NRG Systems

NRG Product Manual

Hybrid XT Vane

Authors:
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Specifications are subject to change without notice.

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When you call or email, you should have the appropriate product documentation at hand and be prepared to give the following information:

- Customer name
- Who purchased equipment
- Item number or description
- Serial number
- When equipment was purchased
- Where equipment is installed - terrain conditions
- Description of the problem with some detail
- What events took place leading up to the problem
- What you have tried while attempting to solve the problem

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All instruments, sensors, software and towers manufactured by NRG Systems are designed to be reliable and easy to use. We welcome your comments and appreciate your help in making NRG products the best available.

INTRODUCTION

The NRG Systems Hybrid XT vane is an electrically heated wind direction sensor designed for wind turbine control and wind resource assessment. The sensor is mounted to the turbine nacelle or meteorological mast and provides an electrical output signal relative to wind direction. While the Hybrid XT sensors can be used for meteorological work, this manual is specific to turbine control applications.

The Hybrid XT is rugged enough to accurately measure wind directions in excess of 70 m/s (156 mph), yet its relatively low moment of inertia permits it to respond rapidly to gusts and lulls. It is built with corrosion resistant materials and finishes, and is sealed against wind-driven rain and dust.

The Hybrid XT sensor line has a captive mounting system with integral connector that allows quick and easy changing of the sensor. There are only three internal components (electronics module, heater assembly and bearing assembly) for ease of maintenance. The Hybrid XT also has a spare label pocket for a customer-supplied identification label.

Using This Manual

Read this manual completely before installing and operating the Hybrid XT vane. Follow all instructions and recommendations closely.

This document and the sensor may use the following symbols:

 Earth (Ground)

 Chassis Ground

 AC Voltage

 AC or DC Voltage

 DC Voltage

 Hot Surface

This typeface within the body of the manual is used for general descriptions and instructions to the user.

This typeface is used to warn users of a potential danger, either to themselves or to the sensor.

VANE OPERATION AND CONSIDERATIONS

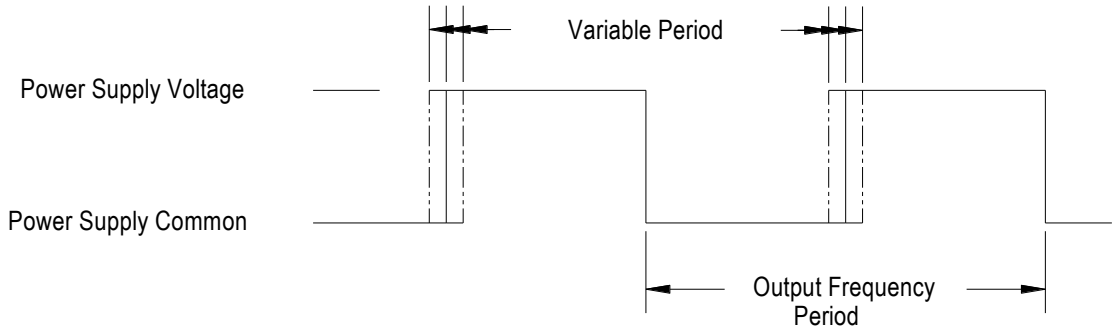
The HXT vane is available with a variety of output signal types including variable frequency and 4-20mA, among others.

Hybrid XT Vane Types

Sensor Part #	Output Signal	Output Wires	Scaling	Notes
#4715	Frequency (Hz)	White	100 – 459 Hz 0 – 359 degrees 1 Hz = 1 deg	– High-level square wave output – Amplitude equals supply voltage – Compatible with Personality Module (NRG Part #3798) – Recommended load resistance 1200 Ω minimum
#5762	mA **CW**	White	4-20 mA **0 – 359 degrees** Linear scaling <4 mA = sensor fault	– **Clockwise** output signal scaling – Standard 4-20 mA current loop – 0.4-degree resolution – Recommended load resistance 50 Ω–1000 Ω
#7894	2-Channel Push-Pull Active LOW	**White** VR (L/R) **Yellow** VL90 (F/B)		– Compatible with PNP & NPN inputs – 2-Channel output – 10-bit (<1 deg) resolution – Recommended load resistance 1200 Ω minimum – Pull-up resistors not required
#9362	mA **CCW**	White	4-20 mA **359 – 0 degrees** Linear scaling <4 mA = sensor fault	– **Counter-Clockwise** output signal scaling – Standard 4-20 mA current loop – 0.4-degree resolution – Recommended load resistance 50 Ω–1000 Ω
#9363	2-Channel Push-Pull Active HIGH	**White** VR (L/R) **Yellow** VL90 (F/B)		– Compatible with PNP & NPN inputs – 2-Channel output – 10-bit (<1 deg) resolution – Recommended load resistance 1200 Ω minimum – Pull-up resistors not required

Frequency Output | HXT Vane Model #4715

The Hybrid XT vane provides a **square wave output signal** with a frequency proportional to the head rotation position. The square wave amplitude is determined by the power supply voltage.



Vane Output Waveform
Output frequency proportional to wind direction

The frequency varies between 100Hz and 459Hz. At 100 Hz, the direction is 0 degrees and at 459 Hz the direction is 359 degrees (1 degree per Hz). Note that the output signal will equal 280 Hz (180 degrees) when the vane is aligned with the rotor. If the frequency output is 0 Hz, this indicates a fault condition. The most likely causes would be: no power, wiring problem, or a failed sensor.

