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

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Nederlands Elektrotechnisch Comité (NEC)

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TECHNICAL REPORT

IEC TR 62331

First edition
2005-02

Pulsed field magnetometry

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PULSED FIELD MAGNETOMETRY

FOREWORD

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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.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

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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