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GeoSIG
swiss made to measure

GSR-12 / GSR-16 Strong Motion Recorder

Features

- **Servo Force Balance Accelerometer**
- **Standard 2 GByte Removable Memory**
- **On-line Diagnostics and Self-Checking System**
- **LED and LCD Status Indication**
- **Detailed Analysis Tool with dedicated GeoDAS Data Analysis Package**
- **Compact and user-friendly**
- **Quick Installation**
- **Minimal Maintenance**
- **Broad Application Field**

Outline

The **GSR-12/16** is an acceleration data acquisition system that represents the state of the art technology in earthquake monitoring. In combination with the high performance e.g. Servo (Force Balance) Accelerometer the GSR-12/16 brings a 72/96 dB dynamic range.

The sensor signals are captured by an A/D converter and digitally filtered to increase accuracy and to provide stable performance.

Various parameter settings allow you to configure the **GSR-12/16** very simply and specifically to your desired requirements.

A variety of trigger conditions can be selected to start data capture into a **Solid State Memory Bank** (SRAM) for later analysis. Recorded data can be conveniently transferred to the central station using the serial interface (PC/RS-232 port or modem).

Transferring data to PC while recording is possible and can be done also via modem

Optionally available is the dial-up system that allows the GSR to call automatically a predefined telephone number after an event has been recorded.

A comprehensive package of advanced, menu-driven analysis software is available. **GeoDAS** is included with the **GSR-12/16** and can be used on-site for a first impression of the recorded data. **GeoDAS Data Analysis Package** is a dedicated evaluation program especially designed by **GeoSIG** for earthquake and civil engineering data analysis. It contains all necessary functions and performances for detailed evaluation in the frequency domain functions (FFT, Power Spectrum, Response Spectrum). Additional include integration (acceleration-velocity and velocity-displacement), CAV (Cumulated Absolute Velocity), Space (Rotation, Display) and various data filters.

The **GSR-12/16** is the ideal compact and most cost effective **12 and 16 Bit** approach.

Specifications GSR-12 / GSR-16 Strong Motion Recorder

Set-up and Configuration
All the necessary parameter and configuration settings are selectable with the easy-to-use **GeoDAS** Windows program. The configuration of the **GSR-12/16** is stored in an internal EEPROM which secures the configuration set-up independent of any backup battery requirements.

Data Analysis
The **GeoDAS** program provides basic time history data evaluation in the field. The **GSR-12/16** supplies data available in binary format or as ASCII files. The **GeoDAS Data Analysis Package** covers the requirements of detailed laboratory analysis for most earthquake and civil engineering applications. Any customary in trade evaluation software package can of course be used as well.

Sensor
Various sensors suitable to your application are available. All sensors are housed in a compact case with a single bolt mount, easy to install and to level with three levelling screws. Some sensors can also be built into the **GSR-12/16** unit (internal sensors).

AC-63 Force Balance Accelerometer

Frequency Response:	DC to 100 Hz
Largest signal:	± 2 g Std. (± 1, ± 0.5 g optional)

AC-43 Accelerometer

Frequency Response:	DC to 100 Hz
Largest signal:	± 2 g Std. (± 4, ± 1, ± 0.5 g optional)

AC-23 Geophone-based Accelerometer

Frequency Response:	0.1 Hz to 50 Hz
Largest signal:	± 2 g Std. (± 1, ± 0.5, ± 0.2 g optional)

VE-23 Velocity Sensor

Frequency response:	4.5 Hz to 315 Hz
Largest signal:	± 100 mm/s

VE-13 Velocity sensor

Frequency response:	1 Hz to 315 Hz
Largest signal:	± 100 mm/s

Analog Filtering

Antialiasing filter:	6th order Butterworth
Bandwidth:	DC to 50 Hz (315 Hz)
Damping:	120 dB / decade
Signal to noise ratio:	> 102 dB

Digitiser

A/D Converter:	12 Bit respectively 16 Bit
Least significant bit for 12 Bit:	0.025 % of full scale
Least significant bit for 16 Bit:	0.0015 % of full scale
Sampling rates:	100, 200, 250 SPS per channel
Bandwidth:	40% of sampling rate

Data Recording

Pre-event-Time:	1 to 20 seconds
Post-event-Time:	1 to 240 seconds
Compression factor:	2.5 typically

Triggering

Level Triggering

Lower band limit:	0.1 Hz (20 dB / decade)
Upper band limit:	12 Hz (40 dB / decade)
Range:	0.1 to 100 % of full scale

STA/LTA Triggering

STA-Base:	0.1 to 10 seconds
LTA-Base:	1 to 100 seconds
STA/LTA-Ratio:	1 to 60 dB

On-Board Memory Card

Type:	Compact Flash
Recording time:	29 minutes per 2 MByte (@ 3 channels, 200 SPS)
Size:	2 GByte

Removable Memory Card (Standard)

Type:	Compact Flash (PC compatible without additional software)
Size:	2 GByte

Power Supply

Type:	Switched power supply
Internal battery:	Rechargeable, 12 VDC, 7.2 Ah Sealed Gel-cell Lead acid battery
Power consumption:	1 W @ 12 VDC typically
Autonomy:	2 days
Charger:	90 - 260 VAC External Power Supply

Time Base

Standard clock accuracy:	20 ppm (10 min/year @ - 10 °C to + 50 °C)
External time interfaces:	GPS (optional)

Indicators

Green:	AC Power LED
Green:	Run/Stop LED
Yellow:	Event/Memory LED
Red:	Warning/Error LED
LCD display:	User selectable choice of display parameters

Communication

Serial ports:	2 (1 for communication, 1 for GPS)
Baud rates:	1200, 2400, 4800, 9600, 38400, 57600, 115200
Communication protocol:	TG protocol
Protocol securities:	Checksum and software handshaking
Communication:	PC/RS-232 port or modem
Modem operations:	Auto Dial

Environment / Housing

Operational temperature:	- 20 °C to + 70 °C
Storage temperature:	- 40 °C to + 85 °C
Humidity:	0 % to 100 % (non condensing)
Type:	Aluminium housing
Size:	280 x 180 x 100 mm
Weight:	7.2 kg (incl. battery)
Protection:	IP65 (NEMA 12)

TCP/IP Communication Option
Using a RS-232-TCP/IP device server, **GSR-12/16** can be seamlessly integrated in a TCP/IP computer network for instrument setup and data acquisition. Doing so each **GSR-12/16** can be assigned a unique IP Address.

Self Test
Permanently active, self monitoring and user selectable, periodical system test including comprehensive sensor, memory, filter, real time clock, battery level and hardware tests.

Seismic Switch / Warning Unit Option
The **GSR-12/16** warning option provides two independent warning / error outputs (relay contacts) based on user selectable criteria. This option allows to configure the GSR-12/16 as a seismic switch.

Alarms:	2 relay for 2 alarm levels 1 relay for equipment fault alarm
Alarm levels:	0.1 to 100 % of full scale (User Programmable per axis)
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:	125VAC / 125 VDC
Max current:	250 mA

Interconnection Capabilities
GeoSIG offers various interconnection options to achieve Common Time, Common Trigger and Communication networks. Please refer to relevant documentation under "Strong Motion Instrument Networks"