

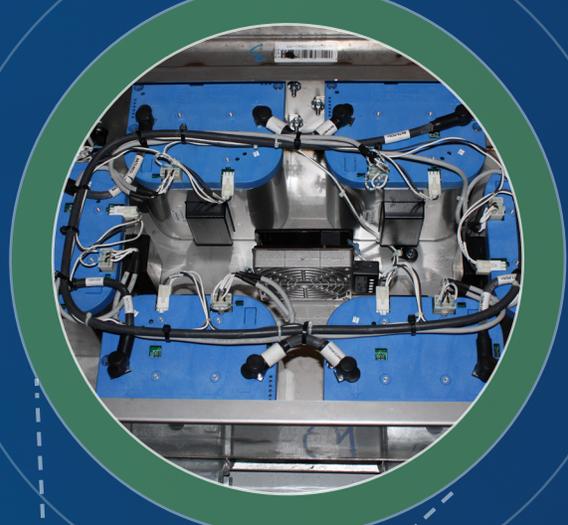
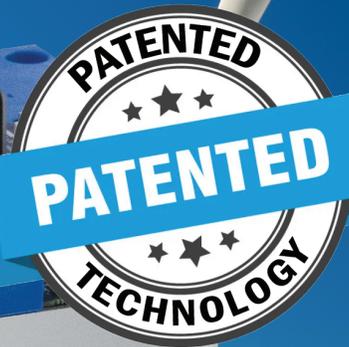


# Richardson Electronics

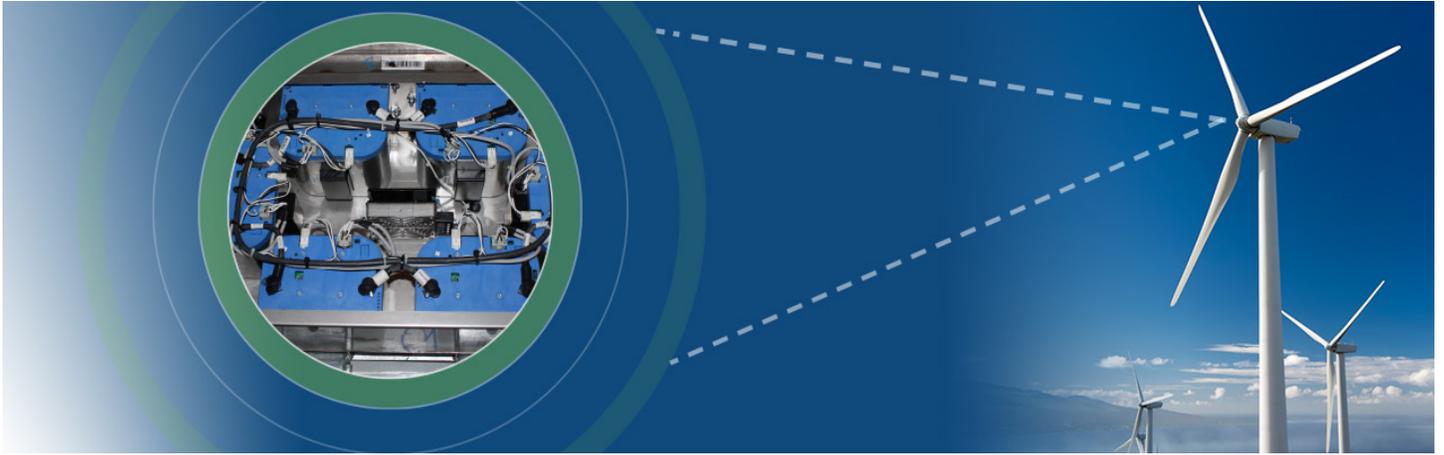
POWER & MICROWAVE  
TECHNOLOGIES

## RICHARDSON ELECTRONICS ULTRA3000<sup>®</sup>

- Energy storage and power delivery for wind turbine pitch systems
- Estimated lifetime of 15+ years
- True plug & play functionality on all GE pitch systems
- No additional brackets or harnesses
- Reduced O&M cost
- Patented Technology



[RELLPOWER.COM/ULTRA3000](http://RELLPOWER.COM/ULTRA3000) | [ULTRA3000@RELL.COM](mailto:ULTRA3000@RELL.COM)

