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

**Compatibilité électromagnétique (CEM) –
Partie 4-5: Techniques d'essai et de mesure – Essai d'immunité aux ondes
de choc**

CONTENTS

FOREWORD.....	7
INTRODUCTION.....	9
INTRODUCTION to the amendment.....	10
1 Scope and object.....	11
2 Normative references	11
3 Terms, definitions and abbreviations	12
3.1 Terms and definitions.....	12
3.2 Abbreviations.....	15
4 General.....	16
4.1 Power system switching transients.....	16
4.2 Lightning transients.....	16
4.3 Simulation of the transients.....	16
5 Test levels.....	16
6 Test instrumentation.....	17
6.1 General.....	17
6.2 1,2/50 μ s combination wave generator.....	17
6.2.1 General.....	17
6.2.2 Performance characteristics of the generator.....	18
6.2.3 Calibration of the generator.....	20
6.3 Coupling/decoupling networks.....	21
6.3.1 General.....	21
6.3.2 Coupling/decoupling networks for a.c./d.c. power port rated up to 200 A per line.....	22
6.3.3 Coupling/decoupling networks for interconnection lines.....	26
6.4 Calibration of coupling/decoupling networks.....	29
6.4.1 General.....	29
6.4.2 Calibration of CDNs for a.c./d.c. power port rated up to 200 A per line.....	30
6.4.3 Calibration of CDNs for interconnection lines.....	30
7 Test setup.....	33
7.1 Test equipment.....	33
7.2 Verification of the test instrumentation.....	33
7.3 Test setup for surges applied to EUT power ports.....	34
7.4 Test setup for surges applied to unshielded unsymmetrical interconnection lines.....	34
7.5 Test setup for surges applied to unshielded symmetrical interconnection lines.....	34
7.6 Test setup for surges applied to shielded lines.....	35
8 Test procedure.....	36
8.1 General.....	36
8.2 Laboratory reference conditions.....	36
8.2.1 Climatic conditions.....	36
8.2.2 Electromagnetic conditions.....	36
8.3 Execution of the test.....	37
9 Evaluation of test results.....	38
10 Test report.....	38

Annex A (normative) Surge testing for unshielded outdoor symmetrical communication lines intended to interconnect to widely dispersed systems	40
A.1 General.....	40
A.2 10/700 μ s combination wave generator	40
A.2.1 Characteristics of the generator.....	40
A.2.2 Performances of the generator	41
A.2.3 Calibration of the generator	43
A.3 Coupling/decoupling networks.....	43
A.3.1 General	43
A.3.2 Coupling/decoupling networks for outdoor communication lines	44
A.4 Calibration of coupling/decoupling networks.....	44
A.5 Test setup for surges applied to outdoor unshielded symmetrical communication lines	45
Annex B (informative) Selection of generators and test levels	47
B.1 General.....	47
B.2 The classification of environments	47
B.3 The definition of port types.....	47
B.4 Generators and surge types	48
B.5 Tables.....	48
Annex C (informative) Explanatory notes	50
C.1 Different source impedance	50
C.2 Application of the tests.....	50
C.2.1 Equipment level immunity	50
C.2.2 System level immunity	50
C.3 Installation classification	51
C.4 Minimum immunity level of ports connected to the a.c./d.c. mains supply.....	52
C.5 Equipment level immunity of ports connected to interconnection lines.....	52
Annex D (informative) Considerations for achieving immunity for equipment connected to low voltage power distribution systems	54
Annex E (informative) Mathematical modelling of surge waveforms	56
E.1 General.....	56
E.2 Normalized time domain voltage surge (1,2/50 μ s).....	57
E.3 Normalized time domain current surge (8/20 μ s)	58
E.4 Normalized time domain voltage surge (10/700 μ s).....	60
E.5 Normalized time domain current surge (5/320 μ s)	62
Annex F (informative) Measurement uncertainty (MU) considerations	65
F.1 Legend	65
F.2 General.....	65
F.3 Uncertainty contributors to the surge measurement uncertainty	66
F.4 Uncertainty of surge calibration.....	66
F.4.1 General	66
F.4.2 Front time of the surge open-circuit voltage	66
F.4.3 Peak of the surge open-circuit voltage	68
F.4.4 Duration of the surge open-circuit voltage.....	69
F.4.5 Further MU contributions to time and amplitude measurements	70
F.4.6 Rise time distortion due to the limited bandwidth of the measuring system.....	70

