



BSI Standards Publication

Aerospace series — Flammability of non metallic materials

Part 3: Small burner test, 45° —
Determination of the resistance of material
to flame and glow propagation and to
flame penetration

National foreword

This British Standard is the UK implementation of EN 3844-3:2011.

The UK participation in its preparation was entrusted to Technical Committee ACE/65, Non-metallic materials for aerospace purposes (excluding textiles).

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© BSI 2011

ISBN 978 0 580 73881 4

ICS 49.025.15

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

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 November 2011.

Amendments issued since publication

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

ICS 49.025.15

English Version

**Aerospace series - Flammability of non metallic materials - Part
3: Small burner test, 45° - Determination of the resistance of
material to flame and glow propagation and to flame penetration**

Série aérospatiale - Inflammabilité des matériaux non
métalliques - Partie 3: Essai au brûleur, 45° - Détermination
de la résistance du matériau à la propagation de la flamme
et de l'incandescence et à la pénétration de flammes

Luft- und Raumfahrt - Entflammbarkeit nicht metallischer
Werkstoffe - Teil 3: Kleinbrenner - Prüfung 45° -
Bestimmung der Beständigkeit eines - Materials gegen die
Ausbreitung von Flammen und Glimmen und gegen
Durchbrennen

This European Standard was approved by CEN on 10 February 2011.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

| | |
|------------------------------|----|
| Foreword..... | 3 |
| 1 Scope | 4 |
| 2 Normative references | 4 |
| 3 Terms and definitions..... | 4 |
| 4 Principle of method | 5 |
| 5 Designation | 5 |
| 6 Test apparatus | 5 |
| 7 Test specimens | 6 |
| 8 Conditioning | 6 |
| 9 Burner adjustment | 6 |
| 10 Test procedure | 6 |
| 11 Report..... | 7 |
| Bibliography | 14 |

Foreword

This document (EN 3844-3:2011) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of ASD, prior to its presentation to CEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2012, and conflicting national standards shall be withdrawn at the latest by May 2012.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies the test for the determination of the resistance of non metallic materials to flame and glow propagation and to flame penetration.

This test method is also used for testing non metallic materials which have to meet the test criteria for the 45° Bunsen burner test.

It is used for evaluation of non metallic materials or constructions used in the interiors of aerospace vehicles but may be used in other applications as specified in applicable procurement and regulatory documents.

This standard should be used to measure and describe the properties of non metallic materials, products or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use.

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.

ASTM-D 5025, *A laboratory burner used for small-scale burning test on plastic materials* ¹⁾

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

time of flame application

length of time the burner flame is applied to the specimen

3.2

after flame time

time in seconds for which the specimen continues to flame after the burner flame has been removed from the specimen

3.3

after glow time

length of time in seconds for which the specimen continues to glow, without flaming combustion, after any flaming combustion ceases following the removal of flame application

3.4

flame penetration

flame penetration occurs if the Bunsen burner flame penetrates (passes through) the test specimen during the time of flame application

NOTE Flame penetration is defined to have occurred if the burner flame passes through a hole or crack in the specimen that forms during the test.

1) Published by: ASTM National (US) American Society for Testing and Materials (<http://www.astm.org/>).

4 Principle of method

Testing is performed on a specimen that is held at an angle of 45° to the horizontal plane. A burner flame, having defined parameters, is applied to the specimen for a defined period of time. The after flame time, after removal of the burner flame, and the after glow time is measured. Flame penetration is reported.

5 Designation

EXAMPLE

| Description block | Identity block |
|------------------------|-----------------|
| 45° BUNSEN BURNER TEST | <u>EN3844-3</u> |

Number of this standard

6 Test apparatus

6.1 Test cabinet

Tests shall be conducted in a draught-free cabinet, as shown in Figure 1. Details and dimensions of the test cabinet are given in Figure 2.

1 mm thick metal sheet shall be used for the bottom surface of the cabinet.

It is recommended to paint the entire inside back walls of the cabinet mat black to facilitate the viewing of the test specimen. A mirror may be located on the inside back surface to facilitate observation of the hidden surface.

It is suggested that the cabinet be located inside an exhaust hood to facilitate clearing the cabinet of smoke and fumes after each test.

Cabinets of bigger dimensions may be used if it has been proven that similar results are obtained.

6.2 Specimen holder

A specimen holder shall be provided, such that the exposed area of the specimen is 203 mm × 203 mm.

The specimen holder shall be fabricated of corrosion-resistant metal.

