CAMPBELL SCIENTIFIC
WHEN MEASUREMENTS MATTER

GRANITE VWIRE 305

8-Channel Dynamic Vibrating-Wire Analyzer

Maximize Your High-Speed, Dynamic Applications

With time-proven reliability and stability of vibrating-wire sensor technology

Overview

The GRANITE™ VWIRE 305 is an eight-channel interface for dynamic measurements of standard vibrating-wire sensors. With the VWIRE 305 interface, you can operate any standard vibrating-wire sensor at "dynamic" rates to achieve faster and better measurements without having to purchase or install new sensors.

The interface measures the resonant frequency of the wire between excitations using the patented vibrating-wire spectral-analysis technology (VSPECT®). VSPECT® provides very fine measurement resolution and limits the influence of external noise by discriminating between signal and noise based on frequency content. Because of this technology, the signal can be carried through longer cables in harsher noise environments, giving you flexibility in your sensor and data-acquisition system siting, while providing sensor diagnostics never available before.

Learn about our patented VSPECT® spectral-analysis technology at our VSPECT® Essentials web resource.

Learn about dynamic vibrating-wire sensor measurements at our Dynamic Vibrating-Wire web resource.

The dynamic vibrating-wire measurement technique is protected under U.S. Patent No. 8,671,758, and the vibrating-wire spectral-analysis technology (VSPECT®) is protected under U.S. Patent No. 7,779,690.

Benefits and Features

- Dedicated measurement hardware for simultaneous measurement of each channel
- Interfaces to any standard vibrating-wire sensor
- Eight simultaneously sampled channels per module; synchronized across multiple modules
- Dynamic measurement rates of 20 to 333 Hz
- Static measurement vibrating-wire and thermistor measurements at 1 Hz
- VSPECT® spectral interpolation algorithms provide superior noise immunity and measurement resolution compared to time-domain period-averaging approach
- Excitation method providing frequent low-energy pulses to maintain a continuous resonant vibration in the sensor
- Onboard post-processing including frequency conversion, temperature conversion, and rainflow histogram calculation
- CPI DAQ connection for channel expansion
- USB 2.0 interface for PC-based operation

Detailed Description

In addition to the dynamic vibrating-wire measurement, the VWIRE 305 makes several auxiliary measurements. A static vibrating-wire measurement is made once each second, along with the dynamic measurements, which provides finer measurement resolution and greater immunity to external noise sources. The VWIRE 305 includes a thermistor input channel paired with each vibrating-wire channel, featuring high-precision 24-bit measurements at a 1 Hz rate. Unique to the VSPECT® technology, a rich set of diagnostic parameters is provided with the vibrating-wire data.

The VWIRE 305 has the capability to simplify post-processing of data by computing common values internally. Vibrating-wire data can be reported as measured frequency or as the frequency squared with a multiplier and offset applied. The thermistor data is reported as resistance or is converted to degrees Celsius using the thermistor's Steinhart-Hart coefficients. The VWIRE 305 can also internally compile rainflow histograms from the final data and report the values at user-specified intervals.

Vibrating-Wire Inputs

Each channel has two terminals for connecting to the coil of the vibrating-wire sensor. Both vibrating-wire terminals are labeled *VW*, and the polarity of the wiring is arbitrary. The sensor is excited and measured through the same connections. Sinusoidal excitation is applied for a few cycles of the wire oscillation. The wire is maintained in a continuously vibrating state. Excitation voltage varies automatically to maintain the desired return signal strength.

Thermistor Inputs

Each channel has two terminals for connecting to the thermistor. Both thermistor terminals are labeled *T*, and the polarity of the wiring is arbitrary. The measurement is a half-bridge configuration with the excitation circuitry and completion resistor integrated into the module.

Specifications

-NOTE-	*Electrical specifications are valid over a -40° to +70°C range, non-condensing environment, unless otherwise specified. Extended electrical specifications are valid over a -55° to +85°C range in a non-condensing environment.*
Operating Temperature Range	» -40° to +70°C (standard) » -55° to +85°C (extended)
Scan Rates	20, 50, 100 Hz
CPI Baud Rate	Selectable from 25 kbps to 1 Mbps
Input Resistance	5 kΩ
Excitation Voltage Range	0 to ±3 V (6 V peak-to-peak)
Excitation Voltage Resolution	26 mV
Measurement Frequency Accuracy	±(0.005% of reading + measurement resolution)
Sustained Input Voltage without Damage	-0.5 to +7.1 V
USB	USB 2.0 full speed connection is available for attaching the device to a PC. (This port is provided to configure the module, send updates, and communicate with the Dynamic Vibrating-Wire Toolbox software. The USB port is not provided for use within a permanent data collection system.)
CPI	Used for connection to the data logger. Baud rate selectable from 50 kbps to 1 Mbps. (Allowable cable length varies depending on baud rate, number of nodes, cable quality, and noise environment, but can be as long as 2,500 ft under proper conditions.)
Mounting	Standard 1-in. grid (Optional DIN rail mounting available.)
Dimensions	20.3 x 12.7 x 5.1 cm (8 x 5 x 2 in.)
Weight	816.47 g (1.8 lb)

Measurement Resolution at Sample Rates

-NOTE-	*Typical values for a 2.5 kHz resonant sensor*
1 Hz Sample Rate	0.005 Hz RMS (noise level)
20 Hz Sample Rate	0.008 Hz RMS (noise level)
50 Hz Sample Rate	0.015 Hz RMS (noise level)
100 Hz Sample Rate	0.035 Hz RMS (noise level)
200 Hz Sample Rate	0.11 Hz RMS (noise level)

333.3 Hz Sample Rate	0.45 Hz RMS (noise level)

Sensor Resonant Frequency Range

20 Hz Sample Rate	❱ 290 Hz (minimum sensor frequency) ❱ 6000 Hz (maximum sensor frequency)
50 Hz Sample Rate	❱ 290 Hz (minimum sensor frequency) ❱ 6000 Hz (maximum sensor frequency)
100 Hz Sample Rate	❱ 580 Hz (minimum sensor frequency) ❱ 6000 Hz (maximum sensor frequency)

Thermistor

Completion Resistor	4.99 kΩ 0.1%
Excitation Voltage	1.5 V
Resolution	0.002 Ω RMS (@ 5 kΩ thermistor resistance)
Accuracy	0.15% of reading (Thermistor accuracy and resistance of the wire should be considered as additional errors.)
Measurement Rate	1 Hz

Power Requirements

Voltage	9.6 to 32 Vdc
Typical Current Drain	190 mA (@ 12 Vdc)