Laboratorio Elettrofisico
LE GROUP

HARD MAGNETIC MATERIALS

AMH-500

AMH-500 is a DC automatic measuring system for characterization of hard magnetic materials, such as Alnico, Ferrite, NdFeB, SmCo and bonded magnets. Measurements are performed at temperature ranging from ambient up to 220°C with special heating poles.

AMH-500 HYSTERESISGRAPH

DESCRIPTION

The AMH-500 meets International Standard IEC 60404-5 and ASTM A977: measurement of magnetically hard materials in closed circuit using an electromagnet.

KEY BENEFITS

- Remanence Br, coercivity HcB, HcJ, max energy product BHmax, Hknee, recoil permeability (μrecoil), etc.
- Temperature measurements from ambient up to 220 °C
- Automatic measurement of 1st and 2nd quadrant, complete hysteresis loop, recoil line
- Wide range of accessories for any sample shape or size

STANDARD CONFIGURATION

Cabinet containing:
Fluxmeters, power supply, heating unit and polarity switch

- Electromagnet + pole pieces
- Measuring coil
- Reference sample, for day-to-day control
- Dedicated software Xenon
- PC and printer

IMPROVEMENTS

With the NEW additional Iron Cobalt Pole pieces the peak of magnetic field density increases considerably: up to 3.2 T with a 2.5 mm fixed gap.

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AMH-500 HYSTERESISGRAPH

MAIN ELECTRICAL CABINET

The Main Electrical Cabinet houses the main power and control modules in a compact, safe, and easily integrable structure. It includes the fluxmeters, power supply unit, heating system, and polarity switch, ensuring stable operation and efficient communication with the magnetic measurement equipment.

The cabinet is designed to provide operational reliability, easy maintenance, and optimal integration within magnetization and measurement systems. See technical specs page 10.

ELECTROMAGNET LEP/100-4S

The Laboratorio Elettrofisico electromagnet model LEP/100-4S is used in all AMH Hysteresisgraphs, for the measurement of hard magnetic materials and cemented carbides.
The model LEP/100-4S is a vertically oriented electromagnet fitted with a 120 mm diameter precision pole piece and with a continuously adjustable upper pole. This allows variation of the air gap from zero to 80 mm for maximum versatility. The pole piece is locked in place by a socket head screw located on the top portion of the yoke frame. Its special design enables to use the electromagnet without any cooling for a moderate working power level. The coils can be electrically connected to any DC power source.

A set of tapered pole pieces with various diameter allows different combinations of field amplification and uniformity: LP-40, LP-60, LP-80, LP-100, LP-120 (number indicates the pole's diameter, in mm). Special temperature poles are also available. They provide a heating surface for experiments and measurements at temperatures up to 220 °C.

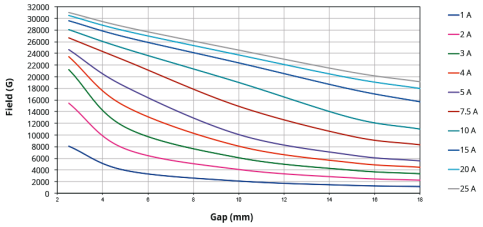
AVAILABLE POLES

IRON POLES	IRON COBALT POLES	HEATING POLES	EMBEDDED COILS
LP-40	LPC-40	LPT-80	LP80/9-9
LP-60	LPC-50	LPT-100	
LP-80	LPC-60	LPT-120	
LP-100	LPC-80		
LP-120			
LP-135			

AMH-500
FIELD DIAGRAMS

IRON POLES (LP)

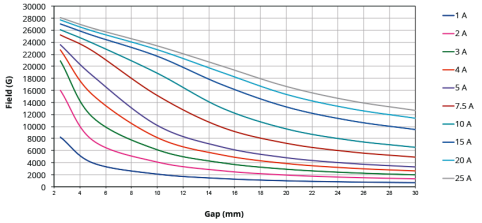
LP-40



POLES LP-40

Diameter	40 mm
Gap adj	0-25 mm
Current 25 A:	
H @ 2.5 mm	3.10 T
H @ 5 mm	2.85 T
H @ 15 mm	2.08 T