F.4.7	Impulse peak and width distortion due to the limited bandwidth of the measuring system	71
F.5	Application of uncertainties in the surge generator compliance criterion.....	72
Annex G (informative)	Method of calibration of impulse measuring systems.....	73
G.1	General.....	73
G.2	Estimation of measuring system response using the convolution integral	73
G.3	Impulse measuring system for open-circuit voltage (1,2/50 μ s, 10/700 μ s)	74
G.4	Impulse measuring system for short-circuit current (8/20 μ s, 5/320 μ s)	74
Annex H (informative)	Coupling/decoupling surges to lines rated above 200 A.....	76
H.1	General.....	76
H.2	Considerations of coupling and decoupling	76
H.3	Additional precautions.....	77
Annex I (informative)	Issues relating to powering EUTs having DC/DC converters at the input	78
I.1	General.....	78
I.2	Considerations for remediation	79
Bibliography	80
Figure 1	– Simplified circuit diagram of the combination wave generator.....	18
Figure 2	– Waveform of open-circuit voltage (1,2/50 μ s) at the output of the generator with no CDN connected	19
Figure 3	– Waveform of short-circuit current (8/20 μ s) at the output of the generator with no CDN connected	20
Figure 4	– Selection of coupling/decoupling method.....	22
Figure 5	– Example of coupling network and decoupling network for capacitive coupling on a.c./d.c. lines line-to-line coupling	24
Figure 6	– Example of coupling network and decoupling network for capacitive coupling on a.c./d.c. lines: line-to-ground coupling.....	25
Figure 7	– Example of coupling network and decoupling network for capacitive coupling on a.c. lines (3 phases): line L2-to-line L3 coupling.....	25
Figure 8	– Example of coupling network and decoupling network for capacitive coupling on a.c. lines (3 phases): line L3-to-ground coupling	26
Figure 9	– Example of coupling network and decoupling network for unshielded unsymmetrical interconnection lines: line-to-line and line-to-ground coupling.....	27
Figure 10	– Example of coupling and decoupling network for unshielded symmetrical interconnection lines: lines-to-ground coupling.....	28
Figure 11	– Example of coupling and decoupling network for unshielded symmetrical interconnection lines: lines-to-ground coupling via capacitors	29
Figure 12	– Example of test setup for surges applied to shielded lines.....	36
Figure A.1	– Simplified circuit diagram of the combination wave generator (10/700 μ s – 5/320 μ s)	41
Figure A.2	– Waveform of open-circuit voltage (10/700 μ s)	42
Figure A.3	– Waveform of the 5/320 μ s short-circuit current waveform.....	42
Figure A.4	– Example of test setup for unshielded outdoor symmetrical communication lines: lines-to-ground coupling, coupling via gas arrestors (primary protection fitted)	44
Figure E.1	– Voltage surge (1,2/50 μ s): width time response T_W	57
Figure E.2	– Voltage surge (1,2/50 μ s): rise time response T	58
Figure E.3	– Voltage surge (1,2/50 μ s): spectral response with $\Delta f = 3,333$ kHz	58

