



The Certification Mark for Onsite
Sustainable Energy Technologies

MCS: 015

Product Certification Scheme Requirements: Electricity-led micro-cogeneration packages in dwellings

Issue 1.1

This standard has been approved by the Steering Group of the Microgeneration Certification Scheme.

This standard was prepared by the Microgeneration Certification Scheme Working Group 9 'Micro-CHP systems.

REVISION OF MICROGENERATION CERTIFICATION STANDARDS

Microgeneration Standards will be revised by issue of revised editions or amendments. Details will be posted on the website at www.microgenerationcertification.org

Technical or other 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 will be given in decimal format with the integer part giving the issue number and the fractional part giving the number of amendments (e.g. Issue 3.2 indicates that the document is at Issue 3 with 2 amendments).

Users of this Standard should ensure that they possess the latest issue and all amendments.

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1. INTRODUCTION

This scheme document identifies the evaluation, assessment requirements and practices for the purposes of certification and listing of electricity-led micro-cogeneration packages. Certification and listing of packages is based on evidence acceptable to the certification body:-

- that the package falls within the scope of this scheme document;
- that the producer has staff, processes and systems in place to ensure that the package placed on the market meets the requirements of this scheme document,

And on:-

- periodic audits of the producer including testing as appropriate;
- compliance with the contract with the certification body for listing and certification including agreement to rectify faults as appropriate

2. SCOPE

This scheme provides ongoing independent, third party assessment and approval of electricity-led micro-cogeneration packages intended for installation in dwellings, where the package:

- A) has a thermal and electrical output of less than 45 kW_t or 50 kW_e respectively,
- B) is fuelled by any of the following – second and third family gas; gas from a bespoke source; hydrogen; mineral oil; other liquid fuels, principally bio-oils; other fuels including unconventional fuels and solid fuels,
- C) is intended to maximise electricity production in response to an electrical demand.
- D) All the co-generated heat recovered will be made use of.

Note: Currently these Scheme Requirements refer to electricity led micro-CHP that use the heat by product for domestic hot water generation only. This will be extended to cover domestic heating as testing methodologies are developed.

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3. NORMATIVE REFERENCES

The following referenced documents are indispensable for the application of this scheme document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

PAS 67: 2008, or the latest available version thereof: Laboratory tests to determine the heating and electrical performance of heat-led micro-cogeneration packages primarily intended for heating dwellings.

(Note: The standard has been updated in July 2010 to accommodate electricity led packages intended for the production of DHW only. It is intended that the standard will be further updated to accommodate all electricity led mCHP packages in due course.)

G83/1: September 2003, or the latest available version thereof: Recommendations for the connection of small-scale embedded generators (up to 16A per phase) in parallel with Public Low-Voltage Distribution Networks

BS EN 15036-1: 2006, or the latest available version thereof: Heating boilers – Test regulations for airborne noise emissions from heat generators – Part1: Airborne noise emissions from heat generators

EU Cogeneration Directive 204/8/EC

Product Characteristics Database, see www.sedbuk.com

CEN/TR 1749: 2005, or the latest available version thereof: European scheme for the classification of gas appliances according to the method of evacuation of the combustion products (types)

MIS 3007-2 Requirements for contractors undertaking the design, supply, installation, set of work, commissioning and handover of a domestic hot water system containing an electricity-led micro-cogeneration package.

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4. DEFINITIONS

4.1 Scope

An electricity-led micro-cogeneration package whose prime mover is intended primarily to generate electricity and produces heat as a by-product.

4.2 Electricity-led micro-cogeneration

Installation and operation of a micro-cogeneration package within a dwelling resulting in:

1. Electricity production exceeding or contributing to the dwelling's annual requirements, and
2. Thermal production equal to or less than the dwelling's annual requirements, for Domestic Hot Water (DHW) Service as tested in accordance with Annex 1.

4.3 Cogeneration unit

A unit that is capable of cogeneration.

4.4 Electricity-led micro-cogeneration unit

A micro-cogeneration unit whose primary purpose is to generate electricity and whose secondary purpose is to generate heat. Unit is controlled so as to prevent heat being generated in excess of the dwelling's requirements.

