

© Copyright SEK. Reproduction in any form without permission is prohibited.

## Passiva avstörningsfilter – Del 3: Filter för vilka provning avseende säkerhet är lämplig

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

Som svensk standard gäller europastandarden EN 60939-3:2015. Den svenska standarden innehåller den officiella engelska språkversionen av EN 60939-3:2015.

### Nationellt förord

Europastandarden EN 60939-3:2015<sup>\*)</sup>

består av:

- **europastandardens ikraftsättningsdokument**, utarbetat inom CENELEC
- **IEC 60939-3, First edition, 2015<sup>\*)</sup> - Passive filter units for electromagnetic interference suppression - Part 3: Passive filter units for which safety tests are appropriate**

utarbetad inom International Electrotechnical Commission, IEC.

---

<sup>\*)</sup> Corrigendum No 1, April 2016 till IEC 60939-3:2015 (EN 60939-3:2015/AC:2016-04) är inarbetat i standarden.

### *Standarder underlättar utvecklingen och höjer elsäkerheten*

Det finns många fördelar med att ha gemensamma tekniska regler för bl a mätning, säkerhet och provning och för utförande, skötsel och dokumentation av elprodukter och elanläggningar.

Genom att utforma sådana standarder blir säkerhetsfordringar tydliga och utvecklingskostnaderna rimliga samtidigt som marknadens acceptans för produkten eller tjänsten ökar.

Många standarder inom elområdet beskriver tekniska lösningar och metoder som åstadkommer den elsäkerhet som föreskrivs av svenska myndigheter och av EU.

### *SEK är Sveriges röst i standardiseringsarbetet inom elområdet*

SEK Svensk Elstandard svarar för standardiseringen inom elområdet i Sverige och samordnar svensk medverkan i internationell och europeisk standardisering. SEK är en ideell organisation med frivilligt deltagande från svenska myndigheter, företag och organisationer som vill medverka till och påverka utformningen av tekniska regler inom elektrotekniken.

SEK samordnar svenska intressenters medverkan i SEKs tekniska kommittéer och stödjer svenska experters medverkan i internationella och europeiska projekt.

### *Stora delar av arbetet sker internationellt*

Utformningen av standarder sker i allt väsentligt i internationellt och europeiskt samarbete. SEK är svensk nationalkommitté av International Electrotechnical Commission (IEC) och Comité Européen de Normalisation Electrotechnique (CENELEC).

Standardiseringsarbetet inom SEK är organiserat i referensgrupper bestående av ett antal tekniska kommittéer som speglar hur arbetet inom IEC och CENELEC är organiserat.

Arbetet i de tekniska kommittéerna är öppet för alla svenska organisationer, företag, institutioner, myndigheter och statliga verk. Den årliga avgiften för deltagandet och intäkter från försäljning finansierar SEKs standardiseringsverksamhet och medlemsavgift till IEC och CENELEC.

### *Var med och påverka!*

Den som deltar i SEKs tekniska kommittéarbete har möjlighet att påverka framtida standarder och får tidig tillgång till information och dokumentation om utvecklingen inom sitt teknikområde. Arbetet och kontakterna med kollegor, kunder och konkurrenter kan gynnsamt påverka enskilda företags affärsutveckling och bidrar till deltagarnas egen kompetensutveckling.

Du som vill dra nytta av dessa möjligheter är välkommen att kontakta SEKs kansli för mer information.

### **SEK Svensk Elstandard**

Box 1284  
164 29 Kista  
Tel 08-444 14 00  
[www.elstandard.se](http://www.elstandard.se)

ICS 31.160

English Version

Passive filter units for electromagnetic interference suppression -  
Part 3: Passive filter units for which safety tests are appropriate  
(IEC 60939-3:2015)

Filtres passifs d'antiparasitage - Partie 3: Filtres passifs  
pour lesquels des essais de sécurité sont appropriés  
(IEC 60939-3:2015)

Passive Filter für die Unterdrückung von  
elektromagnetischen Störungen - Teil 3: Filter, für die  
Sicherheitsprüfungen vorgeschrieben sind  
(IEC 60939-3:2015)

This European Standard was approved by CENELEC on 2015-09-16. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

## **European foreword**

The text of document 40/2387/FDIS, future edition 1 of IEC 60939-3, prepared by IEC/TC 40 "Capacitors and resistors for electronic equipment" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 60939-3:2015.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2016-06-16
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2018-09-16

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

## **Endorsement notice**

The text of the International Standard IEC 60939-3:2015 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60068-2-13	NOTE	Harmonized as EN 60068-2-13.
IEC 60068-2-27	NOTE	Harmonized as EN 60068-2-27.
IEC 60085	NOTE	Harmonized as EN 60085.
IEC 60335-1	NOTE	Harmonized as EN 60335-1.
IEC 60384-9	NOTE	Harmonized as EN 60384-9.
IEC 60947-1	NOTE	Harmonized as EN 60947-1.
IEC 60990	NOTE	Harmonized as EN 60990.
IEC 61112	NOTE	Harmonized as EN 61112.
IEC 62109-1	NOTE	Harmonized as EN 62109-1.

