MEHNA - Heat Network Installer Training – Installation, commissioning and maintenance of Heat Interface Units for the Heat Network Technical Assurance Scheme.

The Manufacturers of Equipment for Heat Networks Association is a not-for-profit trade association, representing and promoting the interests of equipment manufacturers involved with all aspects of a heat network since 2018 and is part of the Energy Utilities Alliance.

About this guide

Heat Networks are a key part of UK Government policy to decarbonise heat demands for both domestic properties and non-domestic buildings, with a target to reach 20% UK wide coverage by 2050.

This guide has been produced to help those installing, commissioning and maintaining heat interface units who have attended HIU training courses. It has been written as a guide for reference use in the field and to aid continued learning.

HNTAS

The Heat Network Technical Assurance Scheme is a Regulation that was introduced under the Energy Act 2023. Its purpose is to ensure good heat networks are built that give reliable outcomes for consumers. Under HNTAS, the installation and commissioning of HIU is regulated with a requirement to verify the installation is as intended and that commissioning has been completed and recorded. This guide gives practical examples of how HNTAS requirements might be demonstrated in the field to an independent Assessor. However, it remains at the Assessor discretion as to how compliance should be demonstrated.

TS1 – Technical Standard

The technical standard that will replace *CIBSE CP1 Heat Networks: A Code of Practice for the UK* will be known as TS1 Heat Network Technical Standard. This code of practice sets out much of the detailed requirement for the complete design, construction, commissioning and operation of a heat network and as such the HIU installer should be familiar with the contents.

BS 8635 – Part 2

This new standard will cover the installation of HIUs and is expected to be released October 2026. It aligns with HNTAS and TS1 requirements to help support good installation practice for HIUs.

Disclaimer

Heat Network technology is continually evolving, as is Government policy and Regulation. This guide has been written with the best available knowledge at the time of what the industry recognizes as Best Practice, but this may change over time, and it is important that the installer keeps up to date. Therefore, the guidance contained within this guide may be subject to change and **manufacturers guidance should always be followed as preference.**

Technical Authors

This guide has been jointly authored by:

Pete Mills (Bosch Thermotechnology, MEHNA and BSi RHE/30)

John Neal (Bosch Thermotechnology Training Team)

Richard Davies (Bosch Thermotechnology, HIU specialist)

Peer reviewers and contributors

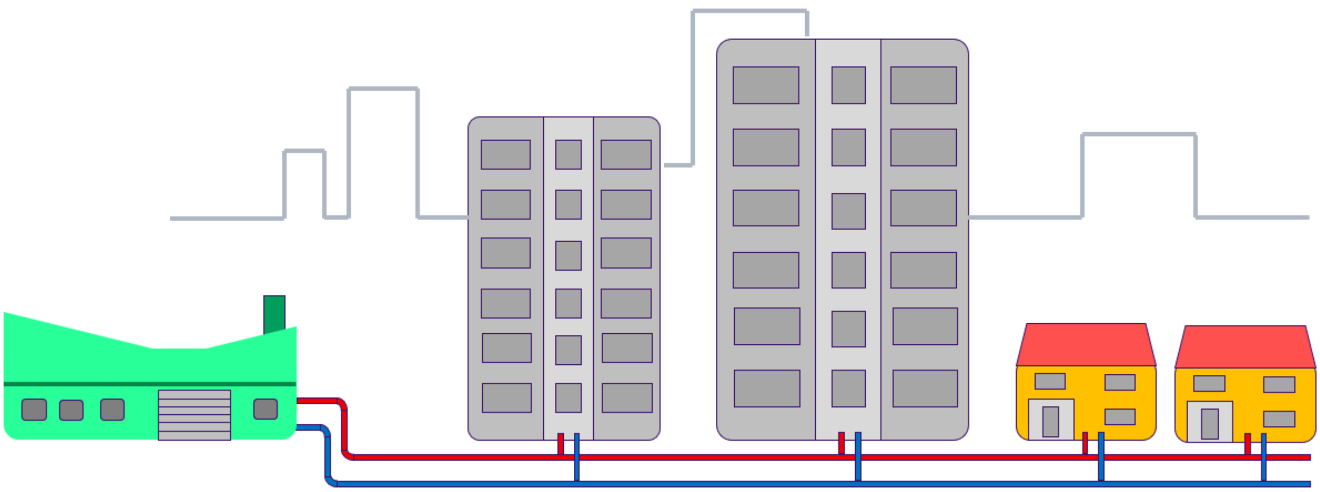
Demi Bozkurt	MEHNA
Mick Casey	Deep Water Blue
Neil Gatland	Herz
Richard Hanson-Gravelle	Heatweb Solutions UK
Gareth Jones	Fairheat / BESA / BSi RHE/30
Phil Jones	DESNZ
Jason Lawrence	Heatweb Solutions UK
Charlie Mowbray	Group – Atlantic (Ideal)
Steve McConnell	MEHNA / BSi RHE/30
Ed Morris	Altecnic
Adam Perry	YGHP
Ian Roberts	Adey
Ian Robinson	Baxi / BSi RHE/30
Richard Ryland	Switch 2
Neil Stead	Intatec
Ian Spencer	Vital Energi / BSi RHE/30
Ian Trott	Baxi
Neil Watson	Adey / BSi RHE/30

The MEHNA HIU installer guide for HNTAS covers key areas that an installer of the Consumer Connection (Heat Interface Unit) should know when installing indirect and direct HIU within 4th generation heat networks serving domestic and light commercial premises.

Contents

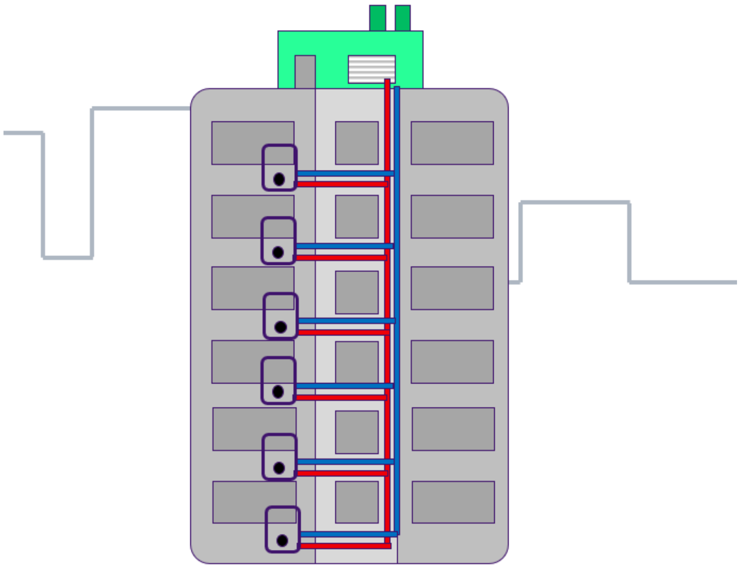
How a Heat Network Functions

Types of heat network and elements



There are two main types of heat network known as Communal heat networks and District heat networks. A district heat network will consist of an energy centre where heat is produced with two or more buildings that are supplied from the energy centre. A system of insulated pipes connects the buildings to the energy centre, sometimes run underground and sometimes within buildings. At the building connection a substation may be used to separate the two systems. Each building will have a building level heat meter, and individual dwellings will also have a heat meter to measure the energy used for billing purposes. Each consumer will typically have a heat interface unit that controls the production of hot water and space heating. Consumers are billed for the energy they have used.

A Communal heat network is one that is contained solely within a single building that may also house the energy centre.



The insulated pipes that supply heat to each dwelling are run within the building envelope. In all other respect they operate like a district heat network.

The parts of a heat network are defined by HNTAS and separated into ***Elements***.

- Energy Centre (the central plant room where heat is generated, pumped and stored)
- District Distribution Network (the main pipes from the Energy Centre that are connected to multiple buildings, often run underground)
- Substation (hydraulic separation that is typically a packaged unit housed in the basement or ground floor of a connected building)
- Communal Distribution Network (the insulated pipes that are run within the individual building)
- Consumer Connection (typically a Heat Interface Unit that controls the flow of heat to produce hot water and heating within a dwelling)
- Consumer Heat System (the space heating system that heats a single dwelling)

In a heat network, heat is produced in the Energy Centre and often stored for a period in a Thermal Store. From here the heat energy is transferred by water that is pumped using variable speed-controlled pumps around the network. The network pipes terminate either at a Substation to a building or at the Consumer Heat Connection (HIU). In many cases HIUs will operate a keep warm function when in standby, to ensure they are ready to produce hot water within a reasonable response time when a tap is opened. The HIU controls the temperature of hot water and space heating to maintain consumer comfort levels. Heat use is measured and monitored by the use of consumer level heat meters in each dwelling.

Heat Network Connection to a dwelling

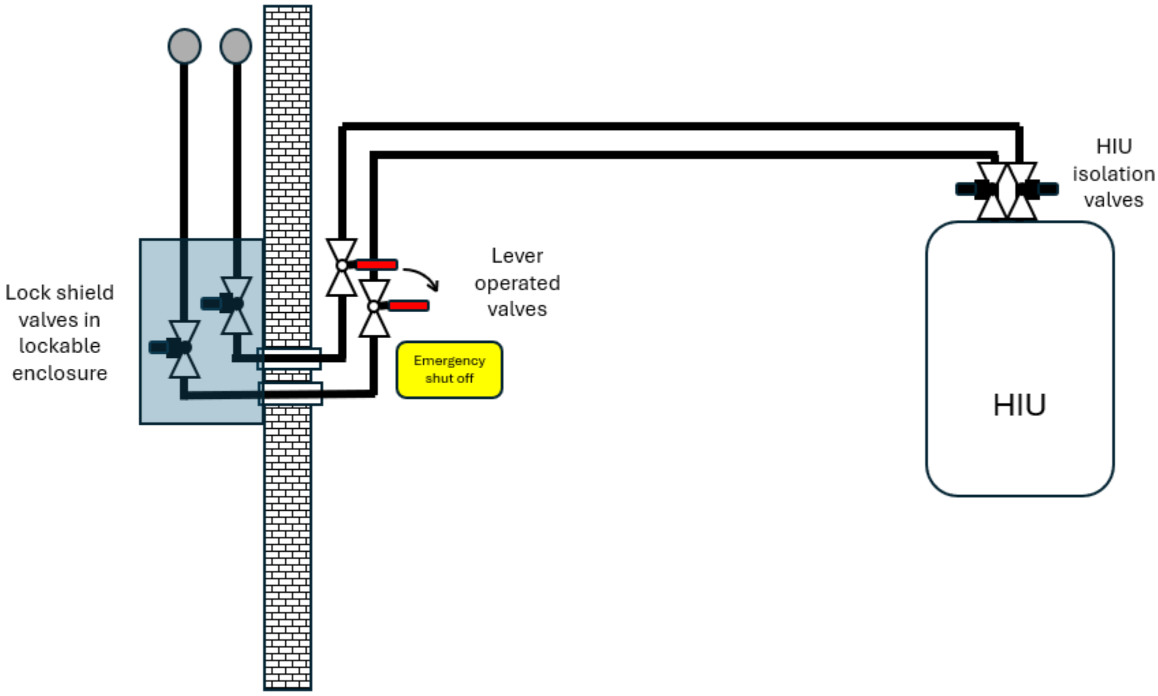


Fig 1 – example of the isolation arrangements for each dwelling, including emergency isolation valves for use by the consumer. Other arrangements are possible.

