



Hybrid XT Retrofit | Vestas V47 Turbines

NRG Retrofit Kits #12806 & 12807

INTRODUCTION

Repowering older models of wind turbines is a good way to increase power production and availability. The Hybrid XT vane and anemometer provide superior performance and accuracy compared to the original mechanical sensors installed on many older turbine platforms. These instructions were created as a guide for performing the retrofit of Hybrid XT turbine control sensors onto the Vestas V47 turbine platform. Keep in mind that there may be variations in the original parts and layouts of these turbines, and as such you may need to deviate from these instructions.

Users should be familiar with the operation of the Hybrid XT anemometer and vane prior to performing this retrofit. These instructions are intended to be used in addition to all applicable procedures and policies for your site and organization.

Product manuals and instructions for retrofits on other turbines can be obtained by contacting NRG Systems at support@nrgsystems.com.

Important Considerations

NOTICE

Always power the heater on your Hybrid XT sensor! Failure to maintain constant heating may lead to corrosion or inferior sensor performance. Constant heating helps prevent condensation from forming on sensor components. If the sensor is used without the heater, the warranty will be void.



WARNING

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.

NOTICE

This procedure requires access to sensor mast.

This procedure should only be performed by qualified personnel, in accordance with onsite safety protocols.



TOOLS REQUIRED

- 10 mm wrench
- 13 mm wrench
- 19mm wrench
- Wire strippers
- Diagonal cutters
- P2 screwdriver
- Small flathead screwdriver
- Digital voltmeter

MATERIALS

- Hybrid XT Anemometer Retrofit Kit | Vestas V47 #12806
 - o Hybrid XT Anemometer #9387
 - o Hybrid XT Cable #9234
 - o Hybrid XT Mounting Adapter #12205
- Hybrid XT Vane Retrofit Kit | Vestas V47 #12807
 - o Hybrid XT Vane #9363
 - o Hybrid XT Cable #9234
 - o Hybrid XT Mounting Adapter #12205
- Vestas V47 Power Supply Kit #12437
 - o Vestas V47 Wiring Kit
 - o Power Supply | 24V DC out #10119
- Zip ties



SENSOR INSTALLATION

Physical Installation

1. Turn off and LOTO F36B breaker in ground cabinet to de-energize the 230V that feeds sensor heaters. Use appropriate LOTO procedures.
2. Assemble the cable & mounting adapter.
 - **Install the #12205 mounts onto each #9234 cable and feed it all the way to the plug.**
Ensure proper orientation of the stub mount by feeding the cable through the mount from the narrower end.
 - **Attach the mount and cable plug together using the 10mm bolt and rectangular nut.**
The bolt and nut come attached to the cable plug. Ensure that the braided shield from the cable is not captured inside the mount.
Orient the notch in the cable plug towards the rotor. The flat face of each mount will face outwards, such that the mounts are oriented opposite each other.
 - **Ground the cable shield to the stub mount.**
Remove or loosen the stainless ground screw. Create an opening in the braided shield of the cable and thread the screw through the shield, then tighten back to the stub mount.



3. Disconnect old sensor wires from the junction box on the back wall of the nacelle above the chain hoist hatch (Figure 1). Remove the cables from the junction box.



Figure 1 | Junction box for old sensor wires

4. Access the sensor mast and remove the old sensors from the mast. The old sensor cabling can be cut and pulled into the nacelle, or remain attached to the sensors and pulled out of the nacelle (Figure 2). Bring all sensors and cables into the nacelle.



Figure 2 | Met mast after removing old sensors



5. Install the cable/stub mount assembly to the sensor mast.
 - **Bolt a mounting adapter to each vertical post of the sensor mast.**

The cable should have been threaded through the mounting adapter.

The mounting adapters attach using the stainless bolts included with each mount.

Orient the adapters to the inside of the vertical posts. The adapters have a flat face with a lip that sits on top of the vertical post.

Tighten the thru-bolt using a 19mm wrench.
 - **Label each cable end (opposite side of the plug) as the vane or anemometer.**

The vane mounts to right side of the mast (nacelle right, when facing the rotor).
 - **Route the cables down the mast and into the nacelle.**

Use the same hole that the old sensor cables were routed through.

