Britwind

Operating Guide for the Britwind R9000 Wind Turbine

Publication No. SM0307-03

2. Your Britwind wind turbine system

The turbine system will normally be based on the following 11 elements:-

- The turbine — Item A
- The tower — Item B
- Tower Base Slip Ring (inside tower base) — Item C
- Power cable connecting the turbine to the electrical panel — Item D
- Rectifier box or G83 controller (Grid+ system) — Item E
- Wind Turbine Controller — Item F
- Inverter — Item G
- Energy meter — Item H
- Fuse box — Item I
- Wind system/mains isolator — Item J
- Wind turbine isolator — Item K

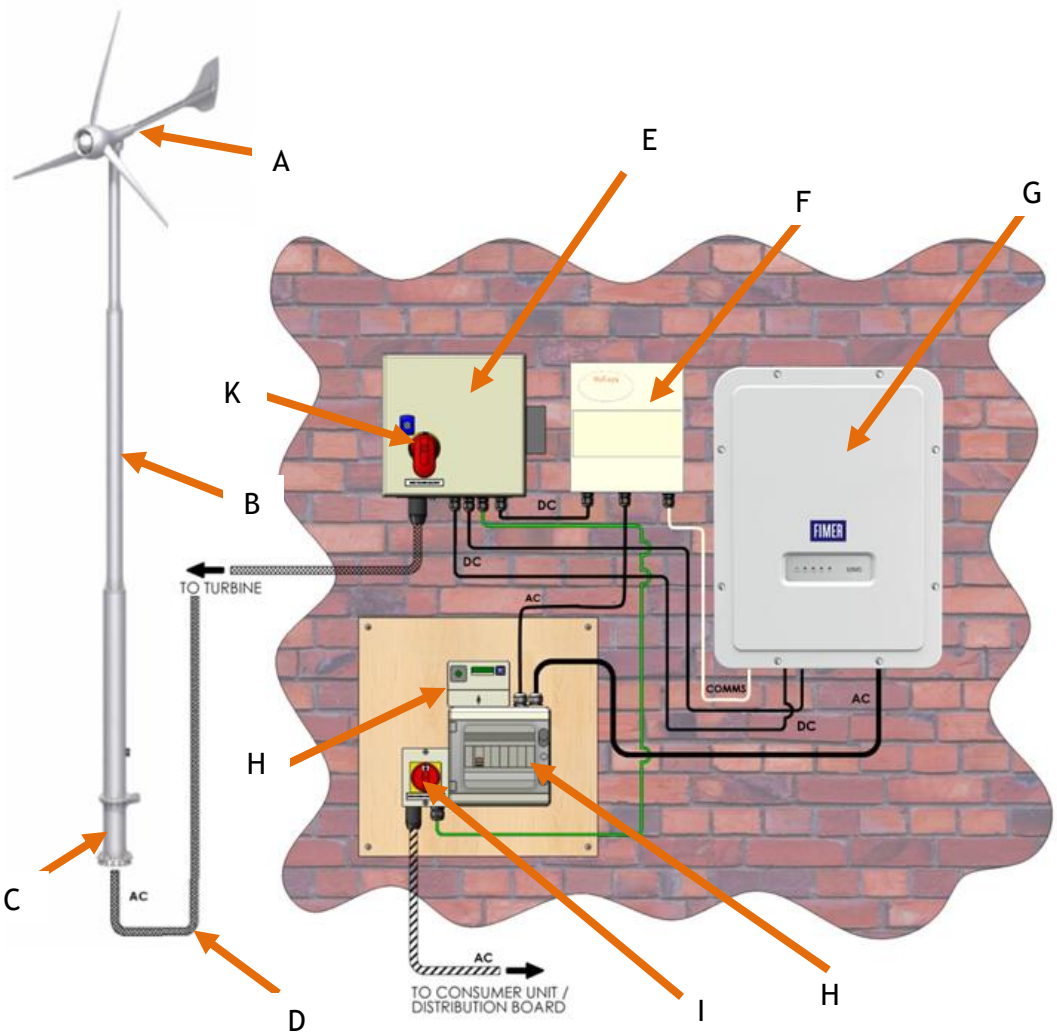


Figure 1: Typical Single Phase Installation

3. How your turbine works

Your Britwind R9000 is a 5kW upwind turbine which means that the blades are placed at the front and are turned into the wind using a tail vane (see figure 2).