At the boundary of each dwelling, the heat network pipes should provide a means of isolation. To comply with the TS1 standard, new dwellings should have both external isolation and internal emergency isolation means. Depending on the arrangement of dwellings, this could mean having external service valves that are protected from unauthorised use and internal isolation valves that are located as near as possible to the entry into the dwelling, in an accessible position that is labelled.

For existing heat networks that are undergoing retrofit, where possible a means of isolating the heat networks supply, other than the HIU service valves, should be incorporated as a minimum.

HIU installation

The primary purpose of installation is to ensure all components that make up the Consumer Connection and Consumer Heat System are installed and work to the design intent. The installer should not vary the design without approval from the responsible system designer, as this may affect the efficiency of the network and ultimately compliance with HNTAS. Future installation of HIUs should conform to BS 8635 – Part 2 (for release October 2026).

Vocational competence

Whilst currently no recognised formal qualification exists for the installation of an HIU, it is expected that the installer should have the necessary vocational competence (as required under HNTAS) that would be gained from equivalent plumbing qualifications or prior experience within the heating industry. As a minimum the installer should complete the HIU manufacturers training course for the HIU being installed.

Method statement

Where multiple HIU are to be installed at a specific project site, a method statement should be created by an experienced competent person covering the installation and commissioning process. The competent person should hold an appropriate category as set out within TS1. For retrofit projects, the method statement should consider any specific requirements or restrictions of the network operator and should include flushing and filling of the HIU and pipework. The method statement should be issued prior to installation to ensure the installer can become familiar with the requirements before commencing any work. The method statement should also support the risk assessment process for the works and will aid consistency across multiple installations.

Handling and storage

HIU and their associated equipment should be stored carefully to avoid damage occurring when on site. They should be stored in a dry, secure environment that will keep them safe from extremes of temperature.

The manufacturers handling instructions should be followed at all times to ensure damage does not occur. For example, packaging designed to protect the HIU whilst in transit should be kept in place until the HIU is adjacent to the installation location. All packaging should be removed carefully and disposed of correctly.

When handling HIU, refer to the manufacturers handling instructions to ensure there is no risk of personal injury due to lifting or dropping the HIU.

Installation instructions

On opening the HIU packaging, ensure the manufacturer's instructions are retained along with any other provided documentation. User instructions should be retained for hand over to the consumer at a later stage along with any performance and environmental information.

Before carrying out any steps of the installation, the installer should familiarise themselves with the instructions and stages of installation.

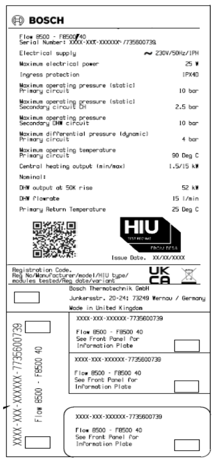
HIU types

There are many possible HIU types (see BS8635 – Part 1 2024 Annex B for a full classification), but the majority are either instantaneous DHW with indirect space heating (sometimes called "Twin Plate"), or instantaneous DHW with direct space heating (sometimes called "Single Plate"). These types are commonly known as indirect and direct HIU. Although there are other types that support cooling and stored hot water, this guide will only consider standard indirect and direct HIUs for use with 4th generation heat networks.

BESA HIU Test Regime

The BESA HIU Test Regime has been established since 2018 as a method of testing performance of HIUs to a common standard. In 2020 the Test Regime was mandated by *CIBSE CP1 Heat Networks: A Code or Practice for the UK* and in 2025 it was adopted as a requirement within TS1 and HNTAS.

HIUs that have been tested to the 2023 version 3.0 standard or later version can be identified from the appliance data label or an external casing label declaring the HIU has a published set of test results on the BESA website.



A QR code links the HIU to be installed to the published set of results. If there is no label or link, the HIU should not be installed until it has been confirmed with the network designer and HIU manufacturer. The test modules passed should be relevant for the primary flow temperature with those above 65°C using the high temperature results and those below 65°C, the low temperature results.

Planning the installation

Before any work is carried out to install the HIU, the installer should consult the method statement and plan the installation, gathering all the additional essential information. The following information will be needed to confirm the HIU to be installed is suitable for the design.

- Operating maximum temperature (primary flow)
- Design primary return temperature
- Design operating differential pressure (kPa)
- Design DHW temperature
- Design DHW flow rate (Instantaneous HIU)
- Design space heating flow temperature
- Design space heating return temperature

Check the selected HIU can operate safely within the design operating conditions, such as working pressure, differential pressure, maximum flow temperature and ambient temperatures.

Installation location

The suitability of the HIU installation location should be checked. HIUs should not be installed over a bed or adjacent to an exit to the dwelling, when that is the only means of escape from the dwelling. They should also not be installed in a wet space where they could be subject to direct water spray, unless suitably protected.

Ensure that the installation location will give the needed manufacturers service clearances and that the wall structure can take the weight. The HIU should be accessible for service and maintenance and for the consumer to read the heat meter, if located within the HIU.

Wall hung HIUs should not be installed above electrical isolation switches, fused spurs, sockets or consumer units.

The location of the HIU may have already been selected by the designer or architect. Consideration should be given to the pipe runs connected to the HIU, especially the volume of the DHW pipework to the taps and outlets, as any increase in volume will lead to delay in hot water at the set temperature reaching the outlets.

System pressures should be checked to ensure the HIU is suitable for use at the design pressures and that the design does not exceed the safe pressure limits set out in BS 8635. Primary (District Heat Network - DHN) operating pressure should not exceed 16 bar with the pipework taking the shortest route to the HIU within a dwelling. Direct HIUs should not exceed operating pressures of 6 bar within the consumer heat system (i.e. radiators).

Pipework connections

Primary network supply pipework (DHN) must be fully insulated with the design specified thickness as close as possible to the HIU, but at least within the final 200mm. For practical reasons, the final insulation can be reduced to 30mm if it is no further than 200mm from the HIU. This gives enough room to arrange pipe offsets to allow for the main insulation thickness. Retrofit installations may have to compromise on insulation thickness where it is not practical, but every effort should be made to use the

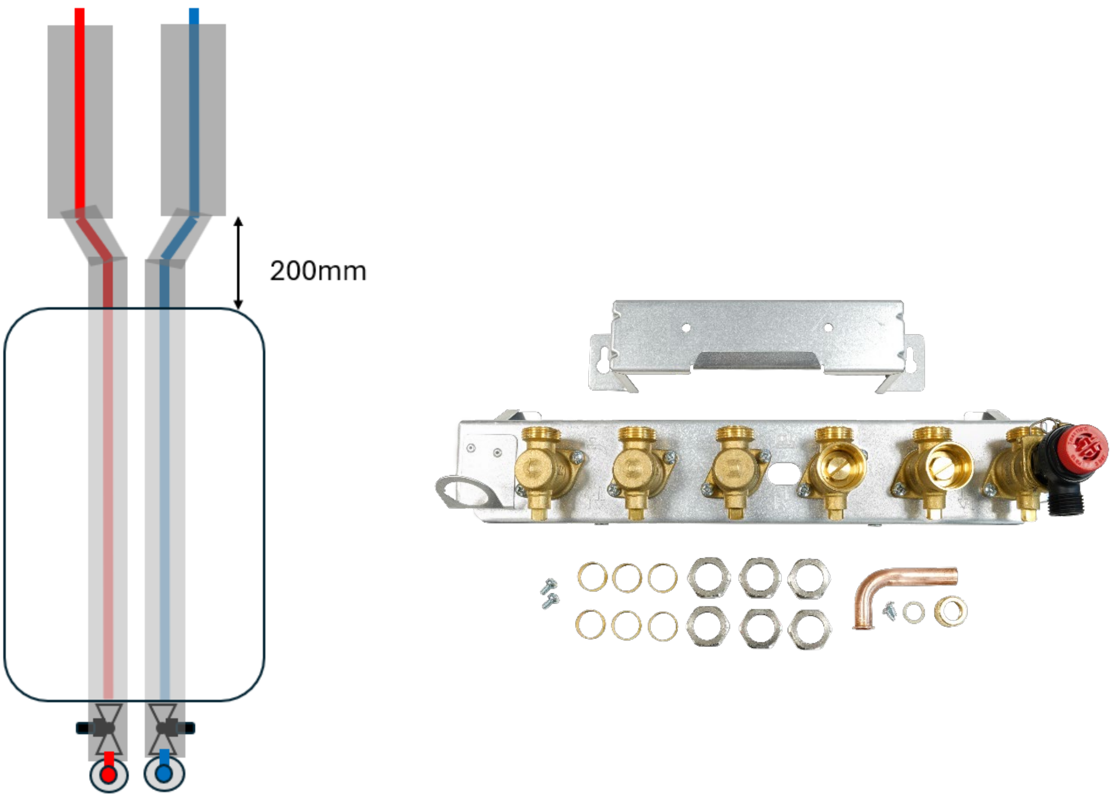


Fig 2 – example primary pipework connection and pre-fix manifold thickest possible insulation. Pay close attention to the pipe support arrangements to ensure there is no thermal bridging, which normally means brackets that support around the outside of the insulation, rather than directly on the pipe.

Flushing bypasses may be a requirement of the design and where these are needed, they should be installed between the Communal distribution network (DHN), flow and return pipes adjacent to the HIU. Flushing bypasses protect any vulnerable components within the HIU during flushing operation. TS1 requires that only temporary flushing bypasses are used. The hose or interconnecting pipe must be removed once flushing is complete and any open connections capped.

