

BS 8635-1:2024



BSI Standards Publication

Hydraulic interface units for heat network applications

Part 1: Specification

bsi.

AVA Documents
Document Sharing Hub

Publishing and copyright information

The BSI copyright notice displayed in this document indicates when the document was last issued.

© The British Standards Institution 2024

Published by BSI Standards Limited 2024

ISBN 978 0 539 19658 0

ICS 27.060.30

The following BSI references relate to the work on this document:

Committee reference RHE/30

Draft for comment 23/30445277 DC

Amendments/corrigenda issued since publication

Date	Text affected
------	---------------

Contents

	Page
Foreword	III
1 Scope	1
2 Normative references	1
3 Terms, definitions and abbreviated terms	2
4 Design	4
4.1 HIU design for use and servicing	4
4.2 HIU design for operation: Pressure	5
<i>Figure 1 — Identification of worst-case temperatures</i>	6
4.3 HIU design for operation: Temperature	7
<i>Figure 2 — Example twin stat control wiring diagram</i>	9
4.4 Heating and cooling meters installed in the HIU	9
4.5 Protection of externally installed HIUs	10
5 Construction and materials	10
5.1 General	10
5.2 Materials	10
6 Manufacture: End of line testing	11
7 Connections to a tertiary system	12
8 Safety	12
8.1 Fire	12
8.2 Scalding	12
8.3 Pressure explosion	12
8.4 Electrocution	12
8.5 Burns	13
8.6 Sharp edges	13
8.7 Lifting	13
8.8 Remote-control device	13
9 Electrical and electromagnetic safety	13
9.1 General	13
9.2 Operational safety in the event of failure of the auxiliary energy	14
10 Packaging	14
11 Documentation: Marking and instructions	14
11.1 Data plate: Identification	14
11.2 Warnings on the HIU and the packaging	15
11.3 Instructions	15
11.4 Presentation	17
Annex A (informative) Example of a risk assessment method and realization of protective measures	18
A.1 Introduction	18
<i>Figure A.1 — Risk analysis tree example</i>	18
A.2 Risk identification	18
A.3 Identification of the sources and sub-sources of the basic risk	18
A.4 Identification of the condition of the source or sub-source	19
A.5 Identification of the classification of the necessary protective measure	19

A.6	Overall classification of a basic risk	19
	Table A.1 — Example for an HIU ($S \times O \times D$) Low = 0, High = 10	19
	Table A.2 — Evaluation	20
	Table A.3 — Consequences of defects failures – Parameter S	20
	Table A.4 — Probability of occurrence – Parameter O	21
	Table A.5 — Probability of discovering failures – Parameter D	21
A.7	Example risk assessment	21
	Table A.6 — Example risk assessment	21
A.8	Protective measures	22
	Figure A.2 — Layers of a safety system	22
	Table A.7 — Protective measures and layers of safety	22
Annex B	(informative) Classification of HIU types	23
	Table B.1 — Classification of HIU types	23
Annex C	(informative) Example calculation of expansion volume for DHW circuit	34
Annex D	(informative) Declaration of conformity	35
	Bibliography	36

Summary of pages

This document comprises a front cover, an inside front cover, pages I to IV, pages 1 to 38, and a back cover.

Foreword

Publishing information

This part of BS 8635 is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 31 July 2024. It was prepared by Technical Committee RHE/30, *Heat exchangers*. A list of organizations represented on this committee can be obtained on request to the committee manager.

Information about this document

This publication can be withdrawn, revised, partially superseded or superseded. Information regarding the status of this publication can be found in the Standards Catalogue on the BSI website at knowledge.bsigroup.com, or by contacting the Customer Services team.

Where websites and webpages have been cited, they are provided for ease of reference and are correct at the time of publication. The location of a webpage or website, or its contents, cannot be guaranteed.

Presentational conventions

The provisions of this document are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is “shall”.

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Where words have alternative spellings, the preferred spelling of the *Shorter Oxford English Dictionary* is used (e.g. “organization” rather than “organisation”).

Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient’s own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

THIS PAGE DELIBERATELY LEFT BLANK

1 Scope

This part of BS 8635 specifies requirements for the design and manufacture of hydraulic interface units (HIUs) to safely deliver heating, cooling and hot water within domestic and commercial heating and cooling systems.

Specifically, it specifies requirements for the construction, performance and safety of HIUs for connection into the following types of heat networks/systems:

- indirect tertiary heating and cooling systems up to 300 kPa (3 bar)¹⁾ pressure;
- direct tertiary heating and cooling systems up to 600 kPa (6 bar) pressure;
- instantaneous hot water systems with a minimum temperature of 50 °C and a maximum load of 70 kW and space heating output up to 20 kW;
- potable stored hot water systems (indirect cylinders) with a minimum storage temperature of 60 °C and a maximum stored volume of 300 l;
- non-potable storage systems;
- heating networks up to 1 600 kPa (16 bar) pressure and temperatures greater than 50 °C and lower than 90 °C;
- cooling networks up to 1 600 kPa (16 bar) pressure and temperatures greater than 2 °C and lower than 20 °C; and
- domestic hot water (DHW) systems with pressure from 50 kPa (0.5 bar) to 1 000 kPa (10.0 bar).

NOTE Annex A gives an example of a risk assessment method that can be used during design.

Substations are not covered in this part.

[Annex B](#) classifies the differing types of HIU and how they perform the function of providing heating, hot water and cooling in dwellings connected to a heat network (district network or communal system).

The intended users of this part are manufacturers of HIUs.

This part might also be of use to procurement professionals, installers, designers, and maintenance and commissioning engineers.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes provisions, or limits the application, of this document.²⁾ For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Standards publications

[BS EN 1057](#), *Copper and copper alloys – Seamless, round copper tubes for water and gas in sanitary and heating applications*

[BS EN 1434-1](#), *Thermal energy meters – Part 1: General requirements*

[BS EN 10226-1](#), *Pipe threads where pressure tight joints are made on the threads – Part 1: Taper external threads and parallel internal threads – Dimensions, tolerances and designation*

[BS EN 10226-2](#), *Pipe threads where pressure tight joints are made on the threads – Part 2: Taper external threads and taper internal threads – Dimensions, tolerances and designation*

¹⁾ 100 kPa = 0.1 MPa = 1 bar = 105 N/m².

²⁾ Documents that are referred to solely in an informative manner are listed in the Bibliography.

BS EN 12828, *Heating systems in buildings – Design for water-based heating systems*

BS EN 13501-1:2018, *Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests*

BS EN 15502-1:2021+A1:2023, *Gas-fired heating boilers – Part 1: General requirements and tests*

BS EN 50090 (all parts), *Home and Building Electronic Systems (HBES)*

BS EN 60335-2-102, *Household and similar electrical appliances – Safety – Part 2-102: Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections*

BS EN 60529, *Degrees of protection provided by enclosures (IP Code)*

BS EN IEC 60335-1:2023+A11:2023, *Household and similar electrical appliances – Safety – Part 1: General requirements*

BS EN ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads – Part 1: Dimensions, tolerances and designation*

BS EN ISO 3166-1, *Codes for the representation of names of countries and their subdivisions – Part 1: Country code*

Other publications

[N1] Building Engineering Services Association (BESA). *Technical Standard for UK HIU Test Regime*. London: BESA, 2023.

[N2] INTERNATIONAL LIVING FUTURE INSTITUTE. *Red List*.³⁾

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this part of BS 8635, the following terms and definitions apply.