## Annex ZA (normative)

### Normative references to international publications with their corresponding European publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: [www.cenelec.eu](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60027-1	-	Letter symbols to be used in electrical technology - Part 1: General	-	-
IEC 60050	series	International Electrotechnical Vocabulary (IEV)	-	-
IEC 60060-1	2010	High-voltage test techniques - Part 1: General definitions and test requirements	EN 60060-1	2010
IEC 60062	-	Marking codes for resistors and capacitors	EN 60062	-
IEC 60068-1	2013	Environmental testing - Part 1: General and guidance	EN 60068-1	2014
IEC 60068-2-1	-	Environmental testing - Part 2-1: Tests - Test A: Cold	EN 60068-2-1	-
IEC 60068-2-2	-	Environmental testing - Part 2-2: Tests - Test B: Dry heat	EN 60068-2-2	-
IEC 60068-2-6	-	Environmental testing - Part 2-6: Tests - Test Fc: Vibration (sinusoidal)	EN 60068-2-6	-
IEC 60068-2-14	-	Environmental testing - Part 2-14: Tests - Test N: Change of temperature	EN 60068-2-14	-
IEC 60068-2-17	-	Basic environmental testing procedures - Part 2-17: Tests - Test Q: Sealing	EN 60068-2-17	-
IEC 60068-2-20	2008	Environmental testing - Part 2-20: Tests - Test T: Test methods for solderability and resistance to soldering heat of devices with leads	EN 60068-2-20	2008
IEC 60068-2-21	-	Environmental testing - Part 2-21: Tests - Test U: Robustness of terminations and integral mounting devices	EN 60068-2-21	-

## EN 60939-3:2015

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60068-2-30	2005	Environmental testing - Part 2-30: Tests - Test Db: Damp heat, cyclic (12 h + 12 h cycle)	EN 60068-2-30	2005
IEC 60068-2-45	1980	Basic environmental testing procedures - Part 2-45: Tests - Test XA and guidance: Immersion in cleaning solvents	EN 60068-2-45	1992
IEC 60068-2-78	-	Environmental testing - Part 2-78: Tests - Test Cab: Damp heat, steady state	EN 60068-2-78	-
IEC 60294	-	Measurement of the dimensions of a cylindrical component with axial terminations	EN 60294	-
IEC 60384-14	2013	Fixed capacitors for use in electronic equipment - Part 14: Sectional specification - Fixed capacitors for electromagnetic interference suppression and connection to the supply mains	EN 60384-14	2013
IEC 60664-1	2007	Insulation coordination for equipment within low-voltage systems - Part 1: Principles, requirements and tests	EN 60664-1	2007
IEC 60695-11-5	-	Fire hazard testing - Part 11-5: Test flames - Needle-flame test method - Apparatus, confirmatory test arrangement and guidance	EN 60695-11-5	-
IEC 60695-11-10	-	Fire hazard testing - Part 11-10: Test flames - 50 W horizontal and vertical flame test methods	EN 60695-11-10	-
IEC 60938-1 + A1	1999 2006	Fixed inductors for electromagnetic interference suppression - Part 1: Generic specification	EN 60938-1 + A1	1999 2007
IEC 60938-2	-	Fixed inductors for electromagnetic interference suppression - Part 2: Sectional specification	EN 60938-2	-
IEC 60939-1	-	Passive filter units for electromagnetic interference suppression - Part 1: Generic specification	EN 60939-1	-
IEC 60940	-	Guidance information on the application of capacitors, resistors, inductors and complete filter units for electromagnetic interference suppression	EN 60940	-
IEC 61140	-	Protection against electric shock - Common aspects for installation and equipment	EN 61140	-
ISO 80000-1	-	Quantities and units - Part 1: General	EN ISO 80000-1	-
CISPR 17	-	Methods of measurement of the suppression characteristics of passive EMC filtering devices	EN 55017	-

