SAFE LOAD testing technologies

I∙I innRecord

Highlights

The Complete Transportation Event Recorder.

SAFE LOAD testing technologies

EASY TO USE: **Quick set up for simple or advanced data analysis:**
Intuitive software allows customers with no testing and analysis experience understand their transport environment.

innRecord

The SF-DR4-02 is a recorder with a high performance piezoelectric accelerometer, a secondary capacitive accelerometer and other environmental sensors.

Highlights

- Convenient, Adaptable, and Reliable: Intuitive Operation and Sensors that Can Go Anywhere

  It has been developed for Product & Testing Engineers to quickly and accurately characterize a vibration, shock or environmental profile, upload the data, analyze it and act upon the results without the need for a full DAQ system.

- Selectable Sensor Packages and Configurable Settings and Software

  Our intuitive software allows our customers with no testing and analysis experience to utilize our sensors to understand their environment. This enables our customers to better develop new and better products and systems.

- NIST Traceable Calibration. Every Device is Calibrated and Made in the USA to Ensure Quality

  Due to the portability of our devices, many of our customers are using our sensors in applications and environments where they may only have one shot to get the data. This requires our customers to trust that the device will survive,

capture all the data they need (not just peak metrics), and capture accurate data. After all, the data our sensors capture will be used to make important decisions.
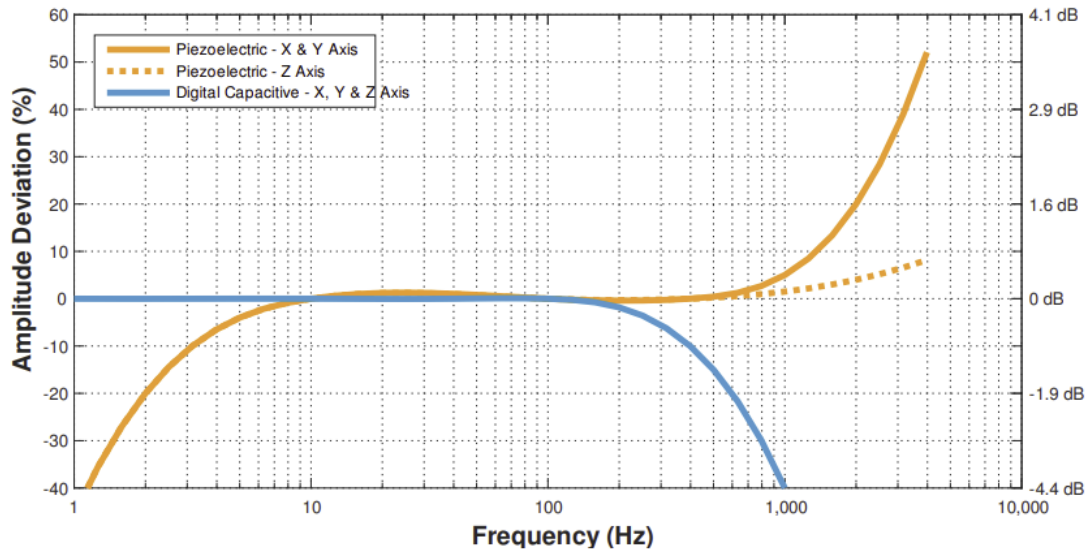
- Standalone measurement system with sensors, storage & rechargeable battery
  Handheld form factor with embedded sensors, storage & power

- More memory than other devices
  Storage capacity for billions of data points.

- More Embedded Sensors. All included in the unit

    o Primary high performance piezoelectric triaxial accelerometer up to 2000G for shock and vibrations measurements with sampling rate up to 20000 Hz

    o Secondary high performance and low consumption capacitive triaxial accelerometer up to 40G for accelerations measurements with sampling rate up to 4000 Hz

    o Gyroscope to measure inclination and velocity change on Pitch, Rall, Yaw with sampling rate up to 200 Hz

    o Magnetometer.

    o Pressure / Temperature / Humidity

    o Light (Useful to know if the package or vehicle has been opened. This sensor is capable of capturing the intensity of visible and ultraviolet light at a rate of 4 Hz. This sensor is not calibrated and is intended for rough, relative measurements only)

