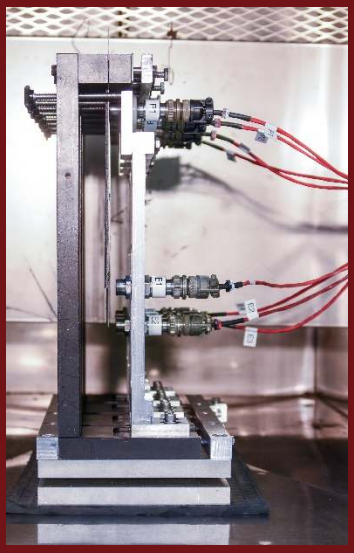
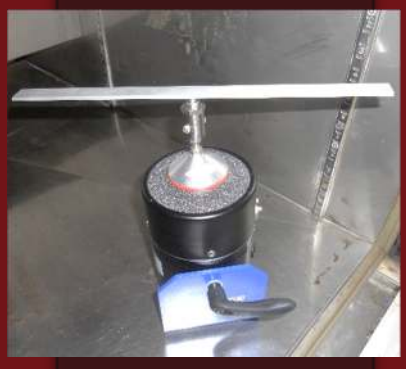




K&STLE DAMP®

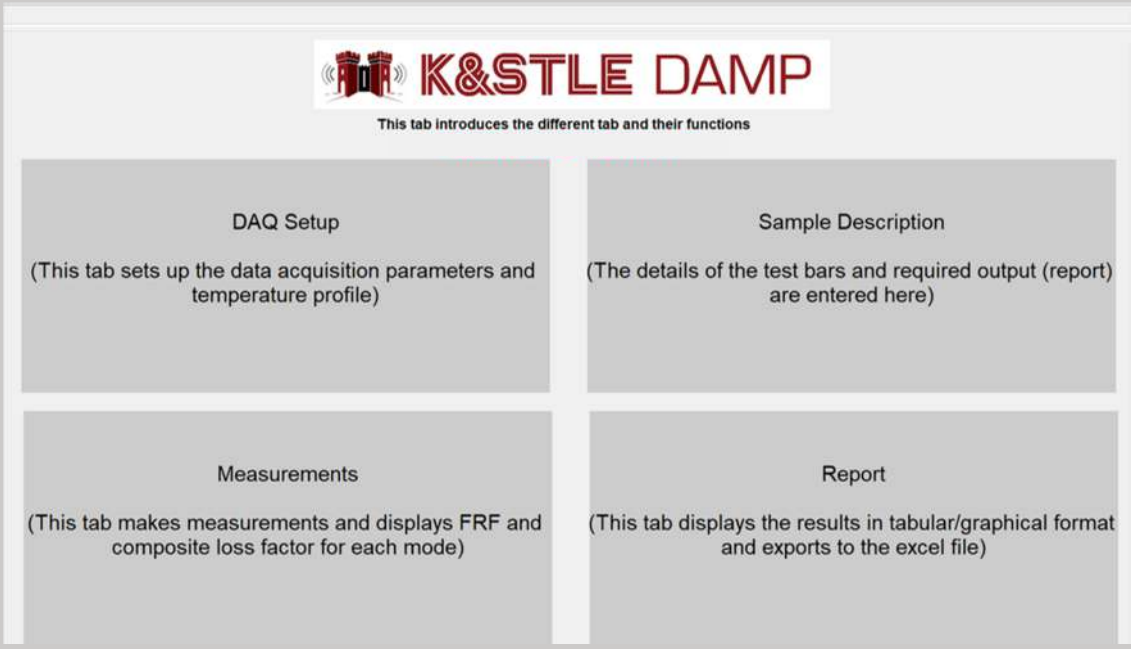
AUTOMATED OBERST BAR AND CENTERPOINT DAMPING TEST SYSTEM

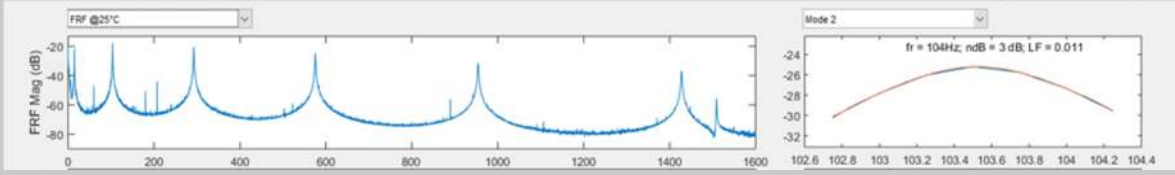
K&STLE DAMP® is a registered automated vibration damping measurement system with the option to do Oberst bar damping test and/or mechanical impedance-based CenterPoint damping test. The device uses simple, practical, and user-friendly GUI software to conduct measurements.

Once the test samples are installed for the testing, the device allows measurements to be conducted unattended. Once all the measurements are done, the operator not only has the data in a final report form but also can review the performance of each measurement.

