



NRG IceFree3™ Vane

NRG Turbine Control Vane

User Manual



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Customer Support

NRG Systems offers a variety of support options to help you get the most from your NRG product. If you have questions about your NRG product, first look in the printed product documentation, the Knowledge Base, or in the Technical Forum in the Tech Support section of NRG's web site. If you cannot find the answer, contact your salesperson or NRG Systems Customer Support for assistance using the information below. Customer support is available 8:30 AM to 5:00 PM EST, Monday through Friday.

NRG Systems, Inc.
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Telephone: 802-482-2255
Toll Free (USA only): 800-448-WIND (800-448-9463)
FAX: 802-482-2272
Email: support@nrgsystems.com

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

NRG Systems maintains an extensive website which includes an in-depth customer support area for NRG customers. If you need assistance at times other than our regular business hours, we suggest visiting our website, **www.nrgsystems.com**.

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

NRG IceFree3™ Vane (Heated)

The NRG IceFree3™ yaw vane is an electrically-heated wind direction sensor designed for wind turbine control at ice-prone sites. The vane base is fixed to the turbine nacelle, with relative “north” facing directly toward the blades. Rotation of the vane indicates yaw errors and provides output signals relative to the fixed vane base.

The IceFree3™ is reliable in heavy and light winds. It is rugged enough to accurately measure winds in excess of 90 meters per second (200 miles per hour), yet its low moment of inertia allows it to respond to winds as low as 2.0 m/s.

NRG Turbine Control Vane (Unheated)

The NRG Turbine Control yaw vane is a rugged wind direction sensor designed specifically for wind turbine control. The vane base is fixed to the turbine nacelle with relative “north” facing directly out toward the blades. Rotation of the vane head interrupts optical sensors and indicates yaw errors by providing output signals relative to the fixed vane base.

The NRG Turbine Control yaw vane is reliable in heavy and light winds. It is rugged enough to accurately measure winds in excess of 90 meters per second (200 miles per hour), yet its low moment of inertia allows it to respond to winds as low as 2.0 m/s.

Sensor Identification

Serial Number

The serial number is etched into the base of the sensor.



Finished Good (FG) vs. Kit Numbers

Finished Good (FG) numbers are used to refer to the sensor itself. A Kit number always includes the FG number, but may include item accessories as well. Always use the Kit # when placing an order.

Quick ID: NRG IceFree3™ Vanes (Heated)

Product	Kit#	FG#	Description	See Page
NRG IceFree3™ Yaw Vane 4 Ch, NPN, 2.8 m	#2451	#2443	<ul style="list-style-type: none">▪ Heated yaw error vane▪ Four NPN outputs▪ 2.8m cable	8
NRG IceFree3™ Yaw Vane 4 Ch, NPN, 4.7 m	#4107	#4102	<ul style="list-style-type: none">▪ Heated yaw error vane▪ Four NPN outputs▪ 4.7m cable	8
NRG IceFree3™ Yaw Vane 4 Ch, NPN, 8.0 m	#2652	#2650	<ul style="list-style-type: none">▪ Heated yaw error vane▪ Four NPN outputs▪ 8.0m cable	8

NRG IceFree3™ Yaw Vane 4 Ch, NPN, 8.0 m, M8	#3292	#3291	<ul style="list-style-type: none"> ▪ Heated yaw error vane ▪ Four NPN outputs ▪ 8.0m cable ▪ 8mm Mounting Screw 	8
NRG IceFree3™ Yaw Vane 4 Ch, NPN, 10.0 m	#3450	#3448	<ul style="list-style-type: none"> ▪ Heated yaw error vane ▪ Four NPN outputs ▪ 10.0m cable 	8
NRG IceFree3™ Yaw Vane 4 Ch, NPN, 17.0 m	#2850	#2848	<ul style="list-style-type: none"> ▪ Heated yaw error vane ▪ Four NPN outputs ▪ 17.0m cable 	8
NRG IceFree3™ Yaw Vane 1 Ch, PNP, 2.8 m	#2808	#2807	<ul style="list-style-type: none"> ▪ Heated yaw error vane ▪ One PNP output ▪ 2.8m cable 	14
NRG IceFree3™ Yaw Vane 1 Ch, PNP, 4.6 m	#3059	#3057	<ul style="list-style-type: none"> ▪ Heated yaw error vane ▪ One PNP output ▪ 4.6m cable 	14
NRG IceFree3™ Yaw Vane 2 Ch, PNP, 8.0 m	#3482	#3480	<ul style="list-style-type: none"> ▪ Heated yaw control vane ▪ Two PNP outputs ▪ 8.0m cable 	19

Quick ID: NRG Turbine Control Vane (Unheated)

Product	Kit#	FG#	Description	See Page
NRG Turbine Control Yaw Vane 2 Ch, PNP, 8.0 m	#3581	#3579	<ul style="list-style-type: none"> ▪ Yaw error vane ▪ Two PNP outputs ▪ 8.0m cable ▪ Unheated sensor 	24

General Sensor Information

ESD, Circuit Protection, and Cautions

- Do not apply greater than 30 Volts to the outputs at any time.
- We suggest that you not mount the sensor until the proper grounding is available. When you mount the sensor, protect the signal wires and connect the ground first. After connecting to ground, attach the signal wires from the sensor.
- There are internal TVS diodes on the output. If the output voltage is pulled above 30 V, or below ground, the diode will clamp the output to ground.
- Do not apply constant reverse voltages to the outputs. The internal diode is intended only to protect the sensor output from transient reverse voltages, for example, the inductive turn-off spike caused by driving reed-relay coils directly from the output.

Heater Operation

The heat source for the IceFree3 is a self-regulating constant-temperature heater. In severe wind and icing conditions, the IceFree3 draws full power and remains clear of ice. As weather conditions improve, the IceFree3 draws less power. The IceFree3's self-regulating feature increases its reliability, insuring that the head does not reach excessive temperatures. The IceFree3 heater is powered by 24 volt power, AC or DC, making it compatible with a wide range of remote site equipment. An optional 120/240V - 24 VAC transformer is also available.

- Following a brief inrush current, the heater quickly settles into its temperature-controlled mode.
- It is recommended that a 15 A slow-blow fuse be placed in line with the heater.

Installation

1. Tape the ends of the cables to prepare them for feeding through the mounting boom. Maintain the isolation of the signal leads from the boom. Remove the nut and bolt from the base of the unit. Feed the cables through the mounting boom until the sensor is on the boom. Align the bolt hole in the base (not the slot) with the hole in the boom such that the hole in the base points forward toward the rotor blades.
2. Check to be sure that the sensor is secure against the top of the boom. Insert the bolt into the slot side of the base. Place the nut on the end of the bolt and tighten.
3. Using the notations on the individual wires, connect the ground (common) lead to your controller first. Then connect the signal leads. Connect power last, especially if power is on during connection. Confirm input on controller.
4. Connect the heater power cable to your power source and check to be sure that the sensor head is heating. You do not need to wait until the body gets hot to be sure the heaters are working. Any warmth at the top of the stem (near the head) means that the heaters are working. The lower housing will take longer to warm up and will not get as hot.

IceFree sensors should be heated year-round to maintain constant bearing temperatures and to prevent moisture or condensation internally. We do not recommend turning off the heaters, even in warm weather.

*Calibration

If the IceFree sensor has been calibrated, a sensor specific calibration report has been shipped with the sensor. If the calibration report should get lost, you may contact NRG for a copy. Please note that you will need the sensor serial number when you contact NRG.

