Freen-9

Small wind turbine owner’s manual

FREEN OÜ
Registration number 14541774
VAT number EE102096378
Arenduse tn 6, Kohtla-Järve, 30328 Ida-Viru maakond, Estonia
freenindustries.com | freenwind.com | freensolar.com | **freen.com**
contact@freen.com
+372 5374 17 54

Content

FREEN OÜ
Registration number 14541774
VAT number EE102096378
Arenduse tn 6, Kohtla-Järve, 30328 Ida-Viru maakond, Estonia
freenindustries.com | freenwind.com | freensolar.com | freen.com
contact@freen.com
+372 5374 17 54

1. FREEN-9 wind turbine brief description

The Freen-9 is a small wind turbine with a rated power of 9kW, featuring a vertical-axis Darrieus rotor and low-speed operation. It is designed for households, small commercial users, and off-grid installations that require a reliable and quiet renewable energy solution capable of operating in variable and turbulent wind conditions.

The main parts of the wind turbine are the foundation, monopole or lattice tower, vertical rotor, direct-drive generator, control system and cables required for electrical power transmission and turbine control.

1. Freen-9 uses a vertical-axis rotor design that allows continuous operation independently of wind direction. This eliminates the need for a yaw system and ensures stable energy production in changing wind conditions.

2. The turbine is equipped with a direct-drive permanent magnet generator, which is a base of turbine module. This configuration removes the need for a gearbox, reduces mechanical losses, and simplifies maintenance.

3. The three aluminum blades are engineered for efficient performance at low and moderate wind speeds while maintaining structural strength and long-term durability.

4. The turbine operates at a low rotational speed, resulting in low noise emissions and reduced mechanical stress, making it suitable for installation near residential areas.

5. An integrated control and protection system continuously monitors operating conditions and provides automatic shutdown in high wind speeds to protect the turbine from overspeed conditions.

6. Freen-9 requires minimal routine maintenance, primarily consisting of periodic visual inspections and basic electrical and mechanical checks.

FREEN OÜ
Registration number 14541774
VAT number EE102096378
Arenduse tn 6, Kohtla-Järve, 30328 Ida-Viru maakond, Estonia
freenindustries.com | freenwind.com | freensolar.com | freen.com
contact@freen.com
+372 5374 17 54

2. FREEN-9 general specification

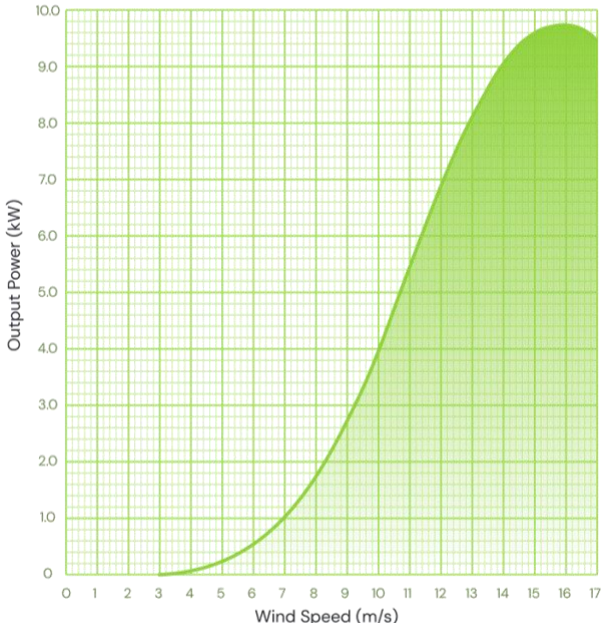
Technical Parameters

- Turbine type: **VAWT (Vertical axis wind turbine)**
- Rated power: **9 kW**
- Turbine diameter: **6 m**
- Tower height: **18 m lattice tower**
- Total turbine height: **20,6 m**
- Turbine weight: **650 kg**
- Tower weight: **2500 kg**
- Rotor type: **vertical-axis rotor**
- Number of blades: **3**
- Swept surface area: **24 m^2**
- Blade material: **aluminium**
- Generator: **PMG**
- Grid connection: **AC coupling inverter**
- Brake System: **PMG**
- Cut in wind speed: **3.5 m/s**
- Rated wind speed: **14 m/s@9 kW**
- Cut out wind speed: **17 m/s**
- Survival wind speed: **35 m/s**
- Remote Monitoring: **optional**
- Wind class: **IEC III, IV**
- Noise level at 100 m: **45 dB**

