

Ring coil - Measuring the stator cores

Electric motor performance is dependent on several parameters, including the magnetic characteristics of the stator. One of the major drawbacks in effectively predicting the motor behaviour is that the magnetic characteristics of the material are generally provided or measured not on the finished product, but on laminations before cutting or assembly, operations that can degrade or otherwise change their quality. With increased focus on efficiency of the electric motors, it is imperative that the magnetic property along with the losses associated with stator core are correctly and rapidly evaluated.

The classical method consists of simplifying the shape of the rotor as a ring and make manual measuring and excitation windings on it. This operation is time-consuming and can be done only in laboratory on selected products.

LE's latest offering 'Ring Coil' eliminates the need of manual winding operation, allowing the operator to measure the stator magnetic characteristics 100% in line, during automated production. The result from the software gives complete magnetic information of each stator and permits comparative and statistical analysis of the production.

KEY BENEFITS

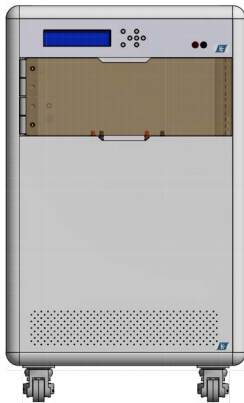
- Total quality control of the electric motors
- High efficiency, increase performance
- No more manual windings
- Reduce the time of measurements
- Safety because it is not necessary to handle large stators for winding
- No counting errors in the number of turns
- Multiple winding selection to optimize low/high frequency or level measurements
- Automatic measurement of complete DC or AC hysteresis loop, normal magnetization curve, permeability curve
- The measuring cycle is fully automatic and is controlled by Laboratorio Elettrofisico exclusive software (Neon 2.0), resulting in complete characterization of the material under test
- Remanence B_r , coercivity H_c , saturation values H_{sat} , B_{sat} , J_{sat} , cycle area, relative permeability, losses, losses separation, etc.
- International Standards: IEC 60404-4, IEC 60404-6, ASTM A596, ASTM A927

SYSTEM CONFIGURATION

The system containing:

- Fluxmeter
- Arbitrary Function Generator
- Power amplifier
- Fast Acquisition Unit cabinet (AMH-50K-S)
- Platform for different size of stators
- Monitor HMI with dedicated software
- PIN for high currents

MODEL DIMENSIONS



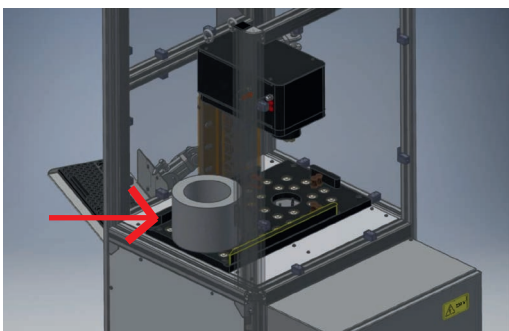
AMH-50K-S

L543 x W830 x H889 mm
L21" x W32.6" x H35"

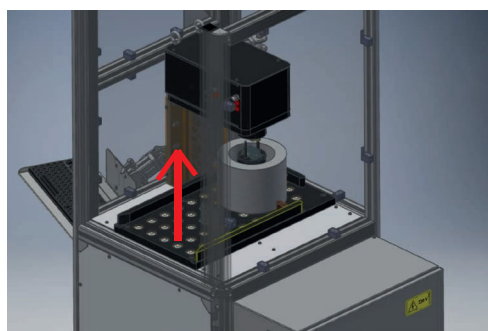
Weight 160 kg - 352 lb

HOW IT WORKS

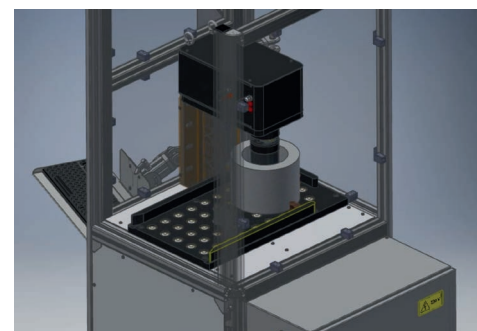
The measuring and excitation turns are fixed in an openable connector, that easily permits the insertion of the stator. The insertion of the stator can be done manually or automatically by the production line, while the closure, selection of turns and measure are completely managed by the Ring-Coil bench. The total turns can be switched in different sets, so that their number match in the best way to the different measuring conditions (low/high frequency, low/high field levels). Everything is done in complete safety way, with protections preventing any possible danger to the operators or the equipment.



