

Carbon monoxide in dwellings and the combustion performance of gas-fired appliances —

Part 2: Guide for using electronic portable combustion gas analysers in the measurement of carbon monoxide and the determination of combustion performance

ICS 13.040.40; 97.100.20

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee GSE/30, Gas installations (1st, 2nd and 3rd family gases), upon which the following bodies were represented:

Boiler and Radiator Manufacturers' Association Ltd
British Flue and Chimney Manufacturers Association
BSI Consumer Policy Committee
Catering Equipment Suppliers' Association
Centrica plc
Council for Registered Gas Installers
Department of Trade and Industry
Health and Safety Executive
Heating and Ventilating Contractors' Association
ICOM Energy Association
Institute of Domestic Heating and Environmental Engineers
Institution of Gas Engineers and Managers
LP Gas Association
Society of British Gas Industries
Co-opted members

The following bodies were also represented in the drafting of this standard:

Advantica Ltd
Association of Plumbing and Heating Contractors
Council of Gas Detection and Environmental Monitoring
Energywatch
National Grid Gas plc

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Contents

	Page
Committees responsible	Inside front cover
Foreword	ii
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Gas analysers	3
5 Determination of ambient levels of CO and CO ₂ in dwellings	4
6 Determination of the combustion performance (CO/CO ₂ ratio) of an appliance	7
Annex A (informative) Electronic portable combustion gas analyser	12
Annex B (informative) Multi-hole sample probes	13
Annex C (informative) Flue/draught diverter configurations for warm air heaters	14
Bibliography	15
Figure B.1 — Probe for gas cooker grill	13
Figure B.2 — Angled probe	13
Figure C.1 — Flue/draught diverter configurations for warm air heaters	14

Foreword

This part of BS 7967 has been prepared under the direction of Technical Committee GSE/30.

BS 7967 consists of the following parts.

- *Part 1: Guide for identifying and managing sources of fumes, smells, spillage/leakage of combustion products and carbon monoxide detector activation.*
- *Part 2: Guide for using electronic portable combustion gas analysers in the measurement of carbon monoxide and the determination of combustion performance.*
- *Part 3: Guide for responding to measurements obtained from electronic portable combustion gas analysers.*
- *Part 4: Guide for using electronic portable combustion gas analysers as part of the process of servicing and maintenance of gas-fired appliances.¹⁾*

This part of BS 7967 is intended to be used in conjunction with BS 7967-1, BS 7967-3 and the *Gas Industry Unsafe Situations Procedure* [1].

This standard has been prepared to provide guidance on the use of electronic portable combustion gas analysers for which no standard has previously been available.

This standard has been written for electronic portable combustion gas analysers that are not suitable for measuring ambient levels of CO₂. However, at the time of publication, analysers equipped with direct reading CO₂ sensors that may be used for measuring ambient levels of CO₂ are becoming available and these will be the subject of a future revision of this standard.

Attention is drawn to the following statutory regulations.

- The Gas Safety (Installation & Use) Regulations 1998 [2].
- Gas Safety (Installation and Use) Regulations (Northern Ireland) 2004 [3].
- Gas Safety (Application) Order 1996 (Isle of Man) [4].
- The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995 [5].
- Gas Safety (Management) Regulations 1996 [6].
- Gas Safety (Management) Regulations (Northern Ireland) 1997 [7].

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its 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 to ii, pages 1 to 16, an inside back cover and a back cover.

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¹⁾ In preparation.

1 Scope

This part of BS 7967 gives guidance on the use of electronic portable combustion gas analysers. It contains information on the following.

- a) The general use of an analyser.
- b) The use of an analyser to determine ambient levels of carbon monoxide (CO) and the presence of carbon dioxide (CO₂) in dwellings (see Note 2).
- c) The use of an analyser to determine CO and CO₂ in combustion products from the following types of gas fired appliances.
 - 1) Flueless appliances (type A appliances), e.g. cooking appliances, space heaters.
 - 2) Open flue appliances (type B appliances).
 - 3) Room sealed appliances (type C appliances).
 - 4) All appliances where the appliance manufacturer has provided a purpose designed sampling point or specific sampling instructions.

NOTE The type A, type B and type C classification of gas fired appliances is described in PD CR 1749.

