

# Fire resistance tests for door and shutter assemblies —

## Part 1: Fire doors and shutters

The European Standard EN 1634-1:2000 has the status of a  
British Standard

ICS 13.220.50

---

NO COPYING WITHOUT BSI PERMISSION EXCEPT AS PERMITTED BY COPYRIGHT LAW

**BSI**  
Documents



Document Sharing Hub

# National foreword

This British Standard is the official English language version of EN 1634-1:2000.

The UK participation in its preparation was entrusted by Technical Committee FSH/22, Fire resistance tests, to Subcommittee FSH/22/5, Test procedures for doors, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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

The possibility of coexistence of this standard and the existing parts of BS 476 for a period of time yet to be determined is currently under discussion in CEN. Further information about the withdrawal of the relevant parts of BS 476 will be notified.

## Cross-references

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

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their 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, the EN title page, pages 2 to 66, an inside back cover and a back cover.

The BSI copyright notice displayed in this document indicates when the document was last issued.

This British Standard, having been prepared under the direction of the Health and Environment Sector Committee, was published under the authority of the Standards Committee and comes into effect on 15 April 2000

© BSI 04-2000

## Amendments issued since publication

| Amd. No. | Date | Comments |
|----------|------|----------|
|          |      |          |
|          |      |          |
|          |      |          |
|          |      |          |
|          |      |          |

ISBN 0 580 32429 X

English version

## Fire resistance tests for door and shutter assemblies - Part 1: Fire doors and shutters

Essais de résistance au feu des blocs-portes et blocs-fermetures - Partie 1: Portes et fermetures résistantes au feu

Feuerwiderstandsprüfungen für Tür- und Abschlusseinrichtungen - Teil 1: Feuerschutzabschlüsse

This European Standard was approved by CEN on 18 February 1999.

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 Central Secretariat 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 Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



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

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

## Contents

|                                                                                                                                        |    |
|----------------------------------------------------------------------------------------------------------------------------------------|----|
| Foreword                                                                                                                               | 3  |
| Introduction                                                                                                                           | 4  |
| 1 Scope                                                                                                                                | 5  |
| 2 Normative references                                                                                                                 | 5  |
| 3 Definitions                                                                                                                          | 5  |
| 4 Test equipment                                                                                                                       | 7  |
| 5 Test conditions                                                                                                                      | 7  |
| 6 Test specimen                                                                                                                        | 7  |
| 7 Installation of test specimen                                                                                                        | 8  |
| 8 Conditioning                                                                                                                         | 9  |
| 9 Application of instrumentation                                                                                                       | 10 |
| 10 Test procedure                                                                                                                      | 14 |
| 11 Performance criteria                                                                                                                | 16 |
| 12 Test report                                                                                                                         | 16 |
| 13 Field of direct application of test results                                                                                         | 17 |
| ANNEX A (Normative) CONDITIONING REQUIREMENTS FOR SUPPORTING CONSTRUCTIONS                                                             | 25 |
| ANNEX B (Normative) FIELD OF DIRECT APPLICATION LIMITS OF PERMITTED SIZE VARIATIONS                                                    | 26 |
| ANNEX C (Informative) BACKGROUND TO FIELD OF DIRECT APPLICATION STATEMENTS FOR ASYMMETRICAL CONSTRUCTIONS AND SUPPORTING CONSTRUCTIONS | 28 |

## Foreword

This European Standard has been prepared by Technical Committee CEN/TC 127, 'Fire safety in buildings', the secretariat of which is held by BSI.

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 July 2000, and conflicting national standards shall be withdrawn at the latest by October 2001.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement the European Standard; Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of the Construction Products Directive.

EN 1634 'Fire resistance tests for door and shutter assemblies' consists of the following:

Part 1: Fire doors and shutters

Part 2: Fire door hardware (in course of preparation)

Part 3: Smoke control doors (in course of preparation)

## Introduction

### Caution

The attention of all persons concerned with managing and carrying out this fire resistance test is drawn to the fact that fire testing may be hazardous and that there is a possibility that toxic and/or harmful smoke and gases may be evolved during the test. Mechanical and operational hazards may also arise during the construction of the test elements or structures, their testing and disposal of test residues.

An assessment of all potential hazards and risks to health shall be made and safety precautions shall be identified and provided. Written safety instructions shall be issued. Appropriate training shall be given to relevant personnel. Laboratory personnel shall ensure that they follow written safety instructions at all times.

