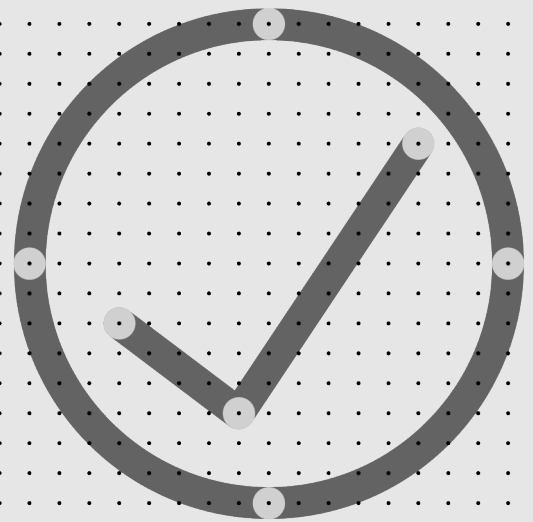


The Bespoke Building Integrated Photovoltaics Standard

(Product)



This Standard was prepared by the MCS Solar Photovoltaics Working Group.

It is published by The MCS Service Company Ltd on behalf of the MCS Charitable Foundation.

Whilst all reasonable care has been taken in the preparation of this document it is provided on an “as is” basis without any guarantee of completeness or accuracy. The MCS Service Company Ltd and The MCS Charitable Foundation (and any related parties) do not accept liability for any errors or omissions in the document nor for the use or application of the information, standards or requirements contained in the document by any third party.

The MCS Service Company Ltd welcomes comments of a technical or editorial nature and these should be sent to *meetings@mcscertified.com*

COPYRIGHT © The MCS Charitable Foundation 2024

This Standard is freely available for personal use. Commercial use by those not holding a valid licence to use the MCS mark is prohibited. In the context of this document commercial use is defined as:

- A manufacturer claiming that any of its products are certified in accordance with this document
- An installation or maintenance contractor claiming that its design, installation or maintenance services are either certified in accordance with, or compliant with, this document
- An organisation offering certification or verification services in accordance with this document

Any unauthorised reproduction, use or transmission of all or part of this document without permission is strictly prohibited.

The MCS Service Company Ltd
First Floor Violet 3,
Sci-Tech Daresbury,
Keckwick Lane,
Cheshire WA4 4AB

www.mcscertified.com
hello@mcscertified.com
0333 103 8130

Issue: 2.0	COPYRIGHT © The MCS Charitable Foundation 2024	MCS 017
Date: 01/08/2024		Page 2 of 20

TABLE OF CONTENTS

- About MCS 4
- Changes to standards..... 5
- Foreword..... 7
- 1 Introduction & Scope 8
- 2 Definitions 9
- 3 Applications to join the Scheme..... 10
- 4 Certification and approval..... 10
 - 4.1 BBIPV product family 10
 - 4.2 BBIPV test sample..... 13
 - 4.3 BBIPV test requirements..... 14
 - 4.4 Deflection test..... 14
 - 4.5 Generic standards..... 14
 - 4.6 Design and product control requirements 16
 - 4.7 Quality and production control 16
 - 4.8 Product marking and data..... 17
- 5 Technical documentation 18
- 6 Maintenance of certification and listing..... 19
 - 6.1 Factory audits 19
 - 6.2 Product audits..... 19
- 7 Certification mark and labelling..... 20

ABOUT MCS

Giving you confidence in home-grown energy

With energy costs constantly rising and climate change affecting us all, low-carbon technology has a bigger and bigger role to play in the future of UK energy.

We're here to ensure it's a positive one.

Working with industry we define, maintain and improve quality – certifying products and installers so people can have confidence in the low-carbon technology they invest in. From solar and wind, to heat pumps, biomass and battery storage, we want to inspire a new generation of home-grown energy, fit for the needs of every UK home and community.

About

The Microgeneration Certification Scheme Service Company Ltd (MCSSCo Ltd) trades as MCS and is wholly owned by the non-profit MCS Charitable Foundation. Since 2007, MCS has become the recognised Standard for UK products and their installation in the small-scale renewables sector.

We create and maintain standards that allow for the certification of products, installers and their installations. Associated with these standards is the certification scheme, run on behalf of MCS by Certification Bodies who hold UKAS accreditation to ISO 17065.

MCS certifies low-carbon products and installations used to produce electricity and heat from renewable sources. It is a mark of quality. Membership of MCS demonstrates adherence to these recognised industry standards; highlighting quality, competency and compliance.

