SLOVENSKI STANDARD
SIST ENV 60695-2-4/2:1999

01-julij-1999

Fire hazard testing -- Part 2: Test methods -- Section 4/sheet 2: 500 W nominal test flames and guidance

Fire hazard testing -- Part 2: Test methods -- Section 4/sheet 2: 500 W nominal test flames and guidance

Prüfungen zur Beurteilung der Brandgefahr -- Teil 2: Prüfverfahren -- Hauptabschnitt 4/Blatt 2: 500 W-Flamme (Nennwert) und Anleitung

Essais relatifs aux risques du feu -- Partie 2: Méthodes d'essai -- Section 4/feuille 2: Flammes d'essai de 500 W (valeur nominale) et guide

Ta slovenski standard je istoveten z: **ENV 60695-2-4/2:1995**

ICS:

13.220.40	Sposobnost vžiga in obnašanje materialov in proizvodov pri gorenju	Ignitability and burning behaviour of materials and products

SIST ENV 60695-2-4/2:1999 **en**

EUROPEAN PRESTANDARD
PRÉNORME EUROPÉENNE
EUROPÄISCHE VORNORM

ENV 60695-2-4/2

October 1995

ICS 13.220.40

Descriptors: Fire hazard testing, 500 W test flames and guidance

English version

Fire hazard testing
Part 2: Test methods
Section 4/sheet 2: 500 W nominal test flames and guidance

(IEC 695-2-4/2 : 1994)

Essais relatifs aux risques du feu
Partie 2: Méthodes d'essai
Section 4/feuille 2: Flammes d'essai de 500 W (valeur nominale) et guide
(CEI 695-2-4/2 : 1994)

Prüfungen zur Beurteilung der Brandgefahr
Teil 2: Prüfverfahren
Hauptabschnitt 4/Blatt 2: 500 W-Flamme (Nennwert) und Anleitung
(IEC 695-2-4/2 : 1994)

This European Prestandard (ENV) was approved by CENELEC on 1995-09-01 as a prospective standard for provisional application. The period of validity of this ENV is limited initially to three years. After two years the members of CENELEC will be requested to submit their comments, particularly on the question whether the ENV can be converted into a European Standard (EN).

CENELEC members are required to announce the existence of this ENV in the same way as for an EN and to make the ENV available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the ENV) until the final decision abouth the possible conversion of the ENV into an EN is reached.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B-1050 Brussels

Foreword

The text of the Technical Report IEC 695-2-4/2 : 1994, prepared by IEC TC 89, Fire hazard testing, was submitted to the CENELEC questionnaire and vote and was approved as ENV 60695-2-4/2 on 1995-09-01.

The following date was fixed:

– latest date by which the existence of the ENV has to be announced at national level (doa) 1996-03-01

Annexes designated 'normative' are part of the body of the standard.

Annexes designated 'informative' are given for information only.

In this standard, annex ZA is normative and annexes A, B, C and D are informative.

Annex ZA has been added by CENELEC.

Contents

INTRODUCTION

IEC 695-2-4/0 gives:

a) guidance on the design and use of flame test methods to assess the effect on the 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 in the following table:

Nominal power of the flame W	Type	Gas	Present status	Remarks Nominal height mm
1 000	Pre-mixed	Propane	IEC 695-2-4/1	ca 175
500 (A)	Pre-mixed	Methane	Method A of this document	ca 125
500 (B)	Pre-mixed	Propane	Method B of this document	ca 125
500 (C)	Pre-mixed	Methane/ propane	Under consideration	ca 125
50	Pre-mixed	Methane	Under consideration	ca 20

The aim of the work, which was 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.

Two methods (A and B) of producing the 500 W flame have been developed and are described in this present report. A third method which uses non-adjustable hardware but which should be more versatile than the hardware used in method B is under evaluation in the working group. If successful, the third method will be published as an addendum to this report to enable an extensive evaluative comparison to be made.

The three test flames are as follows:

– flame A, based on methane, makes use of a more tightly specified version of a burner that has been used in some countries for many years;

– flame B, based on propane, makes use of the same hardware as IEC 695-2-4/1;

– flame C, which is under evaluation in a working group, will make use of a more highly developed version of the burner that is used in method A, and should be capable of being produced with both methane and propane.