3.1.1 differential pressure

difference in pressure between any two points in a hydraulic system

3.1.2 filter and strainer

3.1.2.1 filter

porous device for removing particles smaller than 40 µm

3.1.2.2 strainer

porous device for removing particles larger than 40 µm

3.1.3 heat network supply

part of the heat network, either primary or secondary, which forms the final connection prior to the HIU

3.1.4 hydraulic interface unit (HIU)

hydraulic unit serving a single dwelling, including all connecting and supporting components, if any, supplied by the manufacturer

3.1.5 keep-warm

mechanism internal to the HIU that maintains the heat network supply flow at a set temperature, thereby minimizing the delay of instantaneous hot water delivery

³⁾ Available at: <https://living-future.org/red-list/>.

3.1.6 manufacturer

natural or legal person who manufactures an HIU or fitting or who has an HIU or fitting designed and manufactured and markets that HIU or fitting under their name or trademark

3.1.7 distribution circuit

COMMENTARY ON 3.1.7

Further information is given in CIBSE/ADE CP1 [1].

3.1.7.1 primary

distribution circuits that connect an energy centre to the building

3.1.7.2 secondary

distribution circuits within the building which are separated, with or without a hydraulic break, from the primary (3.1.7.1) distribution circuits

3.1.7.3 tertiary

dwelling internal circuits feeding terminal devices which are separated, with or without a hydraulic break, from the primary (3.1.7.1) or secondary (3.1.7.2) distribution circuits

3.1.8 pressure relief valve

safety device fitted to sealed tertiary heating and cooling systems intended to relieve excess water pressure in the event of a failure

3.1.9 return temperature limiter

device that reacts to heat network supply return temperatures and limits, by reducing the flow rate or other means, the temperature to a given set point to assist with heat network efficiency

3.1.10 substation

hydraulic unit for multiple dwellings, including all connecting and supporting components if any, supplied by the manufacturer

3.1.11 terminal device

heating or cooling output device connected to or served by a heating or chilled water pipework system

NOTE Examples include radiators, fan coil units, air handling units, chilled beams, trench heaters, underfloor heating manifolds, plate heat exchangers and hot water storage devices.

3.2 Abbreviated terms

For the purposes of this part of BS 8635, the following abbreviated terms apply.

CD	cooling direct
CI	cooling indirect
DHW	domestic hot water
HD	heating direct
HD-MD	heating direct with mix-down temperature control
HI	heating indirect
HIU	hydraulic interface unit
HWI	hot water instantaneous
HWIC	hot water indirect cylinder

HWIS	hot water indirect thermal store
HWDS	hot water direct thermal store
LZC	low/zero carbon technologies
MCW	mains cold water
PCM	phase change material
PHE	plate heat exchanger
PV	photovoltaic

4 Design

COMMENTARY ON CLAUSE 4

The requirements of this clause are intended to facilitate the design of an HIU to provide a minimum 15-year service life under normal operating conditions.

4.1 HIU design for use and servicing

4.1.1 General

A risk assessment-based approach shall be taken to identify potential failure modes and risks posed by these modes.

NOTE Annex A gives an example of a risk assessment method that can be used.

Any parts which allow access to others for use and servicing in accordance with the manufacturer's instructions shall be free from sharp edges and corners that might cause damage or personal injury during use and servicing.

The HIU shall be designed such that when installed and used in accordance with the manufacturer's instructions, it is possible to vent the air from the HIU components and waterways if the HIU is not self-venting.

4.1.2 Use and servicing

4.1.2.1 Use

The HIU shall be designed to allow the end user to gain access to and operate all control knobs, buttons, etc., necessary for normal use without having to remove any part of the case, unless this part is capable of being handled easily and safely.

4.1.2.2 Servicing

Parts which are required to be inspected or removed for servicing shall be accessible from the front with appropriate tools and possibly after removal of the case in accordance with the manufacturer's instructions.

Removable parts shall be designed or marked so that they are easy to re-assemble correctly.

4.1.2.3 Isolation

The isolation valves connecting to the HIU shall turn off in a clockwise direction as seen by an observer facing the handle.

4.1.2.4 Flushing bypass

If a flushing bypass is supplied with the HIU, it shall be possible to unambiguously identify the bypass state (open/closed) with a simple visual check. The bypass valve shall be capable of being opened only by means of a tool.

