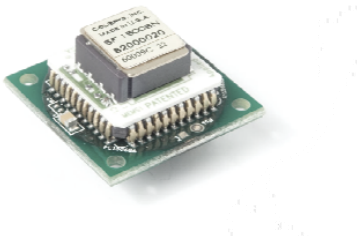
COLIBRYS
SMART SENSING SOLUTIONS

APPLICATION NOTE

Seismic accelerometers for Unattended Ground Sensors (UGS)

30N.UGS.B.05.11



The SF1500S.A for very low noise measurements

Features

- ±3g (SF1500) and ±5g (SF2006)
- Extreme low noise
- Wide frequency response
- Harsh environment
- Small size and low weight

The Sensor of Choice for Unmanned Monitoring

Unattended Ground Sensors (UGS) are unmanned monitoring stations often used for military surveillance, troop movement detection, and target identification. It can also be used for perimeter security or border and access control. This demanding application requires a compact, rugged and high-performance sensor. Compared to conventional coil-and-magnet based velocity transducers, the Si-Flex line of accelerometers offers several key benefits for battlefield monitoring and homeland security.

Rugged, Reliable and Ready to Deploy

Often UGS require a compass to determine deployment orientation with respect to magnetic North. This orientation information is critical for determining the bearing of incoming signals. Conventional sensors which use a permanent magnet limit the use of a compass in close proximity. This problem is solved with the Si-Flex servo accelerometer which uses electrostatic feedback and does not require any magnetic materials. Frequency information below 15 Hz is valuable for resolving features from underground facilities and other potential targets. Conventional seismometers used in UGS are typically limited in frequency response from 20 to 200 Hz. The Si-Flex accelerometer has a flat frequency response from DC to few kHz.

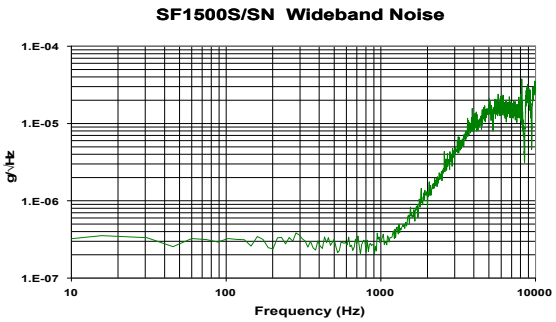


Fig. 1: Output noise level of Colibrys SiFlex accelerometer.

The wider spectrum of signals received improves detection, classification and monitoring on the battlefield. The DC-coupled output of the Si-Flex accelerometer also has the added benefit of providing tilt orientation data for deployed UGS.

Fig. 2: Installation of an UGS.

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Human footsteps, tanks, and military vehicles produce signals that are commonly acquired by UGS. The range at which UGS can detect signals is limited by the sensor noise floor. With a noise floor as low as 300 ng/√Hz, the Si-Flex accelerometer can detect faint signals at a distance, allowing maximum situational awareness on the battlefield.

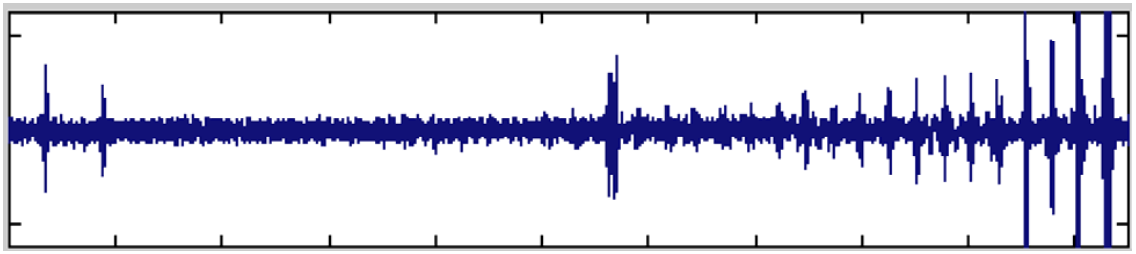

Fig. 3: Footstep data measured with the MEMS accelerometer (span ~22 seconds)

UGS are often deployed without parachutes from aircraft. This deployment method can produce thousands of g's when the UGS impact the ground. The Si-Flex accelerometer can survive up to 1500 g's without external packaging. With clever packaging to damp short-duration high-g shock loads, the Si-Flex accelerometer can survive even higher shock levels. This method of isolation allows desirable low frequency energy to be measured by the accelerometer, while potentially damaging high-frequency energy is attenuated.

Conclusion

A variety of performance parameters such as frequency response, noise floor and shock tolerance make the Si-Flex accelerometer well suited for UGS and related applications. UGS and similar devices can also be used for homeland security, treaty verification and border patrol applications.

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