If you were to look at the signal on an oscilloscope, you would notice that the rising edges fluctuate back and forth from cycle to cycle. This is normal and was designed this way for NRG Systems' factory use. This will not affect your frequency counter in any way. However, if you are using a "time per pulse" measurement method you will want to trigger on the falling edges only. For best accuracy, time and count many cycles then divide the count by the time for an average frequency. This technique also effectively filters out short-term wind direction variations.

4-20 mA Output | HXT Vane Models #5762 | #9362

The HXT 4-20 mA Turbine Control Vane provides an industry-standard 4 to 20 mA output signal sourced by the sensor. The output range of 4 to 20 mA corresponds to 0 to 359 degrees.

Note that the direction of the signal scaling is opposite for the two HXT vane models, 5762 & 9362. You will have to determine which type works with your turbine or PLC.

For yaw control, the sensor should be mounted so that an indicated direction of 180 degrees corresponds to a turbine direction oriented directly into the wind. In this configuration, the sensor output signal is 12 mA when the turbine is aligned with the wind, and the transition from 4 mA output to 20 mA output is opposite the normal control direction.

Under normal operation, the output signal current varies from 4 to 20 mA. A signal outside this range indicates a fault condition. The most likely causes would be a loss of power, a wiring problem, or a failed sensor.

The HXT 4-20 mA signal output has been engineered to adapt to most common 4-20 mA current loop inputs. The range of compatible loads for the current loop signal does depend on the power supply voltage provided to the sensor. At the lowest specified power supply voltage of 11 V DC, the output loop load (or “burden”) may be only up to 350 Ohms maximum (a 7 volt maximum voltage drop). When provided with its maximum 24 V DC power supply voltage, the sensor can drive up to a 1000 Ohm loop load (a 20 V maximum voltage drop).

Push-Pull Output | HXT Vane Models #7894 | #9363

The Push-Pull HXT vanes were designed as a direct replacement for 1- or 2-Channel IceFree3 wind vanes. They provide two output signals, in push-pull format. These outputs can source current when on and sink current when off for compatibility with a wide range of controller inputs, including those designed for existing NPN or PNP sensors.

#7894 is active LOW.
#9363 is active HIGH.

The two signals are Yaw Right / Yaw Left, denoted VL, and the Upwind / Downwind signal, denoted VR90.

- **White wire == VL (yaw right/left)**
- **Yellow wire == VR90 (upwind/downwind)**

When a 1-channel vane is required, only one output signal wire should be connected to the PLC input.

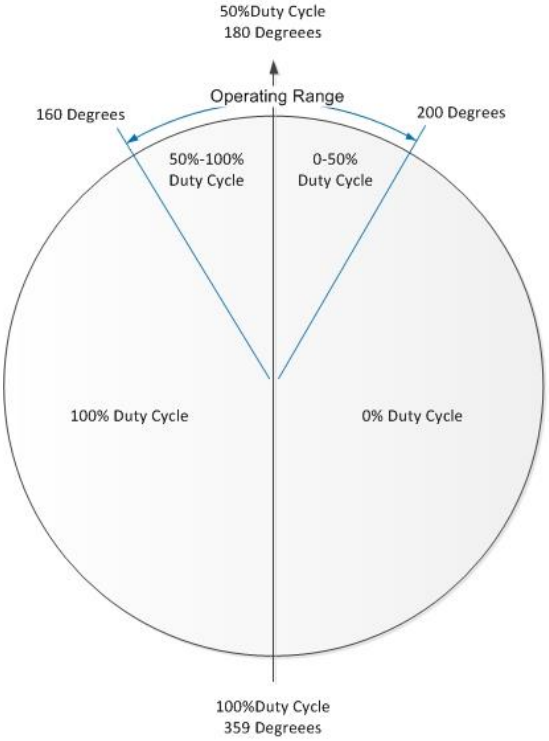
Push-Pull XT Vane Dithering

Most yaw vanes, including many OEM sensors, are under-damped. They move left and right continuously as the blades pass the nacelle and other turbulence affects the sensor. Some turbine control systems depend on this motion, called dithering, to allow them to estimate the average wind direction while observing only one digital signal. The wind vane output is off when the vane is left of center, and on when the vane is right of center. In these systems, the controller compares how much time the sensor indicates left and how much time the sensor indicates right. When the turbine is correctly pointed into the wind, the vane will indicate left and right equally, and the on / off ratio is 50%.

The Hybrid XT turbine control vane head maintains a stable output position that tracks the wind direction more accurately and varies much less than under-damped sensors.

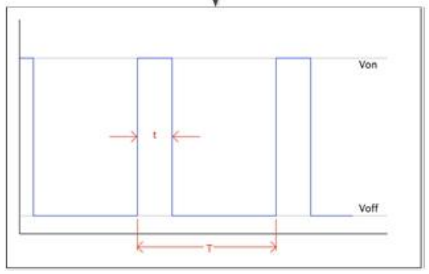
For compatibility with controllers that are expecting a dithered signal, the electronics of the Push-Pull HXT Vane creates a compatible dithered signal. When the HXT vane senses the wind direction is correctly pointed into the wind, the dithered signal is switching on and off with a ratio of 50%. As the wind varies to the right or left, the sensor varies the on/off ratio to simulate an under-damped vane's mechanical dithering.