Sensor Maintenance

The bearings used in the IceFree3 sensors will last a minimum of 2 years. Sensor bearing life is variable and depends upon the amount of exposure to salinity, dust, moisture, icing, vibration, and other environmental factors. These factors independently, or in combination with each other, may reduce the bearing life. Routine maintenance should be considered at 2 year intervals.

NRG IceFree3™ Yaw Vane

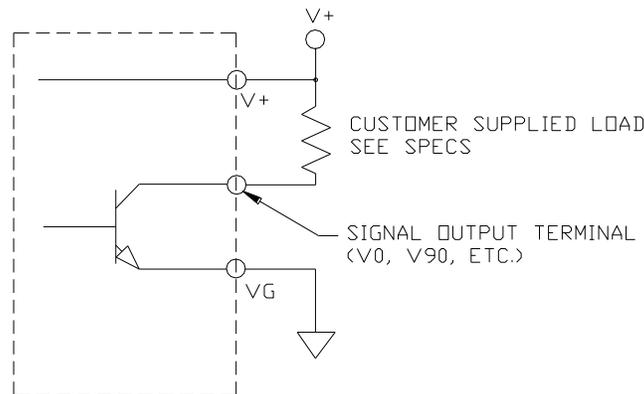
4 Ch, NPN

Kit# 2451, 4107, 2652, 3292, 3450, 2850
FG# 2443, 4102, 2650, 3291, 3448, 2848

NPN Output Circuit Operation

The IceFree3™ yaw vane has four output signals, each centered on one of the four cardinal directions. The outputs are open-collector type; they sink current to signal ground when active and are high impedance when inactive.

Typically, these outputs are used with a pull up resistor from the output to the desired power supply, and then the output is connected to a digital input on the controller. The active outputs are pulled low by the sensor, and when the output is inactive, the signal is pulled high by the resistor to the supply voltage. This open-collector arrangement allows you to choose the signal high voltage independently of the power input supply. The outputs can also directly drive current loop inputs such as reed-relay coils or opto-isolated inputs, if the approximately 4 mA output drive capability is sufficient.

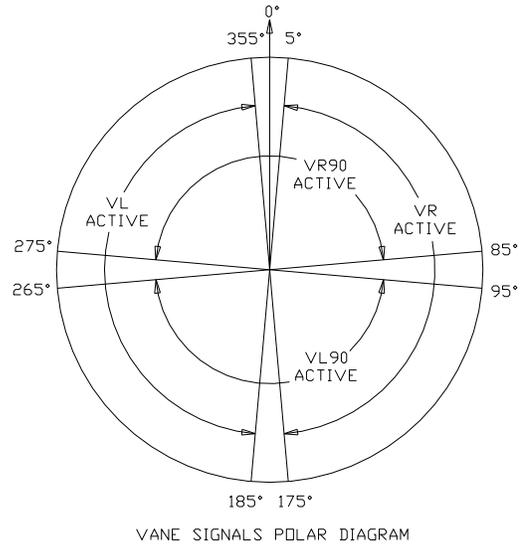
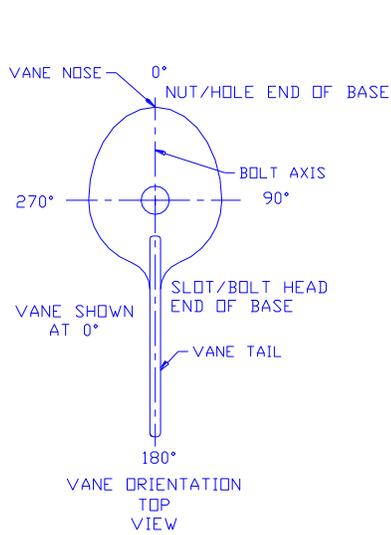


EQUIVALENT CIRCUIT FOR NPN OUTPUTS

The opto-interrupters require an external power supply to operate the LED lamps. The sensor signals are powered through an additional two wires: the red (excitation) and black (ground) wires.

Interpreting Output Signals – 4 Channels

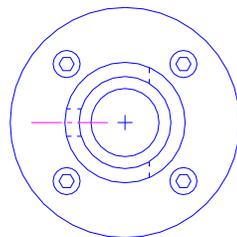
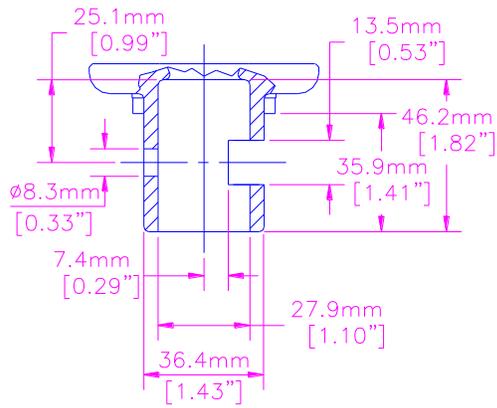
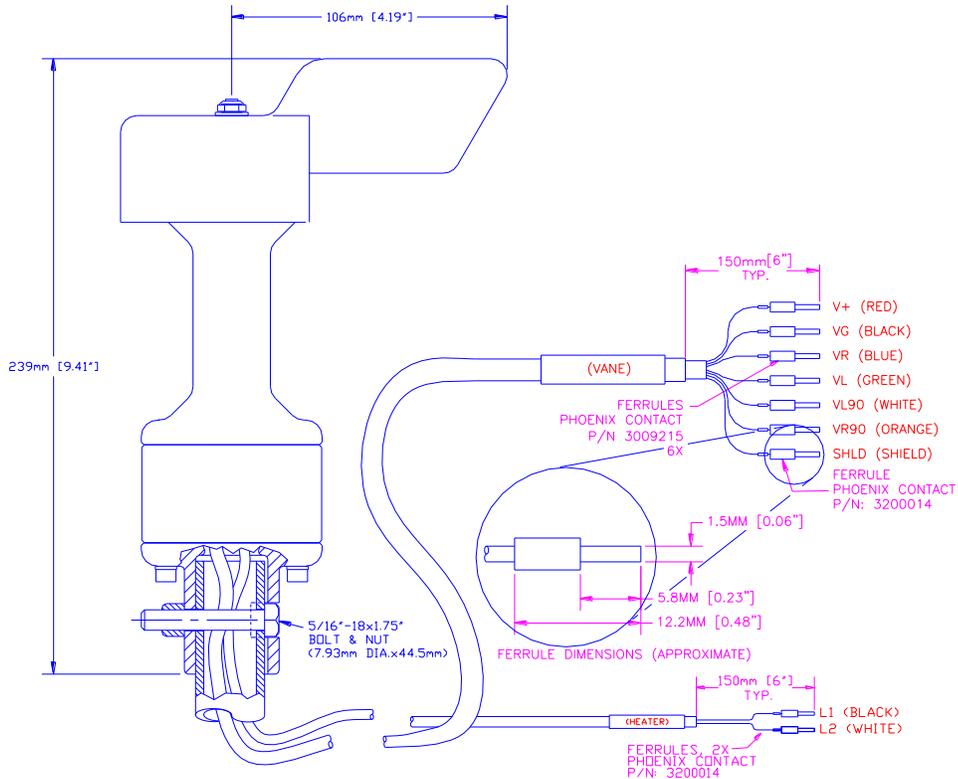
The diagrams and table below indicate when each of the four outputs is active (1) or inactive (0) for each relative direction the nose is pointing. For example, if the vane nose is pointing 55 degrees relative to the base, the VR output (blue wire) and VR90 output (orange wire) will become active.



