

Specification for the design, installation and commissioning of gas fired central heating systems in domestic premises

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Contents

	Page
Foreword	ii
1 Scope	1
2 Normative references	1
3 Terms and definitions	3
4 Items to be agreed and documented	6
5 Central heating systems	7
6 Equipment and fittings	8
7 Information exchange	12
8 Design	14
9 Installation	17
10 Commissioning	23
11 Quality management	27
12 Warranties	31
13 Maintenance and records	31
Annex A (informative) Legal issues	33
Annex B (informative) Environmental conditions	35
Annex C (informative) Data for combination boilers	36
Bibliography	37
Table 1 — Central heating components and their relevant British Standards	9
Table 2 — Copper pipework including insulation (thermal conductivity of 0.04 W/(m·K) at 0 °C)	10
Table 3 — Plastic pipework including insulation (thermal conductivity of 0.04 W/(m·K) at 0 °C)	10
Table 4 — Heating and hot water pipework (thermal conductivity of 0.045 W/(m·K) at 0 °C)	10
Table 5 — Domestic hot water demand	16
Table 6 — Dimensions of metal pipes	20
Table 7 — Dimensions of plastic pipes	20
Table C.1 — Approximate water demand of water appliances	36
Table C.2 — Average flow rates and temperature rise for combination boilers	36

Foreword

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 37 and a back cover.

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1 Scope

This Product Assessment Specification specifies requirements for the sale, design, installation and management of a complete gas fired central heating system, incorporating the boiler, system and temperature control devices.

In addition to the definitive requirements, this Product Assessment Specification also requires the items detailed in clause 4 to be documented. For compliance with this Product Assessment Specification, both the definitive requirements and the documented items have to be satisfied.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this Product Assessment Specification. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. For undated references, the latest edition of the publication referred to applies.

BS 21, *Specification for pipe threads for tubes and fittings where pressure-tight joints are made on the threads (metric dimensions).*

BS 143, *Specification for malleable cast iron and cast copper alloy threaded pipe fittings.*

BS 715, *Specification for metal flue pipes, fittings, terminals and accessories for gas-fired appliances with a rated input not exceeding 60 kW.*

BS 759-1, *Valves, gauges and other safety fittings for application to boilers and to piping installations for and in connection with boilers — Part 1: Specification for valves, mountings and fittings.*

BS 864-3 (Obsolescent), *Capillary and compression tube fittings of copper and copper alloy — Part 3: Compression fittings for polyethylene pipes.*

BS 1010-2, *Specification for draw-off taps and stopvalves for water services (screw-down pattern) — Part 2: Draw-off taps and above-ground stopvalves.*

BS 1212-2, *Float operated valves — Part 2: Specification for diaphragm type float operated valves (copper alloy body) (excluding floats).*

BS 1212-3, *Float operated valves — Part 3: Specification for diaphragm type float operated valves (plastics bodied) for cold water services only (excluding floats).*

BS 1256, *Specification for malleable cast iron and cast copper alloy threaded pipe fittings.*

BS 1289 (all parts), *Flue blocks and masonry terminals for gas appliances.*

BS 1387, *Specification for screwed and socketed steel tubes and tubulars and for plain end steel tubes suitable for welding or for screwing to BS 21 pipe threads.*

BS 1566-1, *Copper indirect cylinders for domestic purposes — Part 1: Specification for double feed indirect cylinders.*

BS 1566-2, *Copper indirect cylinders for domestic purposes — Part 2: Specification for single feed indirect cylinders.*

BS 1740-1, *Specification for wrought steel pipe fittings (screwed BS 21 R-series thread) — Part 1: Metric units.*

BS 2767, *Specification for manually operated copper alloy valves for radiators.*

BS 2871 (all parts), *Specification for copper and copper alloys — Tubes.*

BS 2879, *Specification for draining taps (screw-down pattern).*

BS 3198, *Specification for copper hot water storage combination units for domestic purposes.*

BS 4213, *Specification for cold water storage and combined feed and expansion cisterns (polyolefin or olefin copolymer) up to 500 L capacity used for domestic purposes.*

BS 4814, *Specification for expansion vessels using an internal diaphragm, for sealed hot water heating systems.*

BS 5154, *Specification for copper alloy globe, globe stop and check, check and gate valves.*

