Hyland controller user manual

Specifications

The Hyland controller has been specially designed to work with the Hyland 920 Wind turbine. It is tuned to give optimum performance across a wide range of conditions. It has analogue outputs to allow remote monitoring of controller/ turbine performance.

Controller Voltage Setting	24V	48V
Output Voltage	16-28*	38-56*
Maximum Current	12A when boosting	12A when boosting
Nominal Peak Power	263W @ 24 V	576 W @ 48 V
Standby Power	1.5 W	1.5 W
Input Voltage	5-28	5-56
Dump Resistor (supplied)	600W 2 R Ω	600W 4R Ω
Dump Resistor 30 second Braking capacity	3000 W	3000 W
Reverse Current Protection	Diode in standby / active in operation	
Braking	Controlled	
Stop	Manual, remote and automatic	
Automatic Stop Conditions	>75kmh winds, Over temperature, Fault detection	
Thermal Management	Chassis coupled heat sinking, Thermal derating at elevated temperatures.	
*Modifiable upon request		

If you find any errors or omissions in this manual please provide feedback to sales@diffuse-energy.com

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Installation

Typical installation sees the controller set closest to the battery or battery management system. The preferred controller orientation is such that the power cables are positioned in a downward manner from the wall mounted controller. If equipment is rack mounted the controller can sit flat on a 3RU shelf.

Please note that the controller is not waterproof and therefore should be mounted inside a secondary electrical housing (IP 67) or inside a weather tight building.

Turbine three-phase cable

Power cable from the turbine should be at least 12 AWG/ 3.5mm^2. The turbine comes with a 1.5 m cable length with an Amphenol X-Lok connecter installed. Diffuse Energy will supply a matching cable run as required. For cable lengths greater than 40m 10AWG cable must be used, this is to maintain the breaking torque on the shorted generator in high wind events.

Dump resistor

The dump resistor is rated at 600 W continuous and can become hot during operation. As such, it should not be mounted near or directly below electrical equipment.

Power cable of 12 AWG / 3.5mm^2 should be used between the controller and dump resistor. A cable length of several metres will not affect performance.

Cable Stress Relief

All Cables should be fixed in place close to the termination plugs to prevent stress on the screw terminals. This will alleviate future problems with unplanned disconnection.

DC power Cable

Cable length is largely dependent on individual installations, and therefore some consideration of the cable size may be needed. We recommend a minimum 10 AWG/ 5mm^2 for short runs.

Breaker on output

We recommend using a 20A breaker to allow isolation of the controller from the battery.

Brake operation

The turbine will automatically brake from time to time depending on wind conditions and battery charge state.

If you wish to stop the turbine from operating manually:

The SHORT/RUN switch will short the windings of the generator applying maximum braking torque. In light winds this will stop the turbine completely and in stronger winds it will spin very slowly (~50 rpm) posing no threat.

-48V Systems (positive ground)

In the case where the turbine is being used in a -48V system, as typically found in the telecommunication space the following applies:

The Turbine must be connected –ve to -ve and +ve to +ve terminals NOT reverse polarity!

Connecting the terminals in reverse polarity will create a short on the battery and will likely cause internal damage to the controller.

The communications ports must have an isolated signal processor as otherwise there will be a ground error and equipment to either side of the communication cable may be damaged.

Controller turbine protection

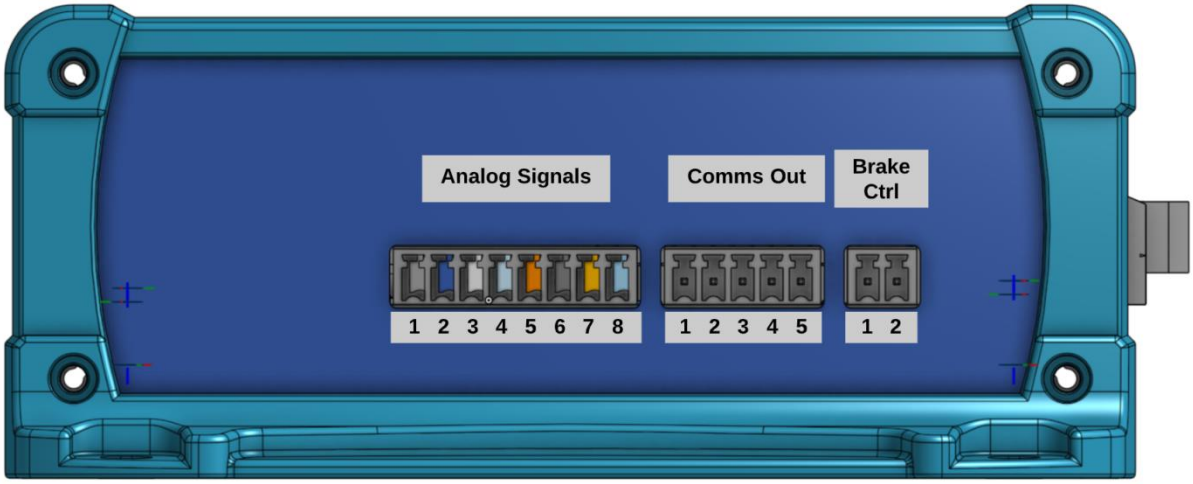
The MkII controller now has a number of additional protections

