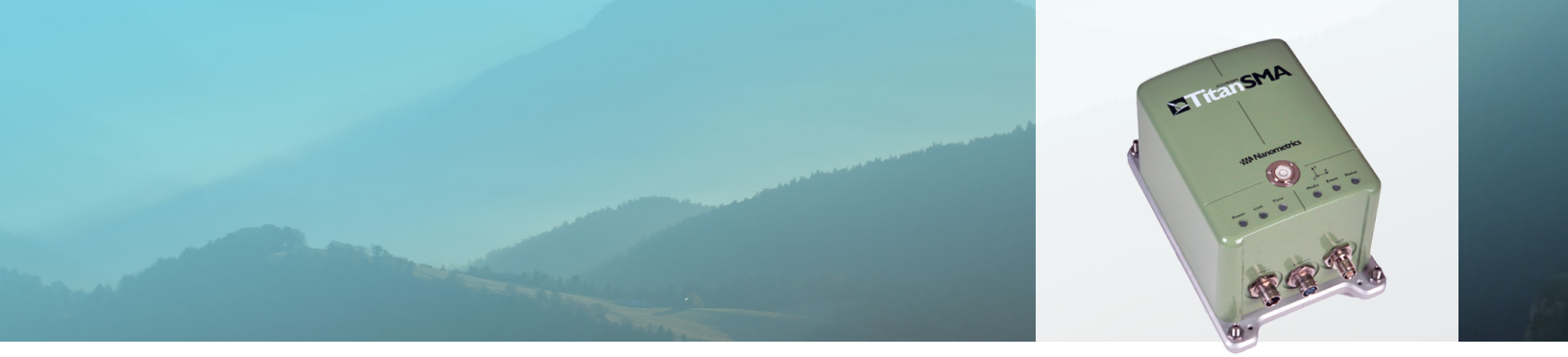
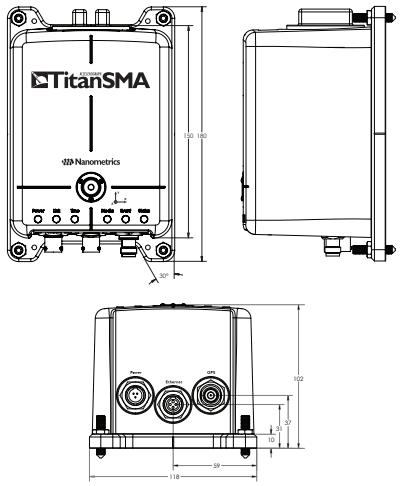


TITAN SMA
STRONG MOTION ACCELEROGRAPH

TitanSMA

The TitanSMA is a strong motion accelerograph designed for high precision observational and structural engineering applications, where scientists and engineers require exceptional dynamic range over a wide frequency band.

The TitanSMA features the same sensor as the Titan Accelerometer with its low noise floor, exceptionally low hysteresis, and industry leading dynamic range. The integrated digitizer and recorder facilitate both standalone and networked free-field monitoring deployments.



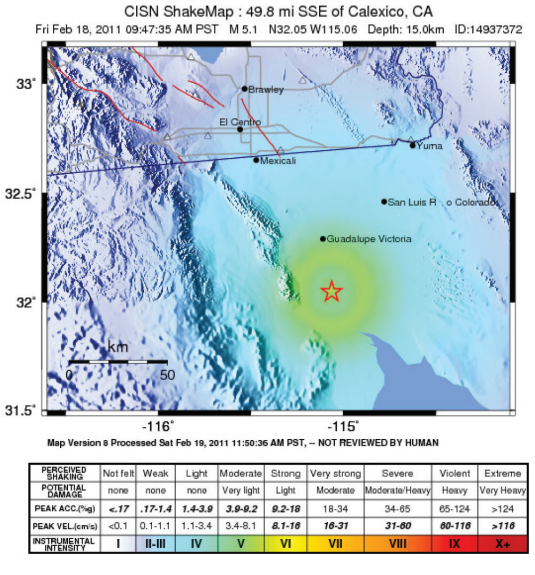
Ease of use features include:

- Convenient data retrieval via removable SD card or local Ethernet in MiniSEED or ASCII formats
- Continual streaming of data to a central server or retrieved on demand from the central site
- HTTP data communications, which requires only Internet website access from within the host IT network to stream continuous or event data
- Instrument configuration/control via browser interface with Ethernet connection
- LED indicators that provide quick visual instrument status
- GNSS, PTP or NTP timing
- Full digitizer/ sensor response metadata files generated on-demand
- Site-to-site encrypted virtual private networks using OpenVPN®
- Easy integration of state-of-health information into existing tools using low bandwidth SNMP communications (Simple Network Management Protocol)

Civil Defense Applications

The TitanSMA provides all the necessary functionality to facilitate civil defense applications such as early warning systems and shake maps:

- Ultra-low latency configurations as low as .25 seconds
- Local real-time processing and transmission of PGA, PGV, and PGD data
- Ability to recognize P-wave events and broadcast warnings
- Network integration of multiple sensors for event triggers and voting



PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

nanometrics

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TECHNICAL SPECIFICATIONS TITAN SMA

**Specifications subject to change without notice*

ACCELEROMETER TECHNOLOGY AND PERFORMANCE

Topology: Triaxial, horizontal-vertical
Feedback: Force balance with capacitive displacement transducer
Centering: Electronic offset zeroing via user interface
Full-scale Range: Electronically selectable range: ±4*g*, ±2*g*, ±1*g*, ±0.5*g*, ±0.25*g*, and ±0.125*g* (nominal)
Sensitivity accuracy: ±0.5%
Bandwidth: DC to 430 Hz
Dynamic Range: (Integrated RMS)
- 166 dB @ 1 Hz over 1 Hz bandwidth
- 155 dB, 3 to 30 Hz