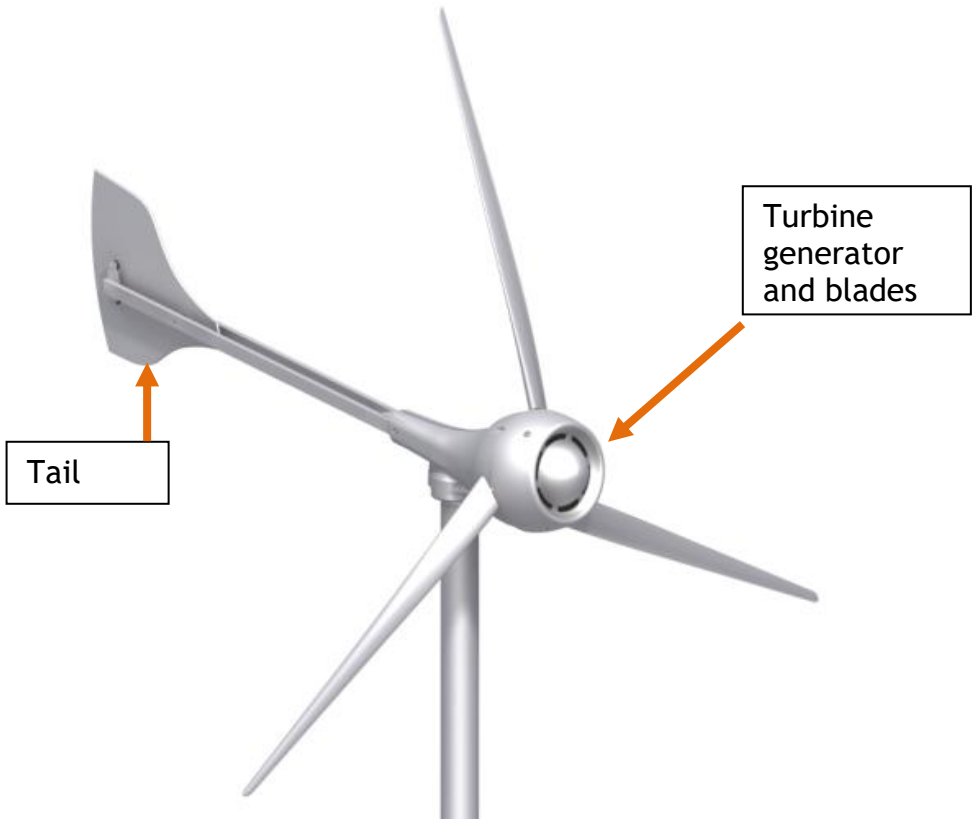


Figure 2: R9000

The turbine starts generating in a wind speed of around 3 metres/second (6.7mph). Your machine has a survival wind speed of 60 metres/second (134mph) and incorporates a patented high-efficiency generator.

The R9000 is equipped with a patented speed regulating system, Reactive Pitch™, which automatically pitches the blades to shed excess power and control turbine speed.

The turbine is designed to be mounted on a series of Britwind approved tower systems.

The brake control switch, located in the tower base, can be used to apply and release the braking system.

The wind turbine produces alternating current (AC) electricity, which varies in both frequency and voltage as the turbine changes speed. This AC electricity is fed down

a cable in the tower and through the underground power cable to an electrical equipment panel.