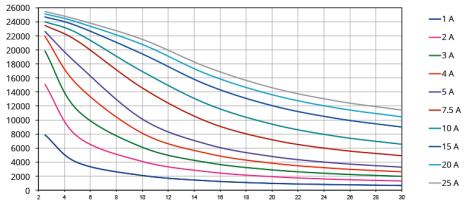
LP-60



POLES LP-60

Diameter	60 mm
Gap adj.	0-30 mm
Current 25 A:	
H @ 5 mm	2.63 T
H @ 10 mm	2.34 T
H @ 20 mm	1.67 T

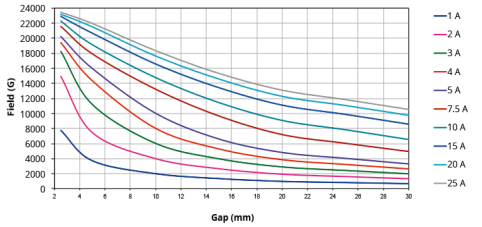
LP-80



POLES LP-80

Diameter	80 mm
Gap adj.	0-50 mm
Current 25 A:	
H @ 5 mm	2.43 T
H @ 10 mm	2.15 T
H @ 20 mm	1.46 T

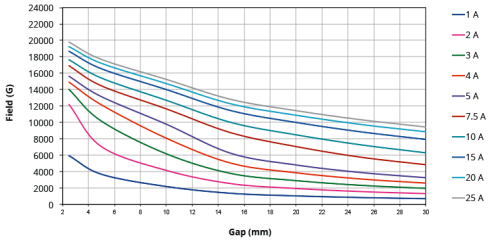
LP-100



POLES LP-100

Diameter	100 mm
Gap adj.	0-60 mm
Current 25 A:	
H @ 5 mm	2.20 T
H @ 10 mm	1.84 T
H @ 20 mm	1.31 T

LP-120

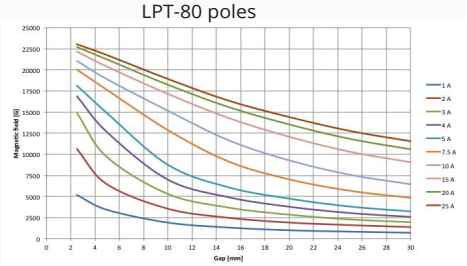


POLES LP-120

Diameter	120 mm
Gap adj.	0-60 mm
Current 25 A:	
H @ 5 mm	1.77 T
H @ 10 mm	1.52 T
H @ 20 mm	1.14 T

HEATING POLES (LPT)

LPT-80 poles

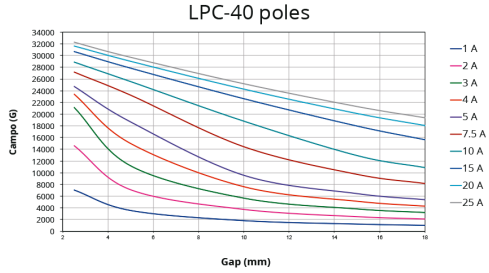


POLES LPT-80

Diameter	80 mm
Gap adj.	0-50 mm
Current 25 A:	
H @ 5 mm	2.17 T
H @ 10 mm	1.89 T
H @ 20 mm	1.44 T

IRON COBALT POLES (LPC)

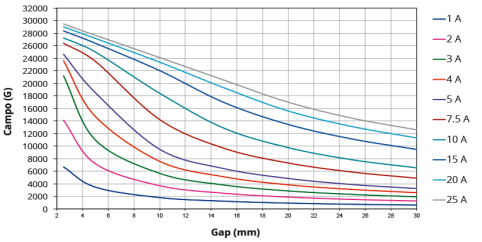
LPC-40 poles



POLES LPC-40

Diameter	40 mm
Gap adj.	0-25 mm
Current 25 A:	
H @ 2.5 mm	3.22 T
H @ 5 mm	2.97 T
H @ 15 mm	2.13 T

LPC-60 poles



POLES LPC-60

Diameter	60 mm
Gap adj.	0-30 mm
Current 25 A:	
H @ 5 mm	2.77 T
H @ 10 mm	2.41 T
H @ 20 mm	1.70 T