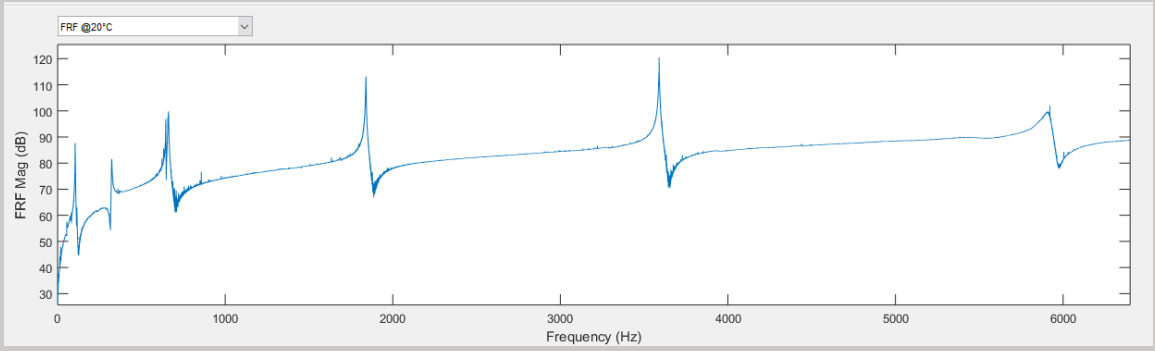
- Oberst Bar Test per SAE J1637
- Mechanical Impedance (CenterPoint) Test per ISO 16940 (SAE J3130 coming)

Below is the building block of the automated test setup





Oberst bar test FRF and mode curve fitting

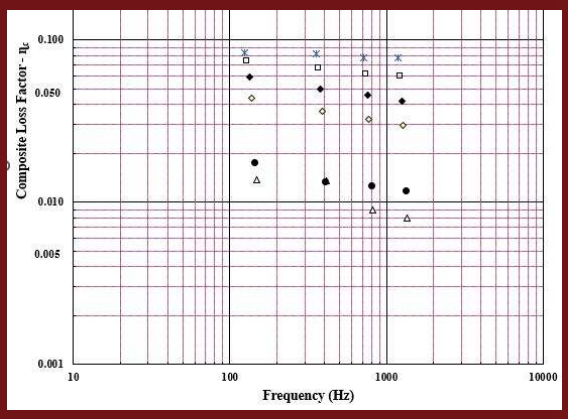


CenterPoint test response function

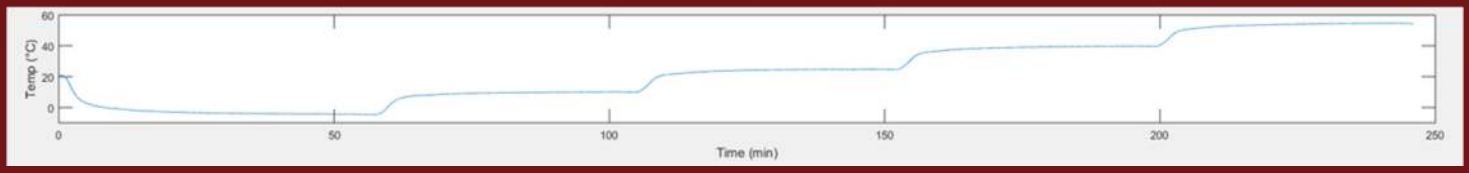
K&STLE DAMP®

AUTOMATED OBERST BAR AND CENTERPOINT DAMPING TEST SYSTEM

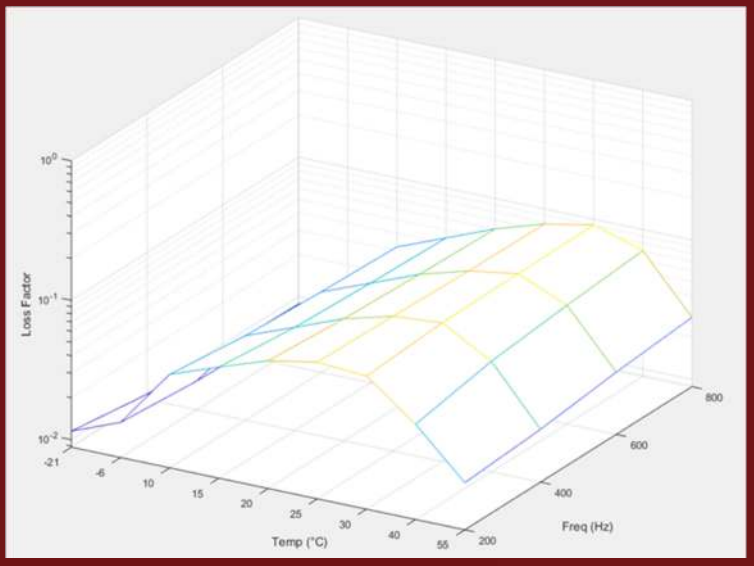
Temperature	Frequency (Hz)	Loss Factor
Modes @ -2...	153	0.012
	429	0.009
	845	0.009
	1399	0.008
Interpolated ...	200	0.01
	400	0.01
	600	0.01
	800	0.01
Modes @ -6°C	150	0.017
	421	0.014
	829	0.013
	1375	0.012
Interpolated ...	200	0.02
	400	0.01
	600	0.01
	800	0.01
Modes @ 10°C	142	0.045
	402	0.036
	795	0.032
	1320	0.029
Interpolated ...	200	0.04
	400	0.04
	600	0.03
	800	0.03
Modes @ 15°C	138	0.06
	393	0.049
	779	0.044
	1295	0.042
Interpolated ...	200	0.06
	400	0.05
	600	0.05



- Automated measurement system
- Easily readable display of resulting frequency response functions (FRFs)
- User friendly display of individual mode computations of resonant frequencies and composite loss factors
- Determination of composite modulus, limited material property, bending rigidity ratio, and more
- Communication between software and temperature chamber as well as graphical real time display of the temperature profile during testing



- Tabular and Graphical results of damping measurements displayed on queue immediately after testing is completed
- 3-Dimensional display (carpet plot) of measured data to visually represent loss factor with temperature and frequency
- Exported data from K&STLE DAMP® software to Excel for easy access of measured data



Kolano and Saha Engineers, Inc.
3559 Sashabaw Road
Waterford, MI 48329-2656
248.674.4100
www.kandse.com