- Rechargeable Battery Life

  Life battery, from 12 hours at REAL continuous time monitoring at 1000 hz sampling frequency up to more than 49 days with 99% triggering time.
  Extend battery life with external power

- Triggering from Sensors and/or Time-Based

- Simple USB Interface for Download & Charging

- Free Two in One Standalone Software Package:
    - First one for configuration, quick analysis and batch file conversion:
        - FFT analysis, PSD, Spectrogram, Digital filtering.
        - Export data to CSV and Matlab.
    - Second one more advance and easier for transport simulations analysis (vibration, shocks, pitch&roll).
        - Fast tool to get PSD breakpoints for shaker simulation.
        - Automatic report, profile and graphics generation.
        - PSD for three orthogonal axes for the 100% events of CDF.
        - PSD for three orthogonal axes for the highest 20% and lowest 80% events of CDF.
        - Probability PSD overlays at 80%, 90%, 95%, 99% and 100% "at or below" levels.
        - Statistical distribution of the RMS level.

- Trusted by Over 2000 Different Commercial Customers

Data Sheet innRecord Model SF-DR4-02

Accelerometer Specifications

Acelerómetro Type	Range	Sampling Rate	Bandwidth	Noise	Resolution
Piezoelectric	± 2000g	20000 Hz	5 to 1000 Hz	< 1.0 gRMS	0.06 g
Digital Capacitive	± 40g	4000 Hz	0 to 300 Hz	< 0.01 gRMS	0.00008 g

Frequency Response Plot

Additional Sensor Specifications

Sensor	Measurement Range	Resolution	Sampling Rate
Gyroscope	2000°/s	0.06 °/s	0 (off) to 200 Hz
Magnetometer	± 1300 µT	0.3 µT	0 (off) to 10 Hz
Temperature	-40 to 85 °C	0.01 °C	0 (off) to 10 Hz
Pressure	1 to 200 kPa	1.6 Pa	0 (off) to 10 Hz
Humidity	0 to 100 %RH	0.04% RH	0 (off) to 10 Hz
Light	0 to > 20 uV	<100 mlx	0 (off) to 4 Hz

Environmental Specifications

Parameter	Range	Notes
Operating Temperature	-40°C to 80°C (-40°F to 176°F)	
Recommended Storage Temperature	15°C to 30°C (59°F to 86°F)	Recharging Temperature 0°C to 45°C (32°F to 113°F)
Humidity	0 to 95 %RH	Non-Condensing
Pressure	20 kPa to 110 kPa (2.9 psi to 16.0 psi)	Absolute Pressure
Shock Limit	>3000 g	
No Electric Field Susceptibility	2 MHz to 18 GHz	@ 200 V/m
No Magnetic Field Susceptibility	30 Hz to 100 kHz	

Internal Battery Life Estimation

Battery performance is heavily dependent upon the device configuration (sensor sample rates and triggers), battery age (including charging cycles) and temperature. The following table provides an estimation of the battery life and storage capacity of this device assuming it has a relatively new battery and it is at room temperature.
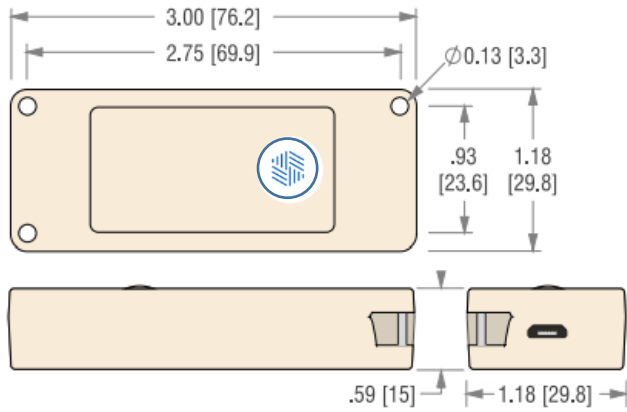
Battery Capacity (mAh)	250				
Memory capacity (Gb)	8				
DC Accelerometer	Activate at 800 hz sampling frequency				
Main Accelerometer	Disable	Activate at 1000 hz sampling frequency		Disable	
Inertial Measurement Unit	Disable		Activate at 200 hz sampling frecuency	Disable	Activate at 200 hz sampling frecuency
Temperature/Pressure	Activate at 10 hz sampling frequency				
Trigger Mode	Continuos time recording			By Triggering (sleep mode 90% of the time)	
Battery Life (days)	0.72	0.50	0.45	10.74	9.30
Data Size Recordered (Gb)	0.32	0.49	0.54	0.48	0.61