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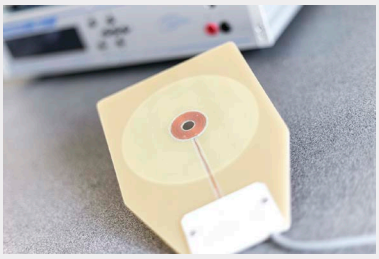
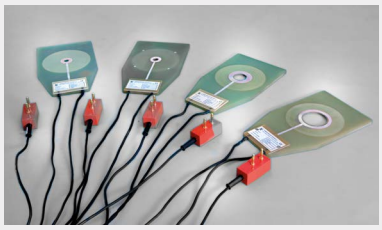
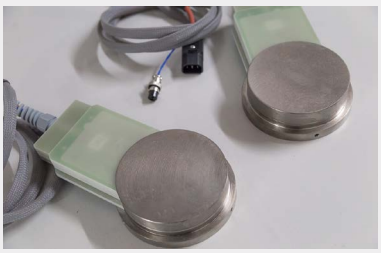
AMH-500 ACCESSORIES 1/3

LJ COMPENSATED COILS







To improve accuracy and resolution, our standard compensated coils measure the J-components with no dependency on the H field measurement. A second set of windings are used to measure the H field. Total B field is derived by the software (B=H+J).

THICKNESS 0,5 mm
TEMPERATURE RANGE 10÷40°C

TYPE	DIAMETER	USABLE POLES
LJX-10	10 mm - 0,39 in	LP-40, 60, 80, 100, 120
LJX-15	15 mm - 0,59 in	LP-60, 80, 100, 120

THICKNESS 1 mm
TEMPERATURE RANGE 10÷40°C

TYPE	DIAMETER	USABLE POLES
LJA-05	5 mm - 0,19 in	LP-40, 60, 80, 100, 120
LJA-10	10 mm - 0,39 in	LP-40, 60, 80, 100, 120
LJA-15	15 mm - 0,59 in	LP-60, 80, 100, 120
LJA-26	26 mm - 1,02 in	LP-60, 80, 100, 120
LJA-42	42 mm - 1,65 in	LP-80, 100, 120
LJA-64	64 mm - 2,51 in	LP-100, 120

THICKNESS 2,5 mm
TEMPERATURE RANGE 100÷220°C

TYPE	DIAMETER	USABLE POLES
LJT-05	5 mm - 0,19 in	LP-40, 60, 80, 100, 120
LJT-10	10 mm - 0,39 in	LP-40, 60, 80, 100, 120
LJT-15	15 mm - 0,59 in	LP-60, 80, 100, 120
LJT-26	26 mm - 1,02 in	LP-60, 80, 100, 120
LJT-42	42 mm - 1,65 in	LP-80, 100, 120
LJT-64	64 mm - 2,51 in	LP-100, 120
LJT-73	73 mm - 2,87 in	LP-120
LJT-82	82 mm - 3,22 in	LP-120
LJT-100	100 mm - 3,93 in	LP-135

LPH-200 SEARCH COIL

LPH-200 can be used alone or combined with embedded poles pieces.

Typical magnetic area	7000 mm² - 10,85 in²
Stem length	120 mm - 4,72 in
Thickness	2.5 mm - 0,09 in
Active area (diameter)	10 mm - 0,39 in

HYS REFERENCE SAMPLES

Reference samples are used for the day-to-day control of the Hysteresisgraph calibration. They can be used to validate other measuring systems. Reference samples are included with AMH-500 or available on demand in any size and material.

MODEL	HYS-F	HYS-Nd	HYS-Al	HYS-Sm	HYS-Ni
MATERIAL	Ferrite	NdFeB	Alnico	SmCo	Nickel

AMH-500 ACCESSORIES 2/3

LP IRON POLES

Several models of interchangeable pole pieces are available to ensure the best measurement accuracy. Pure iron pole caps guarantees an uniform field in the gap with a negligible residual field. Pole cap diameters smaller than 120 mm are tapered to concentrate the field produced by the electromagnet.

