KK to Hybrid™ XT Sensor Retrofit for Siemens 2.3 MW Turbines

Introduction

Instructions for the installation of Hybrid XT sensors for Siemens 2.3 MW turbines are provided below. Users should be familiar with the operation of the Hybrid XT anemometer and vane and Hybrid personality module prior to performing this retrofit.

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

These instructions assume the replacement of the original KK-type anemometer and vane; 601.K2.X27 and 601.K2.X42 respectively.

Safety 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 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.**
⚠ **WARNING**	This procedure requires: • *Access to nominal 220V AC mains power* • *Access to sensor mast*

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

⚠ **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.***

Contents

Materials required

- 9373 - Hybrid XT Anemometer Retrofit Kit, Siemens 2.3MW
  - 7901 – Hybrid XT Push/Pull Anemometer
  - 9197 – Hybrid Adapter
  - 9234 – 10 m cable
- 9374 - Hybrid XT Vane Retrofit Kit, Siemens 2.3MW
  - 9363 – Hybrid XT Push/Pull Vane, active HIGH
  - 9197 – Hybrid Adapter
  - 9234 – 10 m cable
- 9375 - Hybrid XT Heater Power Kit, Siemens 2.3MW
  - 24V DC power supply
  - Wiring

Tools required

- 19 mm wrench (for KK removal and Hybrid Adapter mount)
- 10 mm wrench (for Hybrid XT sensor mount)
- Wire strippers for 20 and 22 AWG wire
- Crimping tool for ferrules for 20 and 22 AWG wire

Procedure

1) **Open wind sensor heating breaker**

   a. In base control panel A1, open breaker CP3
   b. Lock out tag out breaker per site protocols

2) **Install primary wiring for heater power**

   a. Install the Power Supply unit in Cabinet A9 on the open DIN rail space between the Fan at 602.E1 and the relay 602.K1. (see photo on next page)
   b. Mount the fuse holder for AC input power on the open DIN rail space at the lower left of the cabinet.
   c. Use ferrules on all wiring and connect per table:

From	Wire	To	Notes
602.X2 terminal 4	18 AWG Blue	Power Supply, Input "N" terminal	Route through wiring channel
602.X2 terminal 3	18 AWG Brown	AC fuse holder, bottom terminal	Route across the bottom of the cabinet
AC fuse holder, top terminal	18 AWG Brown	Power Supply, Input "L" terminal	Route through wiring channel

   d. Install the 3A primary fuse into the terminal block, but leave the block open at this time.
   e. Re-check wiring above.
   f. Breaker CP3 may now be re-energized. Use your site-specific protocols to clear the LOTO of breaker CP3, and re-energize it. The rest of the installation is done in the nacelle.

3) **Install secondary wiring for heater power**

    a. Remove the cooling air duct to access <u>Weather Station junction box (WSJB)</u>
    b. Open the WSJB
    c. Install one of the supplied strain reliefs in the spare hole on the bottom of WSJB
    d. Install one of the supplied strain reliefs in a spare hole in the bottom of panel A9.
    e. Install the supplied heater power cable; route from cabinet A9 through existing conduit to WSJB
    f. At A9 end, remove 24" of cable jacketing; insert into strain relief
    g. Connect each of the wires as shown below:

From	Wire	To	Notes
Heater Cable	Black	Power Supply Unit (PSU) "-" terminal	
Heater Cable	White	Power Supply Unit (PSU) "+" terminal	
Heater Cable	Green	Frame Ground at the ground bus bar at the bottom of the cabinet.	
PSU "-" terminal	18 AWG Green wire	Frame Ground at the ground bus bar at the bottom of the cabinet.	

The finished installation should look similar to this:

4) Remove KK sensors and cables

  a. In the WSJB, disconnect the cables to the primary wind sensors
  b. Remove the hold-down hardware and fold the weather station mast down to the service position
  c. Remove the existing KK primary sensors from their mounts. Thread the connecting cables back up through the weather station mast and the cable seals, and remove the sensors.

5) Install mount converters

  a. Connect mount converters to "L" sensor brackets as shown below. NOTE the mounts are the same for anemometer and vane. **19 mm wrench**

6) Trim, label and install XT cables

  a. Cut each cable to approximately 15 feet
  b. Label one cable at each end with the provided "ANEM" labels, label the other cable with the "VANE" labels
  c. Terminate the shield braid at the sensor end with a #10 ring lug
  d. Remove the bolt, washer and flag nut from the cable's sensor connector. Thread the cable through the mount.
  e. IMPORTANT: Orient the connector with its Notch, and the "TOWARD ROTOR" label turned toward the WTG's rotor (see below):

f. Install the bolt and washer on one side, the flag nut on the other, finger tight

g. Route the cable shield along the outside of the mount and connect to the green ground screw

h. Route the cables through the mast and weather seals to the WSJB, just as the previous sensor cables were installed