Maximum Life Estimation with External DC Connection

The following table provides an estimation of the maximum battery life to fill the total storage capacity of this device when has been connected to an external power DC battery, assuming it has a relatively new battery and it is at room temperature.

Battery Capacity (mAh)	250 + connected to usb external power dc of 6000	250 + connected to usb external power dc of 3750	250 + connected to usb external power dc of 3500	250 + connected to usb external power dc of 6000	250 + connected to usb external power dc of 4750
Memory capacity (Gb)	8				
DC Accelerometer	Activate at 800 hz sampling frequency				
Main Accelerometer	Disable	Activate at 1000 hz sampling frequency		Disable	
Inertial Measurement Unit	Disable		Activate at 200 hz sampling frecuency	Disable	Activate at 200 hz sampling frecuency
Temperature/Pressure	Activate at 10 hz sampling frequency				
Trigger Mode	Continuos time recording			By Triggering (sleep mode 90% of the time)	
Battery Life (days)	18.06	8.11	6.64	180.60	121.10
Data Size Recordered (Gb)	8.00				

Mechanical Specifications

Mass	40 grams
Case Material	Polycarbonate
Mounting - Screw	4-40 Bolts (70 in-oz)
Mounting - Tape (Double Sided)	3M 950 Tape
Length	76.2 mm (3.00")
Width	29.8 mm (1.18")
Thickness	15.0 mm (0.59")
Ingress Protection	IP 50 (Dust Protected)

The SF-DR4-01 is a recorder with a high performance piezoresistive accelerometer, a secondary capacitive accelerometer and other environmental sensors. It uploads directly to the enDAQ cloud over WiFi after completing a recording yet this wireless connectivity can be configured to be off when desired. Its aluminum enclosure improves reliability in harsh environments and widens its frequency response. The SF-DR4-01 offers an impressive 4,000 mAh battery to allow for the longest recording times of our sensors.

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- Selectable Sensor Packages and Configurable Settings and Software

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- NIST Traceable Calibration. Every Device is Calibrated and Made in the USA to Ensure Quality

  Due to the portability of our devices, many of our customers are using our sensors in applications and environments where they may only have one shot to get the data. This requires our customers to trust that the device will survive, capture all the data they need (not just peak metrics), and capture accurate data. After all, the data our sensors capture will be used to make important decisions.

- Standalone Wireless Measurement System

  Embedded sensors, storage, WiFi connectivity, & power

- More memory than other devices

  Up to 8 Billion data points of Memory for a more in-depth and accurate representation of the test environment.

