



## 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 from anywhere around the world.

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

## Data Analysis

**nair slim** 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, simultaneous to the physical signals.

## Sensor\*

External: All GeoSIG sensors and any other third-party sensors with following specifications can be connected to **nair slim** as external sensor(s):

Sensor output: Differential:  $\pm 20\text{ V}$ ,  $\pm 10\text{ V}$ ,  $\pm 2.5\text{ V}$   
Software selectable

Power to sensor: 15 or 24 VDC / 600 mA

## Digitizer

Channels: 3 or 6\*  
A/D conversion: 32 bit  $\Delta$ - $\Sigma$  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 noise

ANSS:  
0.002 - 50 Hz 141 dB RMS full-scale peak to RMS shorted input noise  
0.01 - 15 Hz 146 dB RMS full-scale peak to RMS shorted input noise  
15 - 30 Hz 146 dB RMS full-scale peak to RMS shorted input noise

Sampling rate: configurable up to 6 channels @ 5000 sps  
supports 2 different simultaneous sample rates  
each channel can have different sampling rates  
Max. bandwidth\*: 0 to 1000 Hz standard (other optional)

Anti-Aliasing Filter: Analog and digital FIR (finite impulse response)

## Indicators

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

## 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  
Level: Freely user configurable threshold  
STA/LTA: Freely user configurable STA/LTA trigger and de-trigger ratios  
Scheduled / Manual: After start-up, at a given date/time, after event or manual  
Early Warning (EEW)\*: JMA Earthquake Early Warning  
Common trigger: Common triggering among separate units over Ethernet TCP/IP networks

## Event Recording

Pre-event memory: 1 - 720 seconds typical; freely user configurable  
Post-event duration: 1 - 7200 seconds typical; freely user configurable

## Event Summary and Parameters

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

## Data Stream

Protocol/Compatibility: GSBUS, SeedLink, Earthworm\*

## Ring Buffer (Continuous Recording)

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 freely configurable duration which can be uploaded automatically to data server.

## 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 storage policy to define reserved space per file type.  
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.

## 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:  $\pm 0.5\text{ ppm}$  @ constant +25 °C  
 $\pm 2.5\text{ ppm}$  @ -10 to +50 °C

after learn  
(source disconnect): < 0.02 ppm @ constant +25 °C  
< 0.1 ppm @ -20 to +50 °C

Accuracy:  
running free: calculate from above drift  
with NTP: <  $\pm 0.5\text{ ms}$   
with GPS or ICC: <  $\pm 0.001\text{ ms}$   
Common time: NTP grade timing accuracy among separate units over Ethernet TCP/IP networks

## Power

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  
Consumption: 130 mA @ 12 VDC for 3 channels  
200 mA @ 12 VDC for 6 channels

## Communication and connectivity

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  
Connectors: Power, Ethernet, Multicom (USB and Serial RS-232), SD card\*, Sensor(s), GPS\*, Alarm\*, Option\*, Intercon\*, Wi-Fi\*, micro-USB console\*

## Alarm and Notification\*

This provides a seismic switch functionality. SMS notification is available\*.  
Alarms: 4 independent solid state relay contacts for trigger alarm and/or error (user selectable). NO or NC contacts available.  
With 1 acknowledge input.  
Alarm levels: Freely user configurable based on event triggers  
Relay Hold-On: 1 to 60 seconds, typical; freely user configurable  
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: 60 V / 250 mA per relay

## Modem / WAN 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: Aluminium housing  
Connectors: Metallic circular screwed, or MIL-style\*  
Size (handles included): 275 x 190 x 100 mm (W x D x H)  
Weight: 3 kg  
Protection: IP65(NEMA 4), IP68 (NEMA 6)\*  
Easy Transport\*: Handles and gasket added for improved portability.

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

\*: optional

●: 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