Each of the rectangular frames shall be at least 2 mm in thickness. An example for a construction is given in Figure 3.

6.3 Burner

6.3.1 Burner type

The burner shall be a Bunsen or Tirril type, have a 9,5 mm inside diameter barrel, and shall be equipped with a needle valve to adjust the gas flow rate and thereby adjust the flame height.

The burner shall have no air supplied either directly or by aspiration. The Bunsen burner defined in ASTM-D 5025 has been found acceptable.

6.3.2 Burner fuel

Bottled methane gas shall be used as burner fuel. Natural gas is also acceptable if it contains more than 90 % methane.

6.3.3 Plumbing for gas supply

The necessary gas connections and the applicable plumbing shall be essentially as specified in Figure 4. A control valve system with a delivery rate designed to furnish gas to the burner under a pressure of at least 5 kPa at the burner inlet shall be installed between the gas supply and the burner.

6.3.4 Flame height indicator

There shall be a flame height indicator spaced 25 mm from the burner barrel and extending above the burner, as shown in Figure 5. The indicator shall have two prongs, 8 mm in length, marking the distances, 22 mm and 38 mm above the top of the burner. When the flame is properly adjusted, then the tip of the flame shall be at the 38 mm prong and for pure methane the tip of the inner cone of the flame will be at the 22 mm prong. The flame height indicator shall be removable.

6.4 Timer

One or more stop-watches or other timers, calibrated and graduated to the nearest 0,1 s, shall be used to measure the time of the flame application and the after flame and after glow time.

7 Test specimens

7.1 Number of specimens

At least three specimens shall be prepared and tested.

7.2 Specimens size

The specimen shall be a square of at least 220 mm × 220 mm.

8 Conditioning

Condition specimens at (23 ± 2) °C and at (50 ± 5) % relative humidity for min. 24 h. Remove only one specimen at a time from the conditioning environment immediately before being tested.

9 Burner adjustment

- Assure that the air supply to the burner is shut off.
- Open the stopcock in the gas line fully.
- Light the burner.
- Adjust the gas flowrate to produce a flame height of 38 mm.

10 Test procedure

Make sure that the test cabinet is essentially draught free.

Assure that the specimen is mounted in the frame, so that the edges are held securely. The exposed surface of the specimen, defined in the test specification shall be faced down.

Place the burner at least 76 mm away from where the specimen will be located during the test.

Insert the specimen into the test position.

Close the cabinet door, and keep it closed during the test.

Place the burner, so that the centre of the burner barrel is under and 25 mm away from the centre of the exposed surface of the specimen, see Figure 6.

Start the timer as soon as the burner is in test position.

Apply the flame for 30 s, then withdraw the burner by moving the burner into start position.

Determine the after flame time and the after glow time for the specimen to the nearest 1 s.

Determine whether flame penetration occurred.

After both flaming and glowing have ceased:

- open the cabinet door slowly to clear the test cabinet of fumes and smoke;
- remove the specimen.

Remove any material from the bottom of the cabinet that fell from the specimen. If necessary, clean the test cabinet window prior to testing the next specimen.

11 Report

The test report shall include the following data:

- complete description of the specimen material and specimen construction (material designation, manufacturer's identification, manufacturing number, construction, specimen thickness, density, etc.);
- manufacturer/supplier and order number;
- statement of conformity given by the quality assurance of specimen manufacturer;
- designation of the test method;
- the after flame time for each specimen tested and the average value;
- the after glow time for each specimen tested to the nearest 1 s and the average value;
- a statement if flame penetration occurred;
- observations about melting, sagging, delamination, or other behaviour that affected the exposed surface area or mode of burning occurred, and the time in seconds at which such behaviour occurred;
- changes in test procedure required by the test specification;
- name and address of the test laboratory/organisation;
- date of testing;
- operator's name and signature of the responsible engineer.

