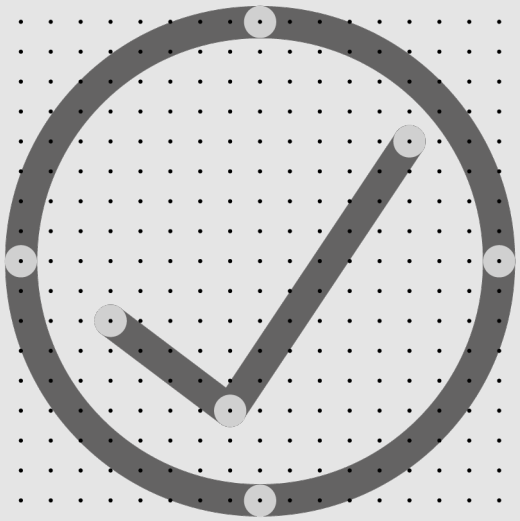
STANDARDS DOCUMENT

MIS 3007 ISSUE 4.0

# The Micro-CHP Standard

## (Installation)



This Standard was prepared by the MCS Working Group 3 'Micro-CHP'.

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*



The MCS Service Company Ltd
Innovation Centre,
Sci-Tech Daresbury,
Keckwick Lane,
Cheshire WA4 4FS

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

# 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

## 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.

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

| Issue No. | Amendment Details | Date |
|---|---|---|
| 1.0 | First Issue | 10/07/09 |
| 2.0 | Addition of text under section 4 – Design and Installation (see 4.2.7) surrounding metering requirements and also under section 4.4 – handover with regards to MCS Certificates and the MID, as agreed at SG Meeting of May 27th 2010. | 26/08/2010 |
| 3.0 | Updated references to read "or latest available version thereof"<br>Updated boiler efficiency database to read "product characteristics database"<br>Updated references in Section 7 Publications referred to, and Appendix B Environmental Performance. | 18/05/2012 |
| 4.0 | Installer Standards were combined. Space heating calculations refined. | 27/04/2022 |

# 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 4.0 is a significant update and replaces issue 3.4. It is available for reference from the date of publication 27/04/2022. Compliance with this issue becomes mandatory for MCS Contractors certified in accordance with MIS 3007 from 01/10/2022 (date of implementation). Issue 3.4 ceases to be valid after 30/09/2022 (date of withdrawal).

This Standard describes the MCS requirements for the assessment, approval and listing of contractors undertaking the supply, design installation, set to work, commissioning and handover of micro-CHP appliances by Accredited Certification Bodies. The listing and approval is based on evidence acceptable to the Certification Body:

- that the system or service meets the Standard
- that the contractor has staff, processes and systems in place to ensure that the system or service delivered meets the Standard
- And on:
- periodic audits of the contractor including testing as appropriate
- compliance with the contract for the MCS listing and approval including agreement to rectify faults as appropriate

This Standard shall be used in conjunction with the scheme document MCS 001 and any other guidance and supplementary material available on the MCS website specifically referring to this Standard (MIS 3007).

*NOTE: This MCS Installation Standard makes use of the terms 'must', 'shall' and 'should' when prescribing certain requirements and procedures. In the context of this document:*

- the term 'must' identifies a requirement by law at the time of publication;
- the term 'shall' prescribes a requirement or procedure that is intended to be complied with in full and without deviation;
- the term 'should' prescribes a requirement or procedure that is intended to be complied with unless reasonable justification can be given.

*Compliance with this MCS Installation Standard does not in itself confer immunity from legal obligations.*

# TABLE OF CONTENTS

# 1 PURPOSE & SCOPE

This Standard specifies the requirements for MCS Contractors undertaking the supply, design, installation, set to work, commissioning and handover of micro-Combined Heat and Power (micro-CHP) appliances for permanent buildings and connected in parallel to the electricity distribution network.

# 2 DEFINITIONS

Refer to MCS 001 for definitions.

# 3 REQUIREMENTS OF THE MCS CONTRACTOR

### 3.1 CAPABILITY

3.1.1 MCS Contractors shall have the competency (see Section 8) and capacity to undertake the supply, design, installation, set to work, commissioning and handover of micro-CHP appliances.

3.1.2 Where MCS contractors do not engage in the design or supply of micro-CHP systems, but work solely as a MCS Contractor for a client who has already commissioned a system design; then the MCS Contractor shall be competent to review and verify that the design would meet the design requirements set out in this Standard and this should be recorded.

### 3.2 ORGANISATION

3.2.1 MCS Contractors shall organise themselves using policies, procedures and systems which meet the minimum requirements in MCS001 to ensure every micro-CHP installation meets this Standard.

*Note: MCS001 includes requirements for Quality Management System, Customer Care, Personnel, Continual Improvement, External Documents, Software Control, Customer Requirements, Contracts, Subcontracting, Purchasing, Test and Measurement Equipment, Product Handling, Training and Competence, all of which can affect the quality of installed systems.*

# 4 PRE-SALE INFORMATION

### 4.1 PERFORMANCE ESTIMATION

4.1.1 For domestic installations, a valid Energy Performance Certificate (EPC) should be used to produce an estimate of the annual energy requirements of the system using the methodology detailed in Appendix A.

