

Thermal performance of domestic gas appliances —

**Part 6: Specification for thermal
performance of combined appliances:
fanned-circulation ducted-air
heater/circulator**

UDC 697.245.51:644.1:683.945:006.3/.8

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW



Document Sharing Hub

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Gas Standards Policy Committee (GSE/-) to Technical Committee GSE/17, upon which the following bodies were represented:

- Association for Consumer Research (ACRE)
- British Gas plc
- British Non-Ferrous Metals Federation
- Consumer Policy Committee of BSI
- Department of Energy (Energy Efficiency Office)
- Department of the Environment (Building Research Establishment)
- Department of Trade and Industry (Consumer Market Division)
- Department of Trade and Industry (Consumer Safety Unit, C A Division)
- Gas Consumers Council
- Institution of Gas Engineers
- Liquefied Petroleum Gas Industry Technical Association (UK)
- National Caravan Council Limited
- Royal Society for the Prevention of Accidents
- Society of British Gas Industries

The following body was also represented in the drafting of the standard, through subcommittees and panels:

Co-opted member

This British Standard, having been prepared under the direction of the Gas Standards Policy Committee, was published under the authority of the Board of BSI and comes into effect on 30 June 1990

© BSI 11-1999

The following BSI references relate to the work on this standard:
Committee reference GSE/17
Draft for comment 87/75479 DC

ISBN 0 580 18746 2

Amendments issued since publication

Amd. No.	Date	Comments

Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
1 Scope	1
2 Definitions	1
3 Thermal performance	1
4 Test methods	3
Figure 1 — Installation of type C ₂ air heaters on the test duct	6
Figure 2 — Sampling probe for type B air heaters	7
Figure 3 — Sampling probe for type C air heaters	8
Figure 4 — Sampling position for type C ₁ air heaters	9
Figure 5 — Sampling position for type C ₂ air heaters	9
Figure 6 — Nomogram for the calculation of mean specific heat of dry combustion products	10
Figure 7 — Test rig (circulator)	11
Table 1 — Minimum net efficiency of air heater under still air conditions: claimed value	2
Table 2 — Minimum net efficiency of circulator under still air conditions: claimed value	2
Publications referred to	Inside back cover

Foreword

This Part of BS 6332 has been prepared under the direction of the Gas Standards Policy Committee to provide a specification for the thermal performance of combined gas-fired fanned-circulation ducted-air heaters/circulators and thus complements the safety requirements for such appliances specified in BS 5258-9. The performance requirements of air heaters and circulators individually given in BS 6332-5 and BS 6332-1, respectively, form the bases of this Part of BS 6332.

In anticipation of this Part of BS 6332, being the subject of third party certification schemes, as are other Parts of BS 6332, it provides for a claim by the appliance manufacturer of a numerical value for the thermal efficiency of a product model. The test authority can then ascertain that a sample submitted for type approval meets this claimed value within a specified test equipment tolerance. Subsequently any sample selected from production of the particular model is expected to comply with a verification value, which also takes into account a specified production tolerance.

Also in common with other Parts of BS 6332, efficiency values are based on the use of net calorific values, instead of gross values as formerly, in alignment with European practice.

Parts of BS 6332 already published are as follows.

- *Part 1: Specification for thermal performance of central heating boilers and circulators;*
- *Part 2: Specification for thermal performance of gas fires;*
- *Part 3: Specification for thermal performance of combined appliances: gas fire/back boiler;*
- *Part 4: Specification for thermal performance of independent convector heaters;*
- *Part 5: Specification for thermal performance of fanned-circulation ducted-air heaters.*

As a consequence of the initiation, by the CEC, of the Gas Appliance Directive and the preparation of European Standards in support of this Directive, it is probable that Parts of BS 6332 will be withdrawn, in due course, and replaced by new British Standards aligned with CEN standards.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

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 Scope

This Part of BS 6332 specifies the thermal efficiency requirements and associated methods of test for gas-fired appliances consisting of a fanned-circulation ducted-air heater of rated heat input not exceeding 60 kW¹⁾ combined with a circulator of rated heat input not exceeding 8 kW¹⁾. The combined appliance is usually of integral construction, the circulator being fitted inside the air heater casing.

It also covers fanned-circulation ducted-air heaters which are designed to be fitted with circulators, as a purchaser's option.

This standard only applies to circulators intended for use as an integral part of the combined appliance. Circulators intended for independent use are covered by BS 6332-1.

This Part covers appliances of the following categories, as described in A.1.3 of BS 4947:1984:

I_T , I_N , $I_{L/B}$, $I_{L/P}$;

II_{TN} , II_{NL} , $II_{NL/B}$, $II_{NL/P}$;

III , $III_{TNL/B}$, $III_{TNL/P}$;

and of the following types, as defined in BS 1179-6:1980:

type B: open-flued appliances;

type C: room-sealed appliances;

type C₁: balanced-flue appliances;

type C₂: Se-duct appliances.

This Part is only applicable to the appliances listed above that comply with BS 5258-9.

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

2 Definitions

For the purposes of this Part of BS 6332, the definitions given in BS 1179:1967 and BS 1179-6:1980 apply, together with the following.