## 1 Scope

This part of EN 1634 specifies a method for determining the fire resistance of door and shutter assemblies designed for installation within openings incorporated in vertical separating elements, such as:

- hinged and pivoted doors;
- horizontally sliding and vertically sliding doors including articulated sliding doors, sectional doors;
- steel single skin folding shutters (uninsulated);
- other sliding folding doors;
- tilting doors;
- rolling shutter doors.

This European Standard is used in conjunction with EN 1363-1.

Doors tested in accordance with this standard can be acceptable for certain lift landing door applications.

The testing of fire dampers and closures for conveyors and track bound transportation systems are specifically excluded.

No requirements are included for mechanical conditioning, e.g. 'shakedown' or durability, as these are included in the relevant product standard.

This method may also be used to determine the fire resistance of non-loadbearing horizontal doors by analogy. However, these are not specifically addressed here and the field of direct application given in clause 13 is not valid for horizontally oriented doors.

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 1363-1 Fire resistance tests - Part 1: General requirements

EN 1363-2 Fire resistance tests - Part 2: Alternative and additional procedures

prEN ISO 13943 Fire safety - Vocabulary (ISO/DIS 13943)

## 3 Definitions

For the purposes of this part of EN 1634, the definitions given in EN 1363-1 and ISO/DIS 13943, together with the following, apply:

**3.1 door or shutter assembly (doorset):** The complete assembly, including any frame or guide, door leaf or leaves, rolling or folding curtain, etc., which is provided for closing of permanent openings in separating elements. This includes all side-panels, vision panels or transom panels, together with the door hardware and any seals (whether provided for the purpose of fire or smoke control or for other purposes such as draught or acoustics) which are used in the assembly.

**3.2 door hardware:** Items such as hinges, handles, locks, panic bar(s), escutcheons, letter plates, kick plates, sliding gear, closing devices, electrical components, wiring, etc., which are, or can be, used in the door or shutter assembly.

**3.3 single action:** The action of a fire door leaf which only opens in one direction.

**3.4 double action:** The action of a fire door leaf which opens in both directions.

**3.5 fire seal:** A seal fitted to the leaf edge or frame reveal for the purpose of extending the period of integrity of the assembly.

**3.6 smoke seal:** A seal fitted to the leaf edge or frame reveal for the purpose of restricting the flow of smoke or hot gases.

**3.7 floor:** The upper surface of the horizontal element on which the door assembly is mounted and which extends from the exposed face to the unexposed face of the assembly.

**3.8 cill:** A member which connects two frame jambs together at the base which may or may not be set into the floor and remains visible.

**3.9 gap:** The clearance between two nominally adjacent surfaces and/or edges, e.g. between the edge of leaf and the reveal of the frame or face of the leaf and the frame stop.

**3.10 through connection:** A fixing or internal spacer that either penetrates through the door or shutter construction from one face to another or directly connects the faces one to the other.

**3.11 standard supporting construction:** A form of construction used to close off the furnace and to support the door or shutter assembly being evaluated and which has a quantifiable influence on both the thermal heat transfer between the construction and the test specimen and provides known resistance to thermal distortion.

**3.12 associated supporting construction:** A specific construction in which the door or shutter assembly is to be installed in practice and which is used to close off the furnace and provide the levels of restraint and thermal heat transfer to be experienced in normal use.

**3.13 test specimen:** A door or shutter assembly which is to be installed in a standard or associated supporting construction to allow it to be evaluated.

**3.14 transom:** A member that extends across the frame from jamb to jamb at the head of the leaf and which creates an aperture to house a transom panel.

**3.15 transom panel:** A fixed panel which is incorporated above a door and is bounded on all edges by either the frame head, the jambs or the transom.

**3.16 flush over panel:** A fixed panel fitted within the head and jambs above the door leaf without a transom fitted and which is of a similar thickness and appearance to the door leaf.

**3.17 side panel:** A fixed panel which is incorporated to one side of a door which is part of the test specimen.

**3.18 primary leaf:** The leaf of a multi-leaved door assembly that is the largest and/or has the handle attached to it as the preferred leaf for general operation. If the leaves of a multi-leaved door are the same size and if the handles (or other hardware such as push plates) are fitted to all leaves, then no primary leaf exists for that door assembly.

## 4 Test equipment

The test equipment specified in EN 1363-1 and, if applicable, EN 1363-2 shall be used.

## 5 Test conditions

The heating and pressure conditions and the furnace atmosphere shall conform to those given in EN 1363-1 or, if applicable, EN 1363-2.