Figure E.4 – Current surge (8/20 μ s): width time response T_w	59
Figure E.5 – Current surge (8/20 μ s): rise time response T_r	60
Figure E.6 – Current surge (8/20 μ s): spectral response with $\Delta f = 10$ kHz	60
Figure E.7 – Voltage surge (10/700 μ s): width time response T_w	61
Figure E.8 – Voltage surge (10/700 μ s): rise time response T_r	62
Figure E.9 – Voltage surge (10/700 μ s): spectral response with $\Delta f = 0,2$ kHz	62
Figure E.10 – Current surge (5/320 μ s): width time response T_w	63
Figure E.11 – Current surge (5/320 μ s): rise time response T_r	64
Figure E.12 – Current surge (5/320 μ s): spectral response with $\Delta f = 0,4$ kHz	64
Figure G.1 – Simplified circuit diagram of the current step generator	75
Figure I.1 – Example of adding a damping circuit to the CDN for DC/DC converter EUTs	79
Table 1 – Test levels	17
Table 2 – Definitions of the waveform parameters 1,2/50 μ s and 8/20 μ s	19
Table 3 – Relationship between peak open-circuit voltage and peak short-circuit current	19
Table 4 – Voltage waveform specification at the EUT port of the CDN	23
Table 5 – Current waveform specification at the EUT port of the CDN	23
Table 6 – Relationship between peak open-circuit voltage and peak short-circuit current at the EUT port of the CDN	24
Table 7 – Summary of calibration process for CDNs for unsymmetrical interconnection lines	31
Table 8 – Surge waveform specifications at the EUT port of the CDN for unsymmetrical interconnection lines	31
Table 9 – Summary of calibration process for CDNs for symmetrical interconnection lines	32
Table 10 – Surge waveform specifications at the EUT port of the CDN for symmetrical interconnection lines	33
Table A.1 – Definitions of the waveform parameters 10/700 μ s and 5/320 μ s	42
Table A.2 – Relationship between peak open-circuit voltage and peak short-circuit current	43
Table A.3 – Summary of calibration process for CDNs for unshielded outdoor symmetrical communication lines	45
Table A.4 – Surge waveform specifications at the EUT port of the CDN for unshielded outdoor symmetrical communication lines	45
Table B.1 – Power ports: selection of the test levels (depending on the installation class)	48
Table B.2 – Circuits/lines: selection of the test levels (depending on the installation class)	49
Table F.1 – Example of uncertainty budget for surge open-circuit voltage front time (T_{fV})	67
Table F.2 – Example of uncertainty budget for surge open-circuit voltage peak value (V_p)	68
Table F.3 – Example of uncertainty budget for surge open-circuit voltage duration (T_d)	69
Table F.4 – α factor, Equation (F.5), of different unidirectional impulse responses corresponding to the same bandwidth of the system B	71

Table F.5 – β factor, Equation (F.9), of the standard surge waveforms.....	72
Table H.1 – Recommended inductance values for decoupling lines (> 200 A)	76

COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

ELECTROMAGNETIC COMPATIBILITY (EMC) –

**Part 4-5: Testing and measurement techniques –
Surge immunity test**

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.
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DISCLAIMER

This Consolidated version is not an official IEC Standard and has been prepared for user convenience. Only the current versions of the standard and its amendment(s) are to be considered the official documents.

This Consolidated version of IEC 61000-4-5 bears the edition number 3.1. It consists of the third edition (2014-05) [documents 77B/711/FDIS and 77B/715/RVD] and its amendment 1 (2017-08) [documents 77B/762/CDV and 77B/773/RVC]. The technical content is identical to the base edition and its amendment.

This Final version does not show where the technical content is modified by amendment 1. A separate Redline version with all changes highlighted is available in this publication.

International Standard IEC 61000-4-5 has been prepared by subcommittee 77B: High frequency phenomena, of IEC technical Committee 77: Electromagnetic compatibility.

It forms Part 4-5 of IEC 61000. It has the status of a basic EMC publication in accordance with IEC Guide 107.

This third edition constitutes a technical revision.

