



The Certification Mark for Onsite
Sustainable Energy Technologies

Microgeneration Installation Standard: MIS 3005

REQUIREMENTS FOR CONTRACTORS UNDERTAKING THE SUPPLY, DESIGN, INSTALLATION, SET TO WORK COMMISSIONING AND HANDOVER OF MICROGENERATION HEAT PUMP SYSTEMS

Issue 2.0

This standard has been approved by the Steering Group of the MCS.

This standard was prepared by the MCS Working Group 6 'Heat Pumps'.

REVISION OF MICROGENERATION INSTALLATION STANDARDS

Microgeneration Installation 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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FOREWORD

This standard identifies the evaluation and assessment practices undertaken by certification bodies of the MCS for the purposes of approval and listing of contractors undertaking the supply, design installation, set to work, commissioning and handover of heat pump systems. 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 document MCS 001.

Government defines Microgeneration as the production of heat and/or electricity on a small-scale from a low carbon source. The various technologies have the potential to help us achieve our objectives of tackling climate change, ensuring reliable energy and tackling fuel poverty.

The objective of Government's Microgeneration strategy is to create conditions under which Microgeneration becomes a realistic alternative or supplementary energy generation source for the householder, for the community and for small businesses.

NOTES:-

Compliance with this Microgeneration Installation Standard does not of itself confer immunity from legal obligations.

Users of Microgeneration Installation Standards should ensure that they possess the latest issue and all amendments.

The Steering Group welcomes comments of a technical or editorial nature and these should be addressed to "the Secretary" at mcs@gemserv.com

Listed products may be viewed on our website: www.microgenerationcertification.org

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1 SCOPE

This standard specifies the requirements of the MCS for the approval and listing of Contractors undertaking the supply, design, installation, set to work, commissioning and handover of microgeneration Heat Pump systems supplying permanent buildings and either linked to the building's space heating and/or hot water system.

The building's space heating and/or hot water system are not included in this Microgeneration Installation Standard. However, the Contractor shall demonstrate that the Microgeneration Heat Pump system is provided in full knowledge of the heat distribution system being used to maximise the efficiency of the combined system.

Microgeneration Heat Pump systems utilise different primary heat sources (ground-, air- and water-sources), each of which requires different design and installation considerations. This Microgeneration Installation Standard includes the requirements for Microgeneration Heat Pump systems for heating or for heating and cooling. Cooling only systems and direct expansion (DX) ground-loop systems are excluded from this Standard.

For the purposes of this Microgeneration Installation Standard, Microgeneration Heat Pump systems are defined as those having a design output that does not exceed 45kW thermal.

2 DEFINITIONS

This Microgeneration 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

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Contractor	An individual, body corporate or body incorporate, applying for or holding certification for the services detailed in Scope, Clause 1 above.
Contract	A written undertaking for the design, supply, installation, set to work and commissioning of Microgeneration systems and technologies
Design	The formulation of a written plan including a specific list of products and fixings to form a completed system for a defined Microgeneration technology. Including extensions and alterations to existing Microgeneration systems.
Installation	The activities associated with placement and fixing of a Microgeneration system
Set to work	The activities necessary to make the Microgeneration system function as a completed system.
Commissioning	The activities to ensure that the installed system operates within the boundaries and conditions of the design and the product manufacturers' claims.
Sub-contract	A written Contract between a certificated Contractor and another firm for supply of products and services in connection with the fulfilment of a Contract.
Handover	The point in a Contract where Commissioning and certification of the system have been satisfactorily completed to the Contract specification so enabling the installation to be formally handed over to the client.
Heat Pump	<p>A device which takes heat energy from a low temperature source and upgrades it to a higher temperature at which it can be usefully employed for heating and/or hot water. Heat pumps may utilise different heat sources:</p> <ul style="list-style-type: none"> • Ground Source, where heat energy is extracted from the ground (e.g. from boreholes, horizontal trenches or aquifers) • Water Source, in which heat energy is extracted from water (e.g. lakes, ponds or rivers) • Air Source, where heat energy is directly extracted from

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	ambient air.
Closed-Loop Heat Exchanger	A sealed loop of pipe containing a circulating fluid used to extract heat from ground- or water- sources.

3 REQUIREMENTS FOR THE CERTIFICATED CONTRACTOR

3.1 Capability

Certificated Contractors shall have the capability to undertake the supply, design, installation, set to work, commissioning and handover of Microgeneration Heat Pump systems.

