



# NRG S1 Anemometer



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## INTRODUCTION

The NRG S1 Anemometer (introduced September, 2019) is a high performance Class 1A anemometer ideally suited for wind resource assessment as well as meteorological and environmental studies. The S1 is compatible with all Symphonie series loggers equipped with an iPack, as well as third party loggers and Data Acquisition systems (DAQ) that accept a square wave signal input.

The sensor has undergone rigorous testing in various lab, field, and wind tunnel conditions; an IEC 61400-12-1:2017 Edition 2 classification report is readily available. For quality traceability as well as sensor specific transfer function, a MEASNET calibration report is available for each individual sensor.

## THEORY OF OPERATION

The anemometer head rotates in the wind, which in turn rotates a shaft supported by steel ball bearings. At the bottom of the rotor is a 14 pole optical chopper which provides the means for high resolution measurement of the rotational frequency of the anemometer head through an optical (opto) interrupter. As the chopper passes the opto interrupter's slot, the circuit produces a square wave with peak-to-peak voltage equivalent to the sensor's excitation voltage.

The sensor draws approximately 0.9mA at 12Vdc and is protected with internal bi-directional transient voltage suppression devices. Additionally, the signal line is protected against miswire by a resettable fuse.

## SENSOR IDENTIFICATION

The S1 can be identified by the yellow label on the base of the body, which contains the "NRG S1 Anemometer" model name, serial number (9412-NNNNNNNN) and barcode.





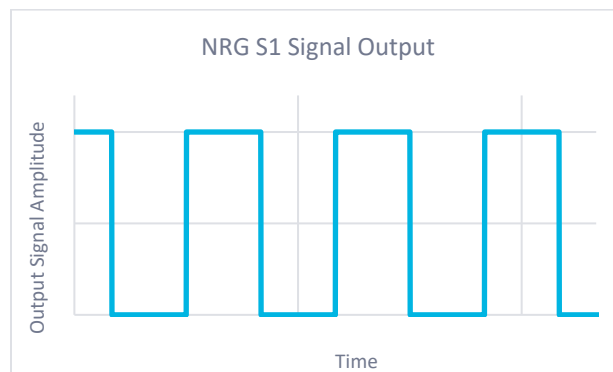
## POWER REQUIREMENTS

The S1 Anemometer requires an excitation voltage of (5 to 28) Vdc and consumes 0.9 mA of current at 12 V.

Excitation Voltage (Vdc)	Current Consumption (mA)
5	1.75
12	0.90
28	0.54

## SIGNAL TYPE

The NRG S1 Anemometer signal output is a square wave (pulse) with amplitude equal to the excitation source. The frequency of the signal is proportional to wind speed.



## ELECTRICAL INTERFACE (PIN OUT AND CONNECTOR)

The NRG S1 Anemometer contains a 3 pin male M12 connector (M12 3P A-code) with the following interface:

NRG S1 Electrical Interface	M12 Connector Pin
Excitation	3
Signal	1
Ground	4
Shield	Shell

Additionally, NRG offers pre-configured cables with integral female M12 3P (A-code) connector in a variety of lengths



**MOUNTING**

The S1 mounts on a 25.4 mm (1 inch) nominal diameter mast.

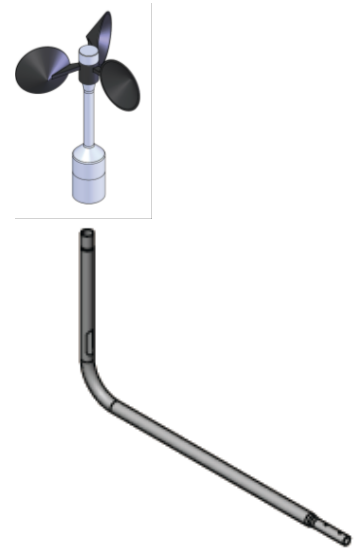
Install the sensor onto the NRG mounting boom as follows:

1. Feed the cable through the boom extension.
2. Connect the cable to the sensor using small profile 12 mm or ½ inch wrench (NRG accessory item 12746).

***NRG Mounting Boom Options***

The following booms are compatible with the NRG S1. Please consult with NRG to determine the best booms for your application.

<b><i>NRG S1 Mounting Boom Items</i></b>	
<b>Item Number</b>	<b>Description</b>
14025	Boom Assembly, 95" (qty 1), NRG S1
14026	Boom Assembly, 95" (qty. 2), NRG S1
14027	Boom Assembly, 95", (qty. 1), Lattice NRG S1
12264	NRG S1 Side Mount Boom Extension





## SYMPHONIEPRO

### Compatibility

The NRG S1 settings are available as “drop-down list” presets in SymphoniePRO Desktop Application 3.7.0 and later. There are no special logger firmware requirements, although it is good practice to keep your firmware up to date. An iPack connected to the logger will supply the required sensor power.