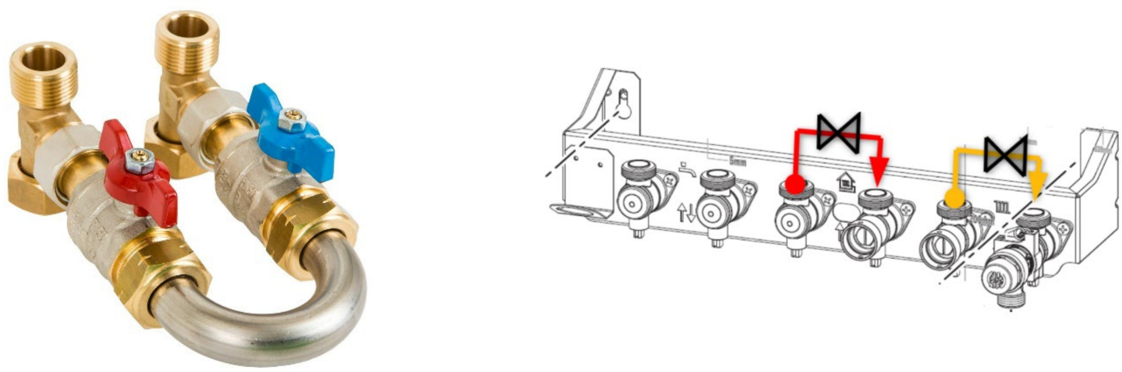


Fig 3 – example of flushing bypass that can be removed and how manifolds can be used temporarily (image Switch 2)

Flushing can also be achieved by flushing directly to waste using the manifold valves or using a temporary connection between the DHN flow and return pipe work.

Where pipes are to be run vertically upwards from the manifold, observe the manufacturer’s instructions where pre-formed kits are used. All high points in pipework shall have a means for venting trapped air and all low points have drain cocks to allow draining.

Mounting the HIU to the wall

Refer to the manufacturer’s instructions to ensure the location of the HIU conforms. Examine the wall structure and select suitable fixings that are recommended for the wall type and weight of the HIU. Where provided, use the manufacturer template to mark out the fixing points and at the same time confirm the clearances meet manufacturers requirements.

For masonry walls, drill the fixing points having first checked for hidden cables and pipes. Mount the HIU first fix rail (if provided) and hanging wall bracket as set out by the manufacturer.

Pipework connections

The HIU is now ready to receive the pipework connections to the first fix rail. For vertical rear pipe routes, use the accessory kit provided by the manufacturer. Connect all pipes to the HIU confirming the flow and return directions and hot and cold inlet directions. Crossed pipework connections are a common problem, and good labelling can help to reduce the risk.

DHW pipework layout

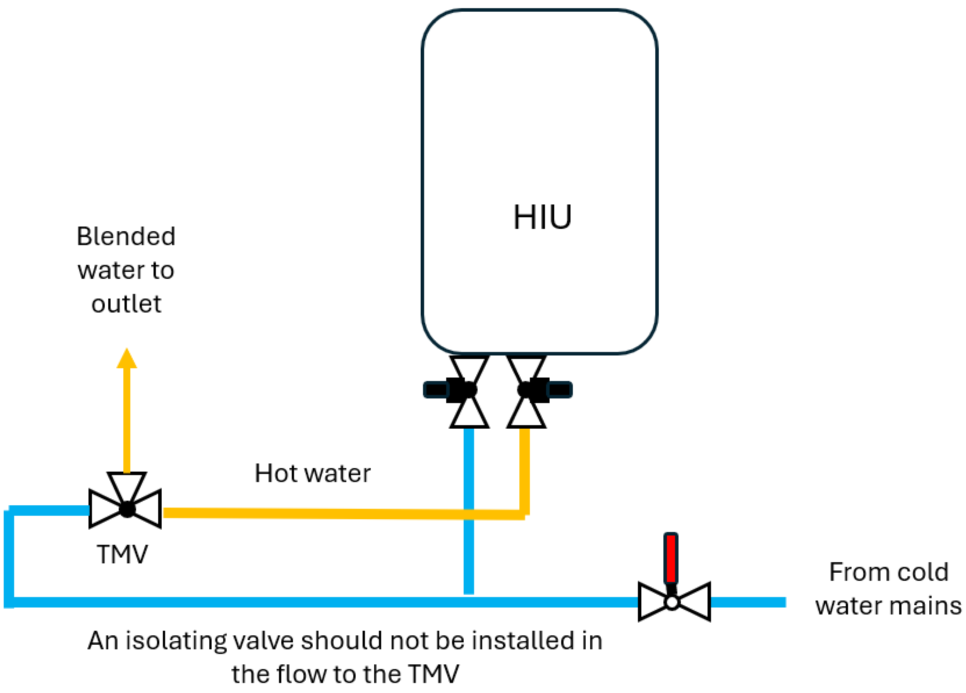


Fig 4 – example pipe layout following CIBSE guidance

Pipework for hot and cold-water supply should be arranged to ensure that any Thermostatic Mixing Valves (TMV) take their cold-water supply after the HIU, as shown in the *CIBSE Guidance note: Domestic hot water temperatures for instantaneous heat interface units* to ensure the TMV operation remains safe under a failure of the cold-water supply.

The length of all pipework runs should be minimised where possible with the volume ≤ 1 litre. Make sure that the DHW pipe sizes are not increased from the design, as this may increase the volume and lengthen the hot water delivery time to the outlets.

Cold water supply

The cold-water supply should be checked to ensure sufficient pressure and flow is available to provide hot water at the design flow rate. Many systems in blocks of flats with multiple floors will have a locally Boosted Cold Water Supply (BCWS). The supply may contain a pressure reducing valve, which should be adjusted to suit the required design flow rates that are likely to be experienced in normal operation for the individual dwelling.

Space heating - Radiator systems

Radiator systems designed for use with HIU within heat networks should be sized for a flow temperature of 55°C for new build systems in accordance with Building Regulations Part L or Scottish Government. (2024). *Building Standards Technical Handbook - Domestic*. The temperature difference (delta T) between the flow and return to radiators should be kept as wide as possible (for low temperature systems aim for 20K to 25K) and at least 15K. Wider delta T means lower return temperatures, which is good for the network efficiency. It also means that the flow rates through radiators is reduced, making it hard to balance using simple lock shield radiator valves. Radiators should therefore incorporate pressure independent radiator valves or pre-settable radiator valves, which are typically also thermostatic. These types of valves can be pre-set for flow rates taken from the design. Record the settings at each pre-set radiator valve.

For retrofit systems, the space heating flow temperature should be kept as low as possible whilst ensuring the radiators sizes will still deliver sufficient heat for the dwelling heat losses.

The arrangement of radiator connections should be Top and Bottom opposite ends, with the flow entering at the top and return at the bottom unless there are technical constraints which would make bottom-bottom entry connections preferable. For smaller radiators Top and Bottom same ends is allowed. The thermostatic radiator valve head should be pointing horizontally away from the radiator to ensure good sensing of the room temperature.

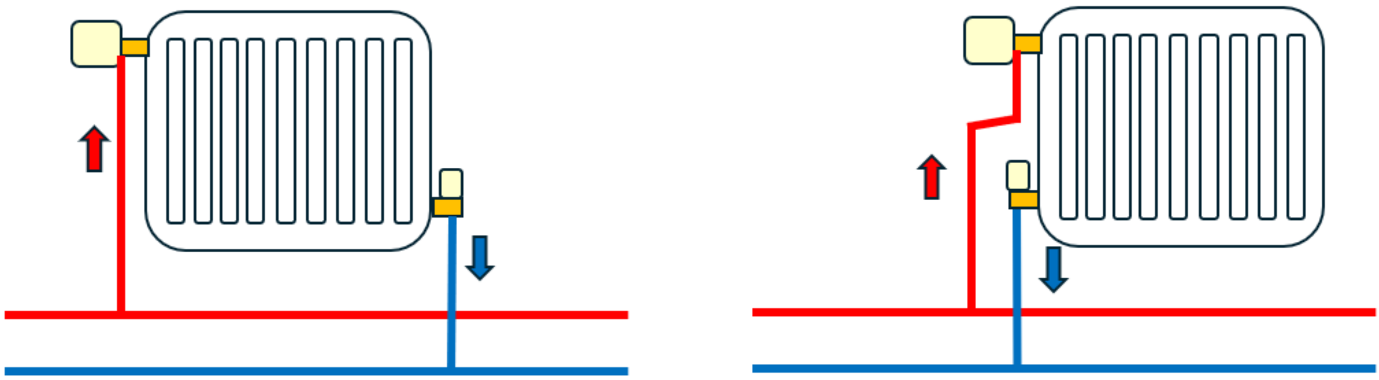


Fig 5 – radiator connection examples for TBOE and TBSE

The use of wet system towel rails should be avoided for heat networks since they give high return temperatures. It is better to use electric towel rails, but where wet systems are used, the towel rail should have a return temperature limiter valve fitted.

For direct HIU, consideration should be given to the protection of equipment downstream of the HIU from high differential pressures. Where these are likely to be experienced, a Differential Pressure Control Valve (DPCV) should be fitted.

Direct space heating systems should not exceed 6 bar working pressure.

