IEC 60938-2

Edition 2.0 2006-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1
AMENDEMENT 1

QC 280100

Fixed inductors for electromagnetic interference suppression – Part 2: Sectional specification

Inductances fixes d'antiparasitage – Partie 2: Spécification intermédiaire

IEC 60938-2:1999/A1:2006

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland
Email: inmail@iec.ch
Web: www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigenda or an amendment might have been published.

- Catalogue of IEC publications: www.iec.ch/searchpub

The IEC on-line Catalogue enables you to search by a variety of criteria (reference number, text, technical committee,…). It also gives information on projects, withdrawn and replaced publications.

- IEC Just Published: www.iec.ch/online_news/justpub

Stay up to date on all new IEC publications. Just Published details twice a month all new publications released. Available on-line and also by email.

- Electropedia: www.electropedia.org

The world's leading online dictionary of electronic and electrical terms containing more than 20 000 terms and definitions in English and French, with equivalent terms in additional languages. Also known as the International Electrotechnical Vocabulary online.

- Customer Service Centre: www.iec.ch/webstore/custserv

If you wish to give us your feedback on this publication or need further assistance, please visit the Customer Service Centre FAQ or contact us:
Email: csc@iec.ch
Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00

A propos de la CEI

La Commission Electrotechnique Internationale (CEI) est la première organisation mondiale qui élabore et publie des normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications CEI

Le contenu technique des publications de la CEI est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

- Catalogue des publications de la CEI: www.iec.ch/searchpub/cur_fut-f.htm

Le Catalogue en-ligne de la CEI vous permet d'effectuer des recherches en utilisant différents critères (numéro de référence, texte, comité d'études,…). Il donne aussi des informations sur les projets et les publications retirées ou remplacées.

- Just Published CEI: www.iec.ch/online_news/justpub

Restez informé sur les nouvelles publications de la CEI. Just Published détaille deux fois par mois les nouvelles publications parues. Disponible en-ligne et aussi par email.

- Electropedia: www.electropedia.org

Le premier dictionnaire en ligne au monde de termes électroniques et électriques. Il contient plus de 20 000 termes et définitions en anglais et en français, ainsi que les termes équivalents dans les langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International en ligne.

- Service Clients: www.iec.ch/webstore/custserv/custserv_entry-f.htm

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions, visitez le FAQ du Service clients ou contactez-nous:
Email: csc@iec.ch
Tél.: +41 22 919 02 11
Fax: +41 22 919 03 00

IEC 60938-2

Edition 2.0 2006-10

INTERNATIONAL STANDARD

NORME INTERNATIONALE

AMENDMENT 1
AMENDEMENT 1

QC 280100

Fixed inductors for electromagnetic interference suppression – Part 2: Sectional specification

Inductances fixes d'antiparasitage – Partie 2: Spécification intermédiaire

INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

PRICE CODE
CODE PRIX

M

ICS 029.100.10; 31.020

ISBN 2-8318-9857-9

FOREWORD

This amendment has been prepared by IEC technical committee 40: Capacitors and resistors for electronic equipment.

This bilingual version, published in 2008-08, corresponds to the English version.

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

CDV	Report on voting
40/1603/CDV	40/1700A/RVC

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

The French version of this amendment has not been voted upon.

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.

Page 5

1.3 Normative references

Add, to the list of references, the following new reference:

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*

CISPR 16-1-1:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*[1)]

CISPR 16-1-2:2003, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – Ancillary equipment – Conducted disturbances*

Page 14

4.2 Voltage proof

Replace the existing Table 3 by the following new Table 3:

1) A new edition of this publication exists.

Table 3 – Measuring points

Inductors for	Test A between terminations*	Test B – Internal insulation) Test C – External insulation Test D** – Between windings and core
Alternating current	4,3 U_R (d.c.)	2 U_R + 1 500 V (a.c.) with a minimum of 2 000 V (a.c.)
Direct current	3 U_R (d.c.)	2 U_R + 1 500 V (d.c.)
* Applies only to inductors with more than one winding. ** Test not required for insulated or non-insulated and self-supporting mountable inductors.		

