



SLOVENSKI STANDARD
oSIST prEN IEC 60939-3:2023
01-junij-2023

Pasivni filtri za dušenje elektromagnetnega motenja - 3. del: Enote pasivnih filtrov, za katere varnostni preskusi ustrezajo

Passive filter units for electromagnetic interference suppression - Part 3: Passive filter units for which safety tests are appropriate

Passive Filter für die Unterdrückung von elektromagnetischen Störungen - Teil 3: Filter, für die Sicherheitsprüfungen vorgeschrieben sind

Filtres passifs d'antiparasitage - Partie 3: Filtres passifs pour lesquels des essais de sécurité sont appropriés

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SECRETARIAT: Netherlands	SECRETARY: Mr Ronald Drenthen
OF INTEREST TO THE FOLLOWING COMMITTEES:	PROPOSED HORIZONTAL STANDARD: <input type="checkbox"/> Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.
FUNCTIONS CONCERNED: <input checked="" type="checkbox"/> EMC <input type="checkbox"/> ENVIRONMENT <input checked="" type="checkbox"/> QUALITY ASSURANCE <input checked="" type="checkbox"/> SAFETY	
<input checked="" type="checkbox"/> SUBMITTED FOR CENELEC PARALLEL VOTING Attention IEC-CENELEC parallel voting The attention of IEC National Committees, members of CENELEC, is drawn to the fact that this Committee Draft for Vote (CDV) is submitted for parallel voting. The CENELEC members are invited to vote through the CENELEC online voting system.	<input type="checkbox"/> NOT SUBMITTED FOR CENELEC PARALLEL VOTING

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- any relevant "in some countries" clauses to be included should this proposal proceed. Recipients are reminded that the enquiry stage is the final stage for submitting "in some countries" clauses. See AC/22/2007.

TITLE:

Passive filter units for electromagnetic interference suppression - Part 3: Passive filter units for which safety tests are appropriate

PROPOSED STABILITY DATE: 2032

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

PASSIVE FILTER UNITS FOR ELECTROMAGNETIC INTERFERENCE SUPPRESSION –

Part 3: Passive filter units for which safety tests are appropriate

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International Standard IEC 60939-3 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 2015 and corrigendum (2016 and 2018).

In addition to a number of editorial improvements, the following main changes have been made with respect to the previous edition:

- Separated chapters for safety and performance tests
- Added note for use of multiple X capacitors bridging basic insulation in 3 phase filters
- Characteristics and conditions to substitute X and Y capacitors are now described in a separate chapter
- Creepage and clearance tables updated and in line with the latest IEC 60938-2 and IEC 60664-1 versions
- Allowing voltage measurement for inductance measurements (ch. 7.3)

- 302 • Added requirements for marking depending on remaining energy after disconnection
- 303 • Added content of CTL DSH 2044:2016 for temperature test of IEC filters
- 304 • Added note about temperature rise required specimens for safety testing.
- 305 • Changed index of capacitors in Annex A to avoid confusion between index name and capacitor class.
- 306 • Moved tests from group 1A to 2. Now samples in group 1A need to be submitted without potting.
- 307 [convenor comment: This is common practice with test houses, otherwise it is impossible to properly
- 308 assess creepage and clearance distances. It is also necessary than to move mechanical tests to
- 309 another group since the absence of potting is impacting the mechanical properties of the filter]
- 310

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

FDIS	Report on voting
40/XXXX/FDIS	40/XXXX/RV

312 Full information on the voting for the approval of this standard can be found in the report on voting

313 indicated in the above table.

314

315 This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

316 A list of all parts in the IEC 60939 series, published under the general title *Passive filter units for*

317 *electromagnetic interference suppression*, can be found on the IEC website.

318 The committee has decided that the contents of this publication will remain unchanged until the stability

319 date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific

320 publication. At this date, the publication will be

- 321 • reconfirmed,
 - 322 • withdrawn,
 - 323 • replaced by a revised edition, or
 - 324 • amended
- 325
- 326

PASSIVE FILTER UNITS FOR ELECTROMAGNETIC INTERFERENCE SUPPRESSION –

Part 3: Passive filter units for which safety tests are appropriate

1 Scope

This specification covers passive filters used to attenuate unwanted radio-frequency signals (such as noise or interference) generated from electromagnetic sources.