#7894 Signal Map

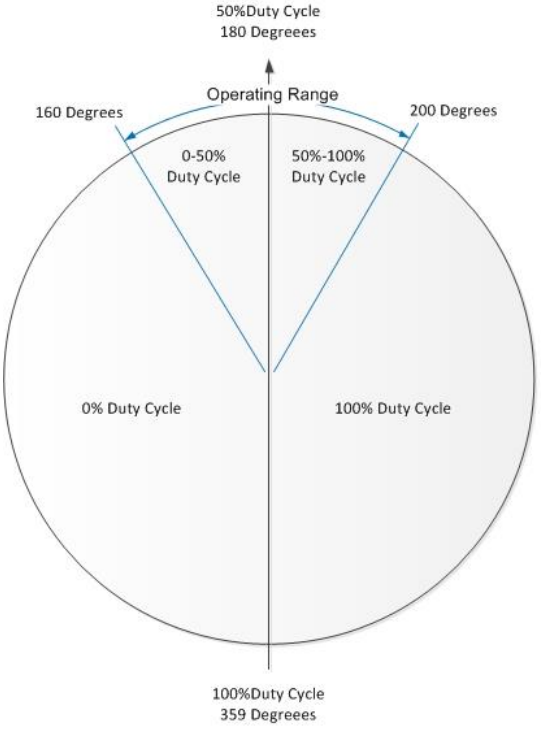


Output: PWM signal with a period (T) of 400ms and duty cycle scaled over range of 160-200 degrees. (0 -160 degrees = 100% duty cycle, 180 degrees = 50% duty cycle, 200-359 degrees = 0% duty cycle)

The "duty cycle" **D** is the ON time as a percentage of the period. Period **T** is 400 ms. The ON time **t** varies from 0 to 400 ms. **D = (t / T)**

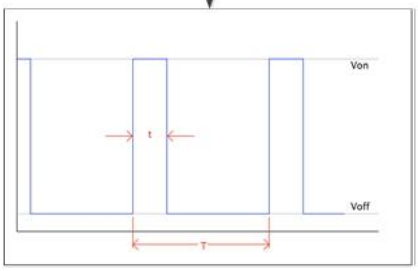


#9363 Signal Map



Output: PWM signal with a period (T) of 400ms and duty cycle scaled over range of 160-200 degrees. (0 -160 degrees = 0% duty cycle, 180 degrees = 50% duty cycle, 200-359 degrees = 100% duty cycle)

The "duty cycle" **D** is the ON time as a percentage of the period. Period **T** is 400 ms. The ON time **t** varies from 0 to 400 ms. **D = (t / T)**



Hybrid XT Vane Head Damping

The Hybrid XT Vane has damping in the head to reduce overshoot and oscillation behind the turbine rotor. One result of this is that the frequency response has been lowered slightly. This may, in some limited circumstances, require a slight adjustment to the turbine controller settings when retrofitting a Hybrid XT in place of an IceFree2, IceFree3, or an original Hybrid. Please contact NRG Systems for further information.

Heater Operation

The heat source for the HXT is a self-regulating, constant-temperature heater. Constant heating prevents condensation and corrosion and maintains proper bearing temperature for consistent performance and transfer function. In severe wind and icing conditions, the HXT draws more power to help remain clear of ice. As conditions improve, the HXT draws less power. The HXT's self-regulating feature increases reliability, ensuring that the head does not reach excessive temperatures. This prevents excessive stress on bearing lubricants and wiring, and prevents a hazard in the presence of combustible materials.

The HXT's heater is powered by 24 volt power, AC or DC, making it compatible with a wide range of turbine controller power supplies and remote site equipment. An optional 120/240 V AC-to-24 V AC transformer is also available.

When power is applied, the heater will draw a brief inrush current. After 30 seconds or less, the heater current reduces to its temperature-controlled value. Accordingly, we recommend a **15A slow-blow fuse or 10A circuit breaker in-line with the heater.**

NOTICE

Always power the heater on your HXT sensor! Failure to maintain constant heating may lead to corrosion or inferior sensor performance. Constant heating prevents condensation from forming on the bearings, enabling the sensor to achieve a 10-year service cycle. **If the sensor is used without the heater, the warranty will be void.**

Sensor surfaces (particularly the head and the upper body) can become quite hot and may burn you; especially in warm ambient conditions.
Use caution when the heater power is on.

ESD and Circuit Protection

The HXT sensor has been designed to withstand most common wiring errors and electrostatic discharge. These include reversed polarity on the power supply inputs, applying power to or shorting the signal output lines, and electrostatic discharge on any line.

However, the sensor is not indestructible. Avoid applying more than the rated power supply to any pin. While extremely rugged, nearby or direct lightning strikes may damage the sensor.

Cable Shielding - Important

The user must decide how to connect the shield of the signal cabling for their application. This is an important part of the overall design of the lightning protection and grounding system for each turbine design.

We recommend that the shield always be connected at the controller end of the cable. This provides shielding against capacitively (electrostatically) coupled interference to the sensor signal.

If the shield can be connected to ground at the sensor boom as well, the shield can also provide protection against inductive (magnetically) coupled noise sources, such as generator noise and lightning electromagnetic pulses. However, you should connect the shield at both ends ONLY if the turbine grounding system provides sufficient bonding and grounding to prevent ground loop currents in the shield wire.

On the cable assembly for the HXT sensor, the shield is available for connection at both ends. If the sensor end is not to be connected, cut off the shield wire at the sensor end before installation to prevent accidental contact to the sensor mount.

