

# INTERNATIONAL STANDARD



Uninterruptible power systems (UPS) –  
Part 2: Electromagnetic compatibility (EMC) requirements

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**Uninterruptible power systems (UPS) –  
Part 2: Electromagnetic compatibility (EMC) requirements**

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**UNINTERRUPTIBLE POWER SYSTEMS (UPS) –**

**Part 2: Electromagnetic compatibility (EMC) requirements**

**INTERPRETATION SHEET 1**

This interpretation sheet has been prepared by subcommittee 22H: Uninterruptible power systems (UPS), of IEC technical committee 22: Power electronic systems and equipment.

The text of this interpretation sheet is based on the following documents:

FDIS	Report on voting
22H/232/FDIS	22H/236/RVD

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

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**Interpretation of 5.3.2.4, Limits at the network ports**

**Introduction**

Sub-clause 5.3.2.4 states that the **network port** limits applicable to **UPS** of **category C1, C2** and **C3** are located in Table 1, Table 2 and Annex C.

It was not clear whether 5.3.2.4 applies to **network ports** that originate and terminate within the **enclosure port** of the **UPS** (i.e. to **network ports** connected exclusively to circuits or devices forming an integral part of the **UPS**).

**Interpretation**

The **network port** limits in Table 1, Table 2 and Annex C apply only to **network ports** for which connection to circuits or devices external to the **enclosure port** of the **UPS** is allowed. This includes, without limitation, connection to PSTN, ISDN, xDSL and Ethernet networks. The limits in Table 1, Table 2 and Annex C do not apply to **network ports** that originate and terminate within the **enclosure port** of the **UPS** (i.e. to **network ports** connected exclusively to circuits or devices forming an integral part of the **UPS**).



## CONTENTS

FOREWORD.....	5
1 Scope.....	7
2 Normative references .....	8
3 Terms, definitions and abbreviated terms .....	9
3.1 Terms and definitions.....	9
3.2 Abbreviated terms.....	12
<del>4 Environment.....</del>	<del>12</del>
4 UPS categories .....	12
4.1 Category C1 UPS .....	12
4.2 Category C2 UPS .....	12
4.3 Category C3 UPS .....	13
4.4 Category C4 UPS .....	13
4.5 Categories and environment .....	13
4.6 Documentation <del>for the purchaser/user</del> .....	14
5 Emission.....	14
5.1 General.....	14
5.2 General test requirements.....	14
5.3 <del>General</del> Measurement <del>conditions</del> requirements.....	15
5.3.1 General .....	15
5.3.2 Conducted emission .....	15
<del>        5.3.3 Applicability.....</del>	<del>18</del>
5.3.3 Radiated emission .....	18
6 Immunity.....	18
6.1 General.....	18
6.2 General requirements and performance criteria .....	18
6.3 Basic immunity requirements <del>— High frequency disturbances</del> .....	19
6.3.1 <del>Conditions</del> General .....	19
6.3.2 <del>Equipment of</del> Category C1 UPS.....	19
6.3.3 <del>Equipment of</del> Category C2 and C3 UPS.....	20
<del>    6.3 Immunity to low frequency signals .....</del>	<del>22</del>
<del>    6.4 Immunity to power frequency magnetic field.....</del>	<del>22</del>
6.4 Immunity to voltage dips, short interruptions and voltage variations .....	22
Annex A (normative) Electromagnetic emission – Test methods.....	23
A.1 General.....	23
A.2 Measuring equipment.....	23
A.2.1 Measuring instruments.....	23
A.2.2 Artificial mains network (AMN).....	23
A.2.3 Voltage probe .....	23
A.2.4 Antennas .....	24
A.2.5 Common mode absorption device (CMAD).....	24
A.2.6 Asymmetric artificial network .....	24
A.3 Test unit configuration .....	24
A.4 Determination of maximum emission configurations .....	25
A.5 Operation of the equipment under test .....	26
A.6 Method of measurement of mains terminal <del>interference</del> disturbance voltage .....	26