*Note: A valid EPC is one which has not expired and where the given annual heat demand is not expected to change such as by, for example, an extension or refurbishment of the building, and where the micro-CHP is intended to supply that changed heat demand. Where no valid EPC exists on the public register, but it is possible to obtain one through a Domestic Energy Assessment, then an EPC should be obtained and lodged. Examples of where it would not be possible to obtain a valid EPC for use would be non-domestic buildings, a planned refurbishment changing the heat demand, or the building is new and not yet complete.*

4.1.2 Where it is not possible to obtain a valid EPC, assess the annual energy heat load for the building (space heating and hot water) using any suitable method. Such calculation method shall be clearly described and justified. That annual energy load shall then be used to produce an estimate of the annual energy performance of the system using the methodology detailed in Appendix A.

4.1.3 This estimate shall be communicated in the prescribed format to the client before the point that the contract is awarded and shall be accompanied by the following text:

*"Important Note: The performance of micro-CHP systems is impossible to predict with certainty due to the variability in the heat load. This estimate is based upon the standard MCS procedure and given as guidance only. It should not be considered as a guarantee of performance."*

4.1.4 Additional estimates may be provided using an alternative methodology, including proprietary software, but:

a) such estimates shall clearly describe and justify the approach taken and factors used
b) they shall not be given greater prominence than the standard MCS estimate
c) they shall be accompanied by warning text stating that it should be treated with caution if it is significantly better than the result given by the standard method.

### 4.2 MINIMUM TECHNICAL INFORMATION

4.2.1 As a minimum, the following technical information shall be communicated in writing to the client before the point that the contract is awarded:

a) The result of the performance estimate calculated in accordance with Section 4.1
b) The physical characteristics of the system (size and weight)
c) The proposed location of the system
d) Maximum power output in kilowatts (KW)
e) Maximum heat output (KW)
f) Performance warranties applying to the system and its output capacity

# 5 DESIGN & INSTALLATION REQUIREMENTS

## 5.1 LEGISLATION

5.1.1 All applicable legislation must be met in full.

*Note: the legislation which applies may be different in England, Wales, Scotland and Northern Ireland.*

5.1.2 MCS Contractors shall ensure, and be able to demonstrate, that they are aware of all current applicable legislation.

5.1.3 MCS Contractors shall make their customers aware of all permissions and approvals required for the installation.

5.1.4 The MCS Contractor shall ensure the building is assessed by a competent professional experienced in micro-CHP systems to ensure that it is suitable for the installation and, by undertaking the proposed works, the building's compliance with the Building Regulations (in particular those relating to energy efficiency and electrical safety) is not compromised.

5.1.5 Suitable and sufficient risk assessments shall be conducted before any work on site commences.

5.1.6 A Construction Phase Plan in accordance with the Construction (Design and Management) Regulations 2015 shall be drawn up before work on site commences.

5.1.7 Where work is undertaken that is notifiable under the Building Regulations it shall be made clear to the customer who shall be responsible for this notification.

5.1.8 The MCS Contractor shall ensure that notification under the Building Regulations has been completed prior to handing over the installation.

*Note: Self-certification, in lieu of building control approval, is only permitted where installation and commissioning is undertaken by a person or organisation deemed competent and registered with a Competent Persons Scheme (CPS) approved by the relevant government department for the scope of work being undertaken. Further details can be found at http://www.competentperson.co.uk.*

5.1.9 The MCS Contractor must ensure the installation is compliant with the Electrical Safety, Quality and Continuity Regulations 2002 and, in accordance with Regulation 22(2)(c), must follow the technical requirements and procedures:

- In Engineering Recommendation (EREC) G98 for installations up to and including 16 A per phase
- In EREC G99 for installations exceeding 16 A per phase
- In EREC G100 where the export of power is to be limited

5.1.10 Notification to the distribution network operator in accordance with the procedures set out in EREC G98 or EREC G99 shall be undertaken by the MCS Contractor.

*Note: the 16 A per phase threshold is the total aggregated AC output of all generators. For example, a 3kW micro-CHP system and a 3kW electrical energy (battery) storage system are connected in parallel to the same single-phase AC supply, gives a combined maximum theoretical output greater than 16 A. In this case EREC G99 applies.*

## 5.2 MANUFACTURER'S INSTRUCTIONS

5.2.1 All equipment should be installed in accordance with its manufacturer's instructions.

5.2.2 Where the manufacturer's instructions conflict with the requirements of this Standard then the requirements of this Standard take precedence unless it can be proven that system performance, safety and durability are no worse than if the requirements of this Standard are followed.

## 5.3 EQUIPMENT CERTIFICATION AND LISTING

5.3.1 The micro-CHP product(s) installed shall be certificated according to the micro-CHP product Standard (MCS014) and listed in the MCS product database (http://www.mcscertified.com).

5.3.2 All installed equipment:

a) Shall be fit for its purpose in the installation
b) Has completed the conformity assessment process and is appropriately marked by a Notified Body in compliance with the relevant legislation

*Note: for example this means the CE mark or the UKCA mark from the 1st January 2023.*

## 5.4 SPACE HEATING DESIGN

5.4.1 Where the micro-CHP appliance is added to provide heat in parallel with an existing heating system, and the building heating envelope and heating system are unchanged, then no heat loss calculations are required.

