

INTERNATIONAL STANDARD

CONSOLIDATED VERSION

**Electromagnetic compatibility (EMC) -
Part 4-34: Testing and measurement techniques - Voltage dips, short
interruptions and voltage variations immunity tests for equipment with ~~input~~
~~mains~~ current more than 16 A per phase**

CONTENTS

FOREWORD	3
INTRODUCTION	5
INTRODUCTION to Amendment 2	5
1 Scope	6
2 Normative references	6
3 Terms and definitions	7
4 General	8
5 Test levels	8
5.1 Voltage dips and short interruptions	9
5.2 Voltage variations (optional)	10
6 Test instrumentation	11
6.1 Test generator	11
6.1.1 Characteristics and performance of the generator	12
6.1.2 Verification of the characteristics of the voltage dips, short interruptions generators	12
6.2 Power source	13
7 Test set-up	13
8 Test procedures	13
8.1 Laboratory reference conditions	14
8.1.1 Climatic conditions	14
8.1.2 Electromagnetic conditions	14
8.2 Execution of the test	14
8.2.1 Voltage dips and short interruptions	14
8.2.2 Voltage variations (optional)	17
9 Evaluation of test results	17
10 Test report	17
Annex A (normative) Test generator peak inrush current drive capability	18
A.1 Test generator inrush current requirement	18
A.2 Measuring test generator peak inrush current drive capability	18
A.3 Test generator requirement during dip current	19
Annex B (informative) Electromagnetic environment classes	20
Annex C (informative) Vectors for three-phase testing	21
C.1 Phase-to-neutral dip vectors	21
C.2 Acceptable Method 1 – phase-to-phase dip vectors	24
C.3 Acceptable Method 2 – phase-to-phase dip vectors	27
Annex D (informative) Test instrumentation	30
Annex E (informative) Dip immunity tests for equipment with large mains current	33
E.1 General	33
E.2 Considering the EUT current rating	33
E.3 Modular testing for large equipment	33
E.4 Combined testing and simulation for large equipment	33
E.5 Considerations for voltage dip immunity analysis of very large equipment operation	34
Annex F (informative) Interpretation of the rise-time and fall-time requirements during EUT testing	35

Bibliography.....	36
Figure 1 – Voltage dip – 70 % voltage dip sine wave graph.....	11
Figure 2 – Voltage variation	11
Figure 3a – Phase-to-neutral testing on three-phase systems	16
Figure 3b – Phase-to-phase testing on three-phase systems – Acceptable Method 1 phase shift.....	16
Figure 3c – Phase-to-phase testing on three-phase systems – Acceptable Method 2 phase shift.....	16
Figure 3d – Not acceptable – phase-to-phase testing without phase shift.....	16
Figure 3 – Testing on three-phase systems.....	16
Figure A.1 – Circuit for determining inrush current drive capability	19
Figure C.1 – Phase-to-neutral dip vectors	22
Figure C.2 – Acceptable Method 1 – phase-to-phase dip vectors	25
Figure C.3 – Acceptable Method 2 – phase-to-phase dip vectors	28
Figure D.1 – Schematic of example test instrumentation for voltage dips and short interruptions using tapped transformer and switches.....	30
Figure D.2 – Applying the example test instrumentation of Figure D.1 to create the Acceptable Method 1 vectors of Figures C.1, C.2, 3b and 3c	31
Figure D.3 – Schematic of example test instrumentation for three-phase voltage dips, short interruptions and voltage variations using power amplifier	32
Table 1 – Preferred test level and durations for voltage dips	9
Table 2 – Preferred test level and durations for short interruptions	10
Table 3 – Timing of short-term supply voltage variations.....	10
Table 4 – Generator specifications.....	12
Table A.1 – Minimum peak inrush current capability.....	18
Table C.1 – Vector values for phase-to-neutral dips.....	23
Table C.2 – Acceptable Method 1 – vector values for phase-to-phase dips	26
Table C.3 – Acceptable Method 2 – vector values for phase-to-phase dips	29

INTERNATIONAL ELECTROTECHNICAL COMMISSION

Part 4-34: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests for equipment with ~~input~~ mains current more than 16 A per phase

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 consolidated version of the official IEC Standard and its amendments has been prepared for user convenience.

