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Pulsed field magnetometry
(IEC/TR 62331:2005, IDT)

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- IEC/TR 62331:2005, IDT

Nederlands Elektrotechnisch Comité (NEC)

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TECHNICAL REPORT

IEC TR 62331

First edition
2005-02

Pulsed field magnetometry

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CONTENTS

FOREWORD	4
INTRODUCTION	6
1 Scope and object.....	7
2 Normative references	7
3 Pulsed field magnetometer (PFM).....	7
3.1 General principles	8
3.2 Size of test specimen	10
4 Field generator.....	10
4.1 General.....	10
4.2 Power supply.....	10
4.3 Magnetizing solenoid.....	14
5 Polarization and magnetic field strength sensors (pick-up coils)	14
5.1 General.....	14
5.2 The polarization sensor (<i>J</i> coil).....	15
5.3 The magnetic field strength sensor (<i>H</i> coil)	16
6 Transient instrumentation and digitizing hardware.....	16
6.1 General.....	16
6.2 Analogue integration and digitization	17
6.3 Digitization and numerical integration	17
6.4 Digitization rate.....	17
7 Data processing	17
7.1 Data processing elements	18
7.2 Temperature.....	23
7.3 Magnetic viscosity	25
7.4 Calibration.....	25
8 Comparison of measurements	29
8.1 Permeameter, "large magnet" comparison.....	29
8.2 Extraction method, "small" test specimen comparison	30
8.3 Comparative measurement conclusions	33
9 Conclusion	33
Bibliography	34
Figure 1 – <i>M'</i> and <i>H</i> time traces for a permanent magnet.....	9
Figure 2 – <i>J(H)</i> and <i>B(H)</i> loop for a permanent magnet	9
Figure 3 – Sine wave (decaying) electrical configuration	11
Figure 4 – Unidirectional pulses (1/2 sine wave) electrical configuration	12
Figure 5 – Unidirectional pulses (decaying) electrical configuration	12
Figure 6 – Three arrangements of <i>J</i> coil assembly configurations (drawing with permission of EMAJ [ref. 30]).....	15
Figure 7 – <i>M</i> and <i>H</i> time traces and $\Phi(H)$ plot of a "zero signal"	19
Figure 8 – <i>J(H)</i> loops of a sintered NdFeB permanent magnet.....	23

Figure 9 – $J(H)$ loop including eddy currents of a conductive bulk nickel specimen measurement result from a PFM system	27
Figure 10 – Copper specimen eddy current measurement result.....	27
Figure 11 – $J(H)$ loop for eddy current “corrected” nickel specimen	28
Figure 12 – Results of a permeameter and a PFM measurement of a “large” specimen.....	29
Figure 13 – Detail of the 1 st and 2 nd quadrants of the measurement results shown in Figure 12 “large magnet”	29
Figure 14 – Comparison of a “small magnet” measured in a super-conducting, extraction method magnetometer (EMM) compared with a PFM measurement result of the same magnet [28]	30
Figure 15 – Measurement result of a NEOMAX 32EH NdFeB cylinder of diameter 10 mm length 7 mm on the TPM-2-10 system [34].....	31
Figure 16 – Measurement result of a NEOMAX 32EH NdFeB cube of dimensions 7 mm × 7 mm × 7 mm [34].....	32
Figure 17 – Measurement result of a sintered Sm2Co17 cylinder of diameter 10 mm and length 7 mm [34].....	33
Table 1 – Comparison of methods of generating the magnetic field strength	13
Table 2 – Classification of the influences of eddy currents.....	21
Table 3 – A comparison of values taken from the measurement results presented in Figure 11 and Figure 12.....	30
Table 4 – Comparison of values measured in Figure 14 above (see NOTE).....	30

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PULSED FIELD MAGNETOMETRY

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IEC 62331, which is a technical report, has been prepared by IEC technical committee 68: Magnetic alloys and steels.

The text of this technical report is based on the following documents:

Enquiry draft	Report on voting
68/299/DTR	68/303/RVC

Full information on the voting for the approval of this technical report can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

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INTRODUCTION

In order to measure the full magnetic characterization of magnetically hard (permanent magnet) materials, it is necessary to apply a magnetic field sufficient to saturate the test specimen of magnetic material.

The generation of this magnetic field can become a practical limiting factor and can determine the appropriate measurement techniques.

Super-conducting magnets can generate very high static or slowly changing magnetic fields but their complexity, high capital outlay and running costs, requiring cryogenic gases make them far from ideal. It is necessary to change fields slowly to avoid “quenching” the super-conducting magnet.

Conventionally wound electro-magnets with slowly changing magnetic fields have a significant heat generation problem through I^2R loss. This can be alleviated through the use of a high relative permeability “iron yoke”. However, saturation of the iron prevents maximum characterization of the loop of rare earth permanent magnet materials to be determined.

A pulsed field system utilizing conventional conductors minimizes heating effects by limiting field durations and by limiting heat generation to acceptable levels. Fields up to 40 Tesla (T) can be generated in this way.

Careful consideration, however, must be given to the instrumentation and method to take account of dynamic effects due to the short duration of the magnetic field.

While work on pulsed field magnetometry is carried out in many parts of the world, the two main groups are MACCHARETEC [ref. 29]¹ in Europe and EMAJ [ref. 30] in Japan. The approach adopted in Japan is one of supporting a standard with fixed specimen sizes, magnetic field strengths and frequencies in a limited number of configurations.

¹ References in square brackets refer to the bibliography.

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