

Building hardware — Controlled door closing devices — Requirements and test methods

The European Standard EN 1154:1996, with the incorporation of amendment A1:2002, has the status of a British Standard

ICS 91.190

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by Technical Committee B/538, Doors, windows, shutters, hardware and curtain walling, to Subcommittee B/538/4, Building hardware, upon which the following bodies were represented:

- Association of Builders' Hardware Manufacturers
- Association of Building Component Manufacturers
- Association of Building Engineers
- British Plastics Federation
- British Security Industry Association
- British Woodworking Federation
- Consumer Policy Committee of BSI
- Council for Aluminium in Building
- Department of the Environment (Building Research Establishment)
- Glass and Glazing Federation
- Guild of Architectural Ironmongers
- Institute of Architectural Ironmongers
- LHC Building Components and Services
- Loss Prevention Council
- National House-building Council

This British Standard, having been prepared under the direction of the Board for Building and Civil Engineering Sector Board, was published under the authority of the Standards Board on 15 July 1997

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Amendments issued since publication

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14074	20 February 2003	See revised national foreword
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Committee reference B/538/4
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National foreword

This British Standard is the official English language version of EN 1154:1996, including amendment A1:2002, published by the European Committee for Standardization (CEN).

The start and finish of text introduced or altered by CEN amendment A1 is indicated in the text by tags **A1** **A1**.

The UK participation in its preparation was entrusted by Technical Committee B/538, *Doors, windows, shutters, hardware and curtain walling*, to its Subcommittee B/538/4, *Building hardware*, 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.

EN 1154:1996 (as amended) is a candidate “harmonized” European Standard and fully takes into account the requirement of the European Commission mandate M101, *Doors, windows, shutters, gates and related hardware*, given under the EU Construction Products Directive (89/106/EEC), and intended to lead to CE marking. The date of applicability of EN 1154:1996 (as amended) as a “harmonized” European Standard, i.e. the date after which this standard may be used for CE marking purposes, is subject to an announcement in the *Official Journal of the European Communities*.

The Commission in consultation with Member States have agreed a transition period for the co-existence of “harmonized” European Standards and their corresponding national standard(s). It is intended that this period will comprise a period, usually nine months after the date of availability of the European Standard, during which any required changes to national regulations are to be made, followed by a further period, usually twelve months, for the implementation of CE marking. At the end of this co-existence period, the national standard(s) will be withdrawn.

Since BS EN 1154:1997 is the current national standard the changes introduced by amendment no. 1 may be implemented from nine months after publication.

Based on this transition period of twenty-one months BS EN 1154:1997 (as amended) will be fully effective in September 2004.

NOTE This date is approximate. Users of this standard should contact BSI Customer Services for confirmation.

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

Cross-references

The British Standards which implement international or European 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.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its 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, pages i and ii, the EN title page, pages 2 to 27 and a back cover.

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English version

Building hardware — Controlled door closing devices — Requirements and test methods

(includes amendment A1:2002)

Quincaillerie pour le bâtiment — Dispositifs de
fermeture de porte avec amortissement —
Prescriptions et méthodes d'essai
(inclut l'amendement A1:2002)

Schlösser und Baubeschläge — Türschließmittel
mit kontrolliertem Schließablauf —
Anforderungen und Prüfverfahren
(enthält Änderung A1:2002)

This European Standard was approved by CEN on 1996-09-28 and amendment A1 was approved by CEN on 2002-11-07. 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, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

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

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

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 33, Doors, windows, shutters, building hardware and curtain walling, the secretariat of which is held by AFNOR.

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 1997, and conflicting national standards shall be withdrawn at the latest by May 1997.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive 89/106/EEC.

For relationship with EU Directive 89/106/EEC, see informative Annex ZA, which is an integral part of this document.

Wherever reference is made to classes, they are considered to be technical classes and not classes according to Article 3(2) of the Construction Products Directive (89/106/EEC).

This European Standard is part of a package of European Standards dedicated to building hardware products, and derives from performance requirements contained in various texts cited in Annex E.

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

Foreword to amendment A1

This document EN 1154:1996/A1:2002, has been prepared by Technical Committee CEN/TC 33, Doors, windows, shutters, building hardware and curtain walling, the Secretariat of which is held by AFNOR.

