IEC 63300

Edition 1.0 2023-06

INTERNATIONAL STANDARD

NORME INTERNATIONALE

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Test methods for electrical and magnetic properties of magnetic powder cores

Méthodes d'essai des propriétés électriques et magnétiques des noyaux en poudre magnétique

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

ICS 29.030, 29.100.10

ISBN 978-2-8322-7139-1

CONTENTS

FOREWORD 6
INTRODUCTION 8
1 Scope 9
2 Normative references 9
3 Terms, definitions, abbreviated terms and symbols 9
3.1 Terms and definitions 9
3.2 Abbreviated terms 9
3.3 Symbols 10
4 Instruments and equipment 10
4.1 General provisions 10
4.2 Excitation source 10
4.2.1 General provisions 10
4.2.2 Sinusoidal wave excitation source 11
4.2.3 Square wave excitation source 11
4.2.4 Calculation of magnetic flux density 12
4.3 Measuring equipment 12
4.3.1 General provisions 12
4.3.2 Voltmeter 12
4.3.3 Data acquisition unit 13
4.4 Sensor 13
4.4.1 Sampling resistor 13
4.4.2 Current transformer 13
4.5 Other descriptions 14
4.5.1 Intermediate connector 14
4.5.2 Thermostat 14
5 Sample 14
5.1 Magnetic core 14
5.2 Winding 14
5.2.1 Winding conditions 14
5.2.2 Dual winding 15
5.2.3 Single winding 15
5.3 Mounting of sample 16
5.4 Parameters of sample 16
6 Measuring conditions 16
6.1 Relation to practice 16
6.2 Effective parameters 17
6.3 Magnetic state of measurement 17
7 Test methods for power loss 17
7.1 Summary 17
7.2 AC power method 18
7.3 DC power method 18
7.4 Calorimetric method 18
8 Test methods for effective permeability 18
8.1 Summary 18
8.2 Large signal AC method 19
8.3 Impedance method 19

8.4 Pulse method 19
9 Test method for effective complex permeability 19
10 Test method for quality factor (Q) 20
11 Verification of measurement accuracy 20
Annex A (informative) AC power method 21
A.1 Overview 21
A.2 Basic circuit diagram 21
A.3 Measuring device 22
A.3.1 High frequency excitation source 22
A.3.2 Exciting winding N_1 and voltage sensing winding N_2 22
A.3.3 Sensing resistor R 22
A.3.4 Data collector 22
A.4 Test steps 22
A.5 Measuring principle 22
A.6 Error analysis 23
A.7 Matters to consider 24
A.7.1 Measurement error 24
A.7.2 Deduction of the winding loss 24
A.8 Specific test methods 24
A.8.1 B-H analyzer method 24
A.8.2 Power analyzer method 24
A.8.3 Capacitive reactive compensation method 24
A.9 Measurement for quality factor (Q) 26
Annex B (informative) DC power method 27
B.1 Overview 27
B.2 Basic circuit diagram 27
B.3 Measuring device 27
B.3.1 DC voltage source U_i 27
B.3.2 DC/AC inverter 27
B.3.3 Exciting winding N_1 27
B.3.4 DC ammeter and DC voltmeter for measuring the average value 28
B.4 Test steps 28
B.5 Measuring principle 28
B.6 Matters to consider 29
B.6.1 Inverter loss 29
B.6.2 Deduction of winding loss 29
Annex C (informative) Calorimetric method 30
C.1 Overview 30
C.2 Basic circuit diagram 30
C.3 Measuring device 30
C.3.1 Excitation source 30
C.3.2 Temperature sensor 30
C.3.3 Thermal insulated container 30
C.3.4 Thermal medium 31
C.3.5 Sample 31
C.4 Test steps 31
C.5 Measuring principle 31
C.6 Matters to consider 32

C.7 Specific test methods 32
C.7.1 Calibration calorimetric method 32
C.7.2 Comparative calorimetric method 33
Annex D (informative) Large signal AC method 35
D.1 Overview 35
D.2 Basic circuit diagram 35
D.3 Measuring device 36
D.3.1 High-frequency excitation source 36
D.3.2 Exciting winding N_1 and voltage sensing winding N_2 36
D.3.3 Sampling resistor R 36
D.3.4 Data collector 36
D.4 Test steps 36
D.5 Measuring principle 37
D.6 Matters to consider 37
Annex E (informative) Impedance method 38
E.1 Overview 38
E.2 Basic circuit diagram 38
E.3 Measuring device 38
E.3.1 Impedance analyzer or LCR meter 38
E.3.2 Exciting winding N_1 38
E.4 Test steps 39
E.5 Measuring principle 39
E.6 Matters to consider 39
Annex F (informative) Pulse method 40
F.1 Overview 40
F.2 Basic circuit diagram 40
F.3 Measuring device 40
F.3.1 Sampling resistor R 40
F.3.2 Switch S 40
F.3.3 Exciting winding N_1 41
F.3.4 Capacitor C 41
F.4 Test steps 41
F.5 Measuring principle 41
F.6 Matters to consider 42
Annex G (informative) Method of verification and criteria for judgment 43
Annex H (informative) Imposing of DC bias on the core 46
H.1 Overview 46
H.2 Matters to consider 48
Annex I (informative) References 49
I.1 Overview 49
I.2 Effect of rise time of square wave excitation on the core loss 49
I.3 Phase error limit 50
I.4 Derivation of Formula (8) 51
I.5 SRF consideration of the sample 52
Bibliography 54

