TRILLIUM
BOREHOLE SEISMMOMETER

Nanometrics’ industry-leading portfolio of Trillium seismometers now includes a borehole variant for deep-earth deployments in cased boreholes.

The Trillium Borehole Seismometer is a very broadband seismometer designed for cased boreholes. The instrument is housed in a stainless steel enclosure with an integrated hole-lock mechanism, strain relief, and a high pressure marine grade connector. An advanced leveling system allows the instrument to self-correct over a tilt range of ±5 degrees.

The Trillium Borehole is ideal for local, regional and tele-seismic studies having a response flat to velocity from 120 seconds to 150 Hz and a self-noise below the NLNM at 100 seconds. Operators will appreciate the low power consumption, remote mass centering and robust no-mass lock design inherent in all Trillium seismometers.

Benefits

- Automatic leveling can be remotely initiated for corrections of up to ±5 degrees, facilitating hole-lock installations in deep boreholes.
- The axis stack is mechanically leveled to ensure that the vertical axis does not couple horizontal noise.
- A robust, waterproof, stainless steel enclosure ensures the sensor is protected from hostile environments.
- Instrument recovery is aided by a fail-safe holelock release mechanism that prevents jamming to the casement during removal.
- Low power consumption of 560 mw minimizes power source requirements at the site.
- Quiet down-hole deployments benefit from the exceptional self-noise below NLNM at 100 s.
TECHNICAL SPECIFICATIONS

**TECHNOLOGY**
- **Topology:** Symmetric triaxial
- **Feedback:** Force balance with capacitive transducer
- **Self-Leveling:** Internal automated leveling ±5° (±10° optional)
- **Leveling Initiation:** Control line or serial port command
- **Mass Centering:** Motorized re-centering automatically initiated during leveling sequence
- **Holelock:** Motorized single jaw, non-jamming
  - Adaptable to a wide range of hole sizes

**PERFORMANCE**
- **Self-noise:** See plot below
- **Sensitivity:** 1200 V/s/m
- **Precision:** ±0.5 relative to User Guide specification
- **Clip Level:** >16.6 mm/s up to 10 Hz and 0.17 g above 10 Hz
- **Temperature:** ±45°C without re-centering

**INTERFACE (CONT'D)**
- **Mass Position Output:** Three independent voltage outputs
- **Calibration Input:** Single voltage input for all channels, independent calibration enable for each channel
  - Calibration in XYZ or UVW
- **Control Lines:** Auto-level & Mass Center, Calibration Enable, XYZ/UVW mode
- **Serial Port:** RS-232 compatible serial IP (SLIP)
  - Onboard web server standard HTTP
  - For enhanced instrument control and status:
    - Self-leveling and mass centering, UVW/XYZ mode, short/long period mode, firmware updates, temperature, mass position, instrument status, serial number and factory info

**POWER**
- **Supply Voltage:** 9 to 36 Volts DC isolated input
- **Power Consumption:** 560 mW typical at 15 V input
- **Protection:** Reverse-voltage protection
  - Auto-resettable over-current protection
  - No fuse to replace

**PHYSICAL**
- **Case Design:** Stainless steel pressure vessel and holelock
- **Diameter:** 143 mm (5.63 in.)
- **Height:** 886 mm (34.9 in.) not including connector or actuator guard pipe
- **Weight:** 30 kg
- **Handling:** Eye bolt on lid for lifting cable
  - 1300 lbf (5800 N) rated

**ENVIRONMENTAL**
- **Operating Temperature:** -20°C to +60°C
- **Storage Temperature:** -40°C to +70°C
- **Water Immersion:** Seismometer protected to 300 m depth; holelock motor protected to 30 m depth. Rated to IP68 and NEMA6P for prolonged submersion
- **Shock:** 20 g half sine, 5 ms without damage, 6 axis
  - No mass lock required for transport

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