

Passive filter units for electromagnetic interference suppression Part 1: Generic specification

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 60939-1:2010 sisaldab Euroopa standardi EN 60939-1:2010 ingliskeelset teksti.

Standard on kinnitatud Eesti Standardikeskuse 30.11.2010 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.

Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 15.10.2010.

Standard on kättesaadav Eesti standardiorganisatsioonist.

This Estonian standard EVS-EN 60939-1:2010 consists of the English text of the European standard EN 60939-1:2010.

This standard is ratified with the order of Estonian Centre for Standardisation dated 30.11.2010 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.

Date of Availability of the European standard text 15.10.2010.

The standard is available from Estonian standardisation organisation.

ICS 31.160

Standardite reprodutseerimis- ja levitamiseõigus kuulub Eesti Standardikeskusele

Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonilisse süsteemi või edastamine ükskõik millises vormis või millisel teel on keelatud ilma Eesti Standardikeskuse poolt antud kirjaliku loata.

Kui Teil on küsimusi standardite autorikaitse kohta, palun võtke ühendust Eesti Standardikeskusega:
Aru 10 Tallinn 10317 Eesti; www.evs.ee; Telefon: 605 5050; E-post: info@evs.ee

Right to reproduce and distribute belongs to the Estonian Centre for Standardisation

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without permission in writing from Estonian Centre for Standardisation.

If you have any questions about standards copyright, please contact Estonian Centre for Standardisation:
Aru str 10 Tallinn 10317 Estonia; www.evs.ee; Phone: 605 5050; E-mail: info@evs.ee

English version

**Passive filter units for electromagnetic interference suppression -
Part 1: Generic specification
(IEC 60939-1:2010)**

Filtres passifs d'antiparasitage -
Partie 1: Spécification générique
(CEI 60939-1:2010)

Passive Filter für die Unterdrückung von
elektromagnetischen Störungen -
Teil 1: Fachgrundspezifikation
(IEC 60939-1:2010)

This European Standard was approved by CENELEC on 2010-10-01. 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 Central Secretariat 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 Central Secretariat 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, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

CENELEC

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

Management Centre: Avenue Marnix 17, B - 1000 Brussels

Foreword

The text of document 40/2046/FDIS, future edition 3 of IEC 60939-1, prepared by IEC TC 40, Capacitors and resistors for electronic equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 60939-1 on 2010-10-01.

This European Standard supersedes EN 60939-1:2005 + corr. Apr.2009.

This EN 60939-1:2010 includes the following significant technical changes with respect to EN 60939-1:2005 + corr. Apr.2009:

- a) Table 3 has been updated, specifying how to handle the Neutral by 3-phase filter with Neutral;
- b) all details about "Quality assessment" have been deleted in this edition, because this standard is a safety standard;
- c) filters shall be subjected to Test Aa of EN 60068-2-1 for 16 h, using the degree of severity of the lower category temperature as prescribed in the relevant specification;
- d) since EN 60068-2-20 does no longer make a difference between Method 1A and 1B, but only describes Method 1, references to the method to be used are updated.

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

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2011-07-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2013-10-01

Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 60939-1:2010 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 60990 NOTE Harmonized as EN 60990.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following referenced documents are indispensable for the application 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.

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

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60027	Series	Letter symbols to be used in electrical technology	-	-
IEC 60050	Series	International Electrotechnical Vocabulary	-	-
IEC 60062	-	Marking codes for resistors and capacitors	EN 60062	-
IEC 60068-1	1988	Environmental testing - Part 1: General and guidance	EN 60068-1 ¹⁾	1994
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 60068-2-13	-	Environmental testing - Part 2-13: Tests - Test M: Low air pressure	EN 60068-2-13	-
IEC 60068-2-14	-	Environmental testing - Part 2-14: Tests - Test N: Change of temperature	EN 60068-2-14	-
IEC 60068-2-17	-	Environmental testing - Part 2-17: Tests - Test Q: Sealing	EN 60068-2-17	-
IEC 60068-2-20	-	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	-
IEC 60068-2-21	-	Environmental testing - Part 2-21: Tests - Test U: Robustness of terminations and integral mounting devices	EN 60068-2-21	-
IEC 60068-2-27	-	Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock	EN 60068-2-27	-
IEC 60068-2-29	-	Environmental testing - Part 2: Tests - Test Eb and guidance: Bump	EN 60068-2-29 ²⁾	-

¹⁾ EN 60068-1 includes A1 to IEC 60068-1 + corr. October .