For example (up to 2.8 T in 2.5 mm gap with LP-60 Pole caps):

TYPE	MAX Ø SAMPLE	USABLE COILS
LP-40	10 mm - 0,39 in	5-10
LP-60	26 mm - 1,02 in	5-26
LP-80	42 mm - 1,65 in	5-42
LP-100	73 mm - 2,87 in	5-73
LP-120	82 mm - 3,22 in	5-82
LP-135	100 mm - 3,93 in	100

See the Electromagnet part page 3.

LPC IRON COBALT POLES

In order to increase the magnetic field within the gap we have the option to substitute the LP Iron pole pieces with several models of interchangeable iron cobalt (Fe-Co) pole pieces (LPC).

For example:

TYPE	MAX Ø SAMPLE	USABLE COILS
LPC-40	10 mm - 0,39 in	5-10
LPC-60	26 mm - 1,02 in	5-26
LPC-80	42 mm - 1,65 in	5-42

LP EMBEDDED COILS

Pole caps with a magnetic sensor embedded below the surface are available. The embedded coils are useful for large ferrite samples (for example loudspeakers magnet) or for deformable sample (bonded ferrite). These coils are Compensated coils for use with the H sensor, model LPH-200.

TYPE	Ø POLE	Ø COIL	WEIGHT
LP-80/9-9	80 mm	10 mm	6 kg

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AMH-500 ACCESSORIES 3/3

LPT HEATING POLES FOR HIGH TEMPERATURE MEASUREMENTS

Heated Pole caps enable measurements above 220 °C, meeting International Standard IEC/TR 61807.

Easy connection to the AMH-500 unit and electromagnet.

	LPT-80	LPT-100	LPT 120
Temperature range	20-220 °C	20-220 °C	20-220 °C
Diameter	80 mm	100 mm	120 mm
Uniformity area	45 mm	75 mm	95 mm
Field at 2,5 mm gap	2.4 T	2.2 T	1.9 T
Weight	6 kg	10 kg	13 kg

KIT FOR FERRITE POWDERS MEASUREMENTS

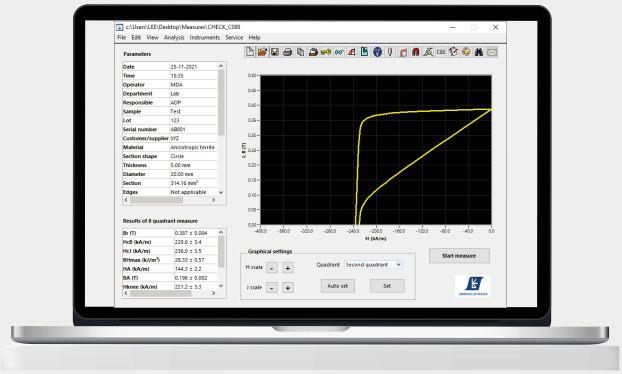
The kit allows the measurement of ferrite magnetic powder at different pressures and densities.The powder is packed in a small case, pressed by accesories having different thicknesses. The various thicknesses result in different pressures and densities for the powder. The software Xenon records that data to enable the evaluation of the magnetic properties vs. density. Additional accesories need compensated coil LJT-26 or LJA-26.

SHAPED POLES FOR FERRITE ARC MAGNETS

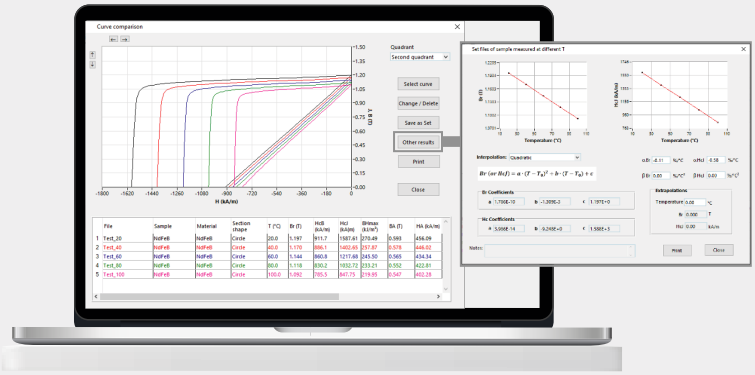
Shaped pole pieces enable the non-destructive quality control of arc-shaped ferrite magnets. This eliminates the difficult task of cutting a regular-size sample from a fragile arc. The B measurement is performed by the coils wound around the pole piece, while the H measurement is performed by the sensor LPH-200. The curvature of arc magnets can vary depending on the application, Laboratorio Elettrofisico can provide custom pole pieces to conform your arc shapes.
The measurement is processed within a fixed gap without using a closed circuit set up. This configuration emulates the performance of the magnet in the final application (typically electric motors).