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 June 2003, and conflicting national standards shall be withdrawn at the latest by September 2004.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

NOTE This amendment refers only to requirements under the Construction Products Directive (89/106/EEC), and CE marking is considered only in regard to this Directive. Where full CE marking may require compliance with other directives it is understood that this is done by following the relevant risk assessment(s) of these other directives, performed in addition to the requirements of this standard

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1 Scope

This standard specifies requirements for controlled door closing devices for swing doors, such devices being mounted on or in the frame, on or in the door, or in the floor.

The scope is limited to manually operated door closing devices where the energy for closing is generated by the user upon opening the door, such that when the door is released, it returns to a closed position, in a controlled manner.

Devices such as spring hinges, which do not exert a checking control during door closing, are outside the scope of this standard.

Door closing devices (door closers) manufactured in accordance with this standard are recommended for use wherever there is a requirement for reliable closing control of a door.

Door closers for use on fire/smoke doors need additional attributes in order to contribute actively to meeting the essential safety requirements in case of fire, either independently or as part of a complete door assembly.

These additional requirements for door closers for use on a fire/smoke door assembly are specified in normative Annex A.

Door closers incorporating electrically powered hold-open mechanisms, for use on fire/smoke door assemblies, are covered by [A1](#) EN 1155. [A1](#)

[A1](#) Door closers incorporating door coordinator devices (with or without electrically powered hold-open devices) are covered by EN 1158. [A1](#)

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.

[A1](#) EN 1155 [A1](#), *Building hardware — Electrically powered hold-open devices for swing doors — Requirements and test methods.*

[A1](#) EN 1670:1998 [A1](#), *Building hardware — Corrosion resistance of hardware for doors, windows, shutters and curtain walling — Requirements and test methods.*

[A1](#) EN 1634-1, *Fire resistance tests for door and shutter assemblies — Part 1: Fire doors and shutters.* [A1](#)

[A1](#) EN 1634-3, *Fire resistance tests for door and shutter assemblies — Part 3: Smoke control doors and shutters.* [A1](#)

3 Definitions

For the purposes of this standard, the following definitions apply:

3.1

controlled door closing device (door closer)

any manually operated door closing mechanism where the energy for closing is generated by the user upon opening the door, and when released, returns the door to the closed position, in a controlled manner. The term includes all arms, brackets, shoes, top centres, floor pivots and other parts supplied with the device and necessary for its installation and operation

3.2

overhead door closer surface mounted

a door closer mounted at or near the door head, on the surface of the door or its transom

([A1](#) see Figure C.1.1 [A1](#))

3.3

overhead concealed door closer door mounted

a door closer, mounted within the thickness of the door ([A1](#) see Figure C.1.2 [A1](#))

3.4

overhead concealed door closer transom mounted

a door closer mounted within the thickness of the transom (A1) see Figure C.1.3 (A1)

3.5

floor concealed door closer — floor spring

a door closer mounted within the floor (A1) see Figure C.1.4 (A1)

3.6

double action door closer

a door closer which allows operation of a door in both directions (A1) see Figure C.2.1 (A1)

3.7

single action door closer

a door closer for use on doors which can open in one direction only and which close against a fixed stop (A1) see Figure C.2.2 (A1)

3.8

door width

the width of the door leaf including any rebated door edges (A1) see Figure C.2.3 (A1)

3.9

closing moment

(A1) the torque generated (A1) by the door closing device which acts upon the door leaf during the closing operation

3.10

opening moment

(A1) the torque generated (A1) by the user which acts upon the door leaf during the opening operation

3.11

backcheck

an inbuilt buffer which helps to prevent a door leaf being flung wide open

3.12

delayed closing

an inbuilt function that allows the door closing action to be (A1) retarded (A1) for an adjustable period of time before resuming controlled closing

3.13

door closer power size

a measure of the closing moment exerted by a door closer

3.14

hold-open

an inbuilt function that allows a door fitted with a door closer to remain open at either a preset or chosen angle until manually released

3.15

electrically powered hold-open

an inbuilt function that allows a door fitted with a door closer to remain open at either a preset or chosen angle until electrically released (see (A1) EN 1155 (A1))

3.16

adjustable closing force

an inbuilt function that allows the closing moment of a door closer to be adjusted over a range of power sizes

3.17

efficiency

a ratio of the opening force applied to the door by the user, and the force available for closing the door, expressed as a percentage (see 7.3.4.2)