## 6 Test specimen

### 6.1 Size

The test specimen and all its components shall be full size unless limited by the size of the front opening of the furnace which will normally be 3 m × 3 m. Door assemblies which cannot be tested at full size shall normally be tested to the maximum size possible consistent with 7.2.3.

### 6.2 Number

The number of test specimens shall be selected as described in EN 1363-1. If testing is carried out from one side only, whether due to the fact that the door assembly is symmetrical or because it is only required to resist fire from one side, this shall be stated in the test report.

### 6.3 Design

The design of the test specimen and the choice of supporting construction shall take into account the requirements of clause 13 if the widest field of direct application is to be achieved.

The sponsor shall declare to the laboratory the design gaps (see 3.9) including tolerances.

Where the door or shutter assembly incorporates side, transom or flush over panels, whether glazed or unglazed, these shall be tested as part of the door assembly. The side panel shall always be on the latch side.

The test specimen shall be fully representative of the door or shutter assembly intended for use in practice, including any appropriate surface finishes and fittings which are an essential part of the specimen and may influence its behaviour in test.

### 6.4 Construction

The test specimens shall be constructed as described in EN 1363-1.

### 6.5 Verification

The sponsor shall provide a specification to a level of detail sufficient to allow the laboratory to conduct a detailed examination of the specimen before the test and to agree the accuracy of the information supplied. EN 1363-1 provides detailed guidance on verification of the test specimen.

When the method of construction precludes a detailed survey of the specimen, without having to permanently damage it or if it is considered that it will subsequently be impossible to evaluate construction details from a post test examination, then one of two options shall be exercised by the laboratory, either:

- a) the laboratory shall request to oversee the manufacture of the door or shutter assembly(ies) which is to be the subject of the test; or
- b) the sponsor shall, at the discretion of the laboratory, be requested to supply an additional assembly or that part of the assembly which cannot be verified (e.g. a door leaf) to the number required for test. The laboratory shall then choose freely which of these shall be submitted to the test and which shall be used to verify the construction.

## **7 Installation of test specimen**

### **7.1 General**

The test specimen shall be installed, as far as possible, in a manner representative of its use in practice.

The specimen shall be mounted in a supporting construction which covers the type in which it is intended to be used. The design of the connection between the door or shutter assembly and the supporting construction, including any fixings and materials used to make the junction, shall be as used in practice and shall be regarded as part of the test specimen. The door and frame assembly shall be mounted within the supporting construction so that it is flush with the exposed face of the supporting construction, unless the normal mounting procedure does not allow this.

The whole area of the test specimen, together with at least the minimum dimensions of the supporting construction required by 7.2.3, shall be exposed to the heating conditions.

### **7.2 Supporting construction**

#### **7.2.1 General**

The fire resistance of any supporting construction shall not be determined from a test in conjunction with a door or shutter assembly and shall be at least commensurate with that anticipated for the door or shutter assembly.

#### **7.2.2 Standard supporting construction**

The choice of standard supporting construction shall reflect the intended normal use of the door or shutter assembly. The rules governing the applicability of the chosen standard supporting construction to other end use situations are given in 13.5.

The standard supporting construction shall be chosen from those given in EN 1363-1.

#### **7.2.3 Erection of standard supporting or associated supporting constructions**

Figures 1 to 8 illustrate the use of supporting constructions in conjunction with the mounting of specimens of different types of door or shutter assemblies.

For flexible standard supporting constructions and all associated supporting constructions the partition or wall shall be erected so that it can distort freely perpendicular to the plane of the construction along the vertical edges, i.e. there shall be a free edge at each end of the construction.

For rigid standard supporting constructions the wall shall be erected with no freedom to distort.

perpendicular to the plane of the wall along the vertical edges, i.e. it shall be fixed to the inside of the test frame as in practice.

The supporting construction shall be built within a test frame conforming to clause 4 of EN 1363-1:1999. The supporting construction shall be prepared in advance of the fitting of the specimen leaving an aperture of the desired size, except when it is normally erected in conjunction with the door or shutter assembly using appropriate fixing methods. There shall be a minimum zone of supporting construction of 200 mm wide exposed within the furnace, each side and over the top of the aperture into which the door and frame assembly is to be fixed. The thickness of the supporting construction may be increased outside of the 200 mm zone. The test construction may incorporate more than one test specimen providing that there is minimum separation between each specimen and between the specimens and the edge of the furnace.

