IEC 60384-14

Edition 4.0 2016-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1
AMENDEMENT 1

Fixed capacitors for use in electronic equipment –
Part 14: Sectional specification – Fixed capacitors for electromagnetic interference suppression and connection to the supply mains

Condensateurs fixes utilisés dans les équipements électroniques –
Partie 14: Spécification intermédiaire – Condensateurs fixes d'antiparasitage et raccordement à l'alimentation

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IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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FOREWORD

This amendment has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment.

The text of this amendment is based on the following documents:

FDIS	Report on voting
40/2463/FDIS	40/2469/RVD

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

The committee has decided that the contents of this amendment and the base publication will remain unchanged until the stability date indicated on the IEC website 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- withdrawn,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.

1.1 Scope

Replace, in the scope, the value "1 000 V d.c." *by* "1 500 V d.c."

1.4 Information to be given in a detail specification

Add, after the third paragraph and before the NOTE, the following new paragraph:

Requirements for safety approved a.c. capacitors to be used in d.c. applications are found in Annex H.

4.12 Damp heat, steady state

Add, after the first paragraph, the following new paragraph:

Requirements for capacitors used in high humidity applications are contained in Annex I.

Add, after the existing Annex G, the new Annex H and Annex I, as follows:

Annex H
(normative)

Use of safety approved a.c. rated capacitors in d.c. applications

H.1 Overview

This annex gives additional requirements for a.c. EMI suppression capacitors for which safety approval is sought and which are connected to a d.c. supply with nominal voltage not exceeding 1 500 V d.c.

If a safety approved capacitor fulfils the requirements of this annex, it is qualified at the d.c. rated voltage exceeding its approved a.c. rated voltage, without changing the capacitor class.

H.2 Background

Safety capacitors approved to this standard are a.c. capacitors which are essentially designed for applications where a.c. voltage is applied.

They have been allowed to be used in d.c. supplies having the same voltage as the a.c. r.m.s. rated voltage of the capacitors. (See 1.5.1, Note 1 to entry).

The class of the capacitors, such as X1 and Y1, is defined according to their peak impulse withstanding voltage and the type of insulation bridged.

A capacitor used for a.c. voltage application is subjected to the voltage waveform with peak voltage equal to r.m.s. voltage times square root of two, which is alternating polarity in a wave cycle, so that safety approved capacitors theoretically can withstand at least a d.c. voltage equivalent to their a.c. rated voltage times square root of two.

H.3 Terms and definitions

H.3.1
d.c. rated voltage
U_R d.c.
maximum d.c. operating voltage, which may be applied continuously to the terminations of a capacitor at any temperature between the lower and the upper category temperatures

Note 1 to entry: This term and designation (U_R d.c.) are used only for a capacitor specified with d.c. rated voltage exceeding its a.c. r.m.s. rated voltage.

Note 2 to entry: This definition replaces that given in IEC 60384-14:2013, 1.5.1.

H.4 Additional requirement for use of X- and Y-capacitors in d.c. applications

A capacitor, which is specified for a d.c. rated voltage exceeding the a.c. r.m.s. rated voltage, shall fulfil the requirements specified in Table H.1 in addition to the tests prescribed in Table 3.

Table H.1 – Additional test conditions

Type	Maximum U_R d.c.	Test voltage d.c. (Test A) (according 4.2.1)	Endurance test (d.c.)	Damp heat, steady state test
X1	1 500 V	2,15 × U_R d.c.	According to 4.14 using d.c. rated voltage instead of U_R, without voltage increased to U_S.	According to 4.12, but with d.c. rated voltage applied to the whole sample.
X2	1 500 V			
Y1	1 500 V	4 × U_R d.c. [a]		
Y2	1 500 V	2,15 × U_R d.c. [a]		
Y4	450 V	2,15 × U_R d.c. [a]		

[a] If an a.c. test voltage is used instead of a d.c. voltage for Y-capacitors, it shall be not less than 0,666 × d.c. test voltage in Table H.1.