4.5 Co-generated heat

The co-generated heat recovered left after system losses.

4.6 Dwelling

A unit of residential accommodation including residential park homes, flats, maisonettes, terraced, semi-detached and detached houses (including all such residential accommodation situated within or forming part of commercial or industrial or agricultural premises) and leisure accommodation.

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Note. It is recognised that this definition can be applied to premises such as those supplying a small number of clients on a bed and breakfast basis.

4.7 Micro-Cogeneration Package

Micro-cogeneration Package is a group of components and equipment, which, when installed in accordance with the manufacturer's specification, using the manufacturer's / producer's micro-cogeneration unit and is supplied for testing under [PAS 67](#), produces sufficient electrical energy to partially or wholly satisfy the electrical and thermal demands of the dwelling and may produce an excess of electrical energy that can be exported to the grid.

A thermal and electrical output of less than 45 kWt or 50 kWe respectively suitable for connection in parallel with the UK public low voltage distribution network in accordance with G83/1.

Note: Manufacturer is the organization that submitted the package for testing against PAS 67.

Important note: Whilst the manufacturer may supply a package for testing under PAS 67, they may only market a unit and specify what components the installer needs to source to comprise the package, The specification of these components are to be detailed in the producer's instruction manual and approved by the Certification Body.

4.8 Producer

For the purposes of this scheme document, a producer is:

- a manufacturer of a micro-cogeneration unit or package selling under his own brand in the UK; or
- a business based in the UK selling under his own brand (or another brand under licence) a micro-cogeneration unit or package manufactured by another business; or
- a professional importer introducing a micro-cogeneration unit or package to the UK market

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4.9 Synchronous mode

Operation of a micro-cogeneration package connected to a public alternating current (AC) electricity distribution network and capable of exporting electrical power to it.

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5. APPLICATIONS TO JOIN THE SCHEME

Applications should be made to a certification body licensed to operate this scheme. The certification body will provide the appropriate application form and details of the applicable fees.

6. MANAGEMENT SYSTEMS CERTIFICATION

Manufacturers shall operate a certified documented manufacturing quality control system, in accordance with the requirements of MCS 010 “Generic Factory Production Control Requirements”

7. CERTIFICATION AND APPROVAL OF THE MICRO-COGENERATION PACKAGE

This section sets out the criteria against which the Certification Body will assess the micro-cogeneration package as suitable for certification and approval together with some supplementary explanatory notes.

7.1 Acceptance Criteria

Acceptance of documented evidence will be at the discretion of the Certification Body providing the certification, but at least the following criteria shall be applied:

- a. Evidence of compliance with conditions of the Scope of this scheme document
- b. Evidence of compliance with the relevant requirements of applicable European directives and UK regulations
- c. Evidence of compliance with the technical requirements for connection and operation as a fixed micro-cogeneration package when installed in parallel with the UK public low voltage distribution network (synchronous mode) in accordance with G83/1,
- d. Evidence of compliance with the performance criteria listed in § 9 of this scheme document

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- e. Verification of the establishment and maintenance of the manufacturing company's quality management system in accordance with the Factory Production Control Requirements (FPC) detailed in § 6 of this scheme document.
- f. Satisfactory review of the technical documentation relating to the package.

7.2 Supplementary Explanatory Notes

Applications for a range of common packages (package families) will be dealt with on a case by case basis. For example, where one or more characteristics are the same for packages with similar design, construction and functionality then the results of tests for these characteristics on one package may be applied to other similar products.

A certificate is awarded following demonstration of satisfactory compliance with this scheme document, i.e. package performance; FPC; and technical documentation.

Certificates contain the name and address of the manufacturer, model and reference number of the micro-cogeneration package, a unique certificate reference number and the issue number and date.

Certificates are valid from the date of issue and are maintained and held in force subject to satisfactory completion of the requirements for maintenance of certification (see § 10), but remain the property of the issuing Certification Body.

Details of the manufacturer and the certificated product(s) are listed on the MCS website www.microgenerationcertification.org.

8. TECHNICAL DOCUMENTATION

The producer may produce only the unit but have it tested with another component to create a package as in the case of the domestic hot water storage cylinder. As part of the instructions, the producer will detail the specification of the other component in order that the installed package is the same as the one tested under PAS 67.

