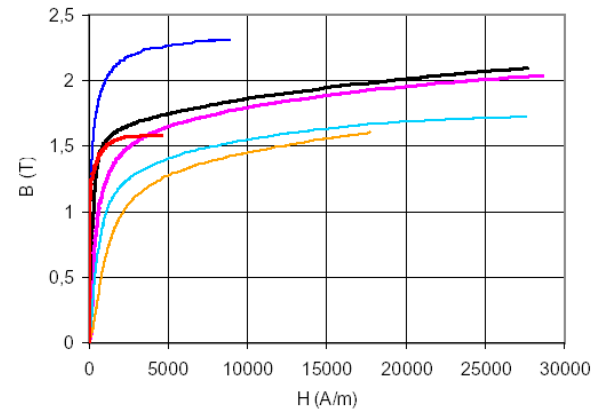


> OBJECTIVE

“ Designing a physical model without knowing the behavior 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 characterisation of your samples



Magnetic flux density curve for several types of soft materials

> AVAILABLE MAGNETIC CHARACTERISATION DATA

STAINLESS STEEL	STRUCTURAL STEEL	PURE IRON	ALLOYS	POWDERS
Ferritic: (UGIPERM 12FM, ...) Martensitic: (UGITECH 416, ...)	XC18 XC48 ...	ARMCO...	Iron-Cobalt (AFK502) Iron-Nickel (SUPRA 50)	SOMALOY 500 ...

CHARACTERISTICS OF A MAGNETIC MATERIAL	
Relative magnetic permeability maximum value (mmax) (1)	3439
Relative magnetic permeability mean value (mmax) (1)	3123
Saturation magnetic polarization Minimum value (J _{min}) (1)	2.06 T
Saturation magnetic polarization Maximum value (J _{max}) (1)	2.1 T à 2.15 T
Relative magnetic permeability Equivalent value for modelling (mr) (1)	3842
Saturation magnetic polarisation Equivalent value for modelling (J _s) (1)	1.811 T

> CHARACTERISATION SERVICES

For any study of characterisation, 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 realisation of magnetic characterisation (first magnetisation and quasi-static loop),
- The detailed synthesis of the characterisation.

PHYSICAL PARAMETERS	SYMBOLS	UNIT (SI)
Magnetic field	H	A/m
Magnetic induction	B	T
Magnetic polarisation	J	T
Magnetic permeability	mr	

> 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

1ST MAGNETISATION CURVE	QUASI-STATIC HYSTERIS LOOP
B(H)	B(H)
J(H)	J(H)
mr (H)	Coercive field: H _c
mr max	Residual Induction: Br
Saturation Induction: J _s	

The above tables summarise the main measured magnitudes thanks to the first magnetisation curve and the quasi-static hysteresis loop of the material.

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

> METHOD DESCRIPTION & REQUIRED SAMPLES

Magnetic characterisation 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.

The characterisation 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.

> COMPATIBILITY WITH FLUX® SOFTWARE

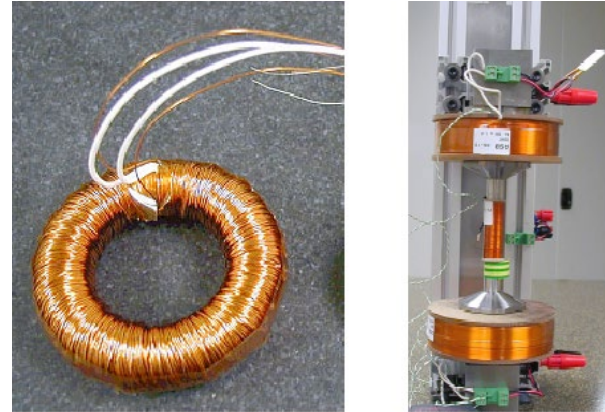
Flux® is a computation software of electric machines and magnetic systems by the finite elements method. This software requires input values about the magnetic properties of materials constituting the structure to be modelled.

The characterisations 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 μ_r and saturation magnetisation J_{sat} allow to feed very easily the model with 2 parameters in Arctangent Model « $J_{sat_a_scal}$ » 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.



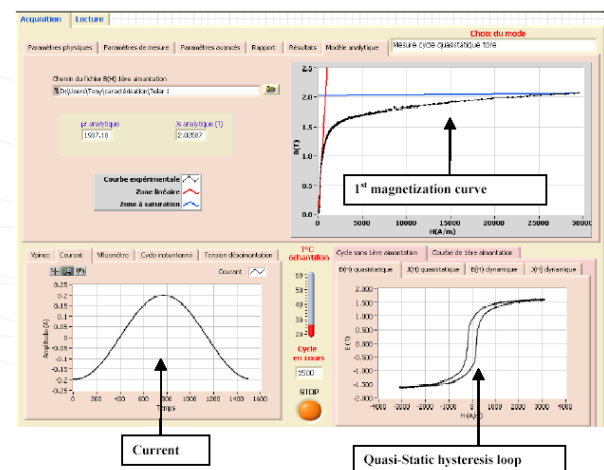
Preparation of raw material UGITECH 416, machining in the form of torus and winding



Torus and Permeameter methods



Set-up for measuring magnetic characterisation



Measures and graphics on Labview interface