

Fire hazard testing —

Part 11-3: Test flames — 500 W flames — Apparatus and confirmational test methods

ICS 13.220; 29.020

National foreword

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This publication is not to be regarded as a British Standard.

It is being issued in the Draft for Development series of publications and is of a provisional nature because the subject matter is in an area which is rapidly developing. It should be applied on this provisional basis, so that information and experience of its practical application may be obtained.

Comments arising from the use of this Draft for Development are requested so that UK experience can be reported to the international organization responsible for the Technical Specification. A review of this publication will be initiated not later than 3 years after its publication by the international organization so that a decision can be taken on its status at the end of its 3-year life. Notification of the start of the review period will be made in an announcement in the appropriate issue of *Update Standards*.

According to the replies received by the end of the review period, the responsible BSI Committee will decide whether to support the conversion into an international standard, to extend the life of the Technical Specification for another 3 years or to withdraw it. Comments should be sent in writing to the Secretary of BSI Technical Committee GEL/89, Fire hazard testing, at British Standards House, 389 Chiswick High Road, London W4 4AL, giving the document reference and clause number and proposing, where possible, an appropriate revision of the text.

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

Cross-references

The British Standards which implement international publications referred to in this document may be found in the BSI Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

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Part 11-3:

Test flames – 500 W flames –

Apparatus and confirmational test methods



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CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms and definitions	7
4 Method A – Production of a standardized 500 W nominal test flame based on existing hardware	8
4.1 Requirements.....	8
4.2 Apparatus and fuel	8
4.2.1 Burner	8
4.2.2 Flowmeter	8
4.2.3 Manometer	8
4.2.4 Control valve	8
4.2.5 Copper block	9
4.2.6 Thermocouple	9
4.2.7 Temperature/time indicating/recording and timing devices	9
4.2.8 Fuel gas	9
4.2.9 Laboratory fumehood/chamber	9
4.3 Production of test flame.....	10
4.4 Confirmation of the test flame.....	10
4.4.1 Principle	10
4.4.2 Procedure.....	10
4.4.3 Verification	11
5 Method B (withdrawn).....	11
6 Method C – Production of a standardized 500 W nominal test flame based on non-adjustable hardware	11
6.1 Requirements.....	11
6.2 Apparatus and fuel	11
6.2.1 Burner	11
6.2.2 Flowmeters.....	12
6.2.3 Manometer	12
6.2.4 Control valves	12
6.2.5 Copper block	12
6.2.6 Thermocouple	12
6.2.7 Temperature/time indicating/recording and timing devices	12
6.2.8 Fuel gas	13
6.2.9 Air supply	13
6.2.10 Laboratory fumehood/chamber	13
6.3 Production of test flame.....	13

6.4	Confirmation of the test flame.....	13
6.4.1	Principle	13
6.4.2	Procedure.....	13
6.4.3	Verification	14
7	Method D (withdrawn).....	14
8	Classification and designation	14
Annex A (informative) Test method A arrangement		16
Annex B (withdrawn).....		20
Annex C (normative) Test method C arrangement.....		21
Annex D (withdrawn).....		27
Annex E (informative) Recommended arrangements for the use of the test flames		28
Annex F (informative) Test arrangements for tests on equipment		29
Annex G (informative) Test arrangements for tests on material		30
Annex H (informative) Access to equipment manufacturers and suppliers		31
Bibliography.....		32
Figure 1 – Copper block.....		14
Figure 2 – Flame height gauge		15
Figure A.1 – General assembly and details		16
Figure A.2 – Supply arrangement for burner (example)		18
Figure A.3 – Confirmatory test arrangement.....		19
Figure C.1 – Burner, method C – General assembly		21
Figure C.2 – Burner details – Burner barrel, O-ring, air manifold and air supply tube		22
Figure C.3 – Burner details – Gas supply tube and gas jet.....		23
Figure C.4 – Burner details – Burner base and elbow block		24
Figure C.5 – Supply arrangement for burner (example).....		25
Figure C.6 – Confirmatory test arrangement		26
Figure F.1 – Examples of test arrangements		29
Figure G.1 – Examples of test arrangements		30

INTERNATIONAL ELECTROTECHNICAL COMMISSION

FIRE HAZARD TESTING –

**Part 11-3: Test flames – 500 W flames –
Apparatus and confirmational test methods**

FOREWORD

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- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC 60695-11-3, which is a technical specification, has been prepared by IEC technical committee 89: Fire hazard testing.

