

Technical Description

Shriram 250 T Wind Electric Generator 250 T Technical Data



ROTOR

Diameter	28.5 m
Area of swept circle	638 sq.m
Speed (rated) High/Low	39.8/26.5 rev/min.
Speed (max.)	46 rev/min.
Number of blades	3
Shaft inclination	6 degree
Alignment	Up wind
Rotation	Clockwise viewed from front.

ROTOR BLADES

Material	GRP
Weight of blades	750 kg. each
Performance regulation	Stall effect
Profile	NACA/WORTMANN
Width: Base	1255 mm approx
Tip	450 mm approx
Twist	28 degrees

GEAR

Type	Planetary gear
Ratio	1:38.17
Cooling	Oil in sump-splash 250 lts. storage in Nacelle Pump circulation

GENERATOR

Type	Asynchronous
Pole changing	4/6
Rated output	250 / 80 kw
Main voltage	400 V \pm 10%
Frequency	50 HZ \pm 5%

HYDRAULIC POWER PACK

Operating Pressure	145 bar
Sump capacity	7 lts.
Pump Capacity	2.6 lts./min.

OPERATING SYSTEMS

Electrical by thyristor regulation

BRAKING SYSTEM

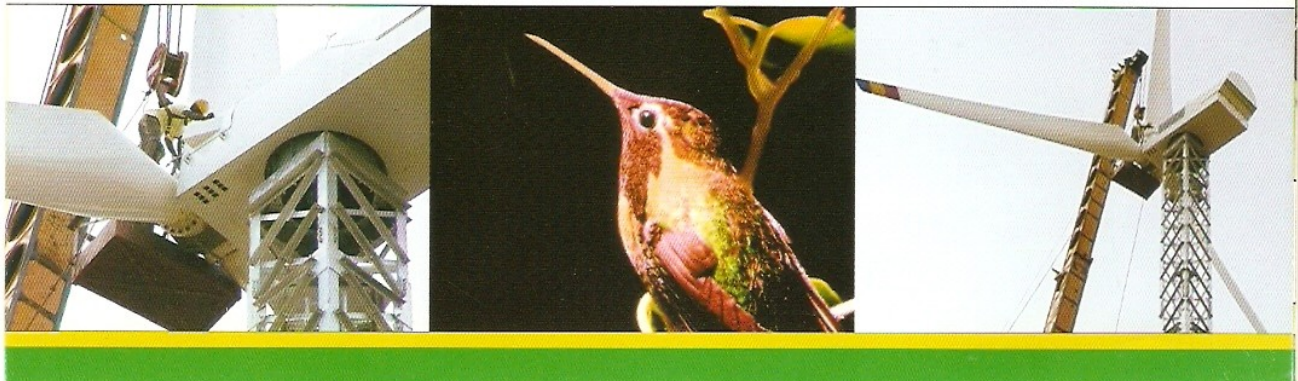
Brake disc (slow-speed side) 2 brake calipers	Spring actuated hydraulically released
Brake disc (high-speed side) 1 brake caliper	Spring actuated hydraulically released
Brake disc (YAW)	1. Spring actuated hydraulically released 2. Damper constantly applied - spring actuated

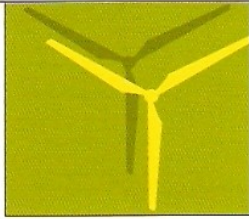
TOWER

STRUCTURE

Construction	Bolted
Corrosion Protection	Hot dip galvenised
Height of tower	40 m / 48.5 m
Hub height	41.5 m / 50 m
Access to nacelle	From inside by ladder
Special coatings can be provided on specific request.	

LATTICE





DESIGN DATA

Rotor output	250 kw
Rated wind speed	14 m/s
Wind speed - cut in	3.5 m/s
Windspeed - cut out	23 m/s
Survival wind speed	58 m/s
Max. output coefficient	CP max : 0.44

ELECTRICAL EQUIPMENT

Switch cabinet containing the control and safety electronics housed in the base in a separate control room.

