

ShockLog® 298 Impact Recorders Technical Data

The ShockLog 298 impact recorder combines advanced tri-axial piezoelectric accelerometer technology with sophisticated, low power electronics and software to offer an advanced shock and vibration data logger. The comprehensive software allows the wake-up, warning, and alarm levels, frequency of data collection, settings of the acceleration range and frequency cutoff filters to be set by the user. When a programmed impact level is exceeded, a detailed event curve will be recorded and a visual alarm will occur alerting the user to the fact that damage may have occurred.

FEATURES



Records impact events;
max peaks X, Y, and Z;
gRMS; and internal temperature

Field-proven tri-axial piezoelectric
accelerometer technology

User-definable warning and alarm levels

LED lights for visual notification of alarms
and warnings

CONTENTS

| | |
|--------------------------------------|----|
| ShockLog 298 Key Features | 2 |
| ShockLog 298 Specifications | 4 |
| Factory Fit Specifications | 6 |
| Accessory Specifications | 7 |
| How to Use the ShockLog 298 | 8 |
| Communications | 9 |
| Security | 9 |
| Software | 10 |
| Product Selection | 11 |
| Best Practices for Mounting | 12 |
| Drawings | 13 |
| Accessories & Related Products | 15 |
| Declaration of Conformity | 15 |
| Ordering Information | 16 |
| Technical Support | 17 |
| Warranty | 17 |

SHOCKLOG 298 KEY FEATURES

The ShockLog 298 has been designed to monitor shock and vibration based on acceleration or velocity measurements. It has several unique features, which make it especially suitable for applications where the cost of exposure to out-of-specification environmental influences is very high. The instrument is equally suitable for protecting high-value fixed or mobile installations and investigating shock and vibration during transportation.

The ShockLog 298 has 12 user-selectable ranges:

| | |
|--------------------------|--|
| Acceleration in g | 1.0, 3.0, 10, 30, 100 & 200 |
| Velocity in cm/s | 1.0, 3.0, 10, 30, 100 & 200 |

Selectable hardware filters allow users to limit the response of the unit to a select frequency range. The frequency filter range covers from 10Hz to 250Hz.

When any of the accelerometer signals exceed the 'wake-up' threshold, the processor turns on and checks the sensor outputs at full sampling speed (4096 samples per second per axis). If the output of any sensor exceeds the alarm thresholds the ShockLog 298 will record a detailed event and flash its status LED accordingly. The ShockLog 298 series offers a "traffic light" system to inform the recipient of the potential magnitude of any given impact utilizing the following sequence:

Green = No Alarms

Amber = Warning

Red = Alarm

In addition, the detailed time history of the first event to set a warning, the first to set an alarm and subsequent events up to the installed memory capacity will be recorded, which depending on setup, could be up to 870 events. The user can adjust the recorded sample rate to make the most efficient use of memory and capture the full extent of any events.

The ShockLog 298 also supports peak recording in fixed time slots. In this mode the highest and lowest signal level present on each input is recorded for each time slot. The time slot length may be set between 10 seconds and 1 hour, and as many as 51840 slots, (peak x, y, z and temperature), may be recorded. The slots may also include data from optional sensors such as temperature humidity, pressure, tilt and roll.

User-Selectable Time Slot Data:

- Max Peaks X, Y, Z 3 bytes
- Min Peaks / gRMS / Ext {X,Y,Z} 3 bytes
- Ext1 or Tilt & Roll 2/4 bytes
- Internal Temperature 2 bytes
- Options:
 - Humidity 2 bytes
 - Pressure 2 bytes
 - External Temperature or Dew Point 2 bytes

ShockLog® 298 Impact Recorders Technical Data

A feature of the ShockLog 298 is the ability to set alarm conditions on any of the selected slot data. Most parameters have a high and low alarm setting point. These slot alarm status alerts will be signaled to the user via a dedicated Slot Alarm LED with Green showing an all clear status and Red warning of a slot alarm.

In addition to events and time slots, the device checks the output of the sensors (the three built in accelerometers, the built in temperature sensor and any external sensors) once every 5 seconds. The information from the sensors is merged into a summary record for each recording period and recorded in nonvolatile memory. The length of the summary period can be set between 10 minutes and 24 hours. There is sufficient memory for 1024 periods.

