

# IceFree Hybrid<sup>TM</sup> XT

TURBINE CONTROL SENSORS

## Reliable turbine control... in any weather

For more power more of the time from your turbine, our new IceFree Hybrid<sup>TM</sup> XT turbine control sensors offer:

- All-weather performance and durability for increased turbine uptime
- Bearings protected from dirt and dust for extended life
- Twin-tail vane design, patent-pending technology, and magnetic damping for improved stability and accuracy
- Backed by NRG Systems' engineering, customer support, service, and warranty



Precise. Reliable. Proven.

Complete Systems | Sensors | Remote Sensors | Tilt-Up Towers | Data Loggers | Turbine Control



NRG Systems, Inc. | Hinesburg, Vermont 05461 USA | 802.482.2255 | [www.icefreehybrid.com](http://www.icefreehybrid.com)

| Specification                      | 4718 IceFree Hybrid XT Heated Anemometer   | 4715 IceFree Hybrid XT Heated Vane   |
|------------------------------------|--|--|
| <b>Applications</b>                | <ul style="list-style-type: none"> <li>wind turbine control for onshore and offshore turbines in all weather conditions</li> </ul>   | <ul style="list-style-type: none"> <li>wind turbine control for onshore and offshore turbines in all weather conditions</li> </ul>   |
| <b>Instrument compatibility</b>    | <ul style="list-style-type: none"> <li>digital inputs of turbine controllers or PLCs</li> </ul>  | <ul style="list-style-type: none"> <li>digital inputs of turbine controllers or PLCs</li> </ul>  |
| <b>Sensor range</b>                | <ul style="list-style-type: none"> <li>maximum speed 70 m/s (157 mph)</li> </ul>   | <ul style="list-style-type: none"> <li>0° to 360°, free rotation</li> </ul>  |
| <b>Signal type</b>                 | <ul style="list-style-type: none"> <li>high level square wave frequency (see manual for details)</li> <li>amplitude equals supply voltage</li> <li>other formats available using optional Hybrid Personality Module</li> </ul>   | <ul style="list-style-type: none"> <li>high level square wave frequency (see manual for details)</li> <li>amplitude equals supply voltage</li> <li>other formats available using optional Hybrid Personality Module</li> </ul>   |
| <b>Transfer function</b>           | <ul style="list-style-type: none"> <li>m/s = Hz x 0.5 - 0.5</li> <li>(miles per hour = Hz x 1.118 - 1.118)</li> </ul>  | <ul style="list-style-type: none"> <li>0° = 100 Hz, 359° = 459 Hz</li> <li>1° per Hz</li> <li>10-bit resolution (&lt;1° resolution)</li> </ul>   |
| <b>Accuracy</b>                    | <ul style="list-style-type: none"> <li>99.7% of sensors fall within 2% of the specified slope</li> <li>calibration available upon request</li> </ul>   | <ul style="list-style-type: none"> <li>linear to ±1°</li> <li>no dead band</li> </ul>  |
| <b>Output signal range</b>         | <ul style="list-style-type: none"> <li>1 to 141 Hz</li> <li>0 Hz output indicates fault</li> </ul>   | <ul style="list-style-type: none"> <li>100 Hz to 459 Hz</li> <li>0 Hz output indicates fault</li> </ul>  |
| <b>Recommended load resistance</b> | <ul style="list-style-type: none"> <li>1200 ohm minimum</li> </ul>   | <ul style="list-style-type: none"> <li>1200 ohm minimum</li> </ul>   |
| <b>Response characteristics</b>    | <ul style="list-style-type: none"> <li>threshold: &lt;2 m/s (&lt;4.5 mph)</li> <li>ASTM D5096-2 in accordance with "Anemometer Performance Determined by ASTM Methods", Lockhart</li> </ul>  | <ul style="list-style-type: none"> <li>threshold: &lt;2.4 m/s (&lt;5.4 mph)</li> <li>ASTM D5366-96</li> </ul>  |
| <b>Power requirements</b>          | <ul style="list-style-type: none"> <li>Electronics <ul style="list-style-type: none"> <li>supply voltage: 8 to 24 V DC</li> <li>supply current: 40 mA typical (not including heater)</li> </ul> </li> <li>Heater <ul style="list-style-type: none"> <li>supply voltage: 24 V (AC or DC)</li> <li>supply current: <ul style="list-style-type: none"> <li>self-regulating heater contained within an aluminum head</li> <li>1 to 4A, thermal load dependent</li> <li>cold start inrush current: 9A peak</li> <li>inrush drops below 4A within 30 seconds</li> </ul> </li> </ul> </li> </ul>  | <ul style="list-style-type: none"> <li>Electronics <ul style="list-style-type: none"> <li>supply voltage: 8 to 24 V DC</li> <li>supply current: 40 mA typical (not including heater)</li> </ul> </li> <li>Heater <ul style="list-style-type: none"> <li>supply voltage: 24 V (AC or DC)</li> <li>supply current: <ul style="list-style-type: none"> <li>self-regulating heater contained within an aluminum head</li> <li>1 to 4A, thermal load dependent</li> <li>cold start inrush current: 9A peak</li> <li>inrush drops below 4A within 30 seconds</li> </ul> </li> </ul> </li> </ul>  |
