

SRS Quick Start Manual



SOFTWARE USER MANUAL

SRS Shock Response Spectrum V21-1



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2. Introduction

Mechanical shock pulses are often analysed in terms of shock response spectrum. The shock response spectrum assumes that the shock pulse is applied as a base input to an array of independent single-degree-of-freedom systems. SDOF system assumes that each system has its own natural frequency. The shock response spectrum gives the peak response of each system.

3. Shock response spectrum model

The shock response spectrum is a calculated function based on the acceleration time history. It applies an acceleration time history as an excitation to an array of single degree-of freedom (SDOF) systems. Each system is assumed to have no mass-loading effect on the base input.

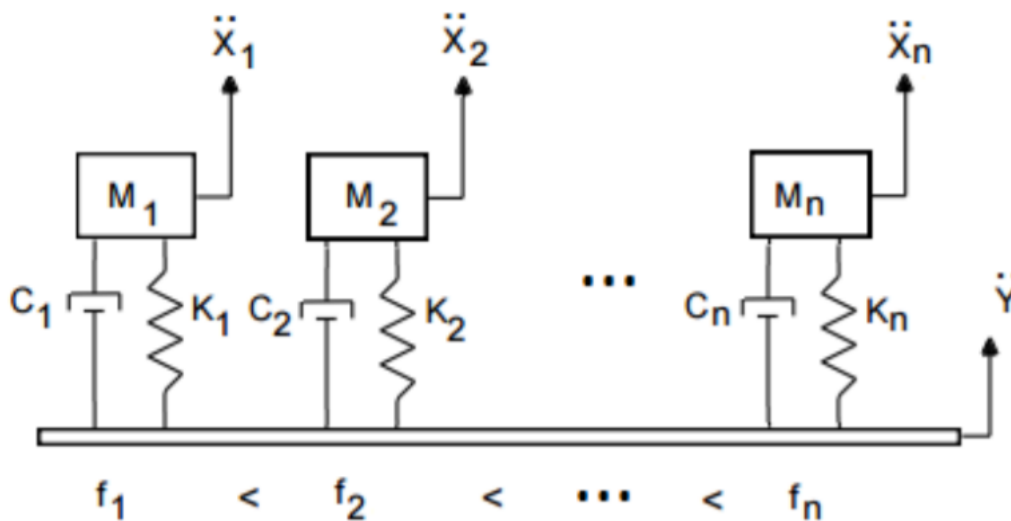


Figure 1: Shock response spectrum model

\ddot{Y} is the base input for each system, and \ddot{X} is the absolute response of each system to the input (double-dot denotes the acceleration). M is the mass, C is the damping coefficient, and K is the stiffness for each system. Natural frequency for each system is marked with f .

4. DewesoftX ® SRS plugin

a) Input signal

The input signal in the SRS plugin is an impulse shock time signal, usually measured with an accelerometer.



b) Calculation parameters

Calculation parameters

Start frequency

120

Hz

End frequency

2000

Hz

☒ Velocity DC filter

50

Damping / Quality factor

☐ Damping

☒ Quality

10

Frequency division (octave)