REGULATION SYSTEM

Performance regulation	- aerodynamical by stall effect - cut-in wind regulation by thyristor regulator.
Following wind direction	Servo motor (worm gearing & Planetary gearing)

WEIGHTS

	LATTICE	
	40 m high	50 m high
Complete Nacelle	10,500 kg	10,500 kg
Tower & Stub	23,100 kg	32,800 kg
Rotor Blade	2,250 kg	2,250 kg
Total Machine	35,850 kg	45,550 kg

DESIGNED SERVICE LIFE

For the complete plant 20 years

FOLLOWING WIND DIRECTION (YAWING)

Sensor	Wind Vane
Drive	Motor
Reduction	Worm & Worm Gear and 2 stage planetary gear reductron. Final pinion on yaw ring gear.
Reduction Ratio	1 :10000

SAFETY DEVICES

Automatic Safety Devices

1. Two independent brake equipments (brake discs) spring actuated and hydraulically released - on slow speed as well as high speed shafts.
2. One centrifugal switch to stop machine if generator over speeding
3. One slip clutch to prevent transmission of excessive torque.

Manually Operated Safety Devices

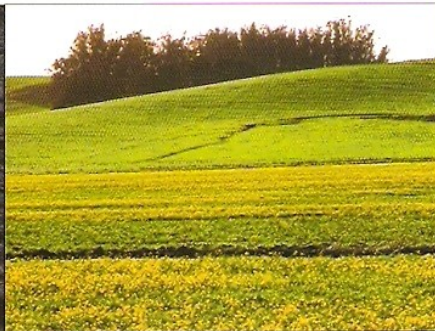
1. Turning the rotor off the wind (manual control).
2. Emergency Stop Switch at Nacelle & Control Panel.

TRIGGERING FACTORS

Automatic braking is initiated in the following adverse circumstances:

- Switch-off in storm conditions
- Electrical overload
- Excessive temperatures (gear box, generator)
- Shortage of lubricant (grease, cooling oil, hydraulic oil)
- Insufficient pressure in the hydraulic system
- Grid supply failure • Excessive speed of generator
- Imbalances (vibration switch)
- Brake lining wear out • Overload of motors (hydraulic, generator, lubrication pump, yaw)
- Failure of thyristor regulator

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250/80kw Nacelle Assembly

SAFETY SYSTEMS

1. Rotor Brake (Low Speed Shaft)
2. Safety Brake (High Speed Shaft)
3. Friction Clutch
4. Mechanical Centrifugal Switch
5. Mechanical Operated Hydraulic Valve

