



Hybrid XT Retrofit | Gamesa Turbines

NRG Retrofit Kits #8535 & 8599

INTRODUCTION

The older NRG IceFree3 turbine control sensors were original equipment on a large number of Gamesa turbine platforms, up until they were replaced by the NRG Hybrid XT sensors. These instructions are for replacing the IceFree3 turbine control sensors with Hybrid XT sensors, as NRG discontinued the repair of IceFree3 sensors in June 2018. The Hybrid XT offers a longer service life, better performance, and does not have an integrated cable compared to the IceFree3.

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 info@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
- Wire strippers
- Diagonal cutters
- P2 screwdriver
- Small flathead screwdriver
- Digital voltmeter

MATERIALS

- Hybrid XT Anemometer Retrofit Kit | Gamesa #8535
 - Hybrid XT Anemometer #9387
 - Hybrid XT Cable #9234
 - Hybrid XT Stub Mast Mounting Adapter #8542
- Hybrid XT Vane Retrofit Kit | Gamesa #8599
 - Hybrid XT Vane #7894
 - Hybrid XT Cable #9234
 - Hybrid XT Stub Mast Mounting Adapter #8542
- Zip ties



SENSOR INSTALLATION

Physical Installation

For more detailed information on installing the stub adapter or cables, see the Hybrid XT Anemometer and Wind Vane manuals.

1. Turn off the breakers to the IceFree3 sensor power and heater power circuits. Use appropriate LOTO procedures if necessary.
2. Make note of the locations where the IceFree3 sensor wires connect to the turbine. Remove those connections and pull the wire free of any cable trays.
3. Assemble the cable & mounting adapter. See Figure 1 for the completed assembly.

- **Install the #8542 stub 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 end with the sensor-mounting hole to the end with the mast slot.

- **Attach the stub 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 stub mount.

Orient the stub mount so that the mounting slot is on the opposite side of the key slot in the plug.

- **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.



Figure 1 | Completed stub mount & cable assembly.



4. Access the sensor mast and remove the IceFree3 sensors from mast mounts. Bring the new Hybrid XT sensors and cable/stub mount assemblies with you to the mast.
The IceFree3 sensor wires can be cut and pulled into the nacelle, or remain attached to the sensors and pulled out of the nacelle.
5. Install the cable/stub mount assembly.
 - **Bolt a stub mount to each IceFree3 mount.**
The stub mounts attach using the stainless bolts included with each stub mount. Tighten using a 13mm wrench.
 - **Label each cable end 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.**
Secure with zip ties.
6. Mount the Hybrid XT vane and anemometer on the appropriate sides of the mast.
Note “THIS SIDE TOWARDS ROTOR” on sensor body.
Secure the sensors by tightening the bolt and nut with a 10mm wrench.



Figure 2 | Hybrid XT sensors installed on the met mast of a G4X turbine



7. Back inside the nacelle, route the cables to the sensor connection terminals.
 Secure the cables along the way and feed into the appropriate cabinet. Allow excess for drip loop and to ensure enough length to reach sensor terminals.
Route the cables away from the generator to prevent any potential signal interference.

8. Once appropriate length has been verified, cut the cable to length and strip the jacket back about 20cm to expose the individual wires. 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 appropriate cabinet and ready to be connected, per the previous section.