A.6.1	Measuring receivers .....	26
A.6.2	Artificial mains network (AMN).....	26
A.6.3	Ground plane.....	27
A.6.4	Equipment set-up for conducted emission measurements.....	27
A.6.5	Conducted emission measurement .....	28
A.7	Method of measurement at AC output ports (where applicable).....	28
A.8	Method of measurement of radiated emission .....	29
A.8.1	General .....	29
A.8.2	Measuring receivers .....	29
A.8.3	Antennas .....	29
A.9	Measurement site .....	29
A.9.1	Test site .....	29
A.9.2	Alternative test sites .....	29
A.10	Equipment set-up for radiated emission tests .....	29
A.10.1	General .....	29
A.10.2	Radiated emission measurement .....	30
A.10.3	Measurement in the presence of high ambient signals .....	30
A.11	Measurement of radiated magnetic disturbances.....	30
A.12	Measurement of network port disturbances .....	30
Annex B (informative)	Electromagnetic emission limits and measurement methods of magnetic field – H field .....	41
Annex C (informative normative)	Electromagnetic emission – Limits of signal network ports .....	43
Annex D (normative)	Electromagnetic immunity – Test methods .....	44
D.1	General.....	44
D.1.1	Object.....	44
D.1.2	Test environment.....	44
D.2	Electrostatic discharge (ESD) .....	44
D.3	Immunity to radiated electromagnetic (EM) fields .....	44
D.3.1	General .....	44
D.3.2	Arrangement of wiring.....	44
D.4	Immunity to fast transients .....	44
D.5	Immunity to surges.....	45
D.6	Immunity to low-frequency signals .....	45
D.6.1	Power line harmonics and inter-harmonics.....	45
D.6.2	Power line unbalance (three-phase UPS systems only) .....	45
Annex E (informative)	User installation testing .....	47
Bibliography	.....	48
Figure 1 – Examples of ports .....		
Figure 1 – UPS ports .....		10
Figure A.1 – Circuit for disturbance voltage measurements on mains supply or UPS output .....		31
Figure A.2 – Minimum alternative test site .....		31
Figure A.3 – Set-up for measurement of conducted emission for table-top units using voltage probe.....		32
Figure A.4 – Set-up for measurement of conducted emission for table-top units using AMN (alternative method) .....		33

Figure A.5 – Test set-up for floor-standing units.....	33
Figure A.6 – Test set-up for floor-standing units using AMN (alternative method).....	34
Figure A.7 – Test configuration for table-top equipment (conducted emission measurement).....	35
Figure A.8 – Test configuration for table-top equipment (conducted emission measurement) – Plan view.....	36
Figure A.9 – Alternative test configuration for table-top equipment (conducted emission measurement) – Plan view.....	36
Figure A.10 – Test configuration for floor-standing equipment (conducted emission measurement).....	37
Figure A.11 – Test configuration for table-top equipment (radiated emission requirement).....	38
Figure A.12 – Test configuration for floor-standing equipment (radiated emission measurement).....	39
Figure A.13 – Test configuration for top entry floor-standing equipment (radiated emission measurement).....	40
Figure B.1 – Test set-up for measuring radiated disturbances.....	41
Figure D.1 – Amplitude unbalance.....	46
Figure D.2 – Phase unbalance.....	46
Table 1 – Limits of mains terminal <del>interference</del> and network port disturbance voltage for category C1 and category C2 UPS in the frequency range 0,15 MHz to 30 MHz.....	16
Table 2 – Limits of mains terminal <del>interference</del> and network port disturbance voltage for category C3 UPS in the frequency range 0,15 MHz to 30 MHz.....	16
Table 3 – Limits of radiated emission in the frequency range 30 MHz to 1 000 MHz.....	18
Table 4 – Performance criteria for immunity tests.....	19
Table 5 – Minimum immunity requirements for category C1 UPS.....	20
Table 6 – Minimum immunity requirements for category C2 and C3 UPS.....	21
Table B.1 – UPS which has a rated output current less than or equal to 16 A.....	42
Table B.2 – UPS which has a rated output current greater than 16 A.....	42
Table C.1 – Limits of <del>signal</del> network ports for category C1 UPS.....	43
Table C.2 – Limits of network ports for category C2 UPS.....	43
Table C.3 – Limits of network ports for category C3 UPS.....	43

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## UNINTERRUPTIBLE POWER SYSTEMS (UPS) –

## Part 2: Electromagnetic compatibility (EMC) requirements

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International Standard IEC 62040-2 has been prepared by subcommittee 22H: Uninterruptible power systems (UPS), of IEC technical committee 22: Power electronic systems and equipment.

