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Power frequency overvoltage protection devices (POPs) for household and similar applications

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Dispositifs de protection contre les surtensions à fréquence industrielle (POP) pour les applications domestiques et similaires

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IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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POWER FREQUENCY OVERVOLTAGE PROTECTION DEVICES (POPs) FOR HOUSEHOLD AND SIMILAR APPLICATIONS

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

FDIS	Report on voting
23E/1131/FDIS	23E/1155/RVD

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POWER FREQUENCY OVERVOLTAGE PROTECTION DEVICES (POPs) FOR HOUSEHOLD AND SIMILAR APPLICATIONS

1 Scope

This document applies to devices for power frequency overvoltage protection (hereafter referred to as "POP") for household and similar uses, with a rated frequency of 50 Hz, 60 Hz or 50/60 Hz, with rated voltage not exceeding 230 V AC (between phase and neutral), and with rated current not exceeding 63 A, either consisting of a functional unit in combination with a main protective device (MPD), or as one single device having opening means able to open the protected circuit in specified conditions.

The main protective device is a circuit-breaker, an RCCB or an RCBO.

NOTE 1 A POP, as one single device, is not a protective device to be used for automatic disconnection of the supply within the meaning specified in IEC 60364-4-41.

POPs are intended for use in an environment with pollution degree 2 and overvoltage category III. Devices for POPs are suitable for isolation.

POPs can be designed as a POP unit assembled to or integrated in a main protective device by the manufacturer or as an assembly of a main protective device mechanically or electrically coupled on site with the POP unit, or as one single POP having opening means able to open the protected circuit in specified conditions.

POPs are intended to mitigate the effects of power frequency overvoltages between a phase and neutral conductor (e.g. caused by loss of a neutral conductor in the three-phase supply upstream of the POP) for downstream equipment by opening the protected circuit when an overvoltage between phase and neutral is detected.

NOTE 2 In this context, the verb "mitigate" means that the POP will provide protection in most cases of power frequency overvoltages.

POPs intended for monitoring one line-to-neutral conductor voltage can be used between two-phase conductors in a phase-to-phase electrical supply system not exceeding 230 V if both conductors are switched and declared as such by the manufacturer.

POPs according to this document are suitable for use in an IT system provided all active conductors are switched.

This document does not apply to protection against common mode overvoltages.

This document does not apply to surge protective devices.

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 60065:2014, *Audio, video and similar electronic apparatus – Safety requirements*

IEC 60269 (all parts), *Low-voltage fuses*

IEC 60364 (all parts), *Low-voltage electrical installations*

IEC 60384-14:2013, *Fixed capacitors for use in electronic equipment – Part 14: Sectional specification – Fixed capacitors for electromagnetic interference suppression and connection to the supply mains*

IEC 60384-14:2013/AMD1:2016

IEC 60417, *Graphical symbols for use on equipment* (available at: <http://www.graphical-symbols.info/equipment>)

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60664-3, *Insulation coordination for equipment within low-voltage systems – Part 3: Use of coating, potting or moulding for protection against pollution*

IEC 60695-2-10, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure*

IEC 60695-2-11:2014, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products (GWEPT)*

IEC 60898-1:2015, *Electrical accessories – Circuit-breakers for overcurrent protection for household and similar installations – Part 1: Circuit-breakers for a.c. operation*

IEC 60898-2:2016, *Electrical accessories – Circuit-breakers for overcurrent protection for household and similar installations – Part 2: Circuit-breakers for AC and DC operation*

IEC 61000-4-2, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-6, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-16:2015, *Electromagnetic compatibility (EMC) – Part 4-16: Testing and measurement techniques – Test for immunity to conducted, common mode disturbances in the frequency range 0 Hz to 150 kHz*

IEC 61000-6-3, *Electromagnetic compatibility (EMC) – Part 6-3: Generic standards – Emission standard for residential, commercial and light-industrial environments*

IEC 61008-1:2010, *Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs) – Part 1: General rules*

IEC 61008-1:2010/AMD1:2012

IEC 61008-1:2010/AMD2:2013

IEC 61009-1:2010, *Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) – Part 1: General rules*