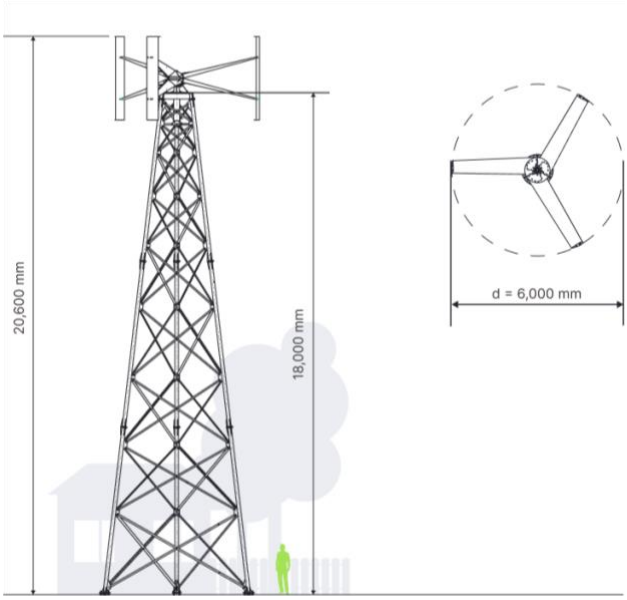
FREEN OÜ
Registration number 14541774
VAT number EE102096378
Arenduse tn 6, Kohtla-Järve, 30328 Ida-Viru maakond, Estonia
freenindustries.com | freenwind.com | freensolar.com | freen.com
contact@freen.com
+372 5374 17 54

- Surface installation area: **36 m²**
- Temperature range: **-25C° - +40C°**
- Lifespan: **20 years**

Power Output



Drawings



FREEN OÜ
Registration number 14541774
VAT number EE102096378
Arenduse tn 6, Kohtla-Järve, 30328 Ida-Viru maakond, Estonia
freenindustries.com | freenwind.com | freensolar.com | freen.com
contact@freen.com
+372 5374 17 54

Annual Energy Production

Wind speed, m/s	AEP, MWh
4,0	2780
4,5	4480
5,0	6640
5,5	9200
6,0	12000
6,5	15000
7,0	18100
7,5	21000
8,0	23700
8,5	26000
9,0	28000
9,5	29600
10,0	30900

The AEP is calculated based on the distribution of wind speed according to Rayleigh, values K=2, t=15°C, P=1013 mbar, ρ=1.225 kg/m^3

FREEN OÜ
Registration number 14541774
VAT number EE102096378
Arenduse tn 6, Kohtla-Järve, 30328 Ida-Viru maakond, Estonia
freenindustries.com | freenwind.com | freensolar.com | freen.com
contact@freen.com
+372 5374 17 54

3. FREEN-9 scope of delivery

Wind turbine scope of delivery		
Item	Quantity	Description
Tower set	1 set	A set of tower components
Power generator and cable set	1 pc	Power generator, bolts and washers; hanging cables, one side connected to the generator, other side for connection to control cabinet on the foundation.
Turbine module set	1 pc	A set of wind turbine components - central rotor hub, upper blade support arms, lower blade support arms, vertical rotor blades, blade mounting hardware (bolts, nuts, washers
Control panel set	1 pc	Control cabinet with turbine control module and inverter. Set of keys for panel door.
Documentation	1 set	Owner´s manual

FREEN OÜ
Registration number 14541774
VAT number EE102096378
Arenduse tn 6, Kohtla-Järve, 30328 Ida-Viru maakond, Estonia
freenindustries.com | freenwind.com | freensolar.com | freen.com
contact@freen.com
+372 5374 17 54

4. Safety system

The main danger to the turbine is rotor over speed.

This turbine is protected by dump load safety system:

The control system continuously monitors operating parameters: rotor speed, wind speed and grid status.

The wind turbine will be automatically disconnected from the grid, and the dump load activates in case of:

1. Output voltage on the generator is higher than 350V
2. Wind speed is higher than 18m/s
3. Grid failure

The dump load (brake resistors) dissipates electrical energy from the generator and reduces rotation speed.

FREEN OÜ
Registration number 14541774
VAT number EE102096378
Arenduse tn 6, Kohtla-Järve, 30328 Ida-Viru maakond, Estonia
freenindustries.com | freenwind.com | freensolar.com | freen.com
contact@freen.com
+372 5374 17 54

5. Control system

Energize the system by switching ON the power supply at the grid connection point and power up the turbine control system.

Following is the short introduction to the control display of the turbine.

The Freen-9 wind turbine is equipped with the GT-PCTC controller manufactured by GREEF (China), which serves as the main user interface and control unit.

For detailed wiring diagrams, parameter settings, alarms, and operating logic, refer to the original manufacturer documentation.

GREEF GT-PCTC Controller and Inverter User Manual
(supplied with the controller or available from the controller manufacturer)

The turbine can be installed and commissioned with surveillance SCADA system, which allows both turbine manufacturer and approved service provider to monitor and control the turbine 24/7. Customers have limited access to the SCADA system to monitor the turbine without any control functionality over the turbine.

FREEN OÜ
Registration number 14541774
VAT number EE102096378
Arenduse tn 6, Kohtla-Järve, 30328 Ida-Viru maakond, Estonia
freenindustries.com | freenwind.com | freensolar.com | freen.com
contact@freen.com
+372 5374 17 54

6. Maintenance

Maintenance is performed by approved service provider.