4.1.3 Water connections

The HIU water connections shall be accessible without the use of tools. They shall be clearly identified in the installation instructions [see 11.3.1a) 14)] and on the HIU. The clearance around the connections, after removing the case when necessary, shall allow use of the tools required to make the connection. It shall be possible to make all the connections without special tools.

Threaded connections shall conform to [BS EN ISO 228-1](#), [BS EN 10226-1](#) or [BS EN 10226-2](#). If copper connections are used, the connecting end of the tube shall conform to [BS EN 1057](#).

4.1.4 Draining and venting

If it is not possible to drain the HIU by means of its water connections, it shall incorporate a device that enables it to be drained and can be operated by means of a tool such as a spanner or screwdriver. Directions for draining shall be included in the installation instructions [see 11.3.1a) 15)].

If it is not possible to vent the HIU upon filling and during operation, it shall incorporate a device that enables venting to be achieved.

A suitable venting point shall be provided for any cylinder, to prevent a vacuum from forming during drainage.

4.2 HIU design for operation: Pressure

4.2.1 General pressure conditions

Any closed-loop space heating or space cooling system hydraulically separated from the network distribution pipework shall conform to [BS EN 12828](#) and include:

- a) a device, such as a pressure gauge, enabling local reading of the operating pressure with a simple visual check, which is easily accessible without a tool; and
- b) an appropriately sized expansion vessel and a pressure relief valve.

The HIU shall be capable of withstanding at least 1.5 times its pressure rating.

4.2.2 Pressure test points

The HIU or connecting valves shall be equipped with appropriate differential pressure test points or blanking plugs across flow and return to permit commissioning, maintenance and fault diagnosis on the heat network connections.

4.2.3 Differential pressure

The HIU shall be designed to accommodate varying network differential pressures.

4.2.4 Water expansion

4.2.4.1 Tertiary heating and cooling expansion vessel

For an indirect HIU, the sealed tertiary heating and cooling system shall incorporate an expansion vessel. The expansion vessel shall be located or protected in such a way that heat cannot damage the diaphragm and it is possible to access the pre-charge valve during maintenance.

To allow a system designer to determine available volume for expanded water in the vessel, the HIU manufacturer shall state in the installation instructions:

- a) vessel volume [see 11.3.1a) 17)];
- b) maximum acceptance factor [see 11.3.1a) 18)]; and
- c) pre-charge pressure and final working pressure [see 11.3.1a) 19)].

4.2.4.2 Tertiary heating and cooling safety relief valve

For an indirect HIU, the tertiary heating and cooling system shall incorporate a safety relief valve. The valve shall be sized in accordance with [BS EN 12828](#). The HIU manufacturer shall state the pressure at which the valve discharges water to protect the tertiary heating and cooling system.

4.2.4.3 DHW circuit: Protection against excess pressure

Measures shall be provided to protect the HIU DHW circuits from pressures exceeding the declared maximum. Where non-return valves (or any similar devices that prevent backflow) are installed in the cold-water mains supply, advice shall be given in the installation instructions if additional protection measures are required at installation [see [11.3.1a](#) 20)].

