IEC 61000-4-29

Edition 2.0 2026-07

INTERNATIONAL STANDARD

REDLINE VERSION

BASIC EMC PUBLICATION

Electromagnetic compatibility (EMC) -
Part 4-29: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests

ICS 33.100.20

ISBN 978-2-8327-1431-7

IEC 61000-4-29:2026-07 RLV(en)

THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2026 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

IEC Secretariat
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
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 corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, …). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch
Discover our powerful search engine and read freely all the publications previews, graphical symbols and the glossary. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 500 terminological entries in English and French, with equivalent terms in 25 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

Warning! Make sure that you obtained this publication from an authorized distributor.

CONTENTS

FOREWORD 3
INTRODUCTION 5
1 Scope ~~and object~~ 6
2 Normative references 6
3 Terms, definitions and abbreviated terms 7
3.1 Terms and definitions 7
3.2 Abbreviated terms 7
4 General 7
5 Test levels 8
6 Test generator 12
6.1 General 12
6.2 Characteristics and performances of the generator 13
6.2.1 General 13
6.2.2 Specific characteristics for the generator operating in "low impedance" conditions 13
6.2.3 Specific characteristics for the generator operating in "high impedance" conditions (short interruption) 14
6.3 Verification of the characteristics of the generator 14
6.3.1 General 14
6.3.2 Output voltage and voltage change 14
6.3.3 Switching characteristics 15
6.3.4 Peak inrush current drive capability 15
6.3.5 Output impedance 16
6.3.6 Test level duration 16
7 Test set-up 16
8 Test procedure 16
8.1 General 16
8.2 Laboratory reference conditions 17
8.2.1 General 17
8.2.2 Climatic conditions 17
8.2.3 Electromagnetic conditions 17
8.3 Execution of the test 17
8.3.1 General 17
8.3.2 Voltage dips and short interruptions 17
8.3.3 Voltage variations 18
9 Evaluation of test results 18
10 Test report 18
Annex A (informative) Example of test generators and test set-up 20
Annex B (normative) Inrush current measurement 22
B.1 Test generator peak inrush current drive capability 22
B.2 EUT peak inrush current 22
Annex C (informative) Description of the DC network 24
Bibliography 25

Figure 1 – Example of voltage dip 10

Figure 2 – Example of short voltage interruption 11
Figure 3 – Examples of voltage variations 12
Figure A.1 – Example of test generator based on two power sources with ~~internal switching~~ switches 20
Figure A.2 – Example of test generator based on a single programmable power supply 21
Figure B.1 – Circuit for measuring the peak inrush current drive capability of a test generator 23
Figure B.2 – Circuit for measuring the peak inrush current of an EUT 23

Table 1 – Preferred test levels and durations for voltage dips 9
Table 2 – Preferred test levels and durations for short voltage interruptions 9
Table 3 – Preferred test levels and durations for voltage variations 9

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

Electromagnetic compatibility (EMC) - Part 4-29: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations on DC input power port immunity tests

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.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) IEC draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). IEC takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, IEC had not received notice of (a) patent(s), which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at https://patents.iec.ch. IEC shall not be held responsible for identifying any or all such patent rights.

This redline version of the official IEC Standard allows the user to identify the changes made to the previous edition IEC 61000-4-29:2000. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

IEC 61000-4-29 has been prepared by subcommittee 77A: EMC – Low frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility. It is an International Standard.

It forms part 4-29 of IEC 61000. It has the status of a basic EMC publication in accordance with IEC Guide 107.

This second edition cancels and replaces the first edition published in 2000. This edition constitutes a technical revision.

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

a) Increase of the output voltage of the test generator to take into account new DC networks voltages;
b) provision of tolerances for the duration of the voltage changes;
c) limitation of the current when applying short interruptions in low impedance condition;
d) general technical clarifications for the specifications of the test generator and their verification;
e) clarifications regarding the loads used to verify the switching characteristics and the peak inrush current drive capability of the test generator;
f) clarifications regarding the evaluation of test results and test reports;
g) description of the DC environment.

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

Draft	Report on voting
77A/1276/CDV	77A/1282/RVC

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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 this document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

– reconfirmed,
– withdrawn, or
– revised.

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 (in so far 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 ~~test procedures related to~~ immunity requirements for testing DC equipment and systems with voltage dips, ~~short~~ interruptions and ~~voltage~~ variations on the DC input power port~~s~~.

1 Scope ~~and object~~

This part of IEC 61000 defines test methods for immunity to voltage dips, short interruptions and voltage variations at the DC input power port of electrical or electronic equipment.

This document is applicable to ~~low voltage d.c. power ports of equipment supplied by external d.c. networks~~ equipment and systems whose DC input power ports are intended to be connected to low voltage DC networks external to the equipment and systems.

The object of this document is to establish a common and reproducible basis for testing electrical and electronic equipment when subjected to voltage dips, short interruptions or voltage variations on DC input power ports.

This document defines:

– the range of test levels;

– the test generator;

– the test set-up;

– the test procedure.

The test described hereinafter applies to electrical and electronic equipment and systems. It also applies to modules or subsystems whenever the equipment under test's (EUT) rated power is greater than the test generator capacity specified in Clause 6.

The ripple at the DC input power port is not included in the scope of this document. It is covered by IEC 61000-4-17.

This document does not specify the tests to be applied to particular apparatus or systems. Its main aim is to give a general basic reference to IEC product committees. These product committees (or users and manufacturers of equipment) remain responsible for the appropriate choice of the tests and the severity level to be applied to their equipment.

2 Normative references

~~The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 61000. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 61000 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.~~

~~IEC 60050(161), *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*~~

~~IEC 61000-4-11, *Electromagnetic compatibility (EMC) – Part 4: Testing and measuring techniques – Section 11: Voltage dips, short interruptions and voltage variations immunity tests*~~

There are no normative references in this document.

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

– IEC Electropedia: available at https://www.electropedia.org/

– ISO Online browsing platform: available at https://www.iso.org/obp

3.1.1
immunity (to a disturbance)
~~the~~ ability of a device, equipment or system to perform without degradation in the presence of an electromagnetic disturbance

[SOURCE: IEC 60050-161:1990, 161-01-20]

3.1.2
voltage dip
sudden reduction of the voltage at a point in the low voltage DC distribution system, followed by voltage recovery after a short period of time, from a few milliseconds up to a few seconds

~~[IEV 161-08-10, modified]~~

3.1.3
short interruption
~~disappearance~~ change of the supply voltage at a point of the low voltage DC distributed system below 20 % of the nominal voltage for a time interval which typically does not exceed 1 min~~. In practice, a dip with amplitude at least 80 % of the rated voltage may be considered as an interruption~~

Note 1 to entry: A short interruption does not necessarily result in a complete disappearance of the supply voltage.

3.1.4
voltage variation
gradual change of the supply voltage from the rated voltage to a lower voltage or from the rated voltage to a higher voltage.~~ The duration of the change can be short or long.~~

3.1.5
malfunction
termination of the ability of an equipment to carry out intended functions, or the execution of unintended functions by the equipment

3.2 Abbreviated terms

DC Direct current

ESR Equivalent series resistance

EUT Equipment under test

LVDC Low-voltage direct current

4 General

The operation of electrical or electronic equipment~~ may~~ can be affected by voltage dips, short interruptions or voltage variations of the power supply.