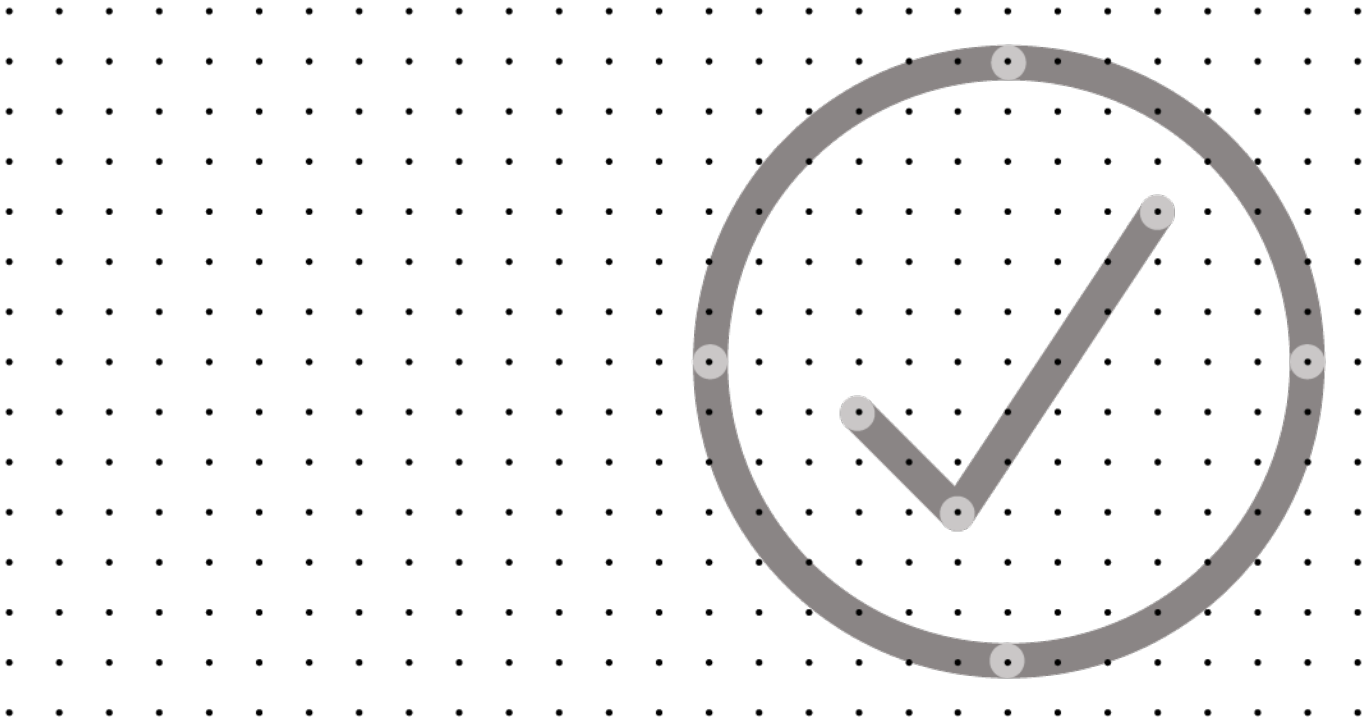
STANDARDS DOCUMENT

MIS 3005-I: 2025 ISSUE 1.0

MCS 2025

Heat Pump: Installation Standard



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ABOUT MCS

MCS: Giving everyone 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. MCS is here to ensure it's a positive one.

MCS is the UK's quality mark for small-scale renewable energy technologies like solar PV, solar heating, heat pumps, biomass, and battery storage. We have two main roles – setting and maintaining standards, and providing consumer protection.

Our Standards define how certified renewable energy installations should be designed and installed using MCS certified products. They are a benchmark for quality developed in close consultation with industry through independent technical working groups.

The Standards are owned by The MCS Foundation (a charitable trust), but maintained and developed by MCS.

www.mcscertified.com

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.

Amendments issued since publication

Issue No.	Amendment details	Date
1.0	First publication for MCS:2025 1.0	01/01/2025

FOREWORD

Compliance with this Standard is mandatory for MCS Contractors certified to MCS: 2025.

