

Safety and performance of gas-fired hot water boilers (60 kW to 2 MW input) —

Part 1: Specification for general requirements

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- Associated Offices Technical Committee
- Boiler and Radiator Manufacturers' Association Ltd.
- British Combustion Equipment Manufacturers' Association
- British Gas plc
- Chartered Institution of Building Services Engineers
- Department of Energy (Energy Efficiency Office)
- Department of the Environment (PSA)
- Health and Safety Executive
- Institution of Gas Engineers
- Liquefied Petroleum Gas Industry Technical Association (UK)
- Loss Prevention Council
- Society of British Gas Industries

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Foreword

This Part of BS 5978 has been prepared under the direction of the Gas Standards Policy Committee and it replaces BS 5978-1:1983, which is withdrawn.

This edition introduces technical changes to bring the standard up to date, by including alterations made by Amendment No. 1 to the 1983 edition and further technical changes to clauses **3**, **6**, **13** and **19**. It does not reflect a full review of the standard, which will be undertaken in due course.

Account has been taken by the committee of experience and current practice, both national and international, in the preparation of this Part of BS 5978.

The constructional requirements for the boilers are specified in BS 779, BS 855 and BS 2790 and test methods used for the determination of boiler thermal performance are described in DD 65-1¹⁾.

BS 5978 is published in three Parts as follows:

- *Part 1: Specification for general requirements;*
- *Part 2: Specification for additional requirements for boilers with atmospheric burners;*
- *Part 3: Specification for additional requirements for boilers with forced or induced draught burners.*

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 12, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

¹⁾ Under revision.

1 Scope

This Part of BS 5978 specifies general requirements, including performance and safety requirements and methods of test, for gas-fired hot water boilers operating at internal pressures up to 4.5 bar²⁾ and having heat inputs from 60 kW up to 2 MW inclusive, calculated on the gross calorific value.

NOTE Electrical requirements are given in BS 5986.

This Part of BS 5978 applies to cast iron and steel boilers constructed in compliance with BS 779, BS 855 or BS 2790 as appropriate. The requirements of this Part of BS 5978, in respect of safety and performance, also apply to boilers constructed of other materials and for which there are no constructional standards.

This Part of BS 5978 applies to boilers designed for use with open flues but does not apply to boilers designed for use with room-sealed and balanced flue systems.

This Part of BS 5978 also applies to boilers designed for use on normal low-pressure district supplies of 2nd and 3rd family gases.

NOTE The titles of the publications referred to in this Part of BS 5978 are listed on the inside back cover.

2 Definitions

For the purposes of this Part of BS 5978 the following definitions, together with those given in BS 1179 and BS 1179-6, apply.

2.1

lock-out

the safety shut-down condition of a control system such that restart cannot be accomplished without manual reset

2.2

overheat control (limit control)

a temperature-actuated device which is preset and sealed, and designed to protect the boiler and its surroundings in the event of failure of the water temperature control

2.3

safety shut-down

the action of shutting off all fuel and ignition energy by means of a safety control such that restart cannot be accomplished without either manual reset or an automatic recycle

2.4

water temperature control

a temperature-actuated control intended to maintain the temperature of the water within the boiler between specified limits

NOTE This is the normal means of boiler water temperature control and should not be confused with the overheat control defined in 2.2.

2.5

automatic burner system

a burner system in which, when starting from the completely shut-down condition, the start-gas flame is established and the main gas valve(s) is/are actuated by the control without manual intervention

NOTE Automatic burners may have pilots which are either interrupted or intermittent.

2.6 non-automatic burner system

a burner system which is not automatic within the meaning of 2.5, i.e. a burner with a permanent pilot ignited under manual supervision

3 Additional requirements for boilers

In addition to complying with this Part of BS 5978, the boiler shall comply with either BS 5978-2 or BS 5978-3, whichever is appropriate to the boiler design.

4 Electrical requirements

Boilers shall comply with BS 5986.

5 General conditions of test

5.1 Test facilities. The test room shall be adequately ventilated but free from draughts that are likely to affect the performance of the boiler.

The air in the test room shall not contain more than 1 000 p.p.m. of carbon dioxide or 10 p.p.m. of carbon monoxide.