Where Contractors do not engage in the design or supply of Microgeneration Heat Pump systems, but work solely as an installer for a client who has already commissioned a system design; then the 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 Quality management system

Contractors shall operate a satisfactory quality management system which meets the additional requirements set out in the scheme document MCS 001

3.3 Sub-contracting

In installations for private customers, any work within the scope of the scheme not undertaken by employees of the Contractor shall be managed through a formal subcontract agreement between the two parties in accordance with the policies and procedures employed by the certificated Contractor. These procedures shall ensure that the subcontractor undertakes the work in accordance with the requirements of this standard.

In other situations (for example new build, or for commercial customers), it is permissible for the physical installation, setting to work and commissioning to be undertaken by others (i.e. not sub-contracted to the Contractor) provided that:

3.3.1 A contract between the Contractor and the commercial client details obligations on the client to include that evidence of skills and training of those employed by the client to do elements of work not undertaken by the Contractor are to be made available to the Contractor to ensure that the competence requirements of this standard are met and that access to the site for training and supervision in accordance with the following sections is agreed in advance.

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3.3.2 The certificated Contractor provides additional product-specific training for those undertaking the work not undertaken by the certificated Contractor.

3.3.3 The certificated Contractor assesses a sample number of installations under the contract which is not less than the square root of the number of installations rounded up to the nearest whole number (e.g. a new build site of 50 installations then a minimum of 8 are assessed).

3.3.4 The certificated Contractor assumes responsibility at handover that the installation is in full compliance with the standard.

3.4 Consumer code of practice

The Contractor shall be a member of and, when dealing with domestic consumers, shall comply with, a code of practice (consumer code), which is relevant to the scope of their business in the Microgeneration sector and which is approved by the Office of Fair Trading (OFT). In the absence of any approved codes the MCS will accept codes that have completed stage 1 of the OFT approval process, (e.g. REAL Code).

4 DESIGN AND INSTALLATION REQUIREMENTS

4.1 Regulations

All applicable regulations and directives must be met in full. It should be noted that regulations that must be applied may be different in England and Wales, Scotland and Northern Ireland. Some guidance on applicable regulations is given in the guidance document MCS 002. This guidance is not necessarily exhaustive and may change from time to time. Certificated contractors shall ensure they have a system to identify all applicable regulations and changes to them.

All work, and working practices, must be in compliance with all relevant health and safety regulations and a risk assessment shall be conducted before any work on site is commenced.

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4.2 Design and installation

The areas of competence relevant to the design and installation of Microgeneration Heat Pump systems are included in Clause 5. The following principles shall be met when designing, specifying and installing Microgeneration Heat Pump systems.

- 4.2.1 It shall be clearly stated by the Contractor what proportion of the building's design heat loss and what proportion of the building's hot water is expected to be provided by the Microgeneration Heat Pump. For bivalent systems the figures stated (i.e. the proportion of the annual energy provided by the Heat Pump) shall be based only on the energy supplied by the Heat Pump and shall not include the contribution from auxiliary heating. It is the responsibility of the Contractor to ensure that the customer understands the implications of this on the heating costs associated with the building.
- 4.2.2 The design of Closed-Loop Heat Exchangers shall be in compliance with the Microgeneration Heat Pump manufacturer's specification and shall be clearly documented so that such compliance may be demonstrated.
- 4.2.3 When designing Closed-Loop Heat Exchangers the thermal conductivity of the local ground conditions, loop configuration, local climate and landscaping shall be taken into consideration. If thermal conductivity data is not available then appropriate in-situ thermal conductivity testing should be performed. Such testing shall be performed by a competent company.
- 4.2.4 Results of the calculations used in the design of Closed-Loop Heat Exchangers should be given. If such calculations are made using software programmes details of how the performance the programme has been verified should be supplied.
- 4.2.5 Attention should be paid to specific ground conditions, particularly to any contamination that might affect the integrity or performance of the Closed-Loop Heat Exchanger. Where land has been remediated care should be taken to ensure that capping layers, etc. (where present) are not damaged or compromised. Backfill material shall not create a fluid pathway in any borehole for environmental contamination of ground layers and/or groundwater.