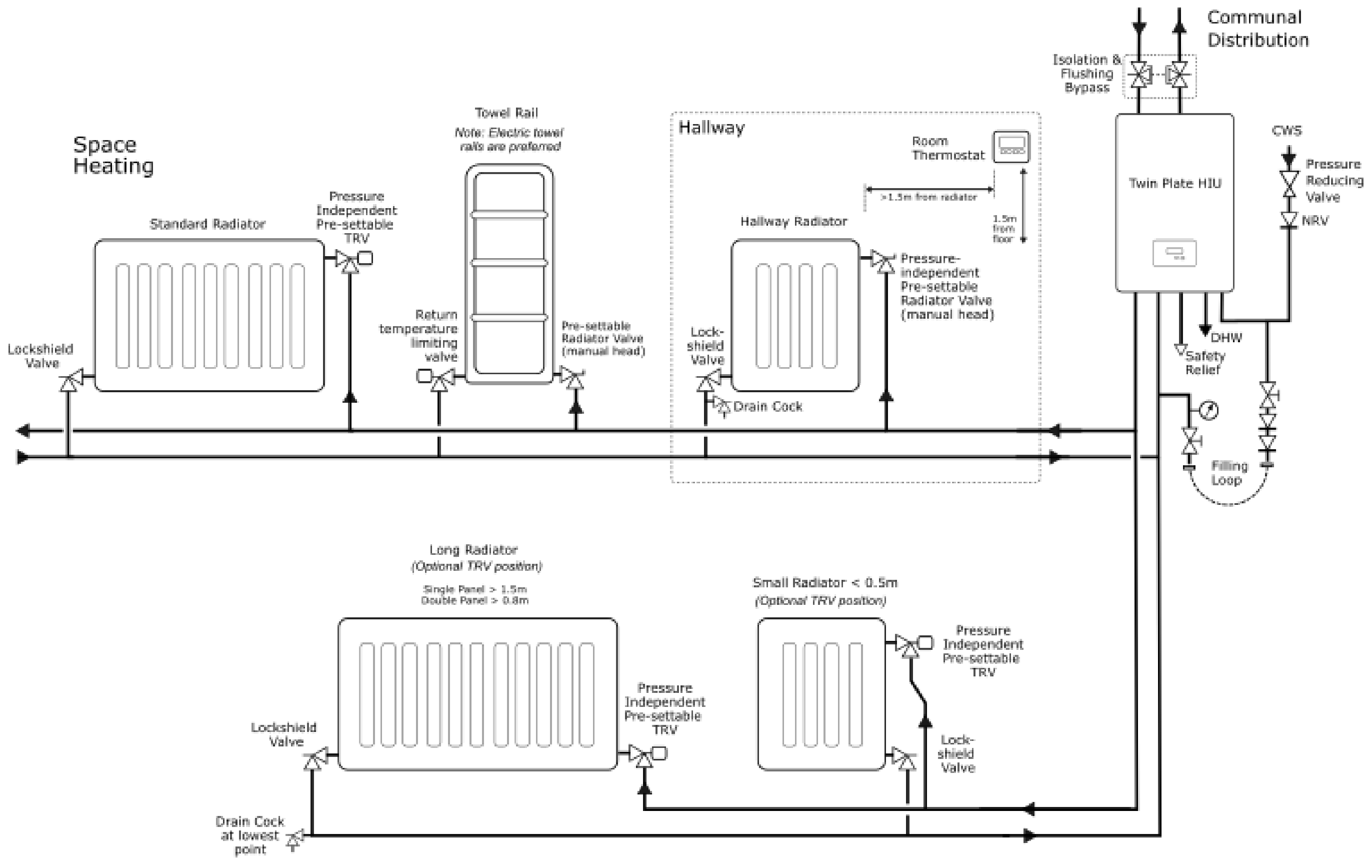


Fig 6 – example consumer heat system. Image (Heatweb).

Space heating – Underfloor systems

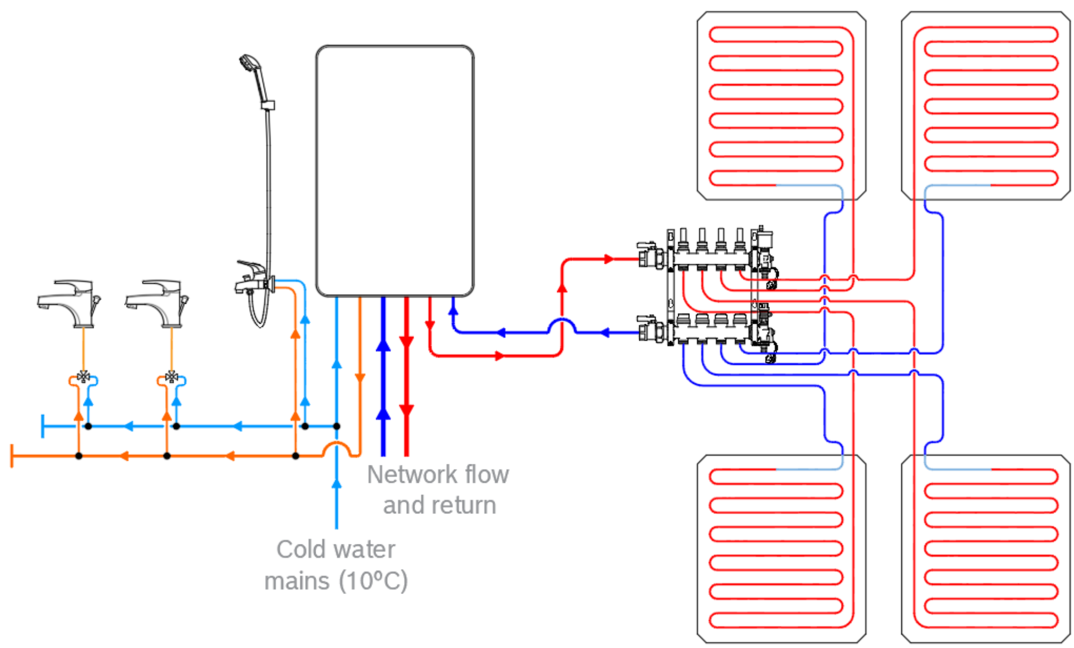


Fig 7 – example HIU with underfloor heating manifold

Underfloor heating systems are designed to operate at low flow temperatures typically <40°C which should ensure low return temperatures. The system types can be split into those with manifolds incorporating internal circulating pump and temperature mixing valve, and those that don't. For those manifolds with pump and mixing valve, the space heating flow temperature from the HIU may need to be at least 5K higher than the design flow temperature from the mixing valve, to ensure the correct operation of the valve. For manifolds without pump and mixing valve, the flow temperature is directly set from the HIU space heating temperature.

Underfloor heating floor screed protection

To protect vulnerable floor screeds, a high limit thermostat should be strapped to the flow pipe from the HIU to ensure space heating operation is disabled in the event of high temperatures, unless the HIU itself has an inbuilt limit thermostat. Typically, this would be set 10K higher than the underfloor design temperature and must be both tamperproof and have a manual reset. The thermostat should preferably be a retained immersion type, or optionally securely strapped to pipework using multiple heat-resistant ties.

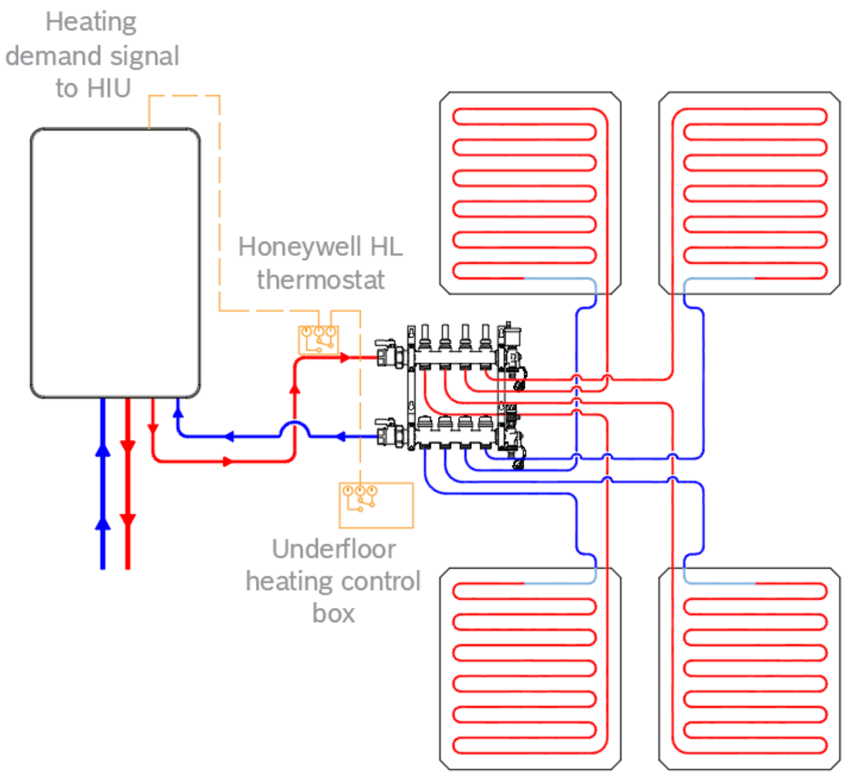


Fig 8 – under floor heating screed protection thermostat example

The high limit thermostat can be wired in series with the heat demand signal from the room controller to the HIU, or to a dedicated contact at the HIU controller where this is available.

Pressure testing and flushing

As part of the acceptance testing requirements, the Consumer Heat System should be pressure tested once installed or where major renovation has taken place. System flushing should be carried out to the prescribed standard (BS 7593) and with the HIU protected in accordance with the manufacturer's instructions using a temporary bypass.

Remove flushing loops afterwards and cap off any valved connections. Remove and clean any strainers that were part of the flushing process.

Refer to the ICOM/MEHNA water treatment and Conditioning of Non-Domestic Systems and Heat Networks for further advice about system flushing and water treatment.

Refer to the BESA TR/6 Site Pressure Testing of Pipework: Guide to Good Practice for pressure testing.

System filling arrangements

For direct HIU, the space heating system is filled directly from the heat network water. The primary filter internal to the HIU also protects the space heating system from debris, whilst the heat network water treatment also treats the space heating system.

For indirect HIU, an approved filling method must be provided to fill the space heating system. This can be achieved using a removable filling loop incorporating a double check valve, filling directly from the Cold-Water Service in line with Water Supply (Water Fittings) Regulations 1999.

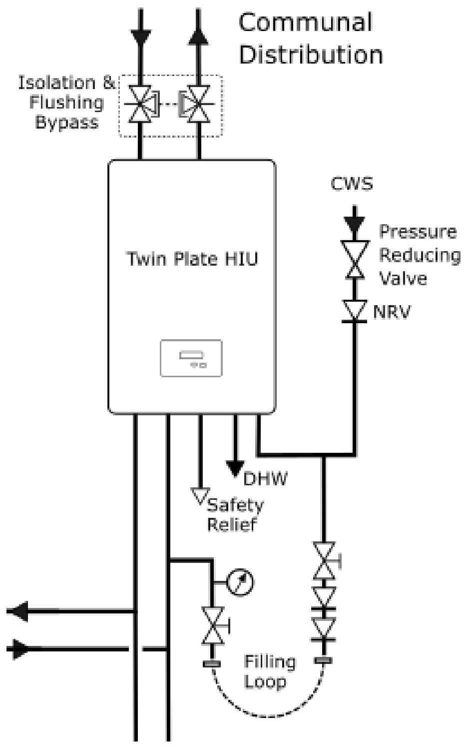


Fig 9 – indirect system filling method example. Image (Heatweb).