- More Embedded Sensors. All included in the unit

  - Primary high performance piezoresistive triaxial accelerometer up to 2000G for shock and vibrations measurements with sampling rate up to 20000 Hz
  - Secondary high performance and low consumption capacitive triaxial accelerometer up to 40G for accelerations measurements with sampling rate up to 4000 Hz
  - Gyroscope to measure inclination and velocity change on Pitch, Rall, Yaw with sampling rate up to 3200 Hz
  - Magnetometer.
  - Pressure / Temperature / Humidity
  - Light (Useful to know if the package or vehicle has been opened. This sensor is capable of capturing the intensity of visible and ultraviolet light at a rate of 4 Hz. This sensor is not calibrated and is intended for rough, relative measurements only)
  - GPS (can record: Latitude and Longitude; Speed in m/s; Epoch time)
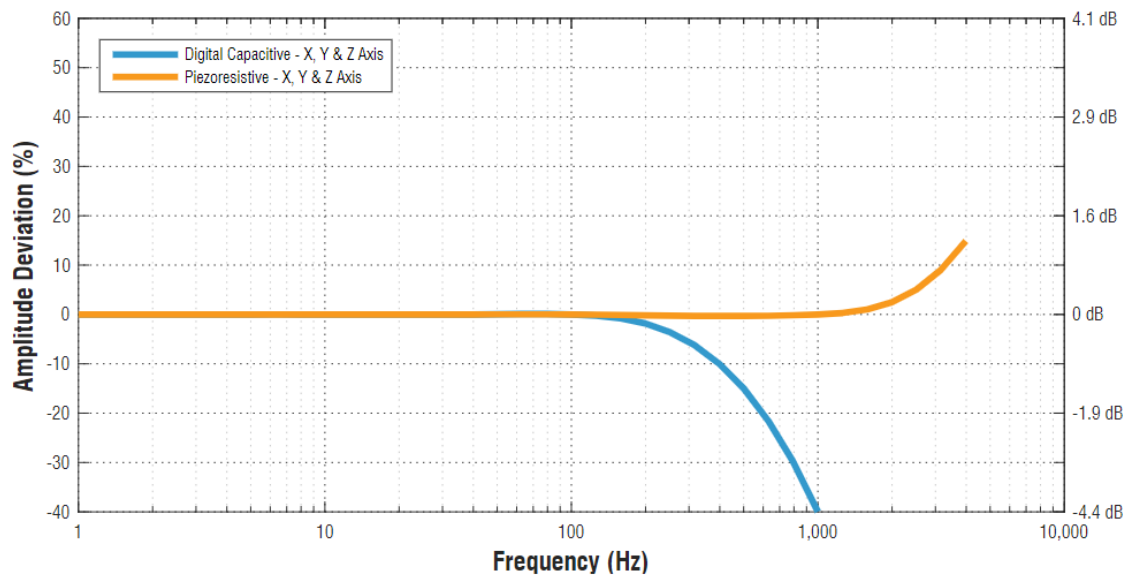 - Microphone (records at same rate as the other channels (up to 20 kHz))

- Longer Rechargeable Battery Life of Many Days

  Long life battery, from 7 days at REAL continuous time monitoring at 1000 hz sampling frequency up to more than 2 years with 99% triggering time.
  Extend battery life with external power

- Triggering from Sensors and/or Time-Based

- Simple USB Interface for Download & Charging

- Free Two in One Standalone Software Package:

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Accelerometer Specifications

Accelerometer Type	Range	Sampling Rate	Bandwidth	Noise	Resolution

Piezoresistive	± 2000g	20000 Hz	0 to 2000 Hz	< 1.6 gRMS	0.06 g
Digital Capacitive	± 40g	4000 Hz	0 to 300 Hz	< 0.01 gRMS	0.00008 g

Frequency Response Plot

Additional Sensor Specifications

Sensor	Measurement Range	Resolution	Sampling Rate

Microphone	105 dB		0 (off) to 20,000 Hz
GPS Location		2.5 m	0 (off) to 1 Hz
GPS Time		60 ns	0 (off) to 1 Hz
Gyroscope	250°/s	0.06 °/s	0 (off) to 3,200 Hz
Magnetometer	± 1300 µT	0.3 µT	0 (off) to 10 Hz
Temperature	-40 to 85 °C	0.01 °C	0 (off) to 10 Hz
Pressure	1 to 200 kPa	1.6 Pa	0 (off) to 10 Hz
Humidity	0 to 100 %RH	0.04% RH	0 (off) to 10 Hz
Light	0 to > 20 uV	<100 mlx	0 (off) to 4 Hz

Environmental Specifications

Parameter	Range	Notes
Operating Temperature	-40°C to 80°C (-40°F to 176°F)	
Recommended Storage Temperature	15°C to 30°C (59°F to 86°F)	Recharging Temperature 0°C to 45°C (32°F to 113°F)
Humidity	0 to 95 %RH	Non-Condensing
Pressure	20 kPa to 110 kPa (2.9 psi to 16.0 psi)	Absolute Pressure
Shock Limit	>3000 g	
No Electric Field Susceptibility	2 MHz to 18 GHz	@ 200 V/m
No Magnetic Field Susceptibility	30 Hz to 100 kHz	