FIRE HAZARD TESTING –

Part 2: Test methods – Section 4/sheet 2: 500 W nominal test flames and guidance

1 Scope

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

Two methods (A and B) are given: flame A based on methane; flame B based on propane.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this technical report. At the time of publication, the editions indicated were valid. All normative documents are subject to revision and parties to agreements based on this technical report are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 695-1-1: 1982, *Fire hazard testing – Part 1: Guidance for the preparation of requirements and test specifications for assessing fire hazard of electrotechnical products – General guidance*

IEC 695-1-2: 1982, *Fire hazard testing – Part 1: Guidance for the preparation of requirements and test specifications for assessing fire hazard of electrotechnical products – Guidance for electronic components*

IEC 695-1-3: 1986, *Fire hazard testing – Part 1: Guidance for the preparation of requirements and test specifications for assessing fire hazard of electrotechnical products – Guidance for use of preselection procedures*

IEC 695-2-4/0: 1991, *Fire hazard testing – Part 2: Test methods – Section 4/sheet 0: Diffusion type and pre-mixed type flame test methods*

IEC 695-2-4/1: 1991, *Fire hazard testing – Part 2: Test methods – Section 4/sheet 1: 1 kW nominal pre-mixed test flame and guidance*

IEC 695-4: 1993, *Fire hazard testing – Part 4: Terminology concerning fire tests*

ISO 1337: 1980, *Wrought coppers (having minimum copper contents of 99,85 %) – Chemical composition and forms of wrought products*

3 Definitions

For the purpose of this technical report, the following definition applies:

standardized 500 W test flame: One that conforms with this technical report, meets all of the requirements given in either clause 4 for method A, or clause 5 for method B.

4 Method A

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 (see annex A);
- supplied with methane gas of purity not less than 99 % at a flow rate equivalent to 965 ml/min ± 30 ml/min at 23 °C, 0,1 MPa*, and at a back pressure of 125 mm ± 5 mm water, using the arrangements of figure A.2.

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

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

The blue cone shall have a height of 40 mm ± 2 mm, when measured using the jig described in figure 2, in subdued light against a dark background.

The overall height of the flame, when measured using the jig described in figure 2, in subdued light against a dark background, shall be 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 ±2 %.

4.2.3 *Manometer*

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

---

* Corrected from the measurements taken under actual conditions of use.

4.2.4 *Control valve*

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

4.2.5 *Copper block*

A copper block of 9 mm diameter, of mass 10,00 g ± 0,05 g in the fully machined but undrilled state (figure 1).

4.2.6 *Thermocouple*

Sheathed fine wire type K (NiCr/NiAl), outer sheath diameter 0,5 mm, suitable for long-term operation at >1 050 °C.

The preferred method of fastening the thermocouple to the block is by compressing the copper around the thermocouple (see 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 °C ± 2 °C to 700 °C ± 3 °C with a tolerance on the measured time of ±0,5 s.

4.2.8 There shall be a means of measuring the ambient air temperature and pressure.

4.2.9 The fuel gas shall be methane with a purity of not less than 99 %.

4.3 *Production of test flame*

The gas supply arrangements for the burner, given in figure A.2, shall be used. Care shall be taken to ensure leak-free connections.

The gas shall be ignited, and the gas flow and back pressure adjusted to the required values. The air inlet shall be adjusted until the blue cone height is 40 mm ± 2 mm, when measured using the jig described in figure 2 in subdued light against a dark background, and then locked in position with the lock nut.

The flame shall appear stable and symmetrical on examination.

4.4 *Confirmation of the test flame*

4.4.1 *Principle*

The time taken for the temperature of the copper block, described in figure 1, to increase from 100 °C to 700 °C shall be 54 s ± 2 s, when the flame confirmatory test arrangement of figure A.3 is used.

4.4.2 *Procedure*

– Set up the arrangement according to figure A.3 in a draught-free environment, ensuring leak-free gas connections.

– Temporarily remove the burner away from the block to ensure no influence of the flame on the block during the preliminary adjustment of the gas flow, gas back pressure and air inlet.

– Ignite the gas, and adjust the gas flow and back pressure to the prescribed conditions. Adjust the air inlet until the blue cone height is 40 mm ± 2 mm, when measured using the jig described in figure 2, and viewed in subdued light against a dark background. Lock the air inlet in position with the lock nut.

– Ensure that the overall height of the flame, measured using the jig described in figure 2, in subdued light against a dark background is approximately 125 mm and that the flame is symmetrical.

– Wait for a period of at least 5 min to allow the burner conditions to reach equilibrium. Check that the gas flow and back pressure and the blue cone height are within the prescribed limits.

– With the temperature/time indicating/recording devices operational, re-position the burner under the block.

– Make three determinations of the time for the temperature of the block to increase from 100 °C ± 2 °C to 700 °C ± 3 °C. Allow the block to cool naturally in air to below 50 °C between determinations.

– If the copper block has not been used before, make a preliminary run to condition the block surface. Discard the result.

– Calculate the mean time in seconds as the result.