This standard is for use with appliances using 1st, 2nd or 3rd family gases.

The guidance given in this standard on how to use gas analysers is intended to be adopted by gas operatives using gas analysers as part of identifying and managing, in accordance with BS 7967-1, sources of fumes, smells, spillage/leakage of combustion products and CO detector activation in dwellings.

This standard does not cover procedures for investigating incidents that are reportable under **6.1** of Reporting of Injuries, Diseases and Dangerous Occurrence Regulations 1995 (RIDDOR) [5] and the Gas Safety (Management) Regulations 1996 (GSMR) [6].

NOTE 1 At the time of installation of a new appliance it is not necessary to carry out tests to measure the level of combustion products in the flue unless the manufacturer's instructions specify that a test be carried out.

NOTE 2 Electronic portable combustion gas analysers that calculate CO₂ levels from an oxygen (O₂) measurement are not suitable for measuring ambient levels of CO₂ in dwellings (see **4.2.2** and Note to Clause **5**). They can, however, detect a change in the ambient CO₂ level in excess of workplace exposure limits. The design is well proven for calculating CO₂ levels in combustion gases in the flue of an appliance. For CO₂ workplace exposure limits, refer to the HSE guidance note on *Workplace exposure limits*, EH40 [8].

NOTE 3 Electronic portable combustion gas analysers are not to be used as a substitute for normal service and maintenance carried out in accordance with gas appliance manufacturers' instructions. BS 7967-4²⁾ describes the options of how they can be used in conjunction with gas appliance manufacturers' instructions.

NOTE 4 Information on the effect of CO can be found in the Institute for Environment and Health's *IEH assessment on indoor air quality in the home (2): Carbon monoxide* [9].

NOTE 5 Combustion products from gas appliances will contain nitrogen oxides (NO_x), predominantly nitrogen monoxide (nitric oxide, NO) and nitrogen dioxide (NO₂). This standard does not deal with the measurement of combustion products such as nitrogen oxides and aldehydes. Such products could be present in the air in sufficient quantities to prove an irritant and could be harmful. For guidance on the occupational health considerations associated with these combustion products, reference can be made to the following documents.

- a) The Institute for Environment and Health's IEH assessment on indoor air quality in the home: Nitrogen dioxide, formaldehyde, volatile organic compounds, house dust mites, fungi and bacteria [10].
- b) The Health and Safety Executive's (HSE's) Chemical Hazard Alert Notices, CHAN 28 on nitrogen monoxide [11] and CHAN 29 on nitrogen dioxide [12]. Please NOTE that these CHANs refer to occupational levels specifically related to the workplace situation. For further guidance refer to the HSE³⁾.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 7927:1998, *including Amendment 1:1999, Heating appliances for domestic applications — Portable apparatus designed to detect and measure specific combustion flue gas products — Requirements*.

²⁾ In preparation.

³⁾ HSE Infoline, Caerphilly Business Park, Caerphilly CF83 3GG, Tel. 0845 345 0055, www.hse.gov.uk.

BS 7967-1:2005, *Carbon monoxide in dwellings and the combustion performance of gas-fired appliances — Part 1: Guide for identifying and managing sources of fumes, smells, spillage/leakage of combustion products and carbon monoxide detector activation.*

BS 7967-3, *Carbon monoxide in dwellings and the combustion performance of gas-fired appliances — Part 3: Guide for responding to measurements obtained from electronic portable combustion analysers.*

3 Terms and definitions

For the purposes of this part of BS 7967 the following terms and definitions apply.

3.1

appliance compartment

enclosure specifically constructed or adapted to accommodate one or more fuel burning appliances

3.2

box radiant gas fire

gas fire designed to heat a room by both radiation and convection incorporating radiant box shaped lattice fronted elements mounted vertically or near vertical and of a design that does not seek to simulate a solid fuel fire bed

3.3

dwelling

unit of residential accommodation including residential park homes, flats, bed-sits, maisonettes, terraced, semi-detached and detached houses (including all such residential accommodation situated within or forming part of commercial or industrial or agricultural premises), leisure accommodation and boats, excluding vessels with an international load line certificate

NOTE It is recognised that the guidance can be applied to premises other than dwellings, such as those supplying a small number of clients on a bed and breakfast basis.

