

TRILLIUM 120 POSTHOLE

AUTO-LEVELING 2000 V-S/M SEISMOMETER WITH 10 DEGREE TILT RANGE

Nanometrics' industry-leading portfolio of Trillium seismometers includes a posthole variant that is revolutionizing the way seismologists deploy instruments and collect seismic data.

Reliability, repeatability, outstanding performance

The **Trillium Posthole Seismometer** is a very broadband seismometer designed for down-hole deployments. The instrument is housed in a stainless steel enclosure incorporating a high-pressure, marine-grade connector making it suitable for uncased buried/posthole installations. An advanced levelling system reorients the internal seismometer mechanism to true vertical, correcting for installations tilted up to 10 degrees.

Local, regional & teleseismic studies

The Trillium PH is ideal for local, regional and teleseismic studies having a response flat to velocity from 120 seconds to 150 Hz and exceptionally low self-noise. Operators will appreciate the low power consumption, automatic mass centering and robust no-mass lock design inherent in all Trillium seismometers.

A highly integrated station solution

When using the Trillium 120 PH with our popular Centaur digitizer, you'll have access to a digital leveling bubble through the Centaur GUI. The virtual leveling bubble makes for easy leveling down a dark hole, or once buried, gives you the ability to check levelness at any time.

Also available:

- Trillium 120 Posthole ± 5 degree and ± 10 degree tilt models, Trillium 120 Borehole and Trillium Horizon for vault or shallow direct bury with 1200 V-s/m or 2000 V-s/m sensitivity



Benefits

- The ability to get beneath the noise, even in urban environments, and keep your assets secure.
- Automatic leveling can be remotely initiated for corrections of up to 10 degrees, simplifying down-hole installation.
- 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.
- Cylindrical down-hole design facilitates buried deployments.
- Low power consumption minimizes power source requirements at the site.

TECHNICAL SPECIFICATIONS TRILLIUM 120 POSTHOLE 10 DEGREE TILT RANGE

Specifications subject to change without notice

TECHNOLOGY

Topology: Symmetric triaxial

Feedback: Force balance with capacitive transducer

Self-Leveling: Internal automated leveling $10^\circ \pm 1$

Leveling Initiation: Control line or serial port command

Mass Centering: Motorized recentring automatically initiated during leveling sequence

Alignment: N-S line on cover for down-hole sighting

- Keying features for down-hole alignment rod
- N-S marks on base for pier installation

Digital tiltmeter: Reports case tilt from vertical for easy installation and remote troubleshooting when used with a Centaur digital recorder

Digital bubble level: Graphical bullseye level is available via Centaur digital recorder Web interface

PERFORMANCE

Self-noise: See plot below

Nominal Sensitivity: 2000 V-s/m $\pm 1\%$

Reference User Guides for precise values

Bandwidth: -3 dB points at 120 s and 150 Hz

Clip Level: 0.010 m/s up to 20 Hz, 0.12 g above 20 Hz, >0.005 m/s 20 - 40 Hz

Dynamic Range: 167 dB @ 1 Hz

Parasitic Resonance: none below 150 Hz

Total harmonic distortion: ≤ -80 dB

INTERFACE

Connector: 20-pin marine

Velocity Output: 40 V peak-to-peak differential

- Selectable XYZ or UVW mode

Mass Position Output: Three independent ± 4 V outputs

Calibration Input: Single voltage input with one active-high control signal for all channels

- Calibration in XYZ or UVW

- Individual channels selectable via web interface

Control Lines: Auto-level & Mass Center, Calibration Enable, XYZ/UVW mode

Serial Port:

- RS-232 compatible serial IP (SLIP) with onboard web server standard HTTP to select sensor operating modes, to mass center, and to access state-of-health, virtual level bubble, firmware updates and metadata
- Plug-and-Play automated workflow interface to select sensor operating modes, and to access state-of-health, virtual level bubble and metadata

POWER

Supply Voltage: 9 to 36 Volts DC isolated input

Power Consumption: 490 mW typical at 15 V input

Protection:

- Reverse-voltage and over-voltage protected
- Self-resetting over-current protection
- Surge protection: 1 kV (EN 61326-1 / IEC 61000-4-5 Level 2)

