SLOVENSKI STANDARD
oSIST prEN IEC 62024-2:2023

01-junij-2023

Visokofrekvenčne induktivne komponente - Električne karakteristike in merilne metode - 2. del: Naznačeni tok tuljav za presmernik DC/DC

High frequency inductive components - Electrical characteristics and measuring methods - Part 2: Rated current of inductors for DC-to-DC converters

Induktive Hochfrequenz-Bauelemente - Elektrische Eigenschaften und Messmethoden - Teil 2: Bemessungsstrom von Drosselspulen für DC/DC-Wandler

Composants inductifs à haute fréquence - Caractéristiques électriques et méthodes de mesure - Partie 2: Courant assigné des bobines d'induction pour des convertisseurs continu-continu

Ta slovenski standard je istoveten z: **prEN IEC 62024-2:2023**

ICS:

29.100.10	Magnetne komponente	Magnetic components

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51/1435/CDV

COMMITTEE DRAFT FOR VOTE (CDV)

PROJECT NUMBER: **IEC 62024-2 ED3**	
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IEC TC 51 : MAGNETIC COMPONENTS, FERRITE AND MAGNETIC POWDER MATERIALS	
SECRETARIAT: Japan	SECRETARY: Mr Takeshi Abe
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: ☐ Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
FUNCTIONS CONCERNED: ☐ EMC ☐ ENVIRONMENT ☐ QUALITY ASSURANCE ☐ SAFETY	
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Recipients of this document are invited to submit, with their comments, notification of

- any relevant patent rights of which they are aware and to provide supporting documentation,
- any relevant “in some countries” clauses to be included should this proposal proceed. Recipients are reminded that the enquiry stage is the final stage for submitting "in some countries" clauses. See AC/22/2007.

TITLE:

High frequency inductive components - Electrical characteristics and measuring methods - Part 2: Rated current of inductors for DC-to-DC converters

PROPOSED STABILITY DATE: 2028

NOTE FROM TC/SC OFFICERS:

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

HIGH FREQUENCY INDUCTIVE COMPONENTS – ELECTRICAL CHARACTERISTICS AND MEASURING METHODS –

Part 2: Rated current of inductors for DC-to-DC converters

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IEC 62024-2 has been prepared by IEC technical committee 51: Magnetic components, ferrite and magnetic powder materials.

This third edition cancels and replaces the second edition published in 2020. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) extension of scope by increase of range of rated current from 22 A to 125 A;
b) extension of scope by increase of footprint limitation from 12 mm X 12 mm to 625 mm^2;
c) addition of upper current limitation for $I_{CLASS\ B}$, $I_{CLASS\ C}$ and $I_{CLASS\ D}$ board to Table 1;
d) revised application examples for Table 1;
e) addition of wire size references for current ranges between 22 A ≤ I ≤ 125 A to Table 2;
f) addition of crimp terminal references to Table 2;
g) addition of thermal camera method.

104 The text of this international standard is based on the following documents:

FDIS	Report on voting
51/xxxx/FDIS	51/xxxx/RVD

105
106 Full information on the voting for its approval can be found in the report on voting indicated in
107 the above table.

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

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

113 A list of all parts of IEC 62024 series, published under the general title *High frequency inductive*
114 *components – Electrical characteristics and measuring methods* can be found on the IEC
115 website.

116 The committee has decided that the contents of this document will remain unchanged until the
117 stability date indicated on the IEC website under webstore.iec.ch in the data related to the
118 specific document. At this date, the document will be

119 • reconfirmed,
120 • withdrawn,
121 • replaced by a revised edition, or
122 • amended.

123

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HIGH FREQUENCY INDUCTIVE COMPONENTS – ELECTRICAL CHARACTERISTICS AND MEASURING METHODS –

Part 2: Rated current of inductors for DC-to-DC converters

1 Scope

This part of IEC 62024 specifies the measuring methods of the rated direct current limits for small inductors as defined below.

Standardized measuring methods for the determination of ratings enable users to accurately compare the current ratings given in various manufacturers' data books.

This document is applicable to leaded and surface mount inductors with dimensions according to IEC 62025-1 and generally with rated current less than 125 A, although inductors with rated current greater than 125 A are available that fall within the dimension restrictions of this document (no larger than a 625 mm^2 footprint). These inductors are typically used in DC-to-DC converters built on PCBs, for electronic and telecommunication equipment, and small size switching power supply units.

The measuring methods are defined by the saturation and temperature rise limitations induced solely by direct current.

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 60068-1:2013, *Environmental testing – Part 1: General and guidance*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

3.1
DC saturation limited current
allowable value of DC current for which the decrease of the inductance is within the specified value

3.2
temperature rise limited current
allowable value of DC current for which the self-generation heat of the inductor results in temperature rise within the specified value

4 Standard atmospheric conditions

4.1 Standard atmospheric conditions for testing

Standard atmospheric conditions for testing shall be as follows (see 4.3 of IEC 60068-1:2013):

– temperature: 15 °C to 35 °C;
– relative humidity: 25 % to 75 %;
– air pressure: 86 kPa to 106 kPa.

In the event of dispute or where required, the measurements shall be repeated using the referee temperatures and such other conditions as given in 4.2.

