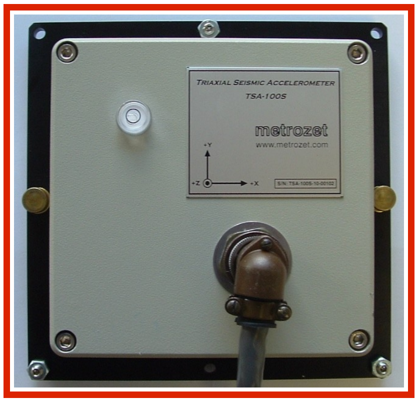

Metrozet TSA-100S
Triaxial Seismic Accelerometer

TSA-100S Accelerometer Specifications
- **Strong Motion Sensor: +/- 4 g Range**
- **Wide Bandwidth: DC to >225 Hz**
- **Low Noise: 2.2 x 10^{-8} g/rtHz at 1 Hz**
- **Low Thermal Drift: 60 micro-g/ºC**
- **High Dynamic Range: 162 dB at 1 Hz**
- **137 dB, 0.1 Hz to 100 Hz, Integrated**
- **High Accuracy:**
- **0.015% Total Non-Linearity**
- **Ultra-Low Hysteresis: 0.005%**

Digital Output Option (TSA-100S-D24)
- **24-bit Digital Data**
- **50, 100, 200, 500 Hz Sampling Rates**
- **125dB, 0.1 to 40 Hz, Integrated**
- **144 dB Anti-alias Protection**
- **Streaming Data**
- **Native miniSEED Data Format**
- **GPS Timing**
- **Up to 32 GB Non-volatile Data Buffer**
- **Standard Isolated RS-485 Interface**

Applications
- **Advanced Seismic Networks**
- **Tsunami Warning Arrays**
- **Structural Monitoring Systems**

Single Supply Option (TSA-100S-S)
- **Wide Input Power Range**

The Metrozet TSA-100S is an advanced sensor for the most critical applications in earthquake recording and structural engineering. Packaged for surface applications, the TSA-100S delivers a large sensing range (+/- 4 g), wide frequency response (DC to >225 Hz), high accuracy (ultra low non-linearity and hysteresis), and industry-leading noise performance. <u>You benefit through more accurate seismic data, more usable data, improved signal integrity and confidence in the quality of your system.</u>

Quality Assurance: In 2007, despite a best-in-class sensor acceptance rate, Metrozet was the first and only supplier to begin dual coherence self-noise testing of every production seismic accelerometer.

Competitive Pricing: You can expect highly competitive pricing and delivery through our distributors, OEM and system integration partners as well as our direct purchase program.

Highest Performance: As the technical data below show, the TSA-100S is a very high performance alternative to a number of common and lower performance earthquake accelerometers (Kinemetrics EpiSensor, Guralp CMG-5T, RefTek 131A). The TSA-100S is pin-compatible with the Kinemetrics EpiSensor.

"The noise of the Metrozet TSA-100S is on average 6dB lower than [the competition] in the 1-10 Hz frequency band" – comment by a research seismologist during very long-term (multiyear) open sensor trials at the UC Berkeley Seismological Laboratory.

Please Click Here to request a quotation for your next network upgrade.

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Torrance, CA 90503
866-823-0339
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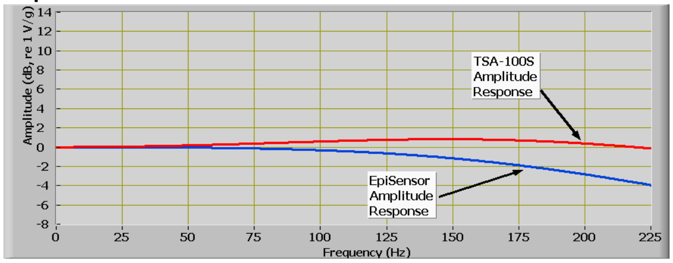
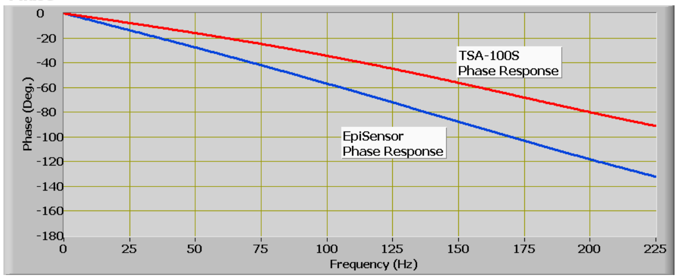
Highest Performance

