

Fire hazard testing —

Part 9-2: Surface spread of flame — Summary and relevance of test methods

ICS 13.220.40; 29.020

National foreword

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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 9-2:

Surface spread of flame –

Summary and relevance of test methods



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INTRODUCTION

The risk of fire needs to be considered in any electrical circuit. The objective of component, circuit and equipment design, as well as the choice of materials, is to reduce the likelihood of fire, even in the event of foreseeable abnormal use, malfunction or failure.

Electrotechnical products, primarily as victims of fire, may nevertheless contribute to the fire. Fire hazard increases as the burning area increases, leading in some cases to flash-over and a fully developed fire. This is a typical fire scenario in buildings. It is therefore useful to measure the rate and extent of the surface spread of flame.

This technical specification describes surface spread of flame test methods in common use to assess electrotechnical products or materials used in electrotechnical products. It forms part of the IEC 60695-9 series which gives guidance to product committees wishing to incorporate test methods for surface spread of flame in product standards.

FIRE HAZARD TESTING –

Part 9-2: Surface spread of flame – Summary and relevance of test methods

1 Scope

This technical specification provides a summary of test methods that are used to determine the surface spread of flame of electrotechnical products or materials from which they are formed.

It represents the current state of the art of the test methods and, where available, includes special observations on their relevance and use.

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 60332-3 (all parts), *Tests on electrical cables under fire conditions – Part 3: Test for vertical flame spread of vertically-mounted bunched wires of cables*

IEC 60695-4:2005, *Fire hazard testing – Part 4: Terminology concerning fire tests*

IEC 60695-9-1, *Fire hazard testing – Part 9-1: Surface spread of flame – General guidance*

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

ISO/IEC Guide 51, *Safety aspects – Guidelines for their inclusion in standards*

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

ISO 5658-2, *Reaction to fire tests – Spread of flame – Part 2: Lateral spread on building products in vertical configuration*

ISO 5658-4, *Reaction to fire tests – Spread of flame – Part 4: Intermediate-scale test of vertical spread of flame with vertically oriented specimen* (available in English only)

3 Terms and definitions

For the purposes of this document the following definitions apply, some of which are taken from ISO/IEC 13943 and IEC 60695-4:

3.1

burned length

maximum extent in a specified direction of the burned area

NOTE It is expressed in metres.

[ISO/IEC 13943 definition 12]

3.2

char (noun)

carbonaceous residue resulting from pyrolysis or incomplete combustion

[ISO/IEC 13943 definition 16]

3.3

char length

maximum extent in a specified direction of the charred area

NOTE In some standards, char length is defined by a specific test method.

3.4

combustible

item capable of combustion

[ISO/IEC 13943 definition 22]

3.5

combustion

exothermic reaction of a substance with an oxidiser

NOTE Combustion generally emits effluent accompanied by flames and/or visible light.

[ISO/IEC 13943 definition 23]

3.6

damaged length

maximum extent, in a specified direction, of the damaged area of a material under specified test conditions (see also *extent of combustion*)

NOTE It is expressed in metres.

3.7

extent of combustion

maximum length of a material that has been destroyed by combustion or pyrolysis, under specified test conditions, excluding any region damaged only by deformation (see also *damaged length*)

[IEC 60695-4 definition 3.16]

3.8

fire

a) process of combustion characterized by the emission of heat and effluent accompanied by smoke, and/or flame, and/or glowing;

b) rapid combustion spreading uncontrolled in time and space

[IEC 60695-4 definition 3.19]

3.9

fire hazard

potential for injury or loss of life and/or damage to property from fire

[IEC 60695-4 definition 3.26]

3.10

fire retardant (noun)

substance added or a treatment applied to a material in order to suppress, reduce or delay the combustion of the material

[IEC 60695-4 definition 3.31]

3.11

fire scenario

detailed description of conditions, including environmental, of one or more stages from before ignition to after completion of combustion in an actual fire at a specific location or in a real-scale simulation

[ISO/IEC 13943 definition 58]

3.12

flame (noun)

zone of combustion in the gaseous phase with emission of visible light

3.13

flame front

boundary of the combustion zone in the gaseous phase at the surface of a material

[IEC 60695-4 definition 3.34]

3.14

flame retardant (noun)

substance added, or a treatment applied, to a material in order to suppress or delay the appearance of a flame and/or reduce its propagation (spread) rate

NOTE The use of flame retardants does not necessarily suppress fire.

[ISO/IEC 13943 definition 65]

3.15

flame spread

propagation of a flame front

[IEC 60695-4 definition 3.36]

3.16

flash-over

rapid transition to a state of total surface involvement in a fire of combustible materials within an enclosure

[IEC 60695-4 definition 3.42]

3.17

fully developed fire

state of total involvement of combustible materials in a fire

[ISO/IEC 13943 definition 80]

3.18

heat release rate

thermal energy released per unit time by an item during combustion under specified conditions

NOTE It is expressed in watts.

[ISO/IEC 13943 definition 88]

3.19

ignition

initiation of combustion

NOTE The term "ignition" in French has a very different meaning [state of body combustion].

[ISO/IEC 13943 definition 96]

3.20

ignition source

source of energy that initiates combustion

[ISO/IEC 13943 definition 97]

3.21

ignition temperature (minimum)

(minimum) temperature of a material or of an ignition source at which sustained combustion can be initiated under specified test conditions, as defined in the test method

NOTE Ignition requires a sufficient volume of flammable gas and oxidant (air). Sustained combustion requires a sufficient rate of production of flammable gas. The minimum ignition temperature implies thermal stressing to infinite time. For practical purposes, the standard should define the minimum ignition temperature appropriately.

[IEC 60695-4 definition 3.51]

3.22

large-scale test

test, the size of which exceeds that of a typical laboratory bench

[IEC 60695-4 definition 3.53]

3.23

pyrolysis

irreversible chemical decomposition of a material under the sole effect of heat

[IEC 60695-4 definition 3.70]

3.24

pyrolysis front

boundary of pyrolysis at the surface of a material

[IEC 60695-4 definition 3.71]