Page 22

Replace the existing Annex A by the following new Annex A:

Annex A
(normative)

Test schedule for safety tests only approval

Subclause number and test (see Note 1)	D or ND (see Note 2)	Conditions of test (see Note 1)	Number of specimens (*n*) and number of non-conforming items (*c*)	Performance requirements (see Note 1)
Group 0	ND		See Tables 1 or 2	
4.1.1 Dimensions (gauging)				See detail specification
4.1 Visual examination				No visible damage Legible marking
4.5 DC line resistance				See detail specification
4.4 Inductance				Within specified tolerance
4.2 Voltage proof		See Table 3 See detail specification for the method Foil method duration: 1 min		No breakdown or flashover
4.3 Insulation resistance		See detail specification for the method		As in 4.3

Subclause number and test (see Note 1)	D or ND (see Note 2)	Conditions of test (see Note 1)	Number of specimens (*n*) and number of non-conforming items (*c*)	Performance requirements (see Note 1)
Group 1A	D		See Tables 1 or 2	
4.1.2 Dimensions (detail)				See detail specification and 4.1.2
Creepage distances and clearances		For method and severity: see detail specification		
4.6 Robustness of terminations		See detail specification for the method (1A or 1B)		No visible damage
4.7 Resistance to soldering heat (if applicable)		For method 1A: Immersion time: 10 s, unless otherwise specified in the detail specification		
4.20 Component solvent resistance (if applicable)				
4.7.2 Final measurements		DC line resistance		As in group 0
		Voltage proof at 66 % of value in Table 3		No breakdown or flashover
		Visual examination		No visible damage
Group 2	D		See Tables 1 or 2	
4.15 Damp heat, steady state		Recovery: 1 h to 26 h		
4.15.1 Final measurement		Visual examination		No visible damage Legible marking
		DC line resistance		As in group 0
		Inductance	See Tables 1 or 2	Within ± 30 % of value measured in group 0
		Voltage proof Voltage: 66 % of voltage applied in group 0 A polarizing voltage shall be applied if specified in the detail specification		No breakdown or flashover
		Insulation resistance		≥ 50 % of value in 4.3

Subclause number and test (see Note 1)	**D or ND** (see Note 2)	**Conditions of test** (see Note 1)	**Number of specimens (*n*) and number of non-conforming items (*c*)**	**Performance requirements** (see Note 1)
Group 3A 4.16 Temperature rise (inductors with mass > 5 g only) 4.16.1 Test conditions 4.16.2 Final measurements 4.18.1 Endurance, current (inductors with mass ≤ 5 g only)	D	 Duration: until thermal equilibrium has been reached Current: rated current Ambient temperature: rated temperature Internal temperature Duration: 1 000 h Current: 1,1 × rated current Recovery: 1 h to 26 h	See Tables 1 or 2 ↓	 As in 4.16.2
Group 3B (inductors with more than one winding only) 4.17 Impulse voltage 4.18.2 Endurance, voltage between line terminations	D	 3 impulses, full wave Crest voltage: see 4.17.1 Duration: 1 000 h Voltage and temperature, see 4.18.2	See Tables 1 or 2 ↓	 No breakdown or flashover
Group 3 4.18.3 Final measurements		 Recovery: 1 h to 26 h Visual examination DC line resistance Voltage proof Voltage: 66 % of voltage applied in group 0 Insulation resistance	See Tables 1 or 2 ↓	 No visible damage Legible marking As for group 0 No breakdown or flashover ≥ 50 % of values in 4.3
Group 4 4.19 Passive flammability (if required in the detail specification)	D		See Tables 1 or 2 ↓	 As in 4.19
NOTE 1 Subclause numbers of test and performance requirements refer to Clause 4 . NOTE 2 In this table, D = destructive, ND = non-destructive.				

Page 25

Replace the existing Annex B by the following new Annex B:

Annex B
(normative)

Test schedule for safety tests and performance tests for qualification approval, assessment level D

Subclause number and test (see Note 1)	**D or ND** (see Note 2)	**Conditions of test** (see Note 1)	**Number of specimens (*n*) and number of non-conforming items (*c*)**	**Performance requirements** (see Note 1)
Group 0	ND		See Tables 1 or 2	
4.1.1 Dimensions (gauging)				See detail specification
4.1 Visual examination				No visible damage Legible marking
4.5 DC line resistance				See detail specification
4.4 Inductance				Within specified tolerance
4.2 Voltage proof		See Table 3 See detail specification for the method Foil method duration: 1 min		No breakdown or flashover
4.3 Insulation resistance		See detail specification for the method		As in 4.3
Group 1A	D		See Tables 1 or 2	
4.1.2 Dimensions (detail)				See detail specification and 4.1.2
4.6 Robustness of terminations		For method and severity: see detail specification		No visible damage
4.7 Resistance to soldering heat (if applicable)		See detail specification for the method (1A or 1B) For method 1A: Immersion time: 10 s, unless otherwise specified in the detail specification		
4.20 Component solvent resistance (if applicable)				
4.7.2 Final measurements		Visual examination DC line resistance		No visible damage As in group 0

