VALEN
Powering Excellence

VALEN 920 WIND TURBINE OWNERS MANUAL

AUSTRALIA
1300 734 253
sales@valen.com.au
www.valen.com.au

NEW ZEALAND
0800 734 253
sales@valen.co.nz
www.valen.co.nz

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Congratulations

Congratulations on purchasing your Hyland 920 Wind Turbine and Hyland 920 MPPT Charge Controller. You are now the owner of the world's most powerful small wind turbine.

To ensure you get the very best performance out of your Hyland 920, we recommend you read this manual prior to installation of the wind turbine and charge controller.

How to use this manual

Follow the instructions detailed in System Installation to prepare your Hyland 920 for operation. Following installation, please verify correct installation of your Hyland 920 as described in Commissioning Hyland 920.

In the event of faulty operation, please refer to the Trouble Shooting section of this User Manual – or contact us at sales@valen.com.au

Note: please refer to the attached 'Hyland 920 Controller User Manual' for instructions relating to the controller.

Check you recieved

The components received from Valen are shown in the table below.

Component	Quantity
Hyland 920 Wind Turbine	1
Diffuse Energy MPPT Charge Controller	1
Dump Resistors 300W (2Ω -24V or 4Ω - 48V)	2

Please contact us at sales@valen.com.au in the event of missing or damaged components.

BYO tools

The tools required for turbine installation are shown in the table below.

Component	Quantity
Flat head screw driver medium	1
Flat head screw driver small (electrical terminal screws)	1

Safety instructions

Please study the following section before commencing installation. This information is provided to ensure your safety during installation, operation, and in case of future maintenance. Please contact us if you have any further questions.

Due to the nature of small wind turbines such as the Hyland 920, there are a number of potential mechanical and electrical hazards as follows.

Mechanical dangers

Maintain a safe distance from the wind turbine during operation.

The primary mechanical danger of the Hyland 920 are the rotating blades. The blades are made from a strong injection moulded carbon fibre composite material with sharp leading and trailing edges. These rotating blades can cause injuries, even at low speeds. Caution must also be taken when unboxing or handling the turbine during installation

- Never attempt to touch spinning blades.
- Never attempt to slow or stop spinning blades in any way other than with the controller.

In the event of extreme weather conditions, it is possible for foreign objects to strike the blades and cause blade fragments to become projectiles. The inclusion of the shrouded diffuser in the Hyland 920 design significantly increases safety during such events.

Australian Standards (AS4024) dictate that turbine must be placed out of reach of personnel. This means at least 2.7m above any platform below the turbine. In the event that work is to be carried out closer to the turbine, then it must be isolated by applying the short and work cannot commence above 40 km/h wind speeds.

Electrical dangers

A breaker should always be installed between the battery and controller to allow electrical isolation.

Never work on the controller wiring without the battery being isolated. Batteries have strong short circuit currents so live work is dangerous.

The generator will produce open circuit voltages during operation if the electrical connection to the battery or load are interrupted. Please ensure the turbine is not in operation before commencing work. Always apply the brake to “short” and isolate from the battery before commencing any work on the controller

Charging currents produced by the Hyland 920 can reach up to 22 A during operation. Please ensure that all electrical wires and components are rated as specified in wiring specifications.

The diversion resistor can become extremely hot in high wind conditions as it acts as a brake to slow the blade rpm. Please ensure that the diversion resistor is appropriately sited with adequate space and ventilation. Do not site the diversion resistor close to flammable materials.