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Technical documentation for the unit or package must be submitted for review. This documentation shall be presented in English and shall be such that it can be assured that the package submitted for test is equivalent to those that are to be manufactured for normal production. The documentation must consist of the following as a minimum;

- a) Manufacturer's name,
- b) Brand name,
- c) Unit or package name,
- d) Unique unit or package identifier – *shall not be the same as any other unit or package currently listed on the Product Characteristics Database,*
- e) Nominal rated heat output,
- f) Nominal maximum electrical output,
- g) Electrical specification – *either 230V 50Hz synchronous single phase or 400V 50Hz synchronous three phase (3 wire or 4 wire)*
- h) Description of prime mover – *e.g. internal combustion engine, external combustion engine, fuel cell, or other (if other an amplified description is required)*
- i) Type of fuel used – *where fuel is unconventional a full description is required*
- j) Whether condensing or non-condensing,
- k) Type of flue system – *designated in accordance with CEN/TR 1749*
- l) Details of intended use and application.
- m) A noise test report – *set out in accordance with § 9c of this scheme document*
- n) Manufacturing drawings and/or specifications including tolerances, issue and revision numbers necessary to establish the build status of the unit or package
- o) Raw material and components specifications necessary to establish the build status of the unit or package.
- p) Details of the quality plan applied during manufacture to ensure ongoing compliance,
- q) 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).
- r) Installation, use and maintenance instructions.

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9. PERFORMANCE CRITERIA

For compliance with this scheme, the micro-cogeneration unit or package must be able to demonstrate the listed performance criteria. 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').

- a) have an attributable, independently verified, energy performance report produced from the comprehensive set of test conditions detailed in Annex 1 appropriate for the intended application of the micro-cogeneration package
- b) have; fulfilled the necessary requirements set out in the EU Cogeneration Directive 2004/8/EC
- c) Has a carbon emissions value (C) 10% less than that for the reference a SEDBUK efficiency greater than or equal to SEDBUK 2005 – 90%/SEDBUK 2009 – 88%, rated condensing boiler as described in Annex 1.
- d) have an attributable, independently verified, noise test report as described in section 6 of BS EN 15036-1: 2006 produced from the test conditions set out in that standard appropriate to the package under test

10. 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:

10.1 Factory Audits

Certification is maintained through annual FPC quality system audits, which shall include a detailed check that the unit being manufactured is to the same specification as the unit tested.

10.2 Product Audits

Unit audits will be conducted as follows:

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10.2.1 Review of the product technical data files including materials

10.2.2 Review of end of line tests in accordance with the manufacturer's quality plan

10.2.3 In exceptional circumstances, justified by the certification body, repeat testing of elements from § 9 a) of this scheme document to confirm that the package continues to meet the minimum performance requirements for certification and listing

11. CERTIFICATION MARK AND LABELLING

All approved units and packages listed under this scheme shall be marked with a label to confirm that the unit or package has been tested and certificated in accordance with the requirements of this scheme document. See below for details.

The producer shall use certification mark(s) only in accordance with the certification body's instructions. An example of a certification mark that can be used for this scheme is as follows:



Certificate No. XXX, approved to MCS 015

Where "XXX" is the certificate number and the logo of the certification body issuing the certification would sit to the right of the MCS logo.

Producers may only use the mark while the certification is maintained.

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ANNEX 1: DOMESTIC HOT WATER ONLY APPLIANCES

Where a microgenerator consists of a prime mover (typically a fuel cell) which is intended only for the production of electricity and domestic hot water (i.e. not space heating) it shall be tested in accordance with this Annex 1 and the PAS 67 domestic hot water only test methodology in clause 12.7 of that standard with the proviso that the definition of a CombiPK package shall be extended to include hot water storage sizes larger than 15 litres. The domestic hot water draw off pattern(s) shall be those specified in PAS 67.

The carbon emission value (C) for the microgenerator must be at least 10% less than that measured in an identical test on a SEDBUK 2005 – 90%/SEDBUK 2009 – 88% rated condensing boiler.