If the bottom of the door or shutter assembly is at floor level in practice, then at the bottom of the aperture continuity of the floor shall be simulated using a solid non-combustible rigid material which has a minimum width of 200 mm on each side of the assembly (i.e. from the exposed to the unexposed face). The furnace floor can be regarded as part of the simulation of the floor continuity provided that it is level with the base of the assembly. If a cill detail is incorporated as part of the door or shutter assembly this shall be incorporated within or placed on top of the extension. If the door or shutter assembly is not to be used at floor level, and provided that it has a frame detail to all four sides of the aperture, then it may be mounted simply within the thickness of the wall, without the extension.

NOTE: If the door assembly is tested in conjunction with a non-combustible floor then this may not represent the situation when the door is installed above a combustible flooring such as timber or carpet.

### 7.3 Gaps

The adjustment of the door leaf(ves) or shutter and gaps shall be within the tolerances of the design values stipulated by the sponsor. These shall be representative of those used in practice so that appropriate clearances exist, e.g. between the fixed and moveable components.

In order to generate the widest field of direct application, the gaps shall be set in between the middle value and the maximum value within the range of gaps given by the sponsor.

NOTE: A door assembly with a specified range of gaps from 3 mm to 8 mm is tested with gaps set between 5,5 mm and 8 mm.

Examples of gap measurements are given in Figures 9 to 12.

## 8 Conditioning

### 8.1 Moisture content

The test specimen shall be conditioned in accordance with EN 1363-1.

Requirements for conditioning of supporting constructions are given in annex A.

### 8.2 Mechanical

Reference shall be made to the product standard for details of requirements for mechanical conditioning of the test specimen before fire testing, e.g. operational test, 'shakedown' or specimen self-closing test.

Durability requirements are given in the relevant product standard.

## 9 Application of instrumentation

### 9.1 Thermocouples

#### 9.1.1 Furnace thermocouples (plate thermometers)

Plate thermometers shall be provided in accordance with EN 1363-1. They shall be evenly distributed over a vertical plane 100 mm from the nearest plane of the test construction (see Figure 13). There shall be at least one plate thermometer for every 1,5 m<sup>2</sup> of the exposed surface area of the test construction, subject to a minimum of four.

The plate thermometers shall be oriented so that side 'A' faces the back wall of the furnace.

#### 9.1.2 Unexposed face thermocouples

##### 9.1.2.1 General

Where no evaluation against the insulation criteria is required of the door or shutter assembly, or any part thereof, no temperature measurements are required.

Where compliance with the insulation criteria is required to be evaluated, thermocouples of the type specified in EN 1363-1 shall be attached to the unexposed face for the purpose of obtaining the average and maximum surface temperatures. General principles for the attachment and exclusion of thermocouples given in EN 1363-1 shall apply.

Evaluation of insulation against a supplementary procedure (see 9.1.2.4) is provided in addition to the normal requirement. The sponsor shall instruct the laboratory if he requires evaluation of the door or shutter assembly against the supplementary procedure as this requires the application of additional thermocouples for this purpose.

The temperature of the supporting construction in which the door assembly is mounted is not required to be measured and therefore no thermocouples are required to be attached to it.

No thermocouple shall be placed within 50 mm of any ironmongery.

Examples of the location of unexposed face thermocouples are shown in Figures 14 to 27.

##### 9.1.2.2 Average temperature

Position five thermocouples (for single or double leaf doors), one at the centre of the leaf (leaves) and one at the centre of each quarter section. These shall not be located closer than 50 mm to any joint, stiffener or through component, nor closer than 100 mm to the edge of the leaf (leaves) or curtain.

For door or shutter assemblies which incorporate discrete areas of different thermal insulation  $\geq 0,1 \text{ m}^2$  (e.g. flush over panels, transom panels, side panels, or glazed panels within a door leaf) extra thermocouples shall be evenly distributed over the sum of the surface of those areas to determine the average temperature at a density of one thermocouple per square metre or part thereof, subject to a minimum of two. The average insulation performance of the sum of each area shall be determined.

When the total area of a single portion of the door or shutter assembly represents less than 0,1 m<sup>2</sup>, it shall be disregarded for the purpose of ascertaining the average unexposed face temperature.

### 9.1.2.3 Maximum temperature

#### a) General

The maximum temperature shall be determined from the five thermocouples fixed to determine the average temperature rise (as given in 9.1.2.2), the roving thermocouple and from additional thermocouples fixed as indicated in 9.1.2.3 b), 9.1.2.3 c) and 9.1.2.3 d).