Dangers during installation or maintenance

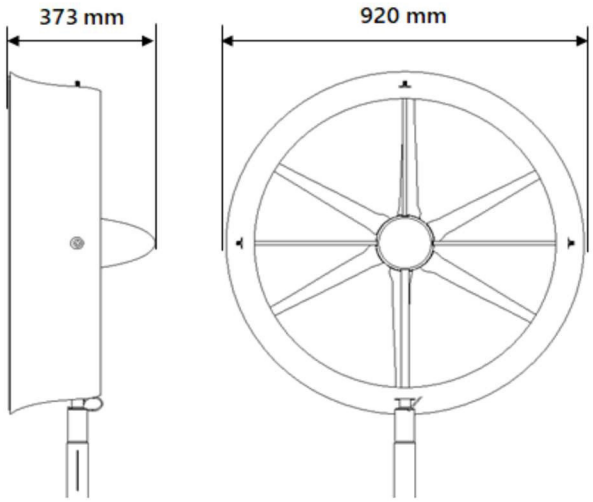
Only work on the Hyland 920 during appropriate weather conditions to prevent injury of personnel.

Do not stand under unsecured objects during installation.

Please ensure all batteries are disconnected from the system prior to conducting work, and the Turbine is connected to the controller with it switched to 'short' to prevent the blades from spinning.

Technical specifications

The technical specifications and turbine dimensions are shown below. Diffuse Energy realise that each application is unique, and customers may require additional information. We welcome the opportunity to supply additional technical information.



Physical dimensions	920 x 920 x 373 mm
Mass	18.5kg
Rated power output	220W
Rated wind speed	11m/s, 40km/h
Peak Current to Battery	20A (limited by breaker)
Peak Power	624 W @ 48 V nominal, 728 W @ 56V charge
Peak Power wind speed	15.5 m/s +, 55km/h+
Cut out wind speed (turbine stopped with remote system)	~19m/s, 70km/h

Estimated annual production for a given annual mean wind speed. We note that the standardised Rayleigh wind resource is often optimistic compared to “real world” sites.	Wind Speed 4 m/s 5 m/s 6 m/s 7 m/s	Rayleigh[1] 380 kWh 731 kWh 1,175 kWh 1,646 kWh	BOM[2] 311 kWh 393 kWh 608 kWh 939 kWh
UV Protection	20 years		
Output Voltage	24, 48 VDC (2 models)		
Voltage Charge limits	29, 56 VDC (modified upon request)		
Protection systems	Generator electrical brake		
Manual contols	Brake, stop		
Yaw system	Passively aligns to the wind direction		
Rotor configuration	6-bladed, horizontal-axis downwind		
CO2 savings	>1,000 kg/yr above 5 m/s		

[1]. Rayleigh distribution assumed as per IEC61400.2 Section 3.60

[2]. Annual power generation based on Bureau of Meteorology wind speed records of 18 Australian airport sites

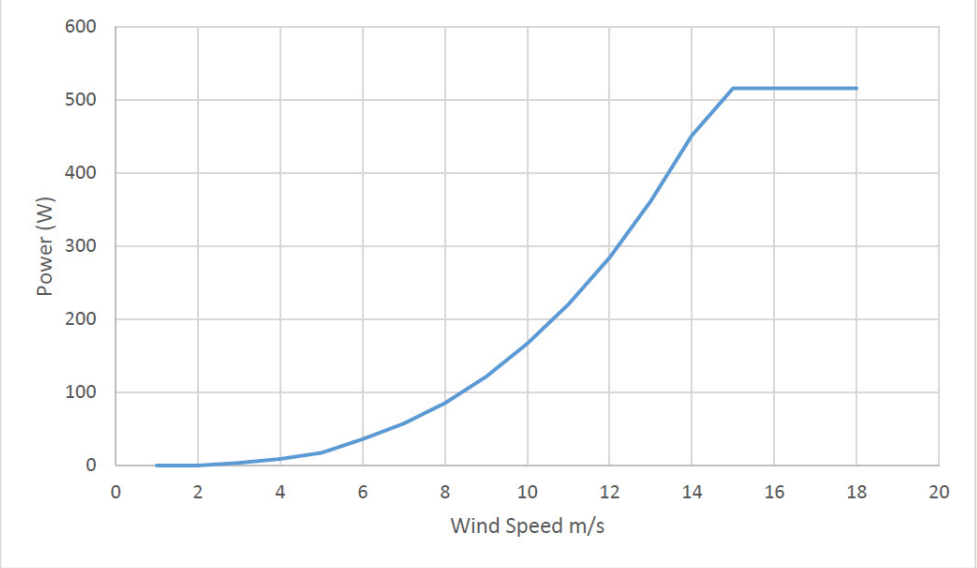
Understanding site power

Predicting the power output of wind turbines at a particular site can be difficult.