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- 4.2.6 The materials used for Closed-Loop Heat Exchangers should be consistent with those specified in HVCA publication Guide to Good Practice - Heat Pumps [TR/30].
- 4.2.7 Heat Pumps should be installed in accordance with Section 3 of HVCA publication Guide to Good Practice – Heat Pumps [TR/30]
- 4.2.8 The Heat Pump system shall be installed such that all manufacturers’ instructions are followed.

4.3 System Performance

- 4.3.1 An estimate of annual energy performance shall be calculated or obtained and shall be communicated in writing to the client at or before the point at which the contract is awarded. Separate calculations for space heating and for hot water shall be performed and subsequently added together to give a combined annual energy performance figure.

The means of estimating the annual energy performance is as follows:

- a) Assess the annual heat load for the building (space heating or hot water) using any suitable performance calculation method. Such calculation method shall be clearly described and justified.
- b) Multiply the result from a) by the proportion of the relevant heat load provided by the Microgeneration Heat Pump system as determined in accordance with Clause 4.2.1.
- c) Divide the result from b) by the default efficiency (expressed as a Coefficient of Performance or CoP) for Heat Pumps contained in SAP 2005 Table 4a (note: CoPs corrected for Heat Pumps with auxiliary heaters should not be used).
- d) Divide the result from c) by the appropriate efficiency adjustment contained in Table 4c of SAP 2005.
- e) Calculate the energy supplied by the auxiliary heater by multiplying the result from a) by the proportion of the relevant heat load not supplied by the Heat Pump.
- f) Add the result from d) to the result from e) to give the total energy required for the relevant heat load.

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g) The results from f) for space heating and hot water are added together to give an overall energy requirement for the building for these heat loads.

This estimate, when communicated to the client, shall be accompanied by the following disclaimer:

‘The performance of Microgeneration heat pump systems is impossible to predict with certainty due to the variability of the climate and its subsequent effect on both heat supply and demand. This estimate is based upon the best available information but is given as guidance only and should not be considered as a guarantee.’

Additional estimates may be provided using an alternative methodology and/or alternative CoP, but any such estimates shall clearly describe and justify the approach taken and factors used, shall not be given greater prominence than the estimate obtained using the method described above and shall have an associated warning that it should be treated with caution if it is significantly greater than the result given by the method described above.

4.3.2 This standard includes reversible systems, i.e. systems that may provide cooling in addition to heating. It is a requirement that such reversible systems be designed and optimised for heating.

4.3.3 The Contractor shall provide evidence of consultation and compliance with the requirements of the designers and installers of the building’s heat distribution system (and hot water system if applicable) regarding specification and performance to ensure the correct and efficient operation of the system as a whole. This shall cover the selection of a Microgeneration Heat Pump of appropriate output for the building, and the design of heat distribution systems and controls compatible with efficient operation.

4.4 Site specific issues

The following issues should be addressed for the design of Heat Pump systems for each installation.

4.4.1 Heat Pumps should be located according to the manufacturer’s instructions.

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- 4.4.2 The suitability of a proposed Heat Pump system installation site, including the location of ground loops or bore holes, where present, shall be assessed by a qualified professional experienced in Heat Pump systems. Contractors shall make their customers aware of all permissions, approvals and licences, for example for the abstraction and discharge of ground water, required for their installation. Where required the Contractor shall ensure that these permissions and approvals have been obtained before work is commenced.
- 4.4.3 Heat Pumps should not be located adjacent to sleeping areas or on floors that can transmit vibration.
- 4.4.4 Anti-vibration pads/mats/mounts and flexible hose connections should be used to reduce the effects of vibration on the building structure.
- 4.4.5 The location of external fans, for example in air-source heat pumps, should be chosen to avoid nuisance to neighbours.
- 4.4.6 Internal fans and ducts should be fitted with sound attenuation devices.

4.5 Commissioning

Heat Pump systems shall be commissioned according to the manufacturer's requirements. Appropriate system checks as outlined in section 3.9 of HVCA publication Guide to Good Practice - Heat Pumps [TR/30] should be performed.

4.6 Documentation

In addition to the estimate of annual energy performance Contractors shall provide customers with a comprehensive document pack and that pack should be in accordance with section 3.10 of HVCA publication Guide to Good Practice - Heat Pumps [TR/30] plus, where applicable:

- 4.6.1 Details of the geotechnical data or survey used in the design of any Closed-Loop Heat Exchanger supplied (if not included in the commissioning reports). In particular the calculations used to support the design (e.g. length/depth/location) of the Closed-Loop Heat Exchanger

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4.6.2 Details of the calculations made to ensure the building's heating load will be met. In providing such documentation it shall be clearly stated by the Contractor what percentage of the building's design heat loss and what percentage of the building's domestic hot water is expected to be provided by the heat pump.