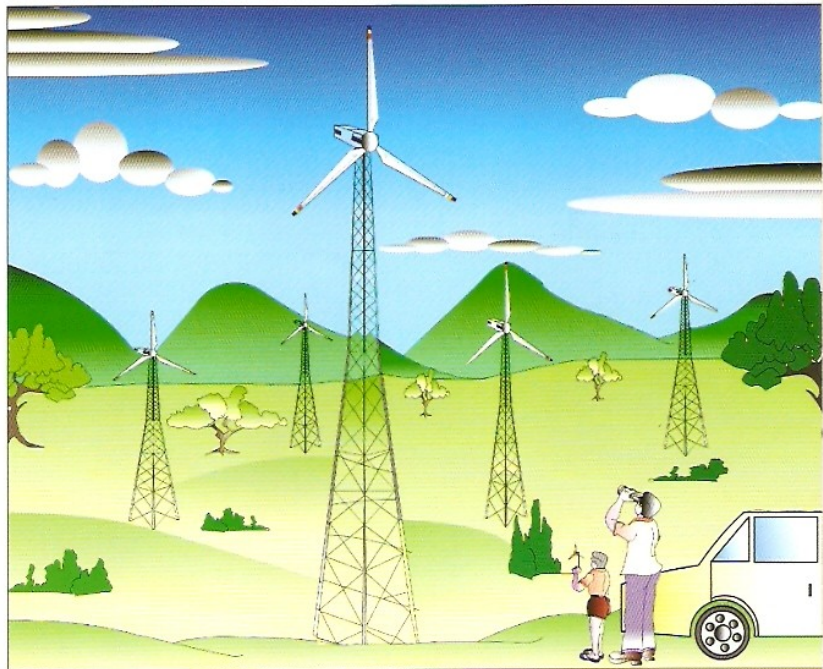
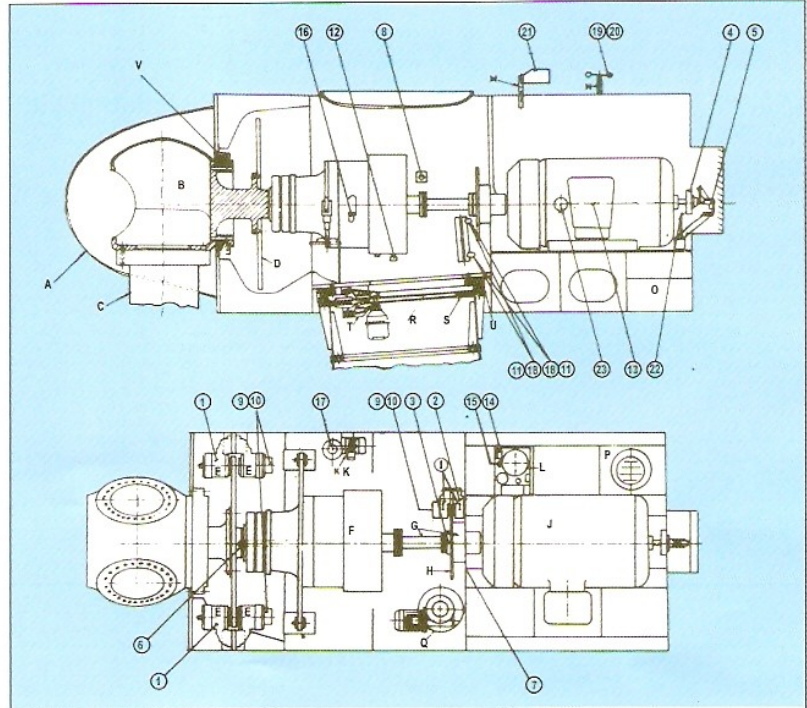
SAFETY SENSORS

6. Electronic Rotational Speed Sensor (Rotor)
7. Vibration Switch
8. Emergency Stop'in Nacelle
9. Brake Pad Safety Switch
10. Brake Pad limit Switch
11. Yaw limit Switch
12. Gear Box Overheating Switch
13. Generator Overheating Switch
14. Hydraulic Pressure Switch
15. Hydraulic Fluid Level Switch
16. Gear Box Oil Level Switch
17. Grease limit Switch of Main Bearing Grease Pump

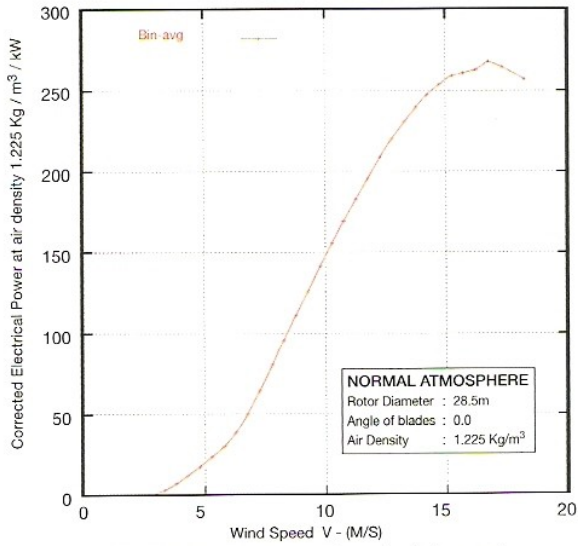
OPERATION SENSORS

18. Yaw Proximity Switch
19. Wind Speed Sensor
20. Wind Speed Sensor Stationary Heating
21. Wind Direction Sensor
22. Optical Rotational Speed Sensor
23. Generator Stationary Heating