Alternatively, an approved filling method using treated water from the heat network can be used to fill the space heating system. If this is the case, the available system pressure should be checked to ensure it is sufficient to fill the consumer heat system to the required cold fill pressure. When filling multiple systems in this way, the network operator should be consulted to ensure that the network filling equipment can handle the volume of water required and that the action will not set off alarms.

Pressure relief valve (PRV) termination

For indirect HIU, a safety pressure relief valve (PRV) will be part of the HIU equipment. The discharge pipe from the PRV must terminate in a safe place in accordance with the manufacturer's instructions and BS 8635 – Part 2.

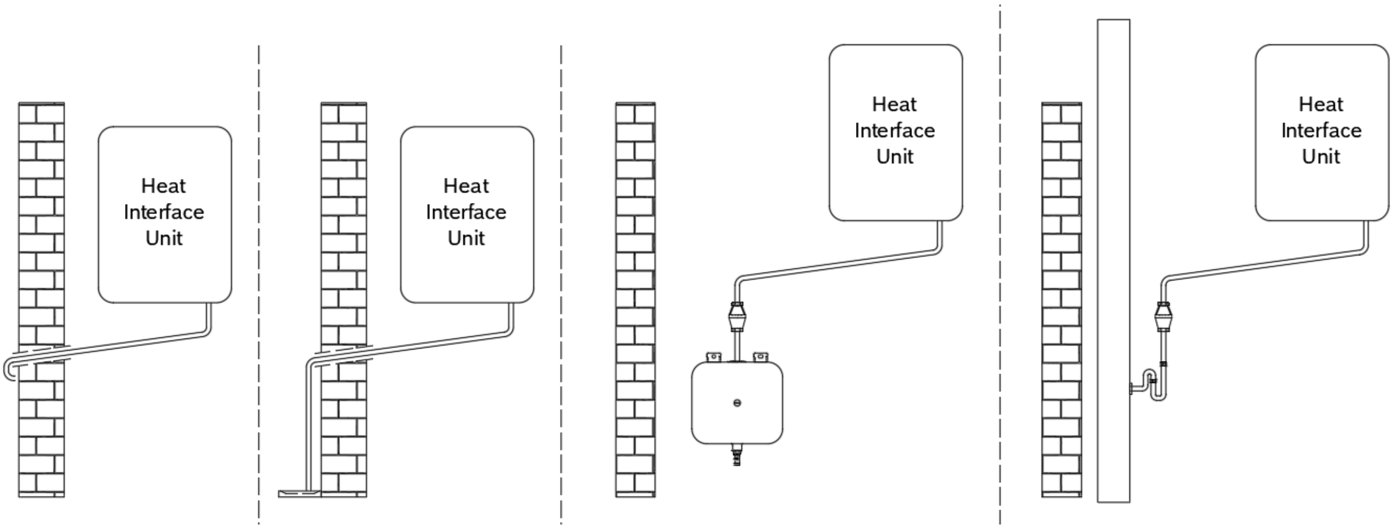


Fig 10 – safe PRV discharge pipe arrangements

Safe termination points can be terminations outside the building that will not cause splashing or harm to anyone if a discharge was to occur. Internally, the PRV may discharge into a waste system and must be kept clear of any electrical components or consumer units. Where internal waste systems are used, a suitable water trap with a minimum 75mm water seal should be incorporated to stop smells permeating into the dwelling. The trap should be filled with water at commissioning and checked during maintenance.

For systems with heat network supply temperatures above 85°C, some manufacturers may require a tundish with a clear protection cover to prevent splashes in the event of a discharge.

Safety discharge vessels

Where the HIU is installed internally within a dwelling with no access to outside walls or internal waste pipework to allow a safe discharge point for the PRV, a safety discharge vessel should be used only where the following conditions are met.

a. The heat network flow temperature is ≤ 85 °C
b. The HIU is an indirect type with no stored hot water and the HIU manufacturer allows the use of a safety discharge vessel.
c. The operating pressure of the network supply is lower than the stated activation pressure of the HIU PRV.
d. The cold-water mains pressure is lower than the stated activation pressure of the HIU PRV.
e. The safety discharge vessel has sufficient volume capacity to accommodate the likely discharge in the event of a failure of the expansion vessel.

f. The safety discharge vessel is secured in place but removable to allow emptying.
g. The water level in the safety discharge vessel is visible and protected by a water limit switch interlocked with the HIU operation.
h. The filler loop for the tertiary system is removed once the system is filled.
i. A warning notice is fitted advising the operator to cease operation of the HIU if discharge water is observed in the vessel, and for a tertiary system requiring topping up via a filling loop, to check that the discharge vessel contains no water.

Electrical connections

With the HIU mounted on the wall and secured to the first fix rail, the electrical connections can be made at the HIU control unit by a qualified electrician.

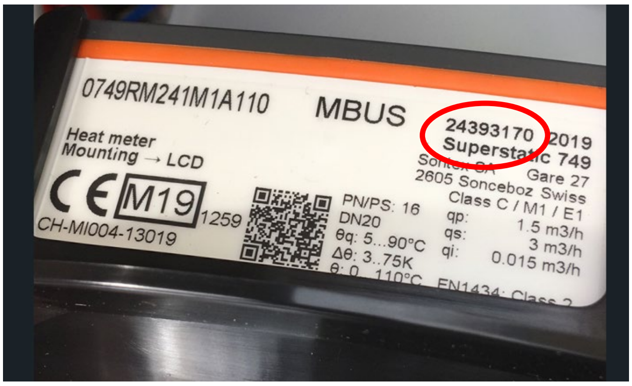
230VAC power supply should be provided from a **unswitched** fused outlet with a fuse rating of 3Amp, unless the manufacturer states differently. The outlet should **not be** positioned underneath the HIU to prevent risk of water damage. Earth bonding of pipework should be checked and confirmed.

External space heating controls should comply with the requirements of Building Regulations Part L, or Scottish Government. (2024). *Building Standards Technical Handbook - Domestic* providing time and temperature control. Observe the rules for large space heating circuits that exceed 150m^2 areas, which must be separated and controlled as individual zones. In this case, two port valves with external wiring can be used with a common switch live creating a demand for space heating at the HIU.

Heat meters

The heat meter is a certified and calibrated device for the purposes of recording the energy used by the consumer. The most common export systems in use are wired Mbus and Wireless Mbus. Wired Mbus cables are two core and should be connected to the heat networks metering and billing system. This may be a local Mbus network or an adjacent metering and billing connection box.

The responsible person for the heat metering system must ensure that the identification number taken from the heat meter is recorded against the dwelling it is installed within. The serial number can be obtained from the heat meter display if the meter is already in position where the label is hidden.



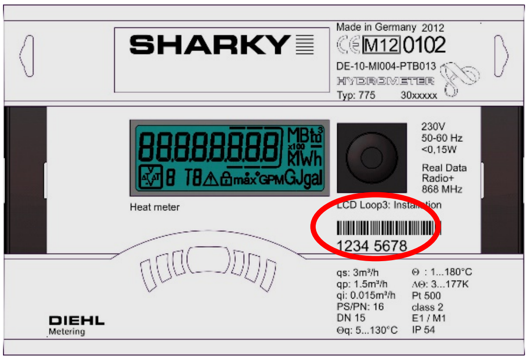


Fig 11 – heat meter serial numbers used for individual identification

Heat meters should not be changed or swapped without permission from the heat network operator

Pre-payment connections

Pre-payment shut off is used by some heat network operators to temporarily stop the energy supply for heating and hot water where consumer credit has run out. Some HIUs have an internal pre-payment connection that can be used to close the internal control valves. The pre-payment connection should be wired to the heat metering and billing providers control box relay. During commissioning, the function should be checked.

Where an HIU has no internal prepayment connection available, an external solenoid valve can be used that fails to the closed position.

Pre-payment connections should be wired back to the billing providers equipment where this is local to the HIU. Functionality and compatibility should be checked with the individual billing provider during commissioning.

Commissioning

HIU Consumer Connection Commissioning

Prior to commissioning the HIU, it should be established that commissioning of the energy centre and distribution network has been completed, including flushing and water treatment. A method statement should be developed with the input from the responsible system designer and heat network operator.

At this stage the design conditions and settings must be known for the HIU, which should include the following:

- Operating temperature (primary flow)
- Design operating differential pressure (kPa)
- Design DHW temperature (50°C)
- Expected primary flow rate at design DHW maximum demand
- Design space heating flow temperature (≤55°C for new build)
- Design primary return temperature – DHW operation (<25°C)
- Design primary return temperature – Space heating operation (<40°C)
- Design primary return temperature – Standby operation (<45°C)
-

Prior to starting the commissioning, the installer must have been trained on the HIU type and have knowledge of the system type.

Filling and venting

Establish that the heat network (DHN) supplying the HIU has been flushed and treated. Remove and clean any strainers present in the primary flow to the HIU. Establish that the Cold-Water supply (CWS) (or where pressurised, the Boosted Cold-Water Supply BCWS) has been set, flushed and treated (if required). Clean any accessible strainers present in the CWS.

Operate the kitchen sink tap to flush air from the DHW supply, then operate all other outlets until water flows free of air.

Identify the method of filling the Consumer Heat System (radiators or underfloor) and whether this will be filled from the CWS or the primary heat network. Direct HIU are filled from the heat network without the need for any other method of filling. Indirect HIU should be filled using the chosen Water Regulations compliant filling method.

Observe the manufacturer's instructions for filling and venting. Establish power to the HIU and activate any service mode to open the HIU control valves during filling and venting for electronic HIUs.

Unless otherwise stated by the HIU manufacturer, space heating systems should be filled to between 1.5 and 2 bar and must be a minimum of 0.5 bar above the expansion vessel pre-charge pressure (the expansion vessel pre-charge should be lowered if needed). Where larger systems with multiple floors are encountered, reference should be made to BS EN 12828 to calculate the correct expansion vessel pre-charge pressure and cold fill pressure.

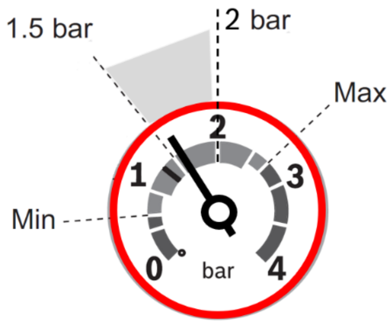


Fig 12 – analogue water pressure gauge showing safe working range

Operate the filling method and observe the pressure within the Consumer Heat System at the pressure gauge until it meets the design cold fill pressure. Vent the radiators or terminal units, topping up the pressure again to the cold fill pressure as needed. Vent all high points at the HIU until free of air. Return the HIU out of service mode.

