

# Proto-SMHD Seismic Rotational Rate Sensor

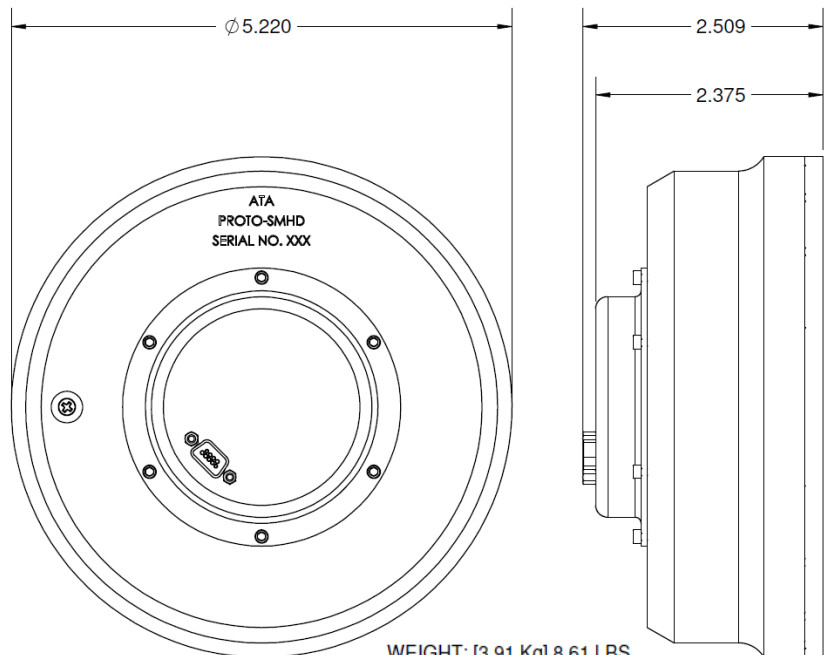
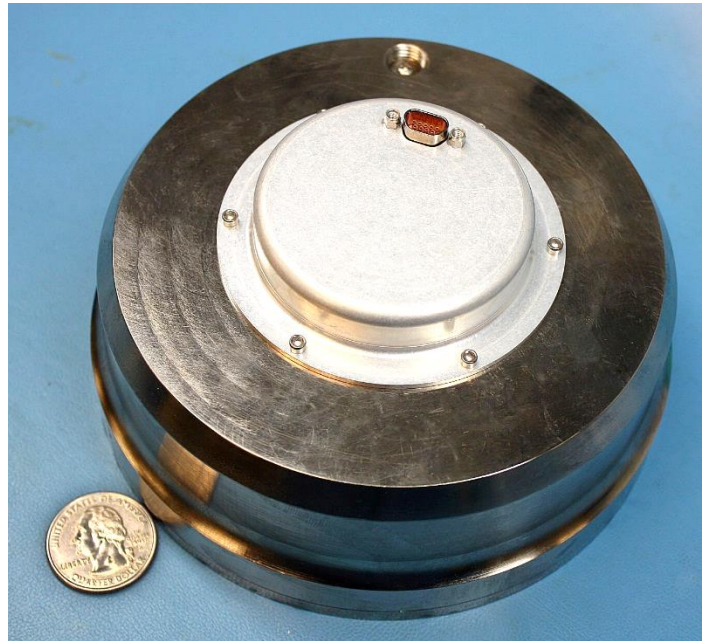
The Prototype Seismic Magnetohydrodynamic sensor (Proto-SMHD) is a portable sensor designed to measure rotational earth motion. It is tailored for mid-frequency micro-seismic signal measurement, with state-of-the-art *nanoradian/second*-level capability from 1-100 Hz. The “prototype” status designates that the sensor is suited for surface and near-surface operations, particularly scientific studies and proof-of-concept deployments.

Applications include induced seismicity monitoring for energy extraction and wastewater injection. Rotational seismic measurements can also enhance traditional seismic surveys and enable new insights in earthquake seismology and strong motion monitoring. The Proto-SMHD offers performance formerly available only at fixed sites set up as scientific observatories, but now in a field-portable package that can fit within large bore downhole tools. The sensor is available in a field-ready triaxial box ready for deployment.

The Proto-SMHD measures angular rate around its cylindrical axis. Boxed sensors are very rugged. Sensor performance, sensitivity, and noise are consistent from unit to unit. ATA's patented angular rate sensors combine the finest materials and workmanship in durable packages that feature:

- Dynamic range >120 dB
- Low power consumption
- Low cross-axis angular sensitivity
- Low translational acceleration sensitivity
- Integral electronics/low noise
- One-year warranty against defects in materials and workmanship on sensors, and 90 days on cables

Specifications are subject to change without notice.



WEIGHT: [3.91 Kg] 8.61 LBS

ALL DIMENSIONS ARE IN INCHES

*This product is subject to U.S. Government approval as required in accordance with the U.S. Government International Traffic in Arms (ITAR) Subchapter M, Title 22, Code of Federal Regulations, Parts 120 through 130 (22 CFR 120-130).*

