

# GRANITE 6 Specifications



Data Acquisition  
System

Electrical specifications are valid over a -40 to +70 °C, non-condensing environment, unless otherwise specified. Extended electrical specifications (noted as XD in specifications) are valid over a -55 to +85 °C non-condensing environment. Recalibration is recommended every three years. Critical specifications and system configuration should be confirmed with Campbell Scientific before purchase.

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## System specifications

**Processor:** Renesas RX63N (32-bit with hardware FPU, running at 100 MHz)

### Memory:

- Total onboard: 128 MB of flash + 4 MB battery-backed SRAM
  - Data storage: 4 MB SRAM + 72 MB flash (extended data storage automatically used for auto-allocated Data Tables not being written to a card)
  - CPU drive: 30 MB flash
  - OS load: 8 MB flash
  - Settings: 1 MB flash
  - Reserved (not accessible): 10 MB flash
- Data storage expansion: Removable microSD flash memory, up to 16 GB
- USB host provides for portable data storage on a mass storage device (MSD). Not intended for long term unattended data storage other than what is available with [TableFile\(\)](#).

**Program Execution Period:** 1 ms to 1 day

### Real-Time Clock:

- Battery backed while external power is disconnected
- **Resolution:** 1 ms
- **Accuracy:** ±3 min. per year, optional GPS correction to ±10 µs; 5.7 ppm

**Wiring Panel Temperature:** Measured using a thermistor, located on the analog board.

## Physical specifications

**Case Material:** Stainless Steel 304 and Aluminum 6061

**Dimensions:** 21.4 x 12.0 x 5.0 cm (8.4 x 4.7 x 2.0 in); additional clearance required for cables, wires, and antennas.

**Weight/Mass:** 0.86 kg (1.9 lb)

## Power requirements

**Protection:** Power inputs are protected against surge, over-voltage, over-current, and reverse power. IEC 61000-4 Class 4 level.

### CHG Terminals:

- **Voltage Input:** 16 to 32 VDC
- **Input Current Limit at 12 VDC:**
  - 1.2 A @ 20 °C maximum

### BAT Terminals:

- 10 to 18 VDC
- 19 VDC sustained voltage limit without damage; transient voltage protected
- 2.5 A max current at 12 VDC at 20° C

### External Batteries:

- Float charge on BAT terminal
- 12 VDC
- Valve-regulated, lead-acid (VRLA)
- 2 to 24 Ah battery typical

**USB Device Power:** Functions that will be active with USB Device 5 VDC include sending programs, adjusting data logger settings, and making some measurements. If USB Device is the only power source, then the CS I/O port and the 12V and SW12 terminals will not be operational.

**Internal Lithium Battery:** 1/2AA, 1.2 Ah, 3.6 VDC (Tadiran L5902S) for battery-backed memory and clock. 1.5-year life with no external power source.



## Average Current Drain:

Assumes 12 VDC on BAT terminals — add 2 mA if using CHG terminals.

- **Idle:** <1 mA
- **Active 1 Hz Scan:** 3 mA
- **Active 20 Hz Scan:** 67 mA
- **Serial (RS-232/RS-485):** Active + 25 mA
- **Ethernet Power Requirements:**
  - **Ethernet 1 Minute:** Active + 1 mA
  - **Ethernet Idle:** Active + 4 mA
  - **Ethernet Link:** Active + 47 mA

**Vehicle Power Connection:** When primary power is pulled from the vehicle power system, a second power supply OR charge regulator may be required to overcome the voltage drop at vehicle start-up.

## Wi-Fi Additional Current Contribution at 12 VDC:

Mode	Wi-Fi Option
Client Mode	7 mA idle, 70 mA communicating
Access Point Mode	62 mA idle, 70 mA communicating
Sleep	<1 mA

## Power output specifications

System power out limits (when powered with 12 VDC)

Temperature (°C)	Current Limit <sup>1</sup> (A)
-40°	3.88
0°	2.98
20°	2.50
50°	1.80
70°	1.35
85°	1.00
<sup>1</sup> Limited by self-resetting thermal fuse	

## 12 V and SW12 V power output terminals

12V, SW12-1, and SW12-2: Provide unregulated 12 VDC power with voltage equal to the Power Input supply voltage. These are disabled when operating on USB power only.