24

☒ Remove DC offset

10

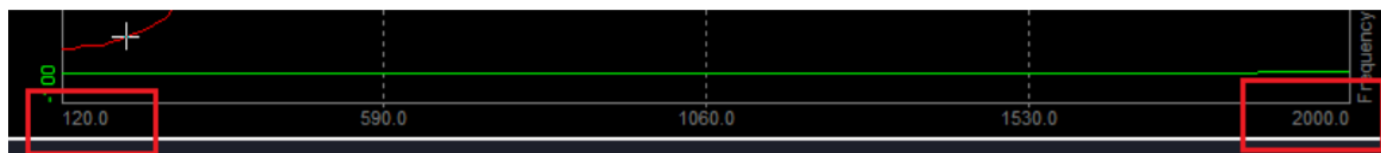
ms

☒ Noise floor

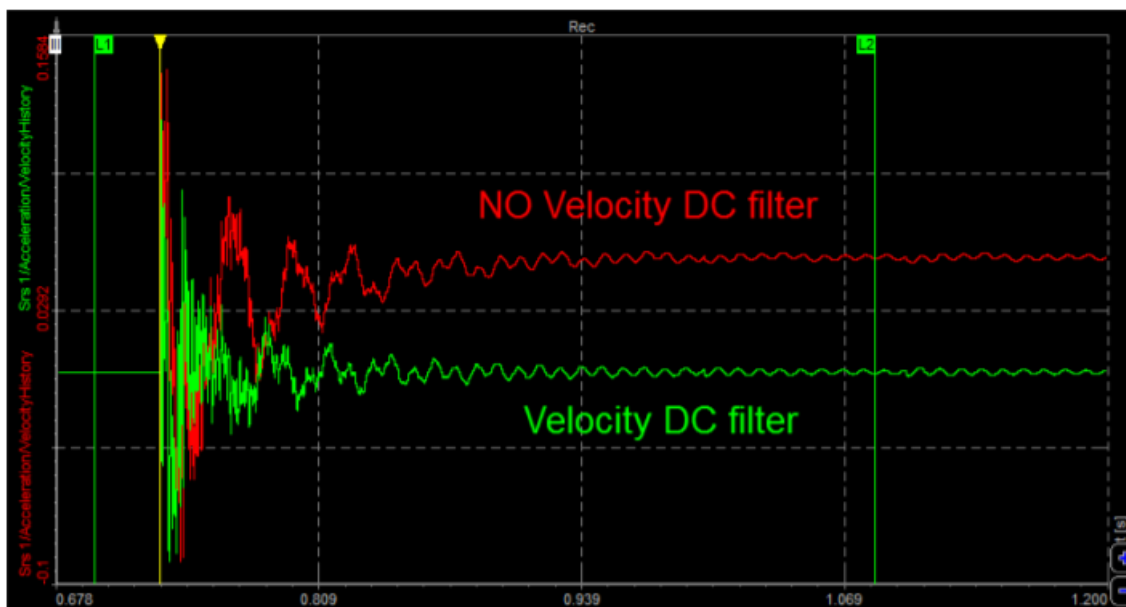
5

ms

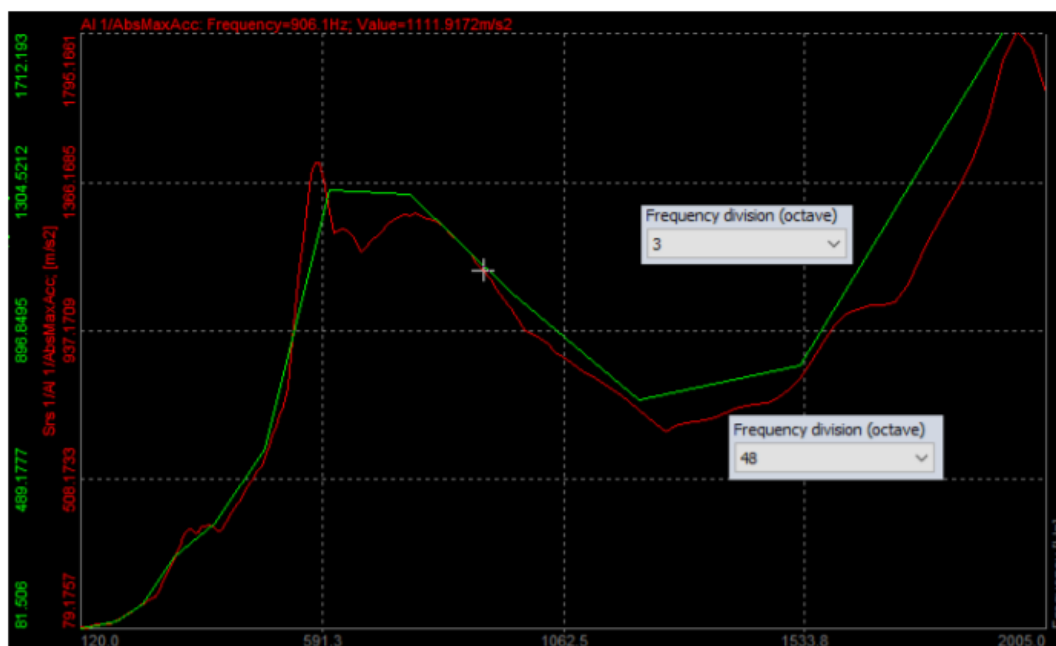
Start and **end** frequency define the calculation range for the frequency spectrum. The upper limit is set to 1/2 of MAX sampling rate.



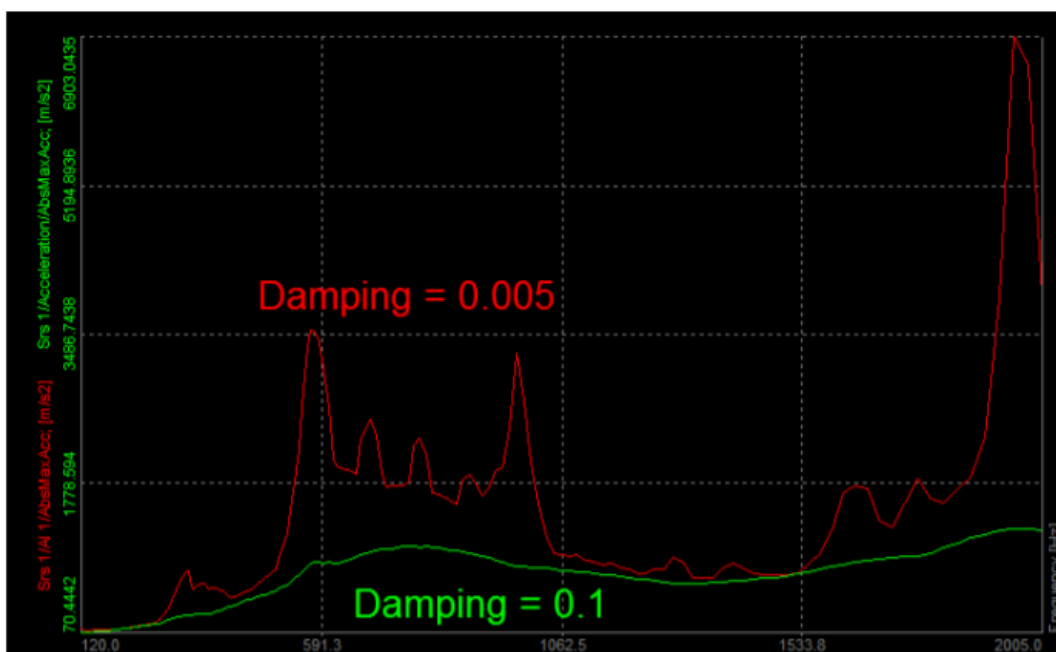
Velocity DC filter removes the DC component of the calculated time signal "InputChannel"/VelocityHistory.



