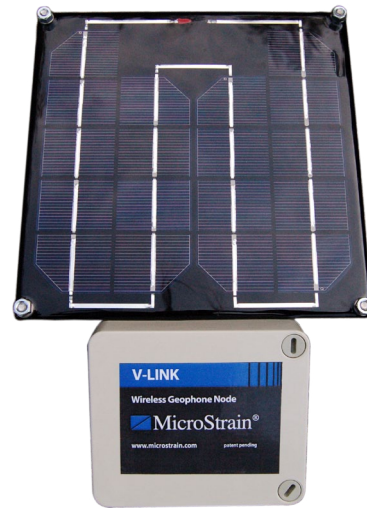


## Solar Powered, Ruggedized Wireless Sensor Nodes



### Introduction

MicroStrain® Field Ruggedized Wireless Sensor Nodes contain either a **V-Link®** wireless voltage node, **SG-Link®** wireless strain node, **G-Link®** wireless accelerometer node, or **TC-Link®** wireless thermocouple node. Each is housed in a rugged NEMA 4X enclosure designed for long-term exposure to the elements. These rugged nodes come standard with high capacity lithium ion batteries designed for operation in extreme temperatures. Optionally, they can be run with solar power, providing autonomous operation for many years.

The **V-Link®** wireless voltage node and **SG-Link®** wireless strain node can be used with most types of analog sensors, including: strain gauges, displacement sensors, load cells, pressure sensors, settlement systems, accelerometers, geophones, temperature sensors and others. The **G-Link®** wireless accelerometer node incorporates a triaxial  $\pm 2 g$  or  $\pm 10 g$  accelerometer.

### Features & Benefits

- 2.4 GHz direct sequence spread spectrum radio is license free worldwide
- IEEE 802.15.4 open communication architecture
- supports simultaneous streaming from multiple nodes to PC
- datalogging rates up to 2048 Hz, stores up to 1,000,000 measurements
- real-time streaming rates up to 4 KHz
- communication range up to 70 m line-of-sight, 300 m with high gain antennas
- rugged NEMA 4X enables long-term exposure in hostile environments
- low power consumption for extended use with primary batteries or solar recharged lithium batteries
- internal rechargeable battery

### Applications

- condition-based monitoring of machines
- health monitoring of civil structures
- smart structures and materials
- experimental test and measurement
- vibration and acoustic noise testing
- distributed security networks



**V-LINK®**

Input channels	up to 8 input channels: 4 full differential, 350 Ω resistance or higher (with optional bridge completion), 3 single ended inputs (0-3 volts maximum), and internal temperature sensor
Measurement accuracy	± 0.1% full scale typical
Resolution	1 bit: 0.024%, 1 microstrain typical for 3 wire full bridge strain gauge (when used in accordance with <b>MicroStrain®</b> recommendations)
DC bridge excitation	+3 volts DC at 50 mA maximum (pulsed to sensors for sample rates of 100 Hz and below to conserve power)
Programmable gain	software programmable for differential input channels from 210 to 4844 (can be reduced with hardware resistor change)
Programmable offset	software programmable
Wireless shunt calibration	channels 1 to 4, Internal shunt calibration resistor 499 KΩ

**SG-LINK®**

Input channels	1 full differential input channel, 350 Ω resistance or higher (with optional bridge completion), 1 single ended input (0 - 3 volts maximum), and internal temperature sensor
Measurement accuracy	± 0.1% full scale typical
Resolution	1 bit: 0.024%, 1 microstrain typical for 3 wire full bridge strain gauge (when used in accordance with <b>MicroStrain®</b> recommendations)
DC bridge excitation	+3 volts DC at 50 mA maximum (pulsed to sensors for sample rates of 100 Hz and below to conserve power)
Programmable gain	software programmable: 104 to 1800
Programmable offset	software programmable
Wireless shunt calibration	channel 1, Internal shunt calibration resistor 499 KΩ
Power consumption	SG-Link node only: real-time streaming - 25 mA, datalogging - 25 mA, sleeping - 0.1 mA External sensors: 350 Ω strain gauge - 8 mA, 1000 Ω strain gauge - 3 mA (to calculate total power consumption, add sensor consumption to above)

**G-LINK®**

On-board accelerometers	triaxial MEMs accelerometers, Analog Devices AD22293 (2 g) or ADXL210 (10 g)
Accelerometer range	± 2 g or ±10 g
Measurement accuracy	10 mg
Resolution	1.5 mg RMS (2 g), 9 mg RMS (10 g)
Maximum acceleration limit	500 g
Power consumption	real-time streaming - 25 mA, datalogging - 25 mA, sleeping - 0.1 mA

**TC-Link**

Thermocouple inputs supported	software selectable: Type J, K, R, S, T, E, B six input channel, one ambient CJC channel. Optional internal relative humidity sensor.
Standard thermocouple measurement range	J: 0 to 760 °C; K: 0 to 1370 °C; R: 0 to 1000 °C; S: 0 to 1750 °C; T: -160 to 400 °C; E: -100 to 990 °C; B: 200 to 2000 °C
Temperature measurement accuracy	± 0.1% full scale or ±2 °C whichever is greater (does not include errors due to TC wire or transducer)
Temperature repeatability	0.1 °C (does not include errors due to TC wire or transducer)
Temperature resolution	0.0625 °C
Cold junction compensation range	-20 °C to 85 °C
Thermocouple connector	six type 1 standard mini (SM) connectors for flat pin TC inputs

**Common Specifications**

(Excluding TC-Link®)

Temperature sensor	-40 °C to 70 °C range, typical accuracy ±2 °C (at 25 °C)
Analog to digital (A/D) converter	successive approximation type, 12 bit resolution
Data storage capacity	2 megabytes (approximately 1,000,000 data points)
Data logging mode	log up to 1,000,000 data points (from 100 to 65,500 samples or continuous) at 32 Hz to 2048 Hz
Sensor event driven trigger	commence datalogging when threshold exceeded
Real-time streaming mode	transmit real time data from node to PC - rate depends on number of active channels: 1 channel - 4 KHz, 2 channels - 2 KHz, 3 channels - 1.33 KHz
Low duty-cycle mode	supports multiple nodes on single RF channel, from 1 sample per hour to 250 Hz
Synchronization between nodes	datalogging ±4 µsec ± 50 ppm, LDC mode time stamped at PC
Sample rate stability	± 25 ppm for sample rates > 1 Hz ±10% for sample rates ≤ 1 Hz
Radio frequency (RF) transceiver carrier	2.4 GHz direct sequence spread spectrum, license free worldwide (2.405 to 2.480 GHz) - 16 channels, radiated power 0 dBm (1 mW)
RF data packet standard	IEEE 802.15.4, open communication architecture
RF data downloading	8 minutes to download full memory
Range for bi-directional RF link	70 m line-of-sight, up to 300 m with optional high gain antenna
Internal Li-Ion battery	3.7 volt lithium ion rechargeable battery; customer may supply external power from 3.2 to 9 volts
Autonomy	depends upon sensors and power source. Solar powered nodes can be designed to operate for up to 5 years without battery maintenance
Operating temperature	-40 °C to + 65 °C with standard battery, -20 °C to +65 °C with rechargeable battery for solar power. -40 °C to +85 °C for electronics only
Mounting options	magnetic, clamp, bolt or pipe mountable
Dimensions	140 mm x 120 mm x 100 mm without solar panel and mounting hardware
Enclosure material	ABS plastic, NEMA 4X
Software	<b>Node Commander®</b> Windows XP/Vista compatible
Compatible base stations	USB, RS-232, Analog, <b>WSDA®</b>

Patents pending



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