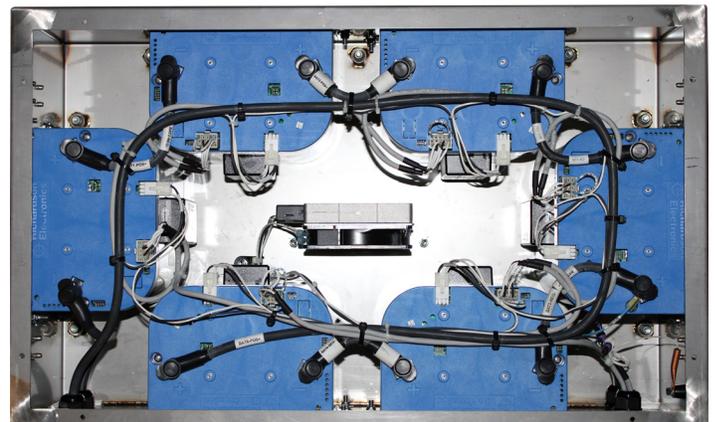


## Energy storage and power delivery for wind turbine pitch systems

Ultracapacitor-based energy storage solutions have significantly enhanced reliability in electric pitch control systems. Ultracapacitors, unlike batteries, have the ability to deliver quick bursts of power in a short time frame, an ideal function for emergency pitching in a wind turbine generator (WTG).

The **ULTRA3000®** Pitch Energy Modules (PEM) is a direct one-to-one replacement for the GE batteries and chargers and can be installed with no modifications to the battery box. Our PEM communicates directly with the GE controller and reports all necessary diagnostic information back to the controller.

We have designed our PEM with owners and installers alike in mind. This eliminates the need for modifications of the wiring harness, installation of additional brackets, or the need to relocate existing components. This greatly reduces installation time, reduces labor costs, and decreases downtime. With over 1 million charge-discharge cycles, our Ultracapacitor Pitch Energy Modules can provide 15 plus years of reliable operation without maintenance.



## PATENTED TECHNOLOGY

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# FEATURES & BENEFITS

## Features

- Estimated lifetime of 15+ years
- Drop-in replacement for batteries on 20 and 30 Nm pitch systems
- Wide operating temperature from -40 to 65°C
- No hazardous chemicals

## Benefits

- No modifications to existing battery box or harness
- Improved turbine reliability
- No loss of batteries or power supplies due to motor regeneration
- Reduced O&M cost

## AC INPUT

|                     |                  |
|---------------------|------------------|
| Voltage             | 85 - 305 VAC     |
| Frequency           | 47 - 440Hz       |
| AC Input Protection | 2.5A @ 250V Fuse |
| Average Current     | 0.5A @ 208 VAC   |

## DC OUTPUT RATING

|                         |   |
|-------------------------|---|
| Standard Charge Voltage | 14.1 VDC                                |
| Settable Voltages       | 12.10-16.13 VDC<br>(0.5 VDC Increments) |
| Charge Time             | < 35 minutes                            |
| Max Charge Current      | 3.1 A                                   |

## ELECTRICAL

|                              |   |
|------------------------------|---|
| Rated Capacitance            | 500 F                                   |
| Minimum Capacitance, initial | 500 F                                   |
| Maximum Capacitance, initial | 520 F                                   |
| Maximum ESRDC initial        | 16mΩ                                    |
| Available Voltage Setpoints  | 12.10-16.13 VDC<br>(0.5 VDC Increments) |
| Absolute Maximum Voltage     | 18 VDC                                  |
| Absolute Maximum Current     | 200 A                                   |
| Individual Cell Capacitance  | 3,000 F                                 |
| Absolute Maximum Energy      | 22.5 Wh                                 |
| Typical Energy Storage       | 13.8Wh @ 14.1V                          |
| Number of Cells              | 6                                       |
| Cell Voltage Management      | Passive                                 |

## THERMAL DATA

|                               |                              |
|-------------------------------|------------------------------|
| Ambient Operating Temperature | -40 to 65 C                  |
| Ambient Storage Temperature   | -40 to 65 C                  |
| Relative Humidity             | 5% - 95%<br>(Non-Condensing) |



## Ratings

- Capacitance: 500 F
- Max. Current (A): 2,100
- Rated Voltage: 18 VDC
- Operating Temperature Range: -40 ~ 65 °C
- Max. Continuous Current @ 40°C: 200 A
- Input Voltage: 85 ~ 305v AC

