

SRI LANKA STANDARD 1544 PART 2: 2021
(IEC 61215-2:2021)
UDC 621.315

**SPECIFICATION FOR
TERRESTRIAL PHOTOVOLTAIC (PV)
MODULES – DESIGN QUALIFICATION
AND TYPE APPROVAL
PART 2: TEST PROCEDURES**
(First Revision)

SRI LANKA STANDARDS INSTITUTION

Sri Lanka Standard
SPECIFICATION FOR TERRESTRIAL PHOTOVOLTAIC (PV) MODULES – DESIGN
QUALIFICATION AND TYPE APPROVAL
PART 2: TEST PROCEDURES
(First Revision)

SLS 1544 Part 2: 2021
(IEC 61215-2:2021)

Gr. U

Copyright Reserved
SRI LANKA STANDARDS INSTITUTION
No. 17, Victoria Place,
Elvitigala Mawatha,
Colombo 08.
SRI LANKA

Sri Lanka Standard
Specification for TERRESTRIAL PHOTOVOLTAIC (PV) MODULES – DESIGN
QUALIFICATION AND TYPE APPROVAL
PART 2: TEST PROCEDURES
(First Revision)

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 2021-12-22.

SLS 1544 Sri Lanka Standard Specification for Terrestrial photovoltaic (PV) modules – design qualification and type approval is published in three parts as follows:

Part 1 : Test requirements

Part 1-1 : Special requirements for testing of crystalline silicon photovoltaic (PV) modules

Part 2 : Test procedures

This part of standard is identical with IEC 61215 Terrestrial photovoltaic (PV) modules – design qualification and type approval, Part 2: 2021 Edition 2.0 Test procedures, published by the International Electrotechnical Commission (IEC).

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.

CROSS REFERENCES

Any corresponding Sri Lanka Standard, for the international standards listed under reference, is not available.



INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Terrestrial photovoltaic (PV) modules – Design qualification and type approval –
Part 2: Test procedures**

**Modules photovoltaïques (PV) pour applications terrestres – Qualification de la
conception et homologation –
Partie 2: Procédures d'essai**



CONTENTS

FOREWORD	6
INTRODUCTION	8
1 Scope	9
2 Normative references	9
3 Terms and definitions	11
4 Test procedures	12
4.1 Visual inspection (MQT 01)	12
4.1.1 Purpose	12
4.1.2 Procedure	12
4.1.3 Requirements	12
4.2 Maximum power determination (MQT 02)	12
4.2.1 Purpose	12
4.2.2 Apparatus	12
4.2.3 Procedure	13
4.3 Insulation test (MQT 03)	13
4.3.1 Purpose	13
4.3.2 Apparatus	14
4.3.3 Test conditions	14
4.3.4 Procedure	14
4.3.5 Test requirements	15
4.4 Measurement of temperature coefficients (MQT 04)	15
4.5 Placeholder section, formerly NMOT	15
4.6 Performance at STC (MQT 06.1)	15
4.6.1 Purpose	15
4.6.2 Apparatus	15
4.6.3 Procedure for measuring at STC (MQT 06.1)	16
4.7 Performance at low irradiance (MQT 07)	16
4.7.1 Purpose	16
4.7.2 Apparatus	16
4.7.3 Procedure	17
4.8 Outdoor exposure test (MQT 08)	17
4.8.1 Purpose	17
4.8.2 Apparatus	17
4.8.3 Procedure	17
4.8.4 Final measurements	18
4.8.5 Requirements	18
4.9 Hot-spot endurance test (MQT 09)	18
4.9.1 Purpose	18
4.9.2 Hot-spot effect	18
4.9.3 Classification of cell interconnection	19
4.9.4 Apparatus	20
4.9.5 Procedure	21
4.9.6 Final measurements	28
4.9.7 Requirements	28
4.10 UV preconditioning test (MQT 10)	28
4.10.1 Purpose	28