Vision

To see MCS certified products and installations in every UK home and community.

Mission

To give people confidence in low-carbon energy technology by defining, maintaining and improving quality.

Values

1. We are expert – ensuring quality through robust technical knowledge
2. We are inspiring – helping to reshape energy in UK homes and communities
3. We are collaborative – working with industry and government to create positive change
4. We are principled – operating in a way that's clear, open and fair
5. We are determined – supporting the UK's drive towards a clean energy future

Issue: 2.0	COPYRIGHT © The MCS Charitable Foundation 2024	MCS 017
Date: 01/08/2024		Page 4 of 20

CHANGES TO STANDARDS

When MCS Standards are revised, the issue number is also revised to indicate the nature of the changes. This can either be a whole new issue or an amendment to the current issue. Details will be posted on the website at www.mcscertified.com

Technical or other significant changes which affect the requirements for the approval or certification of the product or service will result in a new issue. Minor or administrative changes (e.g., corrections of spelling and typographical errors, changes to address and copyright details, the addition of notes for clarification etc.) may be made as amendments.

The issue number is given on the left of the decimal point, and the amendment number on the right. For example, issue 3.2 indicates that it is the third significant version of the document which has had two sets of minor amendments.

Note that only the latest issue of the Standard will show amendment numbers in the table below. All legacy amendment numbers from previous issues are removed for simplicity.

Users of this Standard should ensure that they are using the latest issue.

Amendments issued since publication

Issue No.	Amendment Details	Date
1.0	First Issue.	01/08/2011
1.1	Updates to sections: <ul style="list-style-type: none">• Revision to scope• 4.1 to include parameters which can be varied without impacting certification• Previous 4.1.3 removed	11/03/2015
1.2	Correction of error in foreword.	16/06/2017
1.3	MCS Mark Updated. Rebranding of document, update of email and website addresses and cosmetic changes.	01/12/2019

2.0	Update in response to MCS Standards Project review: <ul style="list-style-type: none"> • Simplification of document's structure and language where possible. • Inclusion of new MCS standard text. • Updating references to other standards. • Incorporating recent feedback from WG members where practicable. • Ensuring consistency with MCS 005 where applicable. • Introduction of new testing conditions to account for bifacial modules. • Modules with Module Level Power Electronics can still be approved in MCS 017. 	01/08/2024
-----	--	------------

FOREWORD

This document contains references to other documents which may be either normative or informative. At the time of publication any editions of those documents, where indicated, were valid. However, as all documents are subject to revision, any users of this document should apply the most recent editions of those referenced documents (unless a dated version is specified).

This issue 2.0 is a major update to issue 1.3. It is available for reference from the date of publication 01/08/2024. Manufacturers or importers of microgeneration systems who have certificated products in accordance with MCS 017 may start working in accordance with this update from the date of publication. Compliance with this update is mandatory for products to be certified in accordance with MCS 017 from the date of implementation 01/08/2026.

Issue: 2.0	COPYRIGHT © The MCS Charitable Foundation 2024	MCS 017
Date: 01/08/2024		Page 7 of 20

1 INTRODUCTION & SCOPE

This Scheme document identifies the evaluation and assessment practices for the purposes of certification and listing of bespoke building integrated photovoltaic (BBIPV) products. Certification and listing of products are based on evidence acceptable to the Certification Body:

- that the product passes the appropriate test requirements of this Standard;
- that the manufacturer has staff, processes, and systems in place to ensure that the product delivered meets this Standard.

And on:

- periodic audits of the manufacturer, including testing as appropriate.
- compliance with the contract with the Certification Body for listing and approval including agreement to rectify faults as appropriate.

Whilst it is not possible to ensure safety, this Standard includes criteria which should help to mitigate potential safety risks from the installation and operation of the product.

Due to the wide variability in BBIPV products, the “standard module” approach for certification of products is not practicable.

This Standard addresses certification of such products by:

- defining how a BBIPV manufacturer can declare a BBIPV product family;
- stating the sample size, the configuration that is required for testing, and the relevant IEC tests that need to be performed on the sample;
- defining the processes and procedures that the manufacturer must have in place to control the manufacture of BBIPV products within the product family, and to ensure they are suitable for the intended application.

Note: PV modules and tiles which do not meet the BBIPV product definition require certification under MCS 005. Where there is any doubt about the applicable Standard (MCS 005 or MCS 017) then clarification shall be sought from MCS.