SW12 current limits	
Temperature (°C)	Current Limit <sup>1</sup> (mA)
-40°	1600
0°	1290
20°	1100
50°	830

SW12 current limits	
Temperature (°C)	Current Limit <sup>1</sup> (mA)
70°	640
85°	500
<sup>1</sup> Thermal fuse hold current.	

## 5 V fixed output

5V: One regulated 5 V output. Supply is shared between the 5V terminal and CS I/O pin 1.

- **Voltage Output:** Regulated 5 V output (±5%)
- **Current Limit:** 250 mA

## U and C as power output

- C Terminals:
  - **Output Resistance ( $R_o$ ):** 150  $\Omega$
  - **5 V Logic Level Drive Capacity:** 10 mA @ 3.5 VDC
  - **3.3 V Logic Level Drive Capacity:** 10 mA @ 1.8 VDC
- U Terminals:

	U odd terminals	U even terminals
Voltage Excitation Max Current @ $\pm 2500$ mV	$\pm 25$ mA	$\pm 25$ mA
Current Excitation Max Current	$\pm 2500$ $\mu$ A	$\pm 2500$ $\mu$ A
5 V Logic Level Output Resistance ( $R_o$ )	75 $\Omega$	150 $\Omega$
5 V Logic Level Max Current @ 3.5 V	20 mA	10 mA
3.3 V Logic Level Output Resistance ( $R_o$ )	73 $\Omega$	145 $\Omega$
3.3 V Logic Level Max Current @ 1.85 V	20 mA	10 mA
U odd terminals: U1, U3, U5, U7, U9, U11. U even terminals: U2, U4, U6, U8, U10, U12		

## CS I/O pin 1

**5 V Logic Level Max Current:** 200 mA

## Voltage and current excitation specifications

A 12-bit DAC produces voltage and current excitation. When used for resistance measurement, excitation is active only during measurement.

## Voltage excitation

**Terminals:** U1 - U12

**Range:**  $\pm 2500$  mV

**Resolution:** 0.6 mV

### Voltage Excitation Absolute Accuracy:

- 0 to 40 °C:  $\pm(0.1\%$  of setting + 1.2 mV)
- -40 to 70 °C:  $\pm(0.1\%$  of setting + 1.5 mV)
- -55 to 85 °C (XD):  $\pm(0.1\%$  of setting + 1.6 mV)

Maximum Source or Sink Current:  $\pm 25$  mA

### Current excitation

Terminals: U1 - U12

Range:  $\pm 2.5$  mA

Resolution: 0.6  $\mu$ A

### Current Excitation Absolute Accuracy):

- 0 to 40 °C:  $\pm(0.11\%$  of setting + 2.0  $\mu$ A)
- -40 to 70 °C:  $\pm(0.12\%$  of setting + 2.5  $\mu$ A)
- -55 to 85 °C (XD):  $\pm(0.13\%$  of setting + 3.0  $\mu$ A)

Compliance Voltage:  $\pm 5$  V

## Analog measurement specifications

12 universal (U) terminals individually configurable for voltage, thermocouple, thermistor, current loop, ratiometric, static vibrating wire, and period average measurements, using a 24-bit ADC. One channel at a time is measured.

