



- Suitable for weak motion precision recording
- Modular Design
- Host of user upgradable options
- Power over Ethernet PoE
- Feature rich hardware and software enhancements
- Powerful web interface



GeoSIG's two most advanced seismic recorders are scai and nair, the groundbreaking latest generation from the GMS series with the highest performance, excellent operational flexibility and enhanced connectivity.

Both instruments are highly advanced and versatile to meet the requirements of any seismological application, though nair boasts an impressive 147dB (0.02-20Hz) making it suitable for weak motion precision recording.

Both scai and nair are highly customisable, with user upgradable options such as increasing the number of channels from 3 to 6, alarm with 4 fast solid state independent relays, as well as an internal GNSS module supporting GPS, GLONASS, BeiDou and Galileo. The highly adaptable units can run GeoSIG's Earthquake Early Warning software, and the user has the option to upgrade to Wi-Fi to ensure easy and convenient data transfer.

At its core, easy self-maintenance, diagnostic tools, self-service and repair are all intended to reduce any potential downtime; the user can replace a faulty module or upgrade with additional modules on site. As standard they come with MIL-style connectors, and are compatible with GeoDAS, GeoSIG's proprietary, multipurpose and versatile software package.

Both wired and wireless network interfaces can be used simultaneously. With their optimized installation, operation and maintenance philosophy, scai and nair offer the real possibility to implement high density arrays with an abundance of features and options.

Highly reduced cost of ownership and user friendly approach in the design make scai and nair the perfect choice for the most advanced user. There have been numerous optimisations within the architecture and the design to enhance the background operation for seamless and fast execution of the processes.

Both scai and nair are compatible with existing GeoSIG sensors and can coexist in the same network as the GMS series of recorders; the simple upgrade path makes the units "future proof." In addition, they offer support for cellular communications and GeoSIG's digital sensor system.

Other features of scai and nair include:

- Power Over Ethernet (PoE) allowing use of single cable for power and communications
- Wide input range selections from 2.5 V to 40 V as well as current loop
- Advanced sensor testing and calibration functions
- Improved web interface capabilities with live data graphs
- Native increased supply voltage range from 9 to 48 VDC
- User configurable sensor supply voltage 15VDC/24VDC



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 structure allows highly increased serviceability and easy hardware field upgrades.

Data Analysis

The GeoDAS software provides basic data evaluation in the field meeting the requirements of most scientific and engineering applications. Optionally GMSnair can perform certain analyses onboard.

Sensor

Various GeoSIG sensors as well as a number of other third party sensors can be housed internally or connected externally to the unit. In case of internal sensor, the levelling is done on the base plate of the GMSnair via its three levelling screws. The base plate is mounted using a single bolt during installation.

Supply voltage: 15 VDC or 24 VDC

Input Range: Differential: ± 20 V, ± 10 V, ± 2.5 V software selectable

Digitizer

Channels: 3 or 6
optionally up to 15 using AC-7xD digital sensors

A/D conversion: 32 bit $\Sigma\Delta$ converters individual for each channel
DSP: 32 bit output word length

Dynamic range:

Overall: 158 dB per-bin @ 1 Hz rel. full-scale RMS
150 dB @ 40 sps peak-peak RMS to RMS shorted input noise

Wide-band:

0 – 500 Hz 131 dB RMS full-scale peak to RMS shorted input noise¹

ANSS:

0.002 – 50 Hz 141 dB RMS full-scale peak to RMS shorted input noise¹

0.01 – 15 Hz 146 dB RMS full-scale peak to RMS shorted input noise¹

15 – 30 Hz 146 dB RMS full-scale peak to RMS shorted input noise¹

Sampling rate: configurable up to 6 channels @ max 1000 sps
supports 2 different simultaneous sample rates
each channel can have different sampling rates

Max. bandwidth: DC to 200 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 Triggering

User adjustable threshold.

STA/LTA Triggering

User adjustable STA / LTA values and STA/LTA trigger and dettrigger ratio.

Event Recording

Pre-event memory: 1 to 720 seconds, typical

Post-event duration: 1 to 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.

Storage Memory

Size and Type: 8 GByte Removable SD Card,
Optionally Compact Flash Card
higher capacity up to 128 GByte on request
FAT32 or EXT4 formatted

Management: Intelligent management of memory card capacity using policies as per file type and ring buffer capacity specification.

Recording format: miniSEED with extended information encapsulated into blockette 2000m, supports STEIM 2 compression

Estimated Capacity: Sampling rate [sps] \times 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.

Data Stream

Protocol/Compatibility: GSBUS, SeedLink, compatible to Earthworm

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.

Time Base

Internal: Intelligent Adaptive Real Time Clock (IARTC)
optional internal GNSS (GPS, GLONASS, BeiDou and Galileo) with external antenna

External: NTP, optionally GPS, or Wired Interconnection

Power Supply

Power over Ethernet: Mode A and B

Input voltage: 9-48 VDC

Internal battery: optional 7.2 Ah for > 24 h autonomy with intelligent charger and battery test, higher autonomy is optionally available with external batteries

Indicators

LED Indicators for Data, Network, Power, Sensor and System

Connectors

Power: 5-pin Mil.style bayonet, shell size 10, male

Ethernet: 7-pin Mil.style bayonet, shell size 10, male

Sensor: 26-pin Mil.style bayonet, shell size 10, female or
13-pin Mil.style bayonet, shell size 10, female

Communication

Configuration & Data Retrieval: Via Ethernet, Wi-Fi, Serial line, Console,
directly via removable memory card or via USB-storage
Network requirements: Fixed or Dynamic IP on Ethernet LAN and/or Internet
connection with Ethernet interface
optional 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 standard, + 3 ports optional

Baud rates: Console: 115200 baud
optional: Serial Stream: 38400, 57600, 115200 baud

Alarm / Seismic Switch / Warning / Notification Option

Alarms: 3 independent or 4 common solid state relay contacts
for trigger alarm and/or error, alarm card directly supports "acknowledge input"
SMS notification is optionally available

Alarm levels: Configurable based on event triggers
(NO or NC selectable during order)

Relay Hold-On: 1 to 60 seconds
(User programmable)

Capacity: The contacts are suitable for a low voltage control. In case large load must be switched then external relays should be implemented.

Interconnected Network Option

Wired or Wireless common time and trigger interconnection network, distributing GPS-grade time precision among several units is optionally available.

Modem Option

Internal or external modems of different types, including cellular 3G/4G modems, are optionally available.

Environment

Operational temperature: -20 to +70 °C*

Storage temperature: -40 to +85 °C*

Humidity: 0 to 100 % RH (non condensing)

Housing

Type: Cast aluminium housing

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)
0.3 kg internal sensor, 2.6 kg battery,
1.3 kg base plate, ask for other options

Protection: IP65 (NEMA 4), optionally IP67 (NEMA 6)

Mounting: Base plate with single bolt, surface mount. When base plate levelled and fixed, GMSnair can be replaced without re-levelling.

Easy Transport: Optional portability accessories are available to facilitate short term measurements.

Preliminary Specifications subject to change without notice

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

*: use of an internal battery may degrade this specification.

°: contact GeoSIG for the optional Earthquake Early Warning functionality.

¹ Method for Calculating Self-Noise Spectra and Operating Ranges for Seismographic Inertial Sensors and Recorders, J. R. Evans, et al., 2010