**ATA**

**“Sensing ways to make the world better®”**

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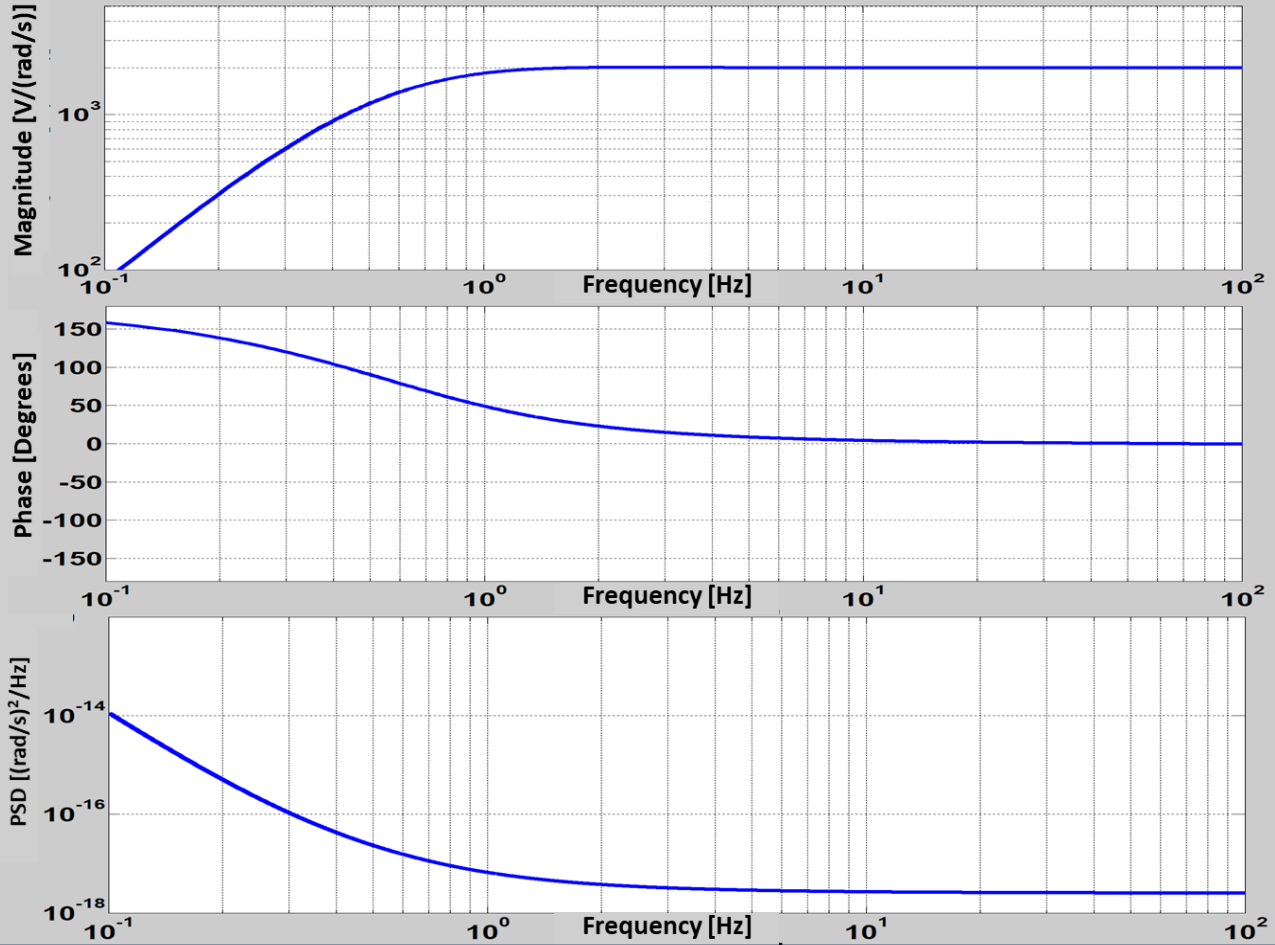
SAI GLOBAL

ISO 9001

Quality

# Nominal Proto-SMHD Product Specification

## Proto-SMHD Frequency Response



### Performance / Electrical

Proto-SMHD Range ( $\pm 10$ V)	$\pm 0.005$ radian/sec
Proto-SMHD Scale Factor <sup>1</sup>	2,000 Volt/(radian/sec)
Bandwidth, -3dB in testing	<1 to 100+ Hz
Cross-axis Angular Error	<1 % (estimated)
Translational Acceleration Sensitivity	<1e-6 radian/g (estimated)
Noise Equivalent Rate (1-100 Hz)	<2e-8 radian/sec rms
Noise Equivalent Angle (1-100 Hz)	<4e-10 radian rms
Temperature Coefficient <sup>2</sup>	<0.1 % / °C (estimated)
Power Dissipation	<0.35 Watt (+/-15 VDC)
Output Impedance	<100 Ohm
Grounding <sup>3</sup>	Case isolated from signal common by 1M $\Omega$ minimum

### Wiring

Proto-SMHD Pin Out Connector ITT, MDM-9S MIL-83513		
Pin	Std. Color	Connection
1	Black	Temperature <sup>4</sup> +
2	Brown	Temperature <sup>4</sup> -
3	Red	Power/Signal Ground
4	Orange	Signal Out
5	Yellow	Power/Signal Ground
6	Green	+15V
7	Blue	-15V
8	Purple	Power/Signal Ground
9	Gray	Case Ground

#### Notes:

1. Measured at 10 Hz, custom scale factors available.
2. Percent change in scale factor per °C measured at 10 Hz.
3. Signal common may be connected to case if required.
4. Analog Devices AD590 2-Terminal IC Temperature Transducer.
5. Prototype units not warranted for temperature >40°C.
6. Prototype units contain mercury sealed inside case.  
Dispose of properly or return units to ATA.

### Environmental

Temperature-Operating <sup>5</sup>	-20°C to +40°C
Temperature- Non-Operating <sup>5</sup>	-20°C to +40°C
Hazardous Materials <sup>6</sup>	Mercury

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