BS 5258-1, *Safety of domestic gas appliances — Part 1: Specification for central heating boilers and circulators.*

BS 5258-8, *Safety of domestic gas appliances — Part 8: Combined appliances: gas fire/back boiler.*

BS 5258-15, *Specification for combination boilers — Part 15: Specification for combination boilers.*

BS 5440-1, *Installation of flues and ventilation for gas appliances of rated input not exceeding 60 kW (1st, 2nd and 3rd family gases) — Part 1: Specification for installation of flues.*

BS 5440-2, *Installation of flues and ventilation for gas appliances of rated input not exceeding 60 kW (1st, 2nd and 3rd family gases) — Part 2: Specification for installation of ventilation for gas appliances.*

BS 5449, *Specification for forced circulation hot water central heating systems for domestic premises.*

BS 5482-1, *Domestic butane- and propane-gas-burning installations — Part 1: Specification for installations at permanent dwellings.*

BS 5615, *Specification for insulating jackets for domestic hot water storage cylinders.*

BS 5955-8, *Plastics pipework (thermoplastics materials) — Part 8: Specification for the installation of thermoplastics pipes and associated fittings for use in domestic hot and cold water services and heating systems.*

BS 5970, *Code of practice for thermal insulation of pipework and equipment (in the temperature range -100 °C to +870 °C).*

BS 6332-1, *Thermal performance of domestic gas appliances — Part 1: Specification for thermal performance of central heating boilers and circulators.*

BS 6332-3, *Thermal performance of domestic gas appliances — Part 3: Specification for thermal performance of combined appliances: gas fire/back boiler.*

BS 6500, *Specification for insulated flexible cords and cables.*

BS 6700, *Specification for design, installation, testing and maintenance of services supplying water for domestic use within buildings and their curtilages.*

BS 6759-1, *Safety valves — Part 1: Specification for safety valves for steam and hot water.*

BS 6798, *Specification for installation of gas-fired hot water boilers of rated input not exceeding 60 kW.*

BS 6891, *Specification for installation of low pressure gas pipework of up to 28 mm (R1) in domestic premises (2nd family gas).*

BS 7074-1, *Application, selection and installation of expansion vessels and ancillary equipment for sealed water systems — Part 1: Code of practice for domestic heating and hot water supply.*

BS 7291-1, *Thermoplastics pipes and associated fittings for hot and cold water for domestic purposes and heating installations in buildings — Part 1: General requirements.*

BS 7291-2, *Thermoplastics pipes and associated fittings for hot and cold water for domestic purposes and heating installations in buildings — Part 2: Specification for polybutylene (PB) pipes and associated fittings.*

BS 7291-3, *Thermoplastics pipes and associated fittings for hot and cold water for domestic purposes and heating installations in buildings — Part 3: Specification for crosslinked polyethylene (PE-X) pipes and associated fittings.*

BS 7593, *Code of practice for treatment of water in domestic hot water central heating systems.*

BS 7671:1992, *Requirements for electrical installations. IEE Wiring Regulations. Sixteenth edition.*

BS 7860, *Specification for carbon monoxide detectors (electrical) for domestic use.*

BS 8600, *Guide to complaints management.*

BS EN 215-1, *Thermostatic radiator valves — Part 1: Requirements and test methods.*

BS EN 297, *Gas-fired central heating boilers — Type B 11 and B 11BS boilers fitted with atmospheric burners of nominal heat input not exceeding 70 kW.*

BS EN 442 (all parts), *Specification for radiators and convectors.*

prEN 483, *Gas-fired central heating boilers — Type C boilers of nominal heat input not exceeding 70 kW.*

BS EN 625, *Gas-fired central heating boilers — Specific requirements for the domestic hot water operation of combination boilers of nominal heat input not exceeding 70 kW.*

prEN 677, *Gas-fired central heating boilers — Specific requirements for condensing boilers with a nominal heat input not exceeding 70 kW.*

BS EN 1254-1, *Copper and copper alloys — Plumbing fittings — Part 1: Fittings with ends for capillary soldering or capillary brazing to copper tubes.*

BS EN 1254-2, *Copper and copper alloys — Plumbing fittings — Part 2: Fittings with compression ends for use with copper tubes.*