3.18**speed control**

the adjustability of the closing speed of the door (see 5.2.6)

3.19**latch control**

a speed control operable only during the last few degrees of door closing (see 5.2.12)

3.20**test cycle**

a test cycle includes all operations of the test door, from the closed position, to opening to the required position and to closing back to the closed position

3.21**standard installation**

normal fitting position stated by the manufacturer, e.g. door closer suitable for fitting to the door face on the “pull” side of the door

4 Classification**4.1 Coding System**

For the purposes of this standard, door closers shall be classified according to the following six digit coding system:

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4.2 Category of use (first digit)

For all internal and external doors for use by the public, and others with little incentive to take care, i.e. where there is some chance of misuse of the door:

- grade 3: For closing doors from at least 105° open;
- grade 4: For closing doors from 180° open.

NOTE 1 Grade 4 classification assumes standard installation according to the manufacturer's instructions.

NOTE 2 For applications subject to extremes of abuse, or for particular limitations of opening angle, door closers incorporating a backcheck function or provision of a separate door stop should be considered (see 5.2.13).

4.3 Durability (second digit)

Only one test duration is identified for door closers manufactured to this standard:

- grade 8: 500 000 test cycles (see 5.2.2).

4.4 Door Closer power size (third digit)

Seven door closer power sizes are identified according to Table 1 of this European Standard.

Where a door closer provides a range of power sizes both the minimum and the maximum sizes shall be identified.

Text deleted

4.5 **A1** Suitability for use on fire/smoke doors (fourth character) **A1**

Two grades of **A1** suitability for use on fire/smoke doors (fourth character) **A1** are identified for door closing devices manufactured to this standard:

- grade 0: Not suitable for use on fire/smoke door assemblies;
- grade 1: Suitable for use on fire/smoke door assemblies, subject to satisfactory assessment of the contribution of the door closer to the fire resistance of specified fire/smoke door assemblies. Such assessment is outside the scope of this European Standard (see prEN 1634-1).

A1 Annex A indicates additional requirements for door closers manufactured to grade 1. **A1**

4.6 Safety (fifth digit)

All door closers are required to satisfy the Essential Requirement of safety in use. Therefore only grade 1 is identified.

4.7 Corrosion resistance (sixth digit)

Five grades of corrosion resistance are identified according to **A1** EN 1670: **A1**

- grade 0: No defined corrosion resistance;
- grade 1: Mild resistance;
- grade 2: Moderate resistance;
- grade 3: High resistance;
- grade 4: Very high resistance.

A1 4.8 Example of classification

The following example denotes a door closer capable of closing doors from at least 105° open, with durability grade 8, with a power size range from size 2 to size 5, not suitable for use on fire/smoke door assemblies, with safety grade 1 and with moderate resistance to corrosion.

3	8	5	0	1	2
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Table 1

1	2	3	4	5	6	7	8	9
Door closer power size	Recommended door leaf width mm max.	Test door mass kg	Closing moment				Opening moment between 0° and 60° Nm max.	Door closer efficiency between 0° and 4° % min.
			between 0° and 4°		between 88° and 92°	any other angle of opening		
			Nm min.	Nm max.	Nm min.	Nm min.		
1	<750	20	9	<13	3	2	26	50
2	850	40	13	<18	4	3	36	50
3	950	60	18	<26	6	4	47	55
4	1 100	80	26	<37	9	6	62	60
5	1 250	100	37	<54	12	8	83	65
6	1 400	120	54	<87	18	11	134	65
7	1 600	160	87	<140	29	18	215	65

NOTE 1 The door widths given are for standard installations. In the case of unusually high or heavy doors, windy or draughty conditions, or special installations, a larger power size of door closer should be used.

NOTE 2 The test door masses shown are only related to door closer power sizes for the purpose of the test procedure. These test door masses are not intended to indicate maximum values for actual use. **A1**

5 Requirements



5.1 Product information

5.1.1 A door closer manufactured to this standard shall be supplied with clear, detailed instructions for its installation, regulation and maintenance, which shall include any limitations of opening angle.

5.1.2 Where a door closer is recommended for fitting in other than a standard application, these instructions shall clearly define the door closer power size for each application of fitting position stated.