It's no longer necessary to cut measurement material samples from ARC shaped magnets.

AMH-500
SOFTWARE XENON



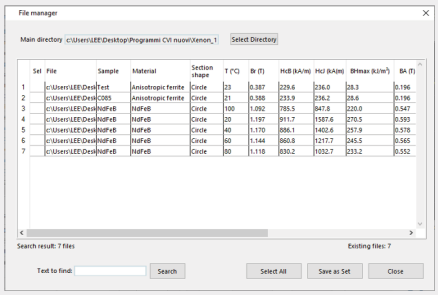
Main panel



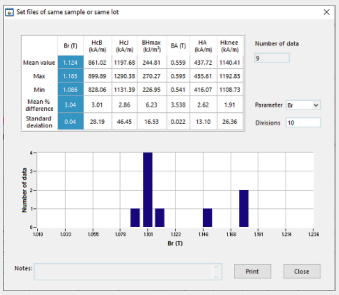
Temperature measurements
(calculation of first and second-order coefficients of variation)

Xenon is a powerful software to manage automatically the measurement and many useful options, such as printing report, database, statistic analysis, etc. It also provides additional help to overcome several physical limitations; extrapolation of the curve at higher or lower temperatures, interpolation of the curve when incomplete or irregular, curve's completion for high-coercivity magnets, etc.

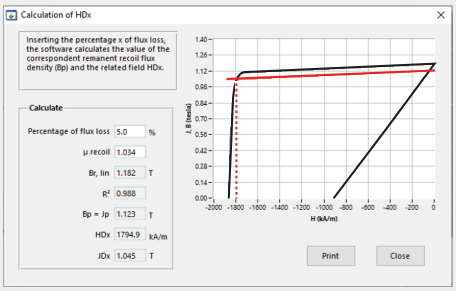
This operating software mantains the overall accuracy controlling all the parameters to ensure the measurement is precise and to prevent operating errors.



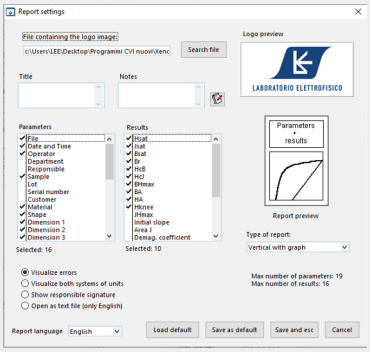
Integrated database with a smart search tool, curve organization and collection, and Excel export functions



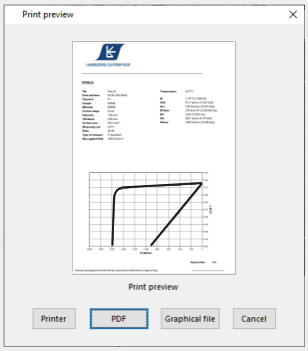
Statistical elaboration of the data of multiple curves



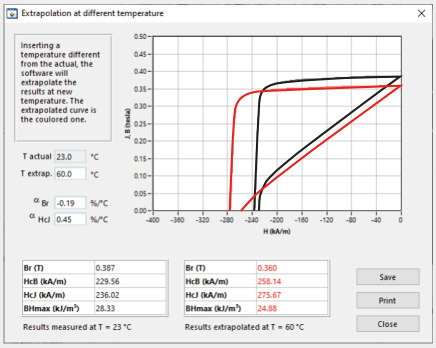
Calculation of demagnetization field strength HDx, accordingly with IEC 60404-8-1



Automatic report setting, with multiple languages choice (included Chinese and Hindi)



Automatic generation and printing of the report (pdf and all main graphical format)