Positioning



Closing



Measuring

TECHNICAL SPECS

GENERAL

AMH-50K-S

Frequency range	DC - 50 kHz
Max power	6600 VA peak
Frequency Ring coil	50 kHz*
Measurable materials	Soft Magnetic Materials
Measurable quantities	Bsat, Jsat, Hsat, Br, Hc, cycle area, μ_{rel} , specific losses P, losses separation
Measurable shapes	ID up to 100 mm - OD up to 300 mm - h 200 mm
Test time	15 secs (typical)
Operating T range	15-40 °C
Weight Stator (max)	200 kg
Max measurable B	no limitation
Waveform	Sinusoidal

ACQUISITION UNIT

ADC Resolution	12 bits
Sampling rate	2 GS/s
Max voltage range	± 20 V

FUNCTION GENERATOR

Frequency	1 μ Hz to 20 MHz (1 μ Hz resolution) max measuring frequency is limited by acquisition unit
Voltage amplitude	20 mVpp to 20 Vpp (4 digit resolution)
Amplitude resolution	14 bits
THD	0.04%

FLUXMETER

Model	Digital Flux
Ranges	(1, 2, 5, 10, 20, 50, 100) x 2000 μ Wb
Resolution	from 1 μ Wb (range 1) to 100 μ Wb (range 100)
Accuracy	$\pm 0.5\%$
Drift	Less than 1 digit/minute

PC AND SOFTWARE

Operating system	Windows
Software	Neon 2.0 (English or Italian)
Connection	LAN

MAIN CABINET

AMH-50K-S

Power Supply	380 Vac 3 phase + ground, 50/60 Hz 32 A absorption
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MANUALS AND DOCUMENTATION

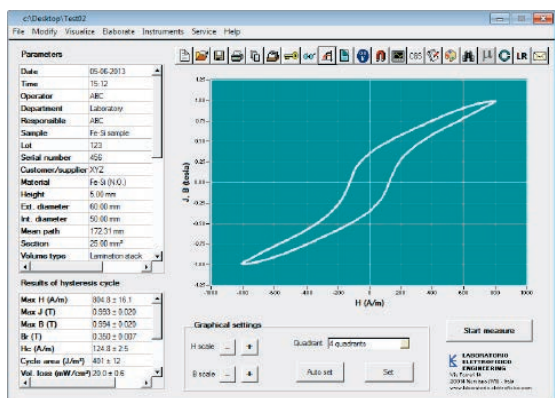
Instruction manual (English or Italian) Calibration certificate, CE mark

*Higher frequency range (up to 200 kHz) also available upon request.

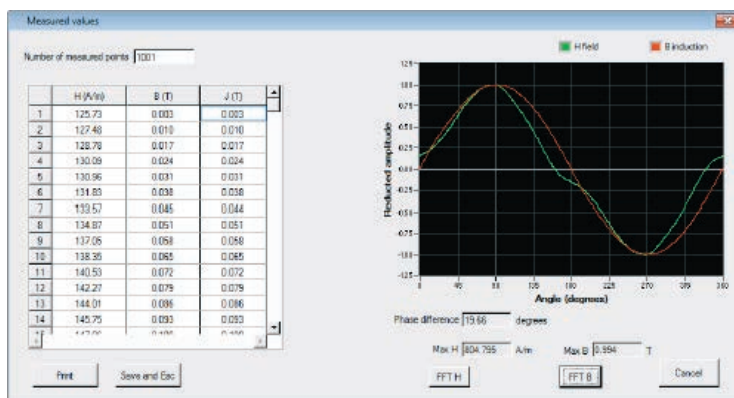


Our proprietary Neon 2.0 software automatically manages measurements for the soft magnetic materials, including comparison of different curves and statistical analysis. The software helps ensure the measuring process is accurate and absolute and helps prevent improper setting of the sample's parameters.

