

# V52-850 kW

Pitch regulated wind turbine with OptiTip® and OptiSpeed™



**Vestas**



## The efficient all-round turbine opens up new opportunities

The V52-850 kW turbine improves exploitation of wind resources. Vestas has done it again. Through intensive development of the V47-660 kW model, Vestas has succeeded in creating a

new, highly efficient turbine that is ideal for all wind conditions.

The Vestas V52-850 kW turbine is a pitch-regulated turbine with a 52 meter diameter three bladed rotor. The speed of revolution of the rotor can vary from 14.0-31.4 rpm, allowing optimal energy capture at both high and modest wind speeds, while simultaneously ensuring the best possible power quality.

### Vestas OptiSpeed™\*

The V52-850 kW turbine is equipped with OptiSpeed™, a system that allows the turbine blades to rotate at varying speeds. OptiSpeed™ is a further development of the OptiSlip® system, which allowed the speed of revolution of both the rotor and the generator to vary by as much as 10%. With OptiSpeed™, the speed of revolution can vary by up to approx. 60%.

OptiSpeed™ is an efficient solution because the converter only transforms the energy from the generator rotor, which is only a small part of the total energy generated by the system. The energy generated by the generator rotor is converted back into electricity suitable for the grid by the converter.

Thanks to the converter, the need to consume reactive power from the electricity grid is eliminated. However, it is possible to adjust the turbine to supply or consume reactive power, if required.

In short: OptiSpeed™ optimises energy production, especially in modest winds, making it easy to adapt the operation of the turbine to the parameters of the electricity grid.

## Lower sound level

Sound levels are of crucial importance when deciding on the placement of wind turbines in populated inland areas – often at locations where wind speeds are low. Thanks to the low speed of revolution of the V52-850 kW turbine in modest wind speeds, Vestas has taken yet another important step towards fulfilling requirements for a wind power solution with a low sound level. The OptiSpeed™ feature makes it possible to program the turbine sound levels before installation so the operation of the turbine is tailored to the specific characteristics of the chosen location.

### Optimal pitch with OptiTip®

As with all other Vestas turbines, the V52-850 kW model is equipped with microprocessor-controlled OptiTip® pitch regulation, which ensures continuous and optimal adjustment of the angles of the blades in relation to the prevailing wind. The OptiTip® and OptiSpeed™ systems make it possible to optimise the solution to the often contradictory requirements for high output and low sound levels, depending on the location.

### Lightning protection

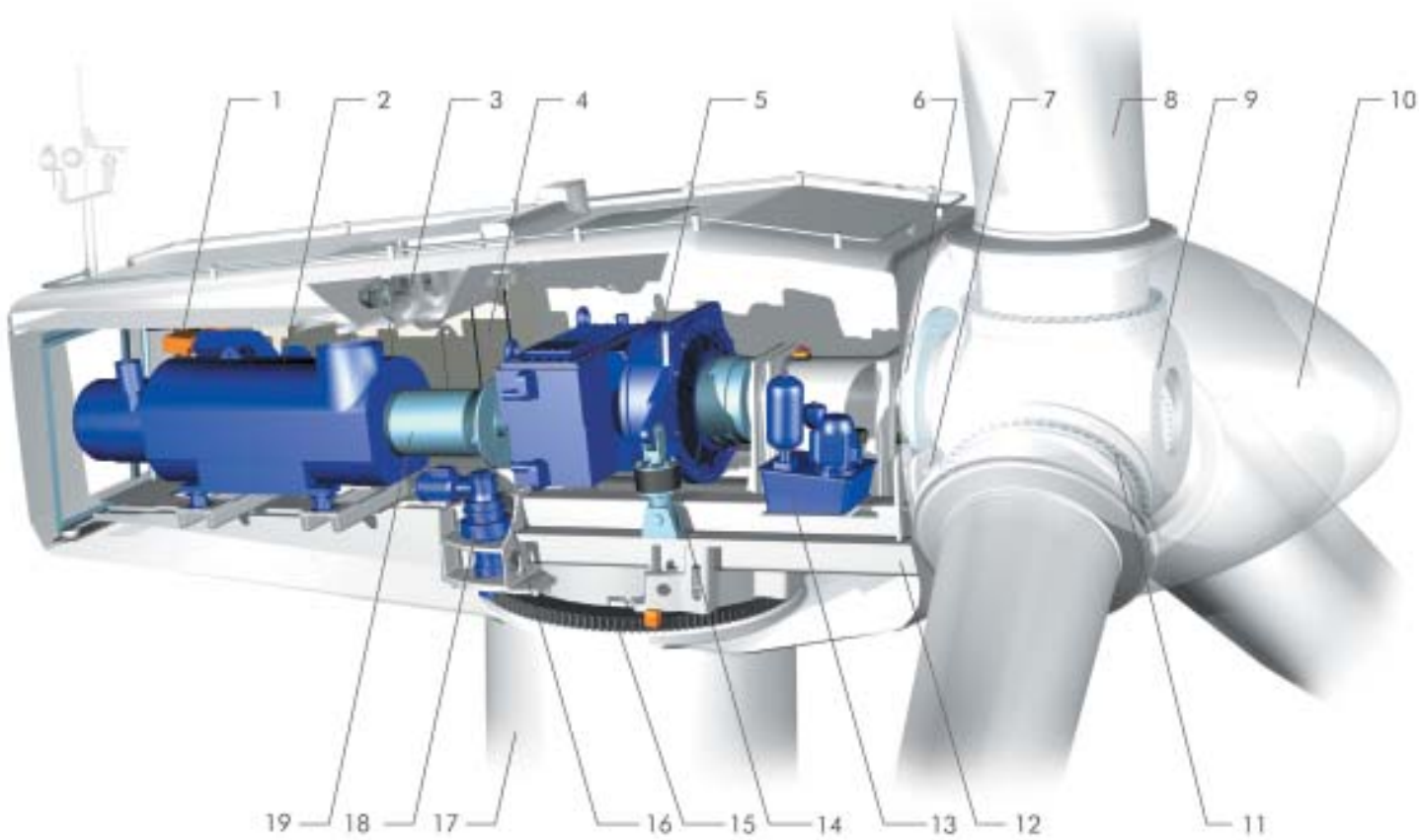
Naturally, the V52-850 kW model is equipped with Vestas Lightning Protection, to protect the entire turbine from the tips of the blades to the foundation. The turbine has, of course, also been thoroughly tested and fully conforms with the applicable IEC standards.