5.2 Performance

5.2.1 *General*

When tested in accordance with Clauses 6 and 7, the door closer shall satisfy the  relevant  performance requirements of 5.2.2 to 5.2.11, and 5.2.12 to 5.2.18 as appropriate.

5.2.2 *Durability*

The door closer shall be able to close a test door conforming to 6.1.1 and 6.2 from an opening angle of 90°, for a minimum of 500 000 test cycles.

Double-action door closers shall be able to close a test door conforming to 6.1.2 and 6.2 from opening angles of 90°, for a minimum of 250 000 test cycles in each direction.



5.2.3 *Closing moment*

After 5 000 test cycles and after 500 000 test cycles the measured closing moments shall be not less than the values stated in Table 1, for the particular power size of closer being tested.

5.2.4 *Opening moment*

After 5 000 test cycles the maximum measured opening moment shall be not more than the value stated in Table 1 for the particular power size of closer being tested.

5.2.5 *Efficiency*

After 5 000 test cycles and after 500 000 test cycles the measured efficiency shall be not less than the values stated in Table 1, for the  particular power size of the door closer being tested. 

5.2.6 *Closing time*

After 5 000 test cycles and after 500 000 test cycles, the closing time, from a door opening angle of 90°, shall be capable of adjustment to 3 s or less, and 20 s or more.

After 500 000 test cycles, the closing time set at 5 000 test cycles shall not have increased by more than 100 %, or decreased by more than 30 %.

5.2.7 *Angles of operation*

The door closer, when installed according to the manufacturer's standard installation instructions, shall permit the test door to open according to its grade under 4.2, and on closing, shall control the door from a minimum angle of 70°, down to the closed position.

5.2.8 *Overload performance*

The door closer shall be capable of withstanding the closing overload tests of 7.3.4.4 and 7.3.6.4 and where relevant 7.3.4.5.

5.2.9 *Temperature dependence*

A set closing time (from a 90° open position) of 5 s at an ambient temperature of 20 °C, shall not increase to more than 25 s or decrease to less than 3 s when tested at –15 °C and 40 °C (see 7.2.1 and 7.2.2).

5.2.10 *Fluid leakage*

Throughout the test programme there shall be no leakage of fluid from the door closer.

5.2.11 *Damage*

Throughout the test programme there shall be no damage to the door closer or its arms that would adversely affect its performance to this standard.

5.2.12 Latch control (optional)

A door closer manufactured to this standard can include a separate control during the final stage of door closing, e.g. to enable accelerated closing to overcome the resistance of a latch bolt. If incorporated, it shall be effective over a maximum range of 15° from the closed position, and shall be adjustable.

5.2.13 Backcheck (optional)

If provided with a backcheck function, the door closer shall be capable of arresting the test door before the 90° open position, when tested in accordance with 7.3.5.2.

5.2.14 ^{A1} Delayed closing

5.2.14.1 Delayed closing (optional)

If provided with a delayed closing function the door closer shall be capable of adjustment, by means of a separate regulator, such that the closing time from 90° to the end of the delay zone, at an ambient temperature of 20 °C, is not less than 20 s. The delay zone shall not extend below the 65° open position. The moment required to override manually the delay action shall not exceed 150 N·m when tested in accordance with 7.3.4.5.

5.2.14.2 Durability of delayed closing

When tested in accordance with 7.3.4.5, the delay time at the conclusion of 500 test cycles shall be between 10 s and 30 s. ^{A1}

5.2.15 Adjustable closing force (optional)

If provided with an adjustable closing force function, the door closer shall comply with the performance requirements of Clause 5, at both the minimum and maximum power settings claimed by the manufacturer.

5.2.16 ^{A1} Zero position (for double action door closers only) ^{A1}

The amount of free play at the zero position of a new door closer shall not exceed 3 mm, and after 500 000 test cycles shall not exceed 6 mm, when tested in accordance with 7.2.3 and 7.3.6.6.

5.2.17 Corrosion resistance

5.2.17.1 The requirements of 5.6 of ^{A1} EN 1670:1998 ^{A1} shall be met, according to its classification (see 4.7).

5.2.17.2 After being subjected to the relevant salt spray test, the closing moment of the door closer shall be not less than 80 % of the closing moment measured prior to the test (see 7.4).