Certification against this Standard does not imply compliance with regulations which may apply to such products unless explicitly stated.

Issue: 2.0	COPYRIGHT © The MCS Charitable Foundation 2024	MCS 017
Date: 01/08/2024		Page 8 of 20

2 DEFINITIONS

<p>Bespoke Building Integrated Photovoltaic (BBIPV) Product</p>	<p>A solar photovoltaic (PV) product that is tailored and manufactured for a specific project. For the purposes of this document, a BBIPV product is defined as being a PV unit that is manufactured in varying sizes and configurations solely for the purpose of being built into the fabric of a structure - such as PV glazing, PV façade units or PV shading units.</p>	
<p>Irradiance Test Conditions</p>	<p>Standard Test Conditions (STC) <i>As defined in BS PD IEC/TS 61836</i></p>	<p>1000 W/m² – front side 0 W/m² – rear side</p>
	<p>Bifacial Name Plate Irradiance (BNPI) <i>As defined in BS EN 61215-1:2021</i></p>	<p>1000 W/m² – front side 135 W/m² – rear side</p>
<p>Module-Level Power Electronics (MLPE)</p>	<p>Module-level power electronics are devices that can be incorporated into a solar PV system to improve its performance in certain conditions (especially where shade is present) and to achieve several other solar design benefits. MLPE includes microinverters and DC power optimizers. They perform some of the same functions as a string inverter or central inverter but are typically coupled to just one (or a few) solar modules rather than many and offer additional features.</p>	

Where a definition does not appear in this Standard, informative reference is made to IEC TS61836 (Solar PV energy systems – terms, definitions and symbols).

3 APPLICATIONS TO JOIN THE SCHEME

Applications should be made to an accredited Certification Body operating this Scheme, who will provide the appropriate application form and details of the applicable fees.

4 CERTIFICATION AND APPROVAL

Certification and approval is based on the following:

- a) An assessment of the evidence demonstrating compliance with the requirements set out in this section below.

Evidence of compliance is generally accepted as independent third party testing by a UKAS (or equivalent) accredited test laboratory. However, other evidence of compliance may be considered at the discretion of the Certification Body (see document MCS 011 Testing Acceptance Criteria).

- b) An assessment of the evidence demonstrating compliance with the requirements set out MCS 010 – Generic Factory Production Control and Product Quality Requirements.
- c) Review of the technical documentation relating to the material or product.

4.1 BBIPV PRODUCT FAMILY

For the purposes of MCS certification, a BBIPV product family is taken to be a related series of products that only vary as permitted within this document.

For any declared (certified) BBIPV product family, this document sets out two categories of parameters:

- a) Parameters that must stay the same across the product family
- b) Parameters that can vary (under controlled circumstances) across the product family

4.1.1 Within a product family, **none** of the following are permitted to vary:

- Cell interconnect material
- Module bus bar material
- Solder technique and material
- Front face material
- Rear face material

Issue: 2.0	COPYRIGHT © The MCS Charitable Foundation 2024	MCS 017
Date: 01/08/2024		Page 10 of 20

NOTE: For the rear face material, as an example, the thickness of the material may change, but the material type must remain the same (i.e., glass must remain glass)

The manufacturer must also declare the maximum deflection permitted for the product: L/x (where L is the BBIPV length and x is the value declared by the manufacturer for the product family).

NOTE: The manufacturer must ensure that controls are in place to ensure that modules supplied within a BBIPV product family are not placed into applications where the module deflection limitations are likely to be exceeded.

4.1.2 Within a product family, the following **are allowed** to vary under controlled circumstances.

Where BBIPV product families include bifacial modules, any testing should be performed under BNPI test conditions instead of STC.

Note: For some of these variations, there is a requirement for the manufacturer to declare associated design limits that apply to the product family.

4.1.2.1 Cell string maxima

For each BBIPV product family, the manufacturer must declare the following cell string maxima:

- Open circuit voltage ($V_{oc\ stc}$)
- Short circuit current ($I_{sc\ stc}$)
- Power ($P_{mpp\ stc}$)

For any product then manufactured within a BBIPV family, the string design (cell type and quantity) may be varied providing none of the above maxima are exceeded.

4.1.2.2 Module maxima

For each BBIPV product family, the manufacturer must declare the following module maxima:

- Open circuit voltage ($V_{oc\ stc}$)
- Short circuit current ($I_{sc\ stc}$)
- Power ($P_{mpp\ stc}$)

For any product then manufactured within a BBIPV family, the module design (cell type and quantity) may be varied providing none of the above maxima are exceeded.

