

# **SLOVENSKI STANDARD** **SIST EN IEC 60938-2:2021**

**01-november-2021**

**Nadomešča:**

**SIST EN 60938-2:2002**

**SIST EN 60938-2:2002/A1:2007**

---

**Fiksne dušilke za dušenje elektromagnetnega motenja - 2. del: Področna specifikacija za električne dušilke (IEC 60938-2:2021)**

Fixed inductors for electromagnetic interference suppression - Part 2: Sectional specification on power line chokes (IEC 60938-2:2021)

Drosseln zur Unterdrückung elektromagnetischer Störungen – Teil 2: Rahmenspezifikation zu Netzdrosseln (IEC 60938-2:2021)

Inductances fixes d'antiparasitage - Partie 2: Spécification intermédiaire sur les bobines d'arrêt pour ligne électrique (IEC 60938-2:2021)

**Ta slovenski standard je istoveten z: EN IEC 60938-2:2021**

---

**ICS:**

29.180

Transformatorji. Dušilke

Transformers. Reactors

**SIST EN IEC 60938-2:2021**

**en**

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

SIST EN IEC 60938-2:2021

<https://standards.iteh.ai/catalog/standards/sist/7e277039-f8a9-48e3-9ce5-27153cbde1f7/sist-en-iec-60938-2-2021>

EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN IEC 60938-2**

August 2021

ICS 29.100.10; 31.020

Supersedes EN 60938-2:1999 and all of its amendments  
and corrigenda (if any)

English Version

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

Inductances fixes d'antiparasitage - Partie 2: Spécification  
intermédiaire sur les bobines d'arrêt pour ligne électrique  
(IEC 60938-2:2021)

Drosseln zur Unterdrückung elektromagnetischer  
Störungen - Teil 2: Rahmenspezifikation zu Netzdrosseln  
(IEC 60938-2:2021)

This European Standard was approved by CENELEC on 2021-08-24. 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.

SIST EN IEC 60938-2:2021

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, Republic of North Macedonia, Romania, Serbia, 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: Rue de la Science 23, B-1040 Brussels**

**EN IEC 60938-2:2021 (E)****European foreword**

The text of document 40/2846/FDIS, future edition 3 of IEC 60938-2, 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 IEC 60938-2:2021.

The following dates are fixed:

- latest date by which the document has to be implemented at national (dop) 2022-05-24 level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with the (dow) 2024-08-24 document have to be withdrawn

This document supersedes EN 60938-2:1999 and all of its amendments and corrigenda (if any).

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

Any feedback and questions on this document should be directed to the users' national committee. A complete listing of these bodies can be found on the CENELEC website.

**Endorsement notice**

**iTeh STANDARD PREVIEW**  
(standards.iteh.ai)

The text of the International Standard IEC 60938-2:2021 was approved by CENELEC as a European Standard without any modification.

SIST EN IEC 60938-2:2021

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

IEC 60063 NOTE Harmonized as EN 60063

IEC 60068-2-1 NOTE Harmonized as EN 60068-2-1

IEC 60068-2-2 NOTE Harmonized as EN 60068-2-2

IEC 60068-2-6 NOTE Harmonized as EN 60068-2-6

IEC 60068-2-20 NOTE Harmonized as EN IEC 60068-2-20

IEC 60068-2-27 NOTE Harmonized as EN 60068-2-27

IEC 60068-2-30 NOTE Harmonized as EN 60068-2-30

IEC 60068-2-58 NOTE Harmonized as EN 60068-2-58

IEC 60068-2-78 NOTE Harmonized as EN 60068-2-78

IEC 60938-2-1 NOTE Harmonized as EN 60938-2-1

## Annex ZA (normative)

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

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.

NOTE 1 Where 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	series	Letters symbols to be used in electrical-technology		-
IEC 60050	series	International Electrotechnical Vocabulary-(IEV)		-
IEC 60060-1	-	High-voltage test techniques - Part 1: General definitions and test requirements	EN 60060-1	-
IEC 60068-1	-	Environmental testing - Part 1: General and guidance	EN 60068-1	-
IEC 60068-2-13	-	Environmental testing - Part 2-13: Tests - Test M: Low air pressure	EN IEC 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	-	Basic environmental testing procedures - Part 2-17: Tests - Test Q: Sealing	EN 60068-2-17	-
IEC 60068-2-21	-	Environmental testing - Part 2-21: Tests -- Test U: Robustness of terminations and integral mounting devices		-
IEC 60068-2-45	-	Basic environmental testing procedures - Part 2-45: Tests - Test XA and guidance: Immersion in cleaning solvents	EN 60068-2-45	-
IEC 60317-0-7	-	Specifications for particular types of winding wires - Part 0-7: General requirements - Fully insulated (FIW) zero-defect enamelled round copper wire	EN 60317-0-7	-
IEC 60317-56	-	Specifications for particular types of winding wires - Part 56: Solderable fully insulated (FIW) zero-defect polyurethane enamelled round copper wire, class 180	EN 60317-56	-
IEC 60335-1	-	Household and similar electrical appliances - Safety - Part 1: General requirements		-
IEC 60617	-	Graphical symbols for diagrams	-	-