^{A1} 5.2.17.3 The acceptance conditions defined in 5.7 of EN 1670:1998 shall be met for all surfaces of the door closer which are visible when the door closer is fitted in service. ^{A1}

5.2.18 ^{A1} Fire/smoke door suitability ^{A1}

A door closer for use on a fire/smoke door assembly shall meet the necessary requirements of Annex A.

6 Test apparatus

6.1 General

6.1.1 Single action door closers

The test apparatus shall consist of a test door mounted in a frame, capable of manual opening to 180° and with automatic actuating means to enable the required opening angle in accordance with 7.3.3.1 and 7.3.5.2.

6.1.2 Double action door closers

The test apparatus shall consist of a test door mounted in a frame, capable of manual opening to at least 120° in each direction and with automatic actuating means to enable the required opening angle in alternate directions, according to 7.3.3.2.

6.2 Test door

6.2.1 The test door shall be 2 000 mm high, and of any width between 750 mm and 1 200 mm, except that, for door closers which do not carry the mass of the door or act as a door pivot, the test door may be between 400 mm and 2 000 mm high. It shall have means of attaching weights so that the door mass can be adjusted to suit the power size of door closer under test in accordance with Table 2. The test door and frame shall be of sufficient rigidity such that no visible distortion takes place during the test sequence.

6.2.2 The position of the centre of gravity shall be nominally at the mid-height position of the test door leaf, and 500 mm from the vertical axis of the hinges or pivots.

6.2.3 The test door shall be mounted vertically, on hinges or bearings, or, in the case of door closers that pivot the door, on the unit under test.

Supporting hinges or bearings forming a part of the test apparatus shall be such that the moment to overcome friction shall not exceed the values stated in Table 2.

The moment shall be determined by measuring the maximum force in newtons required to slowly (not faster than 1°/s) open and close the test door fully, the force being applied perpendicular to the door face. The frictional moment is expressed as the product of the measured force and its distance in metres from the vertical axis of rotation.

6.2.4 Means shall be provided for recording the number of operating cycles of the test door.

6.3 Force measurement

A force gauge or comparable device, with an accuracy of 1,5 % $\sqrt{A_1}$ of reading, $\sqrt{A_1}$ or better shall be provided for determining the opening and closing moments in accordance with this test method.

6.4 Actuating means

The actuating means shall not impede the return of the test door to the fully closed position, under the action of the door closer being tested.

The automatic actuating means shall apply the opening force at a distance of between 500 mm and 700 mm from the vertical axis of rotation of the door.

6.5 Closing overload performance test apparatus

The apparatus shall comprise a cable/pulley/mass system as illustrated in $\sqrt{A_1}$ Figure D.1 $\sqrt{A_1}$, weighted in accordance with Table 2 for the particular power size of closer under test.

The cable shall be of steel, shall have a diameter of between 4 mm and 6 mm, and shall be attached as shown in $\sqrt{A_1}$ Figure D.2 $\sqrt{A_1}$. The pulleys shall have a minimum diameter of 150 mm and shall be fitted with free-spinning ball or needle roller bearings.

The angle between the cable and the face of the test door when it is opened at $90^\circ \pm 5^\circ$ shall be $30^\circ \pm 5^\circ$, and when the door is in the closed position, shall be $90^\circ \pm 5^\circ$.

Means shall be provided by which the test door can be suddenly released from an open position of 90° .

Means shall be provided for arresting the falling weights when the test door reaches 15° from the closed position in such a manner that further closing of the test door is not impeded by the weight or the pulling cable.

An energy absorbing stop may be fitted to the test apparatus at 5° open position to arrest the test door at the closed position.

Table 2

Door closer power size	Test door mass kg	Overload test weight kg	Test door friction N·m max.
1	20	15	0,1
2	40	18	0,2
3	60	21	0,3
4	80	24	0,4
5	100	27	0,5
6	120	30	0,6
7	160	33	0,8

7 Test methods

7.1 General

7.1.1 Tolerances

Throughout this test method the following tolerances shall apply, unless otherwise stated:

— $\overline{A_1}$ mass expressed in kilograms	(kg)	$\pm 2 \%$;
— length expressed in millimetres	(mm)	$\pm 2 \%$;
— angular position expressed in degrees	(°)	$\pm 2^\circ$;
— force expressed in newtons	(N)	$\pm 2 \%$;
— time expressed in seconds	(s)	$\pm 5 \%$;
— temperature expressed in degrees Celsius	(°C)	$\pm 2 \text{ }^\circ\text{C}$;
— moment expressed in Newtons-metres	(Nm)	$\pm 2 \%$. $\overline{A_1}$

The ambient temperature of the test environment shall be controlled throughout the tests to between 15 °C and 30 °C.