5.4.2 The added appliance and peripherals should be designed and installed to allow for safe de-commissioning so that the pre-existing heating system can be restored to full functionality.

*Note: This requirement is UNLIKELY to be met without the provision of sufficient, suitably located, drain points to allow draining of all parts of system (primary and secondary circuits).*

5.4.3 Where the micro-CHP appliance replaces a heating appliance, or is designed to heat an extension to the building heating envelope, or where the heating system heat emitters are being replaced (in part of in full), then heat loss calculations are required in order to correctly size the replacement appliance and all emitters. The following procedure shall be followed:

a) A heat loss calculation should be performed in accordance with BS EN 12831.

b) A design internal temperature not less than the floor-space weighted average of the room temperatures given in Table 1 and external temperatures specified in Table 2 column B (by geographical location), shall be used.

c) When calculating the heat loss through a solid floor in contact with the ground, the temperature difference to be used is the internal design room temperature (Table 1) minus the local annual average external air temperature.

d) When calculating the heat loss through a suspended floor, the temperature difference to be used is the internal design room temperature (Table 1) minus the design external air temperature (Table 2).

e) A micro-CHP appliance should be selected that will provide at least 150% of the calculated design space heating power requirement at the selected internal and external temperatures in Tables 1 and 2, after taking into consideration the design flow temperature and heat emitter sizing. This over-capacity is to allow for intermittent heating patterns and allowances for heating hot water (if applicable).

f) MCS certified equipment shall be used that passes the performance standard stated in MCS014.

| Room | Internal design temperatures (°C) |
|---|---|
| Living room | 21 |
| Dining room | 21 |
| Bedsitting room | 21 |
| Bedroom | 18 |
| Hall and landing | 18 |
| Kitchen | 18 |
| Bathroom | 22 |
| Toilet | 18 |

*Table 1: Internal design temperatures taken from CIBSE Guide which should be consulted for data for other applications. CIBSE Guide A also contains information on how to adapt this data for non-typical levels of clothing and activity.*

| Location | Altitude (m) | Hourly dry-bulb temperature (°C) equal to or exceeded for % of the hours in a year | |
|---|---|---|---|
| | | A (99%) | B (99.6%) |
| Belfast | 68 | -1.2 | -2.6 |
| Birmingham | 96 | -3.4 | -5.4 |
| Cardiff | 67 | -1.6 | -3.2 |
| Edinburgh | 35 | -3.4 | -5.4 |
| Glasgow | 5 | -3.9 | -5.9 |
| London | 25 | -1.8 | -3.3 |
| Manchester | 75 | -2.2 | -3.6 |
| Plymouth | 27 | -0.2 | -1.6 |

*Table 2: Outside design temperatures for different locations in the UK taken from CIBSE Guide A. which also gives information on how to adapt and use this data*

5.4.4 Where other heat sources are available to the same building then:

a) The combined output of all heat sources shall be not less than 100% of the calculated heat loss.

b) All heat sources intended to supply 100% of the calculated heat loss shall be fully and correctly integrated into a single control system.

*Note: the control system should preferably prioritise the source of heat which causes the lowest carbon emissions.*

c) It shall be clearly stated in the contract what proportion of the building's space heating and domestic hot water has been designed to be provided by the micro-CHP appliance.

5.4.5 Where heat is to be provided to only a part or an extension of a building heating envelope then the heat demand calculations should cover that area only. Where this is not calculable within BS EN 12831, a calculation for the entire building heat demand can be used and adjusted propotionally for floor space.

## 5.5 DOMESTIC HOT WATER DESIGN

5.5.1 It is common for micro-CHP appliances to come with dedicated and specially designed hot water and/or thermal storage tanks. Where this is not the case, the following clauses should be used to calculate the hot water tank size and capacity.

5.5.2 Where the micro-CHP appliance is added to provide hot water in parallel with an existing hot water heating system, and the building hot water demand and supply system are unchanged, then no hot water demand calculations for hot water tank sizing are required.

5.5.3 The added appliance and peripherals should be designed and installed to allow for safe de-commissioning so that the pre-existing hot water system can be restored to full functionality.

5.5.4 Where the micro-CHP appliance replaces a hot water appliance, or is designed to provide hot water to an extension to the building envelope then hot water demand calculations are required in order to correctly size a domestic hot water cylinder. The method below should be followed however other calculation methods are acceptable in addition. If the additional method(s) of calculation are notably different in results then the MCS Contractor shall decide which method gives the most suitable result, with the justification explained to the customer.

*Note: Where the micro-CHP appliance comes with a manufacturer's specified hot water tank or the appliance provides instantaneous hot water then no sizing of a hot water cylinder is required.*

5.5.5 In non-domestic buildings calculate the daily hot water demand using an appropriate method accounting for building usage along with number and type of hot water outlets.

5.5.6 In domestic buildings calculate the daily hot water demand ($V_{d,average}$) using the following formula:

$$V_{d,average} = 45 \times N$$

Where N = the greater of:

a) The number of bedrooms + 1

b) The number of known occupants

5.5.7 The desired domestic hot water cylinder reheat time shall be agreed with the customer.

5.5.8 Using the daily hot water demand, reheat times and proposed micro-CHP heating capacity, an appropriately sized hot water cylinder should be specified.