Secure to the sensor mast with zip ties. Create a drip loop off the sensor mast.

6. Mount the Hybrid XT vane and anemometer on the appropriate sides of the mast (Figure 3).

Note “THIS SIDE TOWARDS ROTOR” on sensor body.

Secure the sensors by tightening the bolt and nut with a 10mm wrench.

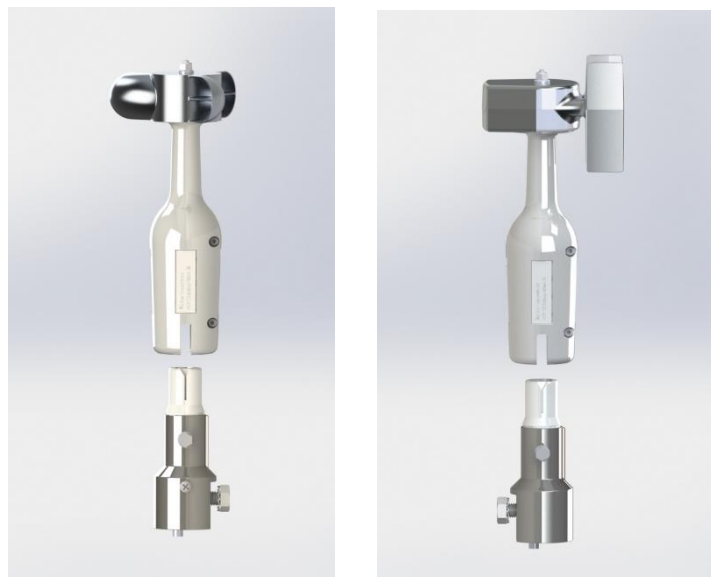


Figure 3 | Renders of the mounting adapter, cable plug, and Hybrid XT sensors



7. Back inside the nacelle, route the cables along the nacelle wall to the sensor connection terminals inside the electrical cabinet (Figure 4).

Secure the cables along the way and feed into the cabinet through the bottom.

Route the cables away from the generator to prevent any potential signal interference.