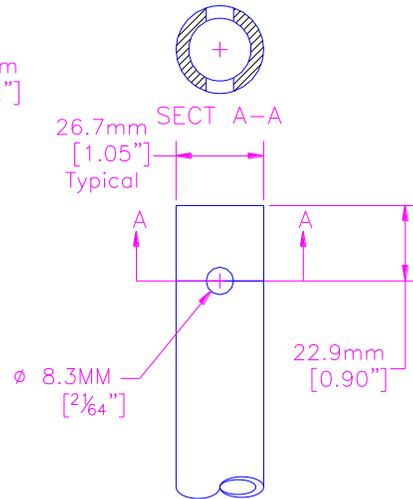
Azimuth Range (clockwise degrees)	Output Signals			
	VR	VL	VR90	VL90
5 to 175	1	0	0	0
185 to 355	0	1	0	0
95 to 265	0	0	0	1
275 to 85	0	0	1	0

Output Signal	Wire Color
VR	Blue
VL	Green
VL90	White
VR90	Orange

[Kit# 2451, 4107, 2652, 3450, 2850]
[FG# 2443, 4102, 2650, 3448, 2848]
Sensor and Mounting Outline

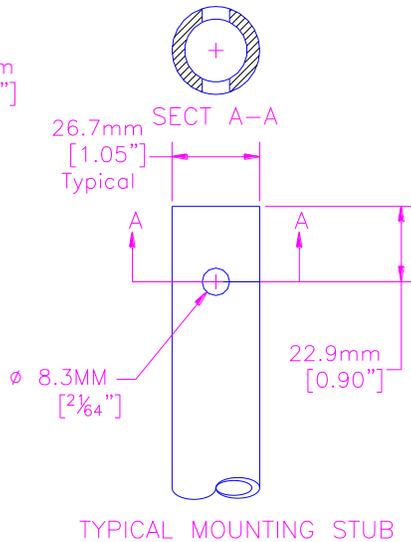
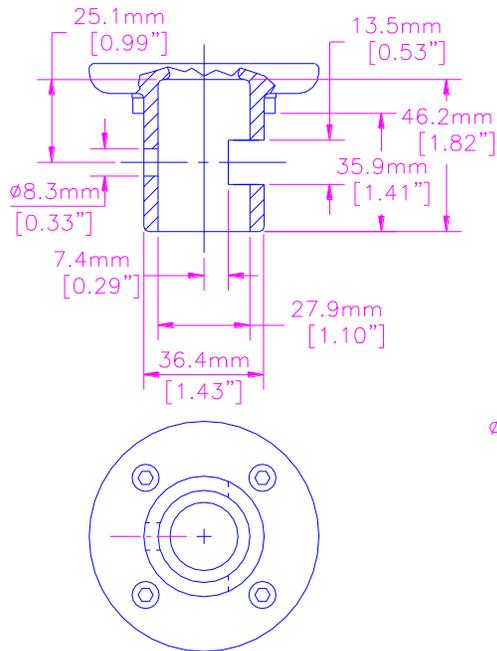
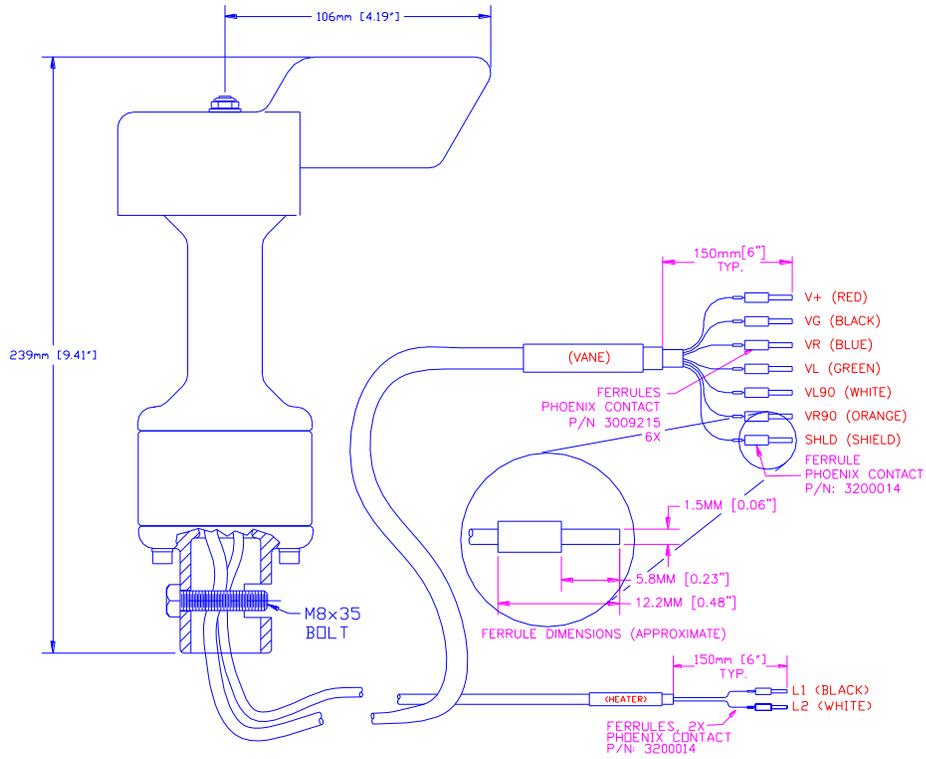


MOUNTING BASE DIMENSIONS



TYPICAL MOUNTING STUB

[Kit# 3292, FG#3291] M8 Sensor and Mounting Outline



MOUNTING BASE DIMENSIONS

[Kit# 2451, 4107, 2652, 3292, 3450, 2850]

[FG# 2443, 4102, 2650, 3291, 3448, 2848]

Specifications

Description	Sensor type	heated yaw error vane
	Applications	wind turbine yaw control
	Sensor range	mechanical range 360°
Output signal	Signal type	<ul style="list-style-type: none"> • four NPN outputs, open-collector, active outputs sink current • can sink 4.0 mA at approximately 0.75 V drop; can sink 1.8 mA at approximately 0.4 V drop
	Transfer function	4 outputs, switch 5 degrees each side of relative north, south, east, and west
	Accuracy	+/- 3 deg
Power requirements	Supply voltage	8 V to 24 V DC
	Supply current	30 mA typical; sensor power draw is internally regulated
	Heater supply voltage	<ul style="list-style-type: none"> • 24 V AC/DC • optional transformer available
	Heater supply current	<ul style="list-style-type: none"> • Inrush: 8 A maximum • Steady state: 1 A at 20 °C (68 °F), 4 A under maximum thermal load (head frozen in clear ice then powered on)
Response characteristics	Threshold	<2 m/s
Installation	Mounting	mounts to a 27 mm (1.05 inch) diameter (3/4 inch IPS) pipe with a 5/16 inch nut and bolt(*FG#3291 uses M8 bolt); cabling exits into mounting pipe
	Tools required	13 mm (0.5 inch) nut driver
Environmental	Operating temperature range	-40 °C to 60 °C (-40 °F to 140 °F)
	Operating humidity range	0 to 100% RH
Physical	Connections	Sensor Cable <ul style="list-style-type: none"> • red: power • black: ground • blue: VR • green: VL • orange: VR90 • white: VL90 Heater Cable <ul style="list-style-type: none"> • black/white: heater power (AC/DC)
	Cable length	Signal and power cables: See Quick ID Table
	Weight	1.23 kg (2.7 pounds) not including cable
	Dimensions	<ul style="list-style-type: none"> • overall assembly height: 239 mm (9.41 inches) • body diameter: 70 mm (2.75 inches) • swept diameter: 212 mm (8.38 inches) • center to tail radius: 106 mm (4.19 inches)
Materials	Body	cast aluminum with black anodized finish and heat-resistant black paint