²⁾ EN 60068-2-29 is superseded by EN 60068-2-27:2009, which is based on IEC 60068-2-27:2008.

<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	Environmental testing - Part 2: 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 60085	-	Electrical insulation - Thermal evaluation and designation	EN 60085	-
IEC 60294	-	Measurement of the dimensions of a cylindrical component having two axial terminations	-	-
IEC 60384-14	2005	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	2005
IEC 60410	-	Sampling plans and procedures for inspection - by attributes	-	-
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	-
CISPR 17	-	Methods of measurement of the suppression characteristics of passive radio interference filters and suppression components	EN 55017	-
ISO 1000	-	SI units and recommendations for the use of their multiples and of certain other units	-	-

This document is a preview generated by EVS

CONTENTS

FOREWORD.....	5
1 General	7
1.1 Scope.....	7
1.2 Normative references	7
2 Terms, definitions and technical data	8
2.1 Units, symbols and terminology	8
2.2 Terms and definitions	9
2.3 Preferred values	11
2.4 Marking.....	11
2.4.1 General	11
2.4.2 Coding.....	11
2.5 Components.....	11
3 Test and measurement procedures.....	11
3.1 General.....	11
3.2 Standard atmospheric conditions.....	12
3.2.1 Standard atmospheric conditions for testing	12
3.2.2 Recovery conditions.....	12
3.2.3 Referee conditions	12
3.2.4 Reference conditions.....	13
3.3 Drying	13
3.4 Visual examination and check of dimensions.....	13
3.4.1 Visual examination	13
3.4.2 Dimensions (gauging).....	13
3.4.3 Dimensions (detail).....	13
3.4.4 Creepage distances and clearances.....	13
3.5 Insulation resistance	13
3.5.1 Measuring voltage	14
3.5.2 Application of measuring voltage	14
3.5.3 Mean time to measuring	15
3.5.4 Temperature correction factor.....	15
3.5.5 Information to be given in a detail specification.....	15
3.6 Voltage proof.....	16
3.6.1 Test circuit and procedure for a d.c. test.....	17
3.6.2 Test circuit and procedure for an a.c. test.....	17
3.6.3 Tests	18
3.6.4 Requirements	18
3.6.5 Repetition of the voltage proof test	19
3.6.6 Information to be given in a detail specification.....	19
3.7 Insertion loss	19
3.8 Discharge resistance	19
3.9 Robustness of terminations	19
3.9.1 General	19
3.9.2 Test Ua1 – Tensile	19
3.9.3 Test Ub – Bending.....	20
3.9.4 Test Uc – Torsion	20
3.9.5 Test Ud – Torque.....	20

3.9.6	Visual examination	20
3.10	Resistance to soldering heat	21
3.10.1	Applicability of the test	21
3.10.2	The measurements prescribed in the relevant specification shall be made	21
3.10.3	The filters shall undergo Test Tb of IEC 60068-2-20 with the following requirements:.....	21
3.10.4	When the test has been carried out, the filters shall be visually examined.....	21
3.11	Solderability	21
3.11.1	Applicability of the test	21
3.12	Rapid change of temperature	22
3.12.1	The measurement prescribed in the relevant specification shall be made.....	22
3.12.2	The filters shall be subjected to Test Na of IEC 60068-2-14 using the degree of severity as prescribed in the relevant specification	22
3.12.3	After recovery, the filters shall be visually examined. There shall be no visible damage.....	22
3.13	Vibration.....	22
3.14	Bump	22
3.15	Shock.....	22
3.16	Container sealing	23
3.17	Climatic sequence	23
3.17.1	Initial measurements	23
3.17.2	Dry heat	23
3.17.3	Damp heat, cyclic, first cycle	23
3.17.4	Cold	23
3.17.5	Low air pressure.....	23
3.17.6	Damp heat, cyclic, remaining cycles.....	24
3.17.7	Final measurements	24
3.18	Damp heat, steady state.....	24
3.19	Temperature rise	24
3.20	Current overload	25
3.21	Endurance.....	25
3.22	Charge and discharge test.....	25
3.22.4	The following information shall be given in the relevant specification:.....	27
3.23	Passive flammability.....	27
3.24	Active flammability	28
3.25	Solvent resistance of marking.....	28
3.26	Component solvent resistance.....	29
3.26.1	Initial measurements	29
3.27	Leakage current	29
3.28	Impedance of protective conductor.....	29
Annex A (informative)	Calculation of leakage current.....	30
Bibliography.....		34
Figure 1	Asymmetrical and symmetrical test circuit.....	10
Figure 2	Examples of the application of Table 3	16
Figure 3	Test circuit for d.c. test	17