### Proven Performance

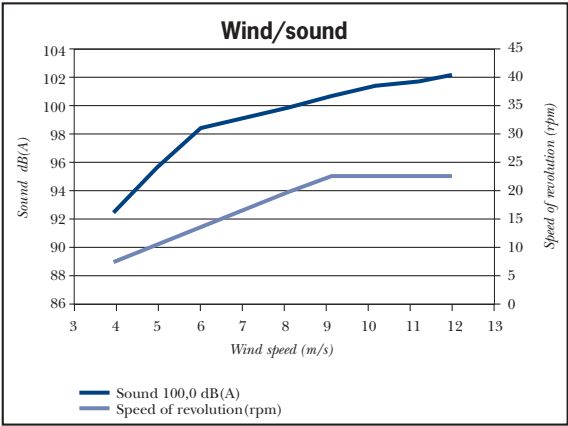
We spend many months testing and documenting the performance of the Vestas turbines. When we are finally satisfied, we run one last check by allowing an independent organisation to verify the results. This is standard practice at Vestas – a procedure we call Proven Performance. It is our guarantee that your Vestas turbine meets the very highest requirements for energy production, availability factor, power quality and sound levels.



\* Vestas OptiSpeed™ is not available in the USA and Canada



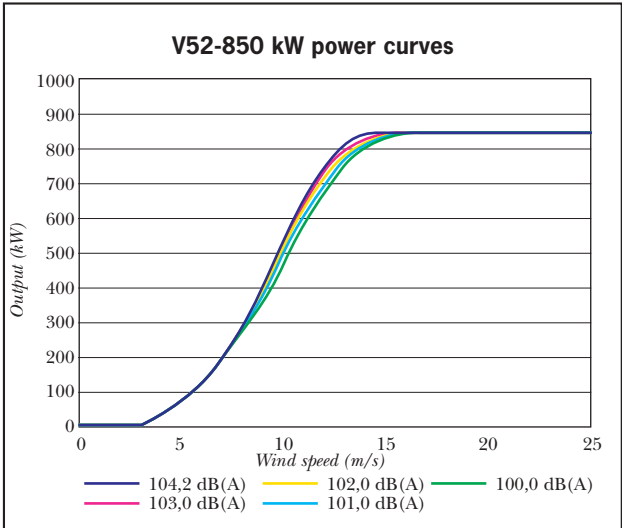
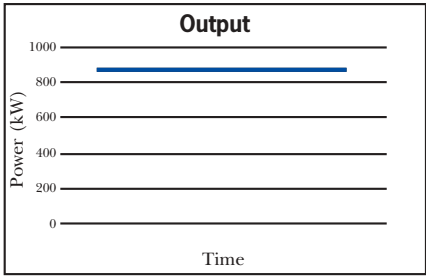
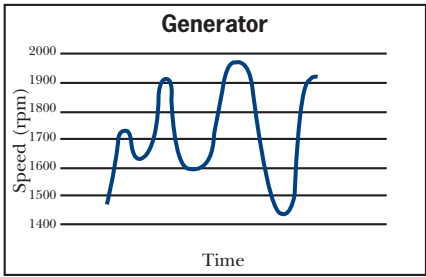
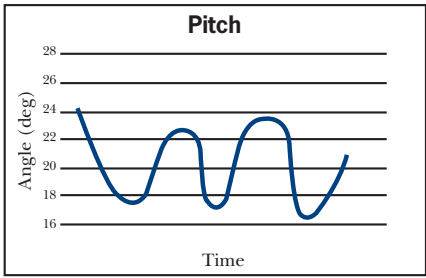
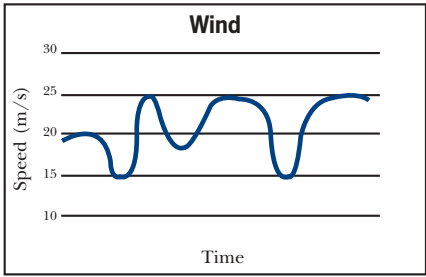
- |                                      |                             |
|--------------------------------------|-----------------------------|
| 1. Service crane                     | 10. Spinner                 |
| 2. OptiSpeed™ generator              | 11. Blade bearing           |
| 3. Cooling system                    | 12. Machine foundation      |
| 4. VMP-top controller with converter | 13. Hydraulic unit          |
| 5. Gearbox                           | 14. Gear torque arm         |
| 6. Main shaft                        | 15. Yaw ring                |
| 7. Rotor lock system                 | 16. Brake                   |
| 8. Blade                             | 17. Tower                   |
| 9. Blade hub                         | 18. Yaw gear                |
|                                      | 19. Composite disc coupling |