Shaft	centerless ground, stainless steel
Bearing	<ul style="list-style-type: none"> • upper: sealed, stainless steel, ball bearing with application specific lubrication • lower: modified teflon bearing
Wing	precision balanced aluminum with black anodized finish and heat-resistant black paint
Cable	<ul style="list-style-type: none"> • Signal: 6 conductor 22 AWG, Teflon jacket with braid shield and drain, 3.6 m (12 feet) long • Heater: 2 conductor 20 AWG, Teflon jacket with braid shield and drain
Enclosure	<ul style="list-style-type: none"> • sealed to IP55 • heater is epoxy encapsulated to IP65 • sensor electronics epoxy encapsulated to IP65
Signal generator	epoxy encapsulated inside glass reinforced thermoplastic shell
Heater	fully encapsulated, self-regulating
Base	cast aluminum with black anodized finish and heat-resistant black paint

NRG IceFree3™ Yaw Vane

1 Ch, PNP

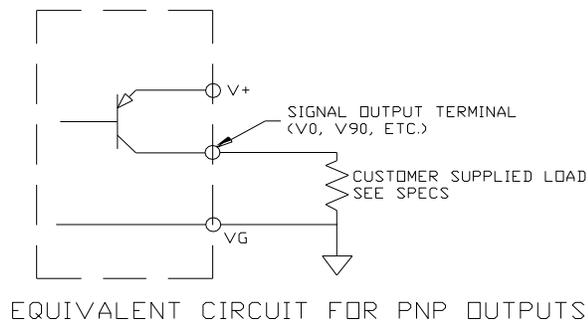
Kit# 2808, 3059

FG# 2807, 3057

PNP Output Circuit Operation

The IceFree3™ Yaw Error sensor has one output signal. The output is “PNP”, which means an active output sources current from the sensor supply to the load on the output.

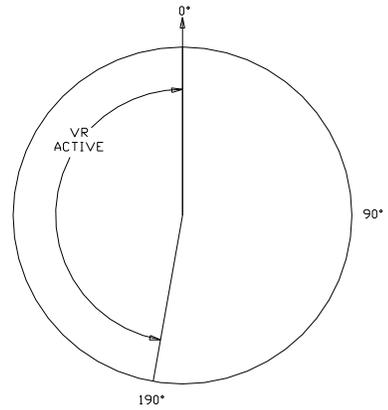
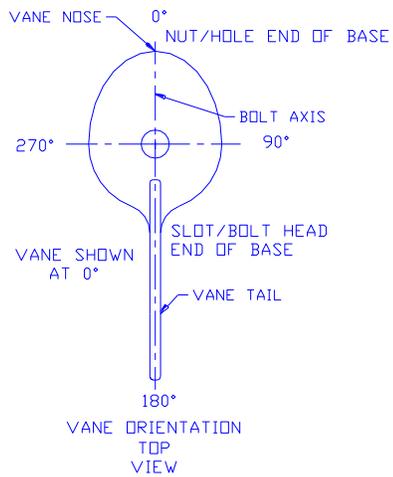
Typically, the output is used by connecting the output to a grounded load such as a relay or optical isolator in the turbine controller. The active output powers the relay coil or opto-isolator loop, and when the output is inactive, the load is off.



The opto-interrupters require an external power supply to operate the LED lamps. The sensor signals are powered through an additional two wires: the red (excitation) and black (ground) wires.

Interpreting Output Signals – 1 Channel

The diagrams and table below indicate when the output is active (1) or inactive (0), for each relative direction the nose is pointing. For example, if the vane nose is pointing 205 degrees relative to the base, the VR output (blue wire) will become active.

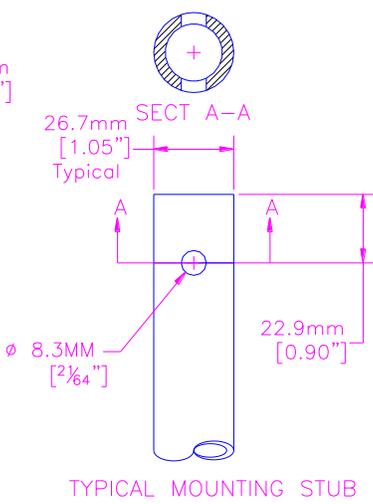
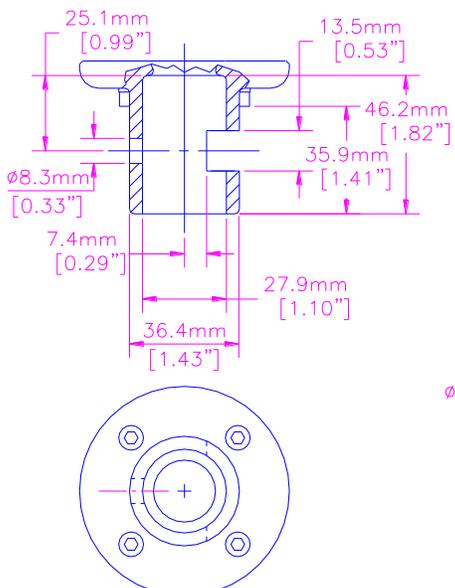
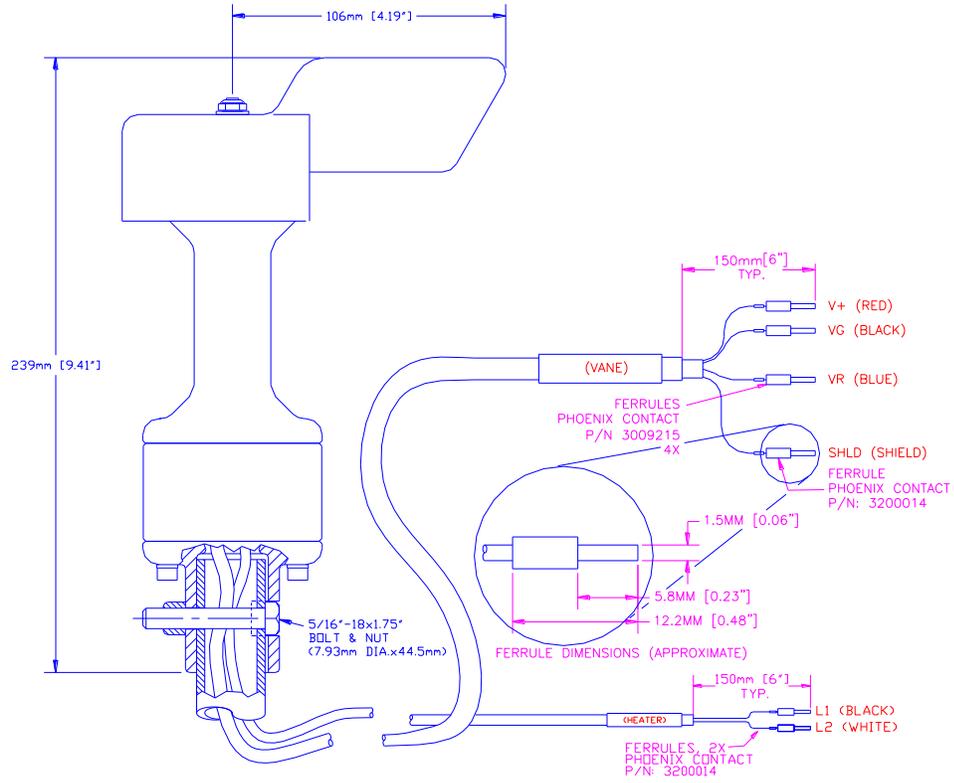