Magnet Safety

The HXT sensors, particularly the vane version, contain small, but powerful neodymium iron boron magnets. These magnets are strong enough to magnetize tools, erase magnetic media (floppy disks and credit cards), damage CRT's (computer monitors and TV's), pinch fingers, etc. They can also shatter if allowed to snap together, causing eye damage. If they are ingested, they can cause serious injury, or even death.

⚠ WARNING Do not allow unskilled persons to disassemble these sensors. Do not remove the magnets from their respective assemblies (Head Assembly and Shaft Assembly). Keep small magnets and small pieces containing magnets away from young children who might mistakenly or intentionally swallow them. Seek immediate medical attention if you suspect a child may have swallowed a magnet.

Transport and Handling

This sensor is a precision instrument. Please use care in its handling to protect the bearings and shaft. It is recommended that the sensor be carefully placed on its side instead of standing up.

If the sensor tips over onto a hard surface, bearing or shaft damage may occur. ***Physical damage to the sensor is not covered by warranty.***

CABLE COMPATIBILITY TABLES

There have been several different versions of the Hybrid cable assembly since inception to accommodate various sensor and turbine configurations. Please see the tables below to verify cable compatibility.

Hybrid/HXT Sensor Cables

Item Number	Description	Notes
4716	Assembly-Cable,600V, 10m, Connector, Power, Signal, With Mounting Bolt, Hybrid TCS	10 m length, 5 pin cable, **Green Tag**
4717	Assembly-Cable,600V,20m, Connector, Power, Signal, With Mounting Bolt, Hybrid TCS	20 m length, 5 pin cable, **Green Tag**
8797	Assembly-Cable,600V,12m,6 Pin Connector, Power, Signal, With Mounting Bolt, Hybrid TCS	12 m length, 6 pin cable**, Red Tag**
9234	Assembly-Cable,300V,10m, Connector, Power, Signal, With Mounting Bolt, Hybrid TCS	10 m length, 6-pin cable **Orange Tag**
9319	Assembly-Cable,300V,20m, Connector, Power, Signal, With Mounting Bolt, Hybrid TCS	20 m length, 6-pin cable **Chartreuse Tag**

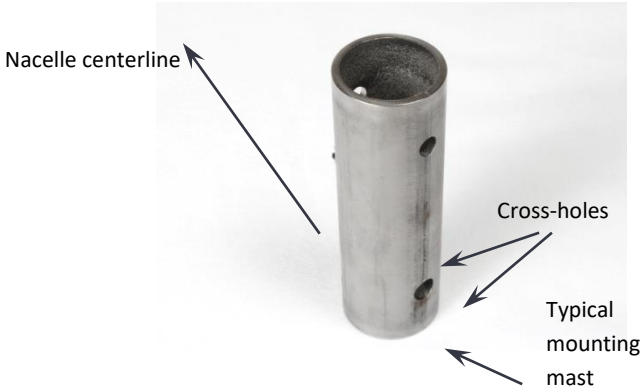
HXT Sensor-to-Cable Compatibility

Sensor Part Number	Sensor Type | Output Type	Compatible Cable Part Numbers	Notes
4715	HXT Vane | Digital Frequency	4716, 4717, 8797, 9234, 9319	Any cable may be used. Yellow (Output 2) is not used and should be left disconnected.
4718	HXT Anemometer | Digital Frequency	4716, 4717, 8797, 9234, 9319	Any cable may be used. Yellow (Output 2) is not used and should be left disconnected.
6624	HXT Anemometer, Calibrated | Digital Frequency	4716, 4717, 8797, 9234, 9319	Any cable may be used. Yellow (Output 2) is not used and should be left disconnected.
5762	HXT Vane | 4-20 mA, Clockwise	4716, 4717, 8797, 9234, 9319	Any cable may be used. Yellow (Output 2) is not used and should be left disconnected.
5763	HXT Anemometer | 4-20 mA, 0-50 m/s scaled	4716, 4717, 8797, 9234, 9319	Any cable may be used. Yellow (Output 2) is not used and should be left disconnected.
7894	HXT Vane | Push-Pull, Active Low	***8797, 9234, 9319 (Red, Orange or Chartreuse tag) only***	**Only newer 6-pin cables can be used. All six wires are required to provide both Vane signals.**
7901	HXT Anemometer | Push-Pull	4716, 4717, 8797, 9234, 9319	Any cable may be used. Yellow (Output 2) is not used and should be left disconnected.
9362	HXT Vane | 4-20 mA, Counter-Clockwise	4716, 4717, 8797, 9234, 9319	Any cable may be used. Yellow (Output 2) is not used and should be left disconnected.
9363	HXT Vane | Push-Pull, Active High	***8797, 9234, 9319 (Red, Orange or Chartreuse tag) only***	**Only newer 6-pin cables can be used. All six wires are required to provide both Vane signals.**
9365	HXT Anemometer | 4-20 mA, 0-60 m/s scaled	4716, 4717, 8797, 9234, 9319	Any cable may be used. Yellow (Output 2) is not used and should be left disconnected.
9392	HXT Anemometer | 4-20 mA, 0-100 m/s scaled	4716, 4717, 8797, 9234, 9319	Any cable may be used. Yellow (Output 2) is not used and should be left disconnected.