The ShockLog 298 series has the option to record the Slot information as gRMS records providing users with the ongoing rms vibration levels being seen throughout a journey or during a product's life.

SHOCKLOG 298 SPECIFICATIONS

COMPLETE INSTRUMENT

| | |
|--|---|
| Operating Temperature Range | -40 to 85°C / -40 to 185°F |
| Drop Test Survival | 1m / 39.4in |
| Dimensions (including connectors & humidity chimney) | 123 x 78 x 55mm / 4.8 x 3.1 x 2.2in |
| Weight (without Battery) | 515g / 1.14lbs |
| Battery | 2 x 3.6V Lithium Thionyl Chloride 2 x 1.5V Alkaline Size AA* |
| Battery Life | Up to 18 months w/ Lithium battery |
| Case Material | Aluminum |
| Sealing | IP67 |
| Accelerometers | Piezoelectric |
| Software Compatability | Windows 10, 8, 7 |
| Communications / Interfaces | USB 2 iButton Cellular (accessory) Satellite (accessory) |
| Indicators | LEDs - 2 Bi-color and 1 Red |
| A-D Converter Resolution | 12 bits |
| Flash Memory for Data | 4 MB |
| External Power Source Option | 6 - 30V |
| External Power Source Average Current (normal) | 3.5mA (Typical); 500 mA (Peak) |

EMC

ETSI EN 301 489-17 v1.3.2 (2008-04)
 ETSI EN 301 489-1 v1.8.1 (2008-04)
 EN61326-2-1:2006
 EN301489-17-V2.1.1
 FCC RULES CFR47: PARTS 15.107 & 15.109
 RTCA DO-160F-Section Radiated Emissions Category B

*Alkaline batteries significantly reduce battery life and operating temperature range.



ShockLog® 298 Impact Recorders Technical Data

DATA COLLECTION

| | |
|--|--------------------|
| Event Processor Wake-up Delay | 0.025 ms |
| Timeslot Interval | 10 to 3600 seconds |
| Samples per Channel per Event | 512 to 4096 |
| Maximum Number of Events (detailed) | 108 to 870 |
| Event Duration | 1 to 128 seconds |
| Number of Timeslots (depends on slot contents) | 14608 to 467456 |
| Maximum Number of Summaries | 1024 |

ACCELEROMETERS

| | |
|---|---|
| Low Frequency Cutoff (-3dB 10g – 100g) | 0.1 - 0.5Hz |
| High Frequency Cutoff (-3dB) | 250 – 300Hz |
| Hardware Filters (Programmable) | 10Hz, 40Hz, 50Hz, 90Hz, 120Hz and 250Hz |
| Resolution (% of full scale) 1% for Peaks | 0.1% |
| Accuracy at 3G Scale | ± 2% |
| Additional Error Other Ranges | ± 2% |
| Additional Error Peak Capture | ± 5% |
| Change of Scale Factor over Temperature | ± 4% |
| Acceleration Ranges | ± 1 to ± 200g |
| Velocity Ranges | ± 1 to ± 200cm/s |
| Wake-up Threshold (% of range) | 5 to 95% |
| Warning and Alarm Thresholds (% of range) | 5 to 95% |

EXTERNAL ANALOG SENSOR INPUT

| | |
|---|--------------|
| Input Voltage Range | 0 to 4.5V |
| Low Frequency Cutoff | 0 Hz |
| High Frequency Cutoff (-3dB) | 200 to 280Hz |
| Resolution | 2mV |
| Scale Factor Accuracy at 4V | ± 2% |
| Change of Scale Factor over Temperature | ± 2% |

FACTORY FIT SPECIFICATIONS (OPTIONAL)

HUMIDITY/TEMPERATURE SPECIFICATIONS

| | |
|--|---|
| Temperature Measuring Range | -40° to 85°C / -40° to 185°F |
| Temperature Accuracy | ± 2°C / ± 4°F |
| Temperature Resolution | 0.1°C |
| Humidity Measuring Range | 0 - 100% RH |
| Humidity Accuracy | ± 3% RH |
| Humidity Resolution | 0.1% RH |
| Dew Point Measuring Range | -40° to 85°C / -40° to 185°F 0 - 100% RH |
| Dew Point Relative Accuracy (-20° to 70°C, 25 to 75% RH) | ± 2°C / ± 4°F |
| Dew Point Resolution | 0.1°C |