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

- a) new Annex E on mathematical modelling of surge waveforms;
- b) new Annex F on measurement uncertainty;
- c) new Annex G on method of calibration of impulse measuring systems;
- d) new Annex H on coupling/decoupling surges to lines rated above 200 A;
- e) moreover while surge test for ports connected to outside telecommunication lines was addressed in 6.2 of the second edition (IEC 61000-4-5:2005), in this third edition (IEC 61000-4-5:2014) the normative Annex A is fully dedicated to this topic. In particular it gives the specifications of the 10/700 μ s combined wave generator.

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

A list of all parts in the IEC 61000 series, published under the general title *Electromagnetic compatibility (EMC)*, can be found on the IEC website.

The committee has decided that the contents of the base publication and its amendment will remain unchanged until the stability 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.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

INTRODUCTION

IEC 61000 is published in separate parts according to the following structure:

Part 1: General

General considerations (introduction, fundamental principles)
Definitions, terminology

Part 2: Environment

Description of the environment
Classification of the environment
Compatibility levels

Part 3: Limits

Emission limits
Immunity limits (insofar as they do not fall under the responsibility of the product committees)

Part 4: Testing and measurement techniques

Measurement techniques
Testing techniques

Part 5: Installation and mitigation guidelines

Installation guidelines
Mitigation methods and devices

Part 6: Generic standards

Part 9: Miscellaneous

Each part is further subdivided into several parts, published either as international standards or as technical specifications or technical reports, some of which have already been published as sections. Others will be published with the part number followed by a dash and a second number identifying the subdivision (example: IEC 61000-6-1).

This part is an International Standard which gives immunity requirements and test procedures related to surge voltages and surge currents.

INTRODUCTION to the amendment

Rationale:

The method for testing DC products in the current revision of IEC61000-4-5 is causing many field related problems for test labs and manufacturers. Many products will not power up through the power CDN in the standard and in some cases may be damaged by the inductance that is necessary to apply the surge (see 77B/734/DC for further information).

The DC./DC converter problem is related to the switching of the converter which produces a voltage drop at the decoupling inductors on one hand and oscillations produced by the EUT impedance in combination with the source on the other hand. Measurements were performed using different brands of CDNs with a device known to show that problem as an EUT. The result shows different oscillations and signal forms of the voltage at the EUT for different CDNs. According to the outcome, the use of a CDN with a higher current rating (i.e. smaller decoupling inductivity) can solve the problem. At the meeting of SC77B/MT12 in Akishima, Japan on August 26, 2016, it was decided to add a statement into 7.3 allowing surge tests with higher current rated CDNs and to add a new Annex I to explain the problem in detail.

ELECTROMAGNETIC COMPATIBILITY (EMC) –

Part 4-5: Testing and measurement techniques – Surge immunity test

1 Scope and object

This part of IEC 61000 relates to the immunity requirements, test methods, and range of recommended test levels for equipment with regard to unidirectional surges caused by over-voltages from switching and lightning transients. Several test levels are defined which relate to different environment and installation conditions. These requirements are developed for and are applicable to electrical and electronic equipment.

The object of this standard is to establish a common reference for evaluating the immunity of electrical and electronic equipment when subjected to surges. The test method documented in this part of IEC 61000 describes a consistent method to assess the immunity of an equipment or system against a defined phenomenon.

NOTE As described in IEC Guide 107, this is a basic EMC publication for use by product committees of the IEC. As also stated in Guide 107, the IEC product committees are responsible for determining whether this immunity test standard is applied or not, and if applied, they are responsible for determining the appropriate test levels and performance criteria. TC 77 and its sub-committees are prepared to co-operate with product committees in the evaluation of the value of particular immunity test levels for their products.

This standard defines:

- a range of test levels;
- test equipment;
- test setups;
- test procedures.

The task of the described laboratory test is to find the reaction of the equipment under test (EUT) under specified operational conditions to surge voltages caused by switching and lightning effects.

It is not intended to test the capability of the EUT's insulation to withstand high-voltage stress. Direct injections of lightning currents, i.e. direct lightning strikes, are not considered in this standard.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050 (all parts), *International Electrotechnical Vocabulary (IEV)* (available at www.electropedia.org)