This third edition cancels and replaces the second edition published in 2005. This edition constitutes a technical revision.

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

- a) the inclusion of **network port** limits in Table 1, Table 2 and Annex C for the sake of consistency with other standards;
- b) a change of quasi-peak limit for **category C3 UPS** in Table 2 for the sake of consistency with other standards;
- c) a clarification in Table 4 about the performance criteria for immunity tests;
- d) a revision of some test configurations in Annex A.

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

FDIS	Report on voting
22H/210/FDIS	22H/212/RVD

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

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

In this document, the following print types are used:

- requirements proper and normative annexes: in roman type;
- compliance statements and test specifications: *in italic type*;
- notes and other informative matter: in smaller roman type;
- normative conditions within tables: in smaller roman type;
- terms that are defined in Clause 3: **bold**.

A list of all parts in the IEC 62040 series, published under the general title *Uninterruptible power systems (UPS)*, 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

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- withdrawn,
- replaced by a revised edition, or
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The contents of the Interpretation sheet of June 2018 have been included in this copy.

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## UNINTERRUPTIBLE POWER SYSTEMS (UPS) –

### Part 2: Electromagnetic compatibility (EMC) requirements

#### 1 Scope

~~This part of IEC 62040 applies to UPS units intended to be installed~~

- ~~— as a unit or in UPS systems comprising a number of interconnected UPS and associated control/switchgear forming a single power system; and~~
- ~~— in any operator accessible area or in separated electrical locations, connected to low-voltage supply networks for either industrial or residential, commercial and light industrial environments.~~

~~This part of IEC 62040 is intended as a product standard allowing the EMC conformity assessment of products of categories C1, C2 and C3 as defined in this part of IEC 62040, before placing them on the market.~~

~~Equipment of category 4 is treated as a fixed installation. Checking is generally done after installation in its final place of use. Sometimes partial checking may be done before. See Annex E~~

~~The requirements have been selected so as to ensure an adequate level of electromagnetic compatibility (EMC) for UPS at public and industrial locations. These levels cannot, however, cover extreme cases, which may occur in any location but with extremely low probability of occurrence.~~

~~This part of IEC 62040 takes into account the differing test conditions necessary to encompass the range of physical sizes and power ratings of UPS.~~

~~A UPS unit or system shall meet the relevant requirements of this part of IEC 62040 as a stand-alone product. EMC phenomena produced by any customers' load connected to the output of the UPS equipment shall not be taken into account.~~

~~Special installation environments are not covered, nor are fault conditions of UPS taken into account.~~

~~This part of IEC 62040 does not cover d.c. supplied electronic ballast or UPS based on rotating machines.~~

~~This part of IEC 62040 states:~~

- ~~— EMC requirements;~~
- ~~— test methods;~~
- ~~— minimum performance levels.~~

This part of IEC 62040 is a type test product standard for electromagnetic compatibility (EMC) and applies to movable, stationary, fixed or built-in, pluggable and permanently connected UPS for use in low-voltage distribution systems with an environment being either residential, commercial, light industrial or industrial, which deliver output voltage with **port** voltages not exceeding 1 500 V DC or 1 000 V AC and which include an energy storage device.

Subject to installing, operating and maintaining the UPS in the manner prescribed by the manufacturer, this standard defines emission limits, immunity levels, test methods and performance criteria for a complete UPS to comply with the essential EMC requirements

necessary to avoid the UPS interfering with other apparatus, e.g. radio receivers, and to avoid the UPS being affected by external phenomena.