Offset: Electronically zeroed to within ±0.005*g*
Non-linearity: < 0.015% total non-linearity
Hysteresis: < 0.005% of full scale
Cross-axis Sensitivity: < 0.5% total
Offset Temperature Coefficient:
Horizontal sensor: 60 µ*g*/°C, typical
Vertical sensor: 320 µ*g*/°C, typical

DIGITIZER PERFORMANCE & CAPABILITIES

Type: True 24-bit ADC per channel, simultaneous sampling
Dynamic Range: 142 dB @ 100 sps, 135 dB @ 500sps (full-scale peak to RMS shorted-input noise)
Sensitivity: 2, 4, 8, 16, 32, and 64 digitizer counts per µ*g*, ±1%
Sample Rates: 1, 2, 5, 10, 20, 40, 50, 80, 100, 125, 200, 250, 500, 1000, 2000 sps
Dual Sample Rate: A second sample rate can be selected from the sample rates above
Decimation Filter: Selectable linear phase (non-causal) or minimum phase (causal)
Anti-alias Filters: -140 dB (linear phase) or -120 dB (minimum phase) at Nyquist frequency, 0 dB at 80% Nyquist
Digital Filters:
- User-configurable low-pass and high-pass
- 1st to 5th order, 0.1 mHz to Nyquist
- Different filters may be configured for primary and secondary sample rates

Orientation Correction: User configurable onboard 3-D data rotation for correcting azimuth and tilt

DATA STREAMING

Continuous: Waveform data, data products, state-of-health and event/trigger data
Formats: Nanometrics NP, SeedLink, QSCD20

TIMING - GNSS & PRECISION NETWORK TIMING

Timing System: Internal DCXO clock disciplined to selectable timing source
Timing Source: Select from GNSS, PTP (Precision Timing Protocol), NTP or free-running
Timing Server: Can serve as PTP or NTP time to other Centaur, Titan SMA/EA or Meridian
Timing Accuracy:
<5 µsec (GNSS Always on or PTP)
<100 µsec (GNSS duty cycled or local NTP)
GNSS Power: Selectable: Always on, duty cycled, or off

CALIBRATION

Waveforms: Synthesized sine, step, and PRB signals
Playback user defined calibration files

EVENTS

Type: Bandpassed STA/LTA or threshold
Trigger Selection: Independent threshold or STA/LTA ratio for each channel
STA/LTA Trigger: Configurable STA, LTA, LTA latching, trigger, and de-trigger thresholds
Trigger Votes: User set votes assigned by channel, transmitted via IP multicast
Threshold Trigger: Selectable from 0.01% to 100% of full scale
Event Statistics: Peak ground acceleration, velocity, displacement, Sa (0.3, 1, 3 Hz)

COMMUNICATIONS

Web-based UI: Supports standard PC, tablet and mobile devices
Interfaces: 10/100 Base-T Ethernet
IP Addressing: Static IP, DHCP or link-local IP
Protocols: WebSocket, UDP/IP (unicast/multicast), or HTTP-based data streaming and SNMPv2c for state-of-health monitoring
VPN: OpenVPN®

DATA RECORDING AND RETRIEVAL

Formats: MiniSEED
Internal Memory: 8 GB flash memory (32, 64, 128 or 256 GB options available)
Removable Media: SD card up to 256 GB
Data Retrieval: Direct download via Ethernet Media exchange via SD card
Response Metadata: Generate and download full digitizer/sensor response files in RESP or Dataless SEED or StationXML format, or access from the SD Archive Media in StationXML format

PHYSICAL AND ENVIRONMENTAL

Housing: Aluminum, surface resistant to corrosion, scratches, and chips
Mounting: Single bolt keyhole mount
Leveling: Integrated bubble level
Adjustable locking leveling screws
Size: 180 mm (L) x 118 mm (W) x 102 mm (H)
Weight: 2.6 kg
Operating Temperature:
–20°C to 60°C (Standard Model)
–45°C to 60°C (Polar Certified Model)
70°C model also available
Storage Temperature:
–40°C to +70°C (Standard Model)
–60°C to +70°C (Polar Certified Model)
Shock:
- 100 *g* half sine, 5 ms without damage, 6 axes
- No mass lock required for transport

Ingress protection: Rated to IP68 at 2 m for 72 hours when connectors mated or capped
Humidity: 0 to 100%

POWER

Supply Voltage: 9 to 36 V DC isolated input
Power Consumption: 2.0 W quiescent, 10 BaseT Ethernet, duty cycled GNSS
Protection:
- Reverse-voltage and over-/under-voltage protected
- Self-resetting over-current protection

Isolation: Supply power is isolated from signal ground
Grounding: Predrilled holes (4) for M4 x 5 grounding lug screw
Battery Manager: User-configurable low voltage shutdown and restart thresholds

INTERFACE

Connectors:
Power (MIL-C-26482G Series 1), Ethernet (MIL-C-26482G Series 1), GNSS (TNC female), USB 2.0 (type A, female)
Status LEDs: Overall Status, Power, Ethernet, Timing, Media, Event notification
Graphical User Interface:
- Provided via onboard web server
- Used for state-of-health and waveform monitoring, viewing and downloading events, calibration, configuration, and maintenance

AVAILABLE MODELS

Model: TSMA3: Strong Motion Accelerograph

Contact a Product Expert Toll Free: 1 855 792 6776 | sales_mkt@nanometrics.ca

nanometrics
Listening to the Earth

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