3.4

customer

occupier of the dwelling, the owner of the dwelling and any person with authority for the time being to take appropriate action in relation to any gas fitting therein

3.5

customer adjustable ventilation

adjustable purpose provided unit/assembly designed to allow ventilation

3.6

electronic portable combustion gas analyser

electronic apparatus that will detect and measure the presence of combustion gases and clearly display the result

3.7

permanent ventilation

non-adjustable purpose provided unit/assembly designed to allow ventilation

3.8

gas operative

person deemed competent to carry out work

NOTE 1 Persons deemed competent to carry out gas work are those who hold a certificate of gas safety competence acceptable to the Council for Registered Gas Installers (CORGI), which includes (without limitation) the Accredited Certification Scheme (ACS) and the Gas Services National Vocational Qualification (e.g. NVQ or SNVQ) that has been aligned with ACS.

NOTE 2 Under the Gas Safety (Installation and Use) Regulations 1998 [2] a business or self-employed person who carries out work has to be a “member of a class of persons approved for the time being by the Health and Safety Executive (HSE)”.

At the time of publication, the body with the HSE approval to operate and maintain a register of businesses who are “members of a class of persons” is CORGI.

3.9

work

installation, maintenance, servicing, removal, permanent adjustment, repair, changing the position, alteration or renewal of a gas fitting or purging it of air or gas

NOTE This term is consistent with the definition given in Regulation 2 of the Gas Safety (Installation and Use) Regulations 1998. Guidance on Regulation 2 is contained in the Health and Safety Commission (HSC) Approved Code of Practice and Guidance, *Safety in the installation and use of gas systems and appliances* [13].

4 Gas analysers

4.1 General

Analysers should be treated with care and used and maintained in accordance with the manufacturer's instructions. Before using the analyser it is essential to read operator manuals and, as appropriate:

- a) ensure that the batteries are correctly inserted, charged and not leaking;
- b) ensure that the analyser has a current proof of calibration;
- c) ensure that the display is functioning correctly;
- d) ensure the analyser is zeroed and purged in accordance with the manufacturer's instructions;
- e) ensure that the pump is working;
- f) ensure that filters and water traps are clean and dry;
- g) ensure that probe tubing is free from leaks or damage.

NOTE It is essential that analysers are only used by a person who:

- a) is competent in their use; and
- b) has an understanding of the results obtained and an awareness of the necessary safety actions and appropriate regulations [e.g. GS(I&U)R].

These analysers should not be used to identify leakage of combustion products from the appliance combustion circuit except where their use for this purpose is detailed in the appliance manufacturer's instructions.

These analysers read very low levels near to zero. Since they can fail to give any reading due to sensor failure, a check should be carried out, for example by measuring combustion products from a cooker grill burner or around a cold saucepan on a hotplate. A small bottle of calibration gas can also be used to check the sensor.

4.2 Selection

NOTE 1 BS 7927 will be superseded by BS EN 50379-3 in March 2007.

NOTE 2 A more detailed description of gas analysers is given in Annex A.

4.2.1 Ambient levels of CO in dwellings

For the measurement of ambient CO levels in dwellings the gas analyser can be:

- a) of a type that measures CO; or
- b) of a type that measures CO and O₂ and calculates the CO₂ levels from the O₂ measured.

The accuracy of gas analysers used in the measurement of CO in dwellings should be guaranteed by the manufacturer and the gas analysers should be of a type that measures and displays CO in ppm. For readings at or below 20 ppm the accuracy should be ± 3 ppm or better and for above 20 ppm the accuracy should be ± 5 % or better of the instrument reading. Regardless of which gas analyser is used, the manufacturer's written specification should be checked to confirm that the analyser is accurate to these levels.

NOTE 1 When using a gas analyser that performs the functions described in b) to measure CO, it is recommended that the gas analyser is certified by the manufacturer as conforming to BS 7927:1998 including Amendment 1:1999.

NOTE 2 Not all gas analysers have the ability to record the maximum CO reading; some only display the current level. In the latter instance it is necessary to exercise extra vigilance to ensure that a peak value does not pass unobserved. This needs to be kept in mind when selecting the gas analyser.