4.10.2	Apparatus	28
4.10.3	Procedure.....	29
4.10.4	Final measurements	29
4.10.5	Requirements	29
4.11	Thermal cycling test (MQT 11)	29
4.11.1	Purpose	29
4.11.2	Apparatus	29
4.11.3	Procedure.....	30
4.11.4	Final measurements	31
4.11.5	Requirements	31
4.12	Humidity-freeze test (MQT 12)	32
4.12.1	Purpose	32
4.12.2	Apparatus	32
4.12.3	Procedure.....	32
4.12.4	Final measurements	32
4.12.5	Requirements	32
4.13	Damp heat test (MQT 13).....	33
4.13.1	Purpose	33
4.13.2	Apparatus	33
4.13.3	Procedure.....	33
4.13.4	Final measurements	34
4.13.5	Requirements	34
4.14	Robustness of terminations (MQT 14)	34
4.14.1	Purpose	34
4.14.2	Retention of junction box on mounting surface (MQT 14.1).....	34
4.14.3	Test of cord anchorage (MQT 14.2)	34
4.15	Wet leakage current test (MQT 15)	35
4.15.1	Purpose	35
4.15.2	Apparatus	35
4.15.3	Procedure.....	35
4.15.4	Requirements	35
4.16	Static mechanical load test (MQT 16).....	36
4.16.1	Purpose	36
4.16.2	Apparatus	36
4.16.3	Procedure.....	37
4.16.4	Final measurements	37
4.16.5	Requirements	37
4.17	Hail test (MQT 17)	37
4.17.1	Purpose	37
4.17.2	Apparatus	37
4.17.3	Procedure.....	38
4.17.4	Final measurements	39
4.17.5	Requirements	39
4.18	Bypass diode testing (MQT 18)	40
4.18.1	Bypass diode thermal test (MQT 18.1).....	40
4.18.2	Bypass diode functionality test (MQT 18.2).....	43
4.19	Stabilization (MQT 19)	44
4.19.1	General	44
4.19.2	Criterion definition for stabilization.....	44

4.19.3	Light induced stabilization procedures	45
4.19.4	Other stabilization procedures	46
4.19.5	Initial stabilization (MQT 19.1)	46
4.19.6	Final stabilization (MQT 19.2)	46
4.19.7	Stress-specific stabilization – BO LID (MQT 19.3)	47
4.20	Cyclic (dynamic) mechanical load test (MQT 20)	47
4.20.1	Purpose	47
4.20.2	Procedure	47
4.20.3	Final measurements	47
4.20.4	Requirements	48
4.21	Potential induced degradation test (MQT 21)	48
4.21.1	Purpose	48
4.21.2	Samples	48
4.21.3	Apparatus	48
4.21.4	Procedure	48
4.21.5	Final measurements	48
4.21.6	Requirements	49
4.22	Bending test (MQT 22)	49
4.22.1	Purpose	49
4.22.2	Apparatus	49
4.22.3	Procedure	49
4.22.4	Final measurements	49
4.22.5	Requirements	49
Annex A (informative)	Recommended setup for managing weights during mechanical loading (MQT 16)	50
Bibliography	54	
Figure 1 – Case S, series connection with optional bypass diode	19	
Figure 2 – Case PS, parallel-series connection with optional bypass diode	19	
Figure 3 – Case SP, series-parallel connection with optional bypass diode	20	
Figure 4 – Module <i>I</i> - <i>V</i> characteristics with different cells totally shadowed	21	
Figure 5 – Module <i>I</i> - <i>V</i> characteristics with the test cell shadowed at different levels	23	
Figure 6 – Hot-spot effect in a MLI thin-film module with serially connected cells	24	
Figure 7 – Thermal cycling test – Temperature and applied current profile	30	
Figure 8 – Proper attachment of 5 N weight to junction box for module utilizing a) electrical termination leads, b) or wire for attachment, and c) only one junction box	31	
Figure 9 – Humidity-freeze cycle – Temperature and humidity profile	33	
Figure 10 – Hail-test equipment	38	
Figure 11 – Hail test impact locations: top for wafer/cell based technologies, bottom for monolithic processed thin film technologies	40	
Figure 12 – Bypass diode thermal test	42	
Figure A.1 – 3D view (at left of figure), end view (at top right), and side view (at bottom right) of gantry crane over mounting jig and loading jig	50	
Figure A.2 – 3D close up views of mounting jig (right) and loading jig (left)	51	
Figure A.3 – 2D view of mounting jig and loading jig	52	
Figure A.4 – 3D view of loading jig	52	
Figure A.5 – Close-up view of loading jig	53	

Table 1 – Voltage stress levels	14
Table 2 – Ice-ball masses and test velocities	38
Table 3 – Impact locations	39