Internal Battery Life Estimation

Battery performance is heavily dependent upon the device configuration (sensor sample rates and triggers), battery age (including charging cycles) and temperature. The following table provides an estimation of the battery life and storage capacity of this device assuming it has a relatively new battery and it is at room temperature.
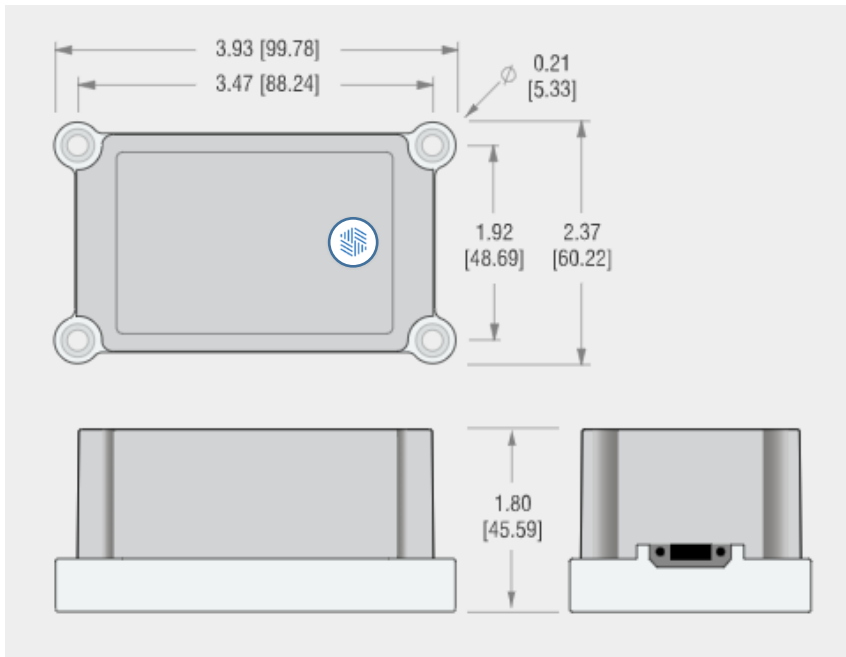
Battery Capacity (mAh)	4000				
Memory capacity (Gb)	16				
DC Accelerometer	Activate at 800 hz sampling frequency				
Main Accelerometer	Disable	Activate at 1000 hz sampling frequency		Disable	
Inertial Measurement Unit	Disable		Activate at 400 hz sampling frecuency	Disable	Activate at 400 hz sampling frecuency
Temperature/Pressure	Activate at 10 hz sampling frequency				
Trigger Mode	Continuos time recording			By Triggering (sleep mode 90% of the	
Battery Life (days)	10.00	12.00	6.30	171.82	148.81
Data Size Recordered (Gb)	4.43	11.84	7.59	7.61	9.83

Maximum Life Estimation with External DC Connection

The following table provides an estimation the maximum battery life to fill the total storage capacity of this device when has been connected to an external power DC battery, assuming it has a relatively new battery and it is at room temperature.

Battery Capacity (mAh)	4000 + connected to usb external power dc of 10250	4000 + connected to usb external power dc of 5250	4000 + connected to usb external power dc of 4500	4000 + connected to usb external power dc of 10250	4000 + connected to usb external power dc of 7250
Memory capacity (Gb)	16				
DC Accelerometer	Activate at 800 hz sampling frequency				
Main Accelerometer	Disable	Activate at 1000 hz sampling frequency		Disable	
Inertial Measurement Unit	Disable		Activate at 400 hz sampling frecuency	Disable	Activate at 400 hz sampling frecuency
Temperature/Pressure	Activate at 10 hz sampling frequency				
Trigger Mode	Continuos time recording			By Triggering (sleep mode 90% of the	
Battery Life (days)	36.13	16.21	13.28	361.40	242.20
Data Size Recordered (Gb)	16.00				

Mechanical Specifications

Mass	250 grams
Case Material	Aluminum Base, Polycarbonate Top
Mounting - Screw	10-32 Bolts (23 ft-lb)
Mounting - Tape (Double Sided)	3M 950 Tape
Length	99.8 mm (3.93")
Width	58.6 mm (2.31")
Thickness	45.6 mm (1.80")
Ingress Protection	IP 50 (Dust Protected)