7.1.2 Sampling

Three test samples shall be used for performance verification to this European Standard (see flow chart Annex B):

- test sample A for general requirements and operation at extremes of temperature;
- test sample B for mechanical performance and durability;
- test sample C for corrosion resistance.

For door closers incorporating an adjustable closing force facility, samples A and B shall each consist of two units, one adjusted to the minimum, and the other adjusted to the maximum power size claimed by the manufacturer. Sample C shall be adjusted to its minimum power size.

$\overline{A_1}$ In each case, the door closer shall be adjusted so that its minimum closing moment between 0° and 4° are as near as possible to the values specified in Table 1.

On door closers with a “hold-open” facility, render that facility inoperable. If this is not possible, an equivalent model without a “hold-open” facility shall be tested. $\overline{A_1}$

7.2 Test procedure — Sample A — General requirements and operation at extremes of temperature

The tests shall be carried out in the order as detailed in 7.2.1 to 7.2.3.

7.2.1 General

Verify that the requirements of 5.1 and Clause 8, and where relevant, 5.2.12 and 5.2.18 are met.

The door closer shall be mounted on a test door according to 6.2 in accordance with the manufacturer's standard installation instructions.

7.2.2 Test of temperature dependence

Before setting and before each measurement at the temperature extremes the door closer shall be conditioned in the temperature controlled chamber for a minimum of 8 h at the relevant temperature.

With the door closer temperature stabilized at 20 °C \pm 1 °C, adjust the closer to provide a smooth closing action from 90° open to fully closed, in a time of 5 s. Take the average of three readings.

Stabilize the door closer temperature at –15 °C \pm 1 °C, open the door slowly to 90° open in a time of not less than 4 s and measure the time taken to return to the fully closed position. Take the average of three readings.

Without readjusting the regulator(s), stabilize the door closer temperature at 40 °C \pm 1 °C and again, measure the closing time from the 90° open position. Take the average of three readings.

Verify that the averaged closing time from 90°, at each temperature extreme, does not decrease to less than 3 s or increase to more than 25 s.

7.2.3 For double action door closers only

Allow the closer to stabilize to ambient temperature and attach an indicator strap to the door closer spindle carrying a pointer 300 mm long measured from its tip to the spindle centre.

Apply a moment of 5 N·m to the spindle in each direction and measure the deflection of the pointer from the zero position.

The closer shall be rejected if the total measured free play exceeds 3 mm.

7.3 Test procedure — Sample B — Mechanical performance and durability

The tests shall be carried out in the order as detailed in 7.3.1 to 7.3.6.

7.3.1 General

Apply weights to the test door so that its total mass and centre of gravity are in accordance with Table 2 and 6.2.2, for the particular power size of closer being tested.

Mount the door closer on the test apparatus according to the manufacturer's standard installation instructions. Open the test door to the maximum angle permitted by the closer under test and verify that the door closer complies with 5.2.7.

A1 Text deleted A1

7.3.2 Door closer adjustment

Adjust the door closer regulator(s) such that the test door closes smoothly from 90° to fully closed within a time of between 3 s to 7 s. If the closer has an additional regulator for the latch control, adjust this to provide a smooth transition from closing to latching speed and to provide a positive, but not slamming, action.

Backcheck or delayed action closers shall have that feature set to its minimum effect or rendered inoperable.

7.3.3 Test apparatus adjustment

7.3.3.1 Single action door closers

Adjust the test door actuating mechanism to open the test door smoothly to 90°, in a time of between 2 s and 3 s, allowing the test door to close under the control of the door closer under test.

A1 Ensure that the test door has returned fully to the closed position before initiating the next opening operation. A1

Continue cycling for a total of 5 000 test cycles.

7.3.3.2 Double action door closers

Adjust the test door actuating mechanism to open the test door smoothly to 90° in one direction, in a time of between 2 s and 3 s, allowing the test door to close under the control of the door closer under test.

Ensure that the test door has returned fully to the closed position before initiating the next opening operation in the other direction.