Frequency division (octave) defines the resolution of the spectrum in frequency domain. Higher the number, better the resolution.



Different **damping factors** produce different SRSs for the same shock waveform. Zero damping will produce a maximum response and very high damping produces a horizontal line. The standard value for relative damping of 5% results in a Q (quality factor) of 10.



Remove DC offset (in milliseconds) removes the DC component of the input time signal. The DC will be calculated the defined time interval behind the position of the first cursor.



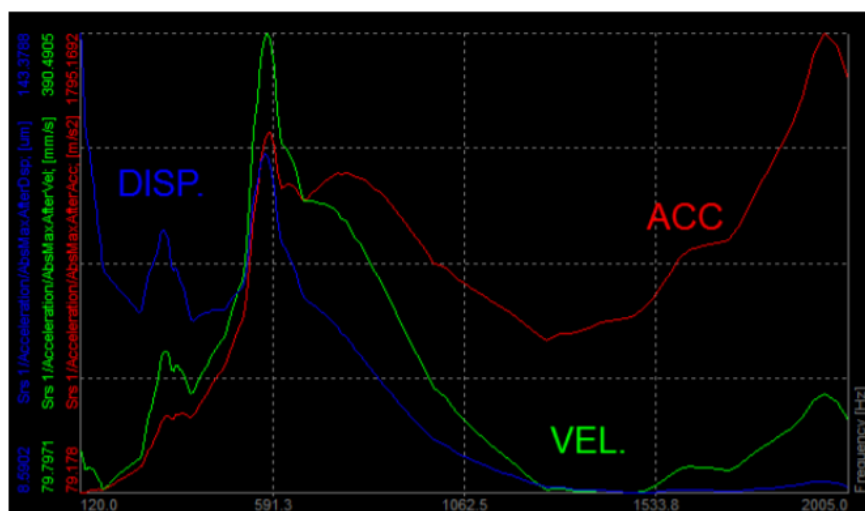
Noise floor (in milliseconds) will calculate the noise floor of the input time signal. The noise floor will be calculated the defined time interval behind the position of the first cursor

c) Results

The results in frequency domain spectrum can be shown as acceleration, velocity or displacement.

Results

☒ Acceleration
 ☒ Velocity
 ☒ Displacement



d) Output channels

As a result, we show absolute maximum, maximum and minimum of acceleration/velocity/displacement. All of those values are calculated in three different sections: during shock, after shock and during the whole measurement

Output channels		
<input checked="" type="checkbox"/> Absolute max (whole measurement)	<input checked="" type="checkbox"/> Absolute max during shock	<input checked="" type="checkbox"/> Absolute max after shock
<input checked="" type="checkbox"/> Max (whole measurement)	<input checked="" type="checkbox"/> Max during shock	<input checked="" type="checkbox"/> Max after shock
<input checked="" type="checkbox"/> Min (whole measurement)	<input checked="" type="checkbox"/> Min during shock	<input checked="" type="checkbox"/> Min after shock