4.2 Reference conditions

For reference purposes, one of the standard atmospheric conditions for referee tests taken from 4.2 of IEC 60068-1:2013 shall be selected and shall be as follows:

– temperature: 20 °C ± 2 °C;
– relative humidity: 60 % to 70 %;
– air pressure: 86 kPa to 106 kPa.

5 Measuring method of DC saturation limited current

5.1 General

When alternating current in which DC current is superimposed is supplied to an inductor, the inductance of the inductor decreases according to the DC current value.

In a typical application, the saturation current results from the peak current of the superposition of AC on DC current. In this document, the saturation current is measured as DC current offsetting a small signal AC current.

NOTE It is not practical to set a standard for AC saturation limited current, because there is an unlimited number of different ways to apply AC current in an application. Therefore, manufacturers and users have generally defined DC saturation limited current as a common point of reference. This document does the same.

5.2 Test conditions

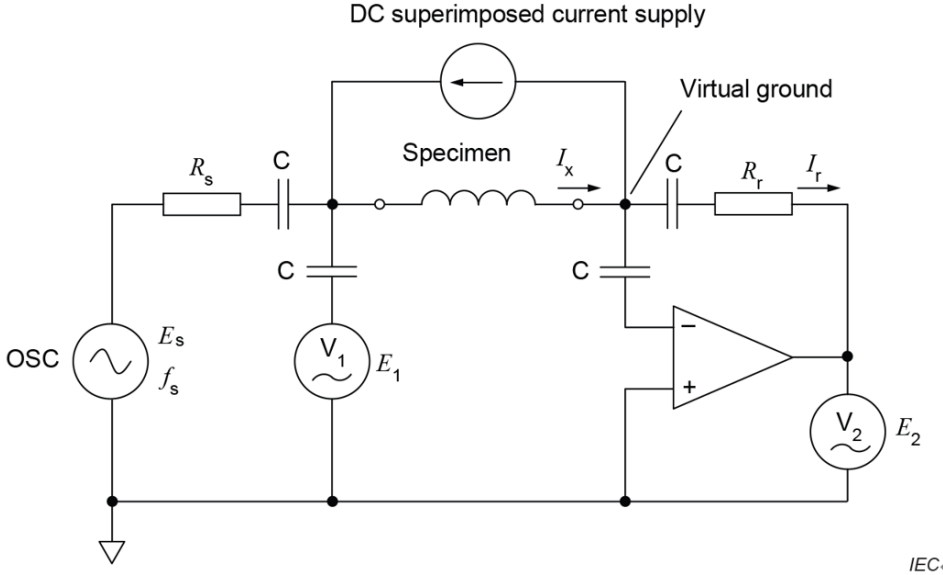
Unless otherwise specified in the detail specification, the test conditions shall be in accordance with Clause 4.

NOTE The variation of the value of DC saturation limited current, as a function of temperature, is dependent on the magnetic material and the structure of the magnetic core of the inductor. However, measurement of DC saturating currents at elevated temperatures is generally not practical for inspection purposes. Therefore, the measurement at room temperature as provided by this document is generally applied for specification purposes. De-rating curves indicating variation of DC saturation limited current as a function of maximum operating temperature of the inductor can be generated. These curves can be used to correlate the DC saturation limited current at room temperature to the DC saturation limited current at typical operating temperatures. In some cases, it will become necessary for the manufacturer and user to agree on an additional specification at a high temperature such as 85 °C, 105 °C or 125 °C.

5.3 Measuring circuit and calculation

5.3.1 Measuring circuit

The measuring circuit is as shown in Figure 1.



Key

Components

R_s source resistor $R = R_s$

R_r range resistor $R = R_r$

V_1 voltmeter

V_2 voltmeter

E_1 RMS voltage value measured by voltmeter V_1

E_2 RMS voltage value measured by voltmeter V_2

E_s RMS voltage value of source

C DC current blocking capacitor

Supplies

f_s frequency of source

I_r supplied current to range resistor

I_x supplied current to specimen

$I_x = I_r$

Figure 1 – Inductance measuring circuit under application of DC saturation condition

5.3.2 Calculation

Voltages E_1 and E_2 shall be measured when frequency f_s and voltage E_s of the signal generator are supplied in accordance with the detail specification, and an initial value of the inductance shall be calculated by the following formulae.

$$Z_x = \frac{E_1}{I_r} = \frac{-E_1}{E_2} R_r$$

$$Z_x = |Z_x|\cos\theta + j|Z_x|\sin\theta$$

$$Z_x = R_x + jX_x$$

$$L_x = \frac{X_x}{\omega} = \frac{X_x}{2\pi f_s}$$

where

R_x is the resistance of the specimen;

X_x is the reactance of the specimen;

Z_x is the impedance of the specimen;

L_x is the equivalent series inductance of the specimen;

E_1 is the applied voltage to the specimen;

E_2 is the applied voltage to the range resistor (= $I_r R_r$);

θ is the phase angle of the complex impedance.

5.4 Attachment jig of inductor

The attachment jig of the specimen shall be specified in a detail specification (see Clause 8) .

5.5 Measuring method

a) A short compensation shall be done before measurement.

b) The specimen shall be connected to the circuit shown in Figure 1, by using the attachment jig specified in 5.4.

c) When the specimen is connected by soldering, it shall be left until it becomes cool enough.