If the door or shutter assembly incorporates discrete areas of different thermal insulation  $\geq 0,1 \text{ m}^2$  (e.g. flush over panels, transom panels, side panels or glazed panels within a door area) which are evaluated separately with respect to average temperature rise, then the evaluation of maximum unexposed face temperature of those areas shall also be undertaken separately. This may require extra unexposed surface thermocouples to be applied as given in c) and d).

Thermocouples shall not be placed on fasteners with a surface diameter less than 12 mm unless they extend through the assembly.

#### b) Temperature of door frame

Thermocouples shall be fixed at each of the following positions:

- i) one at mid-height on each vertical member;
- ii) one on the horizontal top member of the frame (and any transom >30 mm wide, if fitted) at mid-width (100 mm away from the door joint of a multi-leaf door on the primary leaf side);
- iii) on the horizontal top member of the frame (and any transom >30 mm wide, if fitted) 50 mm in from each corner of the leaf opening.

At each of the positions, thermocouples shall be fixed as close as possible, i.e. with the centre of the disc 15 mm from the junction between the frame and the supporting construction. Irrespective of this, the distance of these thermocouples from the inside edge of the frame shall not be greater than 100 mm. See Figure 16.

NOTE: For single leaf doors, if due to the narrow width of the opening the thermocouples specified in ii) and iii) are closer than 550 mm to each other, then that specified in ii) is omitted. See Figure 21.

#### c) Temperature of door leaf or shutter

Thermocouples shall be fixed to the face of each leaf (leaves) or shutter(s) as follows:

- i) at mid-height, 100 mm in from the vertical edges as specified below;
- ii) at mid-width, 100 mm down from the horizontal edge as specified below;
- iii) 100 mm in from the vertical edges, 100 mm down from the horizontal edge as follows:
  - the inside edges of the clear opening for:
    - hinged or pivoted doors opening towards the furnace;
    - shutters or sliding doors installed on the exposed side of the supporting construction.

- the visible part of the edge of the door leaf for:
  - hinged or pivoted doors opening away from the furnace;
  - shutters or sliding doors installed on the unexposed side of the supporting construction.

See Figures 14 to 21 and 23 to 27.

NOTE 1: If due to the narrow width of the leaf (leaves) or shutter(s) the thermocouples specified in ii) and iii) are closer than 500 mm to each other, then those specified in ii) are omitted.

NOTE 2: If the leaf is < 200 mm wide (e.g. as in a multi-leaf folding shutter) then the leaves will be treated as if they were one leaf with respect to application of unexposed face thermocouples for evaluating maximum temperature rise.

Examples of the reduction in the requirement for unexposed face thermocouples with width are given in Figure 21.

Additional thermocouples shall be fixed to other areas of the leaf or shutter (e.g. over any through connection or position where the temperature might be expected to be higher than the mean for the surface subject to the limitations given in 9.1.2.3 a). The additional thermocouples shall be placed not less than 100 mm from the edges of the door leaf.

#### d) Temperatures of other areas

Thermocouples for determination of the maximum temperature rise of side, transom and flush over panels and discrete panels of different thermal insulation within the door leaf shall be applied as for door leaves. However, if there is more than one other area of the same type then they shall be treated as one large area (as those for the average temperature rise are). In such cases thermocouples shall avoid any framework adjacent to the frame leaf. See Figures 26 and 27.

In addition, thermocouples shall be placed on flush over panels and transom panels above door leaves (but not discrete panels within the leaf) as follows:

- i) at mid-width, 100 mm up from the horizontal edge;
- ii) 100 mm in from the vertical edges, 100 mm up from the horizontal edges.

See Figures 23 and 24 for examples of the above. See Figure 22 for exclusion of thermocouples on panels on the basis of size and distance between thermocouples.

The rules for reducing the number of thermocouples on door leaves of decreasing width shall also apply to transom panels, side panels and flush over panels. See Figure 21 for examples.

#### 9.1.2.4 Maximum temperature (supplementary procedure)

##### a) General

The maximum temperature shall be determined from the thermocouples used for the determination of maximum temperature together with additional thermocouples fixed as indicated in 9.1.2.4 b) and 9.1.2.4 c).

##### b) Temperature of door leaf or shutter

Thermocouples shall be fixed to the face of each leaf (leaves) or shutter(s) as follows:

- i) at mid-height, 25 mm in from the vertical edges as specified below;
- ii) at mid-width, 25 mm down from the horizontal edge as specified below;
- iii) 25 mm in from the vertical edges, 25 mm down from the horizontal edge as follows:
  - the inside edges of the clear opening for:
    - hinged or pivoted doors opening towards the furnace;
    - shutters or sliding doors installed on the exposed side of the supporting construction;
  - the visible part of the edge of the door leaf:
    - hinged or pivoted doors opening away from the furnace;
    - shutters or sliding doors installed on the unexposed side of the supporting construction.