BS EN 12098-1, *Controls for heating systems — Part 1: Outside temperature compensated control equipment for hot water heating systems.*

BS EN 60730-1, *Specification for automatic electrical controls for household and similar use — Part 1: General requirements.*

BS EN 60730-2-7, *Specification for automatic electrical controls for household and similar use — Part 2: Particular requirements — Section 7: Timers and time switches.*

BS EN 60730-2-8, *Specification for automatic electrical controls for household and similar use — Part 2: Particular requirements — Section 8: Electrically operated water valves, including mechanical requirements.*

BS EN 60730-2-9, *Specification for automatic electrical controls for household and similar use — Part 2: Particular requirements — Section 9: Temperature sensing controls.*

BS EN 60730-2-15, *Specification for automatic electrical controls for household and similar use — Part 2: Particular requirements — Section 15: Automatic electrical water level sensing controls of the float or electrode-sensor type used in boiler applications.*

BS EN 60730-2-16, *Specification for automatic electrical controls for household and similar use — Part 2: Particular requirements — Section 16: Particular requirements for automatic electrical water level operating controls of the float type for household and similar applications.*

BS ISO 11922-1, *Thermoplastics pipe for the conveyance of fluids — Dimensions and tolerances — Part 1: Metric series.*

3 Terms and definitions

For the purposes of this Product Assessment Specification, the following terms and definitions apply.

3.1

customer

person purchasing the central heating installation and/or the property owner

3.2

installer organization

organization, company or individual entering into a contractual arrangement to provide the product

3.3

installer

individual engineer installing the product on behalf of the installer organization

3.4

product

whole service provided by the installer organization in relation to the central heating installation, from the point of initial enquiry to completion of the after sales service provision

3.5

subcontractor

skilled personnel acting on behalf of the installer organization to carry out any work in relation to the central heating installation

3.6

supplier

third party organization which supplies products, materials or services, in relation to the central heating installation, to the installer organization

3.7

contract

contractual arrangement between the installer organization and customer

3.8

boiler

gas fired central heating boiler installed as the primary heat source for the heating system

3.9 installation

3.9.1

central heating installation

system, boiler and associated equipment

3.9.2

gas installation

gas pipework from the primary gas meter outlet, or emergency shut off valve on the low pressure stage of an LPG installation, to the gas boiler isolation valve

3.10

low temperature hot water (LTHW)

water used as the heating medium, maintained at 100 °C or less throughout the system, whether open or sealed

3.11

open system

central heating system incorporating a water circuit that is open to the atmosphere through a feed cistern and open vent pipe

3.12

sealed system

central heating system incorporating a water circuit that is not open to the atmosphere

3.13

domestic premises

property used solely as a dwelling

3.14

bathroom

room designed to contain a bath or shower

3.15

boiler compartment

enclosure designed or adapted to house a gas fired boiler

3.16

ventilation

process of supplying fresh air to, and remove vitiated air from, a room or internal space

3.17

air vent free area

unobstructed cross-sectional area of an air vent, i.e. the arithmetic sum of the area of individual apertures

3.18

quality assurance

verification that the product or service conforms to the requirements of this specification

3.19

complaint

expression of dissatisfaction with the product provided which fails to meet the requirements set out within the scope of this specification

3.20 operational terminology

3.20.1

boiler rated output

rate at which heat is transferred to water flowing through the boiler when working at its rated heat input under standard conditions

3.20.2

routine maintenance

planned work carried out to ensure that the boiler, controls and equipment are cleaned, adjusted and inspected as appropriate to ensure reliable, efficient and safe operation

3.20.3

breakdown service

service available to the customer to deal with breakdowns, arising from an inability of the system to operate in its entirety or a failure of the system that is likely to lead to water damage

3.21 equipment terminology

3.21.1

combination boiler

appliance designed to provide central heating hot water and domestic hot water without the need for additional secondary storage

3.21.2

condensing boiler

boiler designed to make use of the latent heat of combustion products by condensing water vapour within the appliance

3.21.3

open flued boiler

appliance designed to be connected to an open flue system, its combustion air being drawn from the room, space or enclosure in which it is installed

3.21.4

room sealed boiler

appliance in which the combustion air supply and flue system is not open to the room, space or enclosure in which it is installed