This second edition cancels and replaces the first edition published in 2000 and constitutes a technical revision. It is to be used in conjunction with IEC 60695-1-1 and IEC 60695-11-4.

The main changes with respect to the previous edition are described below:

- The introduction has been revised.
- Test methods B and D have been withdrawn. Test methods A and C have been retained with their original letter designation.
- Normative reference ISO 1337 has been withdrawn without a replacement by ISO/TC 26. The callout Cu-ETP UNS 11000 is the replacement for all references to ISO 1337. It is taken from ASTM B187-00 and describes high conductivity electrolytic copper.
- A new Annex H has been added which provides access to equipment manufacturers and suppliers.
- Alignment with other publications in the IEC 60695-11 series has been made, where appropriate.

It has the status of a basic safety publication in accordance with IEC Guide 104 and ISO/IEC Guide 51.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
89/623/DTS	89/646/RVC

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until 2012. At this date, the publication will be

- transformed into an International standard;
- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

INTRODUCTION

The best method for testing electrotechnical products with regard to fire hazard is to duplicate exactly the conditions occurring in practice. In most instances this is not possible. Accordingly, for practical reasons, the testing of electrotechnical products with regard to fire hazard is best conducted by simulating as closely as possible the actual effects occurring in practice.

This technical specification provides a general description of the apparatus required to produce two test flames and a general description of the principle of a calibration procedure to check that the flame produced meets the requirements. Detailed information for the confirmation of a test flame can be found in IEC 60695-11-40.

This technical specification provides:

- a) guidance on the design and use of flame test methods to assess the effect on the test specimen of flames such as may arise from other ignited items in the vicinity, or from a fire in its early stages;
- b) a general description of the apparatus required to produce the test flame;
- c) a general description of the principle of a calibration procedure to check that the flame produced meets the requirements.

The detailed description of the apparatus needed to produce and verify the test flames is given in a series of sheets, of which this is one.

The status of the series, currently under study, is summarized as follows:

Test flame	Type	Gas	Present status	Apparent overall height mm
500 (A)	Pre-mixed	Methane	Method A of this technical specification	Approximately 125
500 (B)	(Withdrawn)			
500 (C)	Pre-mixed	Methane/ propane	Method C of this technical specification	Approximately 125
500 (D)	(Withdrawn)			
NOTE IEC 60695-11-2 describes the apparatus and confirmatory test method for a 1 000 W nominal test flame and IEC 60695-11-4 describes the apparatus and confirmatory test method for a 50 W nominal test flame.				

The aim of the work, initiated by ACOS, is to make available an appropriate (minimum) series of standardized test flames, covering a range of powers for the use of all committees needing test flames. Wherever possible these test flames have been based on existing types, but with improved specifications.

Methods A and C for producing the 500 W nominal test flame are described in this technical specification. Method A was published in 1994 and was based on existing hardware. Method C is based on non-adjustable hardware that has been specifically developed to produce a highly repeatable and stable test flame. All have been developed as a technical enhancement of previous technology.

Flame A, using only methane, makes use of a more tightly specified version of a burner that has been used in some countries for many years.

Flame C makes use of a more highly developed version of the burner used in method A and is capable of being produced using either methane or propane.

FIRE HAZARD TESTING –

Part 11-3: Test flames – 500 W flames – Apparatus and confirmational test methods

1 Scope

This technical specification provides detailed requirements for the production of a 500 W nominal, pre-mixed type test flame. The approximate overall height is 125 mm.

Two test flames are described: Method A may only be produced using methane whereas method C may be produced using either methane or propane.

One of the responsibilities of a technical committee is, wherever applicable, to make use of basic safety publications in the preparation of its publications.

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.

IEC 60584-1:1995, *Thermocouples – Part 1: Reference tables*

IEC 60584-2:1982, *Thermocouples – Part 2: Tolerances*

IEC 60695-4:1993, *Fire hazard testing – Part 4: Terminology concerning fire tests*

IEC Guide 104:1997, *The preparation of safety publications and the use of basic safety publications and group safety publications*

ISO/IEC Guide 51:1999, *Safety aspects - Guidelines for their inclusion in standards*

ISO/IEC 13943:2000, *Fire safety – Vocabulary*

ASTM-B187, *Standard Specification for Copper, Bus Bar, Rod, and Shapes and General Purpose Rod, Bar, and Shapes*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 13943 and IEC 60695-4, as well as the following definition, apply.

