600 kW Mk IV

The Bonus 600 kW Mk IV wind turbine is the most recent model in the well-known 600 kW series from Bonus. In the Mk IV version, the nacelle and shaft arrangements have been adapted to the concept, developed for the Bonus 1 MW turbine. The rotor and generator systems are similar to the systems of the earlier Mk III version, thereby providing the same high performance.

Rotor

Like all other turbines from Bonus, the 600 kW Mk IV is a three-bladed, stall regulated machine. This concept is simple, reliable and efficient, and the application of recent, aerodynamic advances offers an attractive combination of low noise and high output.

The blade tips act as aerodynamic brakes and are turned perpendicular to the direction of rotation if the turbine must be switched off.
The blade tips are fitted with lightning protection, substantially reducing the risk of damage in case of a direct hit.

Machine Design

The Bonus 600 kW Mk IV has the most recent type of machine arrangement developed by Bonus. The nacelle bedplate is a one-piece steel structure with no welds. The main shaft is long, thereby reducing the reaction forces on the nacelle structure, and the reaction supports are located symmetrically around the tower axis. The result is a simple, rugged, and attractive machine structure.

The transmission system consists of a three-stage planetary/helical gearbox and a two-speed, asynchronous generator. Gearbox cooling is provided by a separate oil cooler, and the generator has a special air cooling system, combining generator and nacelle ventilation with an efficient exhaust silencer. Both the low speed and the high speed windings of the generator have been optimized to provide maximum efficiency at low and medium power levels.

The turbine has two independent safety systems, the aerodynamic brakes and a mechanical disk brake. Both systems are fail-safe, and each system is capable of shutting down the turbine even in the unlikely situation that the other system should fail. The disk brake has two-level braking, using a moderate torque for ordinary stops and a high torque for emergency situations only.

Features which have been characteristic for Bonus for years are applied in the 600 kW Mk IV turbine also: Consistent attention to noise control, a heavy-duty structure with ample design margins, and a uniform high level of quality maintained throughout the machine, from the overall concept to minute details.

Controller

The 600 kW Mk IV turbine has a microprocessor control with liquid crystal display and a portable hand terminal. All controller activities for operation, service and statistics are provided both at the tower base and in the nacelle.

Optional remote monitoring is Windows-based and offers operational status, statistics and changes of operating parameters from the owner's facilities.

Tower

The 600 kW Mk IV turbine is mounted on a tubular steel tower. Internal tower platforms are spaced sufficiently close to allow ascent without additional safety harness (under typical European safety regulations).

Rotor

Rotor diameter	44 m
Swept area	1520 m²
Rotor speed	18/27 rpm
Power regulation	Stall
Blade length	19 m
Blade type	LM 19.1

Generator

Type	Asynchronous
Nominal power	120/600 kW
Speed	1000/1500 rpm
Voltage	690 V
Protection	IP 54
Supplier	ABB

Transmission

Gearbox type	Planetary/helical
Gearbox supplier	Flender

Brake Systems

Air brakes	Pivoting tips
Mechanical brake	Dual disk brake
Activation	Fail-safe (both)

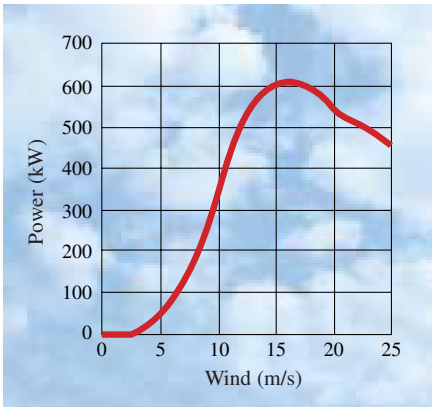
Tower

Type	Conical, tubular
Hub Heights	35 - 60 m
Corrosion protection	Painted

Noise

Noise level (8 m/s, 10 m)	<100 dB
Tonal penalty	None (Joint Nordic Method)

Power Curve



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