Metrozet's TSA-100S provides superior performance

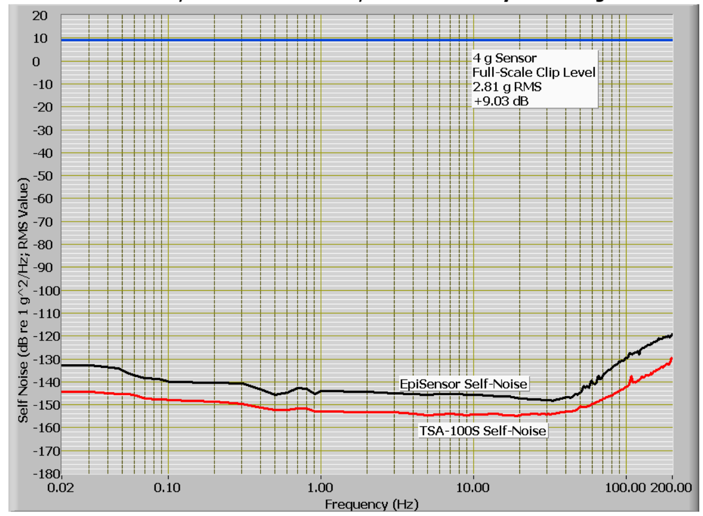
Amplitude



Phase

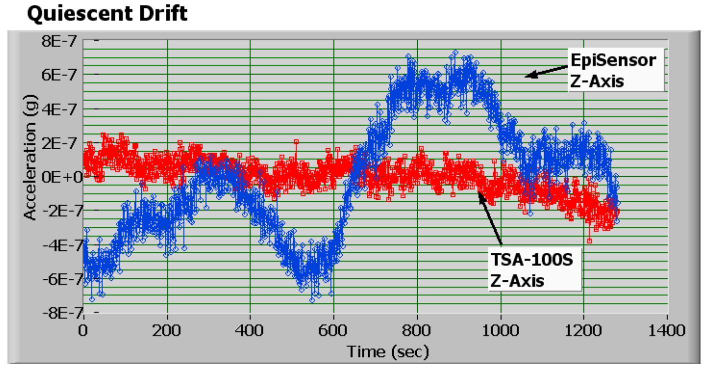


Self-Noise Noise PSD, RMS Full-Scale Levels, and Calculated Dynamic Range



TSA-100S Dynamic Range (dB) at 1 Hz in 1 Hz Bandwidth	TSA-100S Dynamic Range (dB) 0.1 to 100 Hz Integrated	TSA-100S Dynamic Range (dB) 3 to 30 Hz Integrated
162.11	137.28	148.79
EpiSensor Dynamic Range (dB) at 1 Hz in 1 Hz Bandwidth	**EpiSensor Dynamic Range (dB) 0.1 to 100 Hz Integrated**	**EpiSensor Dynamic Range (dB) 3 to 30 Hz Integrated**
153.02	125.88	141.02

Quiescent Drift



Upper Left: Amplitude and phase response; The TSA-100S has higher amplitude response and smaller phase shifts than the EpiSensor, at all frequencies.

Upper Right: Self-noise, full-scale range, and dynamic range; The TSA-100S has nearly 10 dB lower self noise at all frequencies (from DC to 200); the TSA-100S has 9 dB greater dynamic range at 1 Hz, and more than 11 dB greater dynamic range over a 0.1 Hz to 100 Hz bandwidth.

Lower Right: Quiescent drift; both sensors have been stabilized in a low noise seismic laboratory for 48 hours; the TSA-100S drift is 5X lower than that of the EpiSensor, over a 1200 second period.

Comparison of Key Specifications

Specification	***Metrozet TSA-100S***	***Kinemetrics EpiSensor***
Bandwidth	**DC-225 Hz (-90º phase point)**	DC-150 Hz (-90º phase point)
Dynamic Range (in +/- 4 g Sensors)	**162 dB, at 1 Hz, in 1 Hz bandwidth 148 dB, typical, 3 Hz to 30 Hz, integrated 137 dB, typical, 0.1 Hz to 100 Hz, integrated**	153 dB, at 1 Hz, in 1 Hz bandwidth 141 dB, typical, 3 Hz to 30 Hz, integrated 126 dB, typical, 0.1 Hz to 100 Hz, integrated
Offset Temperature Drift	**60 micro-g/ºC, Horizontal 320 micro-g/ºC, Vertical**	500 micro-g/ºC, all axes
Non-Linearity	**0.015% TOTAL non-linearity, over +/-1 g range**	0.1% 2nd order non-linearity, over +/- 1 g range
Hysteresis	**0.005% of full-scale**	0.1 % of full-scale
Cross-Axis Sensitivity	**0.002% within sensor 0.5% total, including mounting misalignment**	1% total, including mounting misalignment