NOTE 1: If due to the narrow width of the leaf (leaves) or shutter(s) the thermocouples specified in ii) and iii) are closer than 575 mm to each other, then those specified in ii) are omitted.

NOTE 2: If the leaf is < 200 mm wide (e.g. as in a multi-leaf folding shutter) then the leaves will be treated as if they were one leaf with respect to application of unexposed face thermocouples for evaluating maximum temperature rise.

Examples of the variation in the requirement for unexposed face thermocouples with width are given in Figure 21.

#### c) Temperature of other areas

Thermocouples for determination of the maximum temperature rise of other areas (excluding discrete panels within doors) shall be applied as for door leaves. However, if there is more than one other area of the same type, then they shall be treated as one large area (as those for the average temperature rise are). In such cases thermocouples shall avoid any framework adjacent to the frame leaf.

In addition, thermocouples shall be placed on flush over panels and transom panels above door leaves as follows:

- i) at mid-width, 25 mm up from the horizontal edge;
- ii) 25 mm in from the vertical edges, 25 mm up from the horizontal edge.

See Figures 23 and 24 for examples of the above. See Figure 22 for exclusion of thermocouples on side transom and flush over panels on the basis of size and distance between thermocouples.

The rules for reducing the number of thermocouples on door leaves of decreasing width shall also apply to transom panels, side panels and flush over panels. See Figure 21 for examples.

## 9.2 Pressure

Install pressure measuring devices in the furnace in accordance with EN 1363-1.

## 9.3 Deflection

Appropriate instrumentation shall be provided to determine a history of all significant movements (i.e. greater than 3 mm) of the test construction during the test. The following components are suggested as areas where significant movement is likely to occur:

- door leaf or shutter relative to frame;
- frame relative to supporting construction;
- supporting construction.

The principle of the measurement shall be by measurement against a fixed datum. The interval between measurements shall be chosen to present a history of deflection during the test.

A suitable method for determining deflection of the test construction including proposals for selection of suitable intervals between measurements is given in EN 1363-1.

NOTE: Measurement of deflection is a mandatory requirement although there are no performance criteria associated with it. Information relating to the relative deflection between components of the test specimen, between the test specimen and the supporting construction and of the supporting construction itself may be important in determining the extended field of application of the test result. Figures 28 to 31 show recommended positions for measuring deflection.

## 9.4 Radiation

If radiation is to be measured, radiometers shall be positioned as described in EN 1363-2.

# 10 Test procedure

## 10.1 Pre-test measurements, examination and preparation

### 10.1.1 General

Before the fire test an examination shall be carried out in the following sequence.

- a) any mechanical conditioning, e.g. "shakedown" carried out by the laboratory in accordance with the product standard;
- b) gap measurements, see 10.1.2;
- c) retention force measurements when a closing mechanism provides assistance to fire resistance by retention of the specimen, see 10.1.3;
- d) final setting, see 10.1.4.

### 10.1.2 Gap measurements

The clearance between moving components and fixed components of the door or shutter assembly (e.g. between door leaf/leaves and the frame) shall be measured prior to the test. Sufficient measurements shall be made to adequately quantify the gaps. There shall be a minimum of three measurements made along each side, top and bottom of each leaf of the door. Measurements to

determine the gaps shall be made at distances not greater than 750 mm apart and shall be given to an accuracy not exceeding 0,5 mm. Inaccessible gaps shall be measured indirectly.

Figures 9 to 12 illustrate examples of the measurements to be taken at various positions for different door edge/frame rebate types. If the gaps measured by the laboratory are not within those defined in 7.3 before the test, then the test result may restrict the direct field of application, see clause 13.

### **10.1.3 Retention force measurements**

The retention forces for all door assemblies which incorporate closing devices and which are meant to be opened unaided by mechanical power shall be measured. These measurements are needed to establish the magnitude of the forces used to retain the door leaf closed to ensure that they are representative of those used in normal practice.

For each door leaf, the retention force shall be determined as given below. For double action doors, the moment shall be determined for each direction of opening and for folding doors, the force shall be determined in the direction of opening.

The retention forces for all door assemblies which incorporate closing devices operated by egressing personnel without mechanical assistance shall be measured as follows:

Open the test door slowly, using a force gauge attached to the handle and operating against the direction of closing, to a distance of 100 mm away from its closed position. Record the highest gauge reading between the closed and 100 mm positions.