3.21.5

storage combination boiler

boiler with an internal hot water store of capacity at least 15 l but not exceeding 70 l

3.21.6

heat emitter

equipment emitting heat for the purposes of space heating

3.21.7

radiator

unit for space heating that warms the air by convection and provides radiation

3.21.8

air vent

non-adjustable purpose-made grille designed to allow the passage of air at all times

3.22 control terminology

3.22.1

timeswitch

device which switches the central heating system on and off at a prescribed time

3.22.2

optimizer control

device which starts and stops the central heating system at the latest possible time to achieve the desired internal temperatures, dependent upon external conditions

3.22.3

compensating controls

device which adjusts the LTHW flow temperature in relation to external temperatures

3.22.4

control valves

device which controls the flow of LTHW, dependent upon the demands of the heating and hot water system

NOTE Devices may be either mixing valves or diverting valves.

3.22.5

comfort conditions

internal environmental conditions that are acceptable to the occupants by varying clothing or physical activities

3.22.6

internal air temperature

average air temperature within the heated space

3.22.7

resultant temperature

combination of inside air temperature, mean radiant temperature and air velocity

3.23

HWS

hot water service

4 Items to be agreed and documented

The following items to be agreed between the contracting parties are specified in the clauses referred to and the processes to fulfil such agreements shall be fully documented and recorded as applicable. For compliance with the specification both the definitive requirements specified throughout the specification and the following documented items shall be satisfied before a claim of compliance with the specification can be made and verified.

- a) rated output of the boiler, see **5.1**;
- b) delivery date of equipment, see **7.4**;
- c) installation commencement date, see **7.4**;
- d) estimated duration of installation, see **7.4**;
- e) installer organization identification, see **7.4**;
- f) installation design, see **7.3**;
- g) pipework routing, see **7.4**;
- h) routing/location of flue pipes, see **7.4**;
- i) location of heat emitters, see **7.4**;
- j) location of controls, see **7.4**;
- k) the proposed sequence of installation, see **7.4**;
- l) protection of the customer's property, see **7.4**;
- m) resolution of any potential installation difficulties, see **7.4**.

5 Central heating systems

5.1 General

All systems shall have the following:

- a) electrical supply: a suitably rated electrical fused spur, installed local to the boiler position, to provide electric isolation for the whole central heating installation;
- b) gas isolation valve, fitted local to, or integral with, the gas fired boiler;
- c) time control of the heating and domestic hot water supply as appropriate;
- d) thermostatic control of the heating and domestic hot water supply;
- e) carbon monoxide (CO) detector local to the boiler if appropriate, or in accordance with the detector manufacturer's recommendations.

All gas appliances shall be CE marked.

Boilers shall only be fitted with external control devices approved by the boiler manufacturer.

Boilers shall be selected with a rated output at least equal to the heat requirements which have been agreed between the installer organization and the customer.

Gas installation pipework shall be designed and installed in accordance with BS 6891.

Electricity supplies shall be installed in accordance with BS 7671.

Boilers shall be installed in accordance with the boiler manufacturer's installation instructions.

5.2 Flues and ventilation

The connection of a boiler to a flue system shall be in accordance with BS 5440-1.

The air supply for the installed boiler shall be in accordance with BS 5440-2.

Where external sources of noise may create a nuisance in specific circumstances, consideration shall be given to the siting of ventilation grilles and/or noise insulation techniques.

5.3 Automatic operation

The LTHW control systems shall be designed for automatic operation, without the need for manual intervention by the occupant.

5.4 Control equipment

5.4.1 Safety equipment

Safety controls shall operate in such a way that in the event of failure, the equipment fails in a safe manner. Safety controls shall be included within a LTHW system to guard against the following:

- a) excessive pressures arising in the system or associated equipment;
- b) excessive temperature arising in the system or associated equipment;
- c) fire or explosion;
- d) the effects of frost (where applicable), see **10.4.2**.

NOTE Attention is drawn to CIBSE Guides A to C [1].

5.4.2 Operating ranges

The operating ranges of sensing elements and controllers used within the installation shall be suitable for LTHW central heating systems.

5.4.3 Accuracy

The accuracy and repeatability of each individual component within the control system shall be such that, when operating influences are taken into account, the system or space temperature remains within the specified tolerances.