VANE SIGNALS POLAR DIAGRAM

Azimuth Range (clockwise degrees)	Output Signal
190 to 360	1

Output Signal	Wire Color
VR	Blue

[Kit# 2808, 3059]
[FG# 2807, 3057]
Sensor and Mounting Outline



MOUNTING BASE DIMENSIONS

[Kit# 2808, 3059]

[FG# 2807, 3057] Specifications

Description	Sensor type	heated yaw error vane
	Applications	wind turbine yaw control
	Sensor range	mechanical range 360°
Output signal	Signal type	<ul style="list-style-type: none"> • one PNP output, active output sources current from the sensor power supply • can source up to 25 mA to within 1 V of the supply voltage • inactive output leakage is less than 100 uA
	Transfer function	output switches 5 degrees each side of relative north
	Accuracy	+/- 3 deg
Power requirements	Supply voltage	8 VDC to 24 VDC
	Supply current	30 mA typical; sensor power draw is internally regulated
	Heater supply voltage	<ul style="list-style-type: none"> • 24 V AC/DC • optional transformer available
	Heater supply current	<ul style="list-style-type: none"> • Inrush: 8 A maximum • Steady state: 1 A at 20 °C (68 °F), 4 A under maximum thermal load (head frozen in clear ice then powered on)
Response characteristics	Threshold	<2 m/s
Installation	Mounting	mounts to a 27 mm (1.05 inch) diameter (3/4 inch IPS) pipe with a 5/16 inch nut and bolt; cabling exits into mounting pipe
	Tools required	13 mm (0.5 inch) nut driver
Environmental	Operating temperature range	-40 °C to 60 °C (-40 °F to 140 °F)
	Operating humidity range	0 to 100% RH
Physical	Connections	Sensor Cable <ul style="list-style-type: none"> • red: power • black: ground • blue: VR Heater Cable <ul style="list-style-type: none"> • black/white: heater power (AC/DC)
	Cable length	Signal and heater cables: See Quick ID Table
	Weight	1.23 kg (2.7 pounds) not including cable
	Dimensions	<ul style="list-style-type: none"> • overall assembly height: 239 mm (9.41 inches) • body diameter: 70 mm (2.75 inches) • swept diameter: 212 mm (8.38 inches) • center to tail radius: 106 mm (4.19 inches)
Materials	Body	cast aluminum with black anodized finish and heat-resistant black paint
	Shaft	centerless ground, stainless steel

	Bearing	<ul style="list-style-type: none"> • upper: sealed, stainless steel, ball bearing with application specific lubrication • lower: modified teflon bearing
	Wing	precision balanced aluminum with black anodized finish and heat-resistant black paint
	Cable	<ul style="list-style-type: none"> • Signal: 3 conductor 22 AWG, Teflon jacket with braid shield and drain, • Heater: 2 conductor 20 AWG, Teflon jacket with braid shield and drain
	Enclosure	<ul style="list-style-type: none"> • sealed to IP55 • heater is epoxy encapsulated to IP65 • sensor electronics epoxy encapsulated to IP65
	Signal generator	epoxy encapsulated inside glass reinforced thermoplastic shell
	Heater	fully encapsulated, self-regulating
	Base	cast aluminum with black anodized finish and heat-resistant black paint

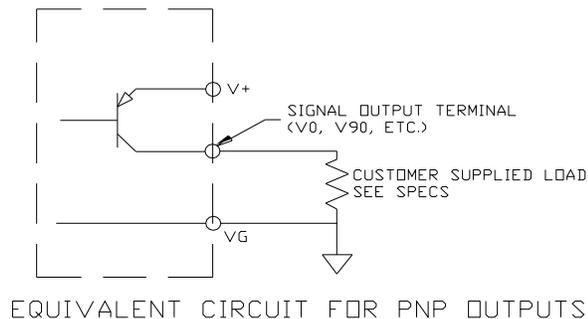
NRG IceFree3™ Yaw Vane 2 Ch, PNP

Kit# 3482
FG# 3480

PNP Output Circuit Operation

The IceFree3™ Yaw Error sensor has one output signal. The output is “PNP”, which means an active output sources current from the sensor supply to the load on the output.

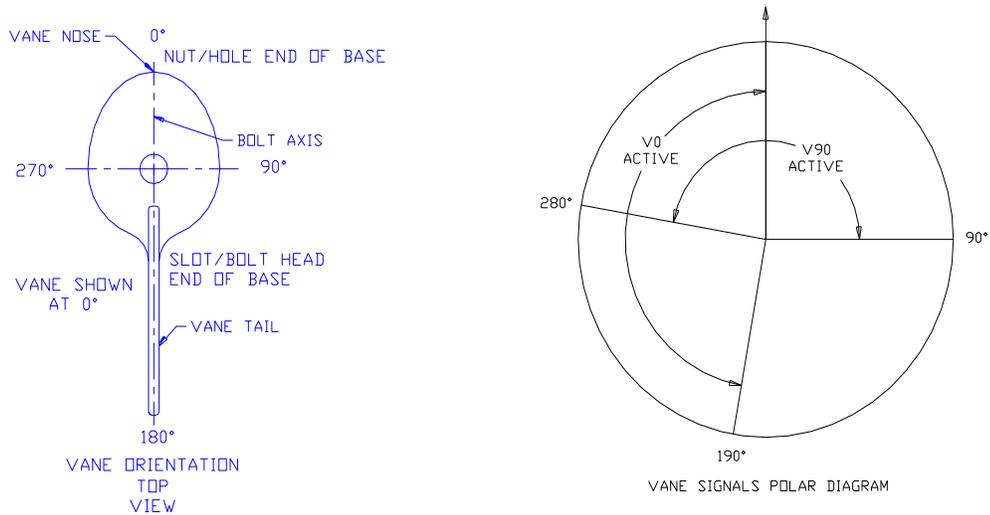
Typically, the output is used by connecting the output to a grounded load such as a relay or optical isolator in the turbine controller. The active output powers the relay coil or opto-isolator loop, and when the output is inactive, the load is off.



The opto-interrupters require an external power supply to operate the LED lamps. The sensor signals are powered through an additional two wires: the red (excitation) and black (ground) wires.

