Doble Off-Line Testing & Assessment

M5500

Sweep Frequency Response Analyzer

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SFRA Tool for Detecting "Hidden" Transformer Faults

The M5500 Sweep Frequency Response Analyzer (SFRA) is the newest generation of SFRA diagnostic instrument from Doble. With incredibly fast sweep speed and expanded dynamic range, you can use the Doble M5500 test set to investigate the mechanical integrity of transformers, reactors, and other equipment with windings. Coupled with the ease-of-use and powerful features of the new SFRA v6 Software, conducting SFRA testing and analysis of your apparatus has never been easier or more productive.

If you can measure the frequency response of a transformer, then you can identify physical movement and other issues with the winding, core, and connections.

The M5500 sends an excitation signal into the transformer and measures the returning signals. Comparing this response to baseline readings and test results from similar units allows you to identify deviations and confirm internal mechanical problems.

The M5500 reduces the uncertainty about apparatus condition by providing solid evidence of mechanical integrity or winding movement. Use it to help determine how a transformer is deteriorating, if it can go back into service after a fault, or if it has been damaged during transit.

Specify Doble SFRA baseline testing as part of the factory test for your new transformer and call for retest at every major transportation mode change or crane lift. Use it after system faults and during routine testing as part of your diagnostic toolkit.

FEATURES

- Lightweight and rugged portable test instrument
- Typical sweep speeds between 15 and 30 seconds for reduced overall testing time
- Default frequency range of 20 Hz to 2 MHz, expanded range from 10 Hz to 25 MHz
- Dynamic Range > 150dB
- Wired or wireless connection to the controlling PC
- Includes new SFRA v6 Software for control and analysis
- "CE" mark indicating electromagnetic compliance, safety, and hazardous substances

BENEFITS

- Ensure transformer performance, reduce maintenance costs and increase the service life of transformers
- Identify problems such as core movement, winding deformation and displacement, faulty core grounds, partial winding collapse, hoop buckling, broken or loose clamping structures, shorted turns and open windings
- Use as part of your regular maintenance program or any time you suspect a problem
- Measurements are highly repeatable so even subtle changes can be used for diagnostic purposes

M5500 TECHNICAL SPECIFICATIONS

EXCITATION SOURCE	
Channels	1
Frequency Range	10 Hz – 25 MHz user defined ,within instrument frequency range
Output Voltage (pk-pk into 50 Ohms)	User selectable between 10 V (default) and 2.5 V
Output Protection	Short circuit protected
Source Impedance	50 Ohms
MEASUREMENT CHANNELS	
Channels	2
Sampling	Simultaneous
Frequency Range	10 Hz – 25 MHz
Max. Sampling Rate	100 MS/s
Input Impedance	50 Ohms
Recommended Calibration Interval	1 year
DATA COLLECTION	
Test Method	Sweep Frequency
PC Comm	USB/Wireless
Frequency Range	20 Hz - 2 MHz (default), user defined within instrument frequency range
Number of Points	1045 points (default) 5000 points max per decade (log) 32,000 points max (linear)
Dynamic Range (20 Hz - 2 MHz)	>150 dB
IF Bandwidth	<10% of measurement frequency, adaptive
Point Spacing	Variable, Linear or Logarithmic
DATA DISPLAY/EXPORT/ANALYSIS	
Tabulation	Frequency/Magnitude/Phase
Export Formats	CSV/IEC/CIGRE, SFRA v5
Plotting	Frequency vs. Magnitude/Phase/ Impedance/Ratio
Analysis	Difference, Cross-Correlation, Leakage Channel, Ratio
PHYSICAL SPECIFICATIONS	
Dimensions	12.25 x 9.5 x 3.7 in 31 x 24 x 9.4 cm
Weight	7 lbs (3.2 kg)
Power Supply	24 VDC (40 W Universal AC in power supply)
Temperature	-25° to + 55°C operating -40° to + 85°C storage
Relative Humidity	0% to 95% non condensing

TEST LEADS CONSTRUCTION

Integrated three lead system in single cable set
Standard (362 kV and below): 60 ft/ 18 m
Optional (> 362 kV): 100 ft/ 30 m
IEC Method 1 kits also available

M5500 RANGE

The M5500 provides a frequency response measurement from 10 Hz to 25 MHz. Doble recommends the default setting of 20 Hz - 2 MHz for transformers as there is limited diagnostic value in measurements outside of this range. The diagnostic frequency range of 20 Hz to 2 MHz covers the most important diagnostic areas:

- Core and Magnetic Properties
- Winding Movement and Deformation
- Interconnections – Leads and Tap Changers

M5500 RESOLUTION

The M5500 measures the frequency response at intervals controlled by the user. The default Tuned Frequency list ensures frequency distribution consistent with other Doble SFRA instruments and compliance with IEC 60076-18. The instrument can also be set to use logarithmic or linear scaling. A constant excitation level is maintained for each frequency measurement. The M5500 has the ability to auto-scale each frequency measurement and optionally apply adaptive filtering—providing an overall dynamic range of >150 dB in the default frequency range.

COMPLIANCE	
Electromagnetic Compatibility (EMC)	EN 61326-1:2013 EN 55011 Class A Group 1 EN 61000-4-2,3,4,5,6,8,11
Environmental	1 IEC 60068-2-1,2,6,27,30,31
Safety	IEC 61010-1 EN 61010-1 UL 61010-1 CAN/CSA C22.2 No. 61010-1-12
RoHS	Directive 2011/65/EU with amendment 2015/863/EU

ORDERING INFORMATION

PART #	PRODUCT
M5500	Doble M5500 Sweep Frequency Response Analyzer
	Includes test set, power supply, AC power cord, USB cable, and reference box in a rugged carry case. Also includes soft carry bag with 60 ft. standard SFRA test lead, shorting leads, extra clips, and safety ground cable. License for two users of SFRA Software v6 Professional provided with each instrument.

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