

## GSR-12LFDC / GSR-16LFDC Strong Motion Recorder

### Features

- 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
- Minimized Maintenance
- Broad Application Field



### Outline

The GSR-xxLFDC is a versatile data acquisition system that represents the state of the art technology in earthquake monitoring with the incorporated high performance Force Balance Accelerometer.

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

GSR facilitates various parameters allowing the user to configure the instrument simply and specifically to the desired requirements.

A variety of trigger conditions can be selected to start data recording on the onboard memory, optionally removable, for later analysis. Recorded event data can be conveniently transferred to a local or remote computer using the serial interface. Transferring the recorded event data while recording another event is also possible.

An optional dial-up system facilitates to call automatically a predefined telephone number after an event has been recorded.

Optionally several interconnected instruments can be deployed to achieve a comprehensive Building Earthquake Monitoring System, which is becoming a worldwide standard in many metropolitan areas for especially buildings with 6 or more stories. GSR-xxLFDC is the ideal, compact and most cost effective Earthquake Monitoring System and is approved and renowned in numerous countries and states.

GSR is delivered with GeoDAS, a graphical Microsoft Windows-based application running under Windows 98/NT4/2000/XP. GeoDAS has user-friendly capabilities for GeoSIG instruments, for instrument configuration and state of health monitoring as well as data acquisition locally or remotely. Optionally a richly configured set of data analysis tools can be activated within GeoDAS.

# Specifications GSR-12LFDC / GSR-16LFDC Strong Motion Recorder

## Set-up and Configuration

All of the instrument configuration and operation settings are selectable via the GeoDAS software. The configuration of the GSR is stored in non volatile memory which secures the configuration independent of any backup battery requirements.

## Data Analysis (Optional)

The GeoDAS program, if activated, provides comprehensive data evaluation. Once a data file is opened the analysis menu is available for functions like FFT, response and terzband spectras, etc. for example for initial rough estimation of mode and natural frequencies of structures.

## Sensor

### Internal AC-43i Accelerometer

Frequency Response: DC to 100 Hz  
 Full Scale:  $\pm 2$  g Std  
 Optional  $\pm 0.625$ ,  $\pm 1$ ,  $\pm 4$  or  $\pm 5$  g  
 Noise: GSR-12LFDC: < 0.350 mg  
 GSR-16LFDC: < 0.080 mg

### 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 and 16 Bit respectively  
 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

### 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

#### Hardware Triggering (optional)

External switch to manually trigger.  
 Not to be used with Interconnection.

## 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 external power supply  
 Internal battery: Rechargeable, 12 VDC, 7.2 Ah  
 Lead battery  
 Power consumption: 140 mA @ 12 VDC typically  
 Autonomy: 2 days  
 Charger: 90 - 260 VAC External Power Supply  
 / (50-60 Hz)

## 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 % RH (non condensing)  
 Type: Aluminium housing  
 Size: 280 x 180 x 100 mm  
 Weight: ~8 kg (incl. battery)  
 Protection: IP65 (NEMA 12)

## TCP/IP Communication Option

Using a RS-232-TCP/IP device server, GSR can be seamlessly integrated in a TCP/IP computer network for instrument setup and data acquisition. Doing so each GSR 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 warning option provides two independent warning / error outputs (relay contacts) based on user selectable criteria. This option allows configuring the GSR 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](#)". Exceptionally GSR-xxLFDC is designed to be used in Building Earthquake Monitoring Systems utilizing interconnection option, for which an example can be seen below.

