

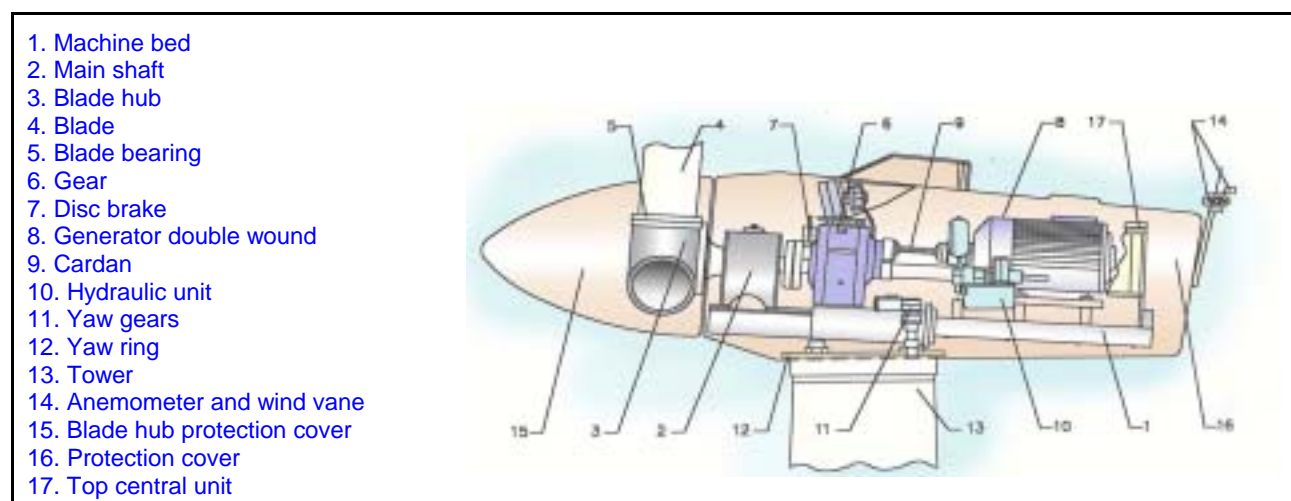
ACSA - A27/225 kW WINDTURBINE

ACSA- A27/225kW Windturbine is a further development of similar windturbines based on the knowledge derived from their exploitation. On this model, the pitch regulation is now even more sensitive and finely tuned, to exploit the advantages that this power system gives, that are detailed below:

- Superior regulation of the max. output of 225kW.
- Smoother coupling-in of the generator.
- Start-up without the motor.
- Less load on the whole construction.
- Braking effected without using the mechanical brake.
- Optimum production under all wind conditions

ACSA -A27/ 225kW Windturbine is described in detail under the following headings:

- | | | | |
|---------------------------|--------------|---------------------|----------------------|
| 1.- Machine structure. | 3.- Nacelle. | 5.- Braking system. | 7.- Safety features. |
| 2.- Tower /lattice tower. | 4.- Blades. | 6.- Cables. | 8.- Control unit. |



1. MACHINE STRUCTURE

The windturbine machine is constructed on a heavy-duty machine bed (1) made of profile tubes and plate in order to concentrate all welding joints in the areas with the lowest load.

The forged main shaft (2) is supported by two spherical roller bearings fitted in their particular cast casings, and joint to a carrying pipe, absorbing both radial and axial forces from the rotor. From experience we know that this design feature ensures an exceptionally large greased area around the shaft and the bearings and thus provides a long and trouble-free service life.

The cast blade hub (3) is bolted onto the main shaft; this hub supports the blades and contains the rolling mechanism.

Each blades (4) is bolted by a blade bearing (5) on to the rotor axle box which ensures that they can easily be turned around their own axis thanks to a moment arm mounted at the pitch mechanism.

A two-stage gearbox (6) with parallel shafts is installed at the rear end of the main shaft. The gear support bracket, which transports moment reactions to the front part of the machine bed, has been designed to ensure equal load impact on both sides. There is an oil refrigeration system over the gearbox.

The disc brake (7) is fitted to the high-speed shaft of the gearbox, and it features two hydraulic disc brake calipers and non-asbestos brake pads.

The generator (8) is driven by a shaft from the gearbox through a cardan (9) with a clutch. The generator has two speeds, 1008 rpm and 760 rpm. By using a doubled wound generator the advantages of the two-generator operation are used without having the usual disadvantages, i. e. a considerable loss of ventilation

The hydraulic unit (10) feeds the brake and the pitch regulation mechanism. The generator and the hydraulic unit are mounted on the rear part of the machine bed. Yawing is done by two electrically driven yaw gears (11) installed on the front part of the machine bed. The gears mesh with the yaw ring (12) bolted on the top of the tower (13). The yawing is controlled by an electronic wind vane (14) and is secured against cable twist via the security device. The blade hub protection cover (15) and the protection cover (16) are made of fiberglass reinforced polyester.