Issue: 2.0	COPYRIGHT © The MCS Charitable Foundation 2024	MCS 017
Date: 01/08/2024		Page 11 of 20

4.1.2.3 *Number of cells*

For any product manufactured within a BBIPV family, the number of cells may be varied providing the string/module voltage, current or power maxima are not exceeded (as above).

4.1.2.4 *PV cell manufacturer and model*

Within a BBIPV product family, cells may be selected from differing suppliers providing that the cell technology remains constant and the string/module voltage, current or power maxima are not exceeded.

For example, if IEC certification has been carried out using a cell with a Silicon Nitride (SiN_x) anti-reflection coating and an Aluminium back surface field then both Mono and polycrystalline silicon cells can be selected from varying manufacturers providing that the antireflection coating and the back surface field are of the same technology as the IEC approval samples.

4.1.2.5 *Junction Box*

Junction boxes may be varied providing that the model utilised during IEC testing is independently certified to VDE 0126-5/05.08/ IEC 61215 and that the proposed replacement holds the same certification.

Junction boxes must also be rated for the module voltage, current and power maxima listed for the BBIPV product family.

Diodes are often supplied with Junction boxes where this is the case then the diode matching the Junction box certification can also be varied (see also section on bypass diodes).

4.1.2.6 *Bypass Diode*

Bypass diodes can only be varied as part of a junction box variation. Bypass diodes encapsulated into a PV module laminate cannot be varied.

4.1.2.7 *Cable type*

DC cables connected to the modules shall comply with BS EN 50618.

The output cable length can be varied.

The output cable cross sectional area can be varied, provided it is not varied to a cross sectional area below the declared value from the IEC test.

Issue: 2.0	COPYRIGHT © The MCS Charitable Foundation 2024	MCS 017
Date: 01/08/2024		Page 12 of 20

4.1.2.8 Connectors

Connectors shall be certified to EN 62852:2015+A1:2020 “Connectors for DC-application in photovoltaic systems” but shall **not** be varied as part of a BBIPV product family. Where the connector is omitted (panel supplied with flying lead type cables) documentation shall be provided to make clear that only the connector type that the product was certified with shall be used during installation.

4.1.2.9 Glass thickness

For a BBIPV product family that uses glass in the front or rear face, the manufacturer must declare the minimum glass thickness permitted within the BBIPV product family. For any product then manufactured within a BBIPV family, the glass thickness must not be less than this declared value.

The level of heat strengthening and/or toughening may also be varied, subject to meeting the glazing and building standards detailed later in this document.

*NOTE: where the front or rear face is any material other than glass (e.g., PVF Film), the specification of this material **cannot be varied in any way**, including its thickness.*

4.1.2.10 Edge clearances

The manufacturer must declare the minimum edge clearance (distance from cell edge to product edge) that is permitted.

For any product then manufactured within a BBIPV family, the edge clearance may be varied providing it is greater than the declared minimum.

4.1.2.11 Cell spacing

The manufacturer must declare the minimum inter cell spacing that is permitted.

For any product then manufactured within a BBIPV family, the inter cell spacing may be varied providing it is greater than the declared minimum.

4.1.2.12 Front Face Outer Coating

The coating on the outer surface of the module can be varied. Where the outer coating is varied, the technical file must be updated to include reference to the variation in the coating (e.g., self-cleaning).

4.2 BBIPV TEST SAMPLE

The test samples for a BBIPV product family shall have the following characteristics, as described in section 5.1 of this document:

Issue: 2.0	COPYRIGHT © The MCS Charitable Foundation 2024	MCS 017
Date: 01/08/2024		Page 13 of 20

- The sample shall contain the maximum number of series connected cells as permitted under the BBIPV family (limited by string / module voltage, current or power maxima)
- The sample shall have the cells located such that they are spaced from the edge of the sample at a distance equal to the minimum edge clearance as declared by the manufacturer
- The sample shall have all cells spaced at the minimum cell spacing as declared by the manufacturer
- Where the front face is glass, the sample shall utilise the thinnest glass as declared by the manufacturer
- Where the rear face is glass, the sample shall utilise the thinnest glass as declared by the manufacturer

4.3 BBIPV TEST REQUIREMENTS

With the exception of product marking requirements, the BBIPV test sample shall be tested to and comply with:

- BS EN IEC 61215-1:2021 Terrestrial photovoltaic (PV) modules – Design qualification and type approval
- BS EN IEC 61730-1:2018 Photovoltaic (PV) module safety qualification

Note: Where a BBIPV product utilises MLPE, as long as the DC side of the PV module passes the relevant part(s) of BS EN IEC 61215, it is still able to be approved under MCS 017.