5.4.4 Control types

5.4.4.1 Time controls

Timeswitches shall be incorporated into central heating systems which allows the user to pre-set on/off periods. Time controls shall be able to continue to operate in the event of power failure by incorporating battery back up.

NOTE Such controls may be overridden in the event of low ambient temperature for frost protection.

5.4.4.2 Temperature controls

Temperature control shall be maintained within one of the following systems:

- a) energy conversion system;
- b) distribution system;
- c) internal temperature control.

5.4.4.3 Energy management controls

Building management controls shall be incorporated into the system, to provide a greater level of control and conserve energy usage. These may be incorporated as part of the time control system and shall consist of one of the following:

- a) optimized control, which serves to start the heating at the latest possible time, whilst achieving the desired temperature at the occupancy time;
- b) weather compensated control, which serves to modify the system operating temperature, in relation to the external temperature, whilst achieving the desired internal temperature.

5.5 Claims for compliance

The system record for an installed system, claimed to comply with this specification, shall be endorsed with the installer's company name and the number and date of this Product Assessment Specification.

6 Equipment and fittings

6.1 Unvented hot water storage systems

Where unvented hot water storage systems with a capacity of more than 15 l are being installed, only equipment product certified by an independent organization, e.g. BSI Kitemark or British Board of Agreement certification, shall be used.

6.2 Central heating systems

6.2.1 General

The components of central heating systems shall conform to an appropriate British Standard, a national standard implementing a harmonized standard or a draft harmonized standard in accordance with Table 1.

6.2.2 Quality assurance

Preference should be given to the purchase of components and parts from independently quality assured and certified sources, for example with the BSI Kitemark. In the absence of such quality assured sources, either, the suppliers should be subject to assessments and monitoring or supplied components should be subject to a statistically based goods receiving inspection and test regime to confirm conformity to this specification.

6.2.3 Thermal insulation

Thermal insulation shall provide protection from freezing in accordance with BS 6700.

NOTE Attention is drawn to the Water Supply (Water Fittings) Regulations 1999 [2], see **A.2**, and Building Regulations [3], [4] and [5], see **A.1**.

If a pipe is losing any heat that is not contributing to the useful heat requirement of a room or space, then that pipe shall be insulated.

Insulation thickness shall be either:

- a) in accordance with Tables 2 to 4; or
- b) different to that specified in Tables 2 to 4, in which case an equivalent thermal efficiency shall be maintained.

Hot water storage cylinders shall be pre-insulated in accordance with BS 1566 or BS 3198. Insulation jackets applied after manufacture of hot water storage cylinders shall conform to BS 5615.

For plastic pipework, the appropriate insulation thickness, generally of equal thickness to the outside pipe diameter, shall be applied dependent on the pipe size used as defined in BS 2871 or BS ISO 11922-1.

Table 1 — Central heating components and their relevant British Standards

Central heating components	British Standards
Central heating boilers	BS 5258-1 or -8 or -15; BS 6332-1, or -3; BS 7074-1; BS EN 297; prEN 483; BS EN 625, prEN 677
Control components – automatic electrical controls – outside temperature compensated control equipment – timers and timeswitches – electrically operated water valves – temperature sensing controls – automatic water level sensing controls – thermostatic radiator valves – carbon monoxide detectors	BS EN 60 730-1 BS EN 12 098-1 BS EN 60 730-2-7 BS EN 60 730-2-8 BS EN 60 730-2-9 BS EN 60 730-2-15, -16 BS EN 215 BS 7860
Valves – draw off taps and stop valves – float operated valves – manually operated valves – drainage taps – copper alloy valves	BS 759 BS 1010-2 BS 1212-2 or -3 BS 2767 BS 2879 BS 5154
Pipes and fittings – pipe threads for tubes and fittings – malleable cast iron and copper alloy threaded pipe fittings – capillary and compression copper and copper alloy fittings – compression fittings for polyethylene pipes – screwed and socketed steel tubes – wrought steel pipe fittings – copper and copper alloy tubes – plastic pipe and fittings	BS 21 BS 143, BS 1256 BS EN 1254-1 and -2 BS 864-3 BS 1387 BS 1740 BS 2871 BS 7291
Radiators and convectors	BS EN 442