## PHYSICAL PROPERTIES

|                               |   |
|-------------------------------|---|
| Mass                          | 4.76 kg                                   |
| Power Terminal                | M6x1 Blind Hole 11 mm Max                 |
| Recommended Torque - Terminal | 2.59 N-m                                  |
| Vibration Specification       | Life Tested To ISO 12405-2 Specifications |
| Environmental Protection      | IP 24                                     |
| Cooling                       | Natural Convection                        |

## POWER AND ENERGY

|   |           |
|---|-----------|
| Usable Specific Power, $P_d$              | 313 W/kg  |
| Impedance Match Specific Power, $P_{max}$ | 652 W/kg  |
| Specific Energy, $E_{max}$                | 2.90 W/kg |
| Stored Energy                             | 13.8 Wh   |

## SAFETY

|   |             |
|---|-------------|
| Short Circuit Current, Typical (Current possible from short circuit at rated voltage, NOT AN OPERATING CURRENT) | 875A        |
| Certifications  | RoHS, REACH |
| High-Pot Test   | 400 VDC     |

## EMI/EMC

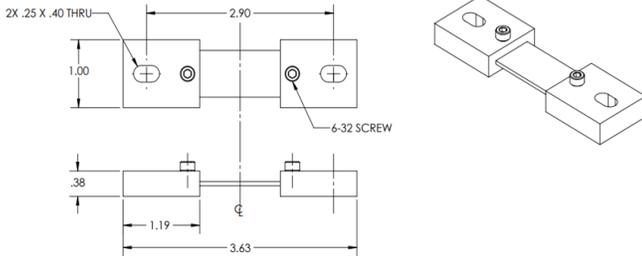
|              |   |
|--------------|---|
| EMC Emission | Compliance to EN61000-4-2,3,4,5,6,8,11, ENSS024, heavy industry level (surge L-N : IKV), criteria A |
| EMC Immunity | Compliance to EN55022 (CISPR22) Class B, EN61000-3-2,-3   |

Designed, Manufactured and Tested in LaFox, IL  
**PATENTED TECHNOLOGY**

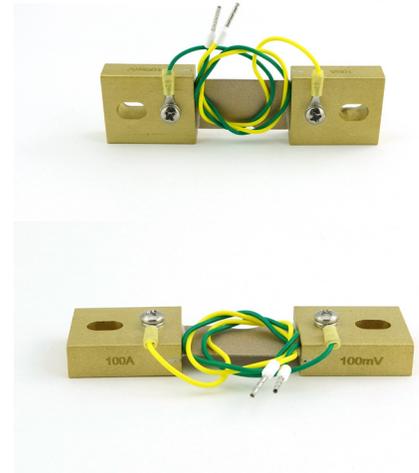
# PITCH SHUNT

## Features

- Robust Drop In Replacement for GE Style Shunts For 30Nm ESS Style Hubs
- Works with batteries or ultracapacitor systems
- Reduced failures in short circuited pitch motor scenarios
- Installation hardware included



POWER & MICROWAVE TECHNOLOGIES



# MANUFACTURING CAPABILITIES

As a highly specialized international manufacturer and distributor, Richardson Electronics produces a wide variety of RF and microwave components, subsystems, as well as electron tube and vacuum devices. In order to meet our customers' stringent requirements, Richardson Electronics utilizes its unique manufacturing processes, equipment, technical expertise and in-house design team.

Our extensive in-house knowledge of materials, RF & microwave and High Voltage applications, coupled with our outstanding quality control, customer specific manufacturing capabilities, make us an ideal vendor-of-choice for many applications

## Richardson Electronics in-house capabilities include:

- Energy Storage Integrator
- Air-Wound Inductors and RF Coil Making
- Brazing, Welding and Joining Operations
- Electromechanical Assembly
- High Voltage Assembly
- Machining
- Plating, Chemical Processing and Finishing
- Solder Dipping
- RF Assembly
- We provide contract manufacturing, custom/private labeling, and testing services for our customers.

Richardson Electronics is dedicated to providing products and services of the highest quality. Our manufacturing facilities are ISO 9001:2015 certified and we maintain our own Corporate Quality Management System.



Richardson Electronics is an international company that provides engineered solutions and electronic components to customers all over the world. We're supported by a network of strategically located sales offices and stocking locations in North America, Europe, Asia, and Latin America.

This global infrastructure allows us to bring together all the right resources and capabilities for your business — whether it's need-design, fabrication, integration, manufacturing, sourcing, or distribution support. At any point in the supply chain and from any place in the world, Richardson Electronics delivers the solutions you need.

## Primary Contacts

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