4.7 Equipment

When making installations in accordance with this standard the Microgeneration Heat Pumps used in installations shall be listed under the MCS (<http://www.microgenerationcertification.org>).

Equipment shall be suitable for its application and have a manufacturer's declaration of conformity for the appropriate standard.

All Microgeneration Heat Pumps that are installed within the European Union must be CE marked in compliance with the relevant European Directives. These are listed in MCS 002.

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5 COMPETENCE OF STAFF

All personnel employed by, or sub-contracted to, the Contractor shall be able to demonstrate that they are trained and competent in the disciplines and skills, appropriate to the activities required for their role, in accordance with this standard.

Complete records of training and competence skills of personnel shall be maintained by the certificated contractor, in particular:

- Design staff, carrying out full conceptual design, shall be able to demonstrate a thorough knowledge of the technologies involved and the interaction of associated technologies.
- All personnel engaged in the actual installation are expected to have technical knowledge and installation skills, to install components and equipment within the designed system, in accordance with all appropriate codes of practice, manufacturer's specifications and regulations.
- All personnel engaged in the final inspection, commissioning, maintenance or repair, shall have a comprehensive technical knowledge of the products, interfacing services and structures to complete the specified processes.

Examples of qualifications that may be suitable for satisfying the training requirements are listed in Appendix A

Note: Due to the current development of the Sector Skills Agreement and the review in progress of the National Occupational Standards for this technology, the indicated suggested scope in the Appendix "A", may change.

For personnel employed in the installation of Microgeneration Heat Pumps assessments of training and competence will cover the following underpinning knowledge areas:

Competences applicable to all heat pump technologies:

- Health and Safety knowledge and awareness including risk assessments
- Assessment of the suitability of a heat pump system for the building and the efficient operation of its heating system (and hot water system if applicable)

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- Energy conservation including the requirements of the Building Regulations Schedule 1 Part L for new and existing buildings.
- Calculation of building heating requirements (including heat losses and the effects of insulation)
- Loop field materials, jointing methods, pressure testing and hydraulic performance
- Antifreeze and corrosion inhibitors
- After-sales service and warranty
- Awareness of different electricity tariffs
- Fault diagnosis
- Effects of source/sink temperatures on performance
- UK electricity network implications for heat pumps
- Power supplies
- Awareness of BS EN 14511
- Refrigerants
- Performance data to be supplied
- System testing (including pressure, electrical and performance testing)
- Commissioning
- Site assessment, including heat pump selection and selection of heat source
- Optimising heat pump capacity and, if appropriate, use of an auxiliary heating system
- Heat pump equipment sitting, mounting and installation including secure fixing and connection of all components
- Environmental considerations – e.g. minimising risk of contamination due to leakage of materials, noise and vibration pollution
- How heat pumps work – principles and components
- Electrical connections and relevance of the Building Regulations Schedule 1 Part P
- Plumbing connections
- Understanding of noise, vibration and insulation requirements and IP rating.

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Competences applicable to specific heat pump technologies

Required Knowledge	Groun d/ Water	Groun d/ Air	Water / Water	Water / Air	Air/ Water	Air/ Air
Closed-Loop Heat Exchanger design and trenching/drilling (including back-filling or grouting)	✓	✓	✓	✓		
Closed-Loop materials, jointing methods, pressure testing and hydraulic performance	✓	✓	✓	✓		
Closed-Loop Heat Exchanger pipe specification	✓	✓	✓	✓		
Purging and filling of Closed-Loop Heat Exchangers	✓	✓	✓	✓		
Circulation around Closed-Loop Heat Exchangers	✓	✓	✓	✓		
Aspects of heating distribution systems relevant to warm water heat pumps	✓		✓		✓	
Controls: Underfloor systems	✓		✓		✓	
Radiator systems	✓		✓		✓	
Air distribution systems		✓	✓	✓	✓	✓
Aspects of heating distribution systems relevant to warm air heat pumps		✓	✓	✓	✓	✓
Heat source water/brine pump performance	✓	✓	✓	✓		
Air flow checks						
Indoor - inc. discharge temperature		✓		✓		✓
Outdoor					✓	✓

6 HANDOVER REQUIREMENTS

The handover procedure described in section 3.10 of HVCA publication Guide to Good Practice - Heat Pumps [TR/30] should be applied.