Diffuse Energy have developed, and continue to improve, a system for assessing site wind resource. If you would like assistance assessing a site, we are more than happy to help out.

Power curve

Wind turbine power generation has a cubic relationship with the inlet wind speed. This means if the wind speed is doubled, the produced power increases by a factor of 8. The power curve of the Hyland 920 is presented below. The Hyland 920 wind turbine system includes a Diffuse Energy maximum power point tracking (MPPT) controller that optimises the amount of power extracted for a given wind speed. For wind speeds beyond 18 m/s (65 kmh) the controller is designed to reduce the rotor speed to limit the power output to 1 kW and prevent the damage of electrical systems.



Also note that when the battery is in a high state of charge the boost circuit of the turbine controller is limited to 10A. The full current applies when the turbine voltage reaches the battery voltage

System installation

The following section outlines the installation procedure for the Hyland 920 wind turbine.

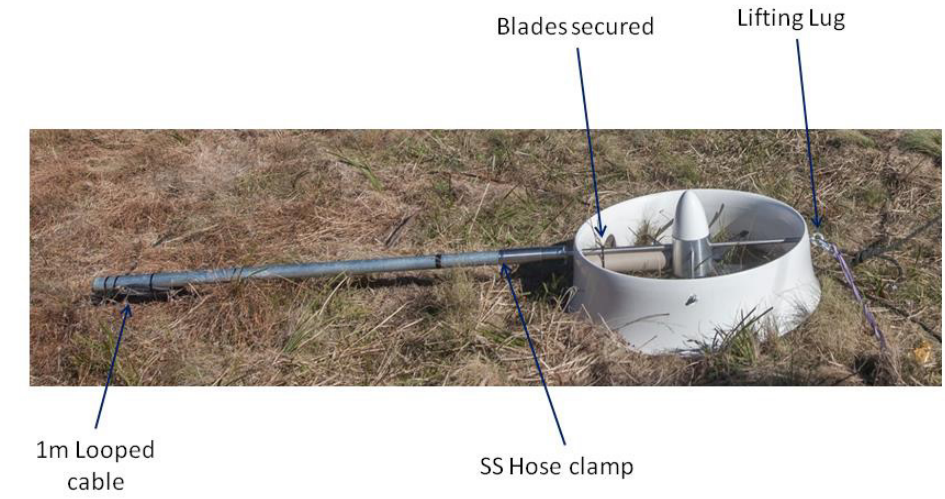
Telecommunications tower installation

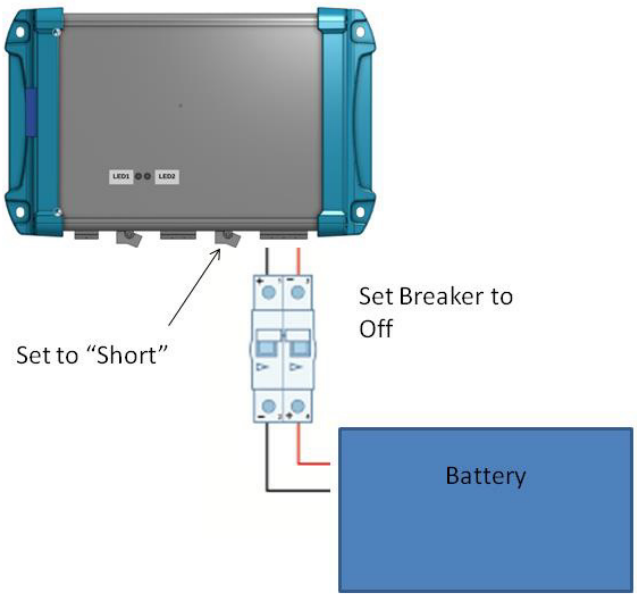
1. Unpack turbine and check that all components are present. Note that the turbine is preassembled and checked prior to delivery.
2. Feed the system 3 core power cable (recommend 12 AWG) through the mounting pole. The turbine is designed to be mounted on a length of **40 NB (48.3 mm OD) Galvanised Pipe.**
3. Attach the Hyland 920 power cable to the system power cable.
4. Insert the yaw mechanism base onto the mounting pole, ensuring that it is fully inserted.
5. Tighten the hose clamp on the base to approximately 4 Nm.
6. Loop a cable tie around the vertical diffuser support and one of the blades. This will prevent the blades from spinning during installation.
7. Install lifting lug to either top support thread or two side support threads. See image below.
8. Hoist turbine up tower using site preferred method.