Both single and multi-channel filters within one enclosure or which are built on a printed circuit board forming a compact entity are included within the scope of this 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 specification. It is up to the manufacturer to state whether a given component is to be designed as a capacitor, an inductor or a filter. Filters can include also other components like resistors and/or varistors or similar components.

This specification applies to passive filter units for electromagnetic interference suppression for which safety tests are appropriate. This implies that filters specified according to this specification will either be connected to mains supplies, when compliance with the mandatory tests of Table B.1 is necessary, or used in other circuit positions where the equipment specification prescribes that some or all of these safety tests are required.

This specification applies to passive filter units, which will be connected to an AC mains or other supply (DC or AC) with a nominal voltage not exceeding 1 000 V AC, with a nominal frequency not exceeding 400 Hz, or 1 500 V DC

NOTE For AC use, IEC 60384-14 applies to capacitors which will be connected to AC mains with a nominal frequency not exceeding 100 Hz.

This specification covers appliance filters (US) but does not cover facility filters, cord-connected filters or direct plug-in filters. These other filters will be covered by another sectional specification.

2 Normative references

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.

IEC 60060-1:2010, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60062:2016, *Marking codes for resistors and capacitors*

IEC 60068-1:2013, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-1:2007, *Environmental testing – Part 2-1: Tests – Test A: Cold*

IEC 60068-2-2:2007, *Environmental testing – Part 2-2: Tests – Test B: Dry heat*

IEC 60068-2-6:2007, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-14:2009, *Environmental testing – Part 2-14: Tests – Test N: Change of temperature*

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

- 369 IEC 60068-2-20:2021, *Environmental testing – Part 2-20: Tests – Test T: Test methods for solderability*
370 *and resistance to soldering heat of devices with leads*
- 371 IEC 60068-2-21:2021, *Environmental testing – Part 2-21: Tests – Test U: Robustness of terminations*
372 *and integral mounting devices*
- 373 IEC 60068-2-30:2005, *Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12*
374 *h cycle)*
- 375 IEC 60068-2-45:1980, *Basic environmental testing procedures – Part 2-45: Tests – Test XA and*
376 *guidance: Immersion in cleaning solvents*
- 377 IEC 60068-2-78:2012, *Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state*
- 378 IEC 60384-14:2023, *Fixed capacitors for use in electronic equipment – Part 14: Sectional specification*
379 *– Fixed capacitors for electromagnetic interference suppression and connection to the supply mains*
- 380 IEC 60664-1:2020, *Insulation coordination for equipment within low-voltage system – Part 1: Principles,*
381 *requirements and tests*
- 382 IEC 60695-11-5:2016, *Fire hazard testing – Part 11-5: Test flames – Needle-flame test method –*
383 *Apparatus, confirmatory test arrangement and guidance*
- 384 IEC 60695-11-10:2013, *Fire hazard testing – Part 11-10: Test flames – 50 W horizontal and vertical*
385 *flame test methods*
- 386 IEC 60938-1:2021, *Fixed inductors for electromagnetic interference suppression – Part 1: Generic*
387 *specification*
- 388 IEC 60938-2:2021, *Fixed inductors for electromagnetic interference suppression – Part 2: Sectional*
389 *specification*
- 390 IEC 60940:2015, *Guidance information on the application of capacitors, resistors, inductors and*
391 *complete filter units for electromagnetic interference suppression*
- 392 IEC 61140:2016, *Protection against electric shock – Common aspects for installation and equipment*
- 393 CISPR 17:2011, *Methods of measurement of the suppression characteristics of passive EMC filtering*
394 *devices*
- 395 UL 44, *Thermoset-Insulated Wires and Cables* UL 83 *Thermoplastic-Insulated Wires and Cables*

396 **3 Terms and definitions**

397 For the purposes of this document and the subordinate specifications, the following terms, definitions,
398 symbols and abbreviated terms apply.