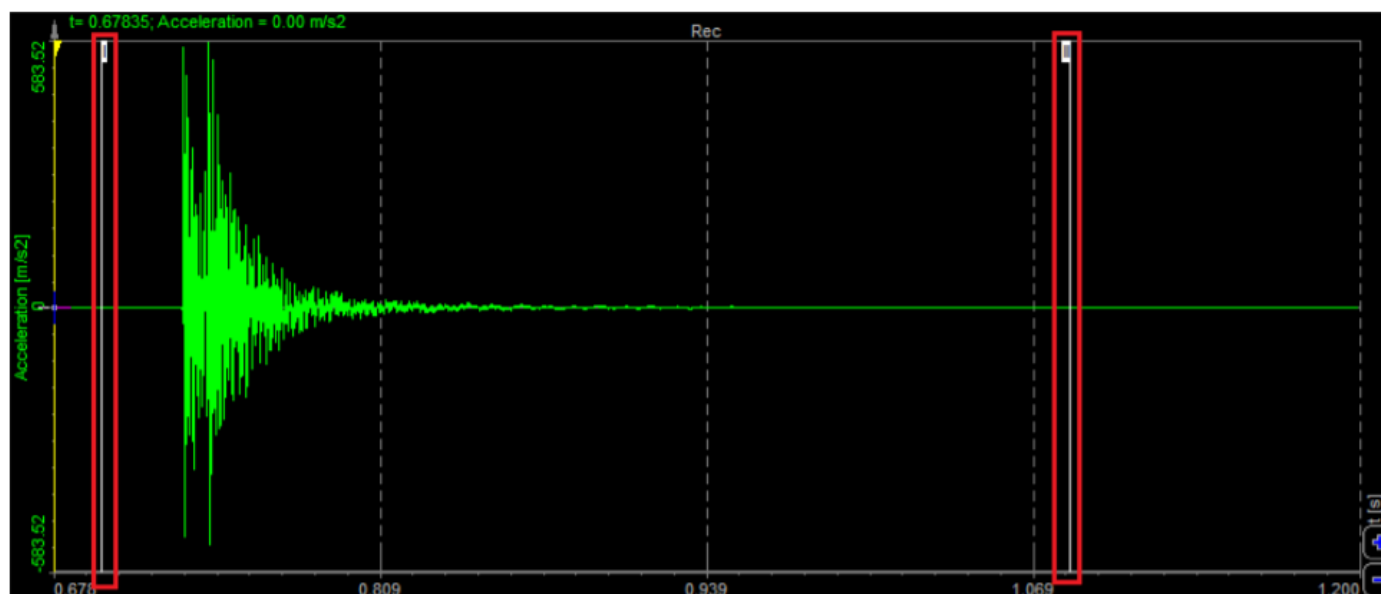
- Absolute max (whole measurement) – **composite/maximax** (the worst-case extrema for both instances). The composite shock response for the absolute maxima is the maximax.
- Max (whole measurement) - **composite/maximax** (the worst-case extrema for both instances). The composite shock response for the absolute maxima is the maximax
- Min (whole measurement) - **composite/maximax** (the worst-case extrema for both instances). The composite shock response for the absolute maxima is the maximax.
- Absolute max during shock - **primary** (forced response, computation during the shock)
- Max during shock - **primary** (forced response, computation during the shock)
- Min during shock - **primary** (forced response, computation during the shock)
- Absolute max after shock - **residual** (free vibration, computation after the shock)
- Max after shock - **residual** (free vibration, computation after the shock)
- Min after shock - **residual** (free vibration, computation after the shock)

4.1 Results

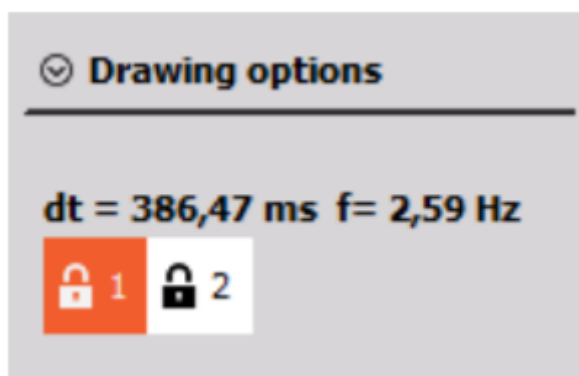
a) Placing the cursors

For the right calculation, we have to place the cursors at the right positions on the recorder.

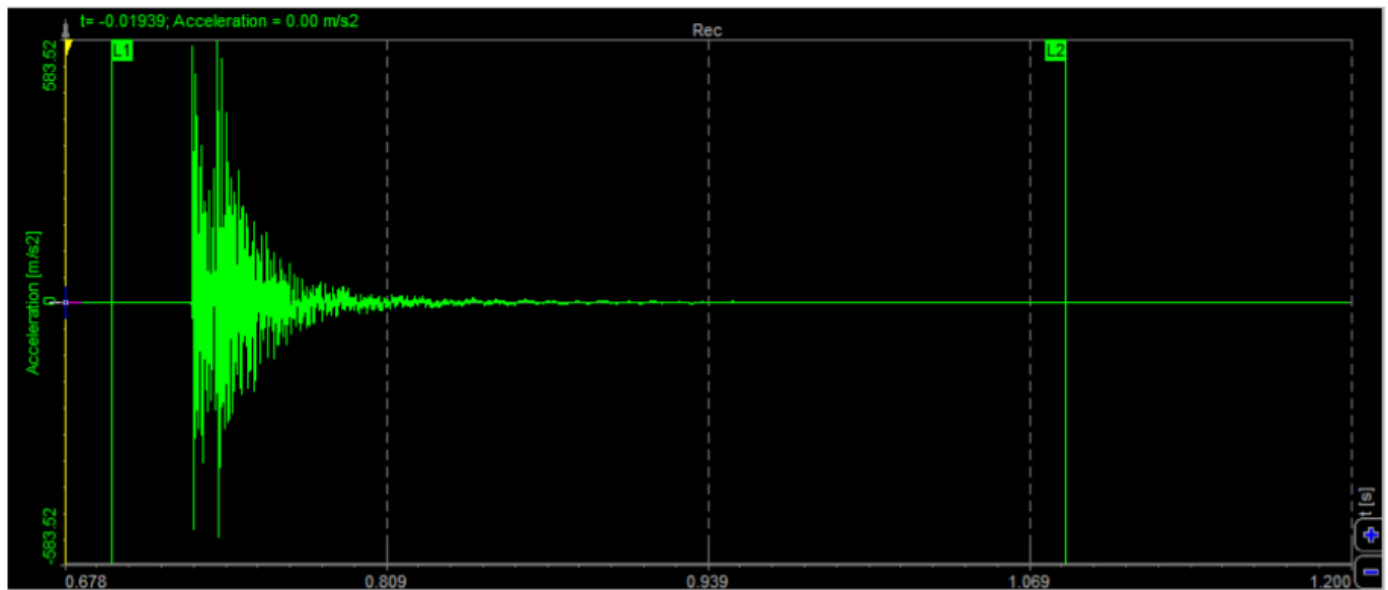
The first cursor (I) has to be placed on the noise floor signal, before the shock. Second cursor (II) has to be placed also on the noise floor, but after the shock.