This standard does not address EMC phenomena produced by loads connected to the UPS or situations created by any apparatus external to the UPS other than as described in the immunity requirements.

This standard is harmonized with applicable IEC standards for electromagnetic emission limits and immunity levels. It contains additional requirements applicable to UPS.

This standard does not cover:

- a) low-voltage DC power supply devices covered by IEC 61204 standards;
- b) systems wherein the output voltage is derived from a rotating machine.

NOTE 1 UPS generally connect to their energy storage device through a DC link. A chemical battery is an example of an energy storage device. Alternative devices can be suitable, and as such, where “battery” appears in the text of this standard, this can be understood as “energy storage device”.

NOTE 2 This type test-based product standard allows EMC conformity assessment of UPS included in one of categories C1, C2 and C3 before placing them on the market. It also provides guidance for conformity assessment of UPS included in category C4 (see Clause 4).

NOTE 3 The differing test conditions necessary to encompass the range of physical sizes and power ratings of a complete UPS are taken into account. A complete UPS can consist of one or more interconnected units. For UPS configuration details refer to IEC 62040-3:2011, Annex A.

NOTE 4 The requirements have been selected so as to permit an adequate level of EMC for UPS installed in residential, commercial, light industrial and industrial locations. The requirements are not always sufficient to cover situations with low probability of occurrence including UPS faults.

## 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 60050-161:1990, International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility~~

IEC 61000-2-2:2002, *Electromagnetic compatibility (EMC) – Part 2-2: Environment – Compatibility levels for low-frequency conducted disturbances and signalling in public low-voltage power supply systems*

IEC 61000-3-2:2000 2014, *Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current  $\leq 16$  A per phase)*

IEC 61000-3-12:2011, *Electromagnetic compatibility (EMC) – Part 3-12: Limits – Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current  $> 16$  A and  $\leq 75$  A per phase*

~~IEC 61000-4-1:2000, Electromagnetic compatibility (EMC) – Part 4-1: Testing and measurement techniques – Overview of IEC 61000-4 series~~

IEC 61000-4-2:1995 2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2002 2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4:~~2004~~ 2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:~~1995~~ 2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

IEC 61000-4-6:~~2003~~ 2013, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances induced by radio-frequency fields*

IEC 61000-4-8:~~1993~~ 2009, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*

IEC 62040-3:~~1999~~ 2011, *Uninterruptible power systems (UPS) – Part 3: Method of specifying the performance and test requirements*

CISPR 11:2015, *Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement*

CISPR 16-1-1:~~2003~~ 2015, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-1: Radio disturbance and immunity measuring apparatus – Measuring apparatus*

CISPR 16-1-2:~~2003~~ 2014, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus—~~Ancillary equipment~~ – Coupling devices for conducted disturbance measurements*

CISPR 16-1-4:2010, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-4: Radio disturbance and immunity measuring apparatus – Antennas and test sites for radiated disturbance measurements*

CISPR 16-1-4:2010/AMD1:2012

IEC 62040-2:2016

CISPR 16-2-1:2014, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-1: Methods of measurement of disturbances and immunity – Conducted disturbance measurements*

CISPR 16-2-3:2010, *Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements*

CISPR 16-2-3:2010/AMD1:2010

CISPR 16-2-3:2010/AMD2:2014

CISPR 22:~~2005~~ 2008, *Information technology equipment – Radio disturbance characteristics – Limits and methods of measurement*

### 3 Terms, definitions and abbreviated terms

#### 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ~~IEC 60050-161 related to EMC and to relevant phenomena~~ IEC 62040-3:2011 and the following apply.