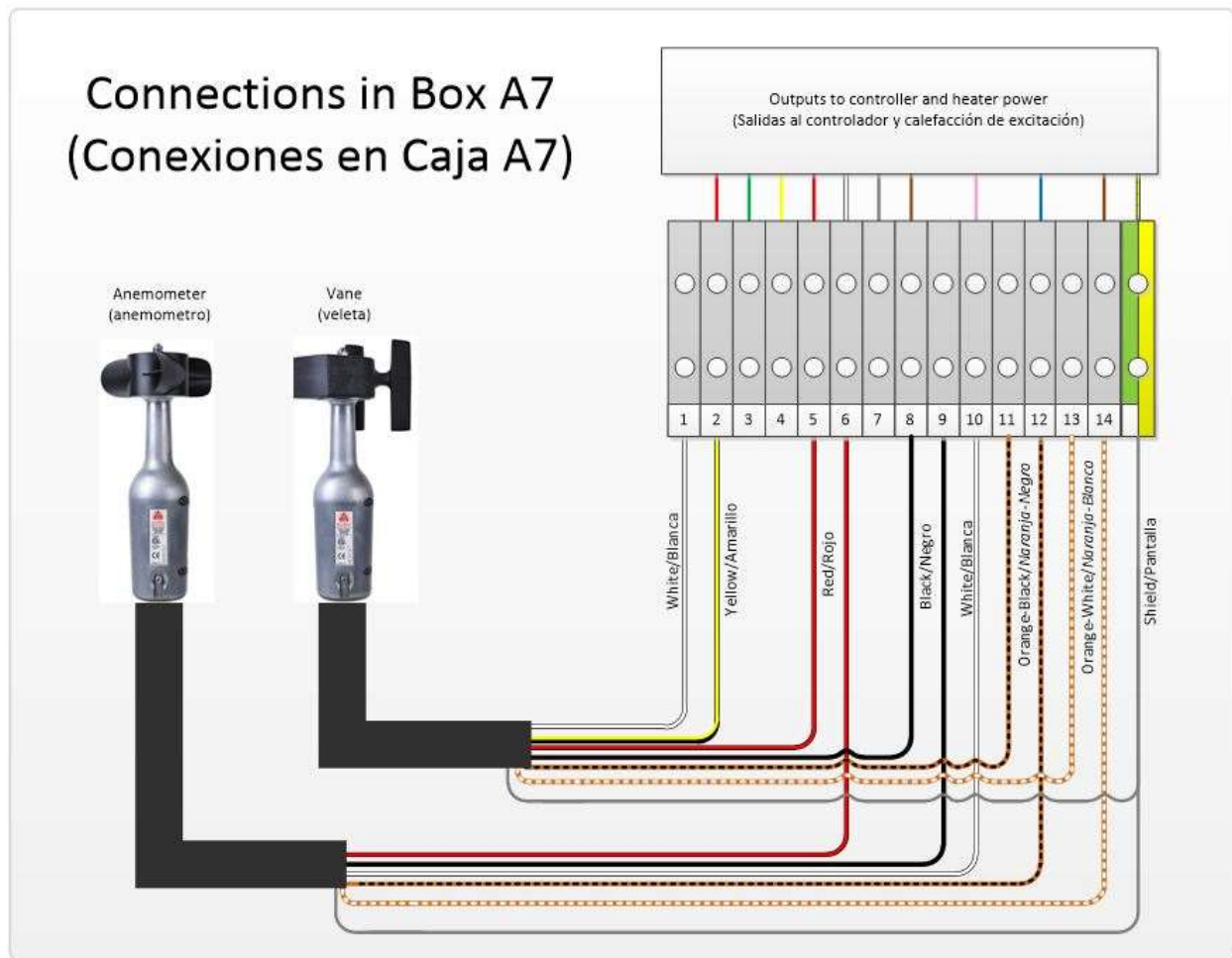
Table 1 | IceFree3 & Hybrid XT Wiring Comparison

	Function	IceFree3 Wiring	Hybrid XT Wiring	Gamesa Wiring
Anemometer	Excitation	Red	Red	Pin 6 (V+)
	Signal	White	White	Pin 10 (Signal)
	Ground	Black	Black	Pin 9 (V-)
	Heater +	White	Orange/White	Pin 14 (Heater)
	Heater -	Black	Orange/Black	Pin 12 (Heater)
	N/A	-	Yellow	NOT CONNECTED
Vane	Excitation	Red	Red	Pin 5 (V+)
	VL Signal	Green	White	Pin 1 (VL)
	VR90 Signal	Orange	Yellow	Pin 2 (VR90)
	Ground	Black	Black	Pin 8 (VG)
	Heater +	White	Orange/White	Pin 11 (Heater)
	Heater -	Black	Orange/Black	Pin 13 (Heater)

Note: Specific wiring locations may vary from one turbine platform to the next.



Hybrid XT Wiring Diagram



Wiring Procedure

1. Strip all wire ends back about 5mm.
2. Connect the wires to the appropriate inputs in the cabinet. Use Table 1 as a guide for comparing the IceFree3 wires to Hybrid XT wires.
For turbines where the IceFree3 sensor signals connected to an inverter card, see the notice in the next section.
3. Turn on the breakers for heater and sensor power to the Hybrid XT sensors.
4. Verify signals and programming to the PLC.

**Wiring & Programming with an Inverter Card****NOTICE**

NRG has been made aware that certain turbine platforms that used IceFree3 sensors as original equipment, particularly the G8X, also used an inverter card in between the sensors and the PLC. When an inverter card is present, specific guidance is needed in order to successfully complete the Hybrid XT retrofit.

Since the IceFree3 and Hybrid XT vanes both use the same types of signals (VL & VR90) but have different output diagrams, the programming mode in the PLC must match how the sensor is wired to the turbine.

Table 2 | Matching the sensor inputs with the PLC programming

CONNECTION LOCATION OF HYBRID XT VANE SIGNAL WIRES	PLC MODE
USING ICEFREE3 INPUTS ON THE INVERTER CARD	IceFree3
BYPASSING INVERTER CARD AND USING PLC INPUTS	Hybrid XT

In other words, using the inverter card means that you must continue to use IceFree3 programming in the turbine's PLC. If you bypass the inverter card and connect directly to the inputs for the PLC, then you should use Hybrid XT programming in the PLC.

NRG does not make a recommendation for one method versus the other at this time. It is up to you to determine which combination suits your needs best.