### Voltage measurements

Terminals:

- **Differential Configuration (H/L):** U1/U2- U11/U12
- **Single-Ended Configuration:** U1 - U12

Input Resistance: 20 G $\Omega$  typical

Input Voltage Limits:  $\pm 5$  V

Sustained Input Voltage without Damage:  $\pm 20$  VDC

DC Common Mode Rejection:

- > 120 dB with input reversal
- $\geq 86$  dB without input reversal

Normal Mode Rejection: > 70 dB @ 60 Hz

Input Current @ 25 °C:  $\pm 2$  nA typical

Filter First Notch Frequency ( $f_{N1}$ ) Range: 5 Hz to 93 kHz (user specified)

Analog Range and Resolution:

		Differential with Input Reversal		Single-Ended and Differential without Input Reversal	
Notch Frequency ( $f_{N1}$ ) (Hz)	Range <sup>1</sup> (mV)	RMS ( $\mu$ V)	Bits <sup>2</sup>	RMS ( $\mu$ V)	Bits <sup>2</sup>
15000	$\pm 5000$	20.0	19	30.0	18
	$\pm 1000$	4.0	19	5.5	18
	$\pm 200$	1.6	18	1.8	17
50/60 <sup>3</sup>	$\pm 5000$	1.2	23	5.0	20
	$\pm 1000$	0.24	23	1.1	20
	$\pm 200$	0.10	22	0.24	20

		Differential with Input Reversal		Single-Ended and Differential without Input Reversal	
Notch Frequency ( $f_{N1}$ ) (Hz)	Range <sup>1</sup> (mV)	RMS ( $\mu$ V)	Bits <sup>2</sup>	RMS ( $\mu$ V)	Bits <sup>2</sup>
5	$\pm 5000$	0.60	24	4.9	20
	$\pm 1000$	0.12	24	1.0	20
	$\pm 200$	0.05	23	0.22	20

<sup>1</sup> Range overhead of  $\sim 5\%$  on all ranges guarantees that full-scale values will not cause over range

<sup>2</sup> Typical effective resolution (ER) in bits; computed from ratio of full-scale range to RMS resolution.

<sup>3</sup> 50/60 corresponds to rejection of 50 and 60 Hz ac power mains noise.

**Accuracy** (does not include sensor or measurement noise):

- 0 to 40 °C:  $\pm(0.04\%$  of measurement + offset)
- -40 to 70 °C:  $\pm(0.06\%$  of measurement + offset)
- -55 to 85 °C (XD):  $\pm(0.08\%$  of measurement + offset)

**Voltage Measurement Accuracy Offsets:**

Range (mV)	Typical Offset ( $\mu$ V RMS)	
	Differential with Input Reversal	Single-Ended or Differential without Input Reversal
$\pm 5000$	$\pm 10$	$\pm 40$
$\pm 1000$	$\pm 5$	$\pm 12$
$\pm 200$	$\pm 2$	$\pm 6$

**Measurement Settling Time:** 20  $\mu$ s to 600 ms; 500  $\mu$ s default

**Multiplexed Measurement Time:**

Measurement time = INT(multiplexed measurement time • (reps+1) + 2ms

	Differential with Input Reversal	Single-Ended or Differential without Input Reversal
Example $f_{N1}$ <sup>1</sup> (Hz)	Time <sup>2</sup> (ms)	Time <sup>2</sup> (ms)
15000	2.8	1.4
60	36	18.1
50	42.07	21.3
5	402.7	201.4

<sup>1</sup> Notch frequency (1/integration time).

<sup>2</sup> Default settling time of 500  $\mu$ s used.

## Resistance measurement specifications

The data logger makes ratiometric-resistance measurements for four- and six-wire full-bridge circuits and two-, three-, and four-wire half-bridge circuits using voltage excitation or for direct resistance measurements using current excitation. Excitation polarity reversal is available to minimize dc error.

### Accuracy:

Assumes input reversal for differential measurements

**RevDiff** and excitation reversal **RevEx** for excitation voltage <1000 mV and excitation current < 1 mA. Does not include bridge resistor errors or sensor and measurement noise.