The figure illustrates the relationship between wind and sound levels as well as wind and speeds of revolution for turbines equipped with OptiSpeed™. It clearly shows the sound level advantages of lower speeds of revolution because the turbine's measured sound level at the lowest level is approx. 7 dB(A) lower at 4 m/s than at 8 m/s. For other sound levels, the advantage is up to 10 dB(A). It should also be noted that a decrease of 3 dB(A) is considered to decrease the sound level by half.

<b>Rotor</b>							
Diameter:	52 m						
Area swept:	2,124 m <sup>2</sup>						
Speed of revolution:	26 rpm						
Operational interval:	14.0-31.4 rpm						
Number of blades:	3						
Power regulation:	Pitch/OptiSpeed™						
Air brake:	Feathered						
<b>Tower</b>							
Hub height (approx.):	40 - 44 - 49 - 55 - 60 - 65 - 74 m						
<b>Operational data</b>							
Cut-in wind speed:	4 m/s						
Nominal wind speed:	16 m/s						
Stop wind speed:	25						
<b>Generator</b>							
Type:	Asynchronous with OptiSpeed™						
Nominal output:	850 kW						
Operational data:	50 Hz 690 V						
Type:	Asynchronous with OptiSpeed™						
Nominal output:	850 kW						
Operational data:	60 Hz 690 V						
<b>Gearbox</b>							
Type:	1 planet step/2-step parallel axle gears						
<b>Control</b>							
Type:	Microprocessor-based monitoring of all turbine functions as well as OptiSpeed™ output regulation and OptiTip® pitch regulation of the blades.						
<b>Weight (IEC IA/IEC IIA)</b>							
	40 m	44 m	49 m	55 m	60 m	65 m	74 m
Tower:	39 t/-	43 t/-	51 t/-	58 t/-	70 t/-	77 t/-	-/95 t
Nacelle:	22 t	22 t	22 t	22 t	22 t	22 t	22 t
Rotor:	10 t	10 t	10 t	10 t	10 t	10 t	10 t
Total:	71 t/-	75 t/-	83 t/-	90 t/-	102 t/-	109 t/-	-/127 t

**Vestas V52-850 kW turbine with OptiSpeed™**



OptiSpeed™ allows the speeds of revolution of both the rotor and the generator to vary by approx. 60%. This reduces fluctuations in the grid system as well as minimises the loads on the vital parts of the turbine.

The sound output level can be adjusted by varying the speed of revolution and the pitch angle of the turbine as illustrated in the figure below. In practice, this means that the sound level recorded at a distance of 300 m (hub height 49 m), for example, can be reduced from 45.0 to 40.8 dB(A).

# Efficient in all areas



Good, stable wind conditions are often found in unobstructed areas and close to the coast. However, there are many complex wind sites with high energy production potential. In developing the V52-850 kW turbine Vestas has recognized the need to make better use of the wind in these more demanding areas.

Vestas OptiSpeed™ and the pitch system reduce the disadvantages of the high and often unstable winds. Even at times with low

wind, this versatile turbine will still achieve optimal output, as Vestas OptiSpeed™ allows the speed of revolution to vary by as much as 60%.

In addition to this, the V52-850 kW model is designed to work with the weak grid conditions often found in remote locations.

The V52-850 kW turbine is an all-round turbine that condenses Vestas' extensive experience into a highly efficient turbine

design. In short, the V52-850 kW model is efficient under all conditions.

Vestas is continuing to strive for excellence by taking firm steps towards full exploitation of the resources of the wind.



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*With quality and care  
we use the wind to create competitive and  
environmentally friendly energy*



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