



## MR2002-SM24 Strong Motion Recorder

Syscom Instruments SA – a pioneer in developing digital seismic measurement systems – has designed the Strong Motion Recorder MR2002-SM24 to meet and exceed your requirements.

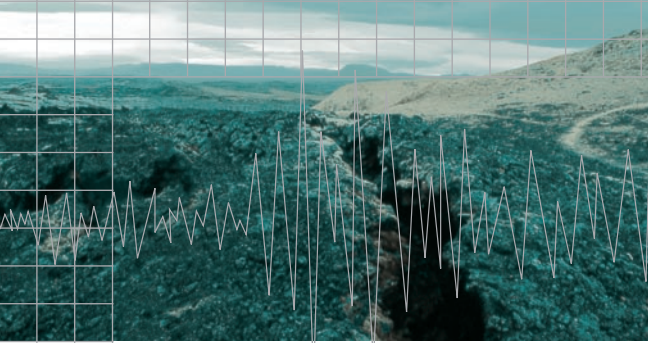
### New features in the latest ,Red Box' are:

- 24 bit recorder
- Triggered or continuous recording
- Mass memory with high data integrity
- GPS with disciplined internal VCXO
- Continuous digital data stream

### Still preserving the well known advantages of the MR2002 family:

- High reliability (MTBF > 120'000 hours)
- Rugged design
- Modular concept
- Best value

## Technical Specification

**MR2002-SM24****Strong Motion Recorder****Data Acquisition**

Principle	3 individual delta-sigma modulators and digital filtering (32 bit DSP)
Recording	24 bit signed (3 bytes)
Resolution	20 bit
Sampling-rate	50, 100, 200, 500 sps, others on request
Number of channels	3 (X,Y,Z) data channels, 4 auxiliary channels (10 bit resolution)
Channel to channel skew	None
Dynamic range	> 114 dB @ 500 sps (RMS noise/RMS clip)
Analog Filter	2 Pole Butterworth (anti-alias filter) - optional
Data Filter	Digital CIC and FIR filter cut-off at 80% of Nyquist frequency -default Optional: User defined FIR or IIR digital filters
Trigger Filter	Digital IIR filter: 0.5 - 15 Hz band-pass - default Optional: User defined FIR or IIR digital filters

**Trigger and De-trigger**

Principle	Level trigger or STA/LTA or combined
Channels	X,Y or Z axis, software- or external trigger
Trigger voting logic	Predefined AND or OR combinations, individual channel votes
Level trigger	0.003 to 50% full scale
STA / LTA	STA: 0,1 to 25s, LTA: to 250s, Ratio: 0,1 to 25, LTA latched/unlatched
De-trigger	In % of trigger

**Microprocessor****Recording**

Principle	Event recording (time history) with on-line data compression (approx. 20 minutes/MByte @ 200 sps, 3 channels, 24 Bit)
Header	Contains status information at time of trigger and event summary
Pre-event recording	1 - 100 seconds (in 1 sec steps)
Post-event recording	1 - 100 seconds (in 1 sec steps)
Max. recording time	Event recording: unlimited Optionally split into files of 1-255 seconds length

### Alarm triggers

Principle	Level trigger with unlimited signal 2 levels (individually settable for each axis)
Channels	OR combination of the 3 axis
Range	0.1 % to 100% full scale
Optional	Seismic intensity alarm, based on CAV (Cumulative Absolute Velocity)

### Clock

Primary Clock	20 ppm (10 min/year) with Lithium back-up battery (> 5 years autonomy)
Secondary Clock	1 ppm, this clock is disciplined by a GPS receiver to < 0.1 ppm accuracy
Time code receivers	DCF or GPS

### Firmware

Principle	Multitasking environment, simultaneous data acquisition and communication (data retrieval or parameter setting)
Intelligent Alerting	System initiates communications or sends text message (SMS) when an event is detected or if the self-test feature detects a malfunction

