V-Sensor FAQ

Last Updated on 03/05/2015

Contents

1. What is the accuracy of the sensor?

There is a difference between peak to peak resolution and noise. There appears to be noise in the sensor when the device is not vibrating, but actually once the device starts vibrating the noise will suddenly drop. Thus the peak to peak resolution is much cleaner than the noise.

For instance if the noise floor for a 2G mode is +/-10mG, the peak to peak resolution would be around +/-4mG.

Refer to the product specification for noise floor values (just note that peak to peak resolution is much cleaner).

2. What is the left hand graph of the screen?

That is the X axis filtered graph. We use that for detecting stations when the sensor is attached onboard the train.

3. When to use the 100G sensor?

Other than for measuring vibration peaks higher than 16G forces, the 100G force sensor can be used as a benchmark to compare with the data of 16G sensor to see whether the high peak is justified or not.

4. What happens if I forget to press the button during a test?

The device will run immediately after you turn on the switch so technically there is not need to press the button.

The button is only for balancing out gravity and start a new file for analysis. Therefore if you don't press the button, you will just see a DC offset signal curve.

5. Does multi sensor mode support ride comfort analysis?

Currently, multi sensor mode will only do the standard RMS (root mean squared analysis). If you have to do ride comfort analysis for multiple sensors placed in different locations, then you have to do them individually using Batch Mode and Report Generation (Onboard Ride Comfort ISO2631).

6. The sensor is designed for trains, can it work for vehicles and structures?

All the software and hardware are designed for both vehicles, trains, and structures (static elements). The software has an extra mode for detecting train stations so it will contain and extra window on the right hand side. Everything else is generic.

7. Why do we need to reset software every time after 1 analysis?

There are 2 gigabytes of data loaded into memory every time you run the sensor for more than a day, and as there is limited memory on some computers, it is recommended to free up the memory after 1 or 2 analysis.

8. Under batch mode, how do I know a report has been generated?

After report generation, there should be a confirmation message: "report created". Please have patience.

9. What is ride comfort analysis?

The RMS value calculated using ride comfort equations is different to the RMS calculated from standard formulas. Ride comfort analysis uses a special filter derived from ISO2631 which selects the majority of vibrations closest to 10Hz (the most uncomfortable frequency) so that the derived RMS is proportionally (in magnitude) to the comfort level of the passenger.
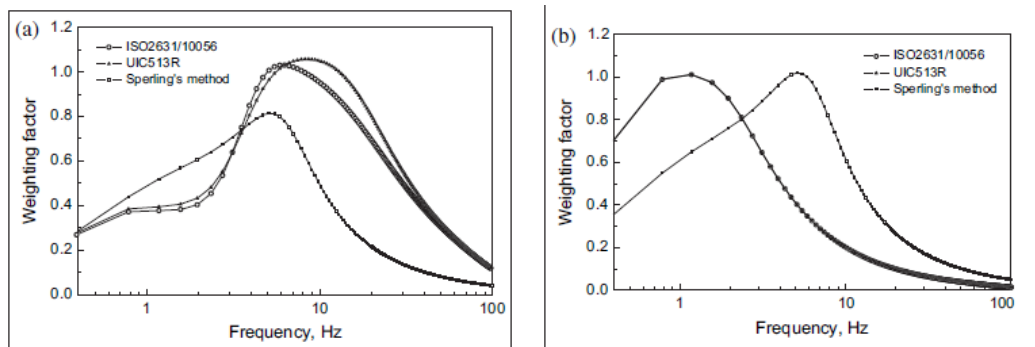

Fig. shows the frequency filter for different standards (including ISO2631) to get the RMS value: (a) vertical direction and (b) lateral and longitudinal directions

The evaluation criteria is shown in the table below.

It's the same for X / Y / Z RMS values calculated.

r.m.s vibration level	Perception
Less than 0.315 m/s^2	Not uncomfortable
0.315 m/s^2 to 0.63 m/s^2	A little uncomfortable
0.5 m/s^2 to 1 m/s^2	Fairly uncomfortable
0.8 m/s^2 to 1.6 m/s^2	Uncomfortable
1.25 m/s^2 to 2.5 m/s^2	Very uncomfortable
Greater than 2 m/s^2	Extremely uncomfortable

(evaluated under the plotted graphs)

Note that if the MacMinder filter was chosen (pre filter of 0.05Hz to 20Hz), this results in a smaller RMS value than that of ISO2631 filter which is between 0.5Hz to 80Hz. Thus, some companies such as Hong Kong railway use a more stringent filter criteria of 10mg and 13mg for vertical and lateral vibration respectively instead of the ISO2631 acceptance criteria.

10. Can we use the ride comfort filter for vehicles instead of trains?

Yes of course. When prompted, please select ISo2631 filter instead of the MacMinder filter.

11. What type of adhesive is recommended for installing the sensors?

- For high vibrating structures, it is recommended to apply Cyanoacrylate adhesive (e.g. Loctite 495) covering the entire base of the sensor. This type of adhesive does not take away the high frequency vibrations compared with standard epoxy.

