAMETERS

WIND CLASS - IEC	IEC S
Annual avg. Wind speed	11 m/s
Weibull shape parameter	k 2.2
Weibull scale parameter	12.4 m/s
Turbulence intensity	IEC B
1 year mean wind speed V1 (10 min avg.)	40 m/s
50 year mean wind speed V50 (10 min avg.)	50 m/s
Max inflow angle (vertical)	0°
Structural design lifetime	25 years

ROTOR

Rotor diameter	164 m
Swept area	21,124 m ²

ELECTRICAL

Frequency	50 Hz
Converter type	Full scale converter
Generator type	Permanent magnet
Nominal voltage	33 - 35 and 66 kV

TOWER

Type	Tubular steel tower
Hub heights	Site specific

BLADE DIMENSIONS

Length	80 m
Max. chord	5.4 m

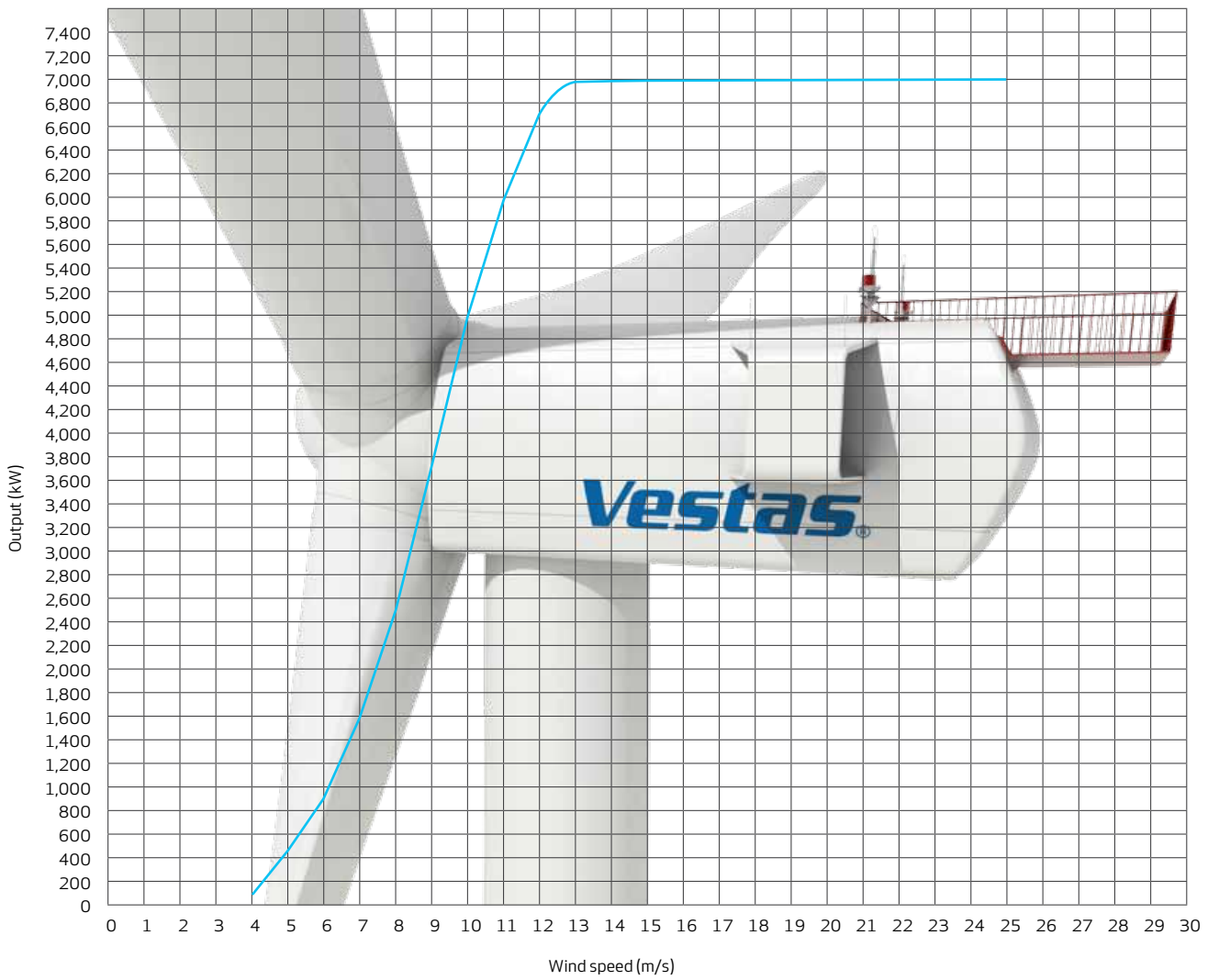
NACELLE DIMENSIONS (INCL. HUB AND COOLERS)

Height	7.5 m
Length	24 m
Width	12 m

WEIGHTS

Nacelle, including hub	390 ± 10% tonnes
Blade	35 tonnes
Tower	Site dependent

POWER CURVE FOR V164-7.0 MW



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