

INTERNATIONAL STANDARD

IEC
60938-1

QC 280000

Second edition
1999-10

Fixed inductors for electromagnetic interference suppression –

Part 1: Generic specification

Inductances fixes d'antiparasitage –

*Partie 1:
Spécification générique*

<https://standards.iteh.ai/standards/iec/60938-1-1999>



Reference number
IEC 60938-1:1999(E)

Numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series.

Consolidated publications

Consolidated versions of some IEC publications including amendments are available. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

Validity of this publication

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology.

Information relating to the date of the reconfirmation of the publication is available in the IEC catalogue.

Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is to be found at the following IEC sources:

- **IEC web site***
- **Catalogue of IEC publications**
Published yearly with regular updates
(On-line catalogue)*
- **IEC Bulletin**
Available both at the IEC web site* and as a printed periodical

Terminology, graphical and letter symbols

For general terminology, readers are referred to IEC 60050: *International Electrotechnical Vocabulary (IEV)*.

For graphical symbols, and letter symbols and signs approved by the IEC for general use, readers are referred to publications IEC 60027: *Letter symbols to be used in electrical technology*, IEC 60417: *Graphical symbols for use on equipment. Index, survey and compilation of the single sheets* and IEC 60617: *Graphical symbols for diagrams*.

* See web site address on title page.

INTERNATIONAL STANDARD

IEC 60938-1

QC 280000

Second edition
1999-10

Fixed inductors for electromagnetic interference suppression –

Part 1: Generic specification

Inductances fixes d'antiparasitage –

*Partie 1:
Spécification générique*

© IEC 1999 — 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
Telefax: +41 22 919 0300

3, rue de Varembe Geneva, Switzerland
e-mail: inmail@iec.ch IEC web site <http://www.iec.ch>



Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

PRICE CODE

P

For price, see current catalogue

CONTENTS

	Page
FOREWORD	4
Clause	
1 General.....	6
1.1 Scope	6
1.2 Normative references	6
2 Technical data.....	8
2.1 Units and symbols.....	8
2.2 Definitions.....	8
2.3 Preferred values.....	10
2.4 Marking.....	11
3 Quality assessment procedures.....	11
3.1 General.....	11
3.2 Primary stage of manufacture.....	11
3.3 Structurally similar inductors	11
3.4 Qualification approval procedures.....	11
3.5 Quality conformance inspection.....	12
3.6 Alternative test methods.....	12
3.7 Unchecked parameters	13
4 Test and measurement procedure.....	13
4.1 General.....	13
4.2 Standard atmospheric conditions.....	13
4.3 Drying.....	14
4.4 Visual examination and check of dimensions.....	14
4.5 Insulation resistance.....	15
4.6 Voltage proof.....	18
4.7 Inductance.....	21
4.8 Insertion loss.....	21
4.9 Robustness of terminations.....	21
4.10 Resistance to soldering heat.....	22
4.11 Solderability (applicable only for terminations intended to be soldered).....	23
4.12 Rapid change of temperature.....	23
4.13 Vibration.....	24
4.14 Bump.....	24
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 Endurance.....	27
4.21 Passive flammability.....	27
4.22 Active flammability.....	28
4.23 Solvent resistance of marking.....	28
4.24 Component solvent resistance.....	28

Annex A (normative) Interpretation of sampling plans and procedures as described in IEC 60410 for use within the IEC quality assessment system for electronic components (IECQ) 29

Annex B (normative) Rules for the preparation of detail specifications for capacitors and resistors for electronic equipment 30

Annex C (normative) Requirements for earth inductors 31

Withhold

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIXED INDUCTORS FOR ELECTROMAGNETIC INTERFERENCE SUPPRESSION –

Part 1: Generic specification

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The 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 the 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 National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60938-1 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 and constitutes a technical revision.

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

FDIS	Report on voting
40/1110/FDIS	40/1136/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 3.

The QC number that appears on the front cover of this publication is the specification number in the IEC Quality Assessment System for Electronic Components (IECQ).

Annexes A, B and C form an integral part of this standard.

The committee has decided that this publication remains valid until 2005.

At this date, in accordance with the committee's decision, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

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

Withdrawing

iTeh Standards
(<https://standards.iteh.ai>)
Document Preview

IEC 60938-1:1999
<https://standards.iteh.ai/catalog/standards-iec/bc74d273-b07c-4a49-830c-851bc2e4eb99/iec-60938-1-1999>

FIXED INDUCTORS FOR ELECTROMAGNETIC INTERFERENCE SUPPRESSION –

Part 1: Generic specification

1 General

1.1 Scope

This International Standard applies to inductors designed for electromagnetic interference suppression intended for use within, or associated with, electronic or electrical equipment and machines. It is restricted to inductors for which safety tests are appropriate.

The combination of two or more inductors within one enclosure is also included.

Inductors within the scope of this standard may also be used to protect apparatus and machines from electrical noise and voltage or current transients coming from either the supply or from other parts of the apparatus.