- **0 to 40 °C:**  $\pm(0.02\%$  of voltage measurement + offset)
- **-40 to 70 °C:**  $\pm(0.025\%$  of voltage measurement + offset)
- **-55 to 85 °C (XD):**  $\pm(0.03\%$  of voltage measurement + offset)

## Period-averaging measurement specifications

**Terminals:** U1-U12

**Accuracy:**  $\pm(0.01\%$  of measurement + resolution), where resolution is 0.13  $\mu\text{s}$  divided by the number of cycles to be measured

### Ranges:

- Minimum signal centered around specified period average threshold.
- Maximum signal centered around data logger ground.
- Maximum frequency =  $1/(2 * (\text{minimum pulse width}))$  for 50% duty cycle signals

Gain Code Option	Voltage Gain	Minimum Peak to Peak Signal (mV)	Maximum Peak to Peak Signal (V)	Minimum Pulse Width ( $\mu\text{s}$ )	Maximum Frequency (kHz)
0	1	500	10	2.5	200
1	2.5	50	2	10	50
2	12.5	10	2	62	8
3	64	2	2	100	5

## Static vibrating wire measurement specifications

Up to 6 static vibrating wire measurements without thermistor measurements, or up to 3 static vibrating wire measurements with thermistor measurements. A U terminal pair both excites and measures vibrating wire transducers. Logarithmic sine-wave-frequency excitation is adjustable up to  $\pm 6$  V (12 V peak-to-peak), programmable from 100 Hz to 6.5 kHz, then followed by frequency domain measurements, one at a time.

**Terminals:** U1 - U12

**Input Resistance:** 4.75 k $\Omega$

**Measurement Type:** Differential voltage

**Range:**  $\pm 200$  mV

**Accuracy:**  $\pm 0.013\%$  of reading

**Resolution:** 0.001 Hz RMS

**Measurement Speed** (vibrating wire and thermistor combined): < 1 s

## Thermistor measurement specifications

6 U terminal pairs can be configured to measure two-wire thermistors directly using an on-board 5 k $\Omega$  resistor to complete the bridge. The U terminal pair both excites and measures the thermistor.

**Terminals:** U1 - U12

**Input Resistance:** 5 k $\Omega$   $\pm 0.1\%$ , 10 ppm/ $^{\circ}\text{C}$  completion resistor

**Measurement Type:** Single-ended voltage

**Range:**  $\pm 5000$  mV

**Resolution:** 0.001  $\Omega$  RMS

**Accuracy:**  $\pm 0.25\%$  of reading

## Current-loop measurement specifications

The data logger makes current-loop measurements by measuring across a current-sense resistor associated with the RS-485 resistive ground terminal.

**Terminal:** RG

**Maximum Input Voltage:**  $\pm 16$  V

**Resistance to Ground:** 101  $\Omega$

**Current Measurement Shunt Resistance:** 10  $\Omega$

**Maximum Current Measurement Range:**  $\pm 80$  mA

**Absolute Maximum Current:**  $\pm 160$  mA

**Resolution:**  $\leq 20$  nA

**Accuracy:**

- **0 to 40 °C:**  $\pm 0.14\%$  of reading
- **-40 to 70 °C:**  $\pm 0.26\%$  of reading

## Pulse measurement specifications

The data logger can measure switch closure or high-frequency pulse signals on C and U terminals. Terminals are configured as pairs with options for pull-up or pull-down. Even-numbered U terminals can be configured as low-level AC inputs. Each terminal has its own independent 32-bit counter. Terminal pairs are U1 and U2, U3 and U4, through U11 and U12.

### NOTE:

Conflicts can occur when a control port pair is used for different instructions ([TimerInput\(\)](#), [PulseCount\(\)](#), [SDI12Recorder\(\)](#), [WaitDigTrig\(\)](#)). For example, if C1 is used for [SDI12Recorder\(\)](#), C2 cannot be used for [TimerInput\(\)](#), [PulseCount\(\)](#), or [WaitDigTrig\(\)](#).