Metrozet TSA-100S: Detailed Specifications

Specification	Value
Technology	Triaxial, force-balance accelerometer with capacitive displacement sensor, restoring coil and calibration coil
Full-Scale Range	+/- 4 g Peak-to-Peak
Responsivity	5V/g Differential; 2.5V/g Single-Ended
Output	Differential to > +/- 20V Peak-to-Peak Single-Ended to > +/- 10 V Peak-to-Peak
Bandwidth[1]	DC to 225 Hz
Dynamic Range[2]	> 160 dB, at 1 Hz, in 1 Hz bandwidth 147 dB, typical, 3 Hz to 30 Hz, integrated 135 dB, typical, 0.1 Hz to 100 Hz, integrated
Self-Noise[3]	2.2 x 10^{-8} gRMS /rtHz @ 1 Hz, Typical 2.0 x 10^{-8} gRMS/rtHz @ 10 Hz, Typical 2.0 x 10^{-8} gRMS/rtHz @ 20 Hz, Typical 2.8 x 10^{-8} gRMS/rtHz @ 50 Hz, Typical 7.0 x 10^{-8} gRMS/rtHz @ 100 Hz, Typical 3.0 x 10^{-7} gRMS/rtHz @ 200 Hz, Typical
Offset	< 0.05 g (less than 0.02g available upon request)
Non-Linearity[4]	< 0.015% Total Non-Linearity
Total Harmonic Distortion[5] (THD)	< -74 dB
Cross-Axis Sensitivity[6]	< 0.002% within each sensor <0.5% total, within triaxial sensor, including axis misalignment
Hysteresis[7]	<200 micro-g peak-to-peak, with +/- 1 g excitation or <0.005% of Full-Scale
Calibration Coil	Standard, digitally enabled Nominal scale factor: 0.04 g/V Calibration Input impedance: >100 MOhms
Offset Temperature Coefficient[8]	60 micro-g/ºC, typical, Horizontal Sensor 320 micro-g/ºC, typical, Vertical Sensor
Supply Voltage Ranges	+/- 12V to +/-16V (standard dual supply)[9] 9-18 Volts (single supply option)
Power Consumption – Standard Dual Supply	Quiescent: +75 mA/-70 mA on +/-12 V Supply Dynamic: +/- 4 mA/g/axis on +/- 12V Supply
Power Consumption – Single Supply Option	Quiescent: 180 mA @12V; 140 mA @ 15V Dynamic: 9 mA/g/axis @12V; 7.5 mA/g/axis @15V
Operating Temperature Range	-40ºC to +85ºC
Connector	19-Socket circular connector Connector Technology, Inc. 851-07A14-19S50-A7
Physical Size	8” (L) x 8” (W) x 3.75” (H) with leveling screws extended Total height with right angle mating connector is <5.75”
Mounting Holes	Three ¼-20 clearance holes at edges with sufficient space for washers/nuts; ¼-20 adjustable leveling feet and bubble level

Notes:

[1] Upper bandwidth is frequency at which sensor response has -90 degree phase shift.

[2] The ratio of RMS full-scale to RMS noise. The dynamic range at 1 Hz, in a 1 Hz bandwidth, is a figure used by Kinemetrics for their EpiSensor.

*[3] Self-noise measurements utilize inter-sensor coherence techniques. See, for example, “Technique for the Measurement of the Noise of a Sensor in the Presence of Large Background Signals,” Review of Scientific Instruments **69**, 2767 (1998).*

[4] Non-Linearity is determined with a 180º tilt test. Total Non-Linearity is the total, peak-to-peak residual error from a linear fit to this data. It is the error over a +/- 1 g range.

[5] THD is determined using the calibration coil. The coil is driven to produce an equivalent acceleration of 0.1 g Peak at 5 Hz Peak amplitude, and the sensor output is recorded. THD is the ratio of the energy in five harmonic peaks to that in the fundamental signal.