## EN IEC 60938-2:2021 (E)

IEC 60664-1	-	Insulation coordination for equipment within low-voltage supply systems - Part 1: Principles, requirements and tests	EN IEC 60664-1	-
IEC 60695-2-11	-	Fire hazard testing - Part 2-11: Glowing/hot-wire based test methods - Glow-wire flammability test method for end products (GWEPT)	EN 60695-2-11	-
IEC 60695-2-12	-	Fire hazard testing - Part 2-12: Glowing/hot-wire based test methods - Glow-wire flammability index (GWFI) test method for materials	EN 60695-2-12	-
IEC 60695-2-13	-	Fire hazard testing - Part 2-13: Glowing/hot-wire based test methods - Glow-wire ignition temperature (GWIT) test method for materials	EN 60695-2-13	-
IEC 60695-10-2	-	Fire hazard testing - Part 10-2: Abnormal heat - Ball pressure test method	EN 60695-10-2	-
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 60695-11-20	-	Fire hazard testing - Part 11-20: Test flames - 500 W flame test method	EN 60695-11-20	-
IEC 60851-5	-	Winding wires Test methods - Part 5: Electrical properties	EN 60851-5	-
IEC 60938-1	2021	Fixed inductors for electromagnetic interference suppression - Part 1: Generic specification	EN IEC 60938-1	2021
IEC 60938-2-2	-	Fixed inductors for electromagnetic interference suppression - Part 2-2: Blank detail specification - Inductors for which safety tests are required (only)	EN 60938-2-2	-
CISPR 17	-	Methods of measurement of the suppression characteristics of passive EMC filtering devices	EN 55017	-
ISO 80000-6	-	Quantities and units - Part 6: Electromagnetism		



IEC 60938-2

Edition 3.0 2021-07

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Fixed inductors for electromagnetic interference suppression –  
Part 2: Sectional specification on power line chokes**

**Inductances fixes d'antiparasitage –  
Partie 2: Spécification intermédiaire sur les bobines d'arrêt pour ligne électrique**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

ICS 29.100.10; 31.020

ISBN 978-2-8322-1002-2

**Warning! Make sure that you obtained this publication from an authorized distributor.  
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

## CONTENTS

FOREWORD .....	5
1 Scope .....	7
2 Normative references .....	7
3 Terms and definitions .....	8
4 General requirements .....	9
4.1 General .....	9
4.2 Preferred values of ratings and characteristics .....	9
4.2.1 Climatic categories .....	9
4.2.2 Nominal inductance and tolerance .....	9
4.2.3 Rated voltage $U_R$ .....	9
4.2.4 Rated temperature $T_r$ .....	9
4.2.5 Rated current $I_r$ .....	10
4.3 Information to be given in a detail specification .....	10
4.3.1 General .....	10
4.3.2 Outline drawing and dimensions .....	10
4.3.3 Mounting .....	11
4.3.4 Ratings and characteristics .....	11
4.4 Insulated inductors for power line applications .....	11
4.5 Marking .....	11
5 Safety tests for approval .....	12
5.1 General .....	12
5.1.1 Approval on the basis of the fixed sample size procedures .....	12
5.1.2 Structurally similar inductors .....	12
5.1.3 Sampling .....	13
5.2 Standard atmospheric conditions .....	13
5.3 Visual examination .....	13
5.3.1 Dimensions (gauging) .....	13
5.3.2 Dimensions (detail) .....	13
5.4 Insulation resistance .....	14
5.5 Voltage test .....	14
5.6 Inductance .....	15
5.7 Line resistance .....	15
5.8 Insertion loss (optional) .....	15
5.9 Temperature rise (applies to inductors with a mass > 5 g only) .....	15
5.9.1 General .....	15
5.9.2 Test method .....	15
5.9.3 Requirements .....	16
5.10 Impulse voltage (applies to inductors with more than one winding only) .....	16
5.10.1 Test conditions .....	16
5.10.2 Initial measurements .....	16
5.10.3 Requirements .....	16
5.11 Endurance .....	16
5.11.1 Test conditions – Endurance current test (applies to inductors with a mass < 5 g only) .....	16
5.11.2 Test conditions – Endurance voltage test between terminations (applies to inductors with more than one winding only) .....	17