4.4.3 The flame is confirmed and may be used for test purposes if the result is within the range 54 s ± 2 s.

5 Method B

5.1 *Requirements.*

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

– using hardware according to figures B.1 to B.5 (see annex B);

– supplied with propane gas of purity not less than 98 % at a flow rate equivalent to 360 ml/min ± 15 ml/min at 23 °C, 0,1 MPa*, and

– supplied with air at a flow rate equivalent to 6,0 l/min ± 0,3 l/min at 23 °C, 0,1 MPa*.

The flame shall be symmetrical, stable and give a result of 54 s ± 2 s in the confirmatory test described in clause 5.4.

The confirmatory test arrangement shown in figure B.7 shall be used.

The approximate dimensions of the flame, measured using the jig described in figure 2, in subdued light, against a dark background, shall be:

blue cone height:	35 mm to	45 mm
overall height:	115 mm to	135 mm

* Corrected from the measurements taken under actual conditions of use.

5.2 *Apparatus and fuel*

5.2.1 *Burner*

The burner shall be in accordance with figures B.1 to B.5 inclusive.

NOTE – The burner tube, gas injector and flame stabilizer are removable for cleaning purposes.

5.2.2 *Flowmeters*

Flowmeters shall be appropriate:

- for the measurement of the gas flow rate of 360 ml/min at 23 °C, 0,1 MPa to an accuracy of ±2 %, and
- for the measurement of the air flow rate of 6,0 l/min at 23 °C, 0,1 MPa to an accuracy of ±2 %.

5.2.3 *Manometers*

Two manometers are required, appropriate for the measurement of pressures in the range 0 to 7,5 kPa. Water manometers may be used for this purpose. They should be adapted to read 0 to 7,5 kPa.

5.2.4 *Control valves*

Two control valves are required to set the flow of gas and air to within the required tolerances.

5.2.5 *Copper block*

A copper block of 9 mm diameter, of mass 10,00 g ± 0,05 g in the fully machined but undrilled state (see figure 1).

5.2.6 *Thermocouple*

Sheathed fine wire type K (NiCr/NiAl), outer sheath diameter 0,5 mm, suitable for long-term operation at >1 050 °C.

The preferred method of fastening the thermocouple to the block is by compressing the copper around the thermocouple (see figure B.7).

5.2.7 *Temperature indicating/recording and timing devices*

The devices shall be appropriate for the measurement of the time for the block to heat up from 100 °C ± 2 °C to 700 °C ± 3 °C with a tolerance on the measured time of ±0,5 s.

5.2.8 There shall be a means of measuring the ambient air temperature and pressure.

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

5.2.10 The air shall be essentially free of oil and water.

5.3 *Production of test flame*

The gas and air supply arrangements for the burner, given in figure B.6, shall be used. Care shall be taken to ensure leak-free connections.

The gas shall be ignited, and the gas and air flows adjusted to the required values.

The flame shall appear stable and symmetrical on examination.

5.4 *Confirmation of the test flame*

5.4.1 *Principle*

The time taken for the temperature of the copper block, described in figure 1, to increase from 100 °C to 700 °C shall be 54 s ± 2 s, when the flame confirmatory test arrangement of figure B.7 is used.

5.4.2 *Procedure*

- Set up the arrangement according to figure B.7 in a draught-free environment, ensuring leak-free gas and air connections.
- Temporarily remove the burner from the block to ensure no influence of the flame on the block during the preliminary adjustment of the gas and air flows.
- Ignite the gas and adjust the gas and air flow rates to the prescribed values. Ensure that the blue cone height and overall height of the flame, when measured using the jig described in figure 2, in subdued light against a dark background are within the prescribed limits, and that the flame is symmetrical. Wait for a period of at least 5 min to allow the burner conditions to reach equilibrium. Check that the gas and air flow rates are within the prescribed limits.
- With the temperature/time indicating/recording devices operational, re-position the burner under the block.
- Make three determinations of the time for the temperature of the block to increase from 100 °C ± 2 °C to 700 °C ± 3 °C. Allow the block to cool naturally in air to below 50 °C between determinations.
- If the copper block has not been used before, make a preliminary run to condition the block surface. Discard the result.
- Calculate the mean time in seconds as the result.

5.4.3 The flame is confirmed and may be used for test purposes if the result is within the range 54 s ± 2 s.

6 Recommended arrangements for the use of the test flames

The criteria to be used for the selection of the appropriate test arrangements are given in IEC 695-2-4/0.

When used for testing equipment, unless otherwise stated in the relevant specification, the recommended distance from the top of the burner tube to the point on the surface of the specimen to be tested is approximately 55 mm, and the burner is fixed in position during the test.