GeoSIG
swiss made to measure

+scai Data Acquisition System   GMS series

Features	Applications

Features

- ❑ Modular electronics for user repair and upgrade
- ❑ 3 or 6* channels, up to 2000 sps sampling rate
- ❑ Low noise individual 24-bit Δ–Σ ADC per channel
- ❑ Internal built-in and/or external sensor options
- ❑ Wired, Wi-Fi*, GSM*, satellite* links
- ❑ Power-Over-Ethernet and wide power range
- ❑ Smart satellite* or network timing
- ❑ USB for storage and communication devices*
- ❑ Continuous data recording to ringbuffers
- ❑ Flexible configuration of multiple triggers
- ❑ Simultaneous data streaming to several clients
- ❑ Virtual signals from realtime processed sensor signal
- ❑ Rugged aluminium housing with easy installation
- ❑ Web Interface compatible with smartphones / tablets
- ❑ Simple and secure remote access over Internet
- ❑ Alarm output with up to 4 dry-contact relays*
- ❑ Internal battery*, low power consumption
- ❑ Hot swappable SD card
- ❑ Third generation of NetQuakes Recorders

Applications

- ❑ Seismic and Earthquake Recorder
- ❑ Structural Health Monitoring
- ❑ Real-time Seismology for Free-field and Urban Areas
- ❑ High Density Earthquake Monitoring Networks
- ❑ Shake / Hazard Mapping based on Instrumental Data
- ❑ Earthquake Early Warning and Rapid Response
- ❑ Damage Estimation, Disaster Management
- ❑ Seismic Alarm and Safe Shutdown
- ❑ Ambient Vibration Testing (optionally fully wireless)
- ❑ Induced Vibration Monitoring and Notification
- ❑ Building Code Compliant Instrumentation

With its optimized installation, operation and maintenance philosophy **scai** offers the real possibility to measure any dynamic motion with an abundance of features and options.

Highly reduced cost of ownership and user-friendly approach in the design make **scai** the perfect choice for the most advanced user.

Numerous optimisations within the architecture and the design yields unprecedented performance for seamless and fast execution of all system processes.

Fully compatible with existing GeoSIG sensors and can co-exist and co-perform in the same network as the GMS series recorders. The simple upgrade path makes the **scai** "future proof".

User-replaceable modular plug-in electronic boards make scai extremely maintainable and future-proof

Use and Versatility

An intuitive web interface is available for easy configuration and interaction as well as display of live data graphs and state of health information, using any web browser.

The device configuration file in XML format can be alternatively edited on site through the instrument console, exchanged by replacing the memory card, remotely from a server or through SSH.

Modular plug-in electronics structure provides highly increased serviceability and maintenance as well as easy hardware field upgrades or replacements.

Data Analysis

scai can perform realtime single/double integration, differentiation, HP/LP/BP filtering, decimation, peak/average calculations on the physical sensor signal and can provide these as realtime virtual signal. All recording and monitoring features can be applied on the virtual signals, simultaneously to the physical signals.

Sensor*

Internal:	scai can include select GeoSIG sensors internally. In that case the model name changes accordingly and the sensor levelling is achieved via the three levelling screws of the single bolt mounted base plate of the scai.
External:	All GeoSIG sensors and any other third-party sensors with following specifications can be connected to scai as external sensor(s):
Sensor output:	Differential: ± 20 V, ± 10 V, ± 2.5 V
	Single ended*: 0 - 20 V, 0 - 10 V, 0 - 2.5 V
	Current loop*: 4 - 20 mA
Power to sensor:	15 or 24 VDC / 600 mA

Digitizer

Channels:	3 or 6*
A/D conversion:	24 bit $\Delta-\Sigma$ converters individual for each channel
DSP:	32 bit output word length
Dynamic range:	
Overall:	146 dB per-bin @ 1 Hz rel. full-scale RMS
	137 dB @ 50 sps peak-peak RMS to RMS shorted input noise
Wide-band:	
0 - 500 Hz	118 dB RMS full-scale peak to RMS shorted input noise
ANSS:	
0.002 - 50 Hz	127 dB RMS full-scale peak to RMS shorted input noise
0.01 - 15 Hz	132 dB RMS full-scale peak to RMS shorted input noise
15 - 30 Hz	133 dB RMS full-scale peak to RMS shorted input noise
Sampling rate:	configurable up to 6 channels @ 2000 sps
	supports 2 different simultaneous sample rates
	each channel can have different sampling rates
Max. bandwidth*:	0 to 1000 Hz
Anti-Aliasing Filter:	Analog and digital FIR (finite impulse response)

Triggering

Several Trigger Sets can be defined in the instrument. Each set can be flexibly configured regarding the source of trigger, main and advanced trigger parameters, trigger processing and selected channels for storage. A voting logic based on the monitored channels can be defined.

Trigger Filter:	Fully independent high-, low- or bandpass trigger filters can be configured.
Level:	User adjustable threshold.
STA/LTA:	User adjustable STA / LTA values and STA/LTA trigger and de-trigger ratio.
Scheduled / Manual:	After start-up, at a given date/time, after event or manual triggers
Early Warning (EEW)*:	JMA Earthquake Early Warning

Event Recording

Pre-event memory:	1 - 720 seconds, typical
Post-event duration:	1 - 7200 seconds, typical

Event Summary and Parameters

Content:	PGA, PGV, PGD, SA (at 0.3, 1, 3 Hz)
Transmission delay:	User defined from trigger time

Ring Buffer

Usage:	User can request an event from any period of the ring buffer by specifying the start time/date and the duration from the console or remotely from a server.
Method:	Ringbuffer files with configurable duration which can be uploaded automatically to data server.