HXT SENSOR INSTALLATION

Mounting Mast Orientation

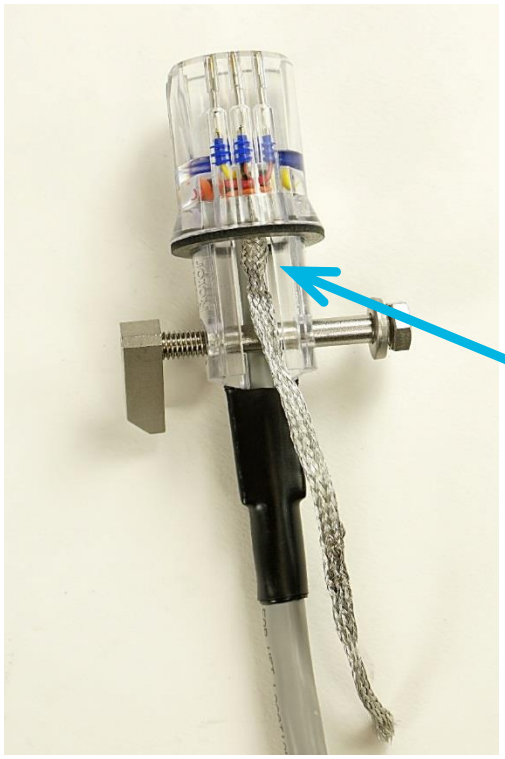
Refer to the technical drawing for details on mounting mast design. Orient the cross-holes in the top of the mounting mast such that they are lined up parallel to the turbine nacelle centerline.



Align cross-holes parallel to nacelle centerline.

Prepare Shield

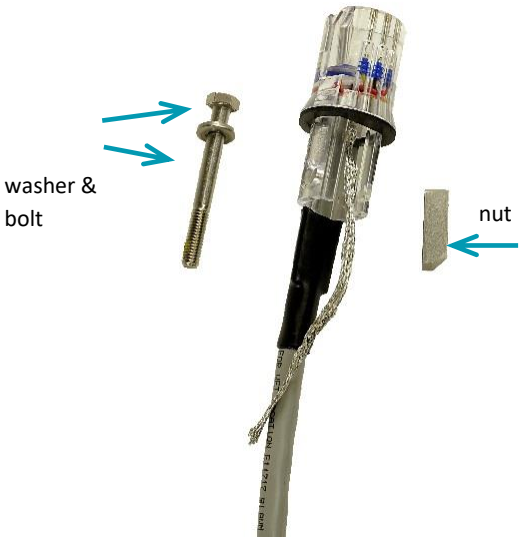
Based on your decision about the cable shield connection scheme, cut off or attach the shield to the mounting mast. If you choose to cut the shield wire, make sure to cut it off short enough to avoid touching the mounting mast or bolt.



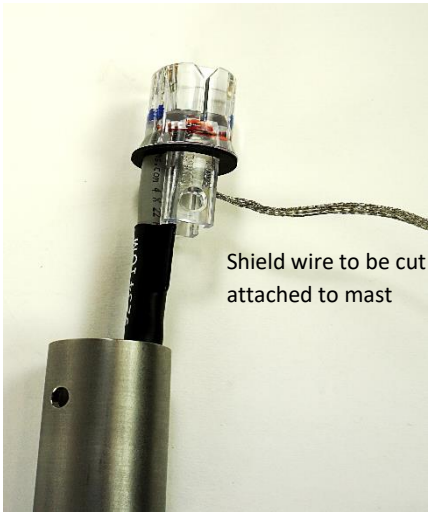
If cutting shield wire, cut close to connector base as shown.

Mount Connector

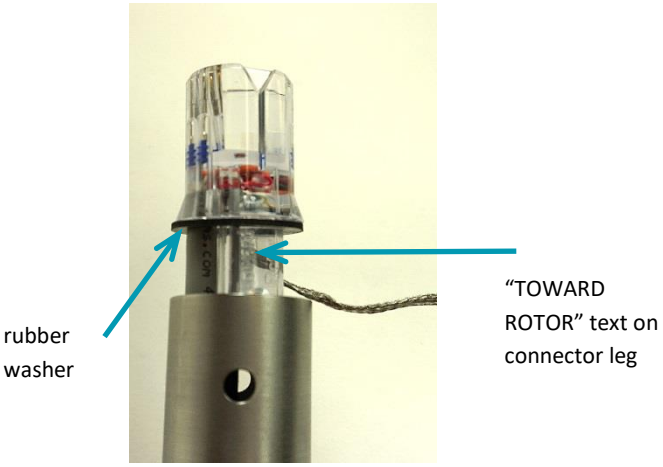
Remove the nut, washer, and bolt from the connector. Feed the cable through the mounting mast until the connector reaches the mast. Align the bolt hole in the connecter with the holes in the mounting mast such that the “TOWARD ROTOR” text molded onto the connector leg is oriented toward the turbine rotor. If you are connecting the shield to the mounting mast, do so now.



Remove **the** nut, washer, & bolt.

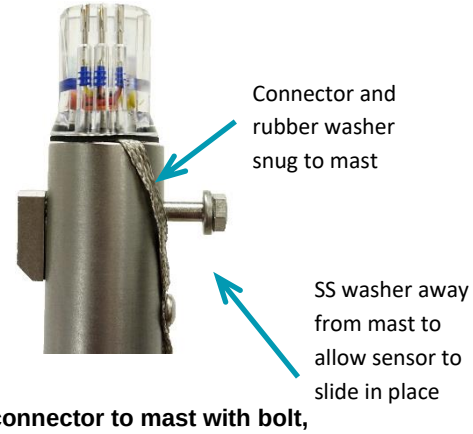


Feed cable through mast.