The purpose of this Standard is to specify best practice in achieving high-quality low carbon technology installations. Whilst it is not possible to ensure safety, this Standard provides requirements which should help mitigate potential safety risks associated with the design and installation of this technology.

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).

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.

1 PURPOSE & SCOPE

1.1 This Standard specifies the requirements for MCS Contractors undertaking the installation, set to work and commissioning of microgeneration heat pump systems supplying permanent buildings with space heating and/or domestic hot water.

1.2 Microgeneration heat pump systems can use different primary heat sources (ground, air, and water), each of which requires different design and installation considerations. This Standard includes the requirements for both compression and thermally activated heat pumps, as well as heat pump systems for heating only or for both heating and cooling. Heat pumps may be either "Monobloc" or "Split" units.

1.3 The following are expressly excluded from this Standard:

- Cooling only systems
- Direct expansion (DX) ground-loop systems
- Heat pumps used for extraction of heat from loft spaces

1.4 Reversible heat pump systems able to provide both heating and cooling are included but shall be designed and optimised for heating.

1.5 For the purposes of this Standard, microgeneration heat pumps are defined as those having a thermal output not exceeding 45 Kilowatt (kW_{th}) as defined by the MCS Product Certification scheme document MCS 007.

1.6 Multiple heat pumps may be used in a single installation with a total design heat load not exceeding 70kW_{th} (determined in accordance with BS EN 12831-1:2017 provided that no single heat pump shall exceed an output of 45kW_{th}.

1.7 Hot water heat pump systems installed in accordance with this Standard shall be used for the provision of domestic hot water only.

2 DEFINITIONS

Refer to Installer Operating Requirements for general definitions (not specific to Heat Pumps). For technical definitions please see below.

Term	Definition
Heat pump	A device which takes heat energy from a low temperature source and upgrades it to a higher temperature at which is can be usefully employed for heating and/or hot water. Heat pumps may utilise different heat sources: • Ground source, where heat energy is extracted from the ground (e.g. from boreholes, horizonal 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 ambient air. This includes solar assisted heat pumps.
Closed-loop heat exchanger	A sealed loop of pipe containing a circulating fluid used to exchange heat from ground-or water-sources.
Ground heat exchanger	The arrangement of horizontally or vertically installed pipes through which the heat transfer fluid circulates and collects low grade heat from the ground. Can be either closed or open loop.
Heat transfer fluid	Fluid that is used to transfer thermal energy between components in a system.
External absorber	A panel which performs the function of an evaporator in a solar assisted heat pump system. This device is remote from the compressor and is usually mounted externally

3 INSTALLATION

3.1 LEGISLATION

3.1.1 All applicable legislation and directives must be met in full.

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

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

3.1.3 For air source heat pumps, where an installation is intended to proceed with Permitted Development Rights for air source heat pumps in England, MCS 020 Planning Standards must be complied with.

3.1.4 The Contractor shall ensure the building is assessed by a competent professional experienced in heat pump 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.

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

3.1.6 Where responsible for notification under the Building Regulations, the MCS Contractor shall ensure that notification has been completed prior to handing over the installation.

Note: Where notification under the Building Regulations is to be undertaken by others (e.g. the developer of a new-build project) then it is permissible for the MCS Contractor to handover the installation immediately following commissioning.

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.

3.1.7 The MCS Contractor shall ensure that the installation is notified to the Distribution Network Operator in accordance with the procedures published by the Energy Networks Association and permission sought to connect to the network in advance of installation where necessary.

Note: a Flow-chart detailing the ENA procedure is available from the website www.energynetworks.org along with the process to follow for connection and notification.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.2.2 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.

3.3 EQUIPMENT CERTIFICATION AND LISTING

3.3.1 The heat pump(s) specified shall be listed on the MCS website (www.mcscertified.com). These listings include heat pumps both MCS certified (according to MCS 007) and by other schemes that MCS considers equivalent.

3.3.2 All equipment installed:

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 but this could change as the UK leaves the EU.