## CONTENTS

FOREWORD.....	7
1 General.....	9
1.1 Scope.....	9
1.2 Normative references.....	9
1.3 Information to be given in a detail specification.....	11
1.3.1 General.....	11
1.3.2 Outline drawing and dimensions.....	11
1.3.3 Mounting.....	11
1.3.4 Ratings and characteristics.....	12
1.3.5 Marking.....	12
1.4 Terms and definitions.....	12
1.5 Marking.....	17
1.5.1 General.....	17
1.5.2 Coding.....	18
1.5.3 Marking details.....	18
1.5.4 Marking of filters.....	18
1.5.5 Marking of packaging.....	18
1.5.6 Additional marking.....	18
1.6 Components.....	18
1.7 Overcurrent protective devices.....	18
1.8 Wiring and Insulation.....	19
1.8.1 General.....	19
1.8.2 Sleeving, tubing and wire insulation.....	19
1.8.3 Properties of insulation material.....	19
1.9 Protective Bonding Conductors.....	19
1.10 Corrosion.....	20
2 Preferred ratings and characteristics.....	20
2.1 Preferred characteristics.....	20
2.1.1 General.....	20
2.1.2 Preferred climatic categories.....	20
2.2 Preferred values of ratings.....	20
2.2.1 Rated voltage ( $U_R$ ).....	20
2.2.2 Rated temperature.....	20
2.2.3 Passive flammability.....	20
3 Test plan for safety tests.....	21
3.1 Structurally similar filters.....	21
3.2 Safety approval procedure.....	21
3.2.1 General.....	21
3.2.2 Sampling.....	21
3.2.3 Tests.....	22
3.3 Requalification tests.....	22
4 Test and measurement procedures.....	24
4.1 General.....	24
4.1.1 General.....	24
4.1.2 Standard atmospheric conditions.....	24
4.1.3 Standard atmospheric conditions for testing.....	24
4.1.4 Recovery conditions.....	25

4.1.5	Referee conditions .....	25
4.1.6	Reference conditions .....	25
4.1.7	Drying.....	26
4.2	Visual examination and check of dimensions .....	26
4.2.1	Visual examination.....	26
4.2.2	Dimensions (gauging) .....	26
4.2.3	Dimensions (detail) .....	26
4.2.4	Creepage distances and clearances .....	26
4.3	Inductance measurement .....	29
4.3.1	General .....	29
4.3.2	Measuring conditions .....	29
4.4	Earth inductors incorporated in filters.....	29
4.5	Capacitance.....	29
4.5.1	General .....	29
4.5.2	Measuring conditions .....	29
4.6	Insertion loss .....	30
4.7	Insulation resistance .....	30
4.7.1	General .....	30
4.7.2	Measuring voltage.....	30
4.7.3	Application of measuring voltage .....	31
4.7.4	Mean time to measuring .....	32
4.7.5	Temperature correction factor .....	32
4.7.6	Information to be given in a detail specification.....	32
4.7.7	Requirements .....	34
4.8	Voltage proof .....	35
4.8.1	General .....	35
4.8.2	Test procedure.....	35
4.8.3	Applied voltage .....	35
4.8.4	Tests .....	36
4.8.5	Requirements .....	37
4.8.6	Repetition of the voltage proof test .....	37
4.8.7	Information to be given in a detail specification.....	37
4.8.8	Requirements .....	37
4.9	DC line resistance or voltage drop at rated current.....	37
4.9.1	General .....	37
4.9.2	DC line resistance.....	37
4.9.3	Voltage drop at rated current.....	37
4.10	Discharge resistance.....	38
4.10.1	General .....	38
4.10.2	Resistor Test .....	38
4.11	Robustness of terminations .....	39
4.11.1	General .....	39
4.11.2	Test Ua1 – Tensile.....	39
4.11.3	Test Ub – Bending .....	39
4.11.4	Test Uc – Torsion.....	39
4.11.5	Test Ud – Torque .....	39
4.11.6	Visual examination.....	41
4.12	Resistance to soldering heat .....	41
4.12.1	Applicability of the test .....	41