This standard does not necessarily apply in its entirety to inductors intended for use on motor vehicles, in aircraft or for marine applications.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60027 (all parts), *Letter symbols to be used in electrical technology*

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

IEC 60062:1992, *Marking codes for resistors and capacitors*

IEC 60068-1:1988, *Environmental testing – Part 1: General and guidance*
Amendment 1 (1992)

IEC 60068-2-1:1990, *Environmental testing – Part 2: Tests – Tests A: Cold*
Amendment 1 (1993)
Amendment 2 (1994)

IEC 60068-2-2:1974, *Environmental testing – Part 2: Tests – Tests B: Dry Heat*
Amendment 1 (1993)
Amendment 2 (1994)

IEC 60068-2-3:1969, *Environmental testing – Part 2: Tests – Test Ca: Damp heat, steady state*
Amendment 1 (1984)

IEC 60068-2-6:1995, *Environmental testing – Part 2: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-13:1983, *Environmental testing – Part 2: Tests – Test M: Low air pressure*

IEC 60068-2-14:1984, *Environmental testing – Part 2: Tests – Test N: Change of temperature*
Amendment 1 (1986)

IEC 60068-2-17:1994, *Environmental testing – Part 2: Tests – Test Q: Sealing*

IEC 60068-2-20:1979, *Environmental testing – Part 2: Tests – Test T: Soldering*
Amendment 2 (1987)

IEC 60068-2-21:1983, *Environmental testing – Part 2: Tests – Test U: Robustness of terminations and integral mounting devices*
Amendment 2 (1991)
Amendment 3 (1992)

IEC 60068-2-27:1987, *Environmental testing – Part 2: Tests – Test Ea and guidance: Shock*

IEC 60068-2-29:1987, *Environmental testing – Part 2: Tests – Test Eb and guidance: Bump*

IEC 60068-2-30:1980, *Environmental testing – Part 2: Tests – Test Db and guidance: Damp heat, cyclic (12 + 12 hour cycle)*
Amendment 1 (1985)

IEC 60068-2-45:1980, *Environmental testing – Part 2: Tests – Test XA and guidance: Immersion in cleaning solvents*
Amendment 1 (1993)

IEC 60294:1969, *Measurement of the dimensions of a cylindrical component having two axial terminations*

IEC 60335-1:1991, *Safety of household and similar electrical appliances – Part 1: General requirements*

IEC 60410:1973, *Sampling plans and procedures for inspection by attributes*

IEC 60617 (all parts), *Graphical symbols for diagrams*

IEC 60695-2-2:1991, *Fire hazard testing – Section 2: Needle-flame test*
Amendment 1 (1994)

CISPR 17:1981, *Methods of measurement of the suppression characteristics of passive radio interference filters and suppression components*

IEC QC 001002-3:1998, *Rules of Procedure of the IEC Quality Assessment System for Electronic Components (IECQ) – Part 3: Approval procedures*

ISO 1000:1992, *SI units and recommendations for the use of their multiples and of certain other units*

2 Technical data

2.1 Units and symbols

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

IEC 60027

IEC 60050

IEC 60617

ISO 1000

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

2.2 Definitions

For the purpose of this International Standard, the following definitions apply.

2.2.1

type

a group of components having similar design features and the similarity of whose manufacturing techniques enables them to be grouped together either for qualification approval or for quality conformance inspection

They are generally covered by a single detail specification.

NOTE – Components described in several detail specifications, may, in some cases, be considered as belonging to the same type.

2.2.2

style

a sub-division of a type, generally based on dimensional factors.

A style may include several variants, generally of a mechanical order

2.2.3

family (of electronic components)

a group of electronic components which predominantly displays a particular physical attribute and/or fulfils a defined function

2.2.4

sub-family (of electronic components)

a group of components within a family manufactured by similar technological methods

2.2.5

rated voltage (U_R)

rated voltage is either the maximum r.m.s. operating voltage of rated frequency or the maximum d.c. operating voltage which may be applied continuously to the terminations of the inductor at any temperature between the lower category temperature and the rated temperature

NOTE – For inductors with only one winding, the rated voltage should only be applied between one terminal and any conducting surface with which the case is liable to come into contact in normal use. For inductors having more than one winding, the rated voltage may be applied across two individual windings.

2.2.6**category voltage (U_C)**

maximum voltage which may be applied continuously to an inductor at its upper category temperature

2.2.7**lower category temperature**

minimum external surface temperature for which the inductor has been designed to operate continuously

2.2.8**upper category temperature**

maximum external surface temperature for which the inductor has been designed to operate continuously

NOTE – The external surface temperature can be affected by internal heating due to the lead-through current. The terminations are considered to be part of the external surface.

2.2.9**rated temperature**

maximum ambient temperature at which an inductor can carry its rated current

2.2.10**rated current**

maximum r.m.s. operating current at rated frequency or maximum d.c. operating current which allows continuous operation of the inductor at the rated temperature. It is assigned by the manufacturer for one or both of the following conditions:

- a) free air (I_{RO});
- b) with a specified heat sink (I_{RH}).

2.2.11**rated inductance (L_R)**

inductance value for which the inductor has been designed and which is usually indicated upon it

2.2.12**insertion loss**

ratio of the voltage before and after the insertion of the suppressor in the circuit as measured at the terminations

NOTE 1 – The insertion loss can be measured either with a symmetrical or an asymmetrical test circuit.

NOTE 2 – When expressed in decibels the insertion loss is 20 times the logarithm of the ratio stated.

2.2.13**asymmetrical test circuit**

a test circuit in which the inductor under test is connected with a coaxial cable of which the outer conductor constitutes a return path for high-frequency current

[CISPR 17:1981, 3.5 modified]

2.2.14**symmetrical test circuit**

a test circuit in which the inductor under test is connected with screened conductor pairs in which the asymmetrical voltage is small enough to be neglected

[CISPR 17:1981, 3.6 modified]