Quick evaluation of the curve and magnet's characteristics at different T using temperature coefficients

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AMH-500 SOFTWARE XENON

FEATURES

TYPE OF MEASUREMENT	▪ 1st quadrant, 2nd quadrant, 1st and 2nd quadrant ▪ Complete hysteresis cycle ▪ Recoil permeability
SETTING OF MEASURING PARAMETERS	▪ Manual or automatic settings of magnetizing and demagnetizing field, speed, resolutions and many other parameters ▪ Setting of thresholds for direct quality control
RESULTS	▪ Br, HcJ, HcB, BHmax, BA, HA, HKnee, Hsat Jsat, Bsat, recoil permeability, magnetic moment, anisotropy parameters, load line, working point, T in °C and °F ▪ Magnetic units in SI and CGS, measures in mm and inches, temperature in °C and °F
DATA PROCESSING	▪ Curve comparison ▪ Curve extrapolation at higher or lower temperature, for a quick evaluation of the measured curve at different T ▪ Curve's interpolation, automatic or using a mathematical function from a list ▪ Extrapolation of uncompleted curves (high-HcJ materials) ▪ Correction of pole pieces' saturation ▪ Processing of curves made with shaped poles ▪ Automatic control of the Fluxmeter's drift
PRINTING A REPORT	▪ 6 pre-set reports with different sizes and contents ▪ Customized report option for changing the information and the language: 10 languages available for printing (European languages + Chinese & Hindi) ▪ Direct print or automatic creation of graphical and/or text file ▪ Reports can be edited
DATA BASE AND FILE SEARCHING	▪ Data base of measuring files with fast search options, ordering, selection, etc. ▪ Full compatibility with other programs, such as Microsoft Excel™
PROTECTION	▪ Password protection for restricting access according to selected parameters.
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 statistical data, i.e. the average, standard deviation, etc.

TECHNICAL SPECIFICATIONS 1/2

GENERAL

MEASURABLE MATERIALS	Alnico, Ferrite, NdFeB, SmCo5, Sm2Co17, bonded magnets
	IMPORTANT NOTE: rare earth magnets need to be saturated
	externally (for ex. with a pulse magnetizer)
MEASURABLE QUANTITIES	Br, HcB, HcJ, BHmax, Hknee, HA, BA, μrecoil, Jsat, Hsat,
	temperature coefficients αBr, αHcJ, load line, working point,
	squareness, etc.
MEASURABLE SHAPES	Cylinder, parallelogram, ring, any prism with parallel bases
SAMPLE SIZE	Diameter or diagonal from 3 to 82 mm, height from 0.5 to 50 mm
ACCURACY	Br ± 1%, HcB, HcJ ± 1.5%, BHmax ± 2%
MAX H FIELD	Up to 3.2 T (2.560 kA/m) with 40 mm poles at 2.5 mm gap
TEST TIME	Less than 30 seconds

MAIN ELECTRICAL CABINET

VOLTAGE	220 V (+10%) single-phase + ground, 50-60 Hz, 16 A max
POWER	3 kVA
DIMENSIONS	L 543 x W 610 x H 420 mm - L 21" x W 24" x H 16,5"
WEIGHT	58.5 kg - 129.3 lb

FLUXMETER DF (2 UNITS)

RANGES	(1, 2, 5, 10, 20, 50, 100) x 2000 μWb
RESOLUTION	from 1 μWb (range 1) to 100 μWb (range 100)
ACCURACY	±0.5%
DRIFT	Less than 1 digit/minute
INPUT IMPENDANCE	10 kΩ x range

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TECHNICAL SPECIFICATIONS 2/2

MAGNETIC YOKE LEP/100-4 S

POLES DIAMETER	120 mm - 4.72”
MAXIMUM AIR GAP	80 mm - 3.14“
MAX FIELD INTENSITY	see diagrams
MOVEMENT OPERATING	Manual
POLES PIECES SETTING	Micrometric
DIMENSIONS (EXCLUDED UPPER POLES ADJUSTMENT)	330 x 410 x 491 mm - 12.9” x 16.1“ x 19.3”
WEIGHT	350 kg (approx) - 780 lb

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