Figure 1 – Figure of square waveform 12

Figure A.1 – Diagram of AC power method 21
Figure A.2 – Circuit diagram of reactive power compensation of capacitor 25
Figure A.3 – Phasor diagram of reactive power compensation of capacitor 26
Figure B.1 – Diagram of DC meter method 27
Figure C.1 – Diagram of the calorimetric method 30
Figure C.2 – Diagram of the calibration calorimetric method 33
Figure C.3 – Diagram of the comparative calorimetric method 34
Figure D.1 – Diagram of large signal AC method 35
Figure E.1 – Diagram of impedance method 38
Figure F.1 – Diagram of pulse method 40
Figure F.2 – Exciting voltage and current waveform on the exciting winding 42
Figure G.1 – Diagram of air-core inductor 44
Figure H.1 – Diagram of imposition of DC bias 47
Figure I.1 – Square wave excitation source 50
Figure I.2 – Diagram of the ratio error and phase error 50
Figure I.3 – Equivalent circuit model of sample 52

Table 1 – Comparisons of measuring methods for power loss 17
Table I.1 – Example for k, α, β and other parameters 50
Table I.2 – Example of core losses error with different f_r 50
Table I.3 – Example of core losses measuring error and ratio error for the phase error 51
Table I.4 – Example of ΔL at different frequencies 53

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TEST METHODS FOR ELECTRICAL AND MAGNETIC PROPERTIES OF MAGNETIC POWDER CORES

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IEC 63300 has been prepared by IEC technical committee 51: Magnetic components, ferrite and magnetic powder materials. It is an International Standard.

The text of this International Standard is based on the following documents:

Draft	Report on voting
51/1419/CDV	51/1436/RVC

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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INTRODUCTION

Magnetic powder cores have the characteristics of low relative permeability, high saturated flux density and low loss. Therefore, compared with ungapped ferrite, the equivalent impedance of a sample of magnetic powder core is much smaller, and the magnetizing current is very large, so the required excitation source will have both high frequency and high-power capacity, which is difficult to obtain in practice. Moreover, the impedance angle of a magnetic powder core under test is very close to 90°, and this results in great difficulties to obtain accurate measurements of power loss.

The IEC 62044 series provides measuring methods of magnetic properties at low and high excitation levels for magnetic cores made of magnetic oxides or metallic powders. However, the methods introduced in the IEC 62044 series cannot fully meet the measurement requirements for magnetic properties of magnetic powder cores. It is therefore useful to have a standard for suitable measuring methods for the magnetic properties of magnetic powder cores.

New test methods with pulse wave excitation and DC power method that account for the characteristics of magnetic power cores are introduced in this document, in addition to some modifications for the traditional test methods. Also, an air core inductor with single winding or dual windings is introduced in the document to verify or calibrate the accuracy of test methods for magnetic properties of magnetic powder cores, because of the linear properties of an air core inductor.

TEST METHODS FOR ELECTRICAL AND MAGNETIC PROPERTIES OF MAGNETIC POWDER CORES

1 Scope

This document provides the test methods for the electrical and magnetic properties of magnetic powder cores used for inductive components in electronics equipment, switch-mode power supplies and power conversion equipment, and introduces measuring principles, scope of application and matters of importance for each method.

The parameters used to characterize the magnetic powder cores include: inductance factor, effective permeability, complex relative permeability, temperature coefficient of permeability, frequency coefficient of permeability, DC bias characteristic, power loss, and quality factor. This document is the basis for determining the characteristic parameters of magnetic powder cores.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 63182-2, *Magnetic powder cores – Guidelines on dimensions and the limits of surface irregularities – Part 2: Ring-cores*

3 Terms, definitions, abbreviated terms and symbols

3.1 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.2 Abbreviated terms

ARV	average rectification value
EPR	equivalent parallel resistance
ESR	equivalent series resistance
FFT	fast Fourier transform
MSE	modified Steinmetz equation
PWM	pulse width modulation
RMS	root mean square
SCR	silicon controlled rectifier
SRF	self-resonant frequency
ZVS	zero voltage switching