



WHITE PAPER

The Critical Role of Torque Sensors in High Precision NVH Testing

Noise, Vibration and Harshness (NVH) testing evaluates the acoustic and vibrational characteristics of components, helping manufacturers to ensure quality and detect even smallest defects or abnormalities that could affect performance and customer experience. With the shift to electric drivetrains, NVH testing has become more important, as small variations in tonal and vibration are far more noticeable.

Discom by HBK provides leading solutions for analyzing NVH phenomena and identifying a wide range of damage patterns in the device under test. Alongside powerful analytics and algorithms, choosing the right sensors is essential for achieving the best results, especially in applications such as gearbox testing.

Which sensors are needed for what purpose?

Vibration sensors/accelerometers	Acoustic sensors/microphones
<ul style="list-style-type: none"> • Gear mesh frequency • Imbalance • Misalignment • Bearing damage • Contamination 	<ul style="list-style-type: none"> • Gear mesh noise • High-frequency noise
Speed sensors/encoder	Torque sensors/flange or shaft
<ul style="list-style-type: none"> • Gear mesh order tracking • Mesh frequency vs. speed mapping • Pass / Fail across speed ramps 	<ul style="list-style-type: none"> • Mesh and order amplitude • Imbalance • Misalignment • Identify loose parts

Why is torque measurement crucial to NVH testing?

Depending on the torque level, the mechanical contact between the gears – including tooth load sharing and the contact pattern – changes, which in turn affects the generated noise characteristics. Torque is used as a control value to assess dyno repeatability and to distinguish component-related noise from noise caused by factors such as torque fluctuations. In addition, low or reversing torque can generate backlash and cause “rattle.”

Two gearboxes look the same under no-load test but can dramatically differ under torque. That’s why accurate and reliable torque measurement is not nice to have but an important an integral part of NVH gear box testing.

Why is speed measurement important to NVH testing?

Accurate speed measurement is a fundamental requirement in NVH testing. It ensures that acoustic and vibration data can be correctly interpreted and compared across different test objects.

There are three key reasons why speed measurement is critical for Discom systems:

1. Influences acoustic phenomena

Rotational speed directly affects acoustic behaviour. In certain speed ranges, resonances can dominate and mask the true acoustic characteristics of the unit under test. Knowing the exact speed helps identify and account for these effects.

2. Enables order analysis

Speed measurement allows for order-based analysis (for example, 1 × speed, 2 × speed). This makes it possible to compare different aggregates independently of their operating speed, even when speed fluctuations occur during testing.

3. Supports synchronous analysis and root cause investigation

Discom systems rely on speed data to perform synchronous analysis. This capability is essential for pinpointing the root causes of NVH issues, as it aligns vibration and noise signals with rotational events for deeper diagnostic insights.

All HBK torque transducers are available with a reliable, proven in use integrated speed encoder. Our in house testing ensures full signal integrity and seamless system compatibility with the Discom NVH unit.

	GOOD	BETTER	BEST
	T40Lite	T40B-T110/T100	T12HP
Accuracy class	0.08	0.05/0.03	0.02
Integrated speed system	256 pulse/rev.	1024/<8192 pulse/rev.	360/720 pulse/rev.