3.1

standardized 500 W test flame

test flame that conforms to this technical specification and meets all of the requirements given in Clause 4 and Clause 6

4 Method A – Production of a standardized 500 W nominal test flame based on existing hardware

4.1 Requirements

A standardized 500 W nominal test flame, according to this method, is one that is produced

- using hardware according to Figures A.1 and A.2,
- supplied with methane gas of purity not less than 98 % at a flow rate equivalent to 965 ml/min $\pm$ 30 ml/min at 23 °C, 0,1 MPa¹, and at a back pressure of 125 mm $\pm$ 5 mm water, using the arrangements of Figure A.2.

The flame shall be symmetrical, stable and give a result of 54 s $\pm$ 2 s in the confirmatory test described in 4.4.

The confirmatory test arrangement shown in Figure A.3 shall be used.

The actual dimensions of the flame, when measured in the laboratory fumehood/chamber using the gauge as described in Figure 2, are as follows:

- blue inner cone height: 38 mm to 42 mm;
- overall height: approximately 125 mm.

4.2 Apparatus and fuel

4.2.1 Burner

The burner shall be in accordance with Figure A.1.

NOTE The burner tube, gas injector and needle valve are removable for cleaning purposes. Care should be taken on re-assembly that the needle valve tip is not damaged and that the needle valve and valve seat (gas injector) are correctly aligned.

4.2.2 Flowmeter

The flowmeter shall be appropriate for the measurement of the gas flow rate of 965 ml/min at 23 °C, 0,1 MPa to an accuracy of $\pm$ 2 %.

NOTE A mass flowmeter is the preferred means of controlling accurately the input flow rate of fuel to the burner. Other methods may be used if they can show equivalent accuracy.

4.2.3 Manometer

The manometer shall be appropriate for the measurement of pressure in the range of 0 kPa to 7,5 kPa. A water manometer may be used for this purpose. It should be adapted to read 0 kPa to 7,5 kPa.

NOTE A manometer is required in conjunction with a mass flowmeter in order to maintain the required back pressure.

4.2.4 Control valve

A control valve is required to set the gas flow rate to within the required tolerances.

¹ When corrected from the measurements taken under actual conditions of use.

4.2.5 Copper block

The copper block shall be 9 mm in diameter, of mass $10,00 \text{ g} \pm 0,05 \text{ g}$ in the fully machined but undrilled state as shown in Figure 1.

There is no verification method for the copper block. Laboratories are encouraged to maintain a standard reference unit, a secondary standard reference unit and a working unit, cross-comparing them as appropriate to verify the working system.

4.2.6 Thermocouple

A class 1 (IEC 60584-2) mineral insulated, metal sheathed fine-wire thermocouple with an insulated junction, is used for measuring the temperature of the copper block. It shall have an overall nominal diameter of 0,5 mm and wires of, for example, NiCr and NiAl (type K) (IEC 60584-1) with the welded point located inside the sheath. The sheath shall consist of a metal resistant to continuous operation at a temperature of at least 1 050 °C. Thermocouple tolerances shall be in accordance with IEC 60584-2, class 1.

NOTE A sheath made from a nickel-based, heat resistant alloy (such as Inconel 600²) will satisfy the above requirements.

The preferred method of fastening the thermocouple to the block, after first ensuring that the thermocouple is inserted to the full depth of the hole, is by compressing the copper around the thermocouple to retain it without damage, as shown in Figure A.3.

4.2.7 Temperature/time indicating/recording and timing devices

The devices shall be appropriate for the measurement of the time for the block to heat up from $100 \text{ °C} \pm 5 \text{ °C}$ to $700 \text{ °C} \pm 3 \text{ °C}$ with a tolerance on the measured time of $\pm 0,5 \text{ s}$. There shall be a means of measuring the ambient air temperature and pressure.

4.2.8 Fuel gas

The fuel gas shall be methane with a purity of not less than 98 %.

4.2.9 Laboratory fumehood/chamber

The laboratory fumehood/chamber shall have an inside volume of at least 0,75 m³. The chamber shall permit observation of tests in progress and shall be draught-free, whilst allowing normal thermal circulation of air past the test specimen during burning. The inside surfaces of the walls shall be of a dark colour. When a lux meter, facing towards the rear of the chamber, is positioned in place of the test flame, the recorded light level shall be less than 20 lx. For safety and convenience, it is desirable that this enclosure (which can be completely closed) be fitted with an extraction device, such as an exhaust fan, to remove products of combustion which may be toxic. The extraction device shall be turned off during the test and turned on immediately after the test to remove the fire effluents. A positive closing damper may be needed.

² This information is given for the convenience of users of this technical specification and does not constitute an endorsement by the IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.