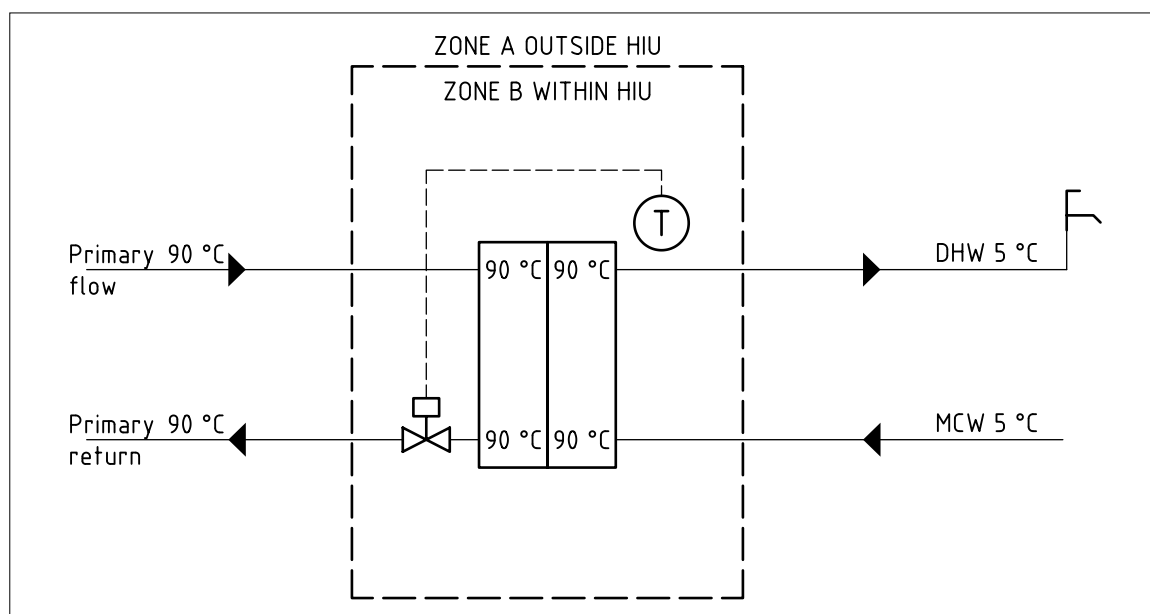
NOTE 1 An example calculation of how to accommodate expansion volume is given in [Annex C](#).

The expansion of the DHW system within the HIU shall be designed for the worst-case scenario (see [Figure 1](#)), which is the maximum temperature rating of the primary side of the HIU stated by the manufacturer.

NOTE 2 90 °C is used in example in [Annex C](#).

The worst-case scenario shall be used to overcome mechanical intervention (actuator removal and temperatures increasing from cold).

Figure 1 — Identification of worst-case temperatures



4.2.4.4 DHW protection against excess pressure with DHW recirculation

Where the HIU is intended for use with DHW recirculation, it shall incorporate temperature control of the DHW recirculation circuit to maintain a safe temperature of potable water but shall be designed to minimize the associated heat losses and return temperatures to the heat network.

If the HIU is suitable for DHW recirculation, the manufacturer's installation instructions shall document how DHW recirculation pipework is to be correctly connected if it is not a standard connection [see [11.3.1a](#) 21)].

The primary return temperature at the HIU from the recirculation circuit shall not exceed 50 °C other than during a pasteurization cycle.

The installation instructions shall document any setting requirements specific to systems with DHW recirculation [see [11.3.1a](#) 22)].

If the HIU is suitable for DHW recirculation, the installation instructions shall state whether a dedicated expansion vessel and pressure relief valve are required as part of the installation external to the HIU [see 11.3.1a) 23)].

For an HIU designed for use with a DHW circulation loop, it shall be possible to periodically pasteurize the DHW PHE and the DHW recirculation loop (see HSG274 Part 2 [2]).

NOTE 1 DHW expansion within the HIU is discussed in 4.2.4.3.

NOTE 2 When a secondary DHW circulation system is adopted to reduce DHW delivery times to outlets, the expansion provided within the HIU is not adequate to deal with the expansion of the system and cannot be relied on.

NOTE 3 The Water Regulations [3] to [5] require a temperature relief valve or combined temperature and pressure relief valve to be provided on every unvented hot water storage vessel with a capacity greater than 15 l.

4.3 HIU design for operation: Temperature

4.3.1 Ambient temperature conditions

Control valve actuators shall be sited in suitable locations such that ambient temperature levels do not materially affect performance.

Heating and cooling meter calculators shall only be located within insulated enclosures if this does not represent a risk of exceeding ambient design conditions of the calculator.