3.4 INSTALLATION

3.4.1 All work under this Standard work shall be carried out:

a) With adequate and proper materials which
   i) are appropriate for the circumstances in which they are used,
   ii) are adequately mixed or prepared, and
   iii) are applied, used or fixed so as adequately to perform the functions for which they are designed; and
b) I+n a workmanlike manner.

3.5 METERING & COMMUNICATION

Metering

3.5.1 A means of recording and displaying the total electricity consumption of the system shall be installed.

3.5.2 The heat pump(s) should be installed so that heat metering could be added at a future date with minimum cost or disruption.

Note: a means of making the addition of heat metering possible with minimum disruption would be to include straight and surface-mounted flow and return pipes near the heat pump and each incorporate 2 full-bore isolation valves. Those isolation valves on the flow pipe should be separated by no less than 175mm. On the return pipe, those valves should be separated by no less than 20 times the pipe diameter (for example the distance between the valves should be 300mm or more of straight pipe when pipe diameter of 15mm).

Data communication & security

3.5.3 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 heat pump system should comply with the technical specification ETSI Technical Specification 103 645 Cyber Security for Consumer Internet of Things.

3.5.4 For installations requiring local area network, home area network, and/or internet access in commercial and industrial premises, permission shall be obtained from those responsible for the client organisation's information technology and information security policies and procedures.

3.6 SITE SPECIFIC ISSUES

3.6.1 Heat pumps should be located according to the manufacturer's instructions.

Note: For air source heat pumps, these will include consideration of factors that may detrimentally affect the performance of the heat pump system such as recirculation of chilled air.

3.6.2 Heat pumps should not be located adjacent to sleeping areas or on floors that can transmit vibration.

3.6.3 Anti-vibration pads/mats/mounts and flexible hose connections should be installed according to the manufacturer's instructions to reduce the effects of vibration on the building structure.

3.6.4 The location of external fans and heat pump compressors should be chosen to avoid nuisance to neighbours.

3.6.5 Internal fans and ducts should be fitted with sound attenuation devices where required to meet recommended or required sound levels..

3.6.6 For air source heat pumps, condensate shall be discharged safely to a suitable drain or soakaway.

3.6.7 Solar Assisted Heat Pump external absorber(s) mounted above or integrated into a pitched roof shall be installed in accordance with MIS 3001.

Note: MIS 3001 contains requirements for mounting solar thermal collectors under the action of wind loads, fire, rainfall and wind driven rain.

3.6.8 Where the external absorber(s) of Solar Assisted Heat Pumps are mounted other than to a pitched roof, the absorber and associated fixings achieve shall be fixed in such a way that achieves the same level of performance as absorbers mounted on a pitched roof.

3.6.9 Where it can optimise system efficiency with the maximum possible gradient, weather compensation should be enabled.

Note: Where weather compensation would reduce the efficiency of the system or be of no practical value, there is no requirement to enable it. However, the Contractor may be expected to explain why this action has been taken and the option retained to enable it at a later date if required. Examples may be the use of fan convectors or other heat emitters exhibiting distinctly non-linear heat outputs at varying temperatures, the lifestyle profile of the occupant and the buildings responsiveness to the heating system.

4 COMMISSIONING

4.1.1 The heat pump 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 heat pump manufacturer and the example given in Appendix B.

Closed-loop ground heat exchangers

4.1.2 The following commissioning procedure shall be followed for each installation:

a) Ground arrays (including header pipes and manifolds) shall be flushed in both directions as one system to remove all debris and purged to remove all air. The heat pump (and its associated pipework) shall be isolated from the ground heat exchanger during this process to avoid damaging the heat exchanger inside the heat pump.

b) The heat pump (and its associated pipework) shall be flushed and purged as another system, in isolation from the ground array system.

c) Once the ground array is free from debris and visible air bubbles/pockets, purging should continue on the entire system, including the heat exchanger inside the heat pump, for a at least 15 minutes with a minimum flow velocity of 0.6 m/s. This is to remove micro air bubbles formed on the inside of the ground array pipes.