**Pulse Event:** Transition from logic low to logic high.

Terminal Pair Configuration	Logic Low	Logic High
5 V	$\leq 1.5$ V	$\geq 3.5$ V
3.3 V	$\leq 0.8$ V	$\geq 2.0$ V

**Maximum Input Voltage:** ±20 VDC

**Maximum Counts Per Channel:** 2<sup>32</sup>

**Maximum Counts Per Scan:** 2<sup>32</sup>

**Input Resistance:** 5 kΩ

**Accuracy:** ±(6 ppm of reading + 0.00001)

### Switch closure input

**Terminals:** C1-C4, U1-U12

**Resistance:** Configurable in terminal pairs with 100 kΩ pull-up or pull-down

**Maximum Input Frequency:** 150 Hz

**Minimum Switch Closed Time:** 5 ms

**Minimum Switch Open Time:** 6 ms

**Maximum Bounce Time:** 1 ms open without being counted

**Software Debounce Time:** 3.3 ms

### High-frequency input

**Terminals:** C1-C4, U1-U12

**Resistance:** Configurable in terminal pairs with 100 kΩ pull-up or pull-down

**Typical Wave Form:** 5 or 3.3 VDC square wave

**Maximum Input Frequency:** 1 MHz

### Low-level AC input

**Terminals:** U2, U4, U6, U8, U10, U12

#### NOTE:

When an even numbered U terminal (for example, U2) is used for low-level AC pulse counting, its paired odd numbered terminal (U1 in this example) can be used only for switch-closure or high-frequency pulse counting or in the digital I/O control or state function.

**DC-offset rejection:** Internal AC coupling eliminates DC-offset voltages up to ±0.05 VDC

**Input Hysteresis:** 12 mV at 1 Hz

**Low-Level AC Pulse Input Ranges for U Terminals:**

Sine wave (mV RMS)	Range (Hz)
20	1.0 to 20
200	0.5 to 200
2000	0.3 to 10,000
5000	0.3 to 20,000

## Digital input/output specifications

Terminals configurable for digital input and output (I/O) including status high/low, pulse width modulation, external interrupt, edge timing, switch closure pulse counting, high-

frequency pulse counting, UART<sup>1</sup>, RS-232<sup>2</sup>, RS-422<sup>3</sup>, RS-485<sup>4</sup>, SDM<sup>5</sup>, SDI-12<sup>6</sup>, I2C<sup>7</sup>, and SPI<sup>8</sup> function. Terminals are configurable in pairs for 5 V or 3.3 V logic for some functions.

#### NOTE:

Conflicts can occur when a control port pair is used for different instructions (`TimerInput()`, `PulseCount()`, `SDI12Recorder()`, `WaitDigTrig()`). For example, if C1 is used for `SDI12Recorder()`, C2 cannot be used for `TimerInput()`, `PulseCount()`, or `WaitDigTrig()`.

**Maximum Input Voltage:** ±20 V

**Logic Levels and Drive Current:**

Terminal Pair Configuration	5 V Source	3.3 V Source
Logic low	≤ 1.5 V	≤ 0.8 V
Logic high	≥ 3.5 V	≥ 2.5 V
C1 - C4	10 mA @ 3.5V	10 mA @ 1.85V
U odd	20 mA @ 3.5V	20 mA @ 1.85V
U even	10 mA @ 3.5V	10 mA @ 1.85V

### Edge timing

**Terminals:** C1-C4, U1-U12

**Maximum Input Frequency:** ≤ 1 kHz

**Resolution:** 520 ns

### Edge counting

**Terminals:** C1-C4, U1-U12

**Maximum Input Frequency:** ≤ 2.2 kHz

### Quadrature input

**Terminals:** C1-C4 and U1-U12 can be configured as digital pairs to monitor the two sensing channels of an encoder.

**Maximum Frequency:** 2.5 kHz

**Resolution:** 31.25 μs or 32 kHz

<sup>1</sup>Universal Asynchronous Receiver/Transmitter for asynchronous serial communications.

<sup>2</sup>Recommended Standard 232. A loose standard defining how two computing devices can communicate with each other. The implementation of RS-232 in Campbell Scientific data loggers to computer communications is quite rigid, but transparent to most users. Features in the data logger that implement RS-232 communications with smart sensors are flexible.

<sup>3</sup>Communications protocol similar to RS-485. Most RS-422 sensors will work with RS-485 protocol.