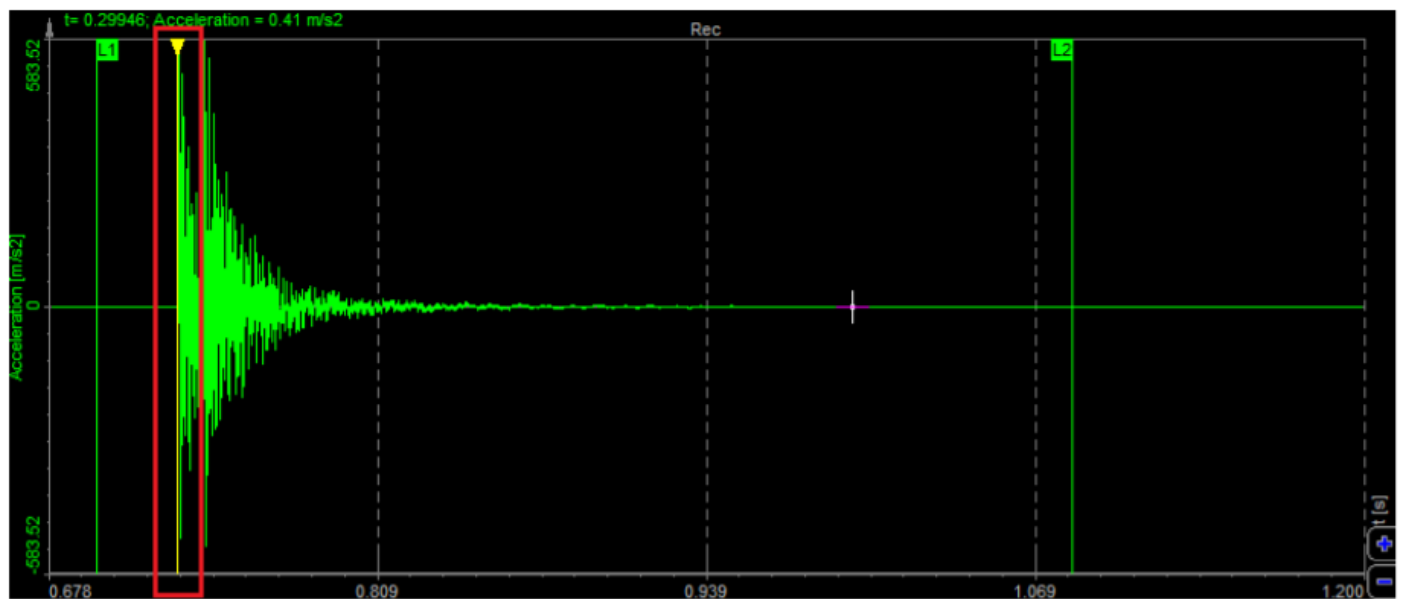
After that, the cursors I and II need to be locked with the click on the buttons:



After the cursors are locked, they change the colour in the recorder.