The carbon emission value (C) shall be calculated using the following formula:

$$C \text{ (total carbon emissions)} = (Q_{\text{fuel}} \times \text{carbon intensity of fuel used}) - ((E_{\text{out}} - E_{\text{in}}) \times \text{carbon intensity of grid electricity}) + ((H_1 - H_2) \times \text{carbon intensity of electricity})$$

where:

H_1	=	Heat content of domestic hot water draw off required as per the specified hot water draw off pattern in kWh
H_2	=	Heat content of domestic hot water draw off delivered in kWh
E_{out}	=	Electricity production during the 24 hour test period
E_{in}	=	Electricity consumption during the 24 hour test period
Q_{fuel}	=	Total gas fuel consumption during 24 hour test period

Note: If $H_2 > H_1$ then H_1 will be deemed to equal H_2 so that $(H_1 - H_2)$ can never give a result which is less than zero.

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ANNEX 2: COMBINED DOMESTIC HEATING AND HOT WATER

APPLIANCES

Where an electricity-led micro-cogeneration package consists of both a prime mover (typically a fuel cell) and a supplementary heat source (typically but not necessarily a gas boiler) and is intended for the production of electricity, domestic space heating and domestic hot water then it shall be tested in accordance with this Annex 2 and the current version of PAS 67 with the proviso that the package definitions shall be extended to include hot water storage sizes larger than 15 litres. A further proviso is that testing of hot water and space heating must be made possible, either:

1. By separate testing of hot water and space heating followed by calculation of the combined performance as defined in PAS 67, performed by the test house; or
2. By direct combined testing, where an accepted procedure exists (refer to MCS 011 – Testing and acceptance criteria)

NOTE: Calculations may be either under MCS 015 within this annex 2 or whenever described in PAS 67.

To establish the carbon emissions value (C) of an electricity-led micro-cogeneration package designed to provide both domestic heating and hot water, sufficient test points are required to adequately describe the performance curve. Whilst additional test points may be selected by a manufacturer, the following test points must be selected as a minimum:

1. 100% thermal output test (required by PAS 67)
2. 30% thermal output test (required by PAS 67)
3. 10% thermal output test (required by PAS 67)
4. 0% thermal output test (standby test required by PAS 67)
5. Domestic hot water test (required by PAS 67)
6. 100% prime mover thermal output, 0% supplementary heat source output test

The 30% and 10% thermal output tests may be achieved either by constant output at a reduced level or by cycling of one or more of the heat sources included within the package.

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The carbon emissions value curve is to be established using data from these test points and compared to the carbon emissions value curve for a SEDBUK 2005 – 90%/SEDBUK 2009 – 88% rated condensing boiler across the same range. The carbon emissions value of the electricity-led micro-cogeneration package shall be at least 10% less than the values for the condensing boiler at all points. Linear relationships should be assumed between test points.

The carbon emission value shall be calculated using the following formula:

$$C \text{ (total carbon emissions)} = (Q_{\text{fuel}} \times \text{carbon intensity of fuel used}) - ((E_{\text{out}} - E_{\text{in}}) \times \text{carbon intensity of displaced grid electricity}^*) + ((H_1 - H_2) \times \text{carbon intensity of displaced grid electricity}^*)$$

Where:

H ₁	Heat load required as per PAS 67 in kWh
H ₂	Heat content delivered in kWh
E _{out}	Electricity production during the test period
E _{in}	Electricity consumption during the test period
Q _{fuel}	Total gas fuel consumption during the test period

[*carbon intensity of displaced grid electricity is taken from the latest version of SAP, currently Table 12 of SAP 2009]

AMENDMENTS ISSUED SINCE PUBLICATION

Document Number:	Amendment Details:	Date:
v1.0	First Issue	16/11/2010
V1.1	<p>Section 3: Boiler Efficiency database changed to Product Characteristics database.</p> <p>Updated references to read “or latest available version thereof”</p> <p>Section 4.5: Co-generated heat section added</p> <p>Section 4.7: Micro-Cogeneration Package definition added</p> <p>Addition of Annex 2 Combined Domestic Heating and Hot Water Appliances</p>	18/05/2012