    Advantages

    > Room temperature cure

    > Fast cure time(practically instant)

    > Broad frequency response and good temperature range

    Disadvantage

    > Need to use a hammer and wedge to remove or alternatively use a solvent (Loctite™ X-NMS or equiv.) to break glue bond down before removing accelerometer
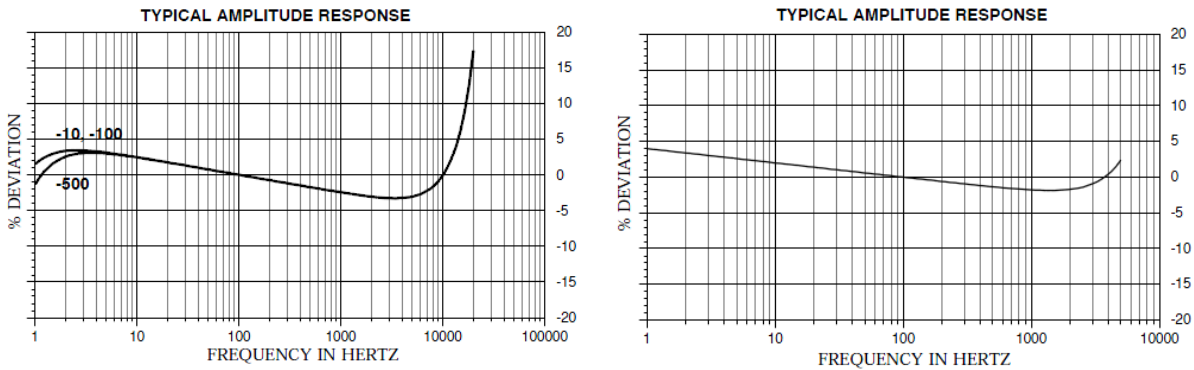
Fig. Frequency response test results for standard Cyanoacrylate adhesive (e.g. Loctite 495)

- For low vibrating structures in the order of milli G (when doing ride comfort analysis), it is recommended to apply double sided tape which results in the same results as applying adhesive. This is easier to install and take out compared with using adhesive)

12. How are train stations detected by the software?

After you have collected the vibration data, we want to detect when the train arrives to zero acceleration at a train station.

This is done automatically when you select train station detector from the menu and a threshold of the noise is taken i.e.
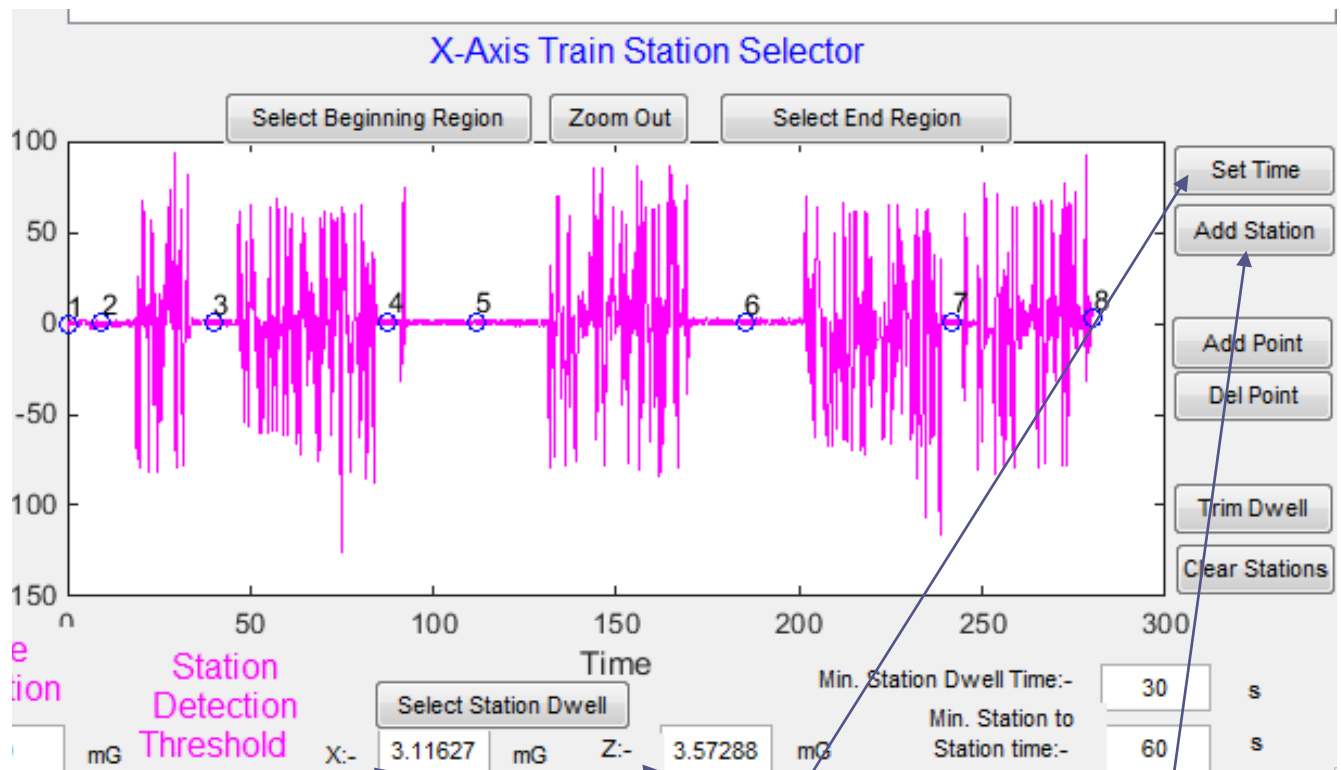
Thresholds

You should select the thresholds yourself using the "select station dwell" button then clicking on sample noise dwell twice which then automatically updates the thresholds shown above.

The software then uses computer vision algorithms to detect stations which are characterized by zero acceleration (near zero).

For cases when you want to manually enter the train stations, please use the buttons on the far right hand side to set the start time (of turning on your sensor) then enter the station arrival times manually.