At the point at which the Microgeneration Heat Pump system is handed over to the client, the documentation as detailed in 4.6 should be provided by the Contractor and explained to the client along with:

- The maintenance requirements and maintenance services available;
- a certificate signed by the contractor containing at least the following:
 - A statement confirming that the Microgeneration Heat Pump system meets the requirements of this standard
 - Client name and address
 - Site address (if different)
 - Contractors name, address etc.
 - List key components installed
 - Estimation of system performance calculated according to 4.3
 - A certificate obtained from the MCS Installation Database, showing that the installation has been registered with the scheme (to be provided within 10 working days of the commissioning date).

Note: all MCS Installations must be notified to the MCS Licensee through the MCS Installation Database, where a certificate will be generated and sent to the customer. There is a £5 per installation fee levied on installers for each installation added to the database.

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7 REGIONAL OFFICES

Where the Contractor wishes to design, install and commission under the Certification Scheme in regional offices, then these offices shall meet the requirements of this standard to be eligible for Certification.

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8 PUBLICATIONS REFERRED TO

In the following list reference to undated publications implies the latest edition and amendments:

- MCS 001- MCS – Installer certification scheme document. Available from www.microgenerationcertification.eu
- MCS002 – Guidance on regulations and directives for Microgeneration installations. Available from www.microgenerationcertification.eu
- Guide to Good Practice - Heat Pumps [TR/30], July 2007 ISBN 0-903783-58-4. HVCA Publications Department, Old Mansion House, Eamont Bridge, Penrith CA10 2BX.
<http://www.hvca.org.uk>

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APPENDIX A: QUALIFICATIONS OF STAFF

The following qualifications may be suitable to satisfy the training requirements detailed under Clause 5:

- Certified EU-CERT.HP installer (Arsenal research, Business Unit Sustainable Energy Systems, Giefinggasse 2, A-1030 Wien, Austria)
- Ground Source Heat Pump Association Installer Training (Ground Source Heat Pump Association, National Energy Centre, Davy Avenue, Knowl Hill, Milton Keynes, Bucks, MK5 8NG)
- International Ground Source Heat Pump Association Accredited Installer (International Ground Source Heat Pump Association, 374 Cordell South, Stillwater, OK 74074, USA)
- Certified Geexchange Designer (Association of Energy Engineers, 4025 Pleasantdale Road, Suite 420, Atlanta, GA 30340, USA)
- Relevant Engineering Services SKILLcard (Engineering Services SKILLcard Ltd, Old Mansion House, Eamont Bridge, Penrith, Cumbria CA10 2BX) – relevance of the holder's skills and experience would require independent verification
- Relevant Construction Skills Certification Scheme (CSCS) card (PO Box 114, Bircham Newton, Kings Lynn, Norfolk, PE31 6XD. www.cscs.uk.com) – relevance of the holder's skills and experience would require independent verification.
- Relevant NVQ/SNVQ level 3 or, in the case of S/NVQ Land Drilling, level 2 – relevance of the qualification would require independent verification
- Accreditation from a relevant training course – relevance of the course would require independent verification
- Membership of a relevant Competent Person Scheme – relevance of the Competent Person Scheme would require independent verification
- Manufacturer's product training – Would be product specific and require independent verification
- Experience gained through a mentoring process – would require independent verification

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- Demonstrable track record of successful installation – would require independent verification

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AMENDMENTS ISSUED SINCE PUBLICATION

Document Number:	Amendment Details:	Date:
1.2	Amended 3.4 Consumer Code of Practice wording Updated e-mail and website addresses	25/02/2008
1.3	Gemserv details added as Licensee. Document reformatted to reflect brand update. References to BERR updated to DECC, MCS logo updated accordingly. Website and email addresses updated to reflect new name.	01/12/2008
1.4	Quality review	10/01/2009
1.5	MCS Mark Updated	25/02/09
1.6	Additional contacting options were added to clause 3.3. As agreed in the MCS Steering on 27/10/2009. References to Clear Skies have been removed from clause 4.7 and a link to the MCS website added.	28/01/2010

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2.0	<p>Addition of text under Section 6 – Handover incorporating the generation of MCS Certificates from the MID for each installation. Changes are as agreed at SG meeting of May 27th 2010.</p>	26/08/2010
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