Subclause number and test (see Note 1)	D or ND (see Note 2)	Conditions of test (see Note 1)	Number of specimens (*n*) and number of non-conforming items (*c*)	Performance requirements (see Note 1)
Group 1B			See Tables 1 or 2	
4.8 Solderability (if applicable)		See detail specification for the method		Good tinning as evidenced by free flowing of the solder with wetting of the terminations, or solder shall flow within 3 s, as applicable
4.21 Solvent resistance of the marking (if applicable)				
4.9 Rapid change of temperature		θ_A = Lower category temperature θ_B = Upper category temperature Five cycles Duration *t* =... h, see 4.9.1		
		Visual examination		No visible damage
4.10 Vibration		For mounting method see detail specification Frequency range: from... Hz to... Hz		
		Total number of sweep cycles:...		
		Visual examination		No visible damage
4.10.2 Final inspection				
4.11 Bump, (or shock, see 4.12)		For mounting method see detail specification Number of bumps:... Acceleration:... m/s^2 Duration of pulse:... ms		
		Visual examination		No visible damage
4.12 Shock, (or bump, see 4.11)		For mounting method see detail specification Acceleration:... m/s^2 Duration of pulse:... ms		
4.11.2 Final measurements		Visual examination		No visible damage
or				
4.12.3		DC line resistance		As in group 0

Subclause number and test (see Note 1)	D or ND (see Note 2)	Conditions of test (see Note 1)	Number of specimens (*n*) and number of non-conforming items (*c*)	Performance requirements (see Note 1)
Group 1	D		See Tables 1 or 2	
4.13 Container sealing (if required in the detail specification)		Test Qc or Qd as prescribed in the detail specification		No leakage
4.14 Climatic sequence				
4.14.2 Dry heat		Temperature: upper category temperature Duration: 16 h		
4.14.3 Damp heat, cyclic, test Db, first cycle				
4.14.4 Cold		Temperature: lower category temperature Duration: 2 h		
4.14.5 Low air pressure (if required in the detail specification)		Air pressure 8,0 kPa unless otherwise stated in the detail specification Duration: 1 h		
		Visual examination		No permanent breakdown, flashover, harmful deformation of the case
4.14.6 Damp heat, cyclic, test Db, remaining cycles		Recovery: 1 h to 26 h		
4.14.7 Final measurement		Visual examination		No visible damage Legible marking
		DC line resistance		As in group 0
		Inductance		Within ± 30 % of value measured in group 0
		Voltage proof Voltage: 66 % of voltage applied in group 0		No breakdown or flashover
		Insulation resistance		≥ 50 % of values in 4.3

Subclause number and test (see Note 1)	D or ND (see Note 2)	Conditions of test (see Note 1)	Number of specimens (*n*) and number of non-conforming items (*c*)	Performance requirements (see Note 1)
Group 2	D		See Tables 1 or 2	
4.15 Damp heat, steady state		Recovery: 1 h to 26 h		
4.15.1 Final measurements		Visual examination		No visible damage Legible marking
		DC line resistance		As in group 0
		Inductance		Within +/- 30 % of value measured in group 0
		Voltage proof Voltage: 66 % of voltage applied in group 0 A polarizing voltage shall be applied if specified in the detail specification		No breakdown or flashover
		Insulation resistance		≥ 50 % of value in 4.3
Group 3A	D		See Tables 1 or 2	
4.16 Temperature rise (inductors with mass > 5 g only)		Duration: until thermal equilibrium has been reached		
4.16.1 Test conditions		Current: rated current Ambient temperature: rated temperature	See Tables 1 or 2	
4.16.2 Final measurements		Internal temperature		As in 4.16.2
4.18.1 Endurance, current (inductors with mass ≤ 5 g only)		Duration: 1 000 h Current: 1,1 × rated current Recovery: 1 h to 26 h		
Group 3B (inductors with more than one winding only)	D		See Tables 1 or 2	
4.17 Impulse voltage		3 impulses, full wave Crest voltage: see 4.17.1		No breakdown or flashover
4.18.2 Endurance, voltage between line terminations		Duration: 1 000 h Voltage and temperature, see 4.18.2		