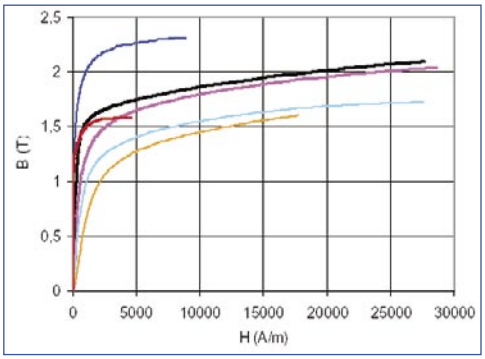
Magnetic Characterization

Objective

" Designing a physical model without knowing the behaviour of the materials used. Are you sure to be efficient ? "

CEDRAT TECHNOLOGIES offers you the possibility to:

- Provide you all or part of the data base on the materials' magnetic properties
- Realise the magnetic characterization of your samples



Magnetic flux density curve for several types of soft materials.

Available magnetic characterization data

Stainless steel	Structural steel	Pure iron	Alloys	Powders (SMC)
Ferritic : (UGIPERM 12FM,...) Martensitic : (UGITECH 416, ...)	XC18 XC48 ...	ARMCO ...	Iron-Cobalt (AFK502) Iron-Nickel (SUPRA 50)	SOMALOY 500 ...

Some materials listed in our data base.

Characteristics	
Relative magnetic permeability maximum value (μ_{max}) (1)	3439
Relative magnetic permeability mean value (μ_{max}) (1)	3123
Saturation magnetic polarization Minimum value (Js_{min}) (1)	2.06 T
Saturation magnetic polarization Maximum value (Js_{max}) (1)	2.1 T à 2.15 T
Relative magnetic permeability Equivalent value for modelling (μ_r) (1)	3842
Saturation magnetic polarisation Equivalent value for modelling (Js) (1)	1.811 T

Characteristics of a magnetic material.

Characterization services

For any study of characterization, we take care of:

- The provisioning of materials and their thermal treatments if needed,
- The preparation of material samples (machining in the form of torus or bar),
- The realization of magnetic characterization (first magnetization and quasi-static loop),
- The detailed synthesis of the characterization.

Measured characteristics

The measured characteristics are:

- First magnetisation curve, hysteresis loop
- Remanent flux density, coercive field,
- Relative permeability (mean and max),
- Saturation of magnetic polarisation

The table here below summarizes the main measured magnitudes thanks to the first magnetization curve and the quasi-static hysteresis loop of the material.

Physical parameters	Symbols	Unit (SI)
Magnetic field	H	A/m
Magnetic induction	B	T
Magnetic polarisation	J	T
Magnetic permeability	μr	
1st magnetization curve	Quasi-static hysteris loop	
B(H)	B(H)	
J(H)	J(H)	
μr (H)	Coercive field: Hc	
μr max	Residual Induction: Br	
Saturation Induction: Js		

Note: the initial permeability of material can also be measured.

Magnetic Characterization

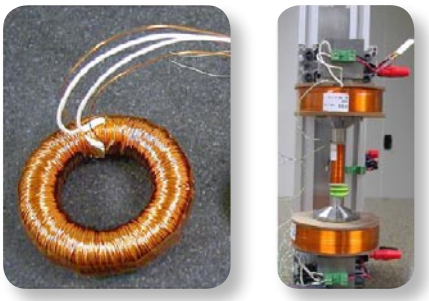
Method description & required samples

Magnetic characterization of materials is carried out with an automatic bench, built and computer driven with Labview 7.1. In order to define the procedure measurement, the international standard IEC 60404-4 has inspired us.

Preparation of raw material UGITECH 416, machining in the form of torus and winding.

The characterization can be achieved in two ways:

- Torus method: we use a ring which is equipped with two windings (field winding and measurement coils) and temperature probe (thermocouple K type).
- Permeameter method: we use a bar 150mm long (max) with a diameter between 10 and 20mm.



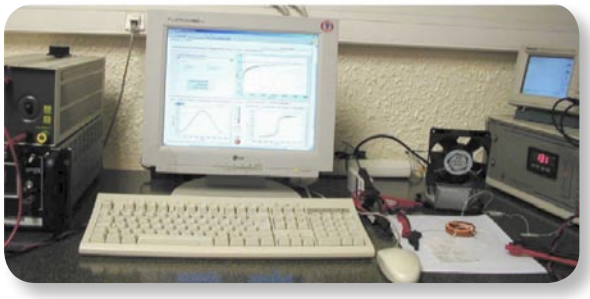
Torus and Permeameter methods.

Compatibility with Flux® software

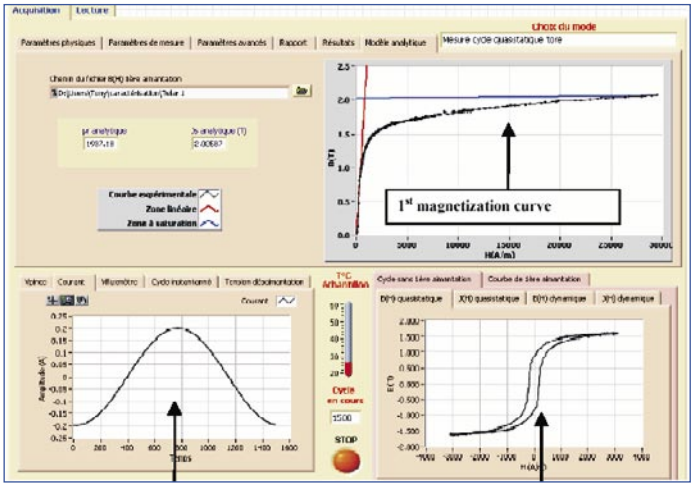
Flux® is a computation software of electric machines and magnetic systems by the finite elements method, http://www.cedrat.com/fileadmin/user_upload/cedrat_groupe/Software_Solutions/Flux/flux.pdf marketed by CEDRAT S.A., Magsoft Corp. and their distributors . This software requires input values about the magnetic properties of materials constituting the structure to be modelled.

The characterizations provided by CEDRAT TECHNOLOGIES allow to introduce the properties necessary to take into account magnetic materials into the Flux models. In particular, the characteristics of initial permeability μr and saturation magnetization Jsat allow to feed very easily the model with 2 parameters in Arctangent Model «Jsat_a_scal» usually used in Flux®. The exact curve B(H) can also be completely introduced under Flux® from a file of measured values given in MS Excel format.

Do not hesitate to ask us for the sales conditions to access to our materials data base.



Set-up for measuring magnetic characterization.



Measures and graphics on Labview interface.

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