Interpreting Output Signals – 2 Channels

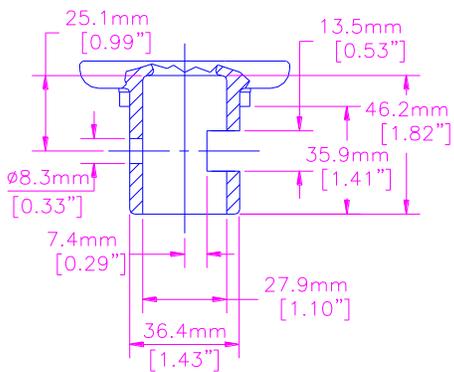
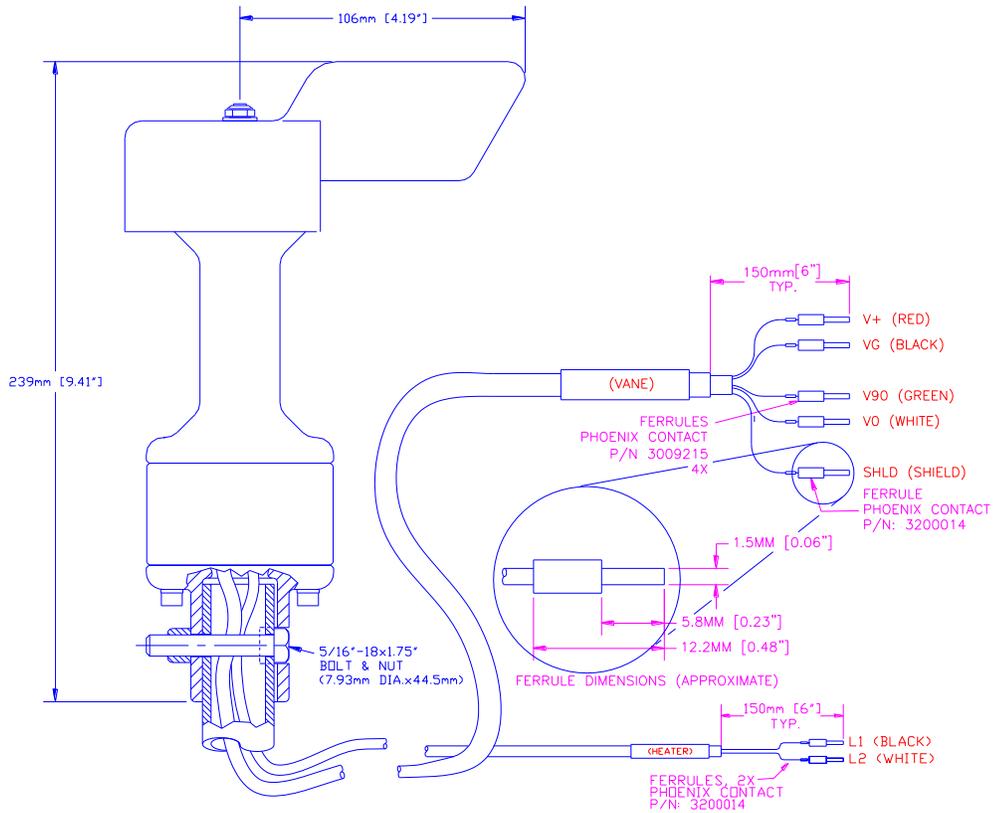
The diagrams and table below indicate when each of the two outputs is active (1) or inactive (0), for each relative direction the nose is pointing. For example, if the vane nose is pointing 35 degrees relative to the base, the V90 output (green wire) will become active.



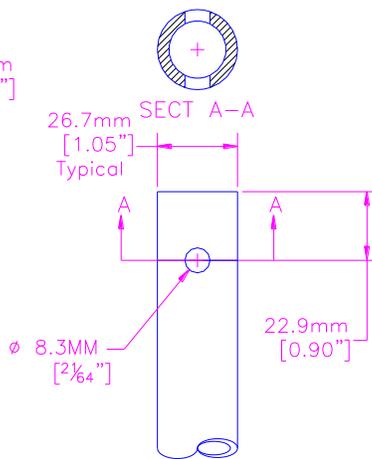
Azimuth Range (clockwise degrees)	Output Signals	
	V90	V0
0 to 90	1	0
90 to 190	0	0
190 to 280	0	1
280 to 0	1	1

Output Signal	Wire Color
V90	Green
V0	White

[Kit# 3482, FG#3480] Sensor and Mounting Outline



MOUNTING BASE DIMENSIONS



TYPICAL MOUNTING STUB

[Kit# 3482, FG#3480] Specifications

Description	Sensor type	heated yaw control vane
	Applications	wind turbine yaw control
	Sensor range	mechanical range 360°
	Instrument compatibility	digital inputs of turbine controllers and PLCs
Output signal	Signal type	<ul style="list-style-type: none"> • PNP outputs: active high output sources current to the sensor output load from the sensor power supply; inactive low output is pulled down to ground by sensor output load • each output can source up to 25 mA to within 1 V of the supply voltage • inactive output leakage is less than 100 uA
	Transfer function	2 outputs; switch points at relative wind 0°, 90°, 190°, 280°
	Accuracy	+/- 3 deg
Power requirements	Supply voltage	8 VDC to 24 VDC
	Supply current	30 mA typical; sensor power draw is internally regulated
	Heater supply voltage	<ul style="list-style-type: none"> • 24 V AC/DC • optional transformer available
	Heater supply current	<ul style="list-style-type: none"> • Inrush: 8 A maximum • Steady state: 1 A at 20 °C (68 °F), 4 A under maximum thermal load (head frozen in clear ice then powered on)
Response characteristics	Threshold	<2 m/s
Installation	Mounting	mounts to a 27 mm (1.05 inch) diameter pipe (3/4 inch pipe size) with a 5/16 inch nut and bolt; cabling exits into mounting pipe
	Tools required	13 mm (0.5 inch) nut driver
Environmental	Operating temperature range	-40 °C to 60 °C (-40 °F to 140 °F)
	Operating humidity range	0 to 100% RH
Physical	Connections	Sensor Cable <ul style="list-style-type: none"> • red: power • black: ground • white: V0 • green: V90 Heater Cable <ul style="list-style-type: none"> • black/white: heater power (AC/DC)
	Cable length	Signal and heater cables: 8.0 m (26.2 feet)
	Weight	1.23 kg (2.7 pounds) not including cable
	Dimensions	<ul style="list-style-type: none"> • overall assembly height: 239 mm (9.41 inches) • body diameter: 70 mm (2.75 inches) • swept diameter: 212 mm (8.38 inches) • center to tail radius: 106 mm (4.19 inches)
Materials	Body	cast aluminum with black anodized finish and heat-resistant black paint
	Shaft	centerless ground, stainless steel

Bearing	<ul style="list-style-type: none"> • upper: sealed, stainless steel, ball bearing with application specific lubrication • lower: modified teflon bearing
Wing	precision balanced aluminum with black anodized finish and heat-resistant black paint
Cable	<ul style="list-style-type: none"> • Signal: 4 conductor 22 AWG, Teflon jacket with braid shield and drain, • Heater: 2 conductor 20 AWG, Teflon jacket with braid shield and drain
Enclosure	<ul style="list-style-type: none"> • sealed to IP55 • heater is epoxy encapsulated to IP65 • sensor electronics epoxy encapsulated to IP65
Signal generator	epoxy encapsulated inside glass reinforced thermoplastic shell
Heater	fully encapsulated, self-regulating
Base	cast aluminum with black anodized finish and heat-resistant black paint

NRG Turbine Control Yaw Vane (Unheated) 2 Ch, PNP

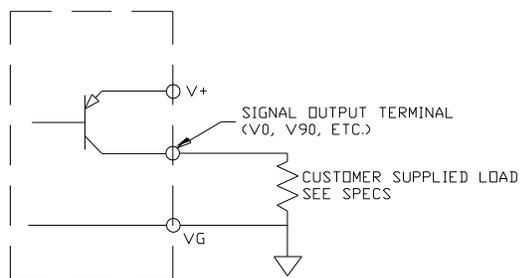
Kit# 3581

FG# 3579

PNP Output Circuit Operation

The NRG Turbine Control Yaw Vane has two output signals. The outputs are “PNP”, which means that an active output sources current from the sensor supply to the load on the output.

