



# TECHNICAL SPECIFICATION



---

**Utility-interconnected photovoltaic inverters – Test procedure for over voltage ride-through measurements**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 27.160

ISBN 978-2-8322-1051-2

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

## CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references .....	6
3 Terms, definitions, symbols and abbreviated terms.....	7
3.1 Terms, definitions and symbols.....	7
3.2 Abbreviated terms.....	10
4 Test circuit and equipment.....	10
4.1 General.....	10
4.2 Test circuit.....	10
4.3 Test equipment.....	11
4.3.1 Measuring instruments.....	11
4.3.2 DC source .....	11
4.3.3 Multi-tap transformer .....	12
4.3.4 Grid fault simulator .....	12
5 Test.....	14
5.1 Test protocol.....	14
5.2 Test curve.....	16
5.3 Test procedure.....	16
5.3.1 Pre-test .....	16
5.3.2 No-load test.....	16
5.3.3 Tolerance .....	16
5.3.4 Load test .....	17
6 Assessment criteria .....	17
Annex A (informative) Determination of critical performance values in OVRT testing.....	18
A.1 General.....	18
A.2 Ride-through time .....	18
A.3 Voltage swell ratio .....	18
A.4 Reactive current.....	19
A.5 Active power .....	19
Annex B (informative) OVRT curve and criteria .....	20
B.1 General.....	20
B.2 OVRT curve .....	20
B.3 Test points .....	20
B.4 Criteria.....	21
Bibliography.....	22
Figure 1 – Testing circuit diagram .....	11
Figure 2 – RLC-series emulator for three-phase EUT.....	12
Figure 3 – RLC-series emulator for single-phase EUT.....	12
Figure 4 – Converter based emulator for three-phase EUT .....	14
Figure 5 – Converter based emulator for single-phase EUT .....	14
Figure 6 – OVRT curve example .....	16

Figure 7 – Tolerance of voltage swell.....	17
Figure A.1 – Critical performance values in OVRT testing.....	18
Figure B.1 – Typical curve of OVRT.....	20
Table 1 – Accuracy of measurements.....	11
Table 2 – Test specification for OVRT (indicative).....	15

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

# UTILITY-INTERCONNECTED PHOTOVOLTAIC INVERTERS – TEST PROCEDURE FOR OVER VOLTAGE RIDE-THROUGH MEASUREMENTS

### 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) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

IEC TS 63217 has been prepared by IEC technical committee 82: Solar photovoltaic energy systems. It is a Technical Specification.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
82/1926/DTS	82/1960/RVDTS

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 Technical Specification 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](http://www.iec.ch/members_experts/refdocs). The main document types developed by IEC are described in greater detail at [www.iec.ch/standardsdev/publications](http://www.iec.ch/standardsdev/publications).

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](http://webstore.iec.ch) in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

**IMPORTANT – The "colour inside" logo on the cover page of this document 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.**

# UTILITY-INTERCONNECTED PHOTOVOLTAIC INVERTERS – TEST PROCEDURE FOR OVER VOLTAGE RIDE-THROUGH MEASUREMENTS

## 1 Scope

This document provides a test procedure for evaluating the performance of Over Voltage Ride-Through (OVRT) functions in inverters used in utility-interconnected photovoltaic (PV) systems.

This document is most applicable to large systems where PV inverters are connected to utility high voltage (HV) distribution systems. However, the applicable procedures may also be used for low voltage (LV) installations in locations where evolving OVRT requirements include such installations, e.g. single-phase or 3-phase systems.

Fundamentally, the assessed OVRT performance is valid only for the specific configuration and operational mode of the inverter under test. Separate assessment is required for the inverter in other factory or user-settable configurations, as these may cause the inverter OVRT response to behave differently.

The measurement procedures are designed to be as non-site-specific as possible, so that OVRT characteristics measured at one test site, for example, can also be considered valid at other sites.

This document is for testing of PV inverters, though it contains information that may also be useful for testing of a complete PV power plant consisting of multiple inverters connected at a single point to the utility grid. It further provides a basis for utility-interconnected PV inverters numerical simulation and model validation.

## 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 61400-21-1:2019, *Wind energy generation systems – Part 21-1: Measurement and assessment of electrical characteristics – Wind turbines*

IEC TS 61836:2016, *Solar photovoltaic energy systems – Terms, definitions and symbols*

IEC TS 63106-1:2020, *Simulators used for testing of photovoltaic power conversion equipment – Recommendations – Part 1: AC power simulators*

IEC TS 63106-2:2022, *Simulators used for testing of photovoltaic power conversion equipment – Recommendations – Part 2: DC power simulators*