399 ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- 400 • IEC Electropedia: available at <http://www.electropedia.org/>
- 401 • ISO Online browsing platform: available at <http://www.iso.org/obp>

402 **3.1**

403 **capacitor of Class X**

404 **RC unit of Class X**

405 capacitor or RC unit of a type suitable for use in situations where failure of the capacitor would not lead
406 to danger of electric shock but could result in a risk of fire. See 4.1.2 for details

407
408
409
410
411

3.2**capacitor of Class Y****RC unit of Class Y**

capacitor or RC-unit of a type suitable for use in situations where failure of the capacitor could lead to danger of electric shock. See 4.1.3 for details

412
413
414

3.3**earth inductor**

inductor that forms part of the earth lead of a filter

415
416
417
418
419

3.4**type**

group of components having similar design features, the similarity of their manufacturing techniques enabling them to be grouped together either for qualification approval or for quality conformance inspection, and generally covered by a single detail specification

420
421

Note 1 to entry: Components described in several detail specifications may, in some cases, be considered as belonging to the same type and may therefore be grouped together for approval and quality conformance inspection.

422
423
424
425

3.5**style**

subdivision of a type generally based on dimensional factors; a style may include several variants, generally of a mechanical order

426
427
428
429
430

3.6**electromagnetic interference suppression filter unit (filter)****radio interference suppression filter unit**

assembly of piece-parts and inductive, capacitive and resistive elements to be used for the reduction of electromagnetic interference caused by electrical or electronic equipment, or other sources

431
432
433
434

3.7**AC mains filter mains filter**

passive filter unit designed essentially for application with a power-frequency alternating voltage supplied from the mains

435
436
437

3.8**DC filter**

passive filter unit designed essentially for application with a DC supply

438
439

Note 1 to entry: Typical DC filters are photovoltaic filters used within inverters/converters etc. between the panel and converter or telecom DC power line filters.

440
441
442
443

3.9**appliance filter**

filter intended to be factory-installed as a component part of end-use appliances or equipment connected to (supplied by) the branch circuits of a building wiring system

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Note 1 to entry: Included in this category are filters installed in medical and dental equipment, office appliances and business equipment, data processing equipment, and household appliances such as mixers, vacuum cleaners, hand tools, and the like.

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3.10**cord-connected filter**

filter provided with a supply cord having an attachment plug for connecting the filter to a branch-circuit receptacle. It is also provided with one or two receptacles for distribution of the filtered voltage to an external (appliance or other equipment) load

451

Note 1 to entry: Cord-connected filters are not covered by this specification, see 1.

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3.11**direct plug-in filter**

filter provided with blades or pins at the filter body that plug directly into a branch-circuit receptacle. It is also provided with one or two receptacles for the distribution of the filtered voltage to an external (appliance or other equipment) load

457 Note 1 to entry: Direct plug-in filters are not covered by this specification, see 1.

3.12

facility filter

459 filter installed as part of the service, feeders, or branch circuitry of a building wiring system

461 Note 1 to entry: Facility filters are not covered by this specification, see 1.

3.13

rated voltage U_R

462 maximum R.M.S. operating voltage at rated frequency or the maximum DC operating voltage which may
463 be applied continuously to the terminations of the filter unit at any temperature between the lower and
464 the upper category temperatures

467 Note 1 to entry: A filter not suitable for the same voltage line-to-line and line-to-ground shall be marked with a slash rating,
468 e.g. 300/520 V AC

469 Note 2 to entry: When it is necessary for clarity the nature of U_R should be shown, like U_R AC or U_R DC

470 Note 3 to entry: Filters may have more than one rated voltage value or may have a rated voltage range.

3.14

working voltage U

472 highest value of the AC R.M.S. voltage at rated frequency or DC voltage across any particular insulation
473 which can occur by design when the equipment is supplied at rated voltage

3.15

rated frequency

475 maximum frequency at which maximum AC operating voltage may be applied to terminations of the filter

3.16

lower category temperature

478 minimum ambient temperature for which the filter has been designed to operate continuously

3.17

upper category temperature

482 maximum ambient temperature for which the filter unit has been designed to operate continuously

3.18

rated temperature

485 maximum ambient temperature at which a filter can carry its rated current

3.19

rated current

487 maximum AC operating current through input and output filter terminations at rated frequency or
488 maximum DC rating current which allows continuous operation of the filter at the rated temperature,
489 assigned by the manufacturer for one or both of the following conditions:
491

492 a) free air (I_{RO});

493 b) with a specified heat sink (I_{RH})

3.20

nominal capacitance C_N

494 effective capacitance value resulting from the combination of capacitive elements of the filter for which
495 a filter has been designed and which may be indicated upon it

3.21

nominal inductance L_N

498 inductance value for which the inductor has been designed and which may be indicated upon it