IEC 61000-4-34 edition 1.2 contains the first edition (2005-10) [documents 77A/498/FDIS and 77A/515/RVD], its amendment 1 (2009-05) [documents 77A/670/CDV and 77A/688/RVC] and its corrigendum 1 (2009-10), and its amendment 2 (2025-08) [documents 77A/1233/CDV and 77A/1247/RVC].

In this Redline version, a vertical line in the margin shows where the technical content is modified by amendments 1 and 2. Additions are in green text, deletions are in strikethrough red text. A separate Final version with all changes accepted is available in this publication.

International Standard IEC 61000-4-34 has been prepared by subcommittee 77A: Low frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility.

It forms Part 4-34 of IEC 61000. It has the status of a Basic EMC Publication in accordance with IEC Guide 107.

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

FDIS	Report on voting
77A/498/FDIS	77A/515/RVD

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

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

The committee has decided that the contents of this document and its amendments 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: 61000-6-1).

INTRODUCTION to Amendment 2

This amendment contains the following main changes in comparison with IEC 61000-4-34:2005 and IEC 61000-4-34:2005/AMD1:2009:

- Addition of a note in Annex C: The sign of phase angles of three-phase systems can differ depending on the convention used. It should be noted that phase angles opposite to those used in the figures and tables in this annex (i.e. -120° for L2 instead of $+120^\circ$) are also common. It is not intended to specify the direction of rotation of the three-phase system used for testing.
- Add $UL1-N = \sqrt{(1+3P^2)}/2$ in Annex C.3,
- Add a new annex "Interpretation of the rise-time and fall-time requirements during EUT testing" (Annex F), as in IEC 61000-4-11:2020, Clause D.4:

1 Scope

This part of IEC 61000 defines the immunity test methods and range of preferred test levels for electrical and electronic equipment connected to low-voltage power supply networks for voltage dips, short interruptions, and voltage variations.

This standard applies to electrical and electronic equipment having a rated ~~input~~ mains current exceeding 16 A per phase. (See Annex E for guidance on electrical and electronic equipment rated at more than 200 A per phase.) It covers equipment installed in residential areas as well as industrial machinery, specifically voltage dips and short interruptions for equipment connected to either 50 Hz or 60 Hz a.c. networks, including 1-phase and 3-phase mains.

NOTE 1 Equipment with a rated ~~input~~ mains current of 16 A or less per phase is covered by publication IEC 61000-4-11.

NOTE 2 There is no upper limit on rated ~~input~~ mains current in this publication. However, in some countries, the rated ~~input~~ mains current may be limited to some upper value, for example 75 A or 250 A, because of mandatory safety standards.

It does not apply to electrical and electronic equipment for connection to 400 Hz a.c. networks. Tests for equipment connected to these networks will be covered by future IEC standards.

The object of this standard is to establish a common reference for evaluating the immunity of electrical and electronic equipment when subjected to voltage dips, short interruptions and voltage variations.

NOTE 1 Voltage fluctuations are covered by publication IEC 61000-4-14.

NOTE 2 For equipment under test with rated currents above 250 A, suitable test equipment may be difficult to obtain. In these cases, the applicability of this standard should be carefully evaluated by committees responsible for generic, product and product-family standards. Alternatively, this standard might be used as a framework for an agreement on performance criteria between the manufacturer and the purchaser.

The test method documented in this part of IEC 61000 describes a consistent method to assess the immunity of equipment or a system against a defined phenomenon. 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 should be applied or not, and if applied, they are responsible for defining the appropriate test levels. Technical committee 77 and its sub-committees are prepared to co-operate with product committees in the evaluation of the value of particular immunity tests for their products.