The temperature in the test room shall be maintained at 20 ± 50 °C.

NOTE Appropriate test rigs are described in DD 65-1 and DD 65-2.

²⁾ 1 bar = 10^5 N/m² = 100 kPa.

5.2 Preparation of boiler for testing

5.2.1 The boiler shall be set up in accordance with the manufacturer's instructions as relevant to the test and with particular reference to minimum declared clearances round the boiler. It shall then be adjusted in accordance with the manufacturer's instructions, using the appropriate reference test gas at an inlet pressure of 17.5 mbar for 2nd family gases (NGA), with 28 mbar for butane (LPGA) and 37 mbar for propane (LPGC) for 3rd family gases.

5.2.2 Before any tests are made, the boiler shall be operated for a period sufficient to dry any insulation and remove any temporary finish that might interfere with observations.

5.2.3 Unless the test method specifically requires otherwise, boilers with a vertical flue outlet shall be fitted with the minimum length of vertical secondary flue specified by the manufacturer and having the same nominal diameter as the flue outlet. In the absence of a manufacturer's specification a 1 m length of flue shall be used for these tests.

Boilers with a horizontal flue outlet shall be fitted in accordance with the manufacturer's instructions which shall state the maximum length of horizontal run and method of adaptation to a vertical flue. Thereafter the vertical flue shall be fitted as above.

5.3 Test procedure. The boiler, including the fuel-carrying parts, shall be examined for soundness before and after completion of the tests specified in accordance with Parts 2 and 3 of this standard as appropriate. The test results shall be deemed invalid unless the system is sound.

During testing the initial adjustment of the boiler shall not be altered unless specifically required by the test method.

Precautions shall be taken to prevent thermostats or other variable controls from acting so as to interfere with the fuel flow, except as necessitated by the test.

Unless the test method specifies otherwise, tests shall be carried out using the appropriate test gas. For boilers using 3rd family gases, test gases LPGA and LPGB shall be used with the boiler adjusted for butane, and test gases LPGC and LPGE shall be used with the boiler adjusted for propane.

NOTE 1 Tables indicating the test gases (taken from BS 4947) to be used for each of the gas families and, where appropriate, their conditions of application, are shown in the relevant clauses of BS 5978-2 and BS 5978-3.

Gas test pressures shall be accurate to within ± 0.2 mbar and controlled so that the variation does not exceed ± 0.2 mbar.

NOTE 2 In general, except for tests involving governor performance, the boiler governor may be put out of action and the specified test pressure obtained by adjustment of the gas pressure at the inlet to the boiler.

The heat input to the boiler shall be determined as specified in BS 4947.

6 Design and construction

6.1 Design and construction

6.1.1 Boiler design. The boiler manufacturer shall specify whether or not the boiler is designed to operate in the condensing mode.

Where the boiler is not designed to operate in the condensing mode, the manufacturer shall specify the minimum return water temperature for which the boiler is suitable.

6.1.2 Boiler construction. A cast iron or steel boiler shall comply with BS 779, BS 855 or BS 2790 as appropriate.

6.2 Component location. Parts that are intended to be removable for maintenance or for cleaning shall be readily accessible, shall be easy to assemble correctly and impossible to assemble incorrectly where incorrect assembly would create a hazard for the user or result in damage to the appliance and its controls.

The burner(s) shall be positively located and so arranged that misalignment cannot occur.

It shall not be possible to loosen complete burner assemblies, jets or injectors without the use of tools.

6.3 Materials in contact with gas

6.3.1 Copper tubing. Copper tubing shall not be used where it is likely to be exposed to temperatures above 100 °C.

6.3.2 Jointing compounds. Jointing compounds shall comply with the relevant requirements of BS 5292.

6.3.3 Solder. Solder having a melting point below 450 °C after application shall not be used for gas-carrying parts.

6.4 Insulation. Thermal or acoustic insulation shall be non-combustible within the requirements of BS 476-4, shall be securely located and shall be protected against mechanical damage, condensate and vermin.

Gas-carrying parts in contact with, or passing through, insulating material shall be adequately protected against possible corrosive effects of the insulant.

6.5 Gas connections. Gas inlet connections shall be suitable for connection to one of the following:

- a) tapered thread installation pipes in accordance with BS 21;