

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Passive filter units for electromagnetic interference suppression –
Part 3: Passive filter units for which safety tests are appropriate**

**Filtres passifs d'antiparasitage –
Partie 3: Filtres passifs pour lesquels des essais de sécurité sont appropriés**

IEC 60939-3:2024

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CONTENTS

| | |
|--|----|
| FOREWORD..... | 8 |
| 1 Scope..... | 10 |
| 2 Normative references | 10 |
| 3 Terms and definitions | 12 |
| 4 General requirements | 16 |
| 4.1 Classification and usage of class X and Y capacitors | 16 |
| 4.1.1 General | 16 |
| 4.1.2 Class X capacitors | 16 |
| 4.1.3 Class Y capacitors | 16 |
| 4.2 Information to be given in a detail specification | 17 |
| 4.2.1 General | 17 |
| 4.2.2 Outline drawing and dimensions | 18 |
| 4.2.3 Mounting | 18 |
| 4.2.4 Ratings and characteristics..... | 18 |
| 4.3 Marking..... | 19 |
| 4.3.1 General | 19 |
| 4.3.2 Coding..... | 19 |
| 4.3.3 Marking details | 19 |
| 4.3.4 Marking of filters | 19 |
| 4.3.5 Marking of packaging..... | 19 |
| 4.3.6 Additional marking | 19 |
| 4.4 Components | 20 |
| 4.5 Overcurrent protective devices..... | 20 |
| 4.6 Wiring and Insulation | 20 |
| 4.6.1 General | 20 |
| 4.6.2 Sleeving, tubing and wire insulation..... | 20 |
| 4.6.3 Properties of insulation material..... | 20 |
| 4.7 Protective Bonding Conductors | 21 |
| 4.8 Corrosion..... | 21 |
| 5 Preferred ratings and characteristics | 21 |
| 5.1 Preferred characteristics | 21 |
| 5.1.1 General | 21 |
| 5.1.2 Preferred climatic categories | 21 |
| 5.2 Preferred values of ratings | 22 |
| 5.2.1 Rated voltage (U_R)..... | 22 |
| 5.2.2 Rated temperature..... | 22 |
| 5.2.3 Passive flammability | 22 |
| 6 Test plan for safety tests | 22 |
| 6.1 Structurally similar filters..... | 22 |
| 6.2 Safety approval procedure | 23 |
| 6.2.1 General | 23 |
| 6.2.2 Sampling | 23 |
| 6.2.3 Tests | 23 |
| 6.3 Requalification tests..... | 24 |
| 7 Test and measurement procedures..... | 24 |
| 7.1 Measurement conditions | 24 |

| | | |
|--------|---|----|
| 7.12.3 | Test Ub – Bending | 40 |
| 7.12.4 | Test Uc – Torsion | 40 |
| 7.12.5 | Test Ud – Torque..... | 40 |
| 7.12.6 | Visual examination | 41 |
| 7.13 | Resistance to soldering heat..... | 41 |
| 7.13.1 | Applicability of the test..... | 41 |
| 7.13.2 | Pre-measurement | 41 |
| 7.13.3 | Test conditions | 41 |
| 7.13.4 | Test severity..... | 42 |
| 7.13.5 | Intermediate inspection, measurements and requirements..... | 42 |
| 7.14 | Climatic sequence..... | 42 |
| 7.14.1 | General | 42 |
| 7.14.2 | Initial measurements | 42 |
| 7.14.3 | Dry heat | 42 |
| 7.14.4 | Damp heat, cyclic | 42 |
| 7.14.5 | Cold..... | 43 |
| 7.14.6 | Low air pressure | 43 |
| 7.14.7 | Damp heat, cyclic, remaining cycles | 43 |
| 7.14.8 | Final inspection, measurements and requirements..... | 43 |
| 7.15 | Damp heat, steady state | 44 |
| 7.15.1 | Pre-measurements | 44 |
| 7.15.2 | Test method | 44 |
| 7.15.3 | Test conditions | 44 |
| 7.15.4 | Final inspection, measurements and requirements..... | 44 |
| 7.16 | Temperature rise | 44 |
| 7.16.1 | General | 44 |
| 7.16.2 | Test method | 45 |
| 7.16.3 | Test description | 45 |
| 7.16.4 | Requirements | 46 |
| 7.17 | Current overload..... | 47 |
| 7.17.1 | Pre-measurements | 47 |
| 7.17.2 | Test method | 47 |
| 7.17.3 | Final inspection, measurements and requirements..... | 48 |
| 7.18 | Leakage current..... | 48 |
| 7.19 | Protective conductor resistance | 48 |
| 7.20 | Impulse voltage..... | 48 |
| 7.20.1 | General | 48 |
| 7.20.2 | Initial measurements | 48 |
| 7.20.3 | Test conditions | 48 |
| 7.20.4 | Requirements | 49 |
| 7.21 | Endurance | 49 |
| 7.21.1 | General | 49 |
| 7.21.2 | General test conditions | 49 |
| 7.21.3 | Test conditions – current test..... | 50 |
| 7.21.4 | Test conditions – voltage test, terminations/case | 50 |
| 7.21.5 | Test conditions – voltage test between terminations | 51 |
| 7.21.6 | Test conditions – combined voltage/current tests..... | 51 |
| 7.21.7 | Final inspection, measurements and requirements..... | 51 |
| 7.22 | Passive flammability | 52 |