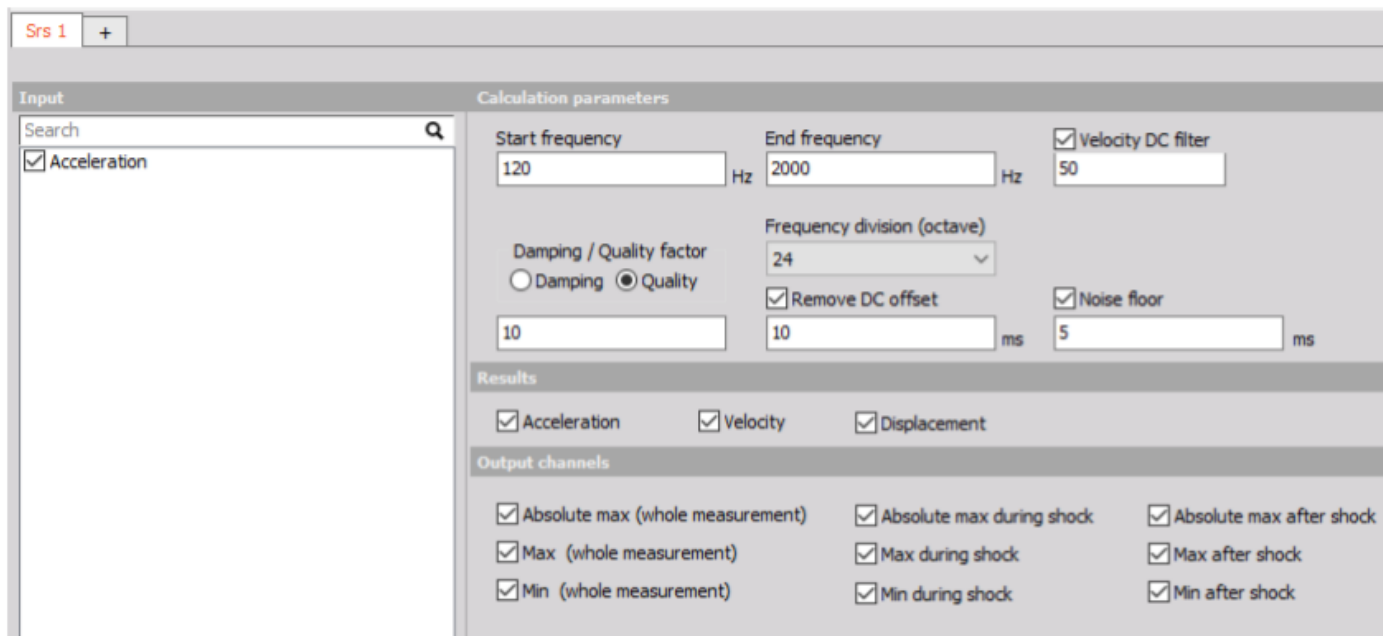


The channel cursor (yellow cursor) that indicates our position in the timeline of the datafile has to be placed at the beginning of the shock.

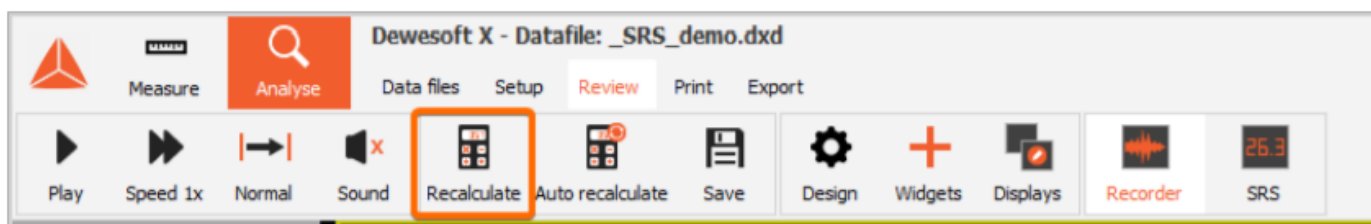


b) Setup the calculation parameters

The next step is to define the calculation parameters (frequency range, damping factor, output channels, ...).