*Note: It is acknowledged that the size of cylinder may be limited by the available space.*

5.5.9 The specification of the domestic hot water cylinder shall follow the manufacturer's and/or cylinder manufacturer's recommendations.

5.5.10 Where an existing domestic hot water cylinder is used then:

a) The thermal insulation of the hot water cylinder, and all pipes connected to it, shall be upgraded to a level at least equivalent to that applicable to new installations under relevant legislation and guidance. For cylinders with factory applied insulation, this condition can be satisfied if the cylinder standing heat loss is certified to comply with Section 12 of BS 1566-1:2002 or equivalent. Where this certification is not apparent, or where the cylinder does not have factory-applied insulation, the

MCS Contractor shall install additional insulation certified to comply with BS 5615:1985.

b) Proper duty of care shall be exercised to ensure that the hot water cylinder is fit for purpose as regards its mechanical integrity. Consideration shall be given to scale build-up affecting overall system efficiency, damage, and deterioration caused by corrosion. Such issues shall be considered in the context of any additional stress placed upon the cylinder through the connection of the micro-CHP (e.g. thermal stress or additional system pressure).

c) The size of the cylinder shall comply with the micro-CHP manufacturer's requirements.

5.5.11 Where hot water is to be provided to only a part or an extension of a building then the hot water demand calculations should cover occupancy in that area only.

5.5.12 Domestic hot water systems shall incorporate a means to prevent bacterial growth (including *legionella bacteria*).

*Note: where prevention is through periodic pasteurisation of the system then a bacterial risk assessment can help determine how frequent this pasteurisation should occur.*

## 5.6 METERING & COMMUNICATION

Metering

5.6.1 A means of recording and displaying the total AC electrical energy output (KWh) and the instantaneous AC generation output of the appliance shall be available.

*5.6.2* If required for billing and / or payment purposes, the means of recording AC generation of the system shall be a meter approved under the European Measuring Instruments Directive (MID) or equivalent British standard showing the serial number on the front panel where it could be photographed alongside the make, model and meter reading.

*Note: Installation of a MID approved meter would also satisfy clause 5.6.1.*

5.6.3 The means of recording AC generation, be it a dedicated meter or otherwise, should be readily accessible and readable by the customer without requiring the use of a tool, ladder or torch.

*Note: Use of computers or the internet is an acceptable method of monitoring AC generation.*

Data Communication & Security

5.6.4 The data privacy and security of the site's home area network shall be maintained. Where the installation comprises of any internet connected devices:

- The device's network access credentials (username & passwords) shall be updated in consultation with the customer
- Relevant components in the micro-CHP system should comply with the technical specification ETSI Technical Specification 103 645 Cyber Security for Consumer Internet of Things.

5.6.5 Installations requiring local area network, home area network, and/or internet access in commercial and industrial premises shall comply with the client organisation's information technology and information security policies and procedures.

### 5.7 SAFETY AND DURABILITY

5.7.1 All work must be compliant with Gas-Safe regulations.

5.7.2 All work on flues must follow Part J of the Building Regulations.

5.7.3 The MCS Contractor shall identify if, in the event of a power cut, the supply of gas to the appliance will be stopped (e.g. there is an automatic gas shut off valve installed). The customer shall be informed of the potential outcomes of a power-cut.

5.7.4 The MCS Contractor shall place on or around any gas-meter or shut-off valves that might restrict gas flow to the appliance a note or warning notifying others that the appliance owner must be notified before shutting-off the gas line.

*Note: Some micro-CHP appliances can be damaged or become temporarily inoperable by the loss of a gas connection.*

5.7.5 The MCS Contractor shall create a dedicated electrical connection from the appliance to the building electrical consumer unit. RCD protection is not necessary unless otherwise stipulated in regulations.

# 6 COMMISSIONING & HANDOVER

### 6.1 COMMISSIONING

6.1.1 The micro-CHP system shall be commissioned according to a documented procedure to ensure that the system is safe, has been installed in accordance with the requirements of this Standard and the manufacturers' requirements, and is operating correctly in accordance with the system design.

*Note: Suitable commissioning checklists can include those provided by the micro-CHP manufacturer and the example given in Appendix B.*

### 6.2 DOCUMENTATION & LABELLING

6.2.1 MCS Contractors shall collate a comprehensive document pack which, as a minimum, includes:

- Copies of all forms and checklists used to commission the system
- The maintenance requirements and maintenance services available
- Manufacturer user manuals and warranty details
- Any documentation or checklists required for any incentive schemes
- Any documentation or checklists required for a safe start-up and shutdown of the appliance
- Dual-supply notice on the consumer unit
- Warning label on any gas meter (or shut-off valves) stating a micro-CHP is installed in the building and gas is not to be turned off without consulting the owner.

### 6.3 HANDOVER

6.3.1 At the point at which the micro-CHP system is handed over to the client, the documentation as detailed in 6.2.1 shall be provided and explained along with a document signed by the MCS Contractor containing at least the following:

- A declaration, signed by the MCS Contractor's on-site representative, confirming that the installation meets the requirements of this Standard
- Client name and address
- Site address (if different)
- MCS Contractor's name, address, contact details etc.
- List of the key components installed
- The estimation of system performance calculated according to Section 4: Pre-Sale Information
- Recommended interval for the first periodic inspection

*Note: See Appendix C for a model handover document.*

6.3.2 No later than 10 working days after commissioning, the installation shall be registered by the MCS Contractor on the MCS Installation Database (MID) and an MCS Certificate generated.