<sup>4</sup>Recommended Standard 485. A standard defining how two computing devices can communicate with each other.

<sup>5</sup>Synchronous Device for Measurement. A processor-based peripheral device or sensor that communicates with the data logger via hardware over a short distance using a protocol proprietary to Campbell Scientific.

<sup>6</sup>Serial Data Interface at 1200 baud. Communications protocol for transferring data between the data logger and SDI-12 compatible smart sensors.

<sup>7</sup>Inter-Integrated Circuit is a multi-controller, multi-peripheral, packet switched, single-ended, serial computer bus.

<sup>8</sup>Serial Peripheral Interface - a clocked synchronous interface, used for short distance communications, generally between embedded devices.

## Pulse-width modulation

**Modulation Voltage:** Logic high

**Maximum Period:** 128 seconds

**Resolution:**

- **0 to ≤ 5 ms:** 1/12 MHz or 83.33 ns
- **> 5 to ≤ 300 ms:** 187.62 kHz or 5.33 μs
- **> 300 ms:** 1/32 kHz or 31.25 μs

## Communications specifications

**Ethernet Port:** RJ45 jack, 10/100Base Mbps, full and half duplex, Auto-MDIX, magnetic isolation, and TVS surge protection.

**Internet Protocols:** Ethernet, PPP, RNDIS, ICMP/Ping, Auto-IP (APIPA), IPv4, IPv6, UDP, TCP, TLS (v1.2), DNS, DHCP, SLAAC, Telnet, HTTP(S), SFTP, FTP(S), POP3/TLS, NTP, SMTP/TLS, SNMPv3, CS I/O IP

**Additional Protocols:** CPI, PakBus, PakBus Encryption, SDM, SDI-12, Modbus RTU / ASCII / TCP, DNP3, custom user definable over serial, NTCIP, NMEA 0183, I2C, SPI

**USB Device:** Micro-B device for computer connectivity

**USB Host:** USB 2.0 full speed host 12 Mbps, Type-A for mass storage devices

**CS I/O:** 9-pin D-sub connector to interface with Campbell Scientific CS I/O peripherals.

**0 – 5 V Serial (U1 to U12, C1 to C4):** Eight independent TX/RX pairs

**SDI-12 (C1, C3, U1, U3, U5, U7, U9, U11):** Eight independent SDI-12 compliant terminals are individually configured and meet SDI-12 Standard v 1.4.

**RS-485 (C1 to C4):** One full duplex or two half duplex

**RS-422 (C1 to C4):** One full duplex or two half duplex

**CPI/RS-232:** Single RJ45 module port that can operate in one of two modes: CPI or RS-232. CPI interfaces with Campbell Scientific CDM measurement peripherals and sensors. RS-232 connects, with an adapter cable, to computer, sensor, or communications devices serially.

**CPI:** One CPI bus. Up to 1 Mbps data rate. Synchronization of devices to 5 μs. Total cable length up to 610 m (2000 ft). Up to 20 devices. CPI is a proprietary interface for communications between Campbell Scientific data loggers and Campbell Scientific CDM peripheral devices. It consists of a physical layer definition and a data protocol.

**Wireless:** Wi-Fi

**Hardwired:** Multi-drop, short haul, RS-232, fiber optic

**Satellite:** GOES, Argos, Inmarsat Hughes, Iridium

## Wi-Fi specifications

WLAN (Wi-Fi)

**Maximum Possible Over-the-Air Data Rates:** <11 Mbps over 802.11b, <54 Mbps over 802.11g, <72 Mbps over 802.11n

**Operating Frequency:** 2.4 GHz, 20 MHz bandwidth

**Antenna Connector:** Reverse Polarity SMA (RPSMA)

**Antenna** (shipped with data logger): Unity gain (0 dBd), 1/2 wave whip, omnidirectional. Features an articulating knuckle joint that can be oriented vertically or at right angles


**Supported Technologies:** 802.11 b/g/n, WPA/WPA2-Personal, WPA/WPA2-Enterprise Security, WEP

**Client Mode:** WPA/WPA2-Personal and Enterprise, WEP

**Access Point Mode:** WPA2-Personal

**Receive Sensitivity:** -97 dBm

## Standards compliance specifications

View compliance and conformity documents at [www.campbellsci.com/granite6](http://www.campbellsci.com/granite6) .