**NOTE:** The latest versions of software, firmware and documentation can be downloaded from this page: <https://www.nrgsystems.com/services-support/resources/documentation-and-downloads/>.

### Wiring

The NRG S1 can be connected to SymphoniePRO counter channels 1-12 and utilizes a familiar 3-wire connection (Excitation, Signal, Ground) plus a shield.

NRG S1 Wire Function	NRG Sensor Cable Conductor	NRG SymphoniePRO Wiring Panel (Channel 1-12)
Excitation	Red	EXC
Signal	White	SIG
Ground	Black	GND
Shield	Shield	SHD

### Channel Configuration

Create the following configuration in the SymphoniePRO Desktop Application. Note, if you do not see the S1 in the “Load From Defaults” drop-down menu, please update your software by visiting the “Services and Support” section of our website (<https://www.nrgsystems.com>).



### ***Default Settings (Desktop Application 3.7.0 and later)***

The SymphoniePRO Desktop Application contains default scaling information for the S1 anemometer. It is also possible to configure using other scaling information such as from an individual sensor's calibration report.

- Scale Factor: 0.0935
- Offset: 0.139
- Signal Type should be set to Pulsed.
- Internal Pull-up resistor should be left disabled.



### SYMPHONIEPLUS3

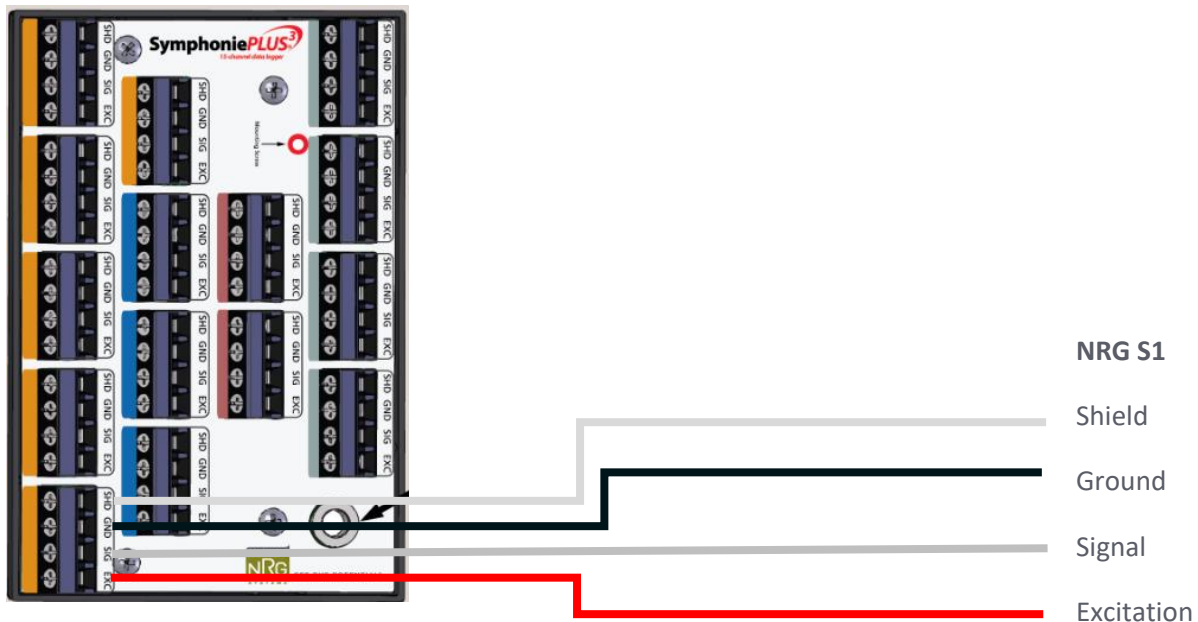
#### Compatibility

The NRG S1 is compatible with the NRG SymphoniePLUS3 channels 1-6 and 13-15, when equipped with an iPack.

#### Wiring

The NRG S1 can be connected to NRG SymphoniePLUS3 channels 1-6 and 13-15 and utilizes a familiar 3-wire connection (Excitation, Signal, Ground) plus a shield.