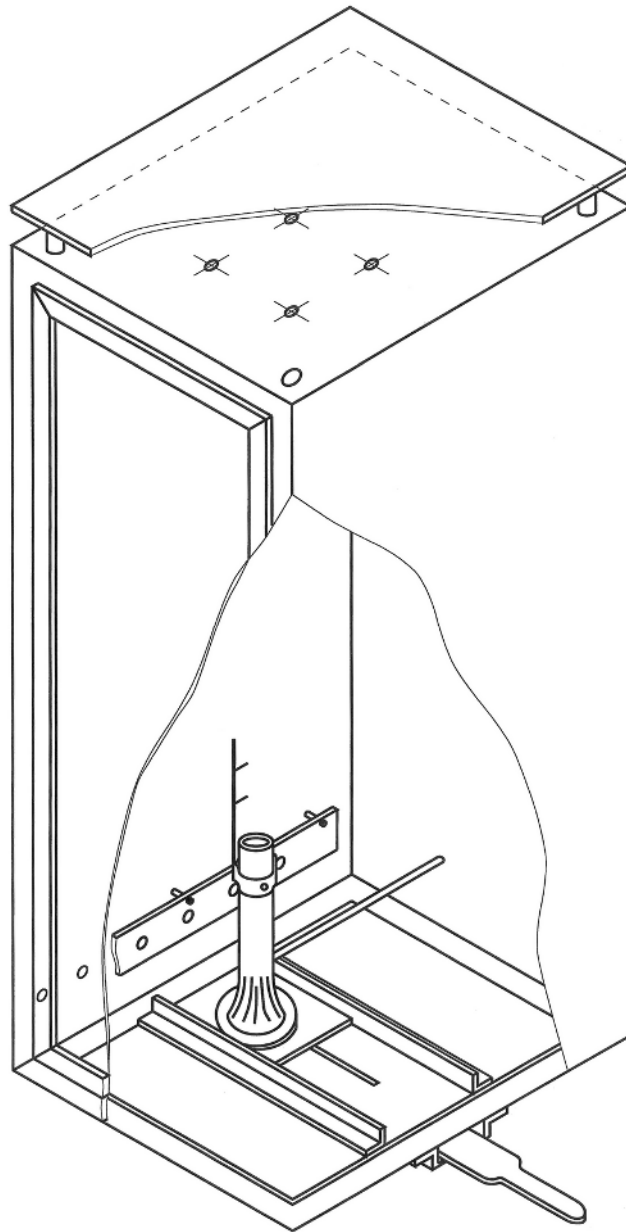


Figure 1 — Draught-free cabinet

Dimensions in millimetres