Data Stream

Protocol/Compatibility:	GSBU, SeedLink, compatible to Earthworm

Storage Memory

Size and Type:	8 GByte Removable SD Card, FAT32 or EXT4 formatted higher capacity on request*
Management:	Intelligent management of memory card capacity using policies as per file type and ring buffer capacity specification.
Recording format:	miniSEED and extended miniSEED with information encapsulated into blockette 2000
Estimated Capacity:	Sampling rate [sps] x 0.4 [MB / day / 3 channel] (example: 40 MByte / day / 3 channel @ 100 sps) typical, since the data is compressed, capacity depends on the context of the data

Indicators

LED Indicators:	RGB LEDs for Power, System, Data, Network and Sensor

Self Test

- Permanent self-monitoring of hardware and software components without affecting their normal operation.
- User-configurable periodical state of health (SOH) report based on comprehensive test of instrument, which can be requested at any time.
- User-configurable periodical sensor test.
- Advanced sensor testing with sine, saw and square wave injections.
- Logging of temperature and humidity inside the unit.

Timing

Internal clock:	Intelligent Adaptive Real Time Clock (IARTC)
Sources:	Network Time Protocol (NTP),
	GNSS (GPS, GLONASS, BeiDou and Galileo) with external antenna up to 5 m cable, or with external module up to 100 m cable*, wired interconnection (ICC)*
Free running drift:	
without any source:	±0.5 ppm @ constant +25 °C
	±2.5 ppm @ -10 to +50 °C
after learn	
(source disconnect):	< ±0.5 ppm @ -10 to +50 °C
Accuracy:	
Running free:	calculate from above drift
Running with NTP:	< ±0.5 ms
Running with GPS or ICC:	< ±0.001 ms

Power Supply

Input voltage:	9 - 48 VDC
	90 - 260 VAC / 50 - 60 Hz to 15 VDC switched UL approved external power block*
Power over Ethernet:	Mode A and B
Power consumption:	130 mA @ 12 VDC for 3 channels
	200 mA @ 12 VDC for 6 channels
Internal battery*:	7.2 Ah for > 24 h autonomy with intelligent charger, higher autonomy is available with external batteries

Communication

Configuration, Data Retrieval:	Ethernet, Wi-Fi*, Serial line, Console, Removable SD card, USB-storage*
Network requirements:	Fixed or Dynamic IP on Ethernet LAN and/or Internet connection with Ethernet interface or OpenVPN, upload to HTTPS and SFTP servers, Wi-Fi (b/g/n) network with WEP, WPA, WPA2 security and Enterprise Mode*
Security:	GeoDAS proprietary protocol over SSL,
	Checksum and software handshaking
Serial ports:	2 ports (console and streaming)
Baud rates:	Console: 115200 baud
	Serial Stream*: 38400, 57600, 115200 baud

Alarm and Notification*

Alarms:	3 independent or 4 common solid state relay contacts (user selectable) for trigger alarm and/or error; with "acknowledge input" support. This provides a seismic switch functionality. SMS notification is available.
Alarm levels:	Configurable based on event triggers
Relay Hold-On:	1 to 60 seconds
	(User programmable)
Capacity:	The contacts are suitable for a low voltage control. In case a large load must be switched then external relays should be implemented.
Max voltage:	125 V / 250 mA

Wired Interconnection (ICC)*

GeoSIG proprietary wired common time and common trigger interconnection network via special dedicated cable, distributing GPS-grade time precision among several units.

Modem / WAN / LAN Interfaces*

External peripheral modules for cellular 3G/4G, SHDSL, Fibre optic, etc are available.

Environment / Reliability

Operational temperature:	-20 to +70 °C▼
Storage temperature:	-40 to +85 °C▼
Humidity:	0 to 100 % RH (non-condensing)
MTBF:	> 500'000 hours (based on GMS series)

Housing

Type:	Cast aluminium housing
Connectors:	Metallic circular screwed, or MIL-style*
Size:	296 x 175 x 140 mm (W x D x H)
Size with base plate:	296 x 225 x 156 mm (W x D x H)
Weight:	4.7 kg (optional < 4 kg*)
	1.3 kg base plate, 0.3 kg internal sensor, 2.6 kg internal battery, ask for other options*
Protection:	IP65(NEMA 4), IP67(NEMA 6)*
Mounting:	Base plate with single bolt, surface mount. When base plate levelled and fixed, scai can be replaced without re-levelling.
Easy Transport*:	Portability accessories are available to facilitate short term measurements.

GMS series are produced in different types to suit particular specifications or regulations. Specifications mentioned in this datasheet may be different among different types.

*: optional

▼: use of an internal battery may degrade this specification

❏: Retrieved data can be in the following formats depending on transmission, software and storage method used: miniSEED, DAT, ASCII, SEISAN, SUDS, SAC, SEG-2, Matlab, Artemis