2 Normative references

The following referenced documents are indispensable for the application 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, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electro-magnetic compatibility*

IEC 61000-2-8, *Electromagnetic compatibility (EMC) – Part 2-8: Environment – Voltage dips and short interruptions on public electric power supply systems with statistical measurement results*

IEC 61000-4-30, *Electromagnetic compatibility (EMC) – Part 4-30: Testing and measurement techniques – Power quality measurement methods*

CONTENTS

FOREWORD	3
INTRODUCTION	5
INTRODUCTION to Amendment 2	5
1 Scope	6
2 Normative references	6
3 Terms and definitions	7
4 General	8
5 Test levels	8
5.1 Voltage dips and short interruptions	8
5.2 Voltage variations (optional)	10
6 Test instrumentation	11
6.1 Test generator	11
6.1.1 Characteristics and performance of the generator	12
6.1.2 Verification of the characteristics of the voltage dips, short interruptions generators	12
6.2 Power source	13
7 Test set-up	13
8 Test procedures	13
8.1 Laboratory reference conditions	14
8.1.1 Climatic conditions	14
8.1.2 Electromagnetic conditions	14
8.2 Execution of the test	14
8.2.1 Voltage dips and short interruptions	14
8.2.2 Voltage variations (optional)	17
9 Evaluation of test results	17
10 Test report	17
Annex A (normative) Test generator current drive capability	18
A.1 Test generator inrush current requirement	18
A.2 Measuring test generator peak inrush current drive capability	18
A.3 Test generator requirement during dip current	19
Annex B (informative) Electromagnetic environment classes	20
Annex C (informative) Vectors for three-phase testing	21
C.1 Phase-to-neutral dip vectors	21
C.2 Acceptable Method 1 – phase-to-phase dip vectors	23
C.3 Acceptable Method 2 – phase-to-phase dip vectors	25
Annex D (informative) Test instrumentation	27
Annex E (informative) Dip immunity tests for equipment with large mains current	30
E.1 General	30
E.2 Considering the EUT current rating	30
E.3 Modular testing for large equipment	30
E.4 Combined testing and simulation for large equipment	30
E.5 Considerations for voltage dip immunity analysis of very large equipment operation	31
Annex F (informative) Interpretation of the rise-time and fall-time requirements during EUT testing	32

Bibliography.....	33
Figure 1 – Voltage dip – 70 % voltage dip sine wave graph.....	11
Figure 2 – Voltage variation	11
Figure 3a – Phase-to-neutral testing on three-phase systems	16
Figure 3b – Phase-to-phase testing on three-phase systems – Acceptable Method 1 phase shift.....	16
Figure 3c – Phase-to-phase testing on three-phase systems – Acceptable Method 2 phase shift.....	16
Figure 3d – Not acceptable – phase-to-phase testing without phase shift.....	16
Figure 3 – Testing on three-phase systems.....	16
Figure A.1 – Circuit for determining inrush current drive capability	19
Figure C.1 – Phase-to-neutral dip vectors	21
Figure C.2 – Acceptable Method 1 – phase-to-phase dip vectors	23
Figure C.3 – Acceptable Method 2 – phase-to-phase dip vectors	25
Figure D.1 – Schematic of example test instrumentation for voltage dips and short interruptions using tapped transformer and switches.....	27
Figure D.2 – Applying the example test instrumentation of Figure D.1 to create the Acceptable Method 1 vectors of Figures C.1, C.2, 3b and 3c	28
Figure D.3 – Schematic of example test instrumentation for three-phase voltage dips, short interruptions and voltage variations using power amplifier	29
Table 1 – Preferred test level and durations for voltage dips	9
Table 2 – Preferred test level and durations for short interruptions	10
Table 3 – Timing of short-term supply voltage variations.....	10
Table 4 – Generator specifications.....	12
Table A.1 – Minimum peak inrush current capability.....	18
Table C.1 – Vector values for phase-to-neutral dips.....	22
Table C.2 – Acceptable Method 1 – vector values for phase-to-phase dips	24
Table C.3 – Acceptable Method 2 – vector values for phase-to-phase dips	26

INTERNATIONAL ELECTROTECHNICAL COMMISSION

Part 4-34: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests for equipment with mains current more than 16 A per phase

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 consolidated version of the official IEC Standard and its amendments has been prepared for user convenience.