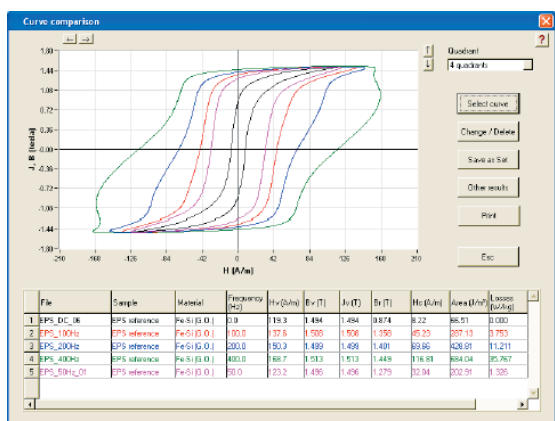
The Automatic Assistant notifies the operator and makes suggestion for the appropriate procedures or settings. The software also provides automatic creation for printing reports, database search feature and curve comparison.



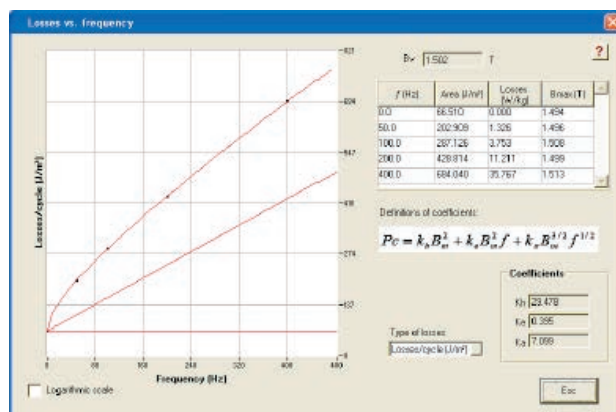
Main panel with example of measurement (at 50 Hz)



Measured points



Comparison of curves with same B_v at different frequencies, which allows the user to evaluate the losses separation and relative coefficients



Losses separation and relative coefficients



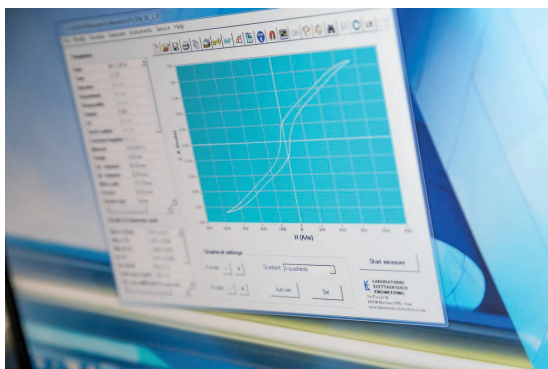
FEATURES

Type of measurement

- Hysteresis loop, normal magnetization curve and relative permeability, in DC and AC conditions
- Sinusoidal B and H condition
- Demagnetization of the sample

Results

- Hsat, Bsat, Jsat, Br, Hc, loop area, relative permeability, specific power losses, losses separation, Steinmetz coefficient and many advanced results
- Magnetic units in SI and CGS, measures in mm and inches, temperature in °C and °F



Data base and file searching

- Data base of measuring files with fast search options, ordering, selection, etc.
- Full compatibility with other spreadsheet programs, such as Microsoft Excel™

Set of measures

Ability to group together different measurements in the same graph. The software recognizes the group type and provides additional results such as losses separation and determination of Steinmetz coefficients

Setting of measuring parameters

- Manual or automatic settings of magnetizing and demagnetizing field, speed, resolutions and many other parameters
- Setting of acceptance limit for direct quality control