NRG S1 Wire Function	NRG Sensor Cable Conductor	NRG SymphoniePLUS3Wiring Panel (Channel 1-6, 13-15)
Excitation	Red	EXC
Signal	White	SIG
Ground	Black	GND
Shield	Shield	SHD







## Channel Configuration

Using the SDR software (available from [nrgsystems.com](http://nrgsystems.com)), configure the logger as follows:

- Description: NRG S1
- Scale Factor: 0.0935
- Offset: 0.139

The screenshot shows the 'Site Information Editor - 0001.nsd' window. It is divided into two main sections: 'Site Information' and 'Sensor Information'. The 'Sensor Information' section is highlighted with a red border.

Site Information	
Site #	0001
Site Desc	Windy Mountain 4
Project Code	WM4
Project Desc	
Site Location	
Site Elevation	000546
Base Time Zone	(UTC+05:00) Ashgabat, Tashkent
Latitude	N 014° 21.944'
Longitude	E 077° 32.058'
Serial Number (5-digit suffix)	15037
Hardware Rev.	034-035-057

Sensor Information	
Channel #	1
As of	Baseline
Description	NRG S1
Details	model 9405
Serial Number	0000072
Height	80
Scale Factor	0.0935
Offset	0.139
Print Precision	0.1
Units	m/s



## SPECIFICATIONS

Please see [nrgsystems.com](http://nrgsystems.com) for up to date product specifications.

Description	Sensor type	3-Cup Anemometer
	Applications	Wind resource assessment IEC 61400-12-1 turbine power curve verification Operational wind farm monitoring Meteorological studies Environmental monitoring
	Instrument compatibility	All NRG Systems Data Loggers
Output signal	Signal type	Square wave with frequency proportional to wind speed Amplitude: Equal to supply voltage (5 to 28) Vdc
	Anemometer Transfer Function	Default transfer function: $m/s = (0.0935 \times Hz) + 0.139$ Refer to individual calibration report for specific anemometer transfer function. All NRG S1 anemometers are calibrated per IEC 61400-12-1, Annex F.
	Calibration	Each anemometer individually calibrated, calibration reports provided via electronic download
Installation	Mounting	Onto a 25 mm (1 inch) diameter mast with 2 set screws
	Tools required	12 mm or ½ inch wrench (NRG item 12746)
Environmental	Operating temperature range	-30 °C to 60 °C (-22 °F to 140 °F)
	Operating humidity range	0 to 100% RH
Physical	Connections	M12 Connector (sensor male, cable female)
	Cable length	Various available
	Dimensions	3 cups of conical cross-section, 51 mm (2 inches) dia. 81 mm (3.2 inches) overall assembly height
Materials	Cups	One piece injection-molded black polycarbonate
	Body	Anodized Aluminum
	Shaft	Stainless Steel
	Bearing	Ball Bearings



### NRG S1 ANEMOMETER ASSOCIATED ITEMS LIST

Item	Description
14025	Boom Assembly, 95" (qty 1), NRG S1
14026	Boom Assembly, 95" (qty. 2), NRG S1
14027	Boom Assembly, 95", (qty. 1), Lattice NRG S1
12264	NRG S1 Side Mount Boom Extension
12651	Cable-Assy, S1, 3C, 22AWG, M12, 100m
12652	Cable-Assy, S1, 3C, 22AWG, M12, 115m
12653	Cable-Assy, S1, 3C, 22AWG, M12, 130m
12643	Cable-Assy, S1, 3C, 22AWG, M12, 13m
12654	Cable-Assy, S1, 3C, 22AWG, M12, 145m
12655	Cable-Assy, S1, 3C, 22AWG, M12, 160m
12644	Cable-Assy, S1, 3C, 22AWG, M12, 24m
12645	Cable-Assy, S1, 3C, 22AWG, M12, 35m
12646	Cable-Assy, S1, 3C, 22AWG, M12, 46m
12647	Cable-Assy, S1, 3C, 22AWG, M12, 57m
12642	Cable-Assy, S1, 3C, 22AWG, M12, 5m
12648	Cable-Assy, S1, 3C, 22AWG, M12, 67m
12649	Cable-Assy, S1, 3C, 22AWG, M12, 80m
12650	Cable-Assy, S1, 3C, 22AWG, M12, 90m
9412	Sensor, Anemometer, S1, Calibrated
9416	Sensor, Anemometer, S1, Calibrated, DWG
9415	Sensor, Anemometer, S1, Calibrated, SOH COP
14037	Service, Calibration, NRG S1 Anemometer, DWG
14036	Service, Calibration, NRG S1 Anemometer, SOH COP
14021	Service, Calibration, NRG S1 Anemometer, SOHWE
12746	Tool, Wrench, NRG S1 Installation