TILT & ROLL SPECIFICATIONS

| | |
|------------------------|--------|
| Tilt Range Monitored | ± 180° |
| Resolution | 0.1° |
| Transverse Sensitivity | 5% |

GPS SPECIFICATIONS

| | |
|---|--|
| Sensitivity | 157 dBm reacquisition 148 dBm cold starting |
| Fast Time to First Fix and switch order to Sensitivity - Channels - Fast TTFF, High Accuracy | 1s/29s (hot/cold start) |
| Channels | 65 |
| High Accuracy Position | 2.5 CEP Velocity 0.1m/sec |

ACCESSORY SPECIFICATIONS

EXTERNAL TEMPERATURE, HUMIDITY, AND PRESSURE SENSOR

| | |
|-----------------------------|--|
| Temperature Measuring Range | -40 to 85°C / -40 to 185°F |
| Temperature Accuracy | ± 2°C / ± 4°F |
| Humidity Measuring Range | 0 - 100% RH |
| Humidity Accuracy | ± 3% |
| Pressure Measuring Range | 0 - 1.1 bar (standard) 0 - 1.2 bar (optional) |
| Pressure Accuracy | ± 10% (1 bar unit) ± 20% (2 bar unit) |

SHOCKLOG SATELLITE SPECIFICATIONS

| | |
|-----------------------------|--|
| Operating Temperature Range | -86°F to 140°F / -30°C to 60°C |
| Size | 12.61in x 9.41in x 4.69in / 320mm x 239 mm x 119mm |
| Weight | 9.7 lbs / 4.4 kg |
| Battery Type | 2 x 3.6V AA Lithium (ShockLog) 4 x 1.5V AA Lithium (Satellite Module) 4 x 3.6V C-Sized Lithium (External Battery Pack) |
| Battery Life | 12 months (ShockLog) 12 months (Interface Board) 3 - 18 months (Internal Satellite Module) 60 - 90 days (External Satellite Module) |
| Enclosure Rating | NEMA 1, 3, 4X, 6P, 12 |
| Satellite Technology | Global LEO Satellite operation using Globalstar Simplex Data Networks |
| Software Compatibility | Windows 10, 8, 7 |

SHOCKLOG CELLULAR SPECIFICATIONS

| | |
|------------------------------|---|
| Operating Temperature Range | -40°F to 185°F / -40°C to 85°C |
| Size | 7.00in x 11.35in x 2.20in / 17.780cm x 28.829cm x 5.588cm |
| Weight | 3.404lbs / 1544g |
| Battery Type | 2 x 3.6V AA Lithium (ShockLog) 6 x 1.5V Lithium AA Batteries (Cellular Module) |
| Battery Life | 18 months (ShockLog) / 90+ days (Cellular Module) |
| Connectivity Global Cellular | 3G/2G |

HOW TO USE THE SHOCKLOG 298

Control your ShockLog device through a simple Windows®-based software program. The software allows for configuration of the ShockLog 298, data extraction, and analysis. Once configured, mount the ShockLog 298 to the equipment to be monitored. When the journey is complete, remove the ShockLog and download the recorded information. The ShockLog Report View provides users with an overview of the entire journey. ShockLog 298 provides peak acceleration values for all three axes reported on a time basis as well a detailed impact curve. Additional environmental conditions can be monitored and displayed, if desired. (See Accessories and Related Products below for more information.) Users are able to zoom in for a closer view, or export data into programs such as Excel and MatLab for more detailed analysis. Please refer to the manual for full details.

COMMUNICATIONS

The ShockLog 298 has several mediums of communication. The primary method is via USB.

When conditions do not dictate a fixed water tight link a standard cable can be used. An IP67 watertight USB connector is available when conditions warrant its use. The supplied watertight cap should be refitted after communications are complete. Should the cap be left off, the unit remains water tight but the exposed connections may become tarnished which may lead to poor communications.

