

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Measurement procedures for materials used in photovoltaic modules –
Part 7-3: Accelerated stress tests – Methods of abrasion of PV module external
surfaces**

**Procédures de mesure des matériaux utilisés dans les modules
photovoltaïques –
Partie 7-3: Essais sous contraintes accélérés – Méthodes d'abrasion des
surfaces externes des modules photovoltaïques**



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MEASUREMENT PROCEDURES FOR MATERIALS USED IN PHOTOVOLTAIC MODULES –

Part 7-3: Accelerated stress tests – Methods of abrasion of PV module external surfaces

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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 International Standard 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. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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- reconfirmed,
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- amended.

INTRODUCTION

There is a need for abrasion test methods in the PV industry, particularly for the front and back surfaces of PV modules. This document defines a set of test methods to be used for evaluating the abrasion of materials and coatings in photovoltaic modules or other solar devices. Linear and rotary machine abrasion methods are specified that can be used to address durability to abrasion with respect to the cleaning of solar devices. Linear abrasion is intended to emulate traditional manual methods of cleaning, where the cleaning equipment typically acts perpendicular to the surface, giving a scratching motion. Rotary abrasion is intended to emulate popular robotic methods of cleaning, where the cleaning element often may act along the surface in a swiping motion. Relative to DIN 53778-2 and ASTM D2486, application specific modifications for the machine abrasion tests include the longer bristle length, use of abrasive (test dust) of the size encountered in PV, the use of dry or wet abrasive as may be encountered during cleaning modules, and the number of test cycles relative to the maintenance of PV systems. A falling sand method is specified that can be used to address durability to abrasion with respect to damage from ordinary use in the application environment, i.e., typically meteorological events. Relative to DIN 52348, modifications include the quantity of test sand, which is intended for examination of PV surfaces and coatings. A forced sand impingement method is specified that can be used to address durability to abrasion from severe weather events and/or the most challenging locations of use. Relative to IEC 60068-2-68, modifications include the composition of test sand that may be compared to the PV application and the falling sand test in this document as well as the specified carrier velocities based on the PV application. The methods in this document can be used to aid performance analysis and/or for the purpose of material design/selection. Comparing the linear brush, rotary brush, falling sand, and forced impingement methods, different rates of abrasion and/or damage morphology can occur between the different test methods – they are not expected to produce the same result.

Formal working reference materials are identified in this document. The purpose of the working reference is to verify the apparatus is installed and working correctly. The characteristic(s) of interest can be verified on a regular basis (monthly, weekly, etc.). The characteristic(s) of interest and their values (with acceptance limits for precision) will be given in a referencing document or future version of this document, based on the results of an interlaboratory precision study.