The electrical equipment panel (figure 1) includes a wind turbine isolator (item J) and a rectifier box or G83 controller if a Grid+ system has been purchased (item E) where the variable alternating current is turned into direct current (DC) in the range of 0Vdc to 470Vdc.

This DC current is fed into the inverter(s) (item F), which converts it to the AC grid voltage and frequency.

The inverters also act as wind turbine controllers, constantly monitoring turbine speed and adjusting the amount of power that they take from the turbine to let the turbine run at its most efficient speed.

From the inverters the AC current is connected via the energy meter (item G) and fuse box (item H) to the wind system/mains Isolator (item I). The energy meter records system energy produced and the energy consumed in keeping the inverters turned on if there is insufficient wind to produce power from the turbine.

The turbine is designed to automatically control its speed and power generation without the need for manual intervention. In the case of a grid failure, or if the grid is turned off by the distribution network operator to allow maintenance, the inverters will automatically disconnect the turbine from the grid and refuse to take power from the turbine.

4. Isolating Your Turbine from the Grid

There may be occasions when owners may wish to isolate the turbine from the grid connection when, for example, electrical work is being carried out on the house wiring.

To Isolate the wind turbine and electrical panel from the household supply switch the wind system/mains isolator (item I) to ‘OFF’.

This will leave the turbine running, but will provide complete electrical isolation of the wind turbine system from the distribution board to which it is connected.

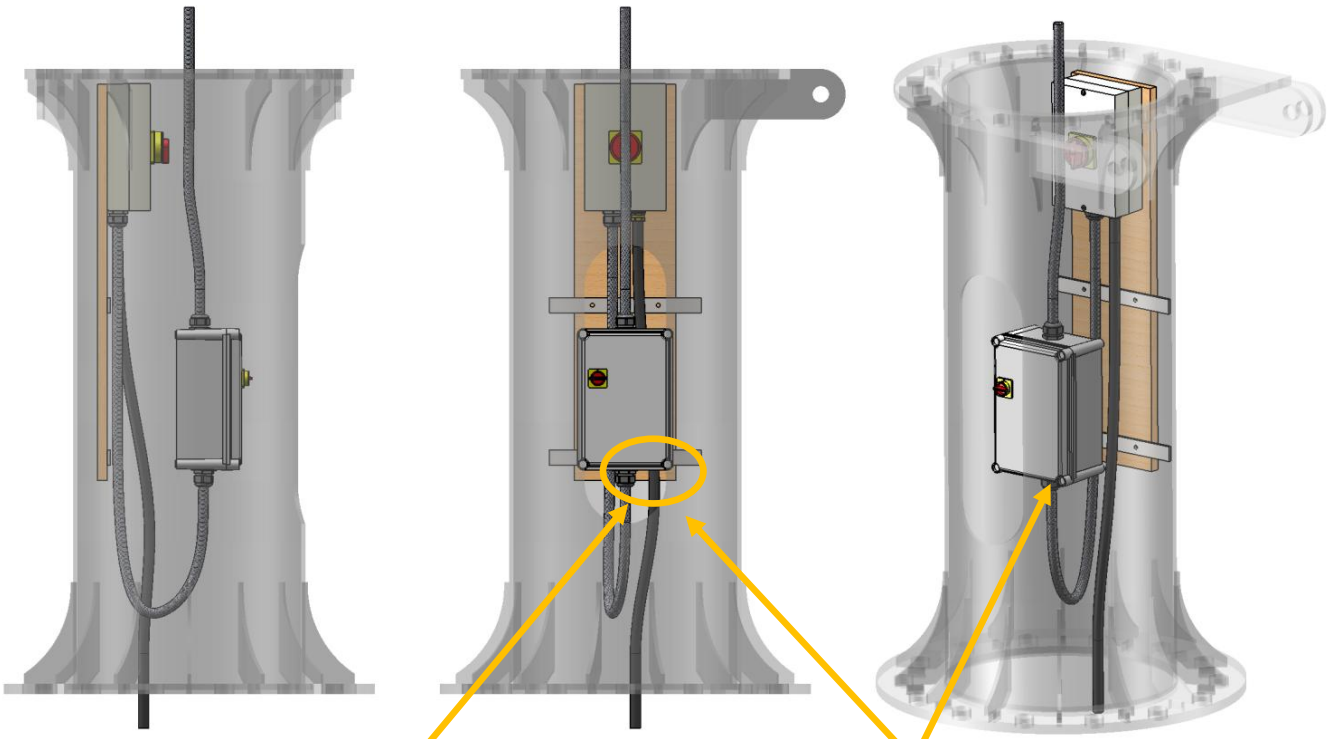
Note: that the electrical panel shown in figure 1 will still be live, as it is still connected to the wind turbine.

