GeoSIG
swiss made to measure

DATA SHEET

GMS^{plus} Measuring System

Key Features

- Second generation of NetQuakes recorder
- 3 or 6 channels, up to 1000 sps*** sampling rate up to 15 channels using digital sensors
- Low noise individual 24-bit Δ-∑ ADC per channel
- Internal built-in and/or external sensors
- Wired Ethernet, Wi-Fi** and Serial links
- Smart NTP timing, GPS time base, or time synchronisation via radio channel or cable
- Enhanced connectivity via landline modems, 3G cellular devices and satellite links
- Recording to SD or CF cards, up to 128 GByte
- USB interface for external storage and communication devices**
- Continuous data recording to ringbuffers
- Flexible configuration of multiple triggers
- Simultaneous data streaming to several clients
- On board data processing and evaluation
- Rugged aluminium housing with levelling base plate for easy installation
- Configuration and status monitoring via web interface compatible with smartphones
- Simple and secure communication over Internet with full remote management
- Internal battery, low power consumption
- Alarm output with up to 4 relays flexibly configurable for different types of events**
- Easily configurable interconnected networks with common timing and triggering

Applications

- Broadband seismic, earthquake and structural measuring and 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^{0} 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

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Specifications

Set-up and Configuration

An intuitive web interface is available for easy configuration with any web browser. Alternatively the configuration file in XML format can be edited on site through the instrument console, exchanged by replacing the memory card, remotely from a server or through SSH. Even if the configuration file can be manually edited at any time, a tool is provided to edit it securely.

Data Analysis

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

Sensor

Internal: GMSplus 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 GMSplus.

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

Sensor output:	±2.5 V or ±10 V; differential or single-end
Power to sensor:	15 VDC / 600 mA

Digitizer

Channels:	3 or 6 optionally up to 15 using AC-7xD / AC-4xD digital sensors (max. 4 sensors)
A/D conversion:	24 bit Δ-Σ converters individual for each channel
DSP:	32 bit output word length
Dynamic range:	146 dB (per bin @ 1 Hz rel. full scale rms) 137 dB @ 50 sps
Sampling rate:	1000**, 500, 250, 200, 100, 50 sps per channel
Max. bandwidth:	DC to 250 Hz, optionally DC to 500 Hz
Anti Aliasing Filter:	Analog and digital FIR (finite impulse response)

CPU

Processor:	ARM 400 MHz
RAM:	128 MByte
Operating System:	GNU/Linux

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 detrigger 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.

Data Stream

Protocol/Compatibility: GSBU, SeedLink, compatible to Earthworm

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 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.

Time Base

Internal:	Intelligent Adaptive Real Time Clock (IARTC)
External:	NTP, optionally GPS, Wired or Wireless Interconnection
Standard TCXO accuracy:	±0.5 ppm (15 s/year) @ +25 °C ±2.5 ppm (75 s/year) @ -10 to +50 °C Optionally higher accuracy TCXO's available.
Accuracy after learn:	< ±0.5 ppm (15 s/year or 2 ms/h)
Accuracy with NTP:	< ±4 ms typical, assuming reasonable access to NTP servers

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Specifications (continued)

Power Supply

Input voltage:	15 VDC (12.5 - 18 VDC) optional 9 - 36 or 18 - 75 VDC optional 90 - 260 VAC / 50 - 60 Hz to 15 VDC switched UL approved external power block
Power consumption:	130 mA @ 12 VDC for 3 channels 200 mA @ 12 VDC for 6 channels
Internal battery:	optional 7.2 Ah for > 24 h autonomy with intelligent charger, higher autonomy is optionally available with external batteries

Indicators

● Green:	Active Charge LED
● Green:	Run/Stop LED
● Yellow:	Event/Memory LED
● Blue:	Network link/Traffic LED
● Red:	Warning/Error LED

Communication

Configuration	Via Ethernet, Wi-Fi, serial line, console,
Data Retrieval****:	or directly via removable memory card.
Network requirements:	Fixed or dynamic IP on Ethernet LAN and/or internet connection with Ethernet interface optional OpenVPN 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
Serial Stream:	38400, 57600, 115200 baud

Alarm / Seismic Switch / Warning / Notification Option

Alarms:	3 independent or 4 common relay contacts for trigger alarm and/or error 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.
Max voltage:	125 V / 250 mA

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

External modems of different types, including cellular 3G/4G modems, are optionally available.

Environment / Reliability

Operational temp:	-20 to +70 °C*
Storage temp:	-40 to +85 °C*
Humidity:	0 to 100 % RH (non-condensing)
MTBF:	> 500'000 hours

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, GMSplus can be replaced without re-levelling.
Easy transport:	Optional portability accessories are available to facilitate short term measurements.

GMSplus 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.
⁰: contact GeoSIG for the optional Earthquake Early Warning functionality.
**: optional
***: only for 3 channels instrument.
****: 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.