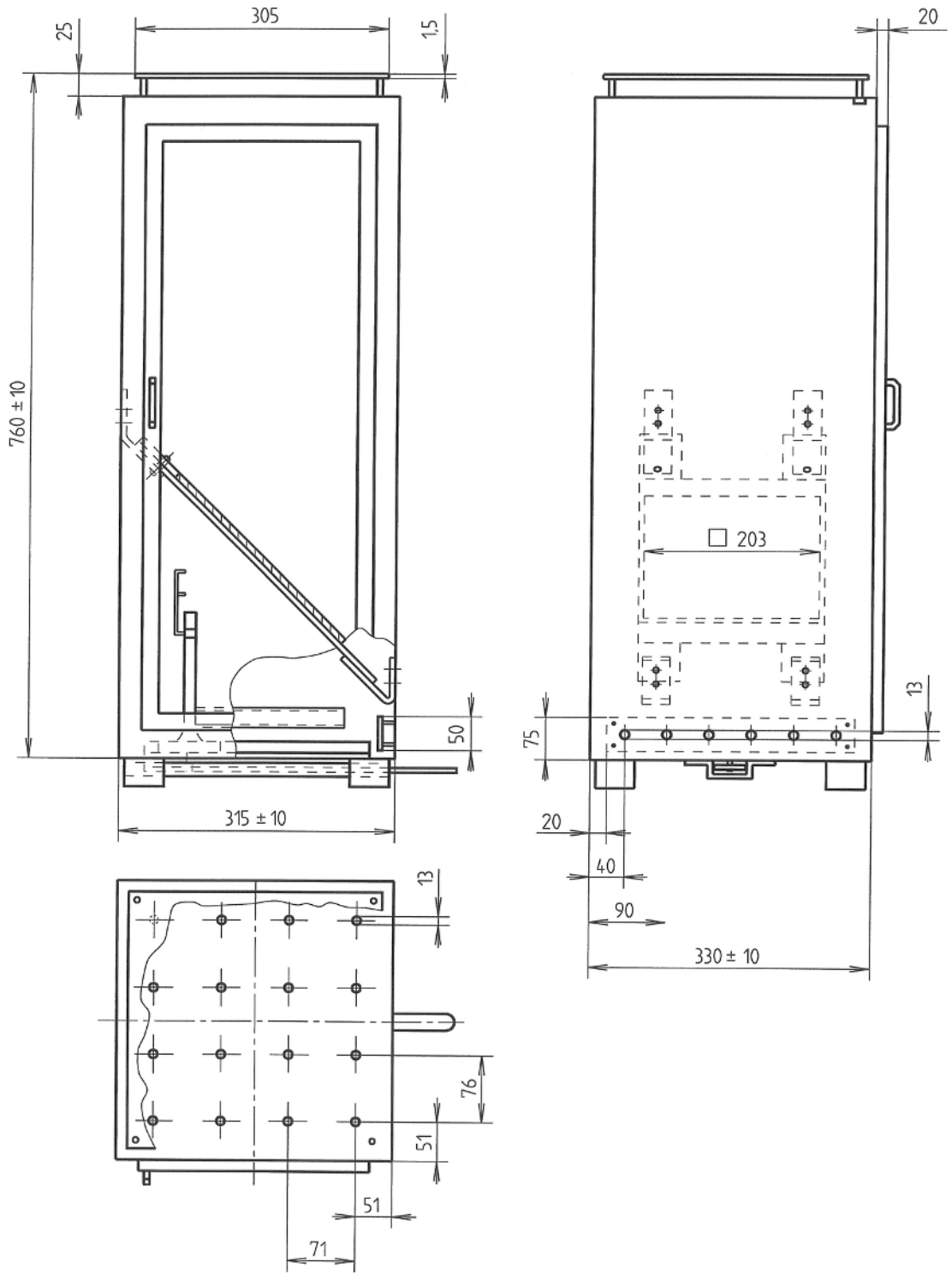


Figure 2 — Details and dimensions

Dimensions in millimetres