The supply from the turbine to the electrical panel can also be isolated using the isolator switch mounted in the rectifier box (item J) or the Isolator switch in the tower base.

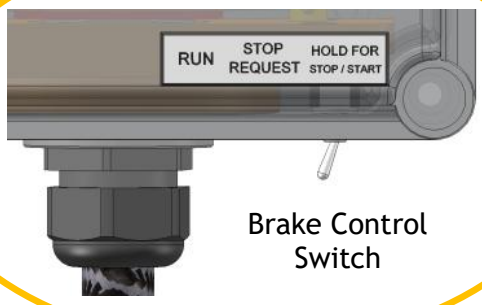
NOTE: The wind turbine isolator on the rectifier box or G83 controller (item J), should never be switched from 'OFF' to 'ON' when the turbine is turning as this leads to a sudden inrush of current which can damage an inverter. Always stop the wind turbine before turning this isolator (item J) back to 'ON'.

Brake Control Switch

The wind turbine can be stopped by applying the brake using the switch on the bottom of the tower base slip ring which is suspended inside the tower base.



The Brake Control Switch is mounted on the bottom face of the Tower Base Slip Ring.

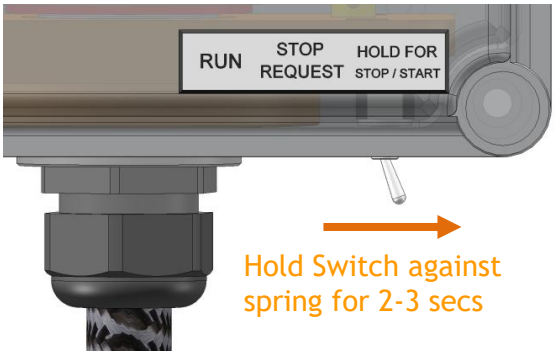


Brake Control Switch

⚠ CAUTION: DO NOT OPEN THE TOWER BASE SLIP RING ENCLOSURE. HIGH VOLTAGES ARE PRESENT IN THE BOX EVEN WHEN THE TURBINE IS NOT RUNNING.

The Brake control switch should be at the ‘RUN’ position (to the LEFT) for all normal operation.
A Key is needed to open the door on the tower base. This key should be given to you when the turbine is commissioned. Please keep it in a safe place

5. Stopping the Wind Turbine



To apply the brake and **Stop the Turbine** hold the Brake Control Switch to the RIGHT at the ‘HOLD FOR STOP / START’ position for 2-3 seconds.

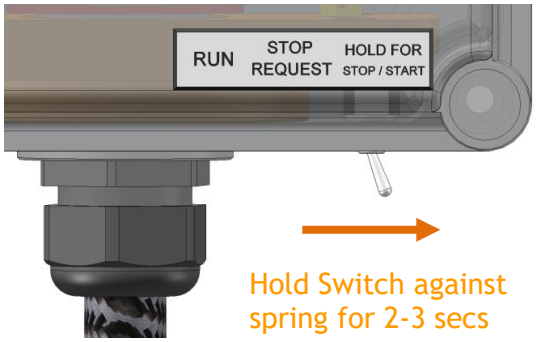
There will be a single beep from the Brake Control Unit at the tower top and the turbine will stop spinning.