H.5 Creepage and clearance distances

When a capacitor approved by this annex is used for a specific application, it shall be confirmed that creepage and clearance distances of the capacitor meet the requirements of the related standards for the application.

NOTE Examples of the specific standards and the requirements mentioned above, see IEC 60939-3: Table 6 and Table 7.

Annex I
(normative)

Humidity robustness grades for applications, where high stability under high humidity operating conditions is required

I.1 Overview

In addition to the description of preferred climatic categories in 2.1.1 and test damp heat, steady state in 4.12, this annex describes specific humidity robustness grades and requirements for applications, where high stability under high humidity operating conditions is required.

I.2 Humidity robustness grades

For high humidity applications the Grades (I) robustness under humidity, Grade (II) robustness under high humidity and Grade (III) high robustness under high humidity are defined.

I.2.1 Grade (I) robustness under humidity

To verify Grade (I), either test condition A or B shall be selected by the manufacturer. For requirements, see Table I.1. In case the capacitors are specified for a.c. and d.c. applications, one sample shall be tested with the rated a.c. voltage, and one sample shall be tested with rated d.c. voltage.

Test condition A: Test damp heat, steady state; 40 °C / 93 % RH duration 21 days, rated voltage applied.

Test condition B: Test damp heat, steady state; 85 °C / 85 % RH duration 168 h, rated voltage applied.

NOTE Test condition B is a substitutional acceleration test for test condition A.

I.2.2 Grade (II) robustness under high humidity

To verify Grade (II), either test condition A or B shall be selected by the manufacturer. For requirements see Table I.1. In case the capacitors are specified for a.c. and d.c. applications, one sample shall be tested with the rated a.c. voltage, and one sample shall be tested with rated d.c. voltage.

Test condition A: Test damp heat, steady state; 40 °C / 93 % RH duration 56 days, rated voltage applied.

Test condition B: Test damp heat, steady state; 85 °C / 85 % RH duration 500 h, rated voltage applied.

NOTE Test condition B is a substitutional acceleration test for test condition A.

I.2.3 Grade (III) high robustness under high humidity

To verify Grade (III), either test condition A or B shall be selected by the manufacturer. For requirements, see Table I.1. In case the capacitors are specified for a.c. and d.c. applications, one sample shall be tested with the rated a.c. voltage, and one sample shall be tested with rated d.c. voltage.

Test condition A: Test damp heat, steady state; 60 °C / 93 % RH duration 56 days, rated voltage applied.

Test condition B: Test damp heat, steady state; 85 °C / 85 % RH duration 1 000 h, rated voltage applied.

NOTE Test condition B is a substitutional acceleration test for test condition A.

Table I.1 – Requirements

Measurement	Measuring method	Requirements
Capacitance	4.2.2	Metalized capacitors: $\lvert \Delta C \rvert \leq 10$ % Ceramic capacitors: $\lvert \Delta C \rvert \leq 15$ %
Tangent of loss angle (metallized capacitors only)	4.2.3	The increase of tan δ over the value measured in Group 0 shall not exceed 0,024 for $C_N \leq 1$ µF [a] 0,015 for $C_N > 1$ µF [a]
Insulation resistance	4.2.5	>50 % of the applicable limits of Table 11 or Table 12, or minimum 200 MΩ, whichever is higher
The change of capacitance value depends on technology, and, as for example in case of ceramic capacitors, can be reversible. Thus the requirements are different. [a] For certain applications smaller values for the increase tan δ may be required.		

I.3 Indication of humidity robustness grades

In addition to the climatic category, information on the humidity robustness grade and the test method used for verification shall be indicated IA, IB, IIA, IIB, IIIA, or IIIB in the information provided by the manufacturer. Marking on the capacitor is not required.

Bibliography

Add, in the Bibliography, after the entry for IEC 60384-14, the following new reference:

IEC 60939-3:2015, *Passive filter units for electromagnetic interference suppression – Part 3: Passive filter units for which safety tests are appropriate*

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