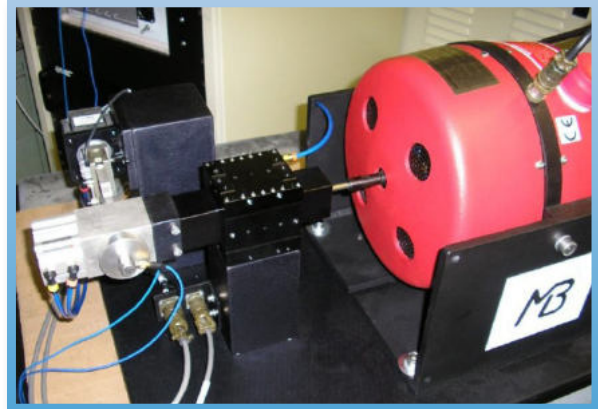


### System Specifications

- Performs & supports all **Jobs-To-Be-Done** (see below list) quickly & accurately, minimizing human error, by automatically making controlled TS measurements, while helping end-users to determine:
  - o Maximum transverse sensitivity
  - o Radial direction, or polar coordinates
- Complies with ISO 16063-31, "Testing of transverse vibration sensitivity, Section 4, Determination of transverse sensitivity using a single-axis vibration generator."
- MB Dynamics Modal 110 calibration exciter for device undertest (DUT) transverse sensitivity (TS) measurements
- Maximum DUT weight: 0.9 kg
- DUT test frequency range: 30 Hz to 2000 Hz
- Maximum acceleration with 10 gram DUT: 10 g's peak



MB Modal 110 Calibration Exciter with TS Fixture and TS Rotator, with 1.5" (38 mm) p-p max. stroke; 1.6" (41 mm) between stops

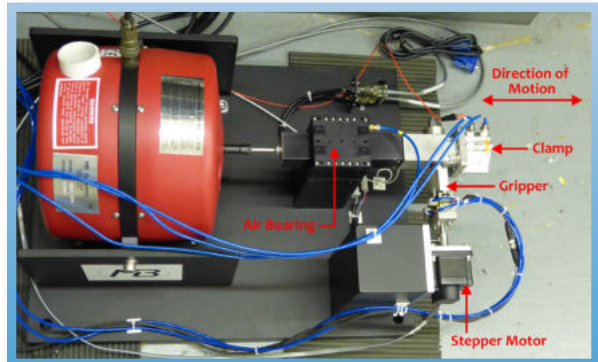
### Jobs to be Done:

- Automatically rotate sensor & acquire data at different rotational angles about its sensing axis
- Measure frequency-based TS at any user-selectable frequencies from 30 Hz to 2000 Hz
- Report the amplitude in % of nominal sensitivity & the radial direction of maximum TS
- Print amplitude vs. frequency plots & typical "figure 8" shaped polar plots
- Automatically position sensor with its radial direction of maximum TS pointing "UP", for marking purposes
- Archive TS measurement data in the same database created during normal Win475 frequency-based calibrations

### Deliverables and Test Procedure:

The Win475-TS option transforms TS measurements, with its capabilities to measure at multiple, user-selectable frequencies, helping end-users to reduce measurement uncertainty. These include both low frequencies for servo, seismic & modal accelerometers, and high frequencies for general-purpose sensors. Frequency-response plots of the Win475-TS option will show TS amplitude variances. TS calculations are made based on a thoroughly-tested algorithm that automatically rotates & measures at four complimentary pairs of angles. It then performs vector math on that data, applying narrow-band, frequency-domain filtering, just like normal Win475 calibrations.

This option is fully automatic, so the user must only input transducer properties & select the first frequency, in order for the software-controlled TS measurements to follow. A stepper-motor-actuated TS Rotator positions the DUT. The TS Fixture with air clamp firmly holds the DUT and its rotational cylinder in place during each data acquisition step. The MB Dynamics Modal 110 calibration exciter provides the necessary vibration inputs. No special signal conditioning is needed beyond what is normally supplied with the Win475. Upon concluding a test, the TS Rotator positions maximum sensitivity vertically so that the user can mark the transducer for future reference. The software then displays sensitivity as a percentage, with the angle displayed as a function of degrees from starting location. Other frequencies may then be repeated as needed. Results are archived as part of that DUT's Win475 calibration history.