6.3.3 The MCS Certificate shall be sent to the customer with instruction to include it within the handover pack.

6.3.4 The generation of the certificate shall be undertaken in full compliance with the terms and conditions of use of the MID[1] and the registration of the system on the MID shall be undertaken only after the system has been fully installed and commissioned and not before.

[1] The terms and conditions of use can be found on the MCS Installation Database website.

6.3.5 A "per installation" fee is levied on MCS Contractors for each registration added to the database. Details of any such fee will be advised from time to time through MCS Certification Bodies.

# 7 MAINTENANCE

7.1.1 A maintenance schedule including the checks to be undertaken and their frequency as stated by the manufacturer shall be provided.

# 8 ROLES & COMPETENCY

8.1.1 All personnel involved in the design and / or installation of micro-CHP systems, either employed by or subcontracted to the MCS Contractor, shall be competent, skilled or instructed for the activities they undertake.

8.1.2 Complete records of training and / or qualifications demonstrating the required competencies shall be maintained by the MCS Contractor, in particular:

- Design personnel - Shall be able to demonstrate a thorough technical knowledge of the technologies involved and the interaction of associated technologies and be able to deliver a compliant design to the requirements of this Standard.
- Installation personnel – Shall be able to demonstrate an adequate level of technical knowledge and installation skills, to install systems to the specified designed in accordance with the requirements of this Standard, applicable codes of practice, manufacturer's instructions and Statutory Regulations.

*Note: As a minimum MCS Contractors should have personnel with demonstrable training and / or experience of micro-CHP systems in accordance with the requirements of this Standard.*

# 9 REGIONAL OFFICES

9.1.1 Where the MCS contractor wishes to design and commission under the certification scheme in regional offices, then these offices shall meet the requirements of this Standard to be eligible for certification.

# 10 PUBLICATIONS, REFERENCE AND FURTHER READING

10.1.1 The below lists are provided so that MCS Contractors know which documents have been used as a basis for the development of the requirements of this MIS Standard and they are able to further research topics if they need to do so.

10.1.2 It is a scheme requirement for MCS Contractors to own at least one copy of the following documents (the latest version) in each office or regional office undertaking design and commissioning work:

- All documentation required for compliance with Gas-Safe
- BS 7671:2018 Requirements for Electrical Installations (the latest edition of the IET Wiring Regulations)
- Engineering Recommendation G98 "Requirements for the connection of Fully Type Tested Micro-generators (up to and including 16 A per phase) in parallel with public Low Voltage Distribution Networks on or after 27 April 2019"
- Engineering Recommendation G99 "Requirements for the connection of generation equipment in parallel with public distribution networks on or after 27 April 2019"
- Engineering Recommendation G100 "Technical Requirements for Customer Export Limiting Schemes"
- MCS 001 - MCS - Contractors certification scheme document.

10.1.3 It is not a scheme requirement for MCS Contractors to own or have immediate access to the documents referenced unless this MIS Standard does not adequately cover off the aspects required.

- BS EN12831-1:2017 Energy performance of buildings. Method for calculation of the design heat load. Space heating load, Module M3-3.
- BS EN1749:2020 - Classification of gas appliances according to the method of supplying combustion air and of evacuation of the combustion products (types).
- BS EN40565:2015+A1:2019 - Gas appliances. Combined heat and power appliance of nominal heat input inferior or equal to 70 kW.
- BS EN 13203-4: 2016 Gas-fired domestic appliances producing hot water. Assessment of energy consumption of gas combined heat and power appliances (mCHP) producing hot water and electricity.
- Guide A: Environmental Design. (CIBSE publication).

# APPENDIX A – PERFORMANCE ESTIMATION

This is a template for calculation of the annual energy performance of a micro-CHP appliance as mentioned in clause 4.1.2. The actual output from micro-CHP will depend greatly on the appliance design and the user's energy usage pattern. As such, it is difficult to predict with accuracy from a simple calculation the actual running-time and output of a micro-CHP.

This template is given here as an indication to the owner/user of what factors are important and what they might expect in output from their micro-CHP appliance under their own unique use cases.

Three worked examples are given; **Worked Examples A and B** are for calculating micro-CHP fuel input and energy output during the heating season for mCHP without and with a supplemental heater respectively. For appliances that also produce domestic hot water during the Summer, a further **Worked Example C** is given to calculate output during the Summer (non-heating season).

**Explanation of Template:**

| **A. Micro-CHP Installation data** | | | Units |
|---|---|---|---|
| (1) | Installed electrical capacity of micro-CHP system - $P_{el}$[2] | | KWel |
| (2) | Installed heat capacity of micro-CHP system – $P_{th}$[3] | | KWth |
| (3) | Overall Efficiency[4] | | % |
| (4) | Fuel use under nominal operation (KW) [(①+②) / ③][5] | | KW |
| **B. Performance calculations** | | | |
| (5) | House heat load (annual)[6,7] | | KWh |
| (6) | mCHP Contribution to that heat load | | % |
| (7) | mCHP Contribution to that heat load as a fraction [⑥/100] | | |
| (8) | Estimated annual run-time [⑤*⑦ / ②] | | hours |
| (9) | Estimated annual electric output [⑧*①][8] | | KWh |
| (10) | Estimated annual heat output [⑧*②] | | KWh |
| (11) | Estimated annual fuel use [④*⑧] | | KWh |
| **C. Estimated micro-CHP electricity self-consumption** | | | |
| (12) | Assumed occupancy archetype | | Home all day/ Home half |

[2] $P_{el}$ in the BS EN50465.