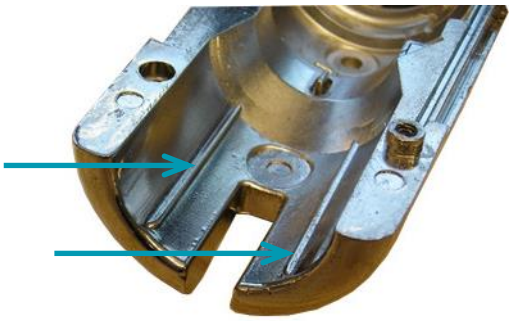
Install connector with “TOWARD ROTOR” text pointing to the rotor.

Be sure that the connector is snug against the top of the mounting mast and that the washer is on the bolt (compression of the rubber washer may be necessary) then pass the bolt though the mast and connector. Now attach the nut to the bolt a few turns until the nylon patch is in contact with the nut. The nylon patch prevents the nut from backing off the bolt threads. Note that the washer is between the mounting mast and the bolt head.



Secure connector to mast with bolt, washer, and nut.

The HXT sensors have four ridges running vertically inside the body's lower end as shown in the picture below. These ensure that the sensor mounts securely on the mounting mast.



Suggested method for attaching shield to mast.

If attaching the shield to the ground screw, make sure that it does not interfere with the mounting ridges by running it straight down the mast from the connector to the ground screw. Do not wrap the wire around the mast. The picture below shows the ground screw attachment option.

Connect Cable to Controller

Route the sensor cable into the nacelle and to its connection point. It may be helpful to label the end of each wire before pulling the cable to its connection point. Following the color code, connect the sensor wires and shield wire to the turbine controller and heater power supply.

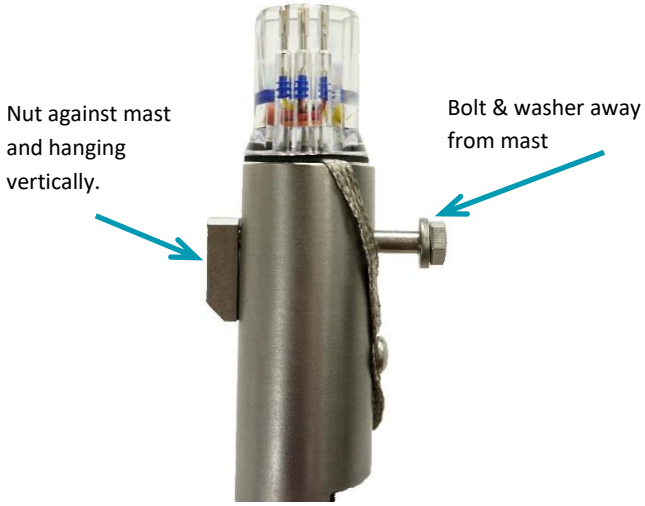
Sensor Common	Black, 22 AWG
Sensor Power	Red, 22 AWG
Sensor Signal	White, 22 AWG
N/A – not used	Yellow, 22 AWG (on all cables shipped since January, 2016)
Heater – *	Orange/White, 20 AWG
Heater + *	Orange/Black, 20 AWG

NOTICE

When powering the sensor heater with DC power, Orange/White MUST be connected to DC Ground (-) and Orange/Black to 24V DC (+).
When using AC power, the wiring order does not matter.

Mount Sensor

To attach the sensor to the mounting mast, slide the clamp bolt and washer away from the mounting mast until the nut is against the mounting mast and is hanging vertically.



Rotate the HXT sensor body so that the “THIS SIDE TOWARD ROTOR” label is facing the turbine rotor. This aligns the internal key with the alignment slot in the connector. Now, slide the sensor down over the boom carefully making sure that the key drops into the slot. Continue to slide the senor down until it is firmly seated on the nut. There will be some drag as the o-ring seal and the connector pins engage. Tighten the bolt using a 10 mm wrench to 7 N-m (5 ft-lbs).

Slide sensor down over mast.

Replacement washers, nuts and bolts can be ordered from NRG Systems (part #4422).

GROUNDING AND BONDING FOR OVER-VOLTAGE PROTECTION

Introduction

The purpose of this section is to outline the recommended practices for wiring, grounding, and bonding of HXT turbine control sensors. The goal is to provide the best possible protection against direct and indirect lightning damage for both the sensor and the interconnected turbine systems.

This section also details the internal construction of the sensor's bonding and over-voltage protection. This allows the wind turbine designer to coordinate the sensor grounding and Over Voltage Protection (OVP) with the rest of the turbine's Lightning Protection System (LPS).

Recommended Practices

The long-term reliability and the Electromagnetic Compatibility (EMC) performance of the sensor are dependent on proper installation and connections. These recommendations could apply to any control electronics or sensors, but are particularly critical for wind sensors because they are exposed on the top of the nacelle.

The purpose of recommendations 1 through 5 is to provide shielding of the internal sensor electronics, heater, and cabling so that they are protected to LPZ 1, per IEC 61400-24.

1 IEC 61400-24 classifies several Lightning Protection Zones (LPZ). LPZ 0A is exposed on the surface of the turbine and is subject to direct lightning attachment. The turbine must provide air terminals such as lightning rods to protect the sensors from direct lightning attachment. This creates an area in LPZ 0B to mount the sensors.