**Protection:** IP40

**EMI and ESD protection:**

- **Immunity:** Meets or exceeds following standards:
  - **ESD:** per IEC 61000-4-2; ±15 kV air, ±8 kV contact discharge
  - **Radiated RF:** per IEC 61000-4-3; 10 V/m, 80-1000 MHz
  - **EFT:** per IEC 61000-4-4; 4 kV power, 4 kV I/O
  - **Surge:** per IEC 61000-4-5; 4 kV power, 4kV I/O
  - **Conducted RF:** per IEC 61000-4-6; 10 V power, 10 V I/O
- Emissions and immunity performance criteria available on request.

**Wi-Fi**

- United States FCC ID: XF6-RS9113SB
- Industry Canada (IC): 8407A-RS9113SB

### NOTE:

The user is responsible for emissions if changing the antenna type or increasing the gain.

## Warranty

**Standard:** Three years against defects in materials and workmanship.

**Extended** (optional): An additional two years, bringing the total to five years.

## Terminal functions

Analog input terminal functions													
	U1	U2	U3	U4	U5	U6	U7	U8	U9	U10	U11	U12	RG
Single-Ended Voltage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Differential Voltage	H	L	H	L	H	L	H	L	H	L	H	L	
Ratiometric/Bridge	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Vibrating Wire (Static, VSPECT®)	✓		✓		✓		✓		✓		✓		
Vibrating Wire with Thermistor	✓				✓				✓				
Thermistor	✓		✓		✓		✓		✓		✓		
Thermocouple	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Current Loop													✓
Period Average	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

Pulse counting terminal functions													
	U1	U2	U3	U4	U5	U6	U7	U8	U9	U10	U11	U12	C1-C4
Switch-Closure	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
High Frequency	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Low-level Ac		✓		✓		✓		✓		✓		✓	

Analog output terminal functions	
	U1-U12
Switched Voltage Excitation	✓
Switched Current Excitation	✓

Voltage output terminal functions						
	U1-U12	C1-C4	12V	SW12-1	SW12-2	5V
3.3 VDC	✓	✓				
5 VDC	✓	✓				✓
12 VDC			✓	✓	✓	

C and even numbered U terminals have limited drive capacity. Voltage levels are configured in pairs.

Communications terminal functions																	
	U1	U2	U3	U4	U5	U6	U7	U8	U9	U10	U11	U12	C1	C2	C3	C4	RS-232/CPI
SDI-12	✓		✓		✓		✓		✓		✓		✓		✓		
GPS Time Sync	PPS	Rx											Tx	Rx	Tx	Rx	
TTL 0-5 V	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	
LVTTL 0-3.3 V	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	Tx	Rx	
RS-232													Tx	Rx	Tx	Rx	✓
RS-485 (Half Duplex)													A-	B+	A-	B+	
RS-485 (Full Duplex)													Tx-	Tx+	Rx-	Rx+	
I2C	SCL	SDA	SCL	SDA	SCL	SDA	SCL	SDA	SCL	SDA	SCL	SDA	SCL	SDA	SCL	SDA	
SPI	MOSI	SCLK	MISO		MOSI	SCLK	MISO		MOSI	SCLK	MISO		MOSI	SCLK	MISO		
SDM	Data	Clk	Enabl		Data	Clk	Enabl		Data	Clk	Enabl		Data	Clk	Enabl		
CPI/CDM																	✓

Digital I/O terminal functions		
	U1-U12	C1-C4
General I/O	✓	✓
Pulse-Width Modulation Output	✓	✓
Timer Input	✓	✓
Interrupt	✓	✓
Quadrature	✓	✓





## Global Sales & Support Network

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