For indirect HIUs, operate the HIU pump by creating a heat demand. Further vent the radiators or terminal units, HIU high points and recheck the cold fill pressure. Return the service setting to the required space heating flow temperature.

Pressure differential test

Prior to commencing commissioning of the HIU, a differential pressure (dP) test should be made to ensure sufficient dP is available at the HIU. If the dP is outside the design parameters, this can result in incorrect commissioning settings, which is particularly important for mechanical HIU. Once the test is completed, where DPCV valves are present, these should be adjusted (if intended by the HIU manufacturer) prior to commissioning.

For a pressure differential test, it is necessary to have Binder test points or similar, installed near to the HIU in the primary flow and return. Alternatively, temporary connection points can be made at the HIU filter DOC and primary return DOC.

Calibrate the test equipment as instructed by the manufacturer and insert the probes into the self-healing test points. Monitor the differential pressure for a period of 5 minutes noting any significant fluctuations. Compare the measured differential pressure against the design intent.

Typically, there should be at least 50 kPa at the HIU, however in some circumstances good operation may be possible with lower differential pressure.

Record the findings in the commissioning checklist including any rectification measures taken.

Set points

Set the required temperatures for the space heating and hot water in accordance with the design. This will typically be 50°C for hot water and space heating at least 5°C below the primary flow temperature. If the space heating temperature is set higher than the primary flow temperature it cannot be reached, the HIU may indicate an error. Make any other set point adjustments following the manufacturer's instructions. This may include

- Keep warm activation
- Keep warm temperature
- Return temperature limiter activation
- Return temperature limiter temperature
- Pump settings

Pump Settings

Refer to the manufacturer's instructions for the appropriate pump setting for the system size and type. The available head from the pump should always be sufficient, but at the same time not excessive, for the system resistance and requirements of the pressure independent thermostatic radiator valves. Refer to the valve manufacturers guidance. Always start at the lowest setting and increase if necessary.

Record all set points on the commissioning check list.

Pipe insulation and bypasses

Prior to carrying out any tests, walk the length of the primary pipe run within the dwelling to ensure it is fully insulated to the specified thickness and that all valves, flanges and fittings are covered.

Check that any flushing bypasses have been closed, capped and the bypass pipe removed. Ensure insulation of the bypass is replaced where it has been removed when in use.

If adjustable Differential Pressure Control Valves are used, ensure these are set for the design. Many HIUs will have this pre-set, so no adjustment is necessary.

Acceptance testing

The following examples of Consumer Connection acceptance testing must be pre-agreed and checked with the appointed Assessor who will observe the tests as they are carried out. Acceptance testing should follow any commissioning procedures that have been specifically produced for the heat network project being worked on.

Note: under the Heat Network Technical Assurance Scheme (HNTAS) acceptance testing could be required at the construction and commissioning stages to confirm the installation operates to the design intent. The appointed independent Assessor will define the level and type of acceptance testing that is appropriate for the particular heat network project. If requirements are not demonstrated successfully, the Assessor may require extended acceptance testing or in some cases 100% of the installation demonstrated as meeting the design. The Assessor may require bespoke checklist and reporting forms to be completed.

Keep warm function test

Ensure there is no active space heating demand or DHW demand and allow the HIU to operate in standby for 30 minutes whilst observing the HIU. At the start of the period note the energy consumption at the heat meter and the temperature of the primary flow pipe. Over the test period the HIU should either pulse the DHW control valve periodically to operate a keep warm cycle or allow and small constant flow. Monitor the flow and return temperatures and any indication that the control valve is opening periodically.

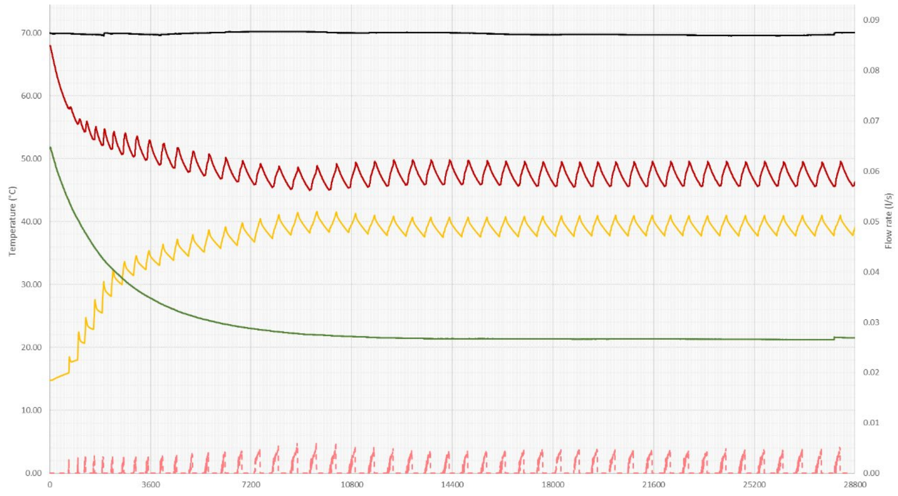


Fig 13 – example of typical keep warm cycle operation behaviour

Depending on the primary temperature for the network, the recorded flow temperature should align with the BESA test results for the HIU taking into consideration the primary flow temperature for the heat network design and the appropriate High or Low temperature results. Return temperatures during keep warm cycle should be <45°C and flow temperatures should be <55°C to avoid scaling risk. Record your findings in the commissioning checklist and that a keep warm function is operating correctly, including any rectification measures taken.

DHW operational test

The DHW operational test will establish that the HIU is able to deliver hot water to the outlets within a reasonable time. The requirements for this test are set out in the *CIBSE Guidance Note: Domestic hot water temperatures from Instantaneous heat interface units* which states that a temperature of 45°C should be reached at the kitchen sink tap (at full flow rate) within 45 seconds. Prior to testing, measure and record the cold-water inlet temperature at the HIU.

Prepare for the test by setting up a thermometer and stopwatch ready at the kitchen sink. HIU DHW function test can only be carried out at an outlet which has **not** been fitted with a TMV. For retrofit projects, it is expected that the system has been updated to restrict flow rate in line with Water Regulations efficiency requirements (Regulation 36). While there is no single fixed maximum flow rate required by the regulation to meet the 125 L/person/day target, typically for a kitchen tap the flow rate expected would be ≤ 8-10 l/m.

From the standby situation with the keep warm function active, open the kitchen sink tap and start the stopwatch. Monitor the temperature of the hot water and stop the stopwatch when the temperature reaches 45°C. Ensure that this recorded time is less than or equal to 45 seconds and that the hot water finally reaches 50°C at the tap.

Operate the DHW at its design maximum flow rate (use a flow cup to measure the flow rate) and measure the primary return temperature back to the network. This should be consistently below 25°C. Measure the primary flow temperature during DHW operation and record the primary flow rate at the heat meter.

Record all findings in the commissioning check list, including any rectification measures taken.

Fig 14 – measuring DHW flow rates, temperature and time to reach outlets (image Bosch).

Space heating operational test

For radiator systems, confirm the pre-set pressure independent radiator valves have been set for the flow rates specified in the design and subsequent commissioning record notes, and that the radiator lock shield valves are fully open. Confirm no air is present in radiators. The pump settings should be made for the system type. For under floor systems, ensure the pump settings are suitable and that flow rates have been set to design.

Once the pump is set correctly, operate the room time and temperature controls to create a heat demand and check that a space heating demand is activated at the HIU.

Measure and record the ambient temperature during the space heating test.

Operate the space heating system and allow it to reach a stable condition. Measure periodically the primary flow and return temperatures and space heating flow and return temperatures. Make sure temperature probes have good contact direct to the pipes and not onto valves or fittings. Confirm that the space heating flow temperature has met the design requirement and that the stable return temperature is <40°C. Confirm the primary return temperature has met the design requirement under stable conditions once the rooms are nearly up to temperature. Make any adjustment necessary and check for high return temperatures at radiators.

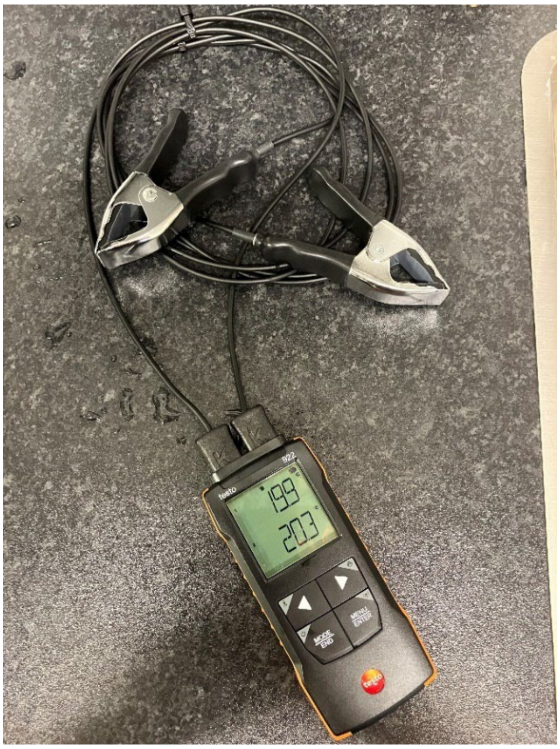


Fig 15 – thermometer for reading differential temperatures (image Bosch)

If a towel rail connected to the space heating systems has been used, monitor the return temperature and check the return temperature limiter has been set correctly as this can be a source of high temperature returns.

Set the room controller to the desired room temperature and check that the space heating demand is deactivated once the temperature in the room has been reached, and any pump overrun has completed.

Record all findings in the commissioning check list, including any rectification measures taken.

Heat Meter operational test

Access the heat meter menu and observe the energy consumption is recording during the above test periods.

Check that the Mbus cable is connected either to a local Mbus network or to a consumer metering and billing systems local to the HIU. Confirm that the AMR system is receiving data from the heat meter.

Water treatment checks

The necessary test will depend on whether a Direct HIU or Indirect HIU is being tested. For a Direct HIU, water treatment tests can be made at the energy centre for the complete heat network. For Indirect HIU, a water treatment test should be carried out at each individual Consumer Heat System and the Energy Centre.