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| | | |
|-----------------------|---|----|
| 7.22.1 | General | 52 |
| 7.22.2 | Test method | 52 |
| 7.23 | Active flammability | 53 |
| 7.24 | Solvent resistance of the marking | 53 |
| 7.24.1 | General | 53 |
| 7.24.2 | Test description | 53 |
| 7.24.3 | Requirements after test | 53 |
| 8 | Optional tests (for performance only) | 53 |
| 8.1 | Solderability | 53 |
| 8.1.1 | General | 53 |
| 8.1.2 | Test method | 53 |
| 8.1.3 | Test conditions | 53 |
| 8.1.4 | Requirements | 54 |
| 8.1.5 | Final measurements and requirements | 54 |
| 8.2 | Rapid change of temperature | 54 |
| 8.2.1 | Pre-measurements | 54 |
| 8.2.2 | Test method | 54 |
| 8.2.3 | Final inspection | 55 |
| 8.3 | Vibration | 55 |
| 8.3.1 | Pre-measurements | 55 |
| 8.3.2 | Test method | 55 |
| 8.3.3 | Test conditions | 55 |
| 8.3.4 | Intermediate inspection | 55 |
| 8.3.5 | Final Inspection | 55 |
| 8.4 | Shock | 55 |
| 8.4.1 | Pre-measurements | 55 |
| 8.4.2 | Test method | 55 |
| 8.4.3 | Test conditions | 55 |
| 8.4.4 | Final Inspection | 56 |
| 8.5 | Container sealing | 56 |
| 8.5.1 | General | 56 |
| 8.5.2 | Test conditions | 56 |
| 8.5.3 | Requirements | 56 |
| 8.6 | Charge and discharge | 56 |
| 8.6.1 | General | 56 |
| 8.6.2 | Test circuits and wave forms | 56 |
| 8.6.3 | Information given in detail specification | 58 |
| 8.6.4 | Initial measurements | 58 |
| 8.6.5 | Test conditions | 59 |
| 8.6.6 | Final measurements and requirements | 59 |
| 8.7 | Component solvent resistance | 59 |
| 8.7.1 | General | 59 |
| 8.7.2 | Initial measurements | 59 |
| 8.7.3 | Test description | 60 |
| 8.7.4 | Final measurements | 60 |
| Annex A (informative) | Calculation of leakage current | 61 |
| A.1 | General | 61 |
| A.2 | Calculation of leakage current for 1-line filters | 61 |
| A.3 | Calculation of leakage current for 2-line filters | 62 |