4.12.2	Pre-measurement .....	41
4.12.3	Test conditions .....	41
4.12.4	Test severity .....	41
4.12.5	Intermediate inspection, measurements and requirements .....	41
4.13	Solderability (for performance only) .....	41
4.13.1	General .....	41
4.13.2	Test method.....	42
4.13.3	Test conditions .....	42
4.13.4	Requirements .....	42
4.13.5	Final measurements and requirements .....	42
4.14	Rapid change of temperature (for performance only) .....	42
4.14.1	Pre-measurements.....	42
4.14.2	Test method.....	43
4.14.3	Final inspection.....	43
4.15	Vibration (for performance only) .....	43
4.15.1	Pre-measurements.....	43
4.15.2	Test method.....	43
4.15.3	Test conditions .....	43
4.15.4	Intermediate inspection .....	43
4.15.5	Final Inspection .....	43
4.16	Shock (for performance only).....	43
4.16.1	Pre measurements .....	43
4.16.2	Test method.....	44
4.16.3	Test conditions .....	44
4.16.4	Final Inspection .....	44
4.17	Container sealing (for performance only) .....	44
4.17.1	General .....	44
4.17.2	Test conditions .....	44
4.17.3	Requirements .....	44
4.18	Climatic sequence.....	44
4.18.1	General .....	44
4.18.2	Initial measurements.....	44
4.18.3	Dry heat.....	45
4.18.4	Damp heat, cyclic.....	45
4.18.5	Cold.....	45
4.18.6	Low air pressure .....	45
4.18.7	Damp heat, cyclic, remaining cycles .....	46
4.18.8	Final inspection, measurements and requirements.....	46
4.19	Damp heat, steady state.....	46
4.19.1	Pre-measurements.....	46
4.19.2	Test method.....	46
4.19.3	Test conditions .....	46
4.19.4	Final inspection, measurements and requirements.....	47
4.20	Temperature rise.....	47
4.20.1	General .....	47
4.20.2	Test method.....	47
4.20.3	Test description .....	48
4.20.4	Requirements .....	49
4.21	Current overload .....	50

4.21.1	Pre-measurements.....	50
4.21.2	Test method.....	50
4.21.3	Final inspection, measurements and requirements.....	50
4.22	Leakage current.....	50
4.23	Protective conductor resistance.....	50
4.24	Impulse voltage.....	51
4.24.1	General.....	51
4.24.2	Initial measurements.....	51
4.24.3	Test conditions.....	51
4.24.4	Requirements.....	51
4.25	Endurance.....	52
4.25.1	General.....	52
4.25.2	General test conditions.....	52
4.25.3	Test conditions – current test.....	52
4.25.4	Test conditions – voltage test, terminations/case.....	53
4.25.5	Test conditions – voltage test between terminations.....	53
4.25.6	Test conditions – combined voltage/current tests.....	54
4.25.7	Final inspection, measurements and requirements.....	54
4.26	Charge and discharge (for performance only).....	54
4.26.1	General.....	54
4.26.2	Test circuits and wave forms.....	54
4.26.3	Information given in detail specification.....	56
4.26.4	Initial measurements.....	56
4.26.5	Test conditions.....	57
4.26.6	Final measurements and requirements.....	57
4.27	Passive flammability.....	57
4.27.1	General.....	57
4.27.2	Test method.....	57
4.28	Active flammability.....	58
4.29	Solvent resistance of the marking.....	58
4.29.1	General.....	58
4.29.2	Test description.....	58
4.29.3	Requirements after test.....	59
4.30	Component solvent resistance (for performance only).....	59
4.30.1	General.....	59
4.30.2	Initial measurements.....	59
4.30.3	Test description.....	59
4.30.4	Final measurements.....	59
Annex A (informative)	Calculation of leakage current.....	60
A.1	General.....	60
A.2	Calculation of leakage current for 1-line filters.....	60
A.3	Calculation of leakage current for 2-line filters.....	61
A.4	Calculation of leakage current for 3-line filters.....	61
A.5	Calculation of leakage current for 4-line filters.....	63
Annex B (normative)	Test schedule for safety requirements only.....	64
Annex C (normative)	Circuit for the impulse voltage test.....	67
Annex D (normative)	Circuit for the endurance test.....	69
Annex E (normative)	Declaration of design.....	70