| <b>Cable &amp; connections</b>     | <ul style="list-style-type: none"> <li>quick-release connector mount</li> <li>braided shield with shield wire</li> <li>600V rated insulation</li> <li>outside diameter of cable = 8.89 mm (0.35 inches)</li> <li>two heater wires (20 AWG)</li> <li>three sensor wires: power, common, signal (22 AWG)</li> </ul>  | <ul style="list-style-type: none"> <li>quick-release connector mount</li> <li>braided shield with shield wire</li> <li>600V rated insulation</li> <li>outside diameter of cable = 8.89 mm (0.35 inches)</li> <li>two heater wires (20 AWG)</li> <li>three sensor wires: power, common, signal (22 AWG)</li> </ul>  |
| <b>Weight</b>                      | <ul style="list-style-type: none"> <li>1.45 kg (3.2 lbs)</li> </ul>  | <ul style="list-style-type: none"> <li>1.68 kg (3.71 lbs)</li> </ul>   |
| <b>Dimensions</b>                  | <ul style="list-style-type: none"> <li>overall height: 238 mm (9.35 inches)</li> <li>swept diameter of rotor: 127 mm (5 inches)</li> <li>body diameter: 58 mm (2.28 inches)</li> </ul>   | <ul style="list-style-type: none"> <li>overall height: 247 mm (9.72 inches)</li> <li>swept diameter of rotor: 150 mm (5.92 inches)</li> <li>body diameter: 58 mm (2.28 inches)</li> </ul>  |
| <b>Materials</b>                   | <ul style="list-style-type: none"> <li>cup head: anodized aluminum</li> <li>body: zinc</li> <li>shaft: stainless steel</li> <li>bearing: double-shielded stainless steel ball bearings in a protective cartridge</li> </ul>  | <ul style="list-style-type: none"> <li>twin-tail: anodized aluminum</li> <li>body: zinc</li> <li>shaft: stainless steel</li> <li>bearing: double-shielded stainless steel ball bearings in a protective cartridge</li> </ul>   |
| <b>Compliant with:</b>             | <ul style="list-style-type: none"> <li>UL61010-1</li> <li>CE</li> </ul>  | <ul style="list-style-type: none"> <li>UL61010-1</li> <li>CE</li> </ul>  |
| <b>Operating temperature range</b> | <ul style="list-style-type: none"> <li>-40° C to 60° C (-40° F to 140° F)</li> </ul>   | <ul style="list-style-type: none"> <li>-40° C to 60° C (-40° F to 140° F)</li> </ul>   |
| <b>Humidity range</b>              | <ul style="list-style-type: none"> <li>0 to 100% RH</li> </ul>   | <ul style="list-style-type: none"> <li>0 to 100% RH</li> </ul>   |
| <b>Environmental</b>               | <ul style="list-style-type: none"> <li>IP55 <ul style="list-style-type: none"> <li>IP5X Dust Intrusion per IEC 60529 and DIN40050-9</li> <li>IPX5 Water Jet per IEC 60529 and DIN40050-9</li> </ul> </li> <li>MIL-STD-810F Method 509.4 (96 Hour Salt Fog Corrosion)</li> <li>IEC 60068-2-52, Severity 1 (28 Day Salt Fog Corrosion)*</li> <li>IEC 60068-2-38 Z/AD (Cyclic Humidity &amp; Temperature)</li> <li>IEC 60068-2-78 (Constant Humidity)</li> <li>Vibration Testing <ul style="list-style-type: none"> <li>IEC 60068-2-6</li> <li>IEC 60068-2-64</li> <li>MIL-STD-810G 514.6 Annex D per profile 514.6D III Category 14*</li> </ul> </li> <li>Packaging meets ISTA 1A Drop Test</li> </ul> | <ul style="list-style-type: none"> <li>IP55 <ul style="list-style-type: none"> <li>IP5X Dust Intrusion per IEC 60529 and DIN40050-9</li> <li>IPX5 Water Jet per IEC 60529 and DIN40050-9</li> </ul> </li> <li>MIL-STD-810F Method 509.4 (96 Hour Salt Fog Corrosion)</li> <li>IEC 60068-2-52, Severity 1 (28 Day Salt Fog Corrosion)*</li> <li>IEC 60068-2-38 Z/AD (Cyclic Humidity &amp; Temperature)</li> <li>IEC 60068-2-78 (Constant Humidity)</li> <li>Vibration Testing <ul style="list-style-type: none"> <li>IEC 60068-2-6</li> <li>IEC 60068-2-64</li> <li>MIL-STD-810G 514.6 Annex D per profile 514.6D III Category 14*</li> </ul> </li> <li>Packaging meets ISTA 1A Drop Test</li> </ul> |

\* pending verification



### To Place Your Order

Contact NRG Sales, 802-482-2255 or visit [nrgsystems.com](http://nrgsystems.com)

110 Riggs Rd., Hinesburg, VT 05461 USA | [info@nrgsystems.com](mailto:info@nrgsystems.com)