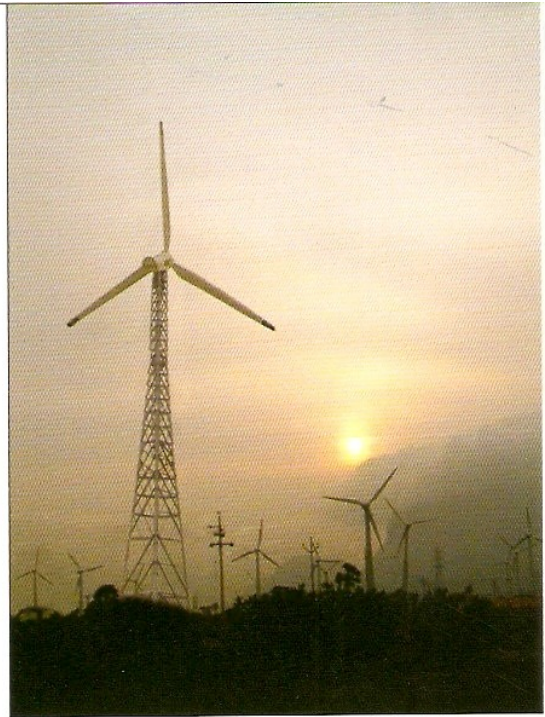
- A - Nose Cover
- B - Rotor Shaft with Hub
- C - Blade
- D - Rotor Brake Disc
- E - Rotor Brake Calipers
- F - Gear Box
- G - Slip Clutch & Intermediate Shaft
- H - High Speed Shaft Brake Disc
- I - High Speed Shaft Brake Calipers
- J - Generator
- K - Grease Pump Assembly
- L - Hydraulic Power Pack
- M - Wind Vane
- N - Anemometer
- O - Gear Box Oil Tank
- P - Cooling Oil Pump
- Q - Yaw Drive Mechanism
- R - Tower Top
- S - Yaw Brake Disc
- T - Yaw Brake Mechanism
- U - Yaw Ring Gear



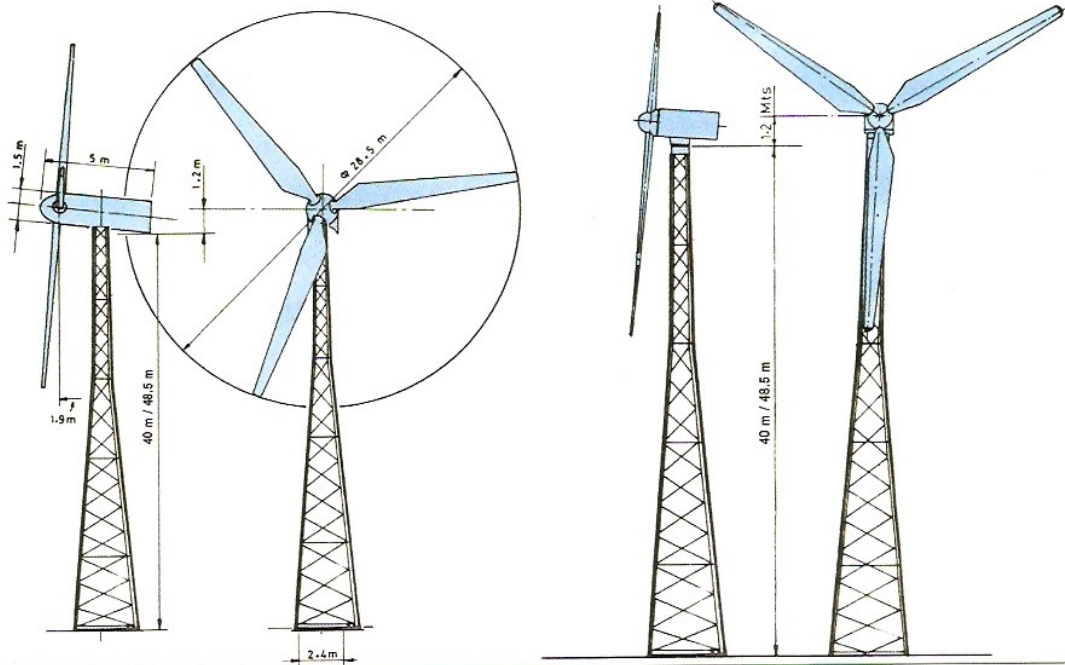
250/80kw Power Curve



Electrical power as a function of wind speed
 (data corrected for standard air density of 1.225 kg/m³)



Shriram 250 T Wind Electric Generator 250 T with Lattice Tower



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