For a quick and simple way of setting up, starting or stopping a unit in the field, an iButton interface is available. The iButton interface also supports the download of a 'one page report' giving a condensed view of the journey data gathered.

SHOCKLOG CELLULAR COMMUNICATION MODULE

Delivers real-time notifications of unacceptable handling in the supply chain. This device alerts you when your shipment has experienced out of tolerance handling conditions. Connects to any new or existing ShockLog 298.

SHOCKLOG SATELLITE IMPACT RECORDING AND TRACKING SYSTEM

A satellite communication module that delivers impact recording, real-time reporting and asset location. The system is programmed with parameters optimized for the user's asset. The ShockLog Satellite is especially suitable for applications where the cost of exposure to out-of-specification environmental conditions and the need to locate the asset are critical.

SECURITY

The ShockLog 298 stores all data and status information in high performance FLASH memory. This memory requires no power to retain data. The instrument is configured by connecting to a PC and running the data analysis / setup software. During the configuration process the operator has the option of setting passwords in order to limit subsequent access to data.

If passwords have been enabled to restrict access to data, reset the unit or other functions, the user must supply those passwords before the software will communicate with the ShockLog.

An area of the FLASH memory is reserved for the security log – this memory records the timing of such actions as resetting the clock or clearing out data and cannot be modified by the operator. It is intended that the security log last the operating life of the instrument and will only be cleared when the ShockLog is recalibrated at the factory.

SOFTWARE

The ShockLog 298 software runs on a desktop or laptop PC using the Windows 10, Windows 8, or Windows 7 operating systems.

The software allows the operator to configure the ShockLog 298 and to extract and examine data records from the instrument.

Reports may be viewed on screen and selected data exported to other applications. Six different reports are available: download, summary, events summary, event details, time slot, and security log data.

Download: This report presents a top-level view of a mission, providing the user with a single page report that can be printed or copied into another document. It contains a Time Slots graph, an Event Summary graph, and the most severe event as well as configuration information. The report start and end time can be adjusted to focus on any part of the mission.

Summary Report: Data gathered at regular intervals is condensed into summary records. The period over which data is summarized can be set between 10 minutes and 24 hours according to the demands of the application. The summary records can be used to give an overview of a long period of data logging in a conventional spreadsheet format. A maximum of 1,024 summaries can be recorded in any one mission. The typical summary report parameters are date, time, number of warnings, number of alarms, max peak x, y, and z, gRMS x, y, and z, max/min temperature, and range.

Events Summary Report: All the events are presented in a graphical or spreadsheet form. For each event the following parameters are available: date, time, range, temperature, max/min x/y/z, modulus. In addition the maximum modulus of all the events may be displayed graphically.

Event Details Report: Detailed information for all of the recorded events is available in spreadsheet or graphical form. When the graphical form is used pan and zoom controls are available. The following parameters are available: sample time, sample number, max/min x, y, and z.

Time Slot Report: Data recorded in the timeslot memory can be displayed in graphical form. The following parameters can be available depending on setup and unit specification: date, time, max peak x, y, and z, min peak x, y, and z, gRMS x, y, and z, max ext1, ext2, min ext1, ext2, internal temperature, humidity, pressure, external temperature, Tilt & Roll.

Security Log Report: The security log data can be displayed in spreadsheet form. The following parameters are available: date and time of, data clearing operations or resets.