Take a water sample from the space heating system from a suitable drain point. Ensure the water sample is labelled with the dwelling number and address details. Take a BCWS sample for a suitable tap near to the filling point and label. Send off the water samples for analysis and make any adjustments and recommendations.

Record the date that the water sample was taken along with any observations.

Commissioning check list

Complete all sections of the commissioning check list and retain any photos that were taken as evidence of completed checks. Ensure any insulation that was removed for access is replaced and check the pipe insulation within the dwelling serving the HIU is correctly located and fully covers any valves and fittings. Record all setting that were made at the HIU during commissioning.

Maintenance

Unless otherwise stated by the manufacturer, maintenance visit to the Consumer Connection should be made as follows.

- For Direct HIU a maximum maintenance interval of five years
- For Indirect HIU a maximum maintenance interval of two years
- HIU manufacturers may have different requirements, which should be followed.

Prior to carrying our any work, note the HIU settings and compare against the design intent.

Establish a table of the intended design operating criteria for the specific site, with acceptable tolerances to check against during the maintenance visit.

	Low limit	High limit	Unit
Standby keep-warm operation			
Flow rate (at heat meter)	0	10	l/hour
Primary flow temperature (at heat meter)	55	57	°C
Primary Return Temperature (at heat meter)	38	42	°C
DHW operation			
Hot water temperature at outlet	49	53	°C
Primary return temperature	20	25	°C
Space heating operation			
Space heating flow temperature	48	52	°C
Space heating return temperature	35	40	°C
Primary return temperature	38	43	°C

Fig 16 – example table of data to check performance against during maintenance

Electrical isolation

Carry out a safe isolation procedure and inspect the electrical isolation method and fuse rating are correct. Check the condition of all flex cables and terminals to the HIU.

Check any Mbus cables for condition where this is the method of exporting heat meter data. Take a photo record of any metering and billing equipment connected to the HIU.

Visual inspection

Assess the condition of the HIU installation and where possible take a photographic record. Record the HIU and heat meter serial numbers. Check the condition of the pipework insulation and any signs of tampering with the HIU. Check with the Consumer if there have been any reported issues in operation since the last maintenance visit.

Cleaning strainers

Over time, debris can collect in the strainers that protect the HIU. The most important of these is the strainer protecting the primary flow to the HIU. Isolate the primary flow and return at the HIU service isolation valves. Drain the HIU using a drain cock close to the strainer maintenance point.

Release the strainer retention nut and remove the mesh strainer. Take a photo record of the strainer mesh prior to cleaning for reference. Wash the mesh strainer under flowing water and inspect for any damage. Take a photo record of the cleaned strainer. Replace the strainer if there are signs of damage, if not re-use the mesh strainer (where permitted by the manufacturer). Reassemble and open the flow valve. Follow the venting procedure found within the manufacturer's instructions and vent all high points.

Open the return valve and check operation of the HIU. Check and clean any strainers installed in the return of the space heating system.

Checking for leaks

Remove the HIU casings to expose the HIU components. Inspect all joints for signs of leaks using a torch. Take a photo record of the full internal components. Locate and rectify any signs of leakage. Record any other remedial work or actions that need follow up.

Inspect the internal insulation to the HIU to ensure it is intact. Ensure any flushing bypasses are closed.

Checking HIU settings

Record the set points for DHW and Space heating temperature. Observe and record any other accessible settings. Do not change any set points unless specifically instructed to do so. Do not be tempted to alter set points if customers are complaining of poor performance but investigate the root cause of why poor performance may be occurring.

Observe the room temperature controller and space heating programmer to check they are functioning and set correctly.

Checking performance in operation

Operate the HIU in DHW mode and check that the hot water delivered at the outlets reaches 50°C (where outlets such as baths are blended using TMV's, check the temperature meets the desired set point). Record the primary return temperature during operation and time for hot water to reach 45°C at the tap.

For indirect HIU, check the cold fill pressure of the space heating system is within 1.5 bar to 2 bar. Check any filler loop where used has been disconnected. Operate the space heating from the room controller and check the flow and return temperatures meet the design intent. Record the flow and return temperatures once stable operating conditions have been reached. Check the operation of the expansion vessel by observing the system pressure rises gradually during heat up. Check the pump is operating correctly and record its setting. Record all findings, remedial actions and temperatures.

Water treatment testing

Follow the prescribed test procedure for water treatment within the Consumer Heat System. Where water samples are required, ensure these are taken correctly and labelled with the date and address of the dwelling.

Refer to the ICOM/MEHNA water treatment and Conditioning of Non-Domestic Systems and Heat Networks guide for further advice taking water samples for analysis.

Heat meter

After the maintenance procedures and checks have been completed and the HIU casing replaced, check the operation of the heat meter. Check the calibration date of the heat meter. Record meter reading.

Findings

Record any findings and remedial actions during the maintenance visit as well as any follow up actions needed.

Fault finding

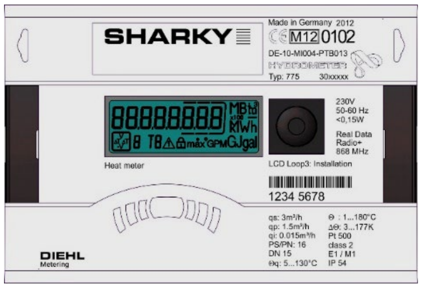
Successful fault-finding stems from a good understanding of how an HIU and Heat Network functions, coupled with knowledge of how to test components and eliminate possible causes until the root cause is found. Avoid making assumptions and test, test, test.

Heat meters as a diagnostic tool

One of the key allies that the HIU installer has when it comes to fault-finding is the fact that nearly every HIU will have a heat meter, either within the HIU or external. Learning how to access the data from the heat meter is fundamental to resolving many common HIU faults. Often the root cause will not be within the HIU but to do with the flow of energy to the HIU.

From every type of heat meter, you should be able to find the following minimum live information by entering the menu that will help diagnose faults.

- Primary flow temperature



- Primary return temperature

- Primary flow rate

- Primary power

Learn how to access the heat meter menu from the manufacturer's instructions. Many will have a single button that has either a short press (< 2 or 3 seconds) and a long press (> 2 or 3 seconds) to access different parts of the menu.

Flow rate measurement is particularly important for fault diagnosis. The flow rate units may be displayed differently depending on the heat meter. The above example is shown in metres cubed per hour (m^3/h), but it may also be displayed as litres per hour (l/h), litres per minute (l/m) or litres per second (l/s).

One metre cubed (m^3/h) is equivalent to 1000 litres per hour (l/h).

One litre per second (l/s) is roughly equivalent to one kilogram per second (kg/s)

Flow rates can be converted easily into different units as follows to get from one to the other.

l/m = l/h / 60

l/s = l/m / 60

l/s = l/h / 3600

l/h = l/m x 60

l/m = l/s x 60

l/h = l/s x 3600

When using the heat meter to measure the flow rate, the refresh rate of the meter display will mean that stable conditions need to be reached before recording the reading. For example, operating a tap will see a few seconds delay before the flow rate is displayed, meaning that to get an accurate reading the tap should be left running until the primary flow rate is stable.

Testing Temperature Sensors

For electronic HIUs, temperature sensors used are often NTC (Negative Temperature Coefficient) Thermistors, which means as the temperature gets hotter, the sensors resistance reduces. Not all the sensor used though have the same resistance rating, so refer to the manufacturer instructions to access the correct table when testing a particular sensor.

Resistance Ω	Temperature °C	Resistance Ω	Temperature °C
36540	0	5504	45
28836	5	4592	50
22932	10	3850	55
18360	15	3242	60
14796	20	2743	65
12000	25	2332	70
9792	30	1990	75
3850	55	1705	80
6634	40	1468	85

Fig 17 – example table of resistance readings for a typical NTC 12k Ohms @ 25°C

The reading from an NTC Thermistor can be checked by using a thermometer and a multimeter. Clip the probe from the thermometer onto the pipe near to the location of the NTC and allow it to settle. Remove the plug connection from the NTC sensor to expose the two terminals. Adjust your multimeter to read resistance Ohms (Ω) and connect the two probes, one on each of the NTC terminals. Read the resistance measured and compare to the table in the manufacturer's instructions to the measured temperature. There will always be a tolerance in how the measurements are made, so we are looking for the resistance reading to roughly match the temperature.

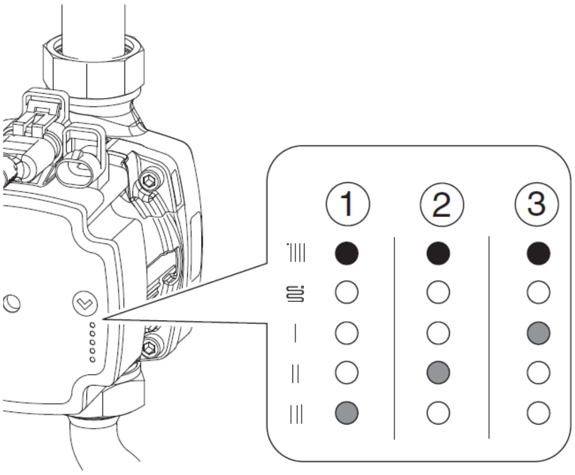
If the reading is significantly adrift, repeat the test again to ensure good contact is being made. A sensor that has a resistance reading that is more than 10% away from its expected reading could be faulty.

Error codes

Some HIUs may have error codes that are either shown in a display or by a sequence of flashing LED's or different coloured LED's. Observing the fault display will indicate both the current operational status of the HIU as well as faults if they occur. Refer to the manufacturer's instructions to interpret the error codes if they appear.

Testing the Pump

Many modern pumps used in indirect HIU will often have inbuilt fault diagnosis. If a pump fault is suspected, observe the active LEDs then read off the fault in the table for the manufacturer's instructions.