From experience the machine structure ensures a compact and efficient windturbine driven by the top control panel (17), with easy access for service and maintenance. In the long run this ensures low operating costs.

2. TOWER

ACSA- A27/225kW Windturbine is available on white painted, steel cone-shaped tubular tower, corrosion resistant or on steel galvanized lattice.

The yaw ring, on which the machine bed is embedded with slide blocks, is mounted on the tower in such a way that access to the nacelle takes place through the yaw ring and a man hole in the front part of the machine bed.

Lamps and power points are installed in the tower as well as an inside ladder, resting and protection platforms and safety cable, also installed in the ladder of the lattice tower.

3. NACELLE

The windturbine's nacelle is covered with a shield which protects the machine components against the environment and reduces the noise. At the same time it allows for sufficient cooling of gear and generators.

The upper part of the shield can be opened to both sides and thus allow for service personnel to stand up in the nacelle and for components to be hoisted in and out, being unnecessary taking the windturbine to the floor. A lamp is installed in the nacelle.

A door in the front end of the shield provides access to the blade hub and the blade bearing.

4. BLADES

The blades are made from fiberglass reinforced polyester (GFRP). The shells are made in a light sandwich construction and are mounted on a supporting closed beam fitted at the root end with 30 embedded special threaded bushings.

The blades are designed and manufactured with a view to optimum balancing of the requirements for efficient wind utilization and minimum load on the windturbine as well as long and troublefree operation.

5. BRAKING SYSTEM

The Windturbine is equipped with two independent systems, both of which, independently, can stop the turbine.

In all normal stop situations only full-feathering of the blades is used. This causes a controlled braking of the turbine with minimum loads on the whole construction.

In very critical situations (emergency stop) the hydraulic disc brake is used together with full-feathering of the blades.

In case of overspeed on the rotor and simultaneous faults on the controller, a monitor independent of the controller will stop the turbine.

6. CABLES

The Windturbine is equipped with the necessary and sufficient wires and cables for connection to the turbine's control unit at the base of the tower.

The public grid cables are connected to the controller's outlets and are not included in the delivery.

7. SAFETY FEATURES

All ACSA- A27/225kW Windturbine safety features meet the safety norms for this kind of resorts, been aimed to avoid any harm to people or the commonwealth.

8. CONTROL UNIT

A microprocessor-based control unit monitors and controls all critical functions of the turbine, including the pitch regulation, in order that the performance of the turbine is optimum at any windspeed. The controller displays data on the current operation and performance of the windturbine.

The generators are coupled in via thyristors, whereas operation takes place via contactors.

The controller is designed to allow remote monitoring and control in case these features are required. These features are not included in the delivery.



MAIN DATA

Rotor:

Diameter	27 m
Swept Area	573 m ²
V _{nom} main generator	43 rpm
V _{nom} small generator	32 rpm
Rotary direction	Clockwise (front view)
Power regulation	Pitch
Number of blades/length	3 / 13 m
Blade material	Fiberglass reinforced polyester (GFRP)
Aerodynamic brakes	Full-feathering of blades
Blade profile	NACA 63-200
Hub height	31,5 m

Operational data:

Start –up wind speed	3,5 m/s
Cut-out wind speed	25,0 m/s
Nominal output achieved at	13,5 m/s

Tower:

Type 1	Cone-shaped, tubular tower
Accessories	Foundation section
Surface	Painted/ metallized
Height	30 m
Type 2	Lattice tower
Accessories	Bolts
Surface	Galvanized
Height	30 m

Generator:

Type: Double wound-Asynchronous	6 pole8 pole
Output	225 kW 50 kW
Current	400 A100 A
Voltage	
400 Vca	400 Vca
Frequency	50 Hz50 Hz
Cos phi	0,810,72
Coupling	Triangle Triangle
Insulation classification	FF
Protection classification	IP54IP54
Temperature protection	PT 100PT 100
Rotations	1008 rpm760 rpm
Manufacturer: SIEMENS, ASEA, ABB or similar.	