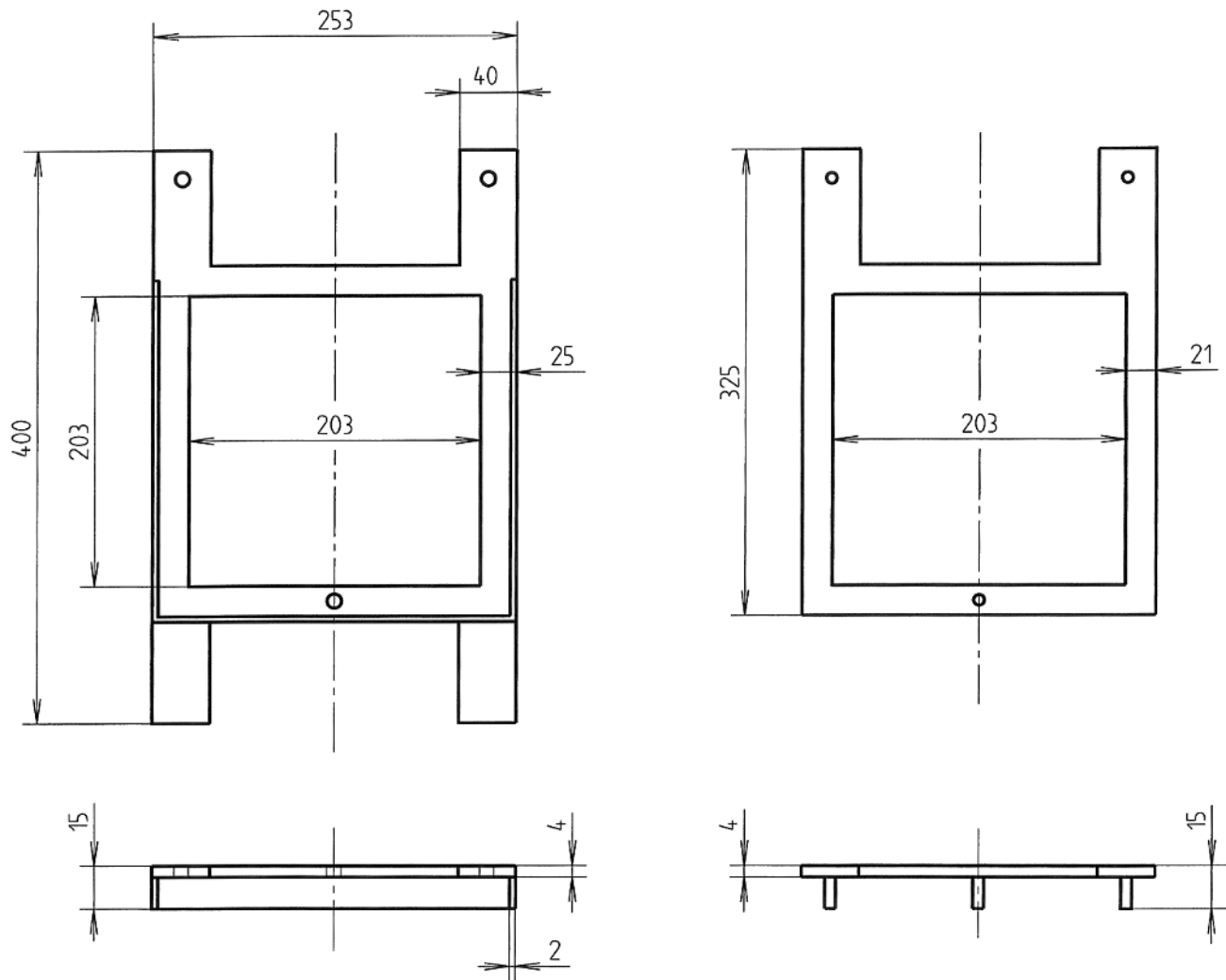
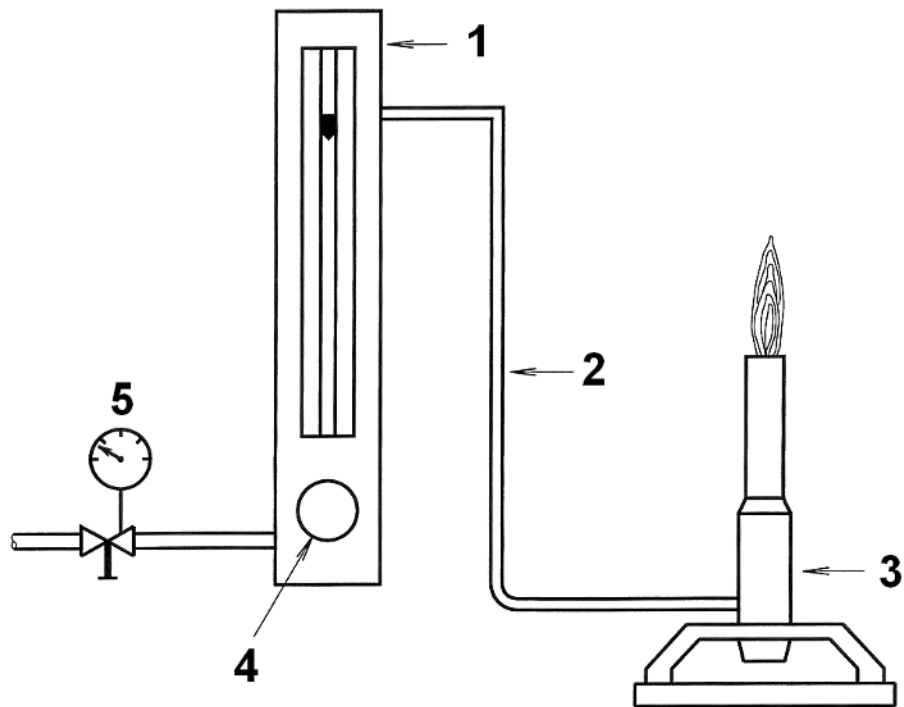