4.4 DEFLECTION TEST

The load test undertaken as part of BS EN IEC 61215 must include a measurement of the deflection of the BBIPV sample. This load test must result in a deflection equal or greater than the value declared by the manufacturer for the product family. In some cases, this may require applying a load greater than is required in the standard BS EN IEC 61215 test.

NOTE: All BBIPV products subsequently produced by the manufacturer will have to be designed such that the maximum unit deflection does not exceed the value declared for the BBIPV product family. This will be addressed by the manufacturer on a case-by-case basis, once the mounting method, unit size, orientation and dynamic loads are established for the project.

4.5 GENERIC STANDARDS

4.5.1 Glazing requirements

Issue: 2.0	COPYRIGHT © The MCS Charitable Foundation 2024	MCS 017
Date: 01/08/2024		Page 14 of 20

The manufacturer of a BBIPV product shall ensure all products within a product family comply with the following glazing standards (as applicable):

- a) Glass to be in accordance with BS 952 and the relevant parts of:
 - BS EN 572 for basic soda lime silicate glass – float (annealed).
 - BS EN 1096 for coated glass
 - BS EN 1863 for heat strengthened glass.
 - BS EN 12150 for toughened glass.
 - BS EN ISO 12543 for laminated glass
 - BS EN 14179 for heat-soaked toughened glass
 - BS EN1991-1 (Eurocode) for the calculation of dead & live loads
- b) Glazing shall be in accordance with BS 62662 and manufacturer’s printed recommendations.
- c) Safety glass to be tested in accordance with BS EN 12600
- d) All safety glass to be suitable for applications as defined and recommended EN ISO 12543, Parts 1, 3, 4, 5 and 6, or EN 12543 Part 2 and BS EN 1279 the Building Regulations, Local Authority requirements, other regulatory relevant Health and Safety requirements.
- e) All safety glass to be marked or suitably labelled in accordance with internationally recognised standards, strictly in accordance with BS 62662 and BS EN 12600.
- f) Marks, safety logos or similar to be universally and uniformly located at a consistent corner and indicated on the drawings.

4.5.2 Building standards

Manufacturers must be able to demonstrate that they have a process in place such that all products are designed and constructed to meet the requirements within the relevant national Building Regulations or standards applicable for the application that the product is intended.

All products must be designed and constructed with a consideration to the required fire classification along with imposed static and live loads. This will require a consideration of the BBIPV product construction, the mounting method and arrangement and the loads imposed (wind, snow etc). Maximum deflection criteria will need to be studied as part of this analysis.

NOTE: Guidance on test methods to obtain a fire classification that may be appropriate are given in MCS 012.

Issue: 2.0	COPYRIGHT © The MCS Charitable Foundation 2024	MCS 017
Date: 01/08/2024		Page 15 of 20

4.6 DESIGN AND PRODUCT CONTROL REQUIREMENTS

4.6.1 Design control

The manufacturer shall be able to demonstrate to the MCS certification authority that they have procedures and processes in place to ensure:

- a) That all products manufactured within the BBIPV product family are designed to meet the generic standards and requirements outlined in section 7 of this document.
- b) That the products are designed such that they do not vary beyond the limited variations declared for that particular product family and remain within the permissible variations described earlier in this document
- c) That for products with multiple strings all internal components and external components (bus bars, header bars, junction box, etc) are designed to meet the voltage and current characteristics of the product.

This shall include an ability to demonstrate that factors including (but not limited to) the intended mounting system, imposed loadings and permissible deflection for the product family have been met in addressing the BBIPV construction. This is of particular relevance when considering the glass thickness / composition for a particular project.

4.7 QUALITY AND PRODUCTION CONTROL

The manufacturer shall demonstrate:

- a) That all products manufactured within the BBIPV product family are manufactured to meet the generic standards and requirements outlined in this document.
- b) That the products are manufactured such that they do not vary beyond the limited variations declared for that particular product family and remain within the permissible variations described earlier in this document.
- c) Where the product family permits variations in glass thickness, the manufacturer shall have demonstrable systems to ensure that the lamination process is correctly adjusted to suit the changes.