Phase compensation:

Installed reactive output	87,5 kVAr 25,0 kVAr
Resulting cos phi	0,940,91
Resulting current	345 A80 A

Gear:

Type	2 speed, parallel shafts
Ratio	1 : 23
Nominal effect	433 kW
Oil volume	70 l
Manufacture	HANSEN, FLENDER o similar

Yaw system:

Type	Active yawing
Control	Windvane
Speed	0,6 degr/sec

Yaw motor:

Type	Asynchronous
Rotation speed	950 rpm

Yaw Gear:

Type	Worm gear/planetary gear
Nominal moment	2 x 5500 Nm
Manufacture	BONFIGLIOLI, or similar

Windvane and Anemometer:

Type	Optoelectrical
Manufacture	VESTAS, or similar

Hydraulic Station:

Type	Gear pump
Capacity	4,2 l/min a 100 bar
Max system pressure	100 bar
Oil volume	30 l
Manufacture	VICKERS SYSTEMS, or similar

Control Unit:

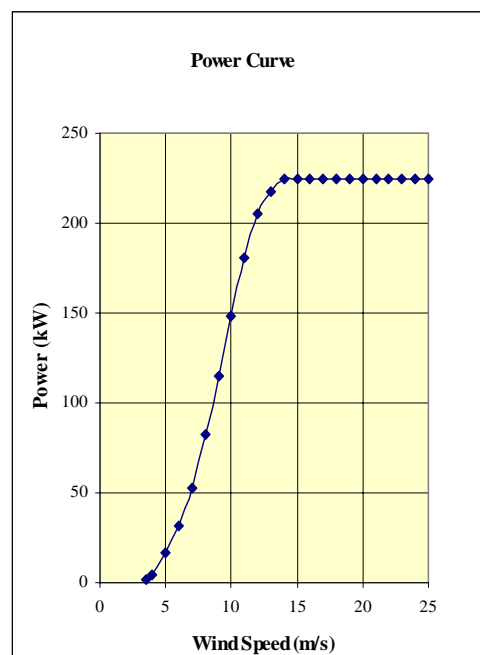
Type	Multi Processors (VMP)
Manufacture	VESTAS

Weight:

Tubular tower	12.000 kg
Nacelle	7.900 kg
Rotor	2.900 kg

POWER CURVE

The power curve below is based on an air density of 1,23 kg/m³.



DELIVERY

The windturbine, as described above, is delivered assembled, erected and commissioned in automatic operation, without the necessary public utility electric grid connection that will be detailed below.

ELECTRIC INSTALLATION

Location of the control unit cabinet:

The control unit cabinet, made in corrosion resistant metal, is placed in the base of the tower and thus well protected against the weather. Its dimensions are:

- Height 2.000 mm
- Width 1.000 mm
- Depth 400 mm

Connection to the utility grid:

Connection to the public utility grid is done via copper cables or aluminum cables. The service cable to the grid must be dimensioned for minimum 450 A and must feature a 500 A fuse. Cable dimension depends on length and material; the terminals in the control unit cabinet are copper with a possibility of connection of cables shoes with 12 mm holes.

Earthing:

The turbine and the controller must be earthed by 50 mm² cables and earthing rods. The maximum resistance of the system must be under 10 Ohm.

Tower lightning:

The control panel has a power point (10 A, 220V) for light supply in the tower and tower power.

Meter arrangement:

In many cases the meter arrangement can be placed with the controller, but in each case it should be discussed with the electricity supply company, usually installed near the transforming station..

Responsability:

ACSA emphasizes that the main connections of the control unit cabinet is the responsibility of the manager/ electrician in question, and that it is not included in the delivery, unless opposed specification.

Foundation:

ACSA supplies standard drawings and the necessary instructions to build the standard foundation as well as the special foundation if they were not included in the delivery.

The geo-technical studies of the soil and the special foundation calculations are not included in the delivery.

APPROPRIATE ACCESS ROAD

It is a condition for the delivery, that appropriate access road to the erection site is established. This access road should allow the entrance of heavy transports, concrete mixers and heavy cranes, all of them necessary for the assembling.

All costs in this connection are on the buyer's account, both the access roads and the working platforms for the assembling. This applies during the subsequent warranty and service period.

WARRANTY

ACSA supplies two (2) years warranty against faults and defects in design and materials provided that the turbine is used according to its purpose and according to ACSA's instructions for use, service and maintenance, ever been done by ACSA or any other ACSA's homologued company.

TECHNICAL SERVICE

Included in the delivery is one (1) free service check during the two year warranty period.

Consumption of normal wearing parts and lubricants is not included in the delivery.

ACSA offers service and maintenance contracts after expiry of the warranty period.

INSURANCE

A deal insurance can be obtained with well-known insurance companies in order to assure the management and exploitation of the windturbine, including the warranty of the production. ACSA will be disposed to give advice about it. The insurance is not included in the delivery.

Special remark: due to the continuous development and improvement of our products, all the specifications related above are subjected to changes without notification.