These requirements shall also apply for other thermostats, sensors, return temperature limiters and overheat cut-out devices which might need to be installed outside insulated enclosures.

Any electronic controls shall be located where safety and performance are not compromised.

4.3.2 Temperature control

Control valves, including actuators, shall be capable of operating within the relevant design parameters of a heat network set out in Clause 1.

Where a heat exchanger is present, such as a PHE or coil within a cylinder, an accompanying temperature regulation device, such as a temperature control valve with a temperature input, shall be provided to control the temperature on the secondary side of the heat exchanger.

It shall be possible to readily establish the set temperature of the temperature setting device and ascertain how to increase or decrease the set temperature. If numbers are used for this purpose, the highest number shall correspond to the highest temperature. Temperature set point increments shall be not greater than 1 °C. This shall also apply to any adjustable keep-warm function in the HIU, if included. Any dial dedicated for setting a keep-warm temperature shall be positioned in such a way that it is capable of being easily read and is not materially impaired by any other component.

4.3.3 Temperature control

Where an HIU provides both DHW and heating, independent temperature control shall be provided for both DHW and heating. The thermostatic control for each service shall modulate primary flow rates, to maintain the set temperatures of the space heating, space cooling and DHW at their set points, within ± 3 °C under varying primary flow temperatures and differential pressures.

The ± 3 °C temperature control stabilization shall be achieved within 30 s of stable heat network supply temperature conditions to the HIU and for a duration of at least 60 s thereafter.

4.3.4 Tertiary circuit control

An HIU with temperature control shall be provided with a method of setting the temperature of the tertiary circuit flow that is capable of being set during commissioning.

4.3.5 Remote temperature control: Domestic hot water, heating and cooling temperature control

Where DHW heating and cooling temperatures are capable of being set remotely, the range of temperature settings shall mirror those that are capable of being set directly on the HIU.

4.3.6 DHW recirculation

The secondary return temperature from the DHW recirculation circuit shall not exceed 55 °C, other than during a pasteurization cycle.

NOTE See 4.2.4.4 for further recommendations on DHW recirculation.

4.3.7 Control of decentralized thermal storage

COMMENTARY ON 4.3.7

Decentralized storage covers systems where thermal energy is stored within the dwelling. The two main categories of thermal storage are:

- a) potable water storage: where the energy storage medium held within the store is potable water (Fluid category 2 of the Water Regulations [3] to [5]) and is for use at the DHW outlets; and*
- b) non-potable water storage: where the energy storage medium held within the store is usually water treated for corrosion prevention and/or containing a phase change material (PCM) or Fluid category 3.*

Both storage categories can be either open-vented or unvented/pressurized.

Potable water stores shall be indirectly connected to the heat network via either an internal heat exchanger such as a heater battery/coil or an external heat exchanger, e.g. a PHE. Non-potable water stores shall only be directly connected to the heat network if the stores are capable of withstanding the operating pressure of the heat network.

Directly connected non-potable water stores shall have connections for fitting an air vent and anti-vacuum valves. These items shall be supplied by the manufacturer with the store.

Non-potable water stores that are indirectly connected to the heat network shall be fitted with a suitable pressure relief valve and expansion vessel.

Where the stores are directly connected to the heat network, they shall incorporate a primary shut-off valve arrangement capable of closing against a differential pressure of not less than 200 kPa (noting that many networks require more than 200 kPa).

4.3.8 Temperature control of storage medium

COMMENTARY ON 4.3.8

There are various methods for controlling the temperature of the storage medium.

Thermostats are commonly used to control the store around a set point at the position of the thermostat's phial. These operate within the hysteresis band accuracy of the thermostat used and provide a single point of control for the whole store.

The switching differential of the thermostat shall be not greater than (6 ± 1) °C.

NOTE For a twin thermostat/sensor on/off control (see Figure 2), the reheat can be delayed until the upper sensor drops below set point and then prolonged until the lower sensor goes above set point. This method of controlling the heat input in a store can provide longer periods when the store is on or offline.