⚠ Note: Always immediately release the switch once the brake has been applied.

⚠ Note: It is necessary to allow a period of 10 seconds in between each brake application/release in order to allow the microprocessor to reset.

When the switch is in the central ‘STOP REQUEST’ position the brake will be automatically applied at a reduced speed (around 160 rpm). This is used to check the operation of the Micro-Processor brake during commissioning. Note that if the switch is left at this central position during normal operation the turbine will repeatedly apply the brake and stop the turbine.

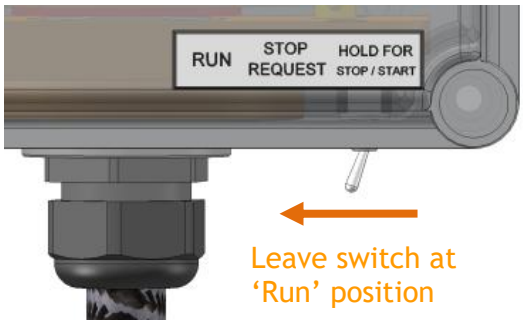
6. Starting the Wind Turbine



Release the brake by holding the Brake Control Switch to the position labelled 'Hold for Stop/Start' for 2-3 seconds or until a whistling sound is heard from the Brake Control Unit at the tower top, and then immediately release the Brake Switch which should spring back to 'Stop Request'. Do not continue to hold the switch at 'Hold for Stop/Start' once the brake relays have switched.

Note that in light winds the turbine may take some time to start moving.

Remember that if the Brake Control Switch is left at the central 'STOP REQUEST' position, the brake will automatically apply once the turbine reaches 160 RPM.



Always therefore leave the switch at the left 'RUN' position during normal operation.

⚠ Note: Always immediately release the switch once the brake has been applied.

⚠ Note: It is necessary to allow a period of 10 seconds in between each brake application/release in order to allow the microprocessor to reset.

The protection system obtains its power from the wind turbine itself and does not rely on batteries to function. The 2 x 9V (PP3) batteries are only used when the Brake Switch is held at 'HOLD FOR STOP/START' to apply or release the brake.

They should therefore last several years and will be checked and renewed by the service teams as part of the normal maintenance schedule.

7. Inverter status

The Inverter/s is located on the electrical equipment panel (figure 1 item F)

Please refer to the inverter user manual for operation and troubleshooting details.

8. Reading the meter

The Energy meter (item G) gives the output in kWh of your turbine since commissioning. The meter display periodically flips between a large number, which is the output of the turbine, and a much smaller number which is the energy absorbed from the grid by the inverters when the turbine is not running. There is also a red light on the meter that flashes at a frequency which increases as more power is generated by the turbine.

9. Maintenance

Maintenance of the Britwind R9000 wind turbine is designed to be straightforward. In order for the warranty to be valid, maintenance should always be carried out by installation and maintenance teams who have been specifically trained and accredited by Britwind. Please contact the company that installed the turbine to find an accredited maintenance team.

The R9000 turbine should have its scheduled maintenance check performed by an accredited maintenance team. The R9000 is a reliable machine and so should not need any additional maintenance. However, if problems do arise, early recognition by the owner can save costly repairs.

To be able to recognise unusual behaviour in your R9000, you should first know what normal behaviour looks like and sounds like, so try to observe and listen to your turbine in all wind conditions. Do this upwind and downwind of the machine and also look at the behaviour of the inverter/s.

We recommend a visual and listening inspection of the turbine every couple of months.

Inspection

1. If the wind is blowing, is the rotor rotating at a speed you think looks right for the wind conditions?

2. If the wind is blowing reasonably well, is the turbine pointed into the wind?

3. For the wind conditions, is the inverter/s behaving as it should?

4. Listen for unusual noises, e.g. regular noises that seem to be related to the speed of the rotor.

5. Check the tower base for loose fasteners or any unusual noises or movements.

Be careful not to confuse turbine noises with background noises on windy days. In very light winds at low rotational speeds there is often a once per revolution tapping sound from the machine.