9. Mount pole in desired location ensuring the pole is vertical. This is very important to ensure the turbine yaw operates correctly.
10. Secure cabling at the base of the pole with a 1 m loop(s) to allow later removal of the turbine from the pole if necessary and allow turbine to yaw freely.
11. Run cabling to the controller and connect the three phases of the turbine power to the controller.
12. Connect the two phases of the output to the battery through a breaker switch. Set the breaker to 'off'.
13. On the turbine controller set the SHORT/RUN switch to SHORT. See image below.
14. Remove the cable tie from the Turbine.
15. Turn the battery breaker to 'on'.
16. On the turbine controller set the SHORT/RUN switch to RUN.
17. Assuming there is wind - the MPPT controller will now power up.

Note: The controller will not be active without turbine power.

Note: See following 'Hyland 920 Controller User Manual' for controller setup instructions.





Free-standing tower installation

1. Unpack turbine and check that all components are present. Note that the turbine is preassembled and checked prior to delivery.
2. Feed the system power cable (recommend 12 AWG) through the mounting pole.
3. Attach the Hyland 920 power cable to the system power cable.
4. Insert the yaw mechanism base on the pole, ensuring that it is fully inserted.
5. Tighten the hose clamp on the base to approximately 4Nm.
6. Secure cabling at the base of the Tower with a 1m loop(s) to allow later removal of the turbine from the pole if necessary and allow turbine to yaw freely.
7. Run cabling to the controller and connect the three phases of the turbine power to the controller.
8. Connect the two phases of the output to the battery through a breaker switch. Set the breaker to ‘off’.
9. On the turbine controller set the SHORT/RUN switch to SHORT. See image below.
10. Remove the cable tie from the Turbine.
11. Turn the battery breaker to ‘on’.
12. On the turbine controller set the SHORT/RUN switch to RUN.
13. Assuming there is wind - the MPPT controller will now power up.

Note: The controller will not be active without turbine power.

Note: See ‘Hyland 920 Controller User Manual’ for controller setup instructions.

Commissioning

Please verify correct installation of your Hyland 920 Wind Turbine using the checklist below..

Hyland 920 Commissioning Chart		
Completed		Page
	TOWER	
	Installed as per manufacturer's instructions	
	Turbine Plumbed vertical	
	ELECTRICAL SYSTEM	
	20A breaker installed between controller and power system	
	10 AWG wires installed between controller and power system/ battery	
	HYLAND 920	
	Yaw clamp tightened to 4 Nm	
	Turbine is tracking wind (tower vertical)	

Operation Guidelines

Please refer to the Hyland 920 controller operation guidelines for information on ‘starting’ and ‘stopping’ turbine operation, and operation during high wind conditions.

Start and stop

The turbine can be slowed by switching the brake on, this will stop it in light wind conditions or significantly reduce power in medium winds

The turbine can be brought to a very slow rotation by switching the short button. This shorts the windings in the generator and applies the maximum braking torque and has been tested to over 100 km/h.