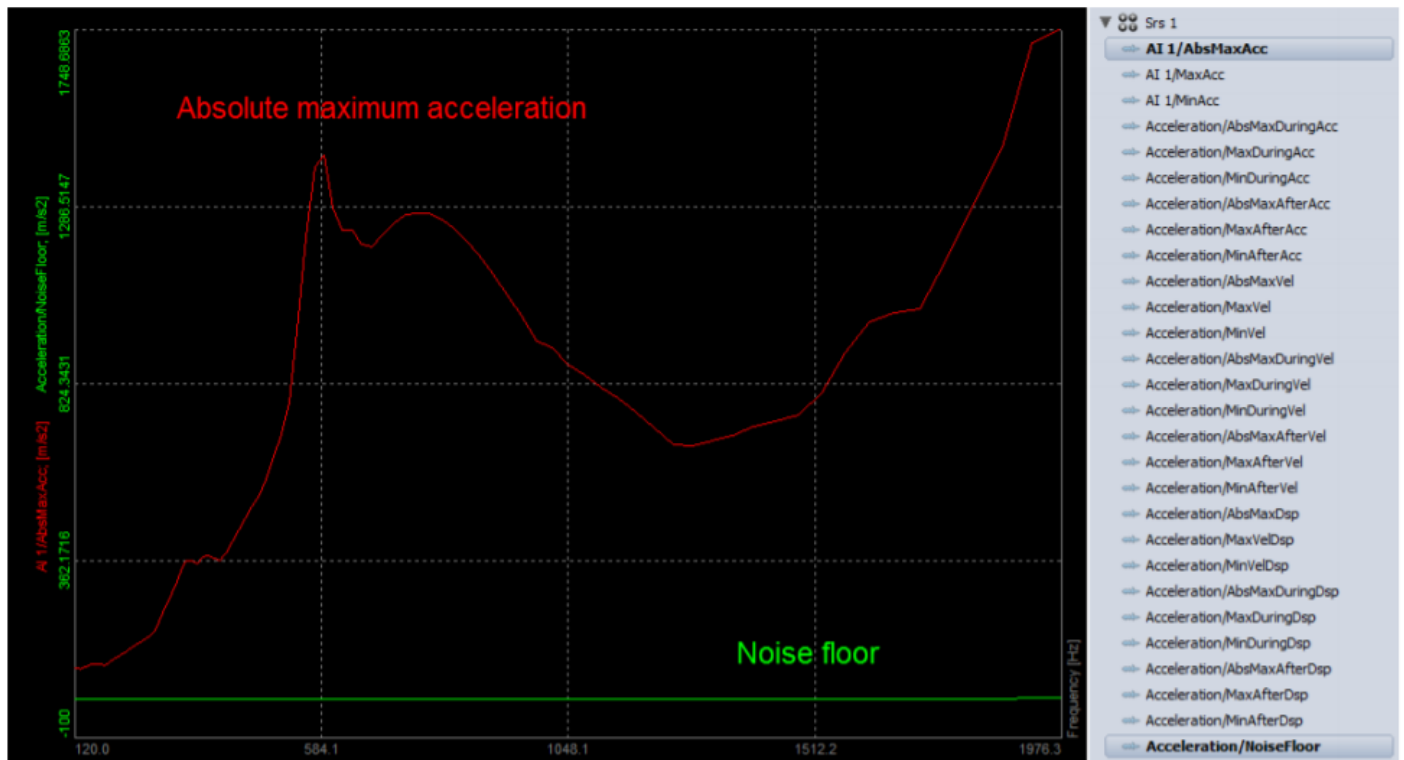


After the parameters and cursors are set, we need to Recalculate the data.



c) Displaying the results

The results of the spectrum are calculated in frequency domain and can be displayed on 2D graph ("ChannelName/VelocityHistory" is a time channel, displayed on the recorder). Under the channel list you can select the displayed channels.



About this document

This is the users manual for the SRS Shock Response Spectrum Math module.

Legend

The following symbols and formats will be used throughout the document.



Important

It gives you important information about the subject.
Please read carefully!



Hint

It gives you a hint or provides additional information about a subject.



Example

Gives you an example of a specific subject.

Warranty information

Notice

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The copy of the specific warranty terms applicable to your Dewesoft product and replacement parts can be obtained from your local sales and service office. To find a local dealer for your country, please visit <https://dewesoft.com/support/distributors>.

Calibration

Every instrument needs to be calibrated at regular intervals. The standard norm across nearly every industry is annual calibration. Before your Dewesoft data acquisition system is delivered, it is calibrated. Detailed calibration reports for your Dewesoft system can be requested. We retain them for at least one year, after system delivery.

Support

Dewesoft has a team of people ready to assist you if you have any questions or any technical difficulties regarding the system. For any support please contact your local distributor first or Dewesoft directly.

Dewesoft d.o.o.
Gabrsko 11a
1420 Trbovlje Slovenia

Europe Tel.: +386 356 25 300

Web: <http://www.dewesoft.com>

Email: Support@dewesoft.com

The telephone hotline is available Monday to Friday from 07:00 to 16:00 CET (GMT +1:00)

Service/repair

The team of Dewesoft also performs any kinds of repairs to your system to assure a safe and proper operation in the future. For information regarding service and repairs please contact your local distributor first or Dewesoft directly on <https://dewesoft.com/support/rma-service>.

Restricted Rights

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Printing History

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Safety instructions

Your safety is our primary concern! Please be safe!

Safety symbols in the manual



Warning

Calls attention to a procedure, practice, or condition that could cause the body injury or death



Caution

Calls attention to a procedure, practice, or condition that could possibly cause damage to equipment or permanent loss of data.

General Safety Instructions



Warning

The following general safety precautions must be observed during all phases of operation, service, and repair of this product. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the product. Dewesoft d.o.o. assumes no liability for the customer's failure to comply with these requirements.

All accessories shown in this document are available as an option and will not be shipped as standard parts.

Environmental Considerations

Information about the environmental impact of the product.

Product End-of-Life Handling

Observe the following guidelines when recycling a Dewesoft system:

System and Components Recycling

Production of these components required the extraction and use of natural resources. The substances contained in the system could be harmful to your health and to the environment if the system is improperly handled at its end of life! Please recycle this product in an appropriate way to avoid unnecessary pollution of the environment and to keep natural resources.



This symbol indicates that this system complies with the European Union's requirements according to Directive 2002/96/EC on waste electrical and electronic equipment (WEEE). Please find further information about recycling on the Dewesoft web site www.dewesoft.com



Restriction of Hazardous Substances

This product has been classified as Monitoring and Control equipment and is outside the scope of the 2002/95/EC RoHS Directive. However, we take care of our environment and the product is lead-free.

General safety and hazard warnings for all Dewesoft systems

Safety of the operator and the unit depend on following these rules.