### Display

4 LED	Power Supply, Run/Self-test, Recording/Memory use, Warning/Error
LC-Display	Status information, peak values of the last event, important settings, time and sync information

## Memory

Primary Memory	Internal 2 MByte SRAM with backup battery
Organisation	Flat or ring-buffer (oldest recordings are overwritten by new ones) - or - buffer memory for the mass storage device
Mass storage	Removable CF disk (Compact Flash) (32 MByte up to 1 GByte), FAT formatted - directly readable by PC
Organisation	Read after write verification and retry in case of failure or removal of CF card

## Power Supply

Battery	Internal lead-acid gel cell 9 Ah, optionally additional external battery
Battery Charger	Temperature dependant charging voltage
Supply Voltage	DC 9-36 V
External Power supply	AC 90-264 V / 47-63 Hz
Power consumption	Approx. 200 mA @ 12 V (standard modules)
Autonomy (with int. battery)	Approx. 40 hours

## I/O and Connectors

Type	Metallic self-latching push-pull connectors with positioning key (LEMO)
Sensor	Bipolar input ( $0 \pm 4$ V), optional differential or pseudo-differential input ( $0 \pm 2.5$ V)
RS-232	Communication with PC or Modem with full galvanic isolation
External (by choice)	2nd RS-232, relay output, Ethernet or telephone cable
Interconnection	4-20 mA, RS422 or fiberoptic for NCC Network Control Center or Master/Slave
Power	Metallic connector with protective GND - internal line filter
Time Code Receiver	Connector for external GPS or DCF antenna

## Ordering Information

		<b>Product Codes</b>
Motion Recorder	MR2002-SM24 with DC supply for external MS2004+ sensor	14.11.1364
	MR2002-SM24 with DC supply for internal MS2004+ sensor (to be ordered separately)	14.11.1324
	MR2002-SM24 with AC supply for external MS2004+ sensor	14.11.1334
	MR2002-SM24 with AC supply for external MS2004+ sensor	14.11.1304
	Prepared for fiber-optic interface	
	MR2002-SM24 with interface for other sensors	consult factory
Alarm-interface	3 low voltage relays (Seismic Switch) - Rating 2 A @ 30 V DC, Nc or No configurable by user Power consumption approx. 40 mA @ 12 V	93.11.2070
Master/Slave	Daisy chain network (up to 4 MR's) using 4-20 mA current-loop	93.11.1100
GPS timing	Internal GPS receiver, external antenna - Power cycling/sets time and location information - Timing accuracy better than 0.5 microsecond to UTC Power consumption approx. 18 mA @ 12 V (GPS operating) with antenna	93.11.1085
DCF timing	Sets time information, accuracy 5 ms Power consumption approx. 4 mA @ 12 V	93.11.2080
Network-interface	Connection to NCC Network Control Center	
	- Fiber-optic interface 850 nm Tx/Rx, distance up to 3 km	93.11.2050
	- Current-loop interface 4-20 mA Tx/Rx, distance up to 1 km	93.11.2060
	Power consumption approx. 40 mA @ 12 V	
LAN / WAN	Internal Ethernet interface (10/100 BASE-T - ISO 8877) - Protocols: TCP/IP, UDP - Alerting: via e-mail - Configuration via WEB Browser (remote configuration via https or SNMP) Power consumption approx. 75 mA @ 12 V	93.11.2120
Modem	Internal V.92 modem for remote access - Alerting: dial-up feature Power consumption approx. 10 mA @ 12 V	93.11.1211

## Dimensions

Housing	Aluminum, 200 x 230 x 110 mm
Weight	7.5 kg
Protection degree	IP 65 (splash-proof)

## Regulations

Electrical Safety	In compliance with EN 50 081 and EN 50 082
EMI/RFI	In compliance with EN 61010
Environmental	In compliance with IEC 68-2 Shock: 30 g/11 ms half-sine Heat: -20° up to +50°C Humidity: up to 100% rh Vibration: up to 5 g (operating)
Conformity	<b>CE</b>