IEC 61000-4-34 edition 1.2 contains the first edition (2005-10) [documents 77A/498/FDIS and 77A/515/RVD], its amendment 1 (2009-05) [documents 77A/670/CDV and 77A/688/RVC] and its corrigendum 1 (2009-10), and its amendment 2 (2025-08) [documents 77A/1233/CDV and 77A/1247/RVC].

This Final version does not show where the technical content is modified by amendments 1 and 2. A separate Redline version with all changes highlighted is available in this publication.

International Standard IEC 61000-4-34 has been prepared by subcommittee 77A: Low frequency phenomena, of IEC technical committee 77: Electromagnetic compatibility.

It forms Part 4-34 of IEC 61000. It has the status of a Basic EMC Publication in accordance with IEC Guide 107.

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

FDIS	Report on voting
77A/498/FDIS	77A/515/RVD

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

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

The committee has decided that the contents of this document and its amendments 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: 61000-6-1).

INTRODUCTION to Amendment 2

This amendment contains the following main changes in comparison with IEC 61000-4-34:2005 and IEC 61000-4-34:2005/AMD1:2009:

- Addition of a note in Annex C: The sign of phase angles of three-phase systems can differ depending on the convention used. It should be noted that phase angles opposite to those used in the figures and tables in this annex (i.e. -120° for L2 instead of $+120^\circ$) are also common. It is not intended to specify the direction of rotation of the three-phase system used for testing.
- Add $UL1-N = \sqrt{(1+3P^2)}/2$ in Annex C.3,
- Add a new annex "Interpretation of the rise-time and fall-time requirements during EUT testing" (Annex F), as in IEC 61000-4-11:2020, Clause D.4:

1 Scope

This part of IEC 61000 defines the immunity test methods and range of preferred test levels for electrical and electronic equipment connected to low-voltage power supply networks for voltage dips, short interruptions, and voltage variations.

This standard applies to electrical and electronic equipment having a rated mains current exceeding 16 A per phase. (See Annex E for guidance on electrical and electronic equipment rated at more than 200 A per phase.) It covers equipment installed in residential areas as well as industrial machinery, specifically voltage dips and short interruptions for equipment connected to either 50 Hz or 60 Hz a.c. networks, including 1-phase and 3-phase mains.

NOTE 1 Equipment with a rated mains current of 16 A or less per phase is covered by publication IEC 61000-4-11.

NOTE 2 There is no upper limit on rated mains current in this publication. However, in some countries, the rated mains current may be limited to some upper value, for example 75 A or 250 A, because of mandatory safety standards.

It does not apply to electrical and electronic equipment for connection to 400 Hz a.c. networks. Tests for equipment connected to these networks will be covered by future IEC standards.

The object of this standard is to establish a common reference for evaluating the immunity of electrical and electronic equipment when subjected to voltage dips, short interruptions and voltage variations.

NOTE 1 Voltage fluctuations are covered by publication IEC 61000-4-14.

NOTE 2 For equipment under test with rated currents above 250 A, suitable test equipment may be difficult to obtain. In these cases, the applicability of this standard should be carefully evaluated by committees responsible for generic, product and product-family standards. Alternatively, this standard might be used as a framework for an agreement on performance criteria between the manufacturer and the purchaser.

The test method documented in this part of IEC 61000 describes a consistent method to assess the immunity of equipment or a system against a defined phenomenon. 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 should be applied or not, and if applied, they are responsible for defining the appropriate test levels. Technical committee 77 and its sub-committees are prepared to co-operate with product committees in the evaluation of the value of particular immunity tests for their products.

2 Normative references

The following referenced documents are indispensable for the application 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, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*

IEC 61000-2-8, *Electromagnetic compatibility (EMC) – Part 2-8: Environment – Voltage dips and short interruptions on public electric power supply systems with statistical measurement results*

IEC 61000-4-30, *Electromagnetic compatibility (EMC) – Part 4-30: Testing and measurement techniques – Power quality measurement methods*