This is quite normal and is due to the blades settling under the force of gravity, with the force on each blade reversing as it goes over top dead centre and bottom dead centre positions.

If however there are any unusual or loud noises which could potentially indicate a problem, the installer who supplied the machine should be contacted immediately.

10. What to do if there is a problem

Warranty and maintenance questions should be directed to your local reseller or installer.

If you have any concerns about the operation of your wind turbine, please contact them with:

1. Accurate description of the symptoms.

2. Wind conditions when symptoms occur.

3. How long the symptoms have been occurring.

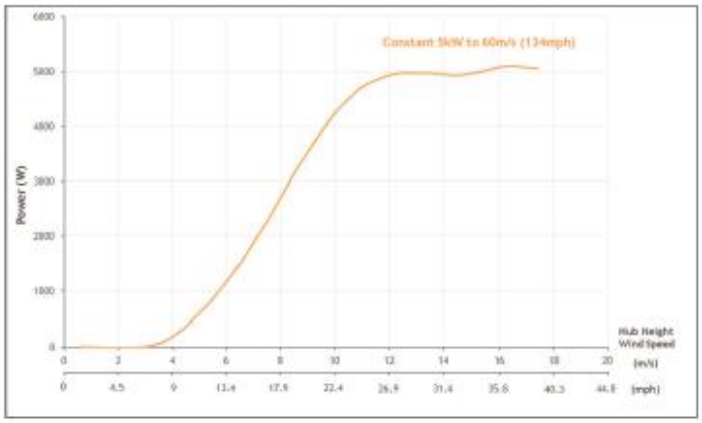
4. If the symptoms have become worse.

Your reseller or installer can advise if a problem is potentially serious, or if it can be left until the next maintenance visit.

11. Specifications

Architecture	Upwind, 3 bladed rotor, self regulating
Nominal Power	5kW @ 12m/s (26.9mph), continuous to 60m/s (134mph)
BWEA Reference Power	4711W (power output at 11m/s (24.6 mph))
Annual Energy Yield	9170kWh with Annual Mean Wind Speed (AMWS) of 5m/s (11.2mph) (to IEC & BWEA Standards)
Cut-In Wind Speed	3m/s (6.7mph)
Cut-Out Wind Speed	None – continuous generation to survival wind speed
Survival Wind Speed	60m/s (134mph)
IEC Turbine Class	Conforms to IEC 61400 to Class II – AMWS up to 8.5m/s (19mph)
Control System	Patented Reactive Pitch™ control
Rotor	Diameter: 5.5m (18') Speed: 200rpm nominal
Blade	Fully optimised aerofoil ensuring max yield & min noise. Low reflection, UV & anti-erosion coatings
Generator	Patented brushless direct drive, air-cored high efficiency Permanent Magnet Alternator
Gearbox	None required (see generator)
Emergency Braking	Patented automatic ElectroBrake™ (with manual control for servicing) No moving parts
Yaw Control	Passive tail vane and rotor
Tower	Free-standing monopole, hydraulic RAM or Gin pole tilt Heights: 10m, 12m, 15m & 18m (33', 40', 50' & 60')
Tower Foundation	Root, pad & rock options
Design Longevity	20 years minimum with regular serv ice inspection
Noise	Lp, 25m = 52.8dB(A). BWEA Reference Sound Level at 8m/s (17.9mph) & 25m (82') distance Lp,60m = 45.3dB(A). BWEA Reference Sound Level at 8m/s (17.9mph) & 60m (197') distance
Operating Temperature Range	-20°C - +50°C
Warranty	5 years (see Britwind Terms & Conditions for details)

Average Power vs Wind Speed



Noise Levels