### **10.1.4 Final setting**

Prior to the fire test, the door or shutter shall be subjected to a final closing involving opening the assembly to a distance of approximately 300 mm and returning it to the closed position. When applicable this shall be done by the closing device. If the assembly does not contain any closing device or it cannot be used in the furnace then the door assembly shall be closed by hand.

Doors may be latched prior to the fire test but shall not be locked unless the door can only be retained in the closed position during normal use by utilizing the lock (i.e. there is no latch or closing device to hold the door in the closed position). This condition is only applicable to doors normally maintained in a locked position. No key shall be left in the lock.

If the final setting procedures are carried out with the specimen in position on the furnace then the furnace shall be in an ambient pressure condition (i.e. with no air input or extraction).

## **10.2 Fire test**

### **10.2.1 General**

Carry out the test using the equipment and procedures in accordance with EN 1363-1 and if required EN 1363-2.

### **10.2.2 Integrity**

When monitoring for integrity, the 6 mm gap gauge shall not be employed at the cill of the door or shutter assembly.

### **10.2.3 Insulation**

When monitoring for insulation the roving thermocouple shall not be employed where fixed thermocouples are not permitted.

## 10.2.4 Radiation

Details of the procedure for assessing radiation are given in EN 1363-2.

## 11 Performance criteria

### 11.1 Integrity

The criteria by which the integrity performance of the test specimen shall be judged are given in EN 1363-1.

### 11.2 Insulation

#### 11.2.1 General

For door or shutter assemblies which incorporate discrete areas of different thermal insulation, compliance with the insulation criteria shall be determined separately for each area.

#### 11.2.2 Average temperature rise

The specimen shall be evaluated against the average temperature rise criterion specified in EN 1363-1. Compliance shall be derived from temperatures recorded from the thermocouples specified in 9.1.2.2.

#### 11.2.3 Maximum temperature rise

The specimen shall be evaluated against the maximum temperature rise criterion specified in EN 1363-1 (180 °C) with the exception that the limit for temperature rise of the frame of the door or shutter assembly shall be 360 °C. Compliance shall be derived from temperatures recorded from the thermocouples specified in 9.1.2.2, 9.1.2.3, and the roving thermocouple subject to the provisions given in 10.2.3.

#### 11.2.4 Maximum temperature rise (supplementary procedure)

The specimen shall be evaluated against the maximum temperature rise criterion specified in EN 1363-1. Compliance shall be derived from temperatures recorded from the thermocouples specified in 9.1.2.2, 9.1.2.3, 9.1.2.4 and the roving thermocouple subject to the provisions given in 10.2.3.

### 11.3 Radiation

Details of the performance criteria for radiation are given in EN 1363-2.

## 12 Test report

In addition to the items required by EN 1363-1, the following shall also be included in the test report:

- a) Reference that the test was carried out in accordance with EN 1634-1.
- b) Details of how the test specimen was verified as described in 6.5.
- c) A reference to which standard supporting construction was chosen, if appropriate.
- d) A description of the associated supporting construction, if appropriate. The constructional

details of the associated supporting construction shall be verified in the same way and shall be as thoroughly described as those of the test specimen.

- e) Information concerning the conditioning of the supporting construction in the light of the relaxations allowed in annex A.
- f) The gap measurements as required by 10.1.2.
- g) The retention forces as required by 10.1.3.
- h) Information concerning any mechanical conditioning performed upon the test specimen.
- i) The result stated in terms of the elapsed time, in completed minutes, between the commencement of heating and the time to failure of insulation under the normal and if appropriate, the supplementary procedure.

## **13 Field of direct application of test results**

### **13.1 General**

The field of direct application of results is restricted to governing the allowable changes to the test specimen following a successful fire resistance test. These variations can be introduced automatically without the need for the sponsor to seek additional evaluation, calculation or approval.

NOTE: When extended product size requirements are envisaged the dimensions of certain components within the test specimen can be less than those intended to be used at full size in order to maximize the extrapolation of the test results by modelling the interaction between components at the same scale.

### **13.2 Materials and constructions**

#### **13.2.1 General**

Unless otherwise stated in the following text the construction of the door assembly shall be the same as that tested. The number of leaves and the mode of operation (e.g. sliding, swinging, single action or double action) shall not be changed.

#### **13.2.2 Specific restrictions on materials and construction**

##### **a) Timber constructions**

The thickness of the door leaves shall not be reduced but may be increased.