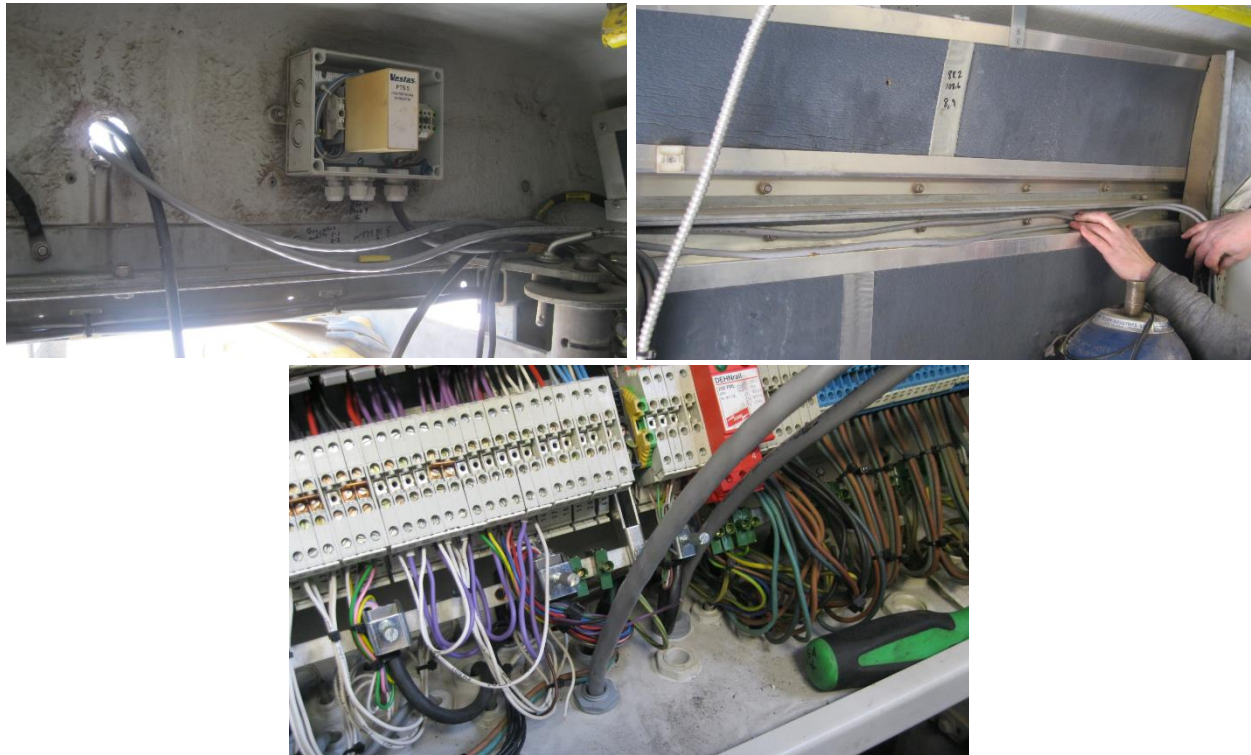


Figure 4 | Routing cables inside the nacelle

8. Install the 24V power supply (NRG part #10119) included in Wiring Kit #12437 to the DIN rail in the electrical cabinet (Figure 5).

Use the empty slot between the relays and yaw drive motor contactors.

If the available space is not enough to fit the power supply then pull the last relay next to the motor contactor to make space. This relay is usually not in service and dedicated to V47 turbines with a 2nd 200 kW generator.

If unable to make space at this location, use best judgement on where to mount the 24V power supply.

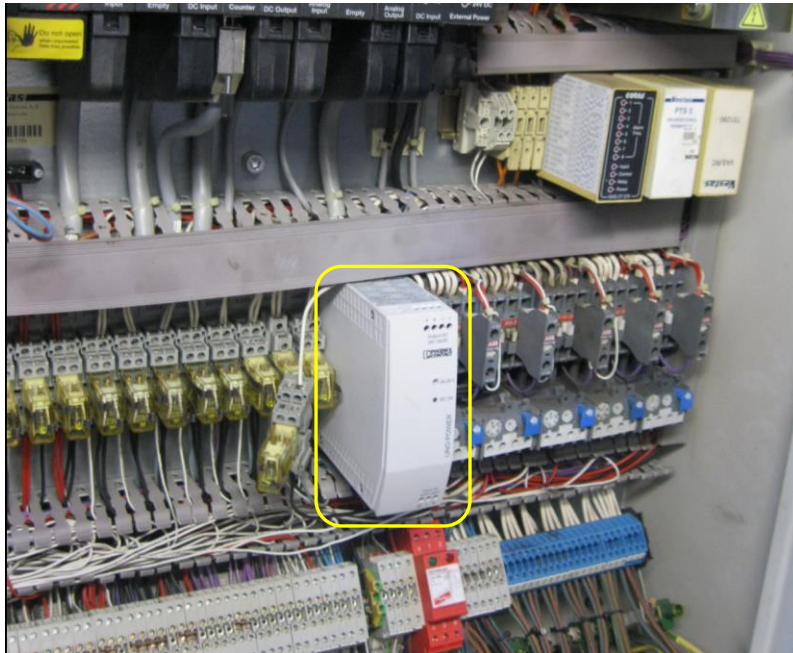


Figure 6 | 24V Power Supply mounted to a DIN rail inside the electrical cabinet.
Note the unmounted relay next to the power supply.

9. Once appropriate length has been verified, cut the cable to length and strip the jacket back about 20cm to expose the individual wires.
Install crimp ferrules to the bare wire ends if desired. This is recommended.
The sensors are now ready to be connected to the turbine.



Sensor Wiring

At this point, the Hybrid XT sensors should be completely installed and the cables should be routed into the electrical cabinet and ready to be connected, per the previous section.

Wiring Procedure

1. If still attached, disconnect the signal and power wires used by the original sensors.
2. Connect the wires from the Hybrid XT cables to the appropriate terminals specified in Table 1 at the end of this section (Figure 6).

