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BSI Standards Publication

Recommendations for renewable energy and hybrid systems for rural electrification

Part 10: Silicon solar module visual inspection guide

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National foreword

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FOREWORD

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Draft PAS	**Report on voting**
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Following publication of this PAS, the technical committee or subcommittee concerned may transform it into an International Standard.

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IMPORTANT – The 'colour inside' logo on the cover page of this publication 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.

INTRODUCTION

This document is organized into a terminology section and a checklist, followed by a table cataloguing and describing the defects to be visually inspected. The schematics in the terminology section describe where each component is found on a common solar PV module. A severity rating is also defined to give users guidelines on how concerning a particular defect may be. In the checklist and the catalogue of defects, defects have been organized by the component of the module on which they appear, followed by severity rating. The order in which components are inspected goes from the back to the front of the module, following a procedure developed elsewhere [3][1]. The catalogue of defects is subdivided into two sections: the first referring to defects that might be found on new modules, and the second describing defects that might appear over time. This document is principally focused on defects that are observable at the beginning of product life. Selected significant defects that may appear over time are also included for completeness and to address the second-hand market.

This document was developed as a response to observations of sub-standard quality and counterfeit solar products present in developing world markets. Many consumers and retailers are not aware of the presence of significant visually observable defects that may limit performance and/or lead to premature product failure. Nor are they aware that good quality PV modules should last 25 years or more. Note that no amount of visual inspection or electrical product testing can guarantee that a module will perform reliably for 25 years.

Although visual inspection cannot catch all possible defects, it can be used as a screening method to identify poor performing products and potential early failure modes. This document was designed with the intention of being a quick tool that is inexpensive to implement, as it does not require any test equipment. Although helpful, no prior knowledge of solar photovoltaics is required to benefit from this guide, and an inspector should be able to be trained in its use in two days or less.

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1 Numbers in square brackets refer to the Bibliography.

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1 Scope

This document is designed to be used as a guide to visually inspect front-contact poly-crystalline and mono-crystalline silicon solar photovoltaic (PV) modules for major defects (less common types of PV modules such as back-contact silicon cells or thin film technologies are not covered herein). The modules under consideration may be of any size or rated power, however some specific use-cases for solar modules may have different requirements and therefore adaption of this document is application and institution dependent (ex. labelling may not be present for a solar module sold as part of a small off-grid lighting kit). This document is meant to supplement and support rather than replace international testing standards (for example IEC 61215 or UL 1703 [1], [2]). A lack of visually observable defects is necessary but not sufficient to determine if a module would pass IEC 61215 testing.

Several applications could be envisioned for this document, including use by:

- border agents to inspect product shipments at ports of entry to a country. Standardized rejection criteria could be used as grounds for barring defective products for import in conjunction with an adopted IEC standard such as IEC 61215;
- standards agencies or regulatory authorities in search and seizure efforts. A tool that can be used onsite to determine if defective or fraudulent products are found for sale in markets;
- retailers/distributors to ensure they are receiving acceptable quality products from manufacturers;
- installers/technicians when selecting product from retailers or distributors for customers;
- educators as a teaching tool for students of solar energy, for example when training technicians;
- inspectors of already installed solar products to catalogue defects and attempt to trouble-shoot failures.

However, as this guide deals primarily with new modules, alternative tools are recommended for this task (see for example [3]).

2 Normative references

There are no normative references in this document.