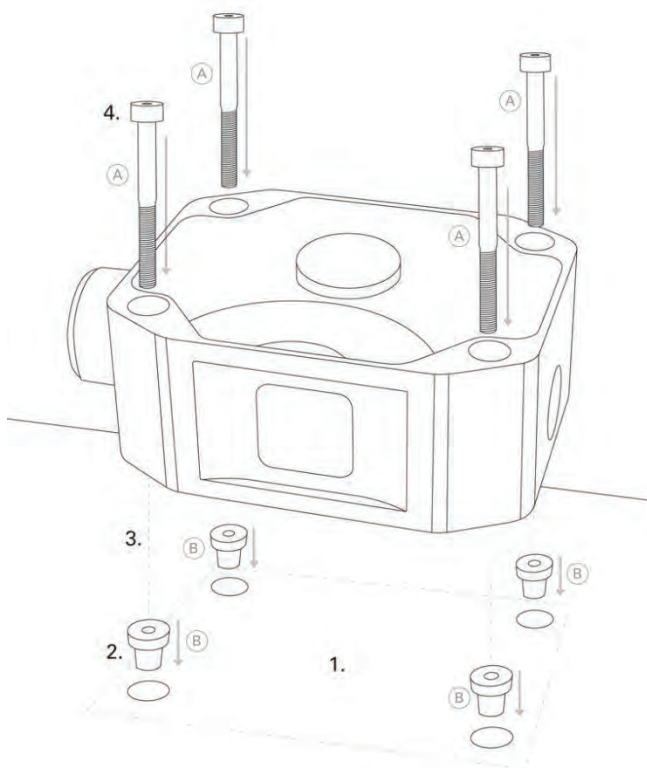
PRODUCT SELECTION

| | SL298-A | SL298-H-A | SL298GPS-A | SL298TR-A | SL298GPS-TR-A | SL298GPS-H-A | SL298TR-H-A | SL298GPS-TR-H-A |
|------------------------|---------|-----------|------------|-----------|---------------|--------------|-------------|-----------------|
| RECORD/MEASURE | | | | | | | | |
| Impact | X | X | X | X | X | X | X | X |
| Internal Temperature | X | X | X | X | X | X | X | X |
| gRMS | X | X | X | X | X | X | X | X |
| Velocity | X | X | X | X | X | X | X | X |
| External Temperature | | X | | | | X | X | X |
| Humidity | | X | | | | X | X | X |
| Tilt | | | | X | X | | X | X |
| Roll | | | | X | X | | X | X |
| GPS Coordinates | | | X | | X | X | | X |
| COMMUNICATE VIA | | | | | | | | |
| USB | X | X | X | X | X | X | X | X |
| iButton | X | X | X | X | X | X | X | X |
| Cellular | X | X | X | X | X | X | X | X |
| Satellite | X | | | | | | | |

BEST PRACTICES FOR MOUNTING

Mount the ShockLog close to the most sensitive part of the product being monitored. The ShockLog should be mounted to a solid, rigid surface and as low as possible. When monitoring long shipments (>20 feet / 6 meters), it is best to mount a ShockLog at both ends of the shipment.

For best results, it is recommended that the unit be mounted directly to the product being monitored using all four mounting bolts included with the ShockLog, as shown in the figure below.



KIT CONTAINS:



(A) 4 x M5x45 bolts

(B) 4 x black rubber anti-vibration
isolation bushings

YOU WILL NEED:

- Electric drill with drill bit between 10.2mm and 10.3mm in diameter
- 5mm allen key

INSTRUCTIONS

1. Drill 4 (four) \varnothing 10.2mm to 10.3mm holes in your product to a depth of at least 17mm. Alternatively a mounting plate with the four holes could be mounted to your product.
2. Insert the 4 isolation bushings in the 4 holes, narrow end first.
3. With the ShockLog facing up align bolts with anti-vibration bushings.
4. Push M5 bolts through the holes from front to back. Tighten bolts clockwise with the allen key. Begin with 2 bolts diagonally opposite each other for optimal grip.

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If it is not possible to mount the ShockLog with mounting bolts, it is possible to use optional magnetic feet or an aggressive adhesive or double-sided tape; however, it is important to remember that the ShockLog should not be free to move inside the shipment.

