

INERIS develops and runs early warning systems applied to risk prevention and management of ground failure geohazards and underground operations.

Designed for real-time remote monitoring, the SYTGEM unit is a multi-parameter, reliable, modular and powerful innovative solution. The SYTGEM unit permits to deploy scalable early warning systems for a local or global monitoring strategy - hazard and stakes - to better fit most situations with no compromise.

Geotechnical, geological and hydrogeological risk prevention and management through remote monitoring must consider not only early warnings of the **geohazard**, but also **worsening and triggering factors**, to guarantee the best capabilities of anticipation. It means to measure numerous different parameters related one to each other through both transitory and long term complex physical interactions. By the way, an important issue during crisis management situations may be to monitor the most vulnerable **stakes**. This concept of **global monitoring** calls clearly for cutting edge early warning systems specifically designed to meet all those requirements.

The SYTGEM® external acquisition unit is a rugged integrated solution based on an industrial PC-type unit combining performance, functional modularity and powerful versatility. The SYTGEM unit integrates ready-to-start embedded software and built-in hardware for direct and rapid deployment of :

- ◆ a SYTGEO® measurement system for automatic monitoring of cabled and radio geotechnical, meteorological and GPS-RTK geodesic data
- ◆ a SYTMIS® measurement system to which seismic, microseismic or acoustic probes are connected for fast data acquisition of triggering events as well as continuous seismic noise recording

The SYTGEM unit features unique smart data acquisition built-in protocols for high quality of time series and efficient monitoring. It supports all compatible peripherals and Windows compatible applications to fit extra and specific advanced automation of the monitoring process. It offers then easy upgradability and may be configured as a remote acquisition system or a stand-alone complete real-time early warning system including advanced data processing and alarm generation.

Highlights

- ◆ **Multi-parameter modular system :**
 - ◆ Geotechnical - Hydrological
 - ◆ Meteoric
 - ◆ Geodesic
 - ◆ Seismic - Microseismic - Acoustic
- ◆ **Seismic and microseismic acquisition in dual modes : triggering events and continuous noise**
- ◆ **CAPA & GAMA dynamic acquisition protocols with Vigilance and Alarm variables**
- ◆ **Automatic self-diagnosis features**
- ◆ **Real time monitoring**
- ◆ **Remote control from central site - Web monitoring**

Fields of application

- Mines and Quarries**
- Structural engineering**
- Hydraulic dams and dykes**
- Geological storages and reservoirs**
- Landslides**
- Faults and seismicity**

Onboard industrial PC-type central unit

operating system : Windows XP Professional, full remote control and supervision of the onboard industrial PC-type central unit through broadband high speed link. GPS clock.

Geotechnical, hydrological, meteorological and geodesic measurements

- ◆ modular connection of SYTGEO[®] receivers through bus cable and SYTGEO[®] radio transmitters - compatible with most of the sensors available on the market: displacement, strain, tilt, pressure, level, force, wind, visibility, temperature, pulse (count scoring), GPS RTK
- ◆ number of SYTGEO[®] receivers: up to 30, number of measuring channels / sensors: >300

Seismic, Microseismic and Acoustic measurements

- ◆ number of microseismic channels available: 16, 32 or 64 following acquisition board configuration, voltage input signal: $\pm 5V$
- ◆ total sampling frequency: 1 MHz for 16/32 channels, 200 kHz for 64 channels, DA conversion: 16 bits
- ◆ fully user controlled multi-criteria triggering engine, with self-adaptive duration of microseismic event recording
- ◆ double simultaneous seismic acquisition : triggering transient events and continuous seismic noise

Supervisory control & coupling

- ◆ CAPA protocol - dynamic Coupling of Active and Passive Acquisition - and GAMA protocol - Automatic Management of Acquisition Modes - Normal, Vigilance, and Alarm
- ◆ control of industrial PCI board with eight optically coupled inputs and eight relay outputs for activation of specific processes and outside automates in Vigilance and Alarm modes
- ◆ automatic management of advanced self-diagnostic features applied to software, internal functions, equipments, external links and power supply, including hardware and software watchdogs
- ◆ automatic transmission of data with full remote control and management of the system from central site

SYTMIS[®], SYTGEO[®] et SYTGEM[®] are trademarks registered by INERIS.
Products and specifications are subject to changes without notice.

For more information and custom applications, please contact us.

Electrical characteristics

- ◆ pass band filtering for 16, 32 or 64 seismic channels
- ◆ 230 V AC, 50 or 60 Hz mains supply – 2P+E 230 V AC power outlets available -10 A – 10 A circuit breaker and 30 mA trigger differential protection unit transient protections, mains current filtering, surge protection on each line, micro inverter, with electric power consumption of 2 A max., 230 V supply, 450 watts.

Enclosure specifications

- ◆ double-skin box casing (stainless steel and aluminum) locked in place
- ◆ automatic internal temperature control, internal cabling and external safety markings
- ◆ IP55, dimensions: H 90x L 65x W 45 cm, mass: approx. 60 kg



Contact : cenaris@ineris.fr