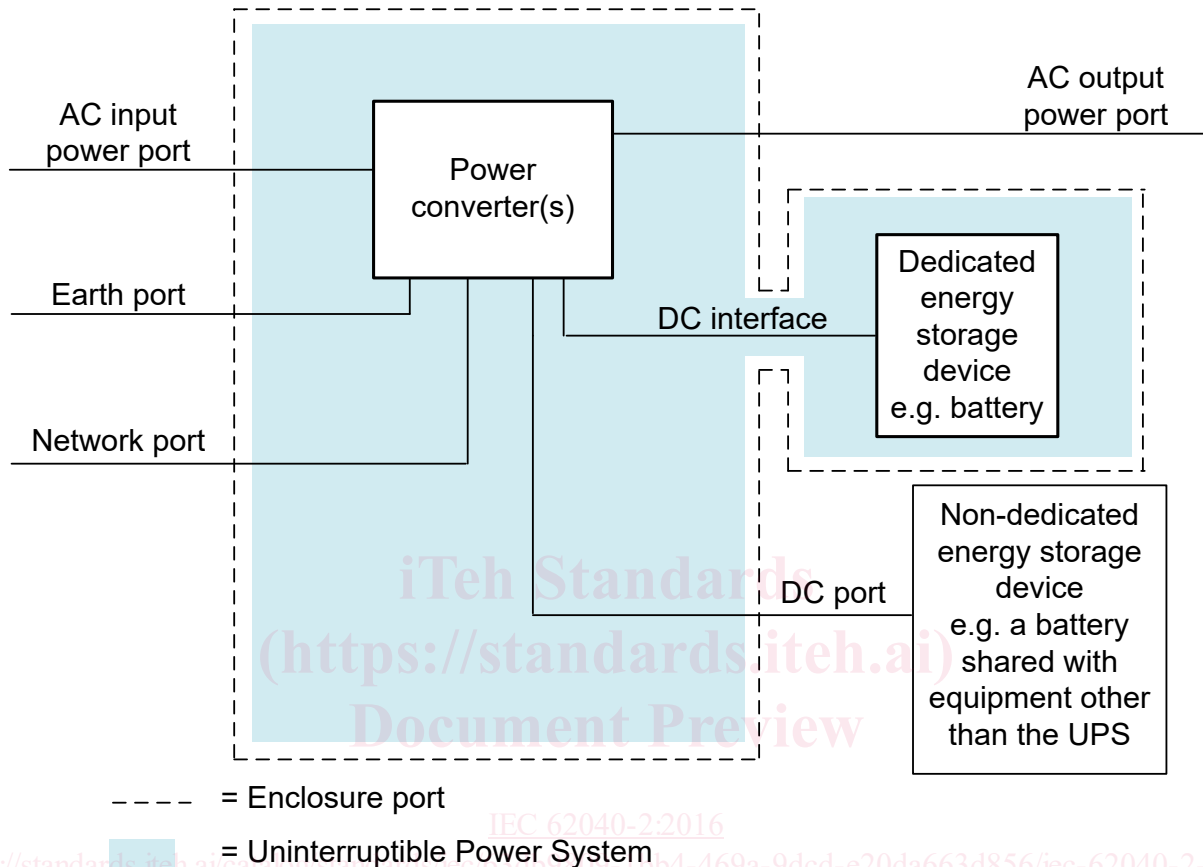
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- IEC Electropedia: available at <http://www.electropedia.org/>

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

**3.1.1 port**

particular interface of the UPS with the external electromagnetic environment as shown in Figure 1



**Figure 1 – UPS ports**

**3.1.2 DC interface**

dedicated connection between the power converter and an energy storage device that is exclusively used by the UPS

Note 1 to entry: The interface to an energy storage device intended for exclusive use of the UPS is not a **port** because this device is included in the UPS. The dedicated energy storage device shown in Figure 1 is connected through a **DC interface**.

**3.1.3 DC port**

connection from the power converter to an energy storage device that is not exclusively used by the UPS

Note 1 to entry: The non-dedicated energy storage device is connected through a **DC port**.

**3.1.4 enclosure port**

physical boundary of the ~~UPS~~ equipment under test (EUT) which electromagnetic fields ~~may~~ can radiate through or impinge on

Note 1 to entry: In Figure 1, the **enclosure port** represented by the dotted line around the power converter(s) and the dedicated energy storage device does not imply the existence of any shielding.