Link to GMSplus response files in IRIS NRL library

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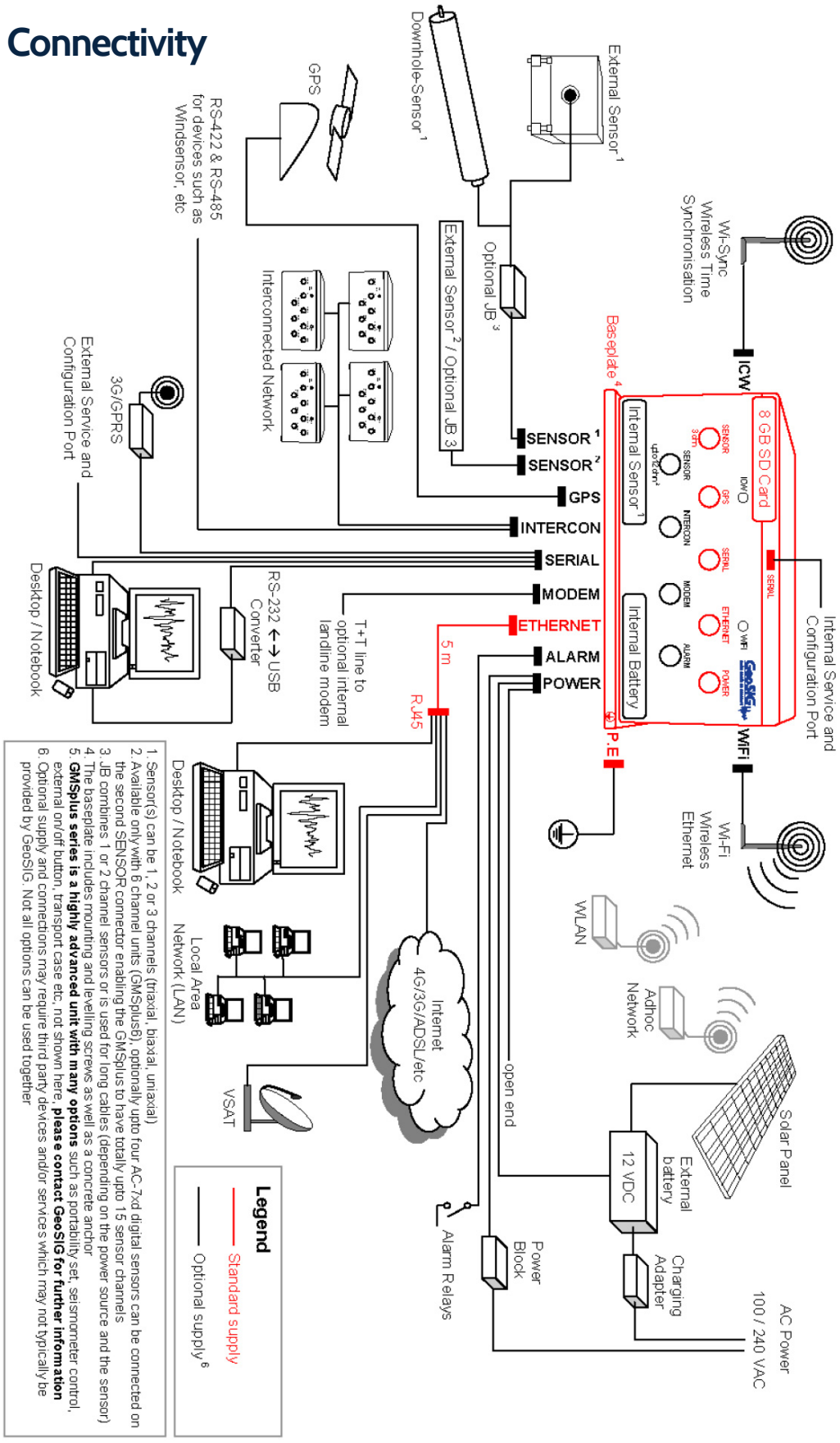
Specifications (continued)

Supply and Connectivity



1 Sensor(s) can be 1, 2 or 3 channels (triaxial, biaxial, uniaxial)
2 Available only with 6 channel units (GMSplus6), optionally upto four AC-7xd digital sensors can be connected on the second SENSOR connector enabling the GMSplus to have totally upto 15 sensor channels
3 JB combines 1 or 2 channel sensors or is used for long cables (depending on the power source and the sensor)
4 The baseplate includes mounting and levelling screws as well as a concrete anchor
5 **GMSplus series is a highly advanced unit with many options** such as portability set, seismometer control, external on/off button, transport case etc, not shown here, **please contact GeoSIG for further information**
6 Optional supply and connections may require third party devices and/or services which may not typically be provided by GeoSIG. Not all options can be used together