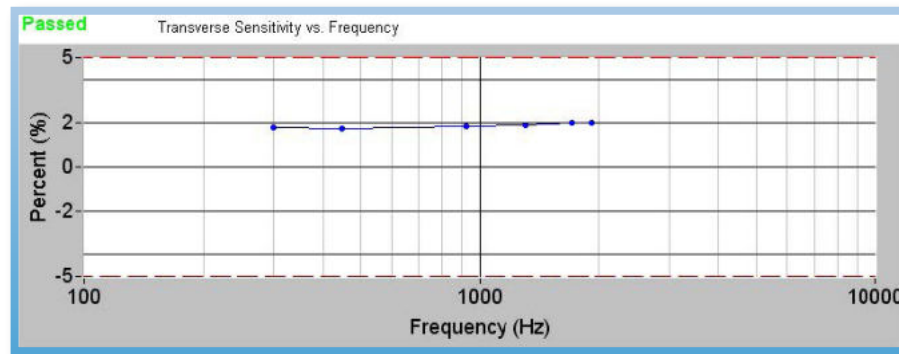


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### Typical MB Win475-TS Reproducibility Results: 300 Hz to 1900 Hz for MB Dynamics Modal 110 Calibration Exciter with TS Fixture and TS Rotator

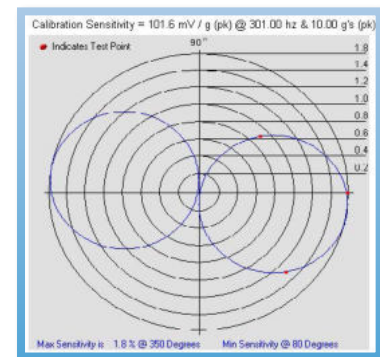
Sensor S/N	Sensitivity	Sensor Mass	No. of measurements	Amplitude Mean	Amplitude Std. Dev.	Angle Mean	Angle Std. Dev.
1685	102.3 mV/g	10 gm	115	1.95 %	0.23 %	-7°	4°
1813	100.3 mV/g	10 gm	92	0.44 %	0.14 %	4°	13°
1610166	1.23 pC/g	25 gm	68	1.04 %	0.31 %	170°	5°
1502	100.5 mV/g	10 gm	74	5.62 %	0.47 %	10°	2°

### MB Win475-TS Typical Results

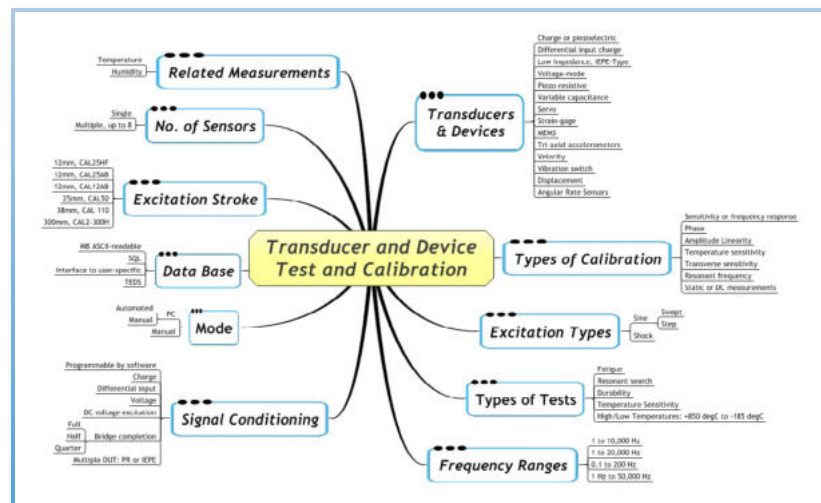


Typical plot created by Win475 software showing one measurement at each frequency step for S/N 1685 (see Reproducibility table above). All data collected at 10 g's peak, nominally 100 m/s<sup>2</sup> of vibration amplitude. Frequency range available is 30 Hz to 2000 Hz at 10 g's. Experimental data were also collected at 15 g's and 20 g's peak, respectively, with no apparent improvement in signal-to-noise ratio, or reduction in measurement uncertainty.

Polar plots for S/N 1685 (in above table) show the maximum transverse sensitivity amplitude and radial direction from the known starting position for a given frequency and vibration amplitude. The red dots below show the data points used to compute the "figure 8" shape from which amplitude and angle are computed.



### The Win475 Vision Map for the Testing and Calibration of Transducers and Devices



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MB-WIN475TS-1118