Note: it expected that the method used by the manufacturer to demonstrate correct lamination will be covered by the controls they adopt in order to meet the requirements of BS EN ISO 12543

Issue: 2.0	COPYRIGHT © The MCS Charitable Foundation 2024	MCS 017
Date: 01/08/2024		Page 16 of 20

4.8 PRODUCT MARKING AND DATA

Each product shall be marked with the manufacturers name and a unique serial number. The marking shall be durable and remain legible over the design life of the product.

Each product shall have the polarity of all connections clearly marked. This can be achieved by cable colour coding or a suitable and durable mark on the cable connector or junction box.

4.8.1 A datasheet shall be provided for each module including the following details as a minimum:

- Open circuit voltage (V_{OC}) under standard test conditions (stc)
- Short circuit current (I_{SC}) stc
- Voltage at Maximum Power (V_{MPP}) stc
- Current at Maximum Power (I_{MPP}) stc
- Maximum System Voltage (V) rating stc
- Voltage temperature coefficient $\%/^{\circ}C$ and $mV/^{\circ}C$
- Maximum Power (W_P) stc
- Maximum Reverse Current (I_R)
- Recommended Fuse Rating

Note: Where thin film or amorphous type technology is used then both pre annealed and post annealed data shall be provided.

4.8.2 Where bifacial modules are used, the datasheet shall provide the same as those in 5.8.1 but performed under BNPI test conditions instead of STC.

Issue: 2.0	COPYRIGHT © The MCS Charitable Foundation 2024	MCS 017
Date: 01/08/2024		Page 17 of 20

5 TECHNICAL DOCUMENTATION

Technical documentation for the product must be submitted for review by the Certification Body and provided to the customer where noted. This documentation shall be presented in English and shall be such that it can be assured that the products submitted for test are equivalent to those that are to be manufactured for normal production. The documentation must consist of the following as a minimum.

Factory data for the Certification Body:

- Details of intended use, application, and classifications (if any) required
- Manufacturing drawings and/or specifications including tolerances, issue and revision numbers
- The revision number of the product.
- Raw material and components specifications
- Details of the quality plan applied during manufacture to ensure ongoing compliance
- Where historical test data is requested to be considered for the application, full test report and details of any existing approvals (Note: each application will be dealt with on a case-by-case basis and further information about the acceptance of previous testing is available on request)
- Installation, use and maintenance instructions
- Sample product data sheet

Data for the Customer:

- Details of intended use, application and classifications (if any) required
- Fabrication drawings and/or specifications including tolerances, issue and revision numbers
- Installation, use and maintenance instructions
- Product data sheet

Issue: 2.0	COPYRIGHT © The MCS Charitable Foundation 2024	MCS 017
Date: 01/08/2024		Page 18 of 20

6 MAINTENANCE OF CERTIFICATION AND LISTING

Certificates and listing are maintained and held in force subject to satisfactory completion of the following requirements for maintenance of certification:

6.1 FACTORY AUDITS

Certification is maintained through on-going audits of the manufacturer's quality control system as appropriate, during which time a detailed check will be made that the product being manufactured is the same as the specification tested.

6.2 PRODUCT AUDITS

Product audits will be conducted as follows:

- Review of the product technical data files including materials
- Review of end of line tests in accordance with the manufacturer's quality plan
- Repeat testing of elements from the product standard as appropriate to confirm that the product continues to meet the requirements for certification and listing.

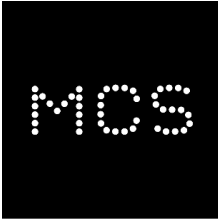
Issue: 2.0	COPYRIGHT © The MCS Charitable Foundation 2024	MCS 017
Date: 01/08/2024		Page 19 of 20

7 CERTIFICATION MARK AND LABELLING

All approved products listed under this Scheme shall be traceable to identify that they have been tested and certificated in accordance with the requirements of the test standard (e.g., via a unique serial number). See below for details.

The Supplier shall use the Certification Mark(s) only in accordance with their Certification Body’s instructions.

The Certification Mark(s) to be used for certified products under the Scheme is as follows:



CERTIFIED

Certificate Number MCS "XXX"
"Description of the Technology certificated"

Where 'XXX' is the certificate number, and the logo of the Certification Body issuing the certification would sit on the right-hand side of the logo.

Companies may only use the Mark while certification is maintained.

Issue: 2.0	COPYRIGHT © The MCS Charitable Foundation 2024	MCS 017
Date: 01/08/2024		Page 20 of 20