2 Careful routing of the lightning down-conductor and coordination of the grounding and bonding of the down-conductor(s) to the turbine's LPS is required to minimize the energy coupled into other systems such as the sensors. Provide maximum possible spacing between lightning down-conductors and any control cabling or raceway. Do not route any other cabling or raceway alongside the lightning down-conductors. These measures will minimize the coupling of lightning electromagnetic pulse (LEMP) energy into other turbine systems.

3 The Sensor body is metal, and bonds to the sensor mounting mast. The mounting mast must be metal. Take particular care to bond the sensor mounting mast to the turbine's LPS in coordination with the placement and bonding of the lightning air terminals and bonding of the turbine frame and nacelle.

4	Use shielded or “screened” cable with high shield coverage for sensor cabling. We recommend bonding the cable shield to the grounding system at both ends- at the sensor, and at the connection to the turbine control system- to provide maximum protection from LEMP. However, see note 6 about preventing ground loops. NRG Systems supplied cables provide a shield at the sensor end. If your LPS design does not use this shield drain, trim it off to prevent short circuits.
5	Run the sensor cabling in metallic raceway or conduit. Bond the raceway or conduit to the LPS at both ends. This provides protection for the sensor and cabling against EMI and LEMP.

Recommendations 6 and 7 relate to ground loops and over-voltage protection.

6	Provide sufficient bonding to prevent ground loop currents in the shields and raceways. Whenever possible, it is better to resolve the underlying grounding problems, rather than leaving the shield unconnected to prevent ground loop current flow.
7	Since the sensor's electronics and cabling are in LPZ 1, isolation and or over-voltage protection should be provided at the interface between the sensor cabling and turbine control system to provide LPZ 2 or better protection for the controller.

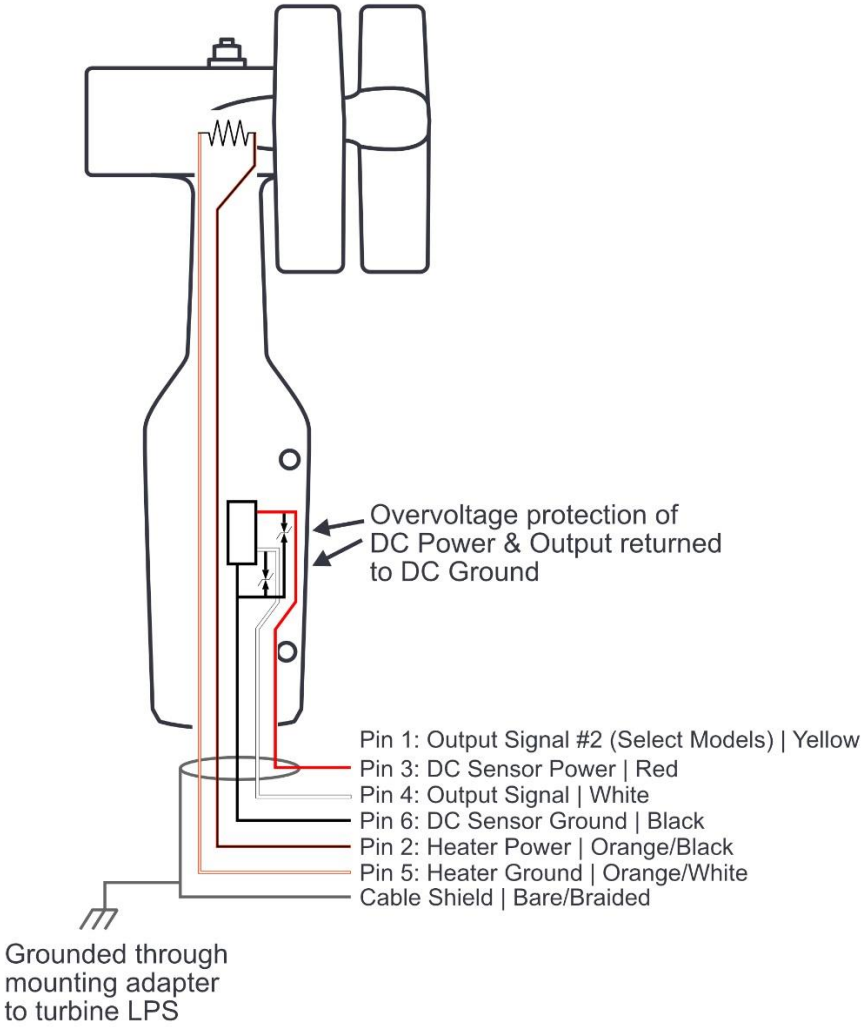
Reference:

1. IEC TR 61400-24: 2002: *Wind Turbine Generator Systems- Part 24: Lightning Protection.*

2. IEC 61312-1: 1995: *Protection against Lightning Electromagnetic Impulse- Part 1: General Principles*

Sensor Wiring Diagram

The HXT turbine control sensor's enclosure is metal, which provides an overall EMI shield for the internal components of the sensor. The sensor includes internal over-voltage protection (OVP) components. For these features to be effective, the sensor must be installed and connected properly. The figure below shows the internal connection details of the sensor bonding and OVP.



Internal bonding and OVP of the HXT turbine control sensor

NOTICE

When powering the sensor heater with DC power, Orange/White MUST be connected to DC Ground (-) and Orange/Black to 24V DC (+).
When using AC power, the wiring order does not matter.