The door leaf thickness and/or density may be increased provided the total increase in weight is not greater than 25 %.

For timber based panel products (e.g. particle board, blockboard, etc), the composition (e.g. type of resin) shall not change from that tested. The density shall not be reduced but may be increased.

The cross-sectional dimensions and/or the density of the timber frames (including rebates) shall not be reduced but may be increased.

b) Steel constructions

The dimensions of steel wrap around frames may be increased to accommodate increased supporting construction thicknesses. The thickness of the steel may also be increased by up to 25 %.

The number of stiffening elements for uninsulated doors and the number and type of fixing of such members within the panel fabrication may be increased proportionally with the increase in size but shall not be reduced.

c) Glazed constructions

The type of glass and the edge fixing technique, including type and number of fixings per metre of perimeter, shall not be changed from those tested.

The number of glazed apertures and each of the dimensions of glass in each pane included within a test specimen of timber or steel construction may be decreased but shall not be increased beyond the tested pane size.

The distance between the edge of glazing and the perimeter of the door leaf, or the distance between glazed apertures shall not be reduced from those incorporated in test specimens. Other positioning within the door can only be modified if this does not involve the removal or re-positioning of structural members.

NOTE: Attention is drawn to the fact that relocating the glazing panel may move it closer to the radiometer and may therefore increase the radiation measured.

### 13.2.3 Decorative finishes

a) Paint

Where the paint finish is not expected to contribute to the fire resistance of the door alternative paints are acceptable and may be added to door leaves or frame products for which unfinished specimens were tested. Where the paint finish contributes to the fire resistance of the door (e.g. intumescent paints) then no change shall be permitted.

b) Decorative laminates

Decorative laminates and timber veneers up to 1,5 mm thickness may be added to the faces (but not the edges) of hinged doors that satisfy the insulation criteria (normal or supplementary procedure).

Decorative laminates and veneers applied to leaves other than timber and those in excess of 1,5 mm thickness shall be tested as part of the test specimen. For all products tested with decorative laminate faces the only variations possible shall be within similar types and thicknesses of material (e.g. for colour, pattern, manufacturer).

### 13.2.4 Frames

The number of fixings used to attach fire resisting doors to supporting constructions may be increased but shall not be decreased and the distance between fixings may be reduced but shall not be increased.

### 13.2.5 Hardware

Changes in hardware are permitted provided the alternative hardware has been demonstrated in another doorset of similar configuration.

The number of any movement restrictors such as locks, latches and hinges may be increased but shall not be decreased.

### 13.3 Permissible size variations

#### 13.3.1 General

Doors of sizes different from those of tested specimens are permitted within certain limitations but the variations are dependent on product type and the length of time that the performance criteria are fulfilled.

#### 13.3.2 Test periods

The amount of variation of size permitted is dependent on whether the classification time was just reached (category 'A') or whether an extended time (category 'B') in accordance with the following values was fulfilled before the test was concluded.

For category 'B':

| <u>Classification time</u> | <u>All performance criteria fulfilled for at least</u> |
|----------------------------|--------------------------------------------------------|
| 15 minutes                 | 18 minutes                                             |
| 20 minutes                 | 24 minutes                                             |
| 30 minutes                 | 36 minutes                                             |
| 45 minutes                 | 52 minutes                                             |
| 60 minutes                 | 68 minutes                                             |
| 90 minutes                 | 100 minutes                                            |
| 120 minutes                | 132 minutes                                            |
| 180 minutes                | 196 minutes                                            |
| 240 minutes                | 260 minutes                                            |

#### 13.3.3 Size variation related to product type

##### 13.3.3.1 General

The rules to cover increase or decrease of size without additional considerations are applicable only to five main product groups:

- i) hinged and pivoted doors;
- ii) horizontally sliding and vertically sliding doors including sectional doors;
- iii) steel single skin folding shutters (uninsulated);
- iv) other sliding folding doors;
- v) rolling shutter doors.

No increases in size are permitted for doors satisfying the radiation criterion unless the insulation criterion is also satisfied. This is because any increase in size will increase the radiation received at a fixed distance away from the door. There are calculation methods which can be used to determine acceptable size increases for such doors; however, these are beyond the scope of direct application. Doors that satisfy both the radiation and insulation criteria may have their sizes increased as outlined in annex B. This is accepted because the increase in radiation resulting from a size increase allowed under this section, for an insulated door, will be such that it will still satisfy the radiation criterion. Size decreases are permitted for both doors which satisfy radiation and those which satisfy insulation and radiation.