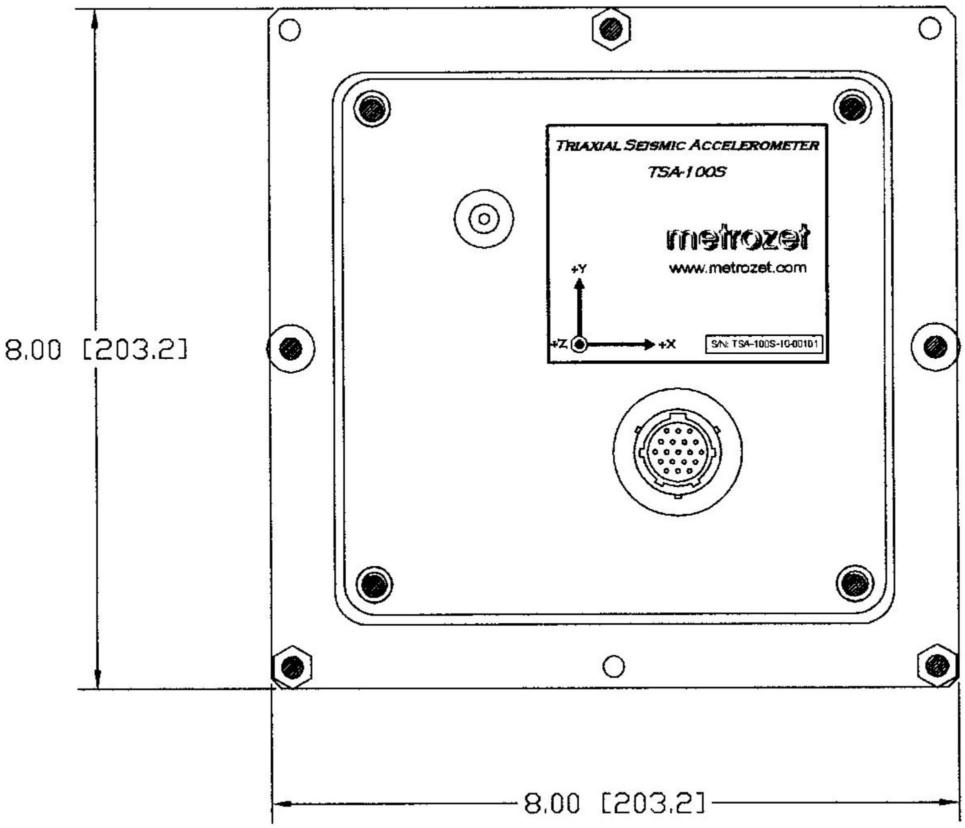
[6] Cross-axis sensitivity includes both the axis misalignment associated with sensor mounting within the triaxial package, and the inherent sensitivity of each sensor alone. The latter is determined from the 180ºtilt test. Mounting misalignment is the dominant factor. The specification is a fraction of the applied signal.

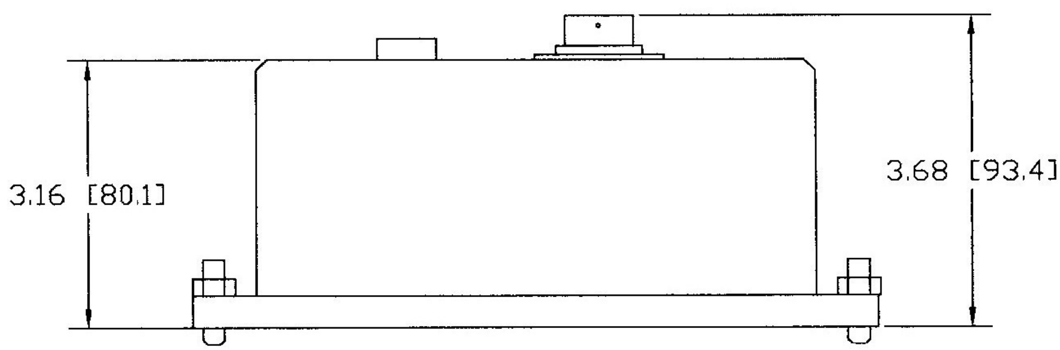
[7] Hysteresis is determined through a repetitive tilt test. Measurements are made at 0º tilt before and after tilting the sensor through a +/- 1 g range. The test provides a measurement of the variation in sensor reading at 0º tilt, approaching from +1 g and -1g. Hysteresis is the total error peak-to-peak variation within the measurement set.

[8] This involves measurement of the sensor output in response to a small increase in housing temperature. The temperature rise is approximately 2.5 ºC. It was measured with a small temperature sensor (LM35) mounted to the housing.

[9] This specification guarantees a +/- 4g Full-Scale Range. The sensor will operate on less than +/- 12V, however the full-scale range will be reduced.

Metrozet TSA-100S: Watertight Package Dimensions





Dimensions in inches [mm]

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