High wind conditions

The Hyland 920 turbine has been mechanically designed to withstand severe winds. The controller can withstand a 22A throughput, however the plugs and cabling are rated to 20A and we recommend a 20A breaker. If possible, the turbine should be put in the short position if it is known that severe wind events are expected. For remote area operation we can supply an automated system that will protect the controller. For details contact us.

NB: By March 2021 the high wind protection will be integral to the controller, it will cause the turbine to shut down at ~75km/h.

Inspection and maintenance

There are no maintainable components on the Hyland 920 wind turbine. Diffuse Energy recommends a visual inspection after severe weather events to ensure there is no damage caused by objects impacting the turbine. In the event that the turbine is underperforming or ‘noisy’ – a more thorough inspection should also be completed.

Other than damage by storms, the other components that can fail are the rotor and yaw bearings, they are designed for a 100,000 hour life (maximum for sealed bearings). If your turbine suffers a failed bearing, contact Valen for assistance.

In the event of underperforming or damaged components - please refer to the ‘Trouble Shooting’ section or contact us at sales@valen.com.au

Trouble Shooting

If problems occur after installation of your new Hyland 920 wind turbine, most can be solved using the following trouble shooting guide.

Hyland 920 Blades are not Spinning		
Possible Source of the Error	**Test**	**Solution**
Not enough wind	Test wind speed	Wait for higher wind speeds. NOTE: The Hyland 920 should begin operation at wind speeds greater than 3 m/s. NOTE: the Hyland 920 has an output shaft seal that will free up after some operation. It may take slightly higher wind speeds to start the turbine when new.
Turbine is switched off at the controller	Check BRAKE/RUN and SHORT/RUN switches on the controller	Switch both switches to RUN
Damaged blades	Check blades for visual damage	If blades are damaged, contact sales@valen.com.au
Stiff generator bearing	• Switch BRAKE/RUN and SHORT/RUN switches on the controller to the BRAKE and SHORT positions respectively. • Try to rotate turbine shaft	If shaft is stiff, contact sales@valen.com.au
Stiff yaw bearing	• Switch BRAKE/RUN and SHORT/RUN switches on the controller to the BRAKE and SHORT positions respectively. • Try to rotate turbine around the yaw axis	If turbine does not rotate, contact sales@valen.com.au
Fault in electrical circuit	• Switch BRAKE/RUN and SHORT/RUN switches on the controller to the BRAKE and SHORT positions respectively. • Contact qualified electrician to check electrical circuit	Repair by authorised personnel.

Zero Power Output		
Possible Source of the Error	**Test**	**Solution**
Not enough wind	Test wind speed	Wait for higher wind speeds. NOTE: The Hyland 920 should begin producing power at wind speeds greater than 3.5 m/s.
Turbine is switched Short Brake is Switched ON	Check SHORT/RUN switch and BRAKE/RUN switch on the controller	Switch both switches to RUN on the controller
Fault in electrical circuit	• Switch BRAKE/RUN and SHORT/RUN switches on the controller to the BRAKE and SHORT positions respectively. • Contract qualified electrician to check electrical circuit	Repair by authorised personnel
Turbine spins in windy conditions but makes no power	• Check continuity between phases at controller plug • Check battery state of charge • Check charge light on controller if red there is a fault	• If there is an open circuit phase check plug and connections. • If full the controller will divert power to the dump resistor • Contact sales@valen.com.au

Inadequate Power Output		
Possible Source of the Error	**Test**	**Solution**
Bad electrical connection	• Switch BRAKE/RUN and SHORT/RUN switches on the controller to the BRAKE and SHORT positions respectively. • Contract qualified electrician to check electrical connection	Replace defective electrical connections by authorised personnel
High electric cable resistance	Check cable cross section and lengths with recommended dimensions in Wiring Specifications	Replace with higher cross section cable
Damaged blades	Check blades for visual damage	If blades are damaged, contact sales@valen.com.au

Further Support

If you require further assistance, please contact us using the details on the back page.

Company Details

Legal Entity	Valen Power Pty Ltd
ACN	134 028 961
Telephone	1300 734 253

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