[3] $P_{ch}$ in the BS EN50465.

[4] *nCHP_100+Supp_0* or *nCHP_100+Supp_100* (for appliances with and without supplemental heaters respectively) in the BS EN50465.

[5] Efficiency figures are in net calorific value (e.g., not including potential condensation heat) while fuels are typically supplied gross calorific value. This equation therefore underestimates fuel use by at a minimum of net over gross calorific value of the fuel.

[6] Heat load taken from a valid EPC.

[7] Or domestic hot water load (in Summer months – see Worked Example C).

[8] May underestimate electricity production especially for mCHP with supplemental heaters where both the mCHP and supplemental heater can operate independently.

| | | | |
|---|---|---|---|
| | | | day/ Out all day |
| (13) | Assumed annual property domestic electricity consumption[9] | | KWh |
| (14) | Expected micro-CHP generation self-consumption[10] | | Nearest 5% |
| (15) | Grid electricity independence / Self-sufficiency [⑨*⑭ / ⑬] | | % |
| **D. Estimated micro-CHP self-consumption – with EESS[11] (if installed)** | | | |
| (16) | Assumed usable capacity of electrical energy storage device which is used for self-consumption | | KWh |
| (17) | Expected micro-CHP generation self-consumption (with EESS)[12] | | Nearest 5% |
| (18) | Grid electricity independence / Self-sufficiency (with EESS) [⑨*⑰ / ⑬] | | % |
| **F. Waste Heat Avoidance** | | | |
| (19) | If heat-load falls below this value micro-CHP may turn down/OFF | | KWh/day |
| **G. Notes** | | | |
| | | | |

[9] Actual consumption values from bills etc are preferred if available

[10] There is no designated method for this calculation. Calculations should take at least Occupancy Archetype and current household electricity consumption levels into account. Please give method details in Section G - Notes or in an attached piece of paper. To reflect the large number of variables and therefore the difficulty in making an accurate calculation, please give the result to the nearest 5%.

[11] EESS – Electrical Energy Storage System (e.g., house battery).

[12] There is no designated method for this calculation but should take at least Occupancy Archetype, electrical demand, battery capacity and battery power output into account. To reflect the large number of variables and therefore the difficulty in making an accurate calculation, please give the result to the nearest 5%.

## Worked Example A: Micro-CHP without supplemental heater for space heating

| A. Micro-CHP Installation data | | | Units |
|---|---|---|---|
| (1) | Installed electrical capacity of micro-CHP system - $P_{el}$ | 1.5 | KWel |
| (2) | Installed heat capacity of micro-CHP system – $P_{th}$ | 1 | KWth |
| (3) | Overall Efficiency | 90 | % |
| (4) | Fuel use under nominal operation (KW) [(①+②) / ③] | 2.8 | KW |
| **B. Performance calculations** | | | |
| (5) | House heat load (annual) | 10,000 | KWh |
| (6) | mCHP Contribution to that heat load | 25.5 | % |
| (7) | mCHP Contribution to that heat load as a fraction [⑥/100] | 0.255 | |
| (8) | Estimated annual run-time [⑤*⑦ / ②] | 2,550 | hours |
| (9) | Estimated annual electric output [⑧*①] | 3,825 | KWh |
| (10) | Estimated annual heat output [⑧*②] | 2,550 | KWh |
| (11) | Estimated annual fuel use [④*⑧] | 7,395 | KWh |
| **C. Estimated micro-CHP electricity self-consumption** | | | |
| (12) | Assumed occupancy archetype | All day | Home all day/ Home half day/ Out all day |
| (13) | Assumed annual property domestic electricity consumption | 5,000 | KWh |
| (14) | Expected micro-CHP generation self-consumption | 40 | Nearest 5% |
| (15) | Grid electricity independence / Self-sufficiency [⑨*⑭ / ⑬] | 31 | % |
| **D. Estimated micro-CHP self-consumption – with EESS (if installed)** | | | |
| (16) | Assumed usable capacity of electrical energy storage device which is used for self-consumption | n/a | KWh |
| (17) | Expected micro-CHP generation self-consumption (with EESS) | n/a | % |
| (18) | Grid electricity independence / Self-sufficiency (with EESS) | n/a | % |
| **F. Waste Heat Avoidance** | | | |
| (19) | If heat-load falls below this value micro-CHP may turn down/OFF | 24 | KWh/day |
| **G. Notes** | | | |
| EXAMPLE | Calculation of Self-consumption of mCHP electric (own method – average demand over output – 0.57KW/1.5KW).<br>No EESS installed. | | |