WARRANTY

NRG Systems (NRG) warrants its products for a period of two years from date of original purchase solely for the benefit of the original consumer purchaser. If this product is determined to be defective in materials or workmanship, NRG will, at NRG's option, repair or replace this product without charge.

This warranty does not cover damage due to improper installation or use, accident or misuse, damages due to any unauthorized service or lightning. This warranty also will not apply if any seal on any instrument or sensor is broken, if any cable has been severed, or the equipment was not adequately grounded.

For complete information about NRG's warranty, visit the **Warranty** page on our website, located in the **Customer Support** section.

REPAIR

To return a defective product, request an RMA (return merchandise authorization) number by calling us at the number below or by emailing support@nrgsystems.com, or by submitting a request through our website's Technical Support area.

Please provide the serial number of the item as well as date of purchase. No products will be accepted for repair work without an RMA number. The product must be returned, postage prepaid, to NRG with a brief description of the problem, RMA number and a return address with phone number.

For complete information about returns and the RMA process, visit the **Return Authorization Request** page on our website, located in the **Customer Support** section.

DECLARATION OF CONFORMITY

Declaration of Conformity

(in accordance with ISO/IEC 17050-1:2004)

NRG Systems Document Number: 7737, Rev **H**

Supplier: NRG Systems

SUPPLIER ADDRESS: 110 Riggs Road, Hinesburg, VT 05461, USA
Telephone: +1 802.482.2255, Fax: +1 802.482.2272
Email: sales@nrgsystems.com

Declares under its sole authority that the Products: Hybrid Turbine Control Sensors, including:

Hybrid XT Vane	**Item 4715**
Hybrid XT Anemometer	**Item 4718**
Hybrid XT 4-20 mA Vane CW	**Item 5762**
Hybrid XT 4-20 mA Anemometer 50 m/s	**Item 5763**
Hybrid XT Push/Pull Active Low Vane	**Item 7894**
Hybrid XT Push/Pull Output Anemometer	**Item 7901**
Hybrid XT 4-20 mA Vane Counter-CW	**Item 9362**
Hybrid XT Push/Pull Active High Vane	**Item 9363**
Hybrid XT 4-20 mA Anemometer 60 m/s	**Item 9365**
Hybrid MC 4-20 mA Vane CW	**Item 9378**
Hybrid MC 4-20 mA Anemometer 50 m/s	**Item 9379**
Hybrid MC Push-Pull Anemometer	**Item 9380**
Hybrid MC Push-Pull Active LOW Vane	**Item 9381**
Hybrid XT Push/Pull Anemometer, FW90	**Item 9387**
Hybrid XT 4-20 mA Anemometer 100 m/s	**Item 9392**
Hybrid XT Push/Pull Anemometer, Low Freq	**Item 9425**
Hybrid XT Cable Assembly 300 V 10 m	**Item 9234**
Hybrid XT Cable Assembly 300 V 20 m	**Item 9319**
Hybrid XT Cable Assembly 300 V 12 m	**Item 15639**
Hybrid XT Cable Assembly 300 V 16 m	**Item 15559**
Hybrid XT Personality module	**Item 3798**

are in conformity with the following requirements of the relevant Union harmonization legislation and technical specifications:

EMC:

Directive 2014/30/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility (recast)

IEC 61326-1, "Electrical Equipment for Measurement, Control and Laboratory Use – EMC Requirements: Part 1 – General Requirements (2020)

CISPR 11 Edition 5.0: 2009, A1:2010 Radiated Emissions, Group 1, Class A

CISPR 11 Edition 5.0: 2009, A1:2010 Conducted Emissions, Group 1, Class A

IEC 61000-4-2, "Electromagnetic Compatibility (EMC) Part 4-2: Testing and Measurement Techniques – Electrostatic Discharge Immunity Test (2009),"

IEC 61000-4-3, "EMC Part 4-3: Testing and Measurement Techniques – Radiated, Radio-Frequency, Electromagnetic Field Immunity Test (2020),"

IEC 61000-4-4, "EMC Part 4-4: Testing and Measurement Techniques – Electrical Fast Transient/Burst Immunity Test (2012),"

IEC 61000-4-5, "EMC Part 4-5: Testing and Measurement Techniques – Surge Immunity Test (2017),"

IEC 61000-4-6, "EMC Part 4-6: Testing and Measurement Techniques – Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields (2014),"

IEC 61000-4-8, "EMC Part 4-8: Testing and Measurement Techniques – Power Frequency Magnetic Field Immunity Test (2010),"

RoHS:

Directive 2011/65/EU (as amended) on the restriction of the use of certain hazardous substances in electrical and electronic equipment (known as RoHS3)

Safety:

Directive 2001/95/EC of the European Parliament and of the Council of 3 December 2001 on general product safety

IEC 61010-1:2010-06 Safety requirements for electrical equipment for measurement, control, and laboratory use

Additional Information:

1. This product complies with the requirements of the applicable directives **2014/30/EU, 2011/65/EU**, and **2001/95/EC** and therefore the product is CE marked in accordance with **93/68/EEC**.
2. All circuits use < 50 V AC or DC, therefore ***Directive 2014/35/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits,*** known as the Low Voltage Directive (LVD), does not apply.
3. FCC compliance is demonstrated with compliant CISPR data.
4. The design documentation, test reports, and assessment laboratory accreditation are under document control in the NRG Systems engineering department.

Issued at Hinesburg, VT, USA
19 March 2021

Michael Purdue, VP of Engineering

APPENDIX A | TECHNICAL DRAWING