Typically, these outputs are used by connecting the output to a grounded load such as a relay or optical isolator in the turbine controller. The active outputs power the relay coil or opto-isolator loop, and when the output is inactive, the load is off.

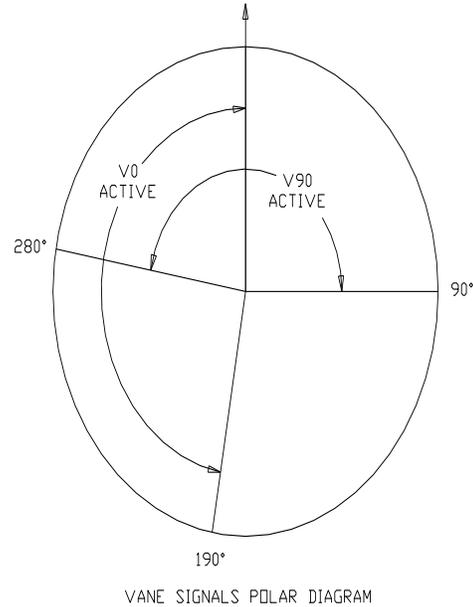
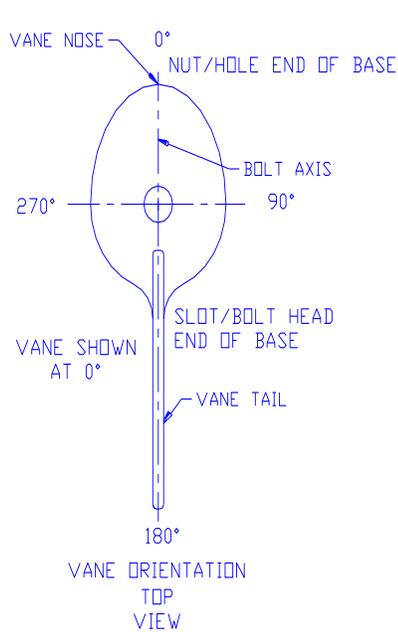


EQUIVALENT CIRCUIT FOR PNP OUTPUTS

The opto-interrupters require an external power supply to operate the LED lamps. The sensor signals are powered through an additional two wires: the red (excitation) and black (ground) wires.

Interpreting Output Signals – 2 Channels

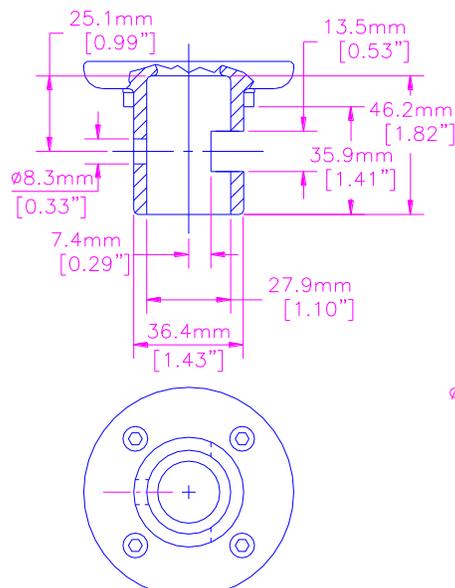
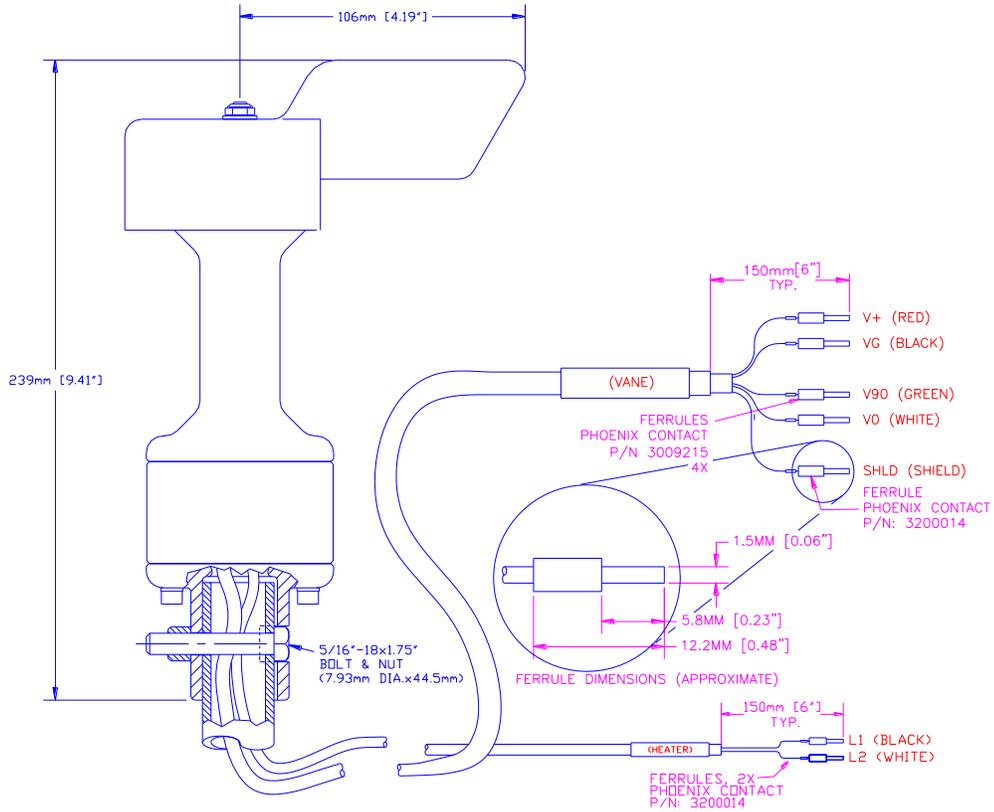
The diagrams and table below indicate when each of the two outputs is active (1) or inactive (0), for each relative direction the nose is pointing. For example, if the vane nose is pointing 35 degrees relative to the base, the V90 output (green wire) will become active.