The Freen-9 vertical axis wind turbine is designed for low-maintenance operation.

Routine maintenance is limited primarily to visual and functional inspections and periodic lubrication of rotating components.

No scheduled replacement of parts is required under normal operating conditions.

Maintenance activities are focused on early detection of abnormal wear, environmental influence, or installation-related issues, ensuring long-term reliability and safe operation.

Inspection Scope

Inspections shall be carried out at defined intervals or after extraordinary events (e.g. storms, lightning strikes, earthquakes).

The following inspections and maintenance shall be performed:

Visual Inspection

1. Inspection of blades and rotor surfaces for cracks, deformation, or impact damage.
2. Inspection of the tower, support structure, and foundation for corrosion, cracks, or settlement.
3. Inspection of the fasteners for loosening, corrosion, or missing elements.
4. Inspection of the protective covers, seals, and enclosures for damage or moisture ingress.
5. Inspection for accumulation of dust, salt, ice, or foreign objects inside any turbine components.

Mechanical Inspection

1. Verification of smooth and unobstructed rotor rotation.
2. Check for abnormal noise, vibration, etc. during operation.

FREEN OÜ
Registration number 14541774
VAT number EE102096378
Arenduse tn 6, Kohtla-Järve, 30328 Ida-Viru maakond, Estonia
freenindustries.com | freenwind.com | freensolar.com | freen.com
contact@freen.com
+372 5374 17 54

3. Inspection of bearings and rotating interfaces for signs of abnormal work or appearance.
4. Verification of correct alignment of rotating components.
5. Bolted connections shall be inspected and torque-checked as part of routine maintenance.
6. Verificate that warning labels and safety signage remain legible, easily readable and securely fixed.

Lubrication (Greasing)

Suitable lubrication is essential for the longevity of generator and bearing lifespan.
Recommended grease:
ESSO BEACON EP2 or equivalent NLGI Grade 2 grease.

Greasing shall be performed in accordance with the following procedure:

1. A light extrusion of new grease must be visible at the all designated greasing points
2. After re-greasing, all excess grease shall be wiped off, and the area shall be inspected for contamination such as sand, salt, dust, or metallic particles.

Maintenance Intervals

Maintenance intervals shall be defined based on site-specific environmental conditions.

Typical guidance:

1. Initial inspection: within the first 3-6 months of operation.
2. Routine inspection: once per year under normal environmental conditions.
3. Greasing: once per year, or more frequently in harsh environments.
4. Extraordinary inspection: after severe weather events or abnormal turbine behavior.

In harsh environments (coastal areas, high salinity, heavy dust, frequent storms, or extreme temperature variations), inspection and greasing intervals shall be reduced accordingly.

Maintenance Records

FREEN OÜ
Registration number 14541774
VAT number EE102096378
Arenduse tn 6, Kohtla-Järve, 30328 Ida-Viru maakond, Estonia
freenindustries.com | freenwind.com | freensolar.com | freen.com
contact@freen.com
+372 5374 17 54

All inspections and maintenance actions shall be documented, including:

1. Date and operating hours.
2. Observations and findings.
3. Lubricant type and quantity used.
4. Corrective actions taken (if any).

These records shall be retained for the lifetime of the turbine and used to refine the site-specific maintenance schedule.

FREEN OÜ
Registration number 14541774
VAT number EE102096378
Arenduse tn 6, Kohtla-Järve, 30328 Ida-Viru maakond, Estonia
freenindustries.com | freenwind.com | freensolar.com | freen.com
contact@freen.com
+372 5374 17 54

7. Foundation

The wind turbine is mounted on the foundation, provided by the customer.

The foundation is designed according to the tower loading diagram provided by Freen.

Turbine load diagram on lattice tower – (doc.# 300139-0)
Turbine load diagram on the monopole tower – (doc.# 300136-0)

The foundation planner and manufacturer may submit additional requirements to installation conditions (regarding weather conditions, access to the installation site, special characteristics of ground) and necessary documentation.

When laying the foundation, cable sleeves are installed into the foundation, which enable cables entering the turbine tower from the bottom. Normally, also a cable trench is constructed and grounding wire installed during laying the foundation.

For the earthing measurements it is suitable to use voltage drop measurement where measured ohmic value must adhere to local regulations, but less than 15 ohms under circumstance. If suitable value is not reached additional grounding wire circuit must be placed around foundation in 600 mm depth and 30 m length (5 m in parallel of each side of foundation in 1 m distance). Grounding wire size should be selected according to local regulations (standard IEC 60364-5-54 or other).

Cable between the grid connection point and wind turbine (foundation) should be chosen and installed according to local regulations and by an authorized service provider.

FREEN OÜ
Registration number 14541774
VAT number EE102096378
Arenduse tn 6, Kohtla-Järve, 30328 Ida-Viru maakond, Estonia
freenindustries.com | freenwind.com | freensolar.com | freen.com
contact@freen.com
+372 5374 17 54