

INTERNATIONAL STANDARD

IEC 60939-2

Second edition
2005-02

Passive filter units for electromagnetic interference suppression –

Part 2: Sectional specification – Passive filter units for which safety tests are appropriate – Test methods and general requirements

© IEC 2005 — Copyright - all rights reserved

No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

International Electrotechnical Commission, 3, rue de Varembé, PO Box 131, CH-1211 Geneva 20, Switzerland
Telephone: +41 22 919 02 11 Telefax: +41 22 919 03 00 E-mail: inmail@iec.ch Web: www.iec.ch



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

X

For price, see current catalogue

CONTENTS

FOREWORD.....	4
1 General.....	6
1.1 Scope.....	6
1.2 Normative references	6
1.3 Information to be given in a detail specification	7
1.4 Definitions	8
1.5 Marking	9
2 Preferred ratings and characteristics	10
2.1 Preferred characteristics	10
2.2 Preferred values of ratings	10
3 Quality assessment procedures.....	11
3.1 Primary stage of manufacture.....	11
3.2 Structurally similar filters	11
3.3 Certified records of released lots.....	11
3.4 Approval testing	11
3.5 Quality conformance inspection.....	13
4 Test and measurement procedures.....	18
4.1 Earth inductors incorporated in filters	18
4.2 Capacitance and tan δ measurements	18
4.3 Visual examination and check of dimensions.....	18
4.4 Voltage proof.....	19
4.5 Insulation resistance	20
4.6 DC line resistance or voltage drop at rated current.....	20
4.7 Insertion loss.....	21
4.8 Discharge resistance.....	21
4.9 Robustness of terminations	22
4.10 Resistance to soldering heat	22
4.11 Solderability	22
4.12 Rapid change of temperature	22
4.13 Vibration.....	23
4.14 Bump	23
4.15 Shock.....	24
4.16 Container sealing	24
4.17 Climatic sequence	25
4.18 Damp heat, steady state.....	26
4.19 Temperature rise.....	26
4.20 Impulse voltage	28
4.21 Endurance.....	29
4.22 Charge and discharge	31
4.23 Passive flammability.....	32
4.24 Current overload	32
4.25 Solvent resistance of the marking.....	32
4.26 Component solvent resistance.....	33
4.27 Active flammability	33

Annex A (normative) Test schedule for qualification approval – Assessment level D / DZ	34
Annex B (normative) Test schedule for safety requirements only	38
Annex C (normative) Circuit for the impulse voltage test	40
Annex D (normative) Circuit for the endurance test	42
Annex E (normative) Declaration of design	43
Figure 1 – Impulse wave form	29
Figure C.1 – Impulse voltage test circuit	40
Table 1 – Classification of class X capacitors	8
Table 2 – Classification of class Y capacitors	9
Table 3 – Tests concerning safety requirements only	14
Table 4 – Sampling plan – Safety and performance tests qualification approval – Assessment level D / DZ	15
Table 5 – Lot-by-lot-tests – Assessment level D / DZ	16
Table 6 – Lot-by-lot test – Safety tests only approval	16
Table 7 – Periodic tests – Assessment level D / DZ	17
Table 8 – Creepage distances and clearances	18
Table 9 – Voltage proof	19
Table 10 – Insulation resistance	20
Table 11 – Preferred severities	24
Table 12 – Measurements and requirements after charge and discharge	31
Table A.1 – Test schedule for qualification approval – Assessment level D / DZ	34
Table B.1 – Test schedule for safety requirements only	38
Table C.1 – Values of C_X , C_T , R_P , R_S , C_P	40
Table C.2 – Values and tolerances of C_X , t_r , t_d	41

INTERNATIONAL ELECTROTECHNICAL COMMISSION

PASSIVE FILTER UNITS FOR ELECTROMAGNETIC INTERFERENCE SUPPRESSION –

Part 2: Sectional specification – Passive filter units for which safety tests are appropriate – Test methods and general requirements

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 provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with an IEC Publication.
- 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 60939-2 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment.

This second edition cancels and replaces the first edition published in 1988. This second edition constitutes a technical revision.

The major changes that have been made between the first and the second edition are :

- Capacitance and $\tan \delta$ measurements, d.c. line resistance or voltage drop at rated current, impulse voltage, passive flammability, current overload, solvent resistance of marking, component solvent resistance and active flammability have been added to Clause 4, test and measurement procedures.

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

FDIS	Report on voting
40/1510/FDIS	40/1537/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.

IEC 60939 consists of the following parts, under the general title *Passive filter units for electromagnetic interference suppression*

- Part 1: Generic specification
- Part 2: Sectional specification: Test methods and general requirements
- Part 2-1: Blank detail specification – Passive filter units for electromagnetic interference suppression – Filters for which safety tests are required (Assessment level D / DZ)
- Part 2-2: Blank detail specification – Passive filter units for electromagnetic interference suppression – Filters for which safety tests are required (Safety tests only)

The committee has decided that the contents of this publication will remain unchanged until the maintenance result 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 November 2005 have been included in this copy.

A bilingual version of this publication may be issued at a later date.

PASSIVE FILTER UNITS FOR ELECTROMAGNETIC INTERFERENCE SUPPRESSION –

Part 2: Sectional specification – Passive filter units for which safety tests are appropriate – Test methods and general requirements

1 General

1.1 Scope

This Sectional specification applies to passive filter units for electromagnetic interference suppression which fall within the scope of the Generic Specification IEC 60939-1.

The scope of this Sectional specification is restricted to passive filter units for which safety tests are appropriate. This implies that filters specified according to this Sectional 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 Sectional specification applies to passive filter units which will be connected to an a.c. mains or other supply with a nominal voltage not exceeding 1 000 V a.c., with a nominal frequency not exceeding 400 Hz, or 1 000 V d.c.

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.

NOTE Components other than inductors and capacitors in the filter unit should fulfil requirements in the relevant IEC Standard.

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

IEC 60062, *Marking codes for resistors and capacitors*

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

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

IEC 60085, *Thermal evaluation and classification of electrical insulation*

IEC 60335-1, *Safety of household and similar electrical appliances – Part 1: General requirements*

IEC 60384-9, *Fixed capacitors for use in electronic equipment – Part 9: Sectional specification: Fixed capacitors of ceramic dielectric, Class 2*

IEC 60384-14, *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 (all parts), *Insulation coordination for equipment within low-voltage systems*

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

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