7) Install Hybrid XT sensors

a. Install RNRG Hybrid Vane 9363 on left side mount

b. Observe the "Toward Rotor" lable to orient sensor properly

c. Plug the sensor on to the mount, it should fully seat without much effort

d. Tighten the mounting bolt to 27 in-lbs (10 mm wrench)

e. Repeat this process for RNRG Hybrid Anemometer 7901 on the other mast

8) Wire sensor heating terminals

a. Install two heater fuse blocks into the WSJB. For easiest access, connect the wiring before mounting the blocks to the rail.

b. Prep each wire with a ferrule NOTE: the white wire will be jumpered to both sensors.

c. Wire per this table:

From	Wire	Function	To	Notes
Heater Cable	White Wire	Heater Power "+"	Anemometer Heater Fuse, bottom end	This terminal has two wires, the feed from the heater cable, and the jumper wire to the other fuse block.
Anemometer Heater Fuse, bottom end	18 AWG White wire, 4" long	Heater Power "+"	Vane Heater Fuse, bottom end	
Heater Cable	Black Wire	Heater Power "-"	Terminal 11	11 was unused. Connect to the bottom terminal
Heater Cable	Green Wire	Frame Ground	Green "GND" terminal	

d. Mount the fuse blocks to the DIN rail in the WSJB. Place them between terminal 11 and the ground block. Move the end stops on the rail as needed to make room.

9) **Prep and connect new sensor cables**

   a. Strip the sensor cable jackets approx. 6". Prep the shield by folding it back and trimming to engage the grounding hubs, the same as the KK sensors.
   b. Thread XT cables through glands in the WSJB, and tighten to engage shield.
   c. Prep each wire with a ferrule *NOTE: Yellow wires not used*

Anemometer Cable	Function	Wind Sensor Junction Box	Notes
Black Wire	**Signal Ground**	terminal 1	Any of the four "1" terminals
Red Wire	**Sensor +24 V power**	terminal 2	Any of the four "2" terminals
White Wire	**Signal**	terminal 3	Wind speed signal
Yellow Wire	Not used	Not connected	Trim and/or coil out of the way
Orange with Black Stripe	**Heater +**	Fuse Holder Top end	
Orange with White Stripe	**Heater -**	terminal 11	Either top terminal
Cable Shield Braid	**Shield**	Grounded to cable hub	Shield Ground, Earth ground

Vane Cable	Function	Wind Sensor Junction Box	Notes
Black Wire	**Signal Ground**	terminal 1	Any of the four "1" terminals
Red Wire	**Sensor +24 V power**	terminal 2	Any of the four "2" terminals
White Wire	**Signal**	terminal 4	Wind direction signal
Yellow Wire	Not used	Not connected	Trim and/or coil out of the way
Orange with Black Stripe	**Heater +**	Fuse Holder Top end	
Orange with White Stripe	**Heater -**	terminal 11	Either top terminal
Cable Shield Braid	**Shield**	Grounded to cable hub	Shield Ground, Earth ground

10) **Test heater power**

   a. Close fuse block left open in section 2) e.
   b. Note "DC OK" LED on DC power supply should light
   c. At WSJB, install the 7 A heater fuses in each block. Tturn on sensor heat by closing the fuse blocks. The "DC OK" LED on the power supply in A7should stay on

11) **Test signals**

   a. VANE: In WSJB, measure DC voltage from any of the four terminal 2 points (+) to any of the four terminal 1 points (-); should be approx. 24V DC.
   b. Measure DC voltage at terminal 4 (+) to any of the four terminal 1 (-) points. Move the vane had by hand; verify:
      i. It reads less than 1V when pointed to right (starboard) side of turbine
      ii. It reads more than 22V when pointed to left (port) side of turbine
   c. ANEMOMETER: While turning the anemometer head slowly, measure the voltage between the signal and ground (WHITE and BLACK) wires on the anemometer cable. The voltage should alternate between nominal 0V (less than one volt) and nominal 24V (more than 22 V).

12) Close out

    a. Stand the weather station mast back in place
    b. Secure with lock bolts
    c. Completed installation should look like the photo:

    d. Replace cover on WSJB
    e. Route cables with drip and service loops, secure
    f. Replace the cooling duct
    g. Secure the control cabinet.

13) System startup

    a. After exiting turbine, start turbine and verify normal operation

14) Verify anemometer scaling and wind speed in SCADA

    a. Check the wind speed scaling parameters for the primary sensors to be sure:
        i. Parameter 8100 "Scale 1" should be set to 5.09
        ii. Parameter 8101, "Offset" should be set to 1.0
        iii. Parameter 8102 "Scale 2" should be set to 5.09
    b. Verify reported wind speed agrees with neighboring machines