Figure 4 – Relay circuit	26
Figure 5 – Thyristor circuit	26
Figure 6 – Voltage and current waveforms	27
Figure A.1 – Leakage current for 1-line filters	30
Figure A.2 – Leakage current for 2-line filters	31
Figure A.3 – Leakage current for 3-line filters	32
Figure A.4 – Leakage current for 4-line filters	33
Table 1 – Standard atmospheric conditions	12
Table 2 – DC voltage for insulation resistance	14
Table 3 – Measuring points	16
Table 4 – Force for wire terminations	20
Table 5 – Torque	20
Table 6 – Number of cycles	24
Table 7 – Categories of flammability	28

This document is a preview generated by EVS

PASSIVE FILTER UNITS FOR ELECTROMAGNETIC INTERFERENCE SUPPRESSION –

Part 1: Generic specification

1 General

1.1 Scope

This generic specification relates to passive filter units for electromagnetic interference suppression for use with, or associated with, electronic or electrical equipment and machines.

Both single and multi-channel filters within one enclosure are included within the scope of this generic 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 generic specification. The manufacturer should state whether a given component is to be designed as a capacitor, an inductor or a filter.

The filter units within the scope of this generic specification are further distinguished as those for which safety tests are appropriate (e.g. those connected to mains supplies) and those for which such tests are not appropriate. A separate sectional specification covers the passive filter units for which safety tests are appropriate.

This generic specification establishes standard terms, inspection procedures and methods of test for use in sectional and detail specifications within the IECQ-CECC system for electronic components.

1.2 Normative references

The following referenced documents are indispensable for the application 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 60027 (all parts), *Letter symbols to be used in electrical technology*

IEC 60050 (all parts), *International Electrotechnical Vocabulary (IEV)*

IEC 60062, *Marking codes for resistors and capacitors*

IEC 60068-1:1988, *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 60068-2-13, *Environmental testing – Part 2-13: Tests – Test M: Low air pressure*

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, *Environmental testing – Part 2-20: Tests – Test T: Soldering*

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

IEC 60068-2-27, *Environmental testing – Part 2-27: Tests – Test Ea and guidance: Shock*

IEC 60068-2-29, *Environmental testing – Part 2-29: Tests – Test Eb and guidance: Bump*

IEC 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 + 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 60085, *Electrical insulation – Thermal evaluation and designation*

IEC 60294, *Measurement of the dimensions of a cylindrical component having two axial terminations.*

IEC 60384-14:2005, *Fixed capacitors for use in electronic equipment – Part 14: Sectional specification: Fixed capacitors for electromagnetic interference suppression and connection to the supply mains*

IEC 60410, *Sampling plans and procedures for inspection by attributes*

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

CISPR 17, *Methods of measurement of the suppression characteristics of passive radio interference filters and suppression components*

ISO 1000, *SI units and recommendations for the use of their multiples and of certain other units*

2 Terms, definitions and technical data

2.1 Units, symbols and terminology

Units, graphical symbols, letter symbols and terminology shall, whenever possible, be taken from the following publications:

- IEC 60027
- IEC 60050
- ISO 1000

When further items are required they shall be derived in accordance with the principles of the publications listed above.