MODAL TESTING FOR STATOR END-WINDINGS

by OROS
MEASURING NOISE & VIBRATION

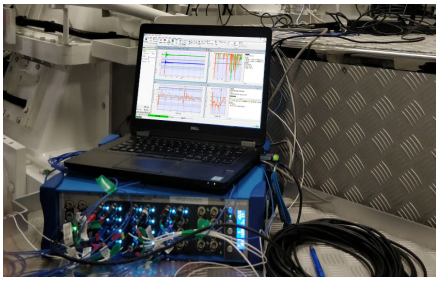
EXTEND THE RELIABILITY OF YOUR ASSETS

End-winding tests are essential for evaluating the structural integrity and performance of stator windings in large electrical machines. They are invaluable tools in both manufacturing and maintenance contexts.

End-winding testing is governed by the standard IEC TS 60034-32:2016, which provides detailed guidelines for conducting thorough assessments to ensure reliability. This standard introduces two key techniques:

Driving Point Analysis (DPA)

DPA measures the vibrational behavior of each individual stator end-winding, excited by an impact hammer. This method enables the detection of potential issues by checking for eigenmodes in the vicinity of electrical harmonics #1 and #2.



Experimental Modal Analysis (EMA)

EMA verifies the natural frequencies and mode shapes of electrical machines globally, aiming to mitigate heightened vibration levels. It involves measuring transfer functions and identifying dynamic properties through impact tests and accelerometers. It is crucial that global modes are kept clear of electromagnetic field harmonics.

Why choosing OROS End-Winding solution?

Teamwork instruments – 4-32 channels portable, flexible and rugged systems, made for the field with high-end metrology capabilities.

Guided by a sequencer – An Excel-configurable sequential guidance tool makes it easy to measure end-winding numbers, track progress, and redo measurements as needed.

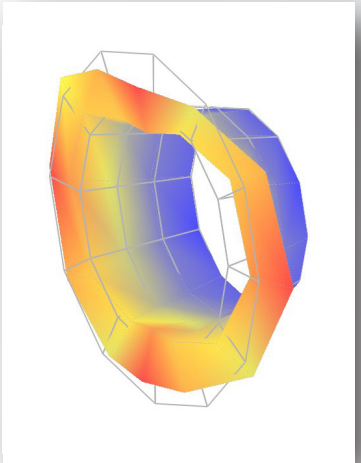
Smart marker – Works in real-time on every new FRF. Advanced algorithm extracts amplitude, phase, and damping of each peak in frequency ranges near electrical harmonics, providing precise insights effortlessly.

Auto-reporting – Easily export vital data provided by Max Marker to your pre-defined reports in Word & Excel. This seamless export occurs after each measurement or during post-processing.

Data check tool – Featuring algorithms for automatic detection of double impacts and overloaded signals. It also offers a manual mode for sensitive test conditions.

Circular mode shape animation – Visualize deformations experienced by the generator at resonant frequencies, enhancing understanding and analysis.

Modes identification – In addition to the Narband method (peak-picking), the Broband method offers CMIF and Stability Diagram. Based on the frequency domain p-LSCF method, data can be curve-fitted to extract modal parameters.



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DRIVING POINT ANALYSIS (DPA) PACKAGE

PK-04-FFT	O4-INST-4	O4 4 ch. USB compact analyzer - Instrument pack
	ORNVG-FULL-4-I	4 ch. NVGate full platform, incl. MON-I, WTF-I, REC-I, instrument locked license
	ORNV-FFT-4-I	4 ch. Narrow band FFT analysis, instrument locked license
	ORNV-XFT-4-I	4 ch. FFT Cross functions (FRFs, Coherences) add-on, instrument locked license
Recommended Transducers	Triaxial accelerometer	IEPE triaxial accelerometer, 100 mV/g
	Impact hammer	IEPE impact hammer, 0.23mV/N, 1.1 kg, soft tip

Main Specifications

Inputs	4 inputs, range ±100 mV to ±40 V	Dimension	185x110x35 mm (7.2x4.3x1.3 inch)
Coupling	AC/DC/IEPE/TEDS/FLOAT	Weight	534g (1.17 lbs)
Sampling	2.048 kS/s to 256 kS/s, 24 bits ADC	FFT analysis	101 to 25601 lines, adjustable band power tracking
Accuracy	Phase ±0.02°, ampl. ±0.02 dB, dyn. 140 dB	Auto-reporting	Current winding nb, direction and tracked peaks stored in real-time

EXPERIMENTAL MODAL ANALYSIS (EMA) PACKAGE

PK-OR36-EMA	OR36-INST-16	OR36 16 ch. Teamwork instrument pack
	ORTW-MCBL-Loc	Teamwork instrument mains power cable
	ORNVG-FULL-32-I	32 ch. NVGate full platform instrument locked license. Incl: MON-I, WTF-I, REC-I
	ORNV-FFT-32-I	32 ch. Narrow band FFT analysis Instrument locked license
	ORNV-XFT-32-I	32 ch. FFT Cross functions (FRFs, Coherences) add-on Instrument locked license
	ORNVS-MOD-EMA-32-I	32 ch. Experimental Modal Analysis Narband&Broband Instrument locked license
Recommended Transducers	Triaxial accelerometer	IEPE triaxial accelerometer, 100 mV/g and 500 mV/g
	Impact hammer	IEPE impact hammer, 0.23mV/N, 1.1 kg, soft tip

Main Specifications

Supported networks	WAN (Internet) / LAN (Company) / Wi-Fi (Wireless)	Powering	AC supply: 100 to 240 VAC 50/60 Hz DC supply: 12 V to 28 V Internal battery NiMh, 2h autonomy
Dimension	114 mm x 280 mm x 325 mm (4 1/2" in x 11 1/32" in x 12 25/32" in)	Input IEPE coupling	IEPE :2 mA or 4 mA power supply with AC coupling (±10%)
Weight	5.6 kg to 6.1 kg (12.3 lb to 13.4 lb)	Narrow band analysis (FFT)	Real-time FFT analysis up to 25601 lines
Cascade	Switchless daisy-chain / Mixed analyzer's type	Spectral dynamic range	> 140 dB

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Instruments - Software - Services

Range of portable Teamwork instruments from 4 to 1000+ channels completed by a powerful and flexible range of applications with a comprehensive software suite (acoustics, structural dynamics, rotating analysis).