| | | |
|-----------------------|--|----|
| A.4 | Calculation of leakage current for 3-line filters | 62 |
| A.5 | Calculation of leakage current for 4-line filters | 64 |
| Annex B (normative) | Sampling plan for safety requirements only | 65 |
| Annex C (normative) | Test schedule for safety requirements only | 67 |
| Annex D (normative) | Circuit for the impulse voltage test | 70 |
| Annex E (normative) | Circuit for the endurance test | 72 |
| Annex F (normative) | Declaration of design..... | 73 |
| Annex G (informative) | Safety and performance tests qualification approval – Assessment level DZ | 74 |
| Annex X (informative) | Cross reference for references to the previous edition of this document..... | 76 |
| Bibliography | | 79 |
| | | |
| Figure 1 | – Asymmetrical and symmetrical test circuit | 15 |
| Figure 2 | – Examples for the application of Tests A and B of Table 7 | 33 |
| Figure 3 | – Examples for the application of Test C of Table 7..... | 34 |
| Figure 4 | – Impulse wave form | 49 |
| Figure 5 | – Relay circuit | 56 |
| Figure 6 | – Thyristor circuit | 57 |
| Figure 7 | – Voltage and current waveforms | 58 |
| Figure A.1 | – Leakage current for 1-line filters | 61 |
| Figure A.2 | – Leakage current for 2-line filters | 62 |
| Figure A.3 | – Leakage current for 3-line filters | 63 |
| Figure A.4 | – Leakage current for 4-line filters | 64 |
| Figure D.1 | – Impulse voltage test circuit | 70 |
| Figure E.1 | – Endurance test circuit | 72 |
| | | |
| Table 1 | – Classification of Class X capacitors | 16 |
| Table 2 | – Classification of Class Y capacitors | 17 |
| Table 3 | – Standard atmospheric conditions..... | 25 |
| Table 4 | – Creepage distances | 28 |
| Table 5 | – Clearance..... | 28 |
| Table 6 | – DC voltage for insulation resistance | 31 |
| Table 7 | – Measuring points..... | 33 |
| Table 8 | – Insulation resistance – Safety tests only..... | 34 |
| Table 9 | – Insulation resistance – Safety and performance tests | 35 |
| Table 10 | – Voltage proof (filter connected to mains) | 36 |
| Table 11 | – Voltage proof (filter not connected to mains; e.g. DC filters) | 36 |
| Table 12 | – Force for wire terminations | 40 |
| Table 13 | – Torque | 40 |
| Table 14 | – Number of cycles..... | 43 |
| Table 15 | – Maximum temperatures | 47 |
| Table 16 | – Categories of flammability | 52 |
| Table 17 | – Preferred severity | 56 |

| | |
|---|----|
| Table 18 – Measurements and requirements after charge and discharge | 59 |
| Table B.1 – Tests concerning safety requirements only..... | 65 |
| Table B.2 – Lot-by-lot test – Safety tests only approval..... | 66 |
| Table C.1 – Test schedule for safety requirements only | 67 |
| Table D.1 – Values of C_X , C_T , R_P , R_S , C_P | 70 |
| Table D.2 – Values and tolerances of C_X , t_r , t_d | 71 |
| Table G.1 – Sampling plan – Assessment level DZ | 74 |
| Table X.1 – Reference to IEC 60939-3 for clause/subclause or annex | 76 |
| Table X.2 – Reference to IEC 60939-3 for Figures/Tables..... | 78 |

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**PASSIVE FILTER UNITS FOR ELECTROMAGNETIC
INTERFERENCE SUPPRESSION –****Part 3: Passive filter units for which safety tests are appropriate**

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IEC 60939-3 has been prepared by of IEC technical committee 40: Capacitors and resistors for electronic equipment. It is an International Standard.

This second edition cancels and replaces the first edition published in 2015, Corrigendum 1:2016 and Corrigendum 2:2018. This edition constitutes a technical revision.

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

- a) Separated clauses for safety and performance tests;
- b) Added note for use of multiple X capacitors bridging basic insulation in 3 phase filters;
- c) Characteristics and conditions to substitute X and Y capacitors are now described in a separate Subclause 4.1;

- d) Creepage and clearance tables updated and in line with the latest editions of IEC 60938-2 and IEC 60664-1;
- e) Allowing voltage measurement for inductance measurements (7.3);
- f) Added requirements for marking depending on remaining energy after disconnection;
- g) Added content of CTL DSH 2044:2016 for temperature test of IEC filters;
- h) Added note about temperature rise required specimens for safety testing;
- i) Changed index of capacitors in Annex A to avoid confusion between index name and capacitor class;
- j) Moved tests from group 1A to 2. Now, samples in group 1A need to be submitted without potting;
- k) Revision of all parts of the document has taken place based on the ISO/IEC Directives, Part 2:2021, and harmonization with other similar kinds of documents. Annex X contains all cross-references of changes in clause/subclause numbers.

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

| Draft | Report on voting |
|--------------|------------------|
| 40/3102/FDIS | 40/3118/RVD |

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/publications.

<https://standards.iteh.ai/IEC/60939-3/2024>

<https://standards.iteh.ai/IEC/60939-3/2024>: A list of all parts in the IEC 60939 series, published under the general title *Passive filter units for electromagnetic interference suppression*, can be found on the IEC website.

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

- reconfirmed,
- withdrawn, or
- revised.

PASSIVE FILTER UNITS FOR ELECTROMAGNETIC INTERFERENCE SUPPRESSION –

Part 3: Passive filter units for which safety tests are appropriate

1 Scope

This part of IEC 60939 covers passive filters used to attenuate unwanted radio-frequency signals (such as noise or interference) generated from electromagnetic sources.