5.11.3	Final inspection, measurements and requirements.....	17
5.12	Robustness of terminations.....	17
5.12.1	General .....	17
5.12.2	Test Ua1 – Tensile .....	18
5.12.3	Test Ub – Bending .....	18
5.12.4	Test Uc – Torsion .....	18
5.12.5	Test Ud – Torque.....	18
5.12.6	Test Ue – Robustness of terminations of SMD-components mounted on PCB.....	18
5.13	Vibration .....	19
5.13.1	Test conditions .....	19
5.13.2	Requirements .....	19
5.14	Shock .....	19
5.14.1	Test conditions .....	19
5.14.2	Requirements .....	20
5.15	Resistance to soldering heat.....	20
5.16	Solderability (optional) .....	20
5.16.1	General .....	20
5.16.2	Preconditioning.....	20
5.16.3	Test procedure .....	20
5.16.4	Final inspection, measurements and requirements.....	20
5.17	Rapid change of temperature (optional) .....	20
5.18	Container sealing (if applicable) .....	21
5.19	Climatic sequence (optional).....	21
5.19.1	General .....	21
5.19.2	Dry heat .....	21
5.19.3	Damp heat, cyclic, test Db, first cycle .....	21
5.19.4	Cold.....	21
5.19.5	Low air pressure .....	21
5.19.6	Damp heat, cyclic, test Db, remaining cycles .....	21
5.19.7	Final inspection, measurements and requirements.....	21
5.20	Damp heat, steady state .....	22
5.21	Passive flammability (optional).....	22
5.22	Glow wire (optional) .....	22
5.23	Ball pressure (optional) .....	23
5.24	Component solvent resistance .....	23
5.25	Solvent resistance of marking .....	23
Annex A (normative)	Sampling plan .....	24
Annex B (normative)	Test schedule.....	25
Annex C (normative)	Declaration of design .....	28
Annex D (normative)	Clearance .....	29
Annex E (normative)	Creepage .....	30
Annex F (normative)	Fully insulated winding wires .....	32
Annex X (informative)	Cross-references for references to the previous edition of this document.....	33
Bibliography	.....	35
Figure 1	– Relation between ambient temperature and applied current .....	10

Table 1 – Test voltages .....	14
Table 2 – Force for tensile stress on terminations .....	18
Table 3 – Torque .....	18
Table 4 – Acceleration .....	19
Table 5 – Sweep cycles .....	19
Table 6 – Preferred severities .....	20
Table 7 – Severities and requirements for passive flammability.....	22
Table D.1 – Clearance distances .....	29
Table E.1 – Creepage distances .....	31
Table F.1 – FIW wires with their minimum test voltages .....	32
Table X.1 – Cross-references .....	33

## iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN IEC 60938-2:2021

<https://standards.iteh.ai/catalog/standards/sist/7e277039-f8a9-48e3-9ce5-27153cbde1f7/sist-en-iec-60938-2-2021>

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## FIXED INDUCTORS FOR ELECTROMAGNETIC INTERFERENCE SUPPRESSION –

### Part 2: Sectional specification on power line chokes

#### 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.

IEC 60938-2 has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment. It is an International Standard.

This third edition cancels and replaces the second edition published in 1999 and its Amendment 1:2006. This edition constitutes a technical revision.

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

- a) the test plan for performance testing has been removed; mandatory safety tests and optional performance tests are listed in one test plan in Annex B;
- b) requirements for Thyristor-Chokes have been withdrawn;
- c) material requirements are harmonized with IEC 60939-3 and UL 60939-3;
- d) AC chokes up to 1 000 V and DC chokes up to 1 500 V are now in the Scope.

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

FDIS	Report on voting
40/2846/FDIS	40/2862/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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in detail at [www.iec.ch/standardsdev/publications](http://www.iec.ch/standardsdev/publications).

A list of all parts in the IEC 60938 series, published under the general title *Fixed inductors 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 "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

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

**iTeh STANDARD PREVIEW**  
([standards.iteh.ai](http://standards.iteh.ai))

[SIST EN IEC 60938-2:2021](https://standards.iteh.ai/catalog/standards/sist/7e277039-f8a9-48e3-9ce5-27153cbde1f7/sist-en-iec-60938-2-2021)  
<https://standards.iteh.ai/catalog/standards/sist/7e277039-f8a9-48e3-9ce5-27153cbde1f7/sist-en-iec-60938-2-2021>

## FIXED INDUCTORS FOR ELECTROMAGNETIC INTERFERENCE SUPPRESSION –

### Part 2: Sectional specification on power line chokes

#### 1 Scope

This part of IEC 60938 applies to fixed inductors designed for electromagnetic interference suppression, which will be connected to an AC mains or other supply with a nominal voltage not exceeding 1 000 V AC RMS or 1 500 V DC with a nominal frequency not exceeding 400 Hz.

This sectional specification is restricted to fixed inductors for which safety tests are appropriate. This implies that inductors specified according to this specification will either be connected to mains supplies, when compliance with the mandatory tests of Annex A is necessary, or used in other circuit positions where the equipment specification prescribes that some or all of these safety tests are required.

The object of this document is to prescribe standard requirements for safety tests, preferred ratings and characteristics, to select from IEC 60938-1 the appropriate methods of test and to give general performance requirements for suppression inductors.

#### 2 Normative references (standards.iteh.ai)

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 applies, including any amendments.

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

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

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

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

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

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

IEC 60317-0-7, *Specifications for particular types of winding wires – Part 0-7: General requirements – Fully insulated (FIW) zero-defect enamelled round copper wire*