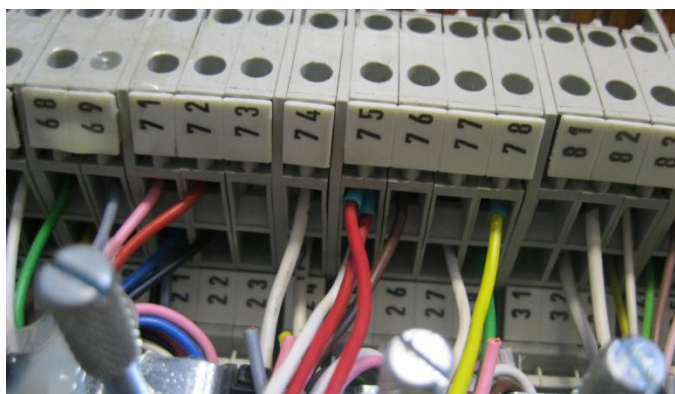


Figure 6 | Hybrid XT wires connected to terminals

3. Connect cable shields to the clamps on the ground bar (Figure 7).

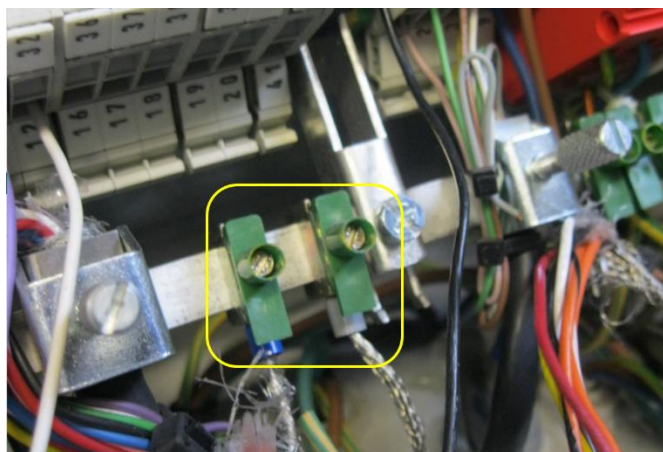


Figure 7 | Cable shields connected to ground bar



Hybrid XT Retrofit | Vestas V47

- Trace Vestas sensor heater cable (W390) from the junction box in the back nacelle wall to the top electrical cabinet. Disconnect the wires at the top cabinet terminal blocks and replace with new wires to be connected to the NRG power supply as follows.

The new wires are included in NRG Wiring Kit #12437

- From A2 X4 Terminal 1 to Power Supply N input (Neutral)
- From A2 X4 Terminal 2 to Power Supply L input (Line/Positive)
- From ground bar to Power Supply ground input

- Verify in the touch screen in the ground cabinet that both wind speed and direction signals are being detected by the controller.
If insufficient wind is present, manually spin the anemometer and vane while verifying the input changes in the touch screen.

LOTO may need to be released prior to this check.

- Verify that the heater power is working by checking that the sensor bodies are warm.
- Parameters 24.4.1 and 24.4.2 (nacelle transfer function slope and offset) may need adjustments later on if the new auto power curve significantly deviates from the reference and previously known curves.

Deviation from previous power curves does not automatically signal an issue with the sensor.
Contact NRG Technical Services for further assistance if needed.

Table 1 | Hybrid XT Wiring

	Function	Hybrid XT Wiring	V47 Wiring
Anemometer	Excitation	Red	Terminal Block 75
	Signal	White	Terminal Block 25
	Ground	Black	Ground Terminal Block
	Heater +	Orange/White	NRG Power Supply +
	Heater -	Orange/Black	NRG Power Supply -
	N/A	Yellow	NOT CONNECTED
Vane	Excitation	Red	Terminal Block 75
	VL Signal	White	Terminal Block 27
	VR90 Signal	Yellow	Terminal Block 78
	Ground	Black	Ground Terminal Block
	Heater +	Orange/White	NRG Power Supply +
	Heater -	Orange/Black	NRG Power Supply -

