

SRI LANKA STANDARD 1543 PART 2 : 2016
IEC 62109 - 2 : 2011
UDC 621.311

**SPECIFICATION FOR
SAFETY OF POWER CONVERTERS FOR USE
IN PHOTOVOLTAIC POWER SYSTEMS
PART 2 : PARTICULAR REQUIREMENTS FOR
INVERTERS**

SRI LANKA STANDARDS INSTITUTION

**Sri Lanka Standard Specification for
SAFETY OF POWER CONVERTERS FOR USE IN PHOTOVOLTAIC POWER SYSTEMS
PART 2: PARTICULAR REQUIREMENTS FOR INVERTERS**

**SLS 1543 Part 2 : 2016
IEC 62109 - 2 : 2011**

Gr. P

Copyright Reserved
**SRI LANKA STANDARDS INSTITUTION
17, Victoria Place
Elvitigala Mawatha
Colombo 8
Sri Lanka**

**Sri Lanka Standard Specification for
SAFETY OF POWER CONVERTERS FOR USE IN PHOTOVOLTAIC POWER
SYSTEMS
PART 2: PARTICULAR REQUIREMENTS FOR INVERTERS**

NATIONAL FOREWORD

This standard was approved by the Sectoral Committee on Electronic Engineering and was authorized for adoption and publication as a Sri Lanka Standard by the Council of Sri Lanka Standards Institution on 2016-11-24.

SLS 1543 Sri Lanka Standard Specification for Safety of power converters for use in photovoltaic power systems is published in two parts as follows:

Part 1: General requirements

Part 2: Particular requirements for inverters

This part of standard is identical with IEC 62109, Safety of power converters for use in photovoltaic power systems, Part 2: 2011 Edition 1.0 Particular requirements for inverters, published by the International Electrotechnical Commission (IEC).

All values given in this standard is in SI units.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or an analysis shall be rounded off in accordance with SLS 102, in case if the method of rounding off is not specified in the text of this standard. The number of figures to be retained in the rounded off value, shall be the same as that of the specified value in this standard.

Terminology and conventions

The text of the International Standard has been accepted as suitable for publication, without any deviation as a Sri Lanka Standard. However, certain terminology and conventions are not identical with those used in Sri Lanka Standards; attention is therefore drawn to the following:

- a) Wherever the words “International Standard” appear referring to this standard they should be interpreted as “Sri Lanka Standard”.
- b) Wherever the page numbers are quoted they are the page numbers of IEC standard.
- c) The comma has been used as a decimal marker. In Sri Lanka Standards it is the current practices to use a full point on the base line as a decimal marker.
- d) Attention is drawn to the possibility that some of the elements of the Sri Lanka Standard may be the subject of patent rights. SLSI shall not be held responsible for identifying any or all such patent rights.

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Safety of power converters for use in photovoltaic power systems –
Part 2: Particular requirements for inverters**

**Sécurité des convertisseurs de puissance utilisés dans les systèmes
photovoltaïques –
Partie 2: Exigences particulières pour les onduleurs**



CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope and object.....	7
1.1 Scope.....	7
2 Normative references	7
3 Terms and definitions	8
4 General testing requirements.....	9
4.4 Testing in single fault condition	9
4.4.4 Single fault conditions to be applied	9
4.4.4.15 Fault-tolerance of protection for grid-interactive inverters.....	9
4.4.4.16 Stand-alone inverters – Load transfer test.....	12
4.4.4.17 Cooling system failure – Blanketing test.....	12
4.7 Electrical ratings tests	12
4.7.3 Measurement requirements for AC output ports for stand-alone inverters	13
4.7.4 Stand-alone Inverter AC output voltage and frequency	13
4.7.4.1 General.....	13
4.7.4.2 Steady state output voltage at nominal DC input	13
4.7.4.3 Steady state output voltage across the DC input range	13
4.7.4.4 Load step response of the output voltage at nominal DC input	13
4.7.4.5 Steady state output frequency.....	13
4.7.5 Stand-alone inverter output voltage waveform	14
4.7.5.1 General.....	14
4.7.5.2 Sinusoidal output voltage waveform requirements	14
4.7.5.3 Non-sinusoidal output waveform requirements	14
4.7.5.4 Information requirements for non-sinusoidal waveforms	14
4.7.5.5 Output voltage waveform requirements for inverters for dedicated loads.....	15
4.8 Additional tests for grid-interactive inverters	15
4.8.1 General requirements regarding inverter isolation and array grounding	15
4.8.2 Array insulation resistance detection for inverters for ungrounded and functionally grounded arrays.....	17
4.8.2.1 Array insulation resistance detection for inverters for ungrounded arrays	17
4.8.2.2 Array insulation resistance detection for inverters for functionally grounded arrays	17
4.8.3 Array residual current detection	18
4.8.3.1 General.....	18
4.8.3.2 30 mA touch current type test for isolated inverters.....	19
4.8.3.3 Fire hazard residual current type test for isolated inverters	19
4.8.3.4 Protection by application of RCD's	19
4.8.3.5 Protection by residual current monitoring	19
4.8.3.6 Systems located in closed electrical operating areas.....	22
5 Marking and documentation.....	22
5.1 Marking	23

5.1.4	Equipment ratings.....	23
5.2	Warning markings	23
5.2.2	Content for warning markings	23
5.2.2.6	Inverters for closed electrical operating areas	24
5.3	Documentation	24
5.3.2	Information related to installation.....	24
5.3.2.1	Ratings	24
5.3.2.2	Grid-interactive inverter setpoints	25
5.3.2.3	Transformers and isolation.....	25
5.3.2.4	Transformers required but not provided.....	25
5.3.2.5	PV modules for non-isolated inverters.....	25
5.3.2.6	Non-sinusoidal output waveform information	25
5.3.2.7	Systems located in closed electrical operating areas.....	26
5.3.2.8	Stand-alone inverter output circuit bonding	26
5.3.2.9	Protection by application of RCD's	26
5.3.2.10	Remote indication of faults.....	26
5.3.2.11	External array insulation resistance measurement and response.....	26
5.3.2.12	Array functional grounding information	26
5.3.2.13	Stand-alone inverters for dedicated loads	27
5.3.2.14	Identification of firmware version(s).....	27
6	Environmental requirements and conditions.....	27
7	Protection against electric shock and energy hazards.....	27
7.3	Protection against electric shock	27
7.3.10	Additional requirements for stand-alone inverters	27
7.3.11	Functionally grounded arrays.....	28
8	Protection against mechanical hazards.....	28
9	Protection against fire hazards	28
9.3	Short-circuit and overcurrent protection.....	28
9.3.4	Inverter backfeed current onto the array	28
10	Protection against sonic pressure hazards.....	28
11	Protection against liquid hazards	28
12	Protection against chemical hazards	28
13	Physical requirements	29
13.9	Fault indication.....	29
14	Components	29
	Bibliography.....	30
	Figure 20 – Example system discussed in Note 2 above	11
	Figure 21 – Example test circuit for residual current detection testing	21
	Table 30 – Requirements based on inverter isolation and array grounding.....	16
	Table 31 – Response time limits for sudden changes in residual current.....	20
	Table 32 – Inverter ratings – Marking requirements	23
	Table 33 – Inverter ratings – Documentation requirements	24