Note: Minimum flow rates to achieve a velocity of 0.6m/s for various pipe diameters and collector types are given in Table 1. Flow rates significantly greater may be required to purge all debris and visible micro-air bubbles. Parallel loops or layouts with variable pipe geometry may require higher flow rates to achieve the required velocity.

Pipe Outer Diameter /mm	Recommended flow rate for flushing and initial purging		Minimum flow rate for purging micro air bubbles after flushing and initial purging
	Horizontal ground arrays (1m/s) /litres/min	Slinky ground arrays (1.5m/s) /litres/min	All ground arrays (0.6m.s) /litres/m
25	20	30	12
32	32	48	20
40	50	76	31
50	79	118	48
65	133	200	81

Table 1

d) Once purged of all micro-air bubbles, pressure test in accordance with BS EN 805:2000 section 11.3.3.4 to ensure watertight. The entire system, which usually comprises the heat pump, header pipes, manifold and all ground arrays shall also be pressure tested.

e) Sufficient antifreeze shall be added to the ground array thermal transfer fluid to protect from freezing down to at least -10°C. The quantity and type of antifreeze shall be appropriate for the system design, in particular with respect to the flow rate stipulated by the heat pump manufacturer; the viscosity of the finished thermal transfer fluid; and the choice of ground array circulation pump.

f) A quantity of biocide recommended by the manufacturer and/or supplier of the antifreeze shall be added to the ground array thermal transfer fluid.

g) Two separate, random samples of the commissioned thermal transfer fluid should be tested using a refractometer to confirm that freeze protection down to at least -10°C has been achieved. Evidence should be provided to the customer that this has been achieved.

Note: Further guidance on commissioning ground loop heat exchangers is published by the Ground Source Heat Pump Association (www.gshp.org.uk).

5 PUBLICATIONS, REFERENCE AND FURTHER READING

The below lists are provided so that 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:

- MIS 3005 – D
- MIS 3005 – I
- MGD 007
- BS 7671:2018+A1:2020 Requirements for Electrical Installations (IET Wiring Regulations Eighteenth Edition). Available from British Standards Institution (BSI): www.bsi-global.com or The Institution of Engineering and Technology (IET): www.theiet.org/publications/
- GSHPA standards
- BS EN 805:2000
- Approved Document G3 "Hot Water Supply and Systems" (England and Wales)
- Hot Water Association Specification HWA 002:2020: Hot water storage vessels for Domestic Purposes for use with Heat Pumps
- BS EN 12831-1:2017 Heating systems in buildings
- CIBSE Domestic Heating Design Guide. A CIBSE publication
- Closed-loop Vertical Borehole – Design, Installation & Materials Standard Issue 1.0 2011 www.gshp.org.uk
- "Design of low-temperature domestic heating systems – a guide for system designers and installers", 2013, BRE Trust publication FB59, www.brebookshop.com
- EN 806-5:2012: Specifications for installations inside buildings conveying water for human consumption
- BS EN ISO 52016-1:2017 Energy Performance of buildings – energy needs for heating and cooling, internal temperatures and sensible and latent heat loads. Calculation procedures
- EN 8558:2015 Guide to the design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages. Complementary guidance to BS EN 806-5:2012
- Environmental good practice guide for ground source heating and cooling. GEHO0311BTPA-E-E. Published by Environment Agency 2011 www.environment-agency.gov.uk
- Guide A: Environmental Design. A CIBSE publication
- HSE Approved code of practice (ACOP) L8 - The control of legionella bacteria in water systems approved code of practice and guidance
- MCS 012 – Product Certification Requirements: Pitched Roof Installation Kits.
- MCS 022 – Ground heat exchanger look-up tables. Supplementary Material to MIS 3005.
- MCS 021 – Heat Emitter Guide.