Both single and multi-channel filters within one enclosure or which are built on a printed circuit board forming a compact entity are included within the scope of this document.

Filters constructed of capacitive elements where the inductance is inherent in the construction of the filter are within the scope of this document. Similarly, filters constructed of inductive elements where the capacitance is inherent in the construction of the filter are also within the scope of this document. It is up to the manufacturer to state whether a given component is to be designed as a capacitor, an inductor or a filter. Filters can include also other components such as resistors and/or varistors or similar components.

This document applies to passive filter units for electromagnetic interference suppression for which safety tests are appropriate. This implies that filters specified according to this document will either be connected to mains supplies, when compliance with the mandatory tests of Table B.1 is necessary, or used in other circuit positions where the equipment specification specifies that some or all of these safety tests are required.

This document applies to passive filter units, which will be connected to an AC mains or other supply (DC or AC) with a nominal voltage not exceeding 1 000 V AC, with a nominal frequency not exceeding 400 Hz, or 1 500 V DC.

NOTE For AC use, IEC 60384-14 applies to capacitors which will be connected to AC mains with a nominal frequency not exceeding 100 Hz.

This document covers appliance filters (US) but does not cover facility filters, cord-connected filters or direct plug-in filters. These other filters will be covered by another sectional specification.

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 60060-1:2010, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60062:2016, *Marking codes for resistors and capacitors*

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

IEC 60068-2-1:2007, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-6:2007, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-14:2023, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

IEC 60068-2-17:2023, *Environmental testing – Part 2-17: Tests – Test Q: Sealing*

IEC 60068-2-20:2021, *Environmental testing – Part 2-20: Tests – Test Ta and Tb: Test methods for solderability and resistance to soldering heat of devices with leads*

IEC 60068-2-21:2021, *Environmental testing – Part 2-21: Tests – Test U: Robustness of terminations and integral mounting devices*

IEC 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)*

IEC 60068-2-45:1980, *Basic environmental testing procedures – Part 2-45: Tests – Test XA and guidance: Immersion in cleaning solvents*

IEC 60068-2-78:2012, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60384-14:2023, *Fixed capacitors for use in electronic equipment – Part 14: Sectional specification – Fixed capacitors for electromagnetic interference suppression and connection to the supply mains*

IEC 60664-1:2020, *Insulation coordination for equipment within low-voltage supply systems – Part 1: Principles, requirements and tests*

[IEC 60939-3:2024](#)

[https://www.ietcstandards.com/standards/iec-60695-11-5-2016-fire-hazard-testing-part-11-5-test-flames-needle-flame-test-method-2024](#)
– Apparatus, confirmatory test arrangement and guidance

IEC 60695-11-10:2013, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical flame test methods*

IEC 60938-1:2021, *Fixed inductors for electromagnetic interference suppression – Part 1: Generic specification*

IEC 60938-2:2021, *Fixed inductors for electromagnetic interference suppression – Part 2: Sectional specification on power line chokes*

IEC 60940:2015, *Guidance information on the application of capacitors, resistors, inductors and complete filter units for electromagnetic interference suppression*

CISPR 17:2011, *Methods of measurement of the suppression characteristics of passive EMC filtering devices*

3 Terms and definitions

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

ISO and IEC maintain terminology 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>

3.1

capacitor of Class X

RC unit of Class X

capacitor or RC unit of a type suitable for use in situations where failure of the capacitor would not lead to danger of electric shock but could result in a risk of fire

Note 1 to entry: See 4.1.2 for details.

3.2

capacitor of Class Y

RC unit of Class Y

capacitor or RC-unit of a type suitable for use in situations where failure of the capacitor could lead to danger of electric shock

Note 1 to entry: See 4.1.3 for details.

3.3

earth inductor

inductor that forms part of the earth lead of a filter

3.4

type

group of components having similar design features, the similarity of their manufacturing techniques enabling them to be grouped together either for qualification approval or for quality conformance inspection, and generally covered by a single detail specification

Note 1 to entry: Components described in several detail specifications may, in some cases, be considered as belonging to the same type and may therefore be grouped together for approval and quality conformance inspection.

3.5

style

subdivision of a type generally based on dimensional factors

Note 1 to entry: A style may include several variants, generally of a mechanical order.

3.6

electromagnetic interference suppression filter unit (filter)

radio interference suppression filter unit

assembly of piece-parts and inductive, capacitive and resistive elements to be used for the reduction of electromagnetic interference caused by electrical or electronic equipment, or other sources

3.7

AC mains filter mains filter

passive filter unit designed essentially for application with a power-frequency alternating voltage supplied from the mains