RVSD Shaker System Characteristics and Performance

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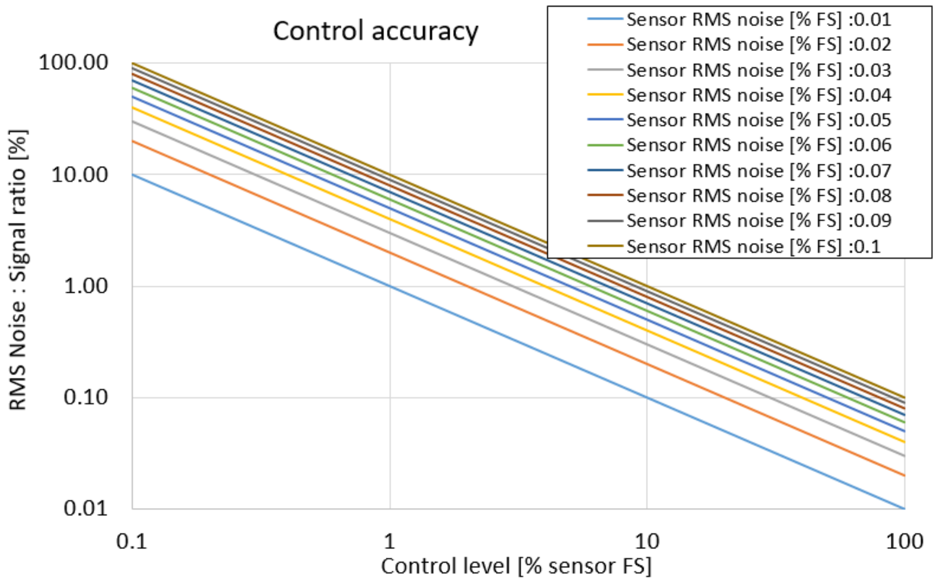
Product overview

Our suite of vibration shaker controllers are designed to be used on new or existing shaker or vibration tests systems including electrodynamic, servo-hydraulic and electric (servo-motor) shakers. Dynamic motion is controlled in accordance with the feedback sensor used. In most cases, this is an accelerometer but, in special circumstances, displacement and velocity (rate) feedback can be used. The controller's performance is influenced by the characteristics and performance of the hardware (shaker, amplifier and feedback sensor). Specifically:

- Best control is achieved if the linearity of the shaker (actuator) is high; that is, when there is there is minimum distortion of the signal. For instance, if a sinusoid command signal is generated, the resulting motion should be as pure a sinusoid as possible (minimal distortion) at the same frequency with no or very small harmonics.
- Best control is achieved where the coherence spectrum of the shaker system is high (greater than 0.95). Control at frequencies where coherence is lower than 0.95 is possible but accuracy will be compromised.
- The magnitude Frequency Response Function (FRF) of the shaker system should be as flat as practically possible (sufficient damping) across the frequency range of interest. Where resonances are unavoidable, it is important that these are not excessive (very low damping).
- While it is recognised that the dynamic characteristics of shaker systems can with vary as a function of test load, it is important that the variations in dynamic characteristics due to environmental conditions (such as oil temperature and pressure for servo-hydraulic systems and temperature for electrodynamic systems) are kept to a minimum. This is particularly important if the system FRF has a large resonant peak (low damping).
- It is important that the shaker is properly mounted. Usually that involves the use of a seismic (or reaction) base which is, itself, supported by suitably compliant mounts such as airbags. The seismic base needs to be carefully designed so that its (rigid body) resonant frequency fall swell outside the frequency range for which the shaker system will be used. Further, if resonance is within or close to the operational frequency range, it is critical that sufficient damping exists to ensure that the effect of resonance on the shaker's operation is mitigated.
- The dynamic range of the feedback sensor should match (that is be only slightly greater) than the expected maximum acceleration to be generated by the system while the noise level should be minimal. The chart below shows how the noise:signal ratio affects control accuracy.
- The frequency response of the feedback sensor should exceed the frequency range of the expected vibrations to be generated.



Control accuracy
Sensor RMS noise [% FS] :0.01
Sensor RMS noise [% FS] :0.02
Sensor RMS noise [% FS] :0.03
Sensor RMS noise [% FS] :0.04
Sensor RMS noise [% FS] :0.05
Sensor RMS noise [% FS] :0.06
Sensor RMS noise [% FS] :0.07
Sensor RMS noise [% FS] :0.08
Sensor RMS noise [% FS] :0.09
Sensor RMS noise [% FS] :0.1
100.00
10.00
1.00
0.10
0.01
RMS Noise : Signal ratio [%]
0.1
1
10
100
Control level [% sensor FS]