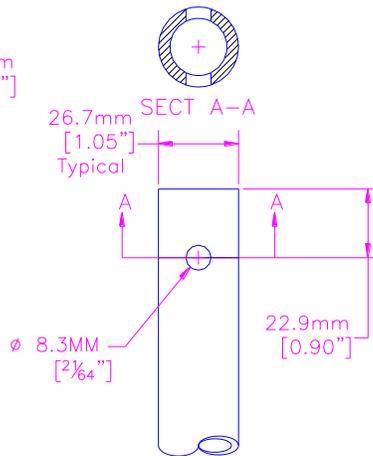
Azimuth Range (clockwise degrees)	Output Signals	
	V90	V0
0 to 90	1	0
90 to 190	0	0
190 to 280	0	1
280 to 0	1	1

Output Signal	Wire Color
V90	Green
V0	White

[Kit# 3581, FG# 3579] Sensor and Mounting Outline



MOUNTING BASE DIMENSIONS



TYPICAL MOUNTING STUB

[Kit# 3581, FG#3579] Specifications

Description	Sensor type	yaw error vane
	Applications	wind turbine yaw control
	Sensor range	mechanical range 360°
Output signal	Signal type	<ul style="list-style-type: none"> • PNP outputs: active high output sources current to the sensor output load from the sensor power supply; inactive low output is pulled down to ground by sensor output load • each output can source up to 25 mA to within 1 V of the supply voltage • inactive output leakage is less than 100 uA
	Transfer function	2 outputs; switch points at relative wind 0°, 90°, 190°, 280°
	Accuracy	+/- 3 deg
Power requirements	Supply voltage	8 VDC to 24 VDC
	Supply current	30 mA typical; sensor power draw is internally regulated
Response characteristics	Threshold	<2 m/s
Installation	Mounting	mounts to a 27 mm (1.05 inch) diameter pipe (3/4 inch pipe size) with a 5/16 inch nut and bolt; cabling exits into mounting pipe
	Tools required	13 mm (0.5 inch) nut driver
Environmental	Operating temperature range	-40 °C to 60 °C (-40 °F to 140 °F)
	Operating humidity range	0 to 100% RH
Physical	Connections	Sensor Cable <ul style="list-style-type: none"> • red: power • black: ground • white: V0 • green: V90
	Cable length	Signal cable: 8.0 m (26.2 feet)
	Weight	1.23 kg (2.7 pounds) not including cable
	Dimensions	<ul style="list-style-type: none"> • overall assembly height: 239 mm (9.41 inches) • body diameter: 70 mm (2.75 inches) • swept diameter: 212 mm (8.38 inches) • center to tail radius: 106 mm (4.19 inches)
Materials	Body	cast aluminum with black anodized finish and heat-resistant black paint
	Shaft	centerless ground, stainless steel
	Bearing	<ul style="list-style-type: none"> • upper: sealed, stainless steel, ball bearing with application specific lubrication • lower: modified teflon bearing
	Wing	precision balanced aluminum with black anodized finish and heat-resistant black paint
	Cable	<ul style="list-style-type: none"> • Signal: 4 conductor 22 AWG, Teflon jacket with braid shield and drain
	Enclosure	<ul style="list-style-type: none"> • sealed to IP55 • sensor electronics epoxy encapsulated to IP65
	Signal generator	epoxy encapsulated inside glass reinforced thermoplastic shell
	Base	cast aluminum with black anodized finish and heat-resistant black paint

Warranty & Repair

Two Year Limited Warranty

NRG Systems, Inc. (NRG) warrants its products for a period of two years from the date of original purchase solely for the benefit of the original consumer purchaser. If this NRG 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, lightning or damages due to any unauthorized service. This warranty also will not apply if any seal on any instrument or sensor is broken or the equipment is not grounded.

To return a defective product, call NRG Systems at the telephone number listed below for an RMA number. You must have available when you call the serial number of the item as well as the date purchased. *No products will be accepted for warranty work without an RMA number.* The product must be returned, postage prepaid, to NRG. Include a brief description of the problem, RMA number and a return address with phone number.

The foregoing limited warranty is given in lieu of all other warranties, express or implied. NRG specifically disclaims all implied warranties, including, but not limited to, any implied warranties of merchantability and fitness for a particular purpose.

The above limited warranty expressly excludes, and NRG shall not be liable for, any incidental or consequential damages caused or related to the use of, inability to use or malfunction of this product.

Prompt disposition: NRG will make a good faith effort for prompt correction or other adjustment with respect to any product which proves to be defective within warranty. First contact NRG or representative from whom product was purchased and ask for an RMA number.

NRG will also make a good faith effort for prompt service after the warranty period. Contact NRG with the nature of the problem and obtain an RMA number.

Inspect your shipments for damaged or missing packages immediately upon receipt. Record any such exceptions on the freight receipt of the delivery agent. If any contents are damaged or missing, report this in writing to the freight carrier and send NRG a copy of the damage report. If you insured the shipment yourself, report any damages to your insurance carrier.

TEL: 802-482-2255

FAX: 802-482-2272 EMAIL: sales@nrgsystems.com

Return Instructions (Repairs)

If you wish to return an item to NRG Systems for repair or any other reason, please **before shipping contact NRG's Service Department by phone (802) 482-2255 or fax (802) 482-2272** to obtain a Return Material Authorization (RMA) Number. The RMA Number allows us to track and route your shipment or repair. Note the RMA Number on all boxes shipped to us and refer to it in your correspondence or phone calls to us. Please fill out a copy of this sheet and send it with your shipment to NRG Systems.

Date: _____ Your Name: _____ RMA No: _____

Items being returned: _____ Serial Number: _____

Reason for return: _____

Warranty: Yes No Not Sure Purchase Date / Invoice No: _____

Estimate for repair charges requested? Yes No Repair not to exceed US\$: _____

Person to be contacted with estimate: _____ Phone: _____

Person to issue Purchase Order for repair: _____ Phone: _____

Billing Address:

Shipping Address:

Send your shipment **FREIGHT PREPAID and INSURED** against loss or damage in transit to:

NRG Systems, Inc.
Attn: Receiving Dept., RMA No. R-_____
110 Riggs Road
Hinesburg, VT 05461, USA

SHIPMENTS SENT FREIGHT COLLECT WILL NOT BE ACCEPTED BY NRG SYSTEMS.

International Customers please state the following in your shipping documents:

"THESE ITEMS ARE BEING RETURNED TO THEIR U.S. MANUFACTURER.
COUNTRY OF MANUFACTURE AND ORIGIN IS U.S.A. HS CODE 9801.00.1025"



Global leaders in wind assessment technology

www.nrgsystems.com

Declaration of Conformity

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

NRG Systems Document Number: N3440, Rev C

Supplier: NRG Systems
Supplier Address: 110 Riggs Road, Hinesburg, VT 05461, USA
Telephone: 802 482 2255, Fax: 802 482 2272
Email: sales@nrgsystems.com

Declares that the Products: IceFree 3 Anemometers and Wind Vanes
Including Model Numbers:

IceFree 3 Anemometer	Models 2377, 2448, 2549, 2578, 2651, 2750, 2777, 2781, 2849, 2847, 3058, 3290, 3445, 3447, 3537, 4107, 4108
IceFree 3 Wind Vane	Models 2378, 2450, 2451, 2652, 2808, 2850, 3059, 3292, 3450, 3482

are in conformity with the requirements of the following standards:

Safety: IEC 61010-1 Ed. 2.0 b:2001, "Safety requirements for electrical equipment for measurement, control, and laboratory use"
EMC: 2004/108/EC "Council Directive of 15 December 2004, on the approximation of the Laws of Member States relating to electromagnetic compatibility"
EN61326-1 Class A "Electrical Equipment for Measurement, Control, and Laboratory Use—EMC Requirements"

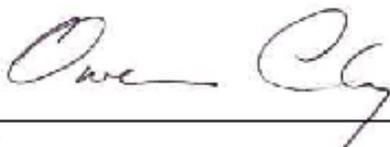
Additional Information:

All circuits are extra low voltage (ELV), therefore standard 2006/95/EC (the low-voltage directive) does not apply.

The technical files and other documentation are on file with Mr. David Blittersdorf, Engineering.

Issued at Hinesburg, VT, USA

08 October 2007



Owen Clay
Engineering Manager

110 Riggs Road, PO Box 509, Hinesburg, Vermont 05461 USA • Tel 802-482-2255 • Fax 802-482-2272 • info@nrgsystems.com