Data elaboration

- Curve comparison
- Curve's interpolation, automatic or using a mathematical function from a list
- Automatic control of the Fluxmeter
- Merging of different curves

Printing a report

- 3 pre-set reports with different sizes and contents
- Customized report option for changing the information and the language between English and Italian
- The report can be opened and saved with other word processor programs, like Microsoft Word™

Protection

Password protection for restricting access according to selected parameters



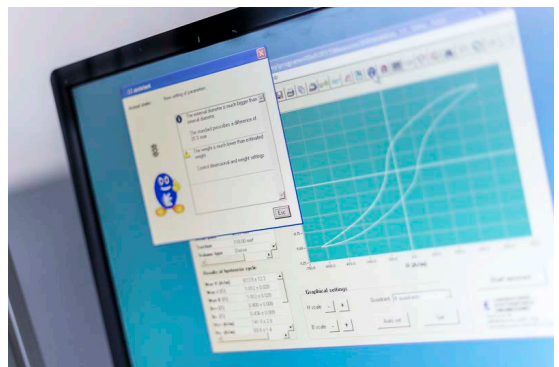
Personalized training

Count on our team of experts for personal training during the acceptance period at Laboratorio Elettrofisico. After delivery, additional training may be arranged at your facility. We'll be happy to create a custom training plan to fit your needs.



Real-time help

The LE Assistant monitors your system in real time and provides suggestions and error messages to improve performance. The LE Assistant is automatically activated if messages or warnings exceed a certain level.



Seamless support

With LE, you're only one button away from expert help. Access support online through TeamViewer screen sharing, Skype us - or send a request for technical assistance directly through your equipment's software. Seamless support for LE equipment is built in.





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MAGNETIZERS



MAGNETIZING STATIONS



MAGNETIZING SYSTEMS FOR INDUSTRY 4.0 AND MEASURING EQUIPMENT FOR ALL MAGNETIC MATERIALS

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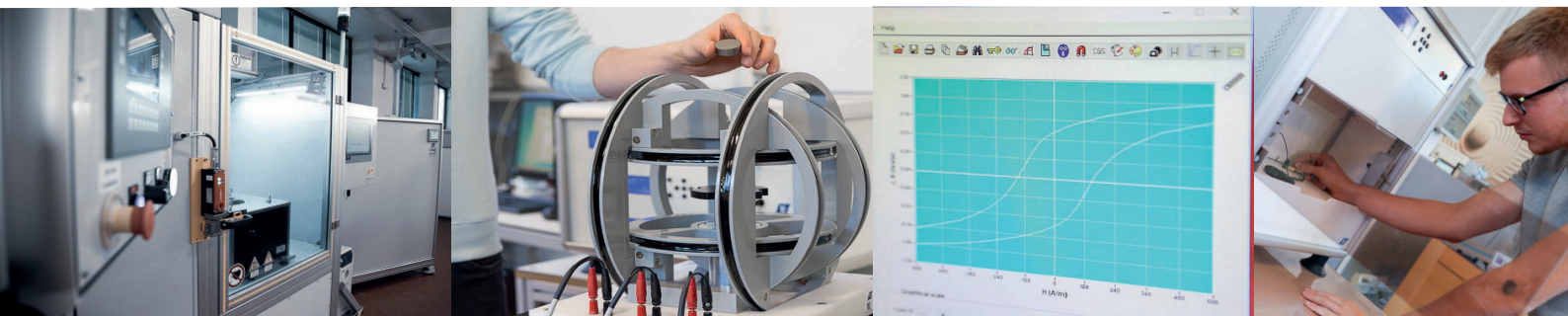
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Founded in 1959, Laboratorio Elettrofisico is a global company specializing in the engineering, design, and manufacture of the world's most precise magnetizing and magnetic measuring equipment. Headquartered in Milan, LE has laboratories, testing facilities, support staff, and services centers in the United States, India, and China.

We reserve the right to make changes to these specifications without notice.
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