Condition	Management	Outcome
Turbine overspeed	The controller applies a partial electrical brake at a set input voltage and ramps to full brake (currently between 54 and 55.8V). The generator has a ~600W continuous 1.2kW peak braking headroom when the brakes are applied. This is over and above the power to the battery	Full Brake will slow the turbine below speed where it can no longer export current. Brake power to dump resistor sized to dissipate 1250W transients.
System over voltage protection	As above, the voltage is assignable in the case there is voltage sensitive equipment being powered. Our boost maximum current is assignable in software. This can be customised to system needs	Maximum voltage can be set to ensure that no part of your system will be above it.

Turbine Over current - High Wind	Installation of 20A breaker limits the output current to below dangerous (to hardware) conditions	Output maintained under 20A at battery charge voltage.
BMS needs to limit power	If the BMS detects an over current or voltage situation it can pass an instruction to apply the brake.	Happens at 100% braking and will slow the turbine and significantly reduce export power
Over current lightning surge	The controller has internal protections to avoid passing a lightning surge.	Critical infrastructure is protected. Although the controller will likely need replacing.
Turbine required to be isolated for personnel	Turbine windings are shorted once the brake is applied (switch on controller). This applies maximum braking torque.	Completely stops blade rotation in low speeds. In greater wind speeds, blade speed may rotate at <50 rpm and poses no hazard. No power is exported. **Note: Disconnecting the main cable to the turbine will remove the Brake**
BMS Fault or Diesel cycles	Should a condition arise where the BMS needs to isolate renewable input, the controller can apply the latching relay to apply the brake.	Turbine will export limited power to battery.

Micro Wind Turbine Controller with MPPT Pin Arrangements

Side Panel



Analog Signals

Pin	Function 48V	Function 48V
1	Generator Current 0-22A scaled to 0.6V-5V, referenced to pin 8.	Generator Current 0-22A scaled to 0.6V-5V, referenced to pin 8.
2	Reference Voltage 0-60V, referenced to pin 8.	Reference Voltage 0-30 V, referenced to pin 8.
3	Generator Voltage 0-60V scaled to 0-5V, referenced to pin 8.	Generator Voltage 0-30V scaled to 0-5V, referenced to pin 8.
4	Output Voltage 0-60V scaled to 0-5V, referenced to pin 8.	Output Voltage 0-30V scaled to 0-5V, referenced to pin 8.
5	Brake Current	Brake Current

	0-22A scaled to 0.6V-5V, referenced to pin 8.	0-22A scaled to 0.6V-5V, referenced to pin 8.
6	Brake Override State 5V in “Run Mode”, 0V when brake switch engaged or brake control asserted, referenced to pin 8.	Brake Override State 5V in “Run Mode”, 0V when brake switch engaged or brake control asserted, referenced to pin 8.
7	Controller Fault.	Controller Fault.
8	`DC Out-` (Gnd)	`DC Out-` (Gnd)

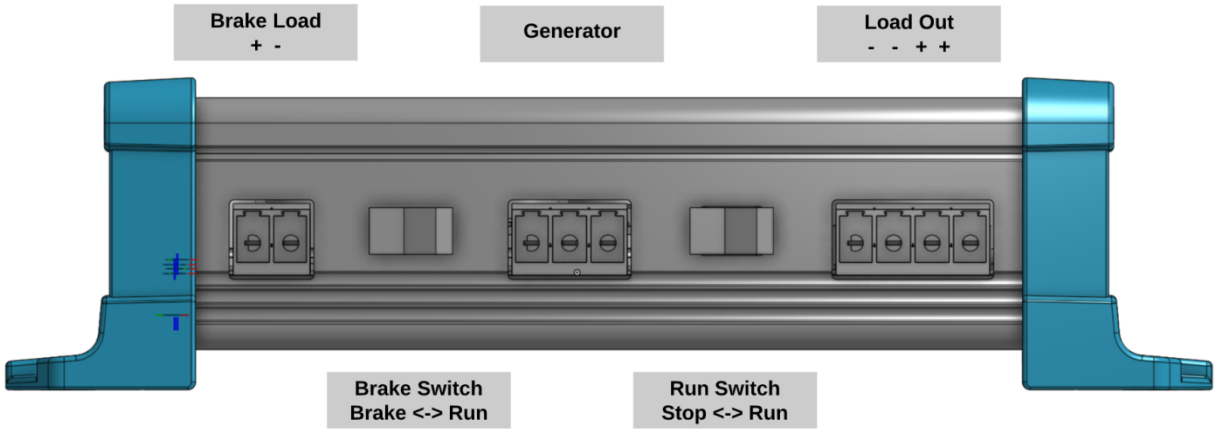
Comms Out

Pin	Function
1	To be assigned in future
2	To be assigned in future
3	To be assigned in future
4	To be assigned in future
5	`DC Out` (Gnd)