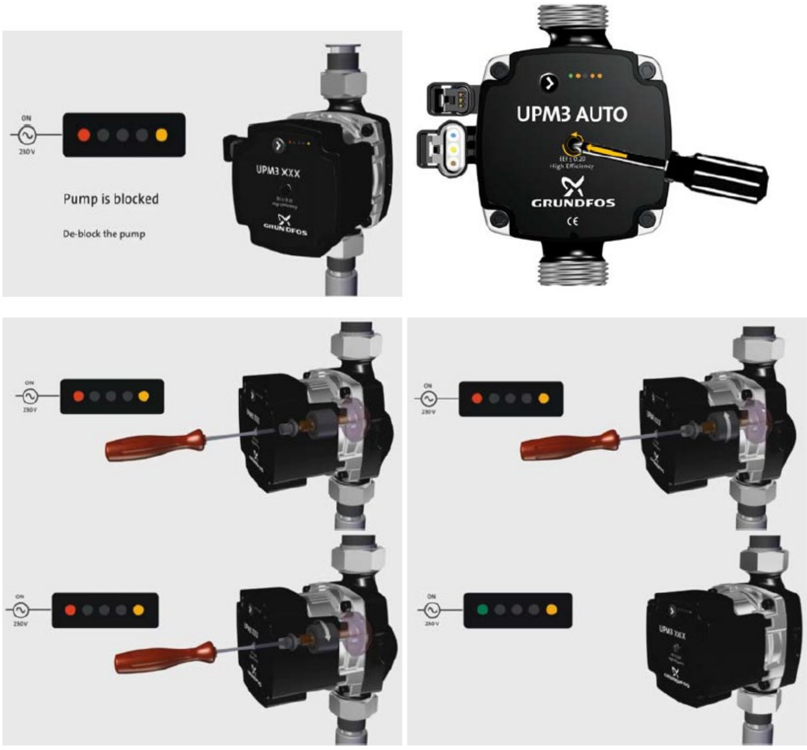
No.	Display	Fault	Pump operation	Remedy
1	red LED + yellow LED (LED 5)	Rotor is blocked	Restart attempt every 1.33 seconds	Wait or unblock the shaft.
2	red LED + yellow LED (LED 4)	Mains voltage too low	Warning only. Pump running.	Check mains voltage.
3	red LED + yellow LED (LED 3)	Electronics fault	Pump stops due to insufficient mains voltage or serious fault.	Check mains voltage, replace pump

Fig 18 – example pump diagnostics

Some HIUs also have a kick function that will activate the pump after 24hrs of inactivity. For this reason, it is recommended to keep the power supply to the HIU active if a dwelling is unoccupied for any time.

If a pump rotor blockage does occur, it may be possible to free the rotor manually and some modern pumps have inbuilt electronic means. For example, the Grundfos UMP3 software will detect a blocked rotor and attempt to unblock the rotor by increasing the motor torque to 24.8 Ncm every 1.33 seconds.

The pump rotor can be manually unblocked by placing a Philips screwdriver No 2 into the hole in the middle of the face plate. Push the screwdriver towards the pump and turn counterclockwise. Other pumps may have similar manual means of unblocking a rotor.



General fault-finding methods – narratives of real-life examples

No DHW fault

The complaint is that only cold water is coming from the hot taps. Since the water coming from the tap is the same temperature as the cold water coming into the dwelling, it suggests that the HIU is not responding to a DHW demand.

Ensure there is power to the HIU and that there are signs such as an illuminated LEDs or display showing that the HIU is turned on. See if any error codes are present.

Assuming the HIU seems ready for use, open a hot tap at the kitchen sink and gain access to the heat meter primary flow rate measurement. Does the reading show any flow through the HIU? If there is no flow or a very small trickle, it either suggests the HIU is not responding or that the energy centre pumps are not operating, or the supply is isolated. If other adjacent dwellings have hot water, check all isolation valves on the primary supply are open. Make sure any pre-payment function is not active, and that credit is available.

When the hot water tap is open, does the HIU respond in any way with different LED’s lit, or signs of valve movement? If it does, this suggests the DHW primary control valve is not functioning. If there is no response, it could be the DHW flow detection such as a turbine or flow switch is not functioning, or a fault with the HIU controller. Mechanical HIUs may have a stuck mechanism within the control valve.

Carry on eliminating the causes until the root cause of the fault is identified. Sometimes this may eventually involve a trial replacement of a component, but using basic fault-finding techniques will narrow down the possibilities.

Poor DHW temperature

This type of complaint is one of the most common and it is important to use a logical method of eliminating possible causes to get to the root cause of the problem.

Operate the hot water tap at the kitchen sink and measure the flow rate and temperature. Allow to stabilize for 1 minute and record the hot water temperature. Is this below 50°C at the expected flow rate from the tap?

With the tap still running, access the heat meter flow rate and temperature measurements, then record these.

Example recorded measurements

- DHW temperature 35°C
- DHW flow rate 9 l/m
- Primary flow rate 0.276 m^3/h = 4.6 l/m
- Primary flow temperature 60°C
- Primary return temperature 13°C

The measurements confirm that the DHW temperature is way below the required 50°C. We check the design requirements for the network and can see that it is designed to operate at 60°C primary temperature, which matches the reading. The flow rate from the kitchen tap seems reasonable and is roughly what we expect. The primary flow rate and return temperature look lower than expected. We could check this against the design criteria, but we can already see that the primary flow rate is way below the DHW flow rate. We would expect this to be roughly just a little lower than the DHW flow rate, so it strongly suggests there is not enough flow rate getting to the plate heat exchanger.

Primary flow rate seems to be the problem, so the first thing to establish is whether the primary strainer is blocked. We isolate and drain the strainer, removing the mesh which has very little contamination. Wash the strainer mesh in running water and replace it.

From this point the problem could lie further down the primary supply or there could be some other flow restriction within the HIU. Our best approach is to establish the primary supply side is delivering to the design conditions first. We establish that an adjacent dwelling is also having poor DHW temperature, so this now sounds like a primary side issue.

At the energy centre we can see that the pumps are operating and since they have been operating as commissioned without issue, for now we will assume they are set correctly. At this point we could set up a differential pressure test, preferably as close to the problem HIU as possible. This would quickly establish if the design differential pressure was available at the HIU, which would then confirm the pump settings are correct. Whilst in the energy centre we notice that the return temperature looks higher than it normally is by quite a bit.

We decide to walk the route of the primary network supply to check that no bypasses have been opened. On the corridor where the lateral feed supplying our dwelling is located, we find a bypass assembly near the end of the run. There is no lock in place, and we can see immediately that the valve has been opened by someone. The assembly is at full flow temperature suggesting the bypass has been fully open. We close the valve and return to the problem HIU. Repeating the initial performance test we get new measurements.

New recorded measurements

- DHW temperature 50°C
- DHW flow rate 9 l/m
- Primary flow rate 0.498 m^3/h = 8.3 l/m
- Primary flow temperature 60°C
- Primary return temperature 16.7°C

It seems we have located the root cause of the problem, and the performance is back to normal. If we had established that in fact the primary supply was performing as expected, further investigation within the HIU would have been necessary. It could have been that the DHW primary control valve was faulty or perhaps a blockage with the plate heat exchanger. The problem bypass should be locked in future or the valve head removed.

No Heating

The customer is complaining that the HIU will not operate in heat mode but still delivers hot water to the taps and shower.

Check the HIU for any apparent error codes and observe how the HIU responds to a DHW demand. Investigate the space heating programmer to ensure it is set up correctly and calling for heat. Check the room control thermostat is calling for heat.

If the HIU does not respond to a heating demand from the controls, use a multimeter to check for a 230V signal at the HIU from the room control. For proprietary control systems supplied by the HIU manufacturer, follow the manufacturers advice to investigate that a demand signal is present.

Gain access to the heat meter and check the measurements for primary flow rate and flow temperature. Observe if there is a flow at the heat meter when a heat demand is active. If there is no flow during a heat demand, it suggests the space heating control valve is not opening and this should be investigated. If there is a flow when a heat demand is active, observe the temperatures.

If the primary side control valve has opened to allow a flow through the plate heat exchanger, but the secondary side is not operating, the temperature difference between the primary flow and return will be very small.

If this is the case, it suggests there is no flow on the secondary side of the plate heat exchanger. Check the pump is operating and that the spindle is turning. If a seized pump is suspected, use the method described by the pump manufacturer to free a seized pump.

Check to see if any filters or strainers are present on the space heating return. Isolate and inspect the strainers, cleaning under running water if necessary.

If none of these possible faults have occurred, check the resistance of the space heating sensors are in tolerance range. Ensure the space heating temperature is set correctly at the HIU controller and that the pump has been activated.

References

This bibliography contains the standards and guidance documents referenced in the guide.

BESA. (2023, or latest edition). *Technical Standard for UK HIU Test Regime*. London: Building Engineering Services Association (BESA) Publications.

BESA. (2022). *TR/6: Site Pressure Testing of Pipework - Guide to Good Practice.* London: Building Engineering Services Association (BESA).

BSI. (2024). BS 8635 - Part 1 *Hydraulic Interface Units for Heat Network Applications - Specification.* London: British Standards Institution (BSI).

BSI. (expected 2026). BS 8635 - Part 2 Hydraulic interface units for heat network applications – Part 2: Installation, commissioning and maintenance – Code of practice. London: British Standards Institution (BSI).

BSI. (2014). *BS EN 12828:2012+A1:2014: Heating Systems in Buildings - Design for Water-Based Heating Systems.* London: British Standards Institution (BSI).

BSI. (2019+A1:2024). *BS 7593:2019 Code of practice for the preparation, commissioning and maintenance of domestic central heating and cooling water systems.* London: British Standards Institution (BSI).

CIBSE & ADE. (2020). *CP1: Heat Networks Code of Practice for the UK*. London: Chartered Institution of Building Services Engineers (CIBSE); Association for Decentralised Energy (ADE).

CIBSE. (2021). *Guidance Note: Domestic Hot Water Temperatures from Instantaneous Heat Interface Units.* Chartered Institution of Building Services Engineers (CIBSE): London.

DEZNZ. TS1 Heat Network Technical Standard (2025)

DESNZ MMS the Metering and Monitoring Standard for Heat Networks (2025)

DLUHC. (2023). *Approved Document L: Conservation of Fuel and Power.* London: Department for Levelling Up, Housing and Communities.

DLUHC. (2024). *Approved Document G: Sanitation, Hot Water Safety and Water Efficiency.* London: Department for Levelling Up, Housing and Communities.

Scottish Government. (2024). *Building Standards Technical Handbook - Domestic.* Edinburgh: Building Standards Division, Scottish Government.

Scottish Government. (2011). *The Water Environment (Controlled Activities) (Scotland) Regulations 2011.* Edinburgh: The Stationery Office.

HM Government. (1999). *The Water Supply (Water Fittings) Regulations 1999.* London: The Stationery Office.

MEHNA/ICOM Water Treatment and Conditioning of Non-Domestic Systems and Heat Networks June 2024 V1.0