

## Seismic Sensor

Reliable underground security

**DESCRIPTION** – Seismic Sensor is an innovative, patent pending security system, aimed to protect pipelines and other buried assets from terrorism, theft and damage.

Based on state-of-the-art embedded technologies, Seismic Sensor offers a unique solution to meet the challenge of pipeline damage prevention.



### Features

- Robust and innovative technology
- Sophisticated signal processing ensures Low False and Nuisance Alarm Rates (FAR / NAR)
- High Probability of detection (Pd)

### Benefits

- Innovative technology designed to guard buried pipelines, regardless of length
- Detects potential intrusion attack and alerts authorities before potential harm or damage occurs
- Protects against advertent damage caused by digging / construction
- Suitable for all pipelines - operational and new grids under construction
- Easily integrated into a full turnkey security solution - including detection systems, perimeter protection and security management system
- Does not interfere with site aesthetics
- Tamper-proof

### Application

Easily integrated into a turnkey security solution, Seismic Sensor generates an alarm when a threat is identified and before the damage occurs.

Seismic Sensor is a covert intrusion detection system designed to generate an alarm when a real and concrete threat is identified by digging in the vicinity of the pipeline - either with hand-tools or machinery. Seismic Sensor does not change site aesthetics and the detection field is invisible. Seismic Sensor's presence is covert so it cannot be located, avoided or tampered with.

Seismic Sensor combines geophones with advanced-technology intrusion recognition algorithms that analyze the seismic signals to effectively filter out false alarms. This intelligent signal processing provides a high Probability of detection (Pd) and an extremely low False and Nuisance Alarm Rate (FAR / NAR).

### Markets

- Pipelines
- Oil and gas industry
- Utilities
- Other assets susceptible to sub surface intrusion

# Technical Specifications

## Pipeline protection

Within the entire oil and gas production infrastructure between the oil fields and the end customer, the pipeline network has always been the most vulnerable to sabotage and theft and the most challenging to secure given the extensive lengths involved - up to hundreds of kilometers. Until now, there has been no effective solution for securing buried pipes against damage caused by terrorism, sabotage, theft or third-party threats.

Senstar has identified the demand for such a product and has introduced a unique technology to address this challenge.

## How it works

- Seismic Sensor is designed to sound an alarm for operators - only when a real and concrete threat is identified.
- Sensing Units (SUs) are installed approximately 150 - 200 m apart.
- SUs are buried along the pipeline, at any depth between the pipe and the surface of the ground.
- SUs can be installed either over the pipeline or within 10 m from the pipeline on either side.
- Each unit is an autonomous entity with a distinct ID.
- SUs are software-based and can be updated as new software versions become available.
- Depending upon the area's characteristics, Seismic Sensor offers several options to securely transfer the alarm message from the SU to the operator - wireless RF, wired or a combination of the two.

## Seismic Sensor's technology

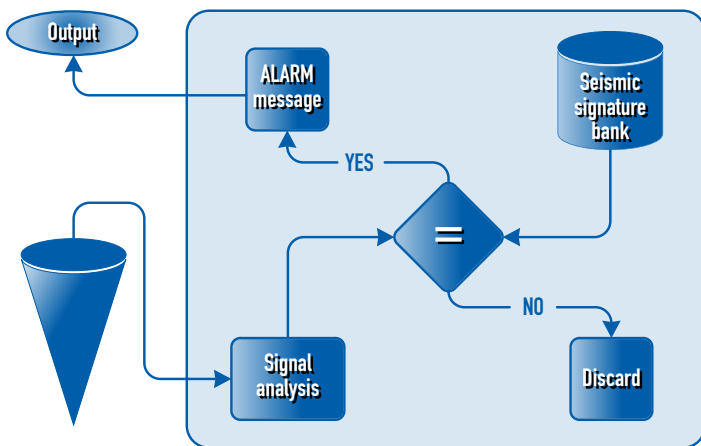
- SUs are powered by a lithium battery pack designed to guarantee full operation for at least 5 years in the wireless mode. Each SU is wrapped in a sealed anti-corrosion container.
- RF communication is based on spread-spectrum technology with UHF frequency and very low power, enabling the co-existence of the system within civilian or military constraints.
- Reception of raw seismic signalling is achieved by using several geophones in a row that are highly sensitive to the frequency domain and typical to the act of digging.
- The location of the identified threat is derived from an accurate measurement of the signal at each sensor. This technique filters out signals that are outside a defined distance from either side of the pipeline, thus decreasing the false alarm rate to a minimum. The identification mechanism installed in the system's computer, guarantees a level of confidence of up to 99%, after an integration time of less than 1 minute.

## Seismic Sensor command and control

Alarm messages are accepted and displayed over a geographical layer - either a map or aerial photo.

By presenting the alarm in this fashion, the control center operator, intervention team (located along the line) and guards in patrol vehicles have a common view of the alarm location, which is essential for immediate reaction.

Patrol vehicles along the pipeline are given information, which is streamed via Seismic Sensor's RF communication. Consequently, any message sent from a sensing unit with a defined ID is automatically geographically displayed on the portable computer installed in the vehicle.



Basic logic flow of a Sensing Unit (SU)

Feature	Seismic Sensor	Fiber-optic cable
Intrusion recognition	very good (Pd > 99%)	medium - low
Multiple event	very good	low
FAR	very low	medium
Location accuracy	high	high
Damage prevention	good	medium
Robustness	high - the system is constructed on independent detectors	low - fiber-optic cable failure brings down the whole system

*Specifications are subject to change without prior notice.*