2.1

claimed efficiency

the efficiency of an appliance claimed by the manufacturer. It may be a net efficiency or a gross efficiency. Where the term is used in this Part, it always relates to net efficiency, either the efficiency as claimed or the equivalent value calculated from a claimed gross efficiency in accordance with the relationship given in the footnote to Table 1

2.2

gross efficiency

the efficiency of an appliance calculated on the assumption that the heat content of the test gas is its gross calorific value

2.3

net efficiency

the efficiency of an appliance calculated on the assumption that the heat content of the test gas is its net calorific value

2.4

test house efficiency

the net efficiency of an appliance measured at the test house on a sample submitted for type approval purposes

2.5

verification efficiency

the net efficiency of an appliance measured during any surveillance or check testing of production appliances

3 Thermal performance

3.1 Efficiency requirements: fanned-circulation ducted-air heater

3.1.1 General

3.1.1.1 The appliance shall comply with 3.1.2 and, as appropriate, with 3.1.3.1, 3.1.3.2 or 3.1.3.3.

3.1.1.2 Efficiency values shall pertain to and shall be measured by the method described in 4.1 and 4.2.1.

3.1.2 Efficiency: still air conditions (all types of appliance)

3.1.2.1 The manufacturer shall claim a net efficiency value which shall be not less than that given in Table 1.

3.1.2.2 The corresponding test house efficiency shall be not less than the claimed efficiency minus 2.

3.1.2.3 The corresponding verification efficiency shall be not less than the claimed efficiency minus 5.

3.1.3 Efficiency: adverse flue conditions

3.1.3.1 Type B appliances

3.1.3.1.1 The test house efficiency, measured under the conditions specified in 3.1.3.1.2, shall be not less than the claimed efficiency minus 9.

¹⁾ Based on gross calorific value.

Table 1 — Minimum net efficiency of air heater under still air conditions: claimed value

Appliance rating	Heat input at which measurement made	Minimum claimed efficiency (net) ^a
fixed	rated	80
range	minimum of range	77
	maximum of range	80
^a The gross efficiency value is related to the net value for the four reference gases as follows:		
for TGA (4)	gross value = 0.899 × net value	
for NGA	gross value = 0.901 × net value	
for LPGA	gross value = 0.926 × net value	
for LPGC	gross value = 0.922 × net value	

3.1.3.1.2 The appliance shall be operated at the rated heat input or at the maximum of the rated range, as appropriate.

A gas sampling probe shall be inserted 200 mm below the top of the 1 m vertical secondary flue to enable the average CO₂ content across the flue to be determined. An extraction fan shall then be connected to the flue and arranged to create a flue flow such that the CO₂ content is reduced to half its original value.

3.1.3.2 Type C₁ appliances

3.1.3.2.1 The test house efficiency measured under the conditions specified in **3.1.3.2.2**, shall be not less than 70 %.

3.1.3.2.2 The appliance shall be operated at the rated heat input or at the maximum of the rated range, as appropriate.

The appliance shall be set up on the wind test rig described in Appendix B of BS 5258-9:1989 and shall be tested with a horizontal wind of 4.5 m/s directly on the terminal.

3.1.3.3 Type C₂ appliances

3.1.3.3.1 The test house efficiency, measured under the conditions specified in **3.1.3.3.2**, shall be not less than 70 %.

3.1.3.3.2 The appliance shall be operated at the rated heat input or at the maximum of the rated range, as appropriate.

The appliance shall be set up on the test duct as described in Appendix C of BS 5258-9:1989 in such a way that the distance between the back of the appliance and the end of the outlet connecting duct is twice the diameter of the latter (see Figure 1). If it is necessary to increase the length of the connecting ducts using extension ducts, suitable extension ducts shall be supplied by the manufacturer.

The appliance shall be tested with an upward air flow of velocity 1.5 m/s.

3.2 Efficiency requirements: circulator

3.2.1 General

3.2.1.1 The appliance shall comply with **3.2.2**. A natural draught type B appliance shall also comply with **3.2.3**.

3.2.1.2 Efficiency values shall pertain to and shall be measured by the method described in **4.1** and **4.2.2**.

3.2.2 Efficiency: still air conditions

3.2.2.1 The manufacturer shall claim an efficiency value which shall be not less than that given in Table 2.

Table 2 — Minimum net efficiency of circulator under still air conditions: claimed value

Appliance rating	Heat input at which measurement made	Minimum claimed efficiency (net) ^a
fixed	rated	79
range	minimum of range	76
	maximum of range	79
^a The gross efficiency value is related to the net value for the four reference gases as follows:		
for TGA (4)	gross value = 0.899 × net value	
for NGA	gross value = 0.901 × net value	
for LPGA	gross value = 0.926 × net value	
for LPGC	gross value = 0.922 × net value	

3.2.2.2 The corresponding test house efficiency shall be not less than the claimed efficiency value minus 2.

3.2.2.3 The corresponding verification efficiency shall be not less than the claimed efficiency value minus 5.

3.2.3 Efficiency requirements for natural draught type B appliances: adverse flue conditions

3.2.3.1 Test house efficiency

3.2.3.1.1 The test house efficiency, measured under the conditions specified in **3.2.3.1.2**, shall be not less than 75 %.

3.2.3.1.2 The appliance shall be operated at the rated heat input, or the maximum rated heat input if range-rated.