- Use this system under the terms of the specifications only to avoid any possible danger.
- Read your manual before operating the system.
- Observe local laws when using the instrument.
- DO NOT touch internal wiring!
- DO NOT use higher supply voltage than specified!
- Use only original plugs and cables for harnessing.
- You may not connect higher voltages than rated to any connectors.
- The power cable and connector serve as Power-Breaker. The cable must not exceed 3 meters, the disconnect function must be possible without tools.
- Maintenance must be executed by qualified staff only.
- During the use of the system, it might be possible to access other parts of a more comprehensive system. Please read and follow the safety instructions provided in the manuals of all other components regarding warning and security advice for using the system.
- With this product, only use the power cable delivered or defined for the host country.
- DO NOT connect or disconnect sensors, probes or test leads, as these parts are connected to a voltage supply unit.
- Ground the equipment: For Safety Class I equipment (equipment having a protective earth terminal), a non-interruptible safety earth ground must be provided from the mains power source to the product input wiring terminals.
- Please note the characteristics and indicators on the system to avoid fire or electric shocks. Before connecting the system, please read the corresponding specifications in the product manual carefully.
- The inputs must not, unless otherwise noted (CATx identification), be connected to the main circuit of category II, III and IV.
- The power cord separates the system from the power supply. Do not block the power cord, since it has to be accessible for the users.
- DO NOT use the system if equipment covers or shields are removed.
- If you assume the system is damaged, get it examined by authorized personnel only.
- Adverse environmental conditions are Moisture or high humidity Dust, flammable gases, fumes or dissolver Thunderstorm or thunderstorm conditions (except assembly PNA) Electrostatic fields, etc.
- The measurement category can be adjusted depending on module configuration.
- Any other use than described above may damage your system and is attended with dangers like short-circuiting, fire or electric shocks.
- The whole system must not be changed, rebuilt or opened.
- DO NOT operate damaged equipment: Whenever it is possible that the safety protection features built into this product have been impaired, either through physical damage, excessive moisture, or any other reason, REMOVE POWER and do not use the product until the safe operation can be verified by service-trained personnel. If necessary, return the product to Dewesoft sales and service office for service and repair to ensure that safety features are maintained.
- If you assume a more riskless use is not provided anymore, the system has to be rendered inoperative and should be protected against inadvertent operation. It is assumed that a more riskless operation is not possible anymore if the system is damaged obviously or causes strange noises. The system does not work anymore. The system has been exposed to long storage in adverse environments. The system has been exposed to heavy shipment strain.

- Warranty void if damages caused by disregarding this manual. For consequential damages, NO liability will be assumed!
- Warranty void if damage to property or persons caused by improper use or disregarding the safety instructions.
- Unauthorized changing or rebuilding the system is prohibited due to safety and permission reasons (CE).
- Be careful with voltages >25 VAC or >35 VDC! These voltages are already high enough in order to get a perilous electric shock by touching the wiring.
- The product heats during operation. Make sure there is adequate ventilation. Ventilation slots must not be covered!
- Only fuses of the specified type and nominal current may be used. The use of patched fuses is prohibited.
- Prevent using metal bare wires! Risk of short circuit and fire hazard!
- DO NOT use the system before, during or shortly after a thunderstorm (risk of lightning and high energy over-voltage). An advanced range of application under certain conditions is allowed with therefore designed products only. For details please refer to the specifications.
- Make sure that your hands, shoes, clothes, the floor, the system or measuring leads, integrated circuits and so on, are dry.
- DO NOT use the system in rooms with flammable gases, fumes or dust or in adverse environmental conditions.
- Avoid operation in the immediate vicinity of high magnetic or electromagnetic fields, transmitting antennas or high-frequency generators, for exact values please refer to enclosed specifications.
- Use measurement leads or measurement accessories aligned with the specification of the system only. Fire hazard in case of overload!
- Lithium ion batteries are classified as not hazardous when used according to the recommendations of the manufacturer described in Battery Safety Data Sheet, which is available for download from [this link](#).
- Do not switch on the system after transporting it from a cold into a warm room and vice versa. The thereby created condensation may damage your system. Acclimatise the system unpowered to room temperature.
- Do not disassemble the system! There is a high risk of getting a perilous electric shock. Capacitors still might be charged, even if the system has been removed from the power supply.
- The electrical installations and equipment in industrial facilities must be observed by the security regulations and insurance institutions.
- The use of the measuring system in schools and other training facilities must be observed by skilled personnel.
- The measuring systems are not designed for use in humans and animals.
- Please contact a professional if you have doubts about the method of operation, safety or the connection of the system.
- Please be careful with the product. Shocks, hits and dropping it from already- lower level may damage your system.
- Please also consider the detailed technical reference manual as well as the security advice of the connected systems.
- This product has left the factory in safety-related flawlessness and in proper condition. In order to maintain this condition and guarantee safety use, the user has to consider the security advice and warnings in this manual.

IEC 61326-1 applies to this part of IEC 61326 but is limited to systems and equipment for industrial applications intended to perform safety functions as defined in IEC 61508 with SIL 1-3.

The electromagnetic environments encompassed by this product family standard are industrial, both indoor and outdoor, as described for industrial locations in IEC 61000-6-2 or defined in 3.7 of IEC 61326-1.

Equipment and systems intended for use in other electromagnetic environments, for example, in the process industry or in environments with potentially explosive atmospheres, are excluded from the scope of this product family standard, IEC 61326-3-1.

Devices and systems according to IEC 61508 or IEC 61511 which are considered as “operationally well-tried”, are excluded from the scope of IEC 61326-3-1.

Fire-alarm and safety-alarm systems, intended for the protection of buildings, are excluded from the scope of IEC 61326-3-1.

Documentation version history

Version	Date	Notes
1.0	15/12/16	Initial version
1.1	19/04/17	Added names for SRS instances
1.2	13/11/2019	Fixed max End frequency, updated pictures
1.3	19/02/2021	Fixed max Freq.
V21-1	22/09/2021	New template