Brake Control

Pin	Function
1	Short to `DC Out` to engage Brake
2	`DC Out` (Gnd)

Front Panel



Brake Load Connector

Pin	Function
1	Brake Resistor Terminal 1
2	Brake Resistor Terminal 2

Generator Connector

Pin	Function
1	Phase 1
2	Phase 2
3	Phase 3

Load Out

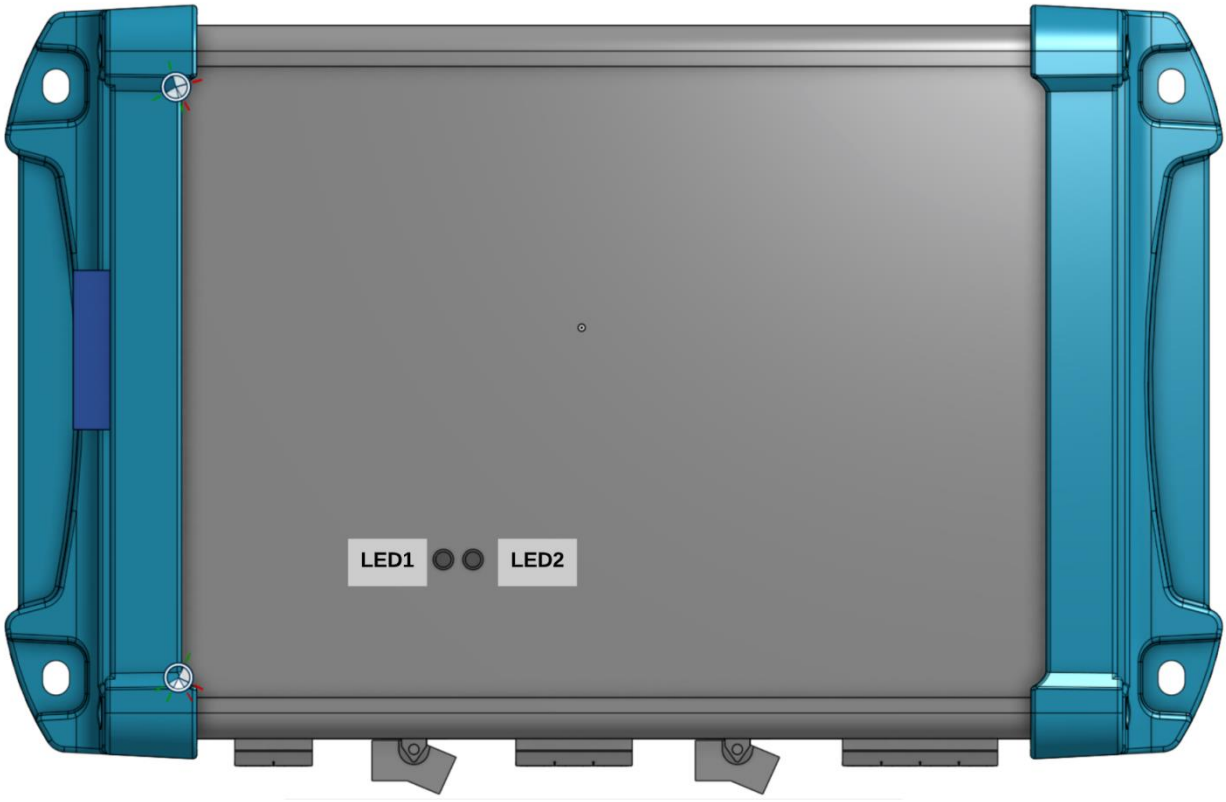
Pin	Function
1	Load Negative Terminal (`DC Out-`)
2	Load Negative Terminal (`DC Out-`)

3	Load Positive Terminal (DC Out+)
4	Load Positive Terminal (DC Out+)

Body

Aluminium Chassis	Isolated, do not earth.
End plastics	Non-conductive.

Top Panel



LED Functions

The controller has four LEDs on the Front Panel

Legend	O	Off
	|	On
	.	Short Flash
	-	long flash

Lamp	Condition	sequence	Colour
On	controller connected to Battery	|	Green
	Controller disconnected from Battery	O	
	Output relay Open	----	Red
	Remote stop switch activated	.-.-	Green
	Manual Stop switch activated	.-.-	Red
Charging	Charging Asynchronous	----	Green
	Charging Synchronous	|	Green
	Not charging	O	
Stop	Turbine not operating	----	Green
	Manual stop switch activated	.-.-	Green
	Stop due to Fault	|	Green
	Turbine operating	O	Green
	Remote stop switch activated	.--.	Green
	Brake operating	.O.O	Green
Fault	Stop switch activated	.-.-	Red
	Over voltage (storm)	|	Red
	Over Current	----	Red
	Derating from Temp	.O.O	Red
	Stop from Temp	....	Red
	Generator Fault (Either Phase fault)	.--.	Red
	Remote stop switch activated	.-.-	Green
	No Fault	O	

Typical Electrical Integration

There are several options for integration into your current system - we are happy to work with you to find the best solution.

Below is a typical solar/wind/diesel hybrid system.