Figure 3 — Specimen holder



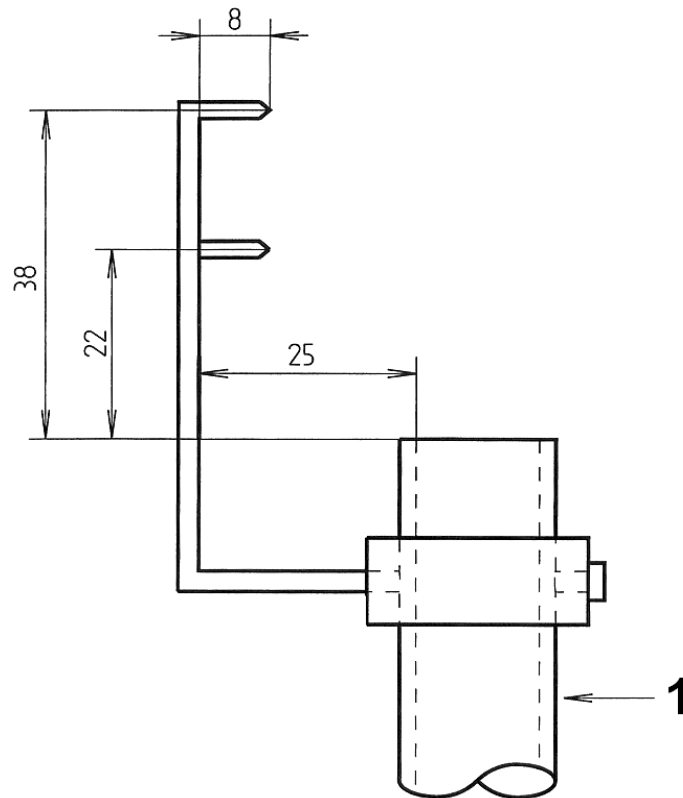
Key

- 1 flowmeter (optional)
- 2 hose
- 3 burner

- 4 needle valve
- 5 pressure-gauge valve

Figure 4 — Plumbing of gas supply

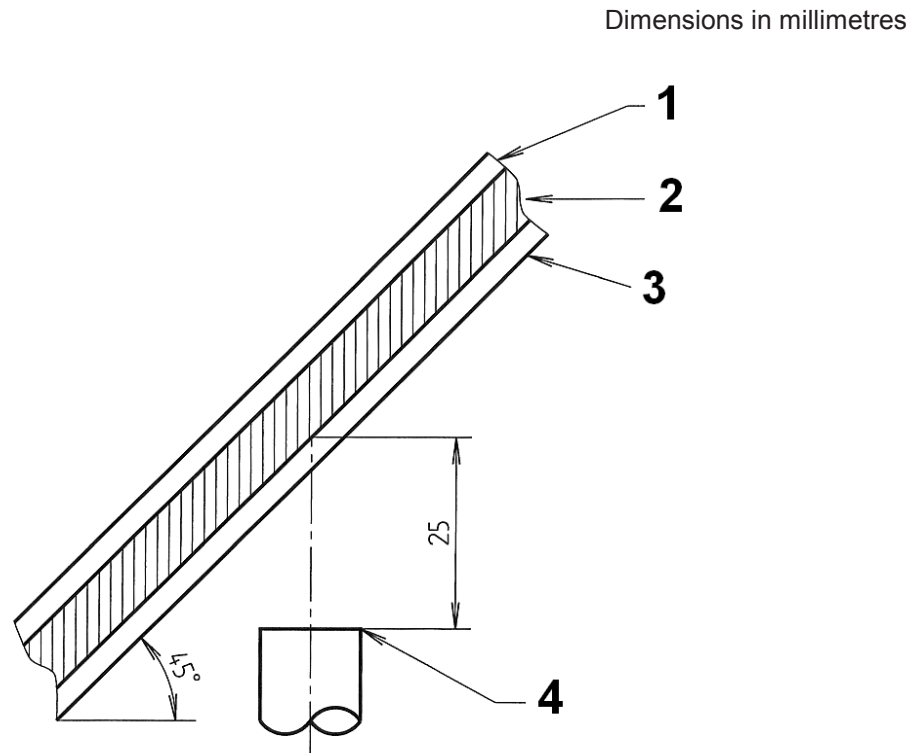
Dimensions in millimetres



Key

1 burner

Figure 5 — Flame height indicator



Key

- 1 specimen holder (top)
- 2 specimen
- 3 specimen holder (bottom)
- 4 burner orifice

Figure 6 — Flame position the specimen

Bibliography

For the preparation of this standard, the following documents were used:

- [1] FAR Part 25 Section 25.853, Federal Aviation Administration Part 25 - Airworthiness Standards: Transport Category Airplanes - Fire Protection Sec 25.853 Compartment interiors
- [2] FAR Part 25 Appendix F Part 1 Paragraph (a) (2) (3) and (6), Federal Aviation Administration - Appendix F to Part 25. Part 1: Test criteria and procedures for showing compliance with § 25.853 or 25.855 (a) Material test criteria.
 - 2) Cargo and baggage compartment not occupied by crew or passengers (III)
 - 3) Vertical test
 - 6) Forty-five degree test

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards-based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

All the data, software and documentation set out in all British Standards and other BSI publications are the property of and copyrighted by BSI, or some person or entity that owns copyright in the information used (such as the international standardization bodies) and has formally licensed such information to BSI for commercial publication and use. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI. Details and advice can be obtained from the Copyright & Licensing Department.

Useful Contacts:

Customer Services

Tel: +44 845 086 9001

Email (orders): orders@bsigroup.com

Email (enquiries): cservices@bsigroup.com

Subscriptions

Tel: +44 845 086 9001

Email: subscriptions@bsigroup.com

Knowledge Centre

Tel: +44 20 8996 7004

Email: knowledgecentre@bsigroup.com

Copyright & Licensing

Tel: +44 20 8996 7070

Email: copyright@bsigroup.com



...making excellence a habit.™