- MCS 031 – MCS Heat Pump System Performance Estimate
- "Report for DECC: Measurement of domestic hot water consumption in dwellings", Energy Monitoring Company, March 2008. Available from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48188/3147-measure-domestic-hot-water-consump.pdf
- The Compliance Certificate template for heat pump systems.
- CP2: Surface water source heat pumps — a Code of Practice for the UK (CIBSE, 2016)

APPENDIX A – 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:	
Post Code:		Contact No:	
Email:		Email:	

Product Information			
Heat pump type:		Manufacturer:	
HP Model No:		Serial No:	
Indoor Model No:		Serial No:	
Interface Model No:		Serial No:	
Installed as per manufacturer's instructions:			

Pre-commissioning Checks - Electrical							
Electrical supply (single/three phase):		Incoming Voltage					
Resistance to earth (L-E):	Ω	L1-N	v	L1-E	v	N-E	v
Short circuit test (L-N):	Ω	L2-N	v	L2-E	v	L1-L2	v
Visual condition of installation:		L3-N	v	L3-E	v	L1-L3	v
All sensors checked and reading correctly:						L2-L3	v

Heat pump control parameters					
Running Mode (Auto/Man/Eco):		Comp start (min):		Legionella cycle heat source (1):	
Heat Curve setting:		Collector pump setting:		Type of auxiliary heating (1):	
Max flow temp (MAX):	°C	CH pump setting:		Max auxiliary power (1):	kW
MAX at outdoor temp:	°C	DHW start:	°C	Auxiliary bi-valent point:	°C
Min flow temp (MIN):	°C	DHW stop:	°C	Aux heat meter reading (kWh):	
MIN at outdoor temp:	°C	Legionella cycle temp:	°C		
Heat stop temp:	°C	Legionella freq (days):			

Heat pump running data					
Outdoor:	°C	Source in:	°C	Superheat:	K
Indoor:	°C	Source out:	°C	Subcooling:	K
Flow:	°C	Discharge:	°C	TEV inlet:	°C
Return:	°C	Suction:	°C	DHW temp:	°C
HP running hours:		DHW running hours:		Aux heater running hours:	
kWh meter 1 reading:		kWh meter 2 reading:		Heat meter reading (MWh):	

(1): Where more than one back-up or auxiliary (supplementary) heat source exists please identify clearly in "Technicians Comments" including if bi-valent or co-valent

Absorber (ASHP only)

Antifreeze make & type:		Anti-vibration feet fitted where req:		Clearance around unit	
Freeze protection:	°C	Condensate drainage suitable:		Back:	mm
Correct clearance around unit:		Evaporator clear of debris:		Front:	mm
Installed on suitable base/bracket:		Insulated and vapour sealed:		Right:	mm
SPLIT SYSTEMS ONLY: System evacuated and refrig charged by F Gas registered operative:				Left:	mm
Refrigerant No and charge:			kg	Below:	mm

Collector (GSHP only)

Type of ground collector:		Header pipe diameter:	mm	Freeze Protection to:	°C
Total No of loops/boreholes:		Pressure tested to BS EN 805:		Expansion vessel pre-charge:	bar
Total length of collector:	m	System flushed & purged:		Collector system pressure:	bar
Collector pipe diameter:	mm	Biocide used:		Insulation vapour sealed:	
Total length of header:	m	Thermal Transfer Fluid make & type:		Collector installed to design:	

Central Heating System

Emitter types:		Heating (HTG) ΔT:	K	Inhibitor/anti-freeze used:	
System pressure:	bar	Strainers/filters clear:		HTG system purged of air:	
Expansion vessel pre-charge:	bar	HTG System flushed and cleaned:		DHW cylinder volume (litres):	
Safety relief valve setting:	bar	HTG System cleaner used:		G3 commissioning cert completed:	
Buffer store volume (litres):		HTG system water treated:		System installed as per design:	
Circulation pump setting:		Do all emitters heat up evenly with a similar ΔT across F&R:			

Heating system controls

Type of HTG controls installed:		HP control (demand or degree minutes):	
Have the controls been setup as per design:		HTG control (HP or 3rd party):	
Have the controls been demonstrated and explained to the customer?		DHW control (HP or 3rd party):	
Has the customer been provided with all documentation required by MIS 3005 D & I?			

Technicians comments

Technicians Signature:		Date:	
Customers Signature:		Date:	