

SEMI PV78-0817 (Reapproved 0922) TEST METHOD FOR BENDING PROPERTY OF FLEXIBLE THIN FILM PHOTOVOLTAIC (PV) MODULES

This Standard was technically approved by the Photovoltaic Global Technical Committee. This edition was approved for publication by the global Audits and Reviews Subcommittee on May 5, 2022. Available at www.semiviews.org and www.semi.org in September 2022; originally published August 2017.

NOTICE: Paragraphs entitled 'NOTE:' are not an official part of this Standard or Safety Guideline and are not intended to modify or supersede the official Standard or Safety Guideline. These have been supplied by the global technical committee to enhance the usage of the Standard or Safety Guideline.

1 Purpose

1.1 The flexible thin film photovoltaic (PV) modules may bend in the process of installation and transportation. Therefore, a test method is needed to determine the bending property of the flexible thin film PV modules.

1.2 This Standard provides a bending performance test method for the flexible thin film PV modules and specifies the scope of application, testing procedures, assessment means, etc.

2 Scope

2.1 This Standard describes procedures for the measurement of flexible thin film PV module and severity of test requirements.

2.2 This procedure is applicable for flexible thin film PV modules.

NOTICE: SEMI Standards and Safety Guidelines do not purport to address all safety issues associated with their use. It is the responsibility of the users of the Documents to establish appropriate safety and health practices, and determine the applicability of regulatory or other limitations prior to use.

3 Referenced Standards and Documents

3.1 IEC® Standards¹

IEC 60904-1 — Photovoltaic Devices - Part 1: Measurements of Photovoltaic Current-Voltage Characteristics

IEC 60904-9 — Photovoltaic Devices - Part 9: Solar Simulator Performance Requirements

IEC 61215-1 — Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 1: Test Requirements

IEC 61215-2 — Terrestrial Photovoltaic (PV) Modules - Design Qualification and Type Approval - Part 2: Test Procedures

NOTICE: Unless otherwise indicated, all documents cited shall be the latest published versions.

4 Terminology

4.1 Definitions

4.1.1 *flexible thin-film photovoltaic module* — thin-film photovoltaic module that is designed to be intentionally and repetitively twisted, curved or otherwise bent without physical, electrical or visual damage.

4.1.2 *sun side down* — install the module on the roller, hang a load at the edge of the module where junction box located, the module with back side outward shall be rolled from one edge without junction box to the other edge, then unfold the module.

NOTE 1: Don't bend the junction box avoiding any damage to mechanical integrity of module.

¹ International Electrotechnical Commission, 3 rue de Varembe, Case Postale 131, CH-1211 Geneva 20, Switzerland; Telephone: +41.22.919.02.11, <http://www.iec.ch>. IEC trademark is owned by International Electrotechnical Commission.

4.1.3 *sun side up* — install the module on the roller, hang a load at the edge of the module where junction box is located, the module with front side outward shall be rolled from one edge without junction box to the other edge, then unfold the module.

5 Summary of Test Method

5.1 The failure of a flexible thin film PV module is determined by comparing maximum output power and EL scan of the module before and after bending test.

5.2 The function of internal diodes is determined by performing an IR scan before and after bending test.

5.3 The existence of leakage current of a flexible thin film PV module is determined by performing wet leakage current test before and after bending test.

5.4 The bending test is divided into three severities according to the test method and the diameter of the roller.

5.5 The maximum output power measurement procedures are in accordance with IEC 60904-1.

6 Apparatus

6.1 A radiant source (natural sunlight or a solar simulator class BBA or better in accordance with IEC 60904-9).

6.2 Electroluminescence (EL) equipment with constant current power supply capable of providing 1 time the STC peak power current of the module in the forward direction.

6.3 Infrared (IR) camera with constant current power supply capable of providing one time the STC peak power current of the module in the reverse direction.

6.4 A roller device which can hold the module sun side up or sun side down, also can wind the module freely when the module is applied an electric current, the installation cannot cause damage to the module. The rotation speed of roller is no more than 170 mm/s.

6.5 The cross-sectional tensile extent of the module is no more than 0.07 MPa.

6.6 Means for monitoring, throughout the test, the continuity of the internal circuit of each module.

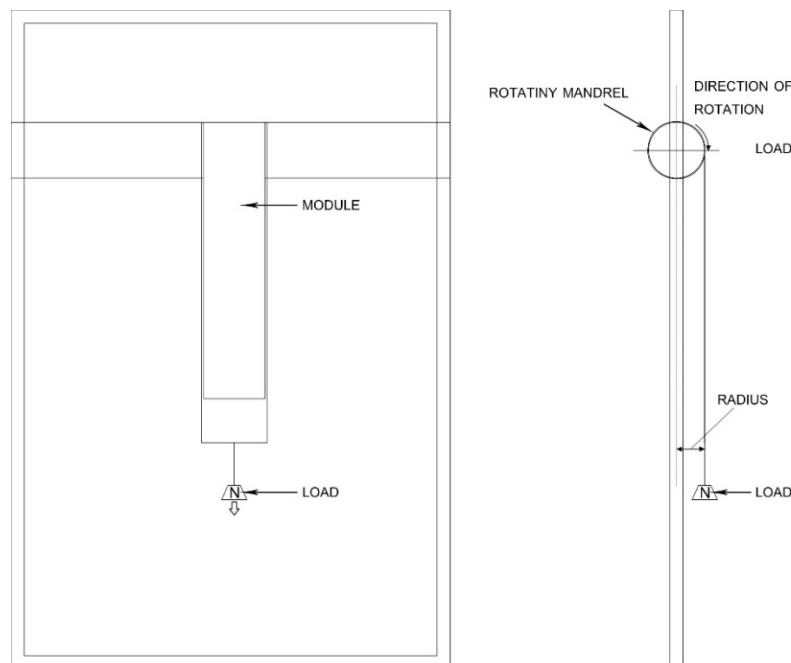


Figure 1
Typical Arrangement for Bending Property of Flexible Thin Film PV Modules