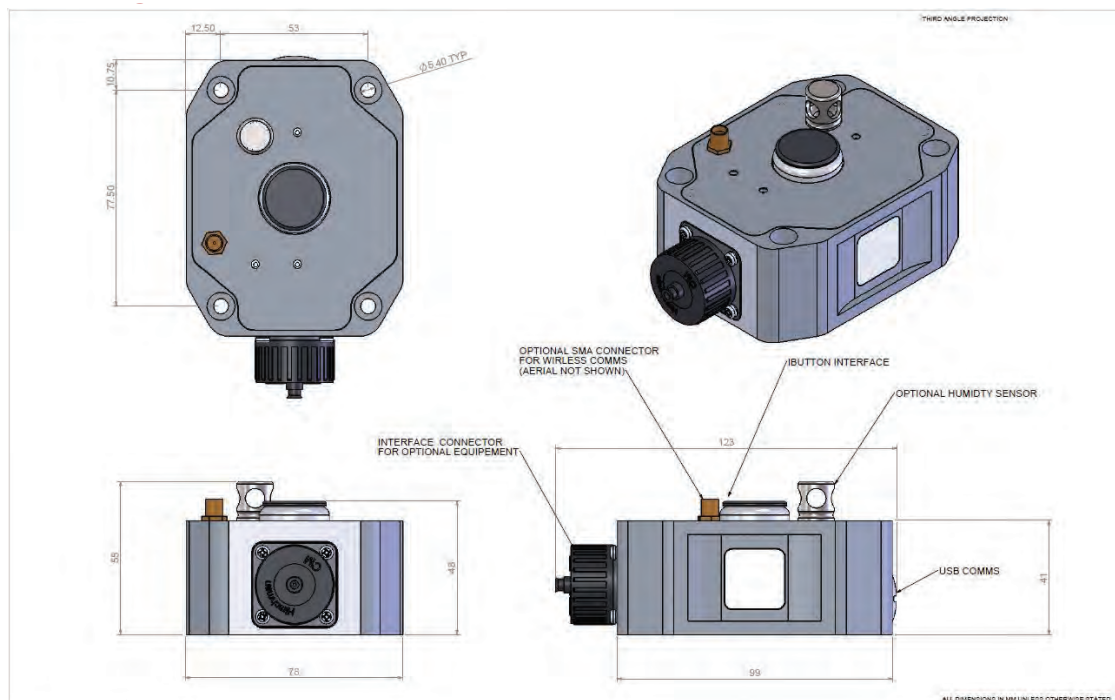
Additionally, standard and magnetic mounting plates are available that have been predrilled for the four rubber bushings provided in the mounting kit. See the Drawings section for plate dimensions.

Avoid building special brackets to mount the ShockLog. If a cover is required over the product being monitored, place the cover over the ShockLog, but do not attach the ShockLog to the cover.

The ShockLog assumes the axes indicated on the unit. Mount the ShockLog either vertically or horizontally and note the orientation to assist with data analysis.

DRAWINGS

SHOCKLOG 298®



ACCESSORIES & RELATED PRODUCTS

Batteries, a mounting kit and a companion label are included with each ShockLog 298. New users of the ShockLog 298 will be required to purchase a kit in order to get all the necessary accessories and software licenses to correctly operate the device. The kit contains the following items (USB stick containing software and manual; Quick Start User Manual; USB Communication Cable; iButton Set: start, stop, download, setup, and clock iButtons; USB Connection BUS and Cable; and 2 AA Lithium Batteries). Additional software licenses, iButtons, and cables can be ordered separately.

The following components can be ordered to extend the conditions monitored by the ShockLog:

- Optional Cellular Connectivity Module (accessory)
- Optional Satellite Connectivity Module (accessory)
- Optional Humidity/Temperature Sensor (built-in)
- Optional Humidity/Pressure/Temperature Sensor (accessory)
- Optional Tilt & Roll Sensor (built-in)
- Optional GPS Coordinate Recorder (built-in)

DECLARATION OF CONFORMITY

This ShockLog product is in compliance with the essential requirements and other relevant provisions of directives, ESTI EN 301 489, EN 61326, FCC Rules CFR47 Parts 15 and RTCA/DO160D. Copies of these Declarations of Conformity are available upon request.

TECHNICAL SUPPORT

If you are unsure of how to use or interpret the ShockLog 298, please contact Shockwatch.

WARRANTY

If a product fails to conform to the specifications stated in this document, the product may be returned to SpotSee at any time prior to the product's specified expiration date or, if no expiration date is specified, within one year from the date of shipment. SpotSee shall either refund the purchase price (without interest), or repair and/or replace the product (or, in the case of services, re-perform such services) at no additional cost. The warranty is void if the defect has resulted from accident, misuse, abuse or misapplication. Any product which is identified as defective during the warranty period and is returned to SpotSee with a Return Material Authorization (RMA) number (which must be obtained from SpotSee prior to any return) within thirty (30) days after discovery of the defect with a written description of the defect will be replaced by SpotSee.