## Worked Example B: Micro-CHP with supplemental heater for space heating

| A. Micro-CHP Installation data | | | Units |
|---|---|---|---|
| (1) | Installed electrical capacity of micro-CHP system - $P_{el}$ | 0.75 | KWel |
| (2) | Installed heat capacity of micro-CHP system – $P_{th}$ | 7.76 | KWth |
| (3) | Overall Efficiency | 81 | % |
| (4) | Fuel use under nominal operation (KW) [(①+②) / ③] | 9.6 | KW |
| **B. Performance calculations** | | | |
| (5) | House heat load (annual) | 10,000 | KWh |
| (6) | mCHP Contribution to that heat load | 100 | % |
| (7) | mCHP Contribution to that heat load as a fraction [⑥/100] | 1 | |
| (8) | Estimated annual run-time [⑤*⑦ / ②] | 1276 | hours |
| (9) | Estimated annual electric output [⑧*①] | 956 | KWh |
| (10) | Estimated annual heat output [⑧*②] | 9,902 | KWh |
| (11) | Estimated annual fuel use [④*⑧] | 12,250 | KWh |
| **C. Estimated micro-CHP electricity self-consumption** | | | |
| (12) | Assumed occupancy archetype | Half day | Home all day/ Home half day/ Out all day |
| (13) | Assumed annual property domestic electricity consumption | 2500 | KWh |
| (14) | Expected micro-CHP generation self-consumption | 50 | % |
| (15) | Grid electricity independence / Self-sufficiency [⑨*⑭ / ⑬] | 19 | Nearest % |
| **D. Estimated micro-CHP self-consumption – with EESS (if installed)** | | | |
| (16) | Assumed usable capacity of electrical energy storage device, which is used for self-consumption | n/a | KWh |
| (17) | Expected micro-CHP generation self-consumption (with EESS) | n/a | % |
| (18) | Grid electricity independence / Self-sufficiency (with EESS) | n/a | % |
| **F. Waste Heat Avoidance** | | | |
| (19) | If heat-load falls below this value micro-CHP may turn down/OFF | 24 | KWh/day |
| **G. Notes** | | | |
| | Consumption taken from electric bills.<br>Self-consumption of mCHP electric (default value of 50%) | | |

## Worked Example C: Micro-CHP – Summer domestic hot water production only

| A. Micro-CHP Installation data | | | Units |
|---|---|---|---|
| (1) | Installed electrical capacity of micro-CHP system - $P_{el}$ | 0.3 | KWel |
| (2) | Installed heat capacity of micro-CHP system – $P_{th}$ | 0.7 | KWth |
| (3) | Overall Efficiency | 90 | % |
| (4) | Fuel use under nominal operation (KW) [(①+②) / ③] | 1.11 | KW |
| **B. Performance calculations** | | | |
| (5) | House DHW load (Summer) | 2,750 | KWh |
| (6) | mCHP Contribution to that DHW load | 100 | % |
| (7) | mCHP Contribution to that DHW load as a fraction [⑥/100] | 1 | |
| (8) | Estimated run-time [⑤*⑦ / ②] | 3,929 | hours |
| (9) | Estimated electric output [⑧*①] | 1,179 | KWh |
| (10) | Estimated heat output [⑧*②] | 2,750 | KWh |
| (11) | Estimated fuel use [④*⑧] | 4,361 | KWh |
| **C. Estimated micro-CHP electricity self-consumption** | | | |
| (12) | Assumed occupancy archetype | - | Home all day/ Home half day/ Out all day |
| (13) | Assumed annual property domestic electricity consumption | - | KWh |
| (14) | Expected micro-CHP generation self-consumption | - | Nearest 5% |
| (15) | Grid electricity independence / Self-sufficiency [⑨*⑭ / ⑬] | - | Nearest % |
| **D. Estimated micro-CHP self-consumption – with EESS (if installed)** | | | |
| (16) | Assumed usable capacity of electrical energy storage device, which is used for self-consumption | 8 | KWh |
| (17) | Expected micro-CHP generation self-consumption (with EESS) | 100 | Nearest 5% |
| (18) | Grid electricity independence / Self-sufficiency (with EESS) | 47 | % |
| **F. Waste Heat Avoidance** | | | |
| (19) | If heat-load falls below this value micro-CHP may turn down/OFF | 17 | KWh/day |
| **G. Notes** | | | |
| | Consumption from electric bills.<br>Calculations for self-consumption of mCHP electric (EESS installed – so assumed 100%). | | |

## Blank Template for printing/copying

| A. Micro-CHP Installation data | | | Units |
|---|---|---|---|
| (1) | Installed electrical capacity of micro-CHP system - $P_{el}$ | | KWel |
| (2) | Installed heat capacity of micro-CHP system – $P_{th}$ | | KWth |
| (3) | Overall Efficiency | | % |
| (4) | Fuel use under nominal operation (KW) [(①+②) / ③] | | KW |
| **B. Performance calculations** | | | |
| (5) | House heat load (annual) | | KWh |
| (6) | mCHP Contribution to that heat load | | % |
| (7) | mCHP Contribution to that heat load as a fraction [⑥/100] | | |
| (8) | Estimated annual run-time [⑤*⑦ / ②] | | hours |
| (9) | Estimated annual electric output [⑧*①] | | KWh |
| (10) | Estimated annual heat output [⑧*②] | | KWh |
| (11) | Estimated annual fuel use [④*⑧] | | KWh |
| **C. Estimated micro-CHP electricity self-consumption** | | | |
| (12) | Assumed occupancy archetype | | Home all day/ Home half day/ Out all day |
| (13) | Assumed annual property domestic electricity consumption | | KWh |
| (14) | Expected micro-CHP generation self-consumption | | Nearest 5% |
| (15) | Grid electricity independence / Self-sufficiency [⑨*⑭ / ⑬] | | % |
| **D. Estimated micro-CHP self-consumption – with EESS (if installed)** | | | |
| (16) | Assumed usable capacity of electrical energy storage device which is used for self-consumption | | KWh |
| (17) | Expected micro-CHP generation self-consumption (with EESS) | | Nearest 5% |
| (18) | Grid electricity independence / Self-sufficiency (with EESS) [⑨*⑰ / ⑬] | | % |
| **F. Waste Heat Avoidance** | | | |
| (19) | If heat-load falls below this value micro-CHP may turn down/OFF | | KWh/day |
| **G. Notes** | | | |
| | | | |