Annex F (informative) Safety and performance tests qualification approval – Assessment level DZ .....	71
Annex P (informative) Additional components and material standards .....	73
Bibliography .....	74
Figure 1 – Asymmetrical and symmetrical test circuit .....	17
Figure 2 – Examples for the application of Tests A and B of Table 9 .....	33
Figure 3 – Examples for the application of Test C of Table 9.....	34
Figure 4 – Impulse wave form .....	51
Figure 5 – Relay circuit .....	55
Figure 6 – Thyristor circuit .....	55
Figure 7 – Voltage and current waveforms.....	56
Figure A.1 – Leakage current for 1-line filters .....	60
Figure A.2 – Leakage current for 2-line filters .....	61
Figure A.3 – Leakage current for 3-line filters .....	62
Figure A.4 – Leakage current for 4-line filters .....	63
Figure C.1 – Impulse voltage test circuit.....	67
Figure D.1 – Endurance test circuit .....	69
Table 1 – Classification of Class X capacitors.....	13
Table 2 – Classification of Class Y capacitors.....	14
Table 3 – Tests concerning safety requirements only.....	23
Table 4 – Lot-by-lot test – Safety tests only approval.....	24
Table 5 – Standard atmospheric conditions .....	25
Table 6 – Creepage distances.....	28
Table 7 – Clearance.....	29
Table 8 – DC voltage for insulation resistance .....	31
Table 9 – Measuring points .....	33
Table 10 – Insulation resistance – Safety tests only.....	34
Table 11 – Insulation resistance – Safety and performance tests .....	35
Table 12 – Voltage proof (filter connected to mains) .....	36
Table 13 – Voltage proof (filter not connected to mains; e.g. d.c. filters).....	36
Table 14 – Force for wire terminations .....	39
Table 15 – Torque .....	40
Table 16 – Preferred severity .....	44
Table 17 – Number of cycles.....	46
Table 18 – Maximum temperatures.....	49
Table 19 – Measurements and requirements after charge and discharge.....	57
Table 20 – Categories of flammability.....	58
Table B.1 – Test schedule for safety requirements only (1 of 3) .....	64
Table C.1 – Values of $C_X$ , $C_T$ , $R_P$ , $R_S$ , $C_P$ .....	67
Table C.2 – Values and tolerances of $C_X$ , $t_r$ , $t_d$ .....	68
Table F.1 – Sampling plan – Assessment level DZ (1 of 2).....	71

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

—————

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

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

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

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

FDIS	Report on voting
40/2387/FDIS	40/2398A/RVD

Full information on the voting for the approval of this standard 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.

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 publication will remain unchanged until the stability 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.

The contents of the corrigendum of April 2016 have been included in this copy.

# PASSIVE FILTER UNITS FOR ELECTROMAGNETIC INTERFERENCE SUPPRESSION –

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

### 1 General

#### 1.1 Scope

This specification 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 specification.

Filters constructed of capacitive elements where the inductance is inherent in the construction of the filter are within the scope of this specification. Similarly, filters constructed of inductive elements where the capacitance is inherent in the construction of the filter are also within the scope of this specification. 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 like resistors and/or varistors or similar components

This specification applies to passive filter units for electromagnetic interference suppression for which safety tests are appropriate. This implies that filters specified according to this specification will either be connected to mains supplies, when compliance with the mandatory tests of Table 3 is necessary, or used in other circuit positions where the equipment specification prescribes that some or all of these safety tests are required.

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

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

This specification 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.

#### 1.2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 These documents are referenced, in whole, in part or as alternative requirements to the requirements contained in this standard. Their use is specified, where necessary, for the application of the requirements of this standard.

NOTE 2 The list below is a summary of all standards that are referred to within this standard. Appearance of a standard in the list does not mean that the standard or parts of it are applicable. Only those parts that are specifically referenced in this standard are applicable.

IEC 60027-1, *Letters symbols to be used in electrical technology – Part 1: General*

IEC 60050 (all parts), *International electrotechnical vocabulary*

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

IEC 60062, *Marking codes for resistors and capacitors*

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

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

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

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

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

IEC 60068-2-17, *Basic environmental testing procedures – Part 2-17: Tests – Test Q: Sealing*

IEC 60068-2-20:2008, *Environmental testing – Part 2-20: Tests – Test T: Test methods for solderability and resistance to soldering heat of devices with leads*

IEC 60068-2-21, *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, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*

IEC 60294, *Measurement of the dimensions of a cylindrical component with axial terminations*

IEC 60384-14:2013, *Fixed capacitors for use in electronic equipment – Part 14: Sectional specification – Fixed capacitors for electromagnetic interference suppression and connection to the supply mains*

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage system – Part 1: Principles, requirements and tests*

IEC 60695-11-5, *Fire hazard testing – Part 11-5: Test flames – Needle-flame test method – Apparatus, confirmatory test arrangement and guidance*

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

IEC 60938-1:2006, *Fixed inductors for electromagnetic interference suppression – Part 1: Generic specification*

IEC 60938-2, *Fixed inductors for electromagnetic interference suppression – Part 2: Sectional specification*

IEC 60939-1, *Passive filter units for electromagnetic interference suppression – Part 1: Generic specification*

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

IEC 61140, *Protection against electric shock – Common aspects for installation and equipment*

ISO 80000-1, *Quantities and units – Part 1: General*

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