PHYSICAL

Case Design: Stainless steel pressure vessel

Diameter: 170 mm ± 3 mm

Height: 432 mm not including connector or feet

Weight: 21 kg

Handling: Eye bolt on lid for lifting cable

- 1300 lbf (5800 N) rated

ENVIRONMENTAL

T120-PH2-2000-XC

Operating Temperature: -40°C to 60°C

Storage Temperature: -40°C to 70°C

T120-PH2-2000-PE

Operating Temperature: -50°C to 60°C

Storage Temperature: -50°C to 70°C

Ingress Protection: Rated to IP68 and NEMA6P to 300 m for prolonged immersion. A dry hole is recommended for best seismic performance

Humidity: 0%-100% operating

Altitude: Up to 5000 m above sea level operating

Shock: 20 g half sine, 5 ms without damage, 6 axis

- No mass lock required for transport

RELIABILITY

Design lifespan: >10 years

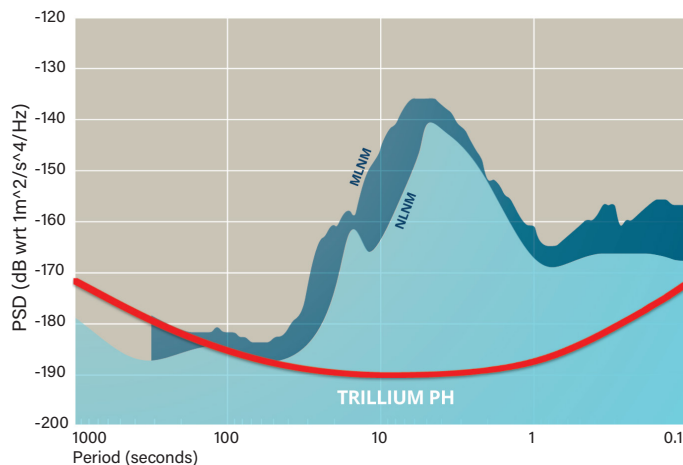
MTBF: >1,000,000 hours

AVAILABLE MODELS

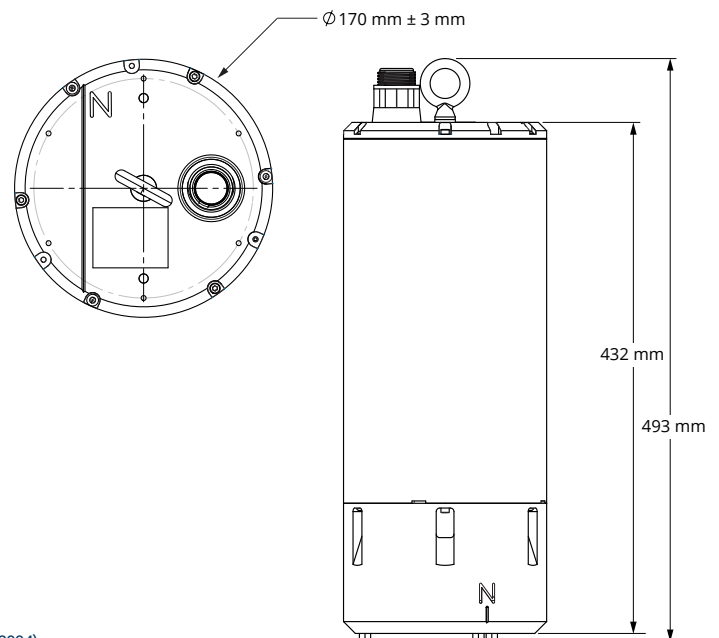
T120-PH2-2000-XC

T120-PH2-2000-PE

SELF-NOISE PERFORMANCE PLOT



Seismometer self-noise plotted against NLNM (after Peterson, 1993) and MLNM (after McNamara and Buland, 2004)



Contact a product expert Toll Free: 1 855 792 6776 | sales_mkt@nanometrics.ca



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3001 Solandt Road, Kanata, Ontario, Canada K2K 2M8 | Tel: +1 613 592 6776