# APPENDIX B – EXAMPLE COMMISSIONING CHECKLIST

*Note: Please refer to any manufacturers commissioning checklist and record information requirements as this may affect the equipment warranty.*

| Customer Details | | Company Details | |
|---|---|---|---|
| Customer Name: | | Job Reference: | |
| Address: | | Date: | |
| | | Technician: | |
| | | MCS No: | |
| | | Gas Safe No: | |
| Post Code: | | Contact No: | |
| Email: | | Email: | |

| Product Information | | | |
|---|---|---|---|
| Manufacturer: | | | |
| Micro-CHP type: | | Fuel Type: | |
| Model No: | | Serial No: | |
| Electrical Output (kW): | | Heat Output (kW): | |
| Installed as per manufacturer's instructions: | | | |

| System Details | Micro-CHP | Cylinder (if installed) | Boiler (if applicable) |
|---|---|---|---|
| System Working Pressure (bar) | | | |
| Expansion vessel precharge (bar) | | | |
| Distilled water fill? | | | |
| Water fill hardness (°dH) | | | |
| Inhibitors? | | | |
| Safety Valve rating (bar) | | | |
| Safety Valve pipe Size DN/ Discharge pipe DN | | | |

| Installation Details | | | | | |
|---|---|---|---|---|---|
| All installation works complete | [ ] | All electrical wiring complete | [ ] | Electrical supply tested | [ ] |
| Ventilation is installed & correct | [ ] | Any safety controls fitted and tested | [ ] | Local electrical isolation provided | [ ] |
| Fuel supply purged and tested | [ ] | Gas Filter installed (for black dust) | [ ] | All pipework installation complete | [ ] |
| Is flue complete | [ ] | 3rd party flue certificate available | [ ] | Equivalent length of flue (m) | [ ] |
| System filled and vented | [ ] | Heating Controls set-up per design | [ ] | Labelling on electrical isolation to indicate generation device | [ ] |
| Sufficient heat load available | [ ] | Radiators balanced | [ ] | Demonstrated and explained to owner/user | [ ] |

## Gas Line Checks

| | Micro-CHP | Boiler (if applicable) |
|---|---|---|
| Appliance tightness test | [ ] | [ ] |
| Flue operation correct | [ ] | [ ] |
| Correct Ventilation | [ ] | [ ] |
| Safe & Operational | [ ] | [ ] |

## Flue Checks

| Reading | Low | Average | High |
|---|---|---|---|
| O2 (%) | | | |
| CO (ppm) | | | |
| CO2 (%) | | | |
| Ratio CO/CO2 | | | |
| NOx (mg/kWh) | | | |
| Eff.NCV (%) | | | |
| Flue Draught (hPa) | | | |
| Flue gas temp (°C) | | | |
| Ambient temp (°C) | | | |
| Excess Air (%) | | | |

## Technicians comments

| | | | |
|---|---|---|---|
| Technicians Signature: | | Date: | |
| Customers Signature: | | Date: | |

# APPENDIX C – MODEL HANDOVER DOCUMENT

| Micro-CHP Handover Document | ☐ Initial verification |
|---|---|
| | ☐ Periodic verification |

| | |
|---|---|
| Client | |
| Installation Address | |
| Test Date | |

| | |
|---|---|
| Description of installation (key components installed) | |
| Fuel Type | |

| | |
|---|---|
| Contractor's name and address | |
| Contractor Contact: | Telephone:<br>Email: |
| MCS Contact | Telephone: 0333 103 8130<br>Email: hello@mcscertified.com |

| | |
|---|---|
| Electrical Output | kW |
| Heat Output | kW |
| Estimated annual electrical output | kWh |
| Estimated annual heat output | kWh |
| Estimated annual fuel use | kWh |

## Design, Construction, Inspection and Testing

I/we being the person(s) responsible for the design, construction, inspection and testing of the Micro-CHP System installation (as indicated by the signatures below), particulars of which are described above, having exercised reasonable skill and care when carrying out the design, construction, inspection and testing, hereby certify that the said work for which I/we have been responsible is, to the best of my/our knowledge and belief, in accordance with MCS Installation Standard MIS 3007.

| | | |
|---|---|---|
| Signature(s):<br><br>Name(s):<br><br>Date:<br>(The extent of liability of the signatory(s) is limited to the work described above) | Next inspection recommended after not more than: | Years |
| | Comments: | |