IEC 61009-1:2010/AMD1:2012

IEC 61009-1:2010/AMD2:2013

IEC 61249-2 (all parts), *Materials for printed boards and other interconnecting structures*

IEC 61543:1995, *Residual current-operated protective devices (RCDs) for household and similar use – Electromagnetic compatibility*

IEC 61543:1995/AMD1:2004

IEC 61543:1995/AMD2:2005

IEC 61558-1, *Safety of transformers, reactors, power supply units and combinations thereof – Part 1: General requirements and tests*

IEC 61558-2 (all parts), *Safety of transformers, reactors, power supply units and combinations thereof*

IEC 62423, *Type F and type B residual current operated circuit-breakers with and without integral overcurrent protection for household and similar uses*

IEC 62873-2, *Residual current operated circuit-breakers for household and similar use – Part 2: Residual current devices (RCDs) – Vocabulary*

IEC 62873-3-1, *Residual current operated circuit-breakers for household and similar use – Part 3-1: Particular requirements for RCDs with screwless type terminals for external copper conductors*

IEC 62873-3-2, *Residual current operated circuit-breakers for household and similar use – Part 3-2: Particular requirements for RCDs with flat quick-connect terminations*

IEC 62873-3-3, *Residual current operated circuit-breakers for household and similar use – Part 3-3: Specific requirements for RCDs with screw-type terminals for external untreated aluminium conductors and with aluminium screw-type terminals for use with copper or with aluminium conductors*

ISO 306, *Plastics – Thermoplastic materials – Determination of Vicat softening temperature (VST)*

CISPR 14-1, *Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus – Part 1: Emission*

CISPR 32, *Electromagnetic compatibility of multimedia equipment – Emission requirements*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62873-2 and the following apply.

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

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

NOTE Where the terms "voltage" or "current" are used, they imply RMS values, unless otherwise specified.

3.1.1**power frequency overvoltage**

increase of the voltage at the rated frequency in the electrical supply system, above a specified threshold

3.1.2**power frequency overvoltage protective device****POP**

device intended to mitigate the effects of power frequency overvoltages between the phase and neutral conductor (e.g. caused by loss of the neutral conductor in the three-phase supply upstream of the POP) for downstream equipment

Note 1 to entry: A POP monitoring one line-to-neutral conductor voltage can be used also to mitigate the effects of power frequency overvoltages between two-phase conductors in phase-to-phase electrical supply systems.

Note 2 to entry: This note applies to the French language only.

3.1.3**main protective device****MPD**

device to which the POP is intended to be integrated, or mechanically coupled, or electrically coupled, directly or through a release unit and which trips under specified conditions

Note 1 to entry: The main protective device is a circuit-breaker (IEC 60898-1 or IEC 60898-2) or an RCCB (IEC 61008-1 or IEC 62423) or an RCBO (IEC 61009-1 or IEC 62423).

Note 2 to entry: This note applies to the French language only.

3.1.4**actuating voltage**

U_a

voltage value measured between the phase and neutral conductor, at which the POP actuates the main protective device or the integrated opening means

3.1.5**release unit**

device mechanically connected to a main protective device, which releases the holding means and permits the automatic opening of the main protective device

Note 1 to entry: The release unit may be mechanically coupled with the MPD or integrated into the MPD.

3.1.6**POP unit**

part of the POP ensuring the function of detection of power frequency overvoltages and initiating the operation of the device to cause interruption of the current

Note 1 to entry: The interruption of the current can either be provided by opening means (see 4.1.4) or by a main protective device assembled or integrated by the manufacturer with the POP unit (see 4.1.1) or by a main protective device coupled on site with a POP unit (see 4.1.2 and 4.1.3).

3.1.7**break time**

t_B

time that elapses between the instant when the overvoltage is suddenly attained, and the instant when the MPD associated to the POP or the integrated opening means has switched OFF the protected circuit

3.1.8**non-actuating time**

t_{0A}

maximum period during which a given overvoltage can be applied to the POP without causing it to operate