Continue alternate cycling in each direction for a total of 5 000 test cycles.

7.3.4 Tests at 5 000 test cycles

7.3.4.1 Calculation of opening/closing moments

Record the ambient temperature. Allow the door closer A1 body surface A1 to cool to within 2 °C of ambient temperature.

Adjust the closing time regulator(s) to a fully open position and measure both the opening and closing forces of the door closer. The forces are measured by slowly (not faster than 1°/s) opening and closing the test door using the force gauge positioned perpendicular to the door face when the door is in an open position from 0° to 4° and from 88° to 92°. In each case the maximum value is to be noted. Take the average of three readings.

Use the same method to open the door to a 60° opening. Note the maximum opening force obtained during this procedure. Take the average of three readings.

A1 Allow the door to close from its maximum opening angle permitted by the door closer under test to 2°, and note the minimum closing force obtained during its travel. Take the average of three readings. **A1**

In the case of double action door closers this procedure shall be carried out in each direction.

NOTE 1 For double action door closers this procedure may require the use of a different test door that does not limit the angle of opening.

Calculate the opening and closing moments in each case as the product of these average gauge readings and the distance of the force gauge in metres from the vertical axis of the hinges or pivots.

NOTE 2 This procedure does not preclude the use of automatic measuring and recording equipment.

Verify that the values of the opening/closing moments are in accordance with Table 1 for the particular power size of the closer being tested.

7.3.4.2 Efficiency

Calculate the door closer efficiency as a percentage as follows:

$$\text{Efficiency} = \frac{\text{Average of max. closing force between } 0^\circ \text{ and } 4^\circ}{\text{Average of max. opening force between } 0^\circ \text{ and } 4^\circ} \times 100$$

Verify that the value of the efficiency is in accordance with the values stated in Table 1 for the particular power size of door closer being tested.

7.3.4.3 Closing time

Adjust the closing time regulator(s) as necessary and verify that the closing time from 90° is capable of adjustment to between 3 s and 20 s, according to 5.2.6.

7.3.4.4 Closing overload test

Adjust the closing time from 90° open to 10 s. Hold the test door open at 90° with the cable and weights attached, according to 6.5 and Annex D, Figure D.2, and then release the door, allowing the weights to fall. This test shall be carried out 10 times.

NOTE The falling mass is arrested when the door is 15° open, the door continuing to close under its own momentum until it is arrested by the energy absorbing stop at 5° or the frame at 0°, or in the case of double action closers, until it stops of its own accord.

7.3.4.5 For delayed closing door closers only

Adjust the door closer to the maximum delay time and open the test door to 90°. With a force gauge positioned perpendicular to the door face, measure the force and calculate the moment required to move the test door out of the delay zone in a time of between 2 s and 5 s.

The closer shall be rejected if the required moment is greater than **A1** 150 Nm **A1**, or less than twice the 90° closing moment stated in Table 1 for the particular power size of closer being tested.

A1 Restabilize the door closer to a temperature of 20 °C, and open the test door to 95°. Verify that the closing time from 90° to the end of the delay zone can be adjusted to at least 20 s in accordance with 5.2.1.

Adjust the test door actuating mechanism to open the test door smoothly to 95° in a time of between 2 s and 4 s, allowing the test door to close under the control of the door closer under test. Adjust the door closer to a delay time of 20 s from 90° to the end of the delay zone. Ensure that the test door returns fully to the closed position, and after a waiting period of 270 s start the next opening operation. Continue cycling to a total of 500 test cycles.

During the last 5 cycles of the test, measure the delay time from 90° to the end of the delay zone and verify that each measurement is between 10 s and 30 s. **A1**

7.3.5 Continuation of cycling tests

7.3.5.1 All door closers except those incorporating backcheck function

Reset the closing time regulator(s) in accordance with 7.3.2 and record the time. The regulator(s) shall remain unaltered until completion of 7.3.6.1.

Resume the cycling test to a total of 500 000 test cycles.

7.3.5.2 For door closers incorporating backcheck function

7.3.5.2.1 General

Reset the closing time regulator(s) in accordance with 7.3.2. ^[A1] The backcheck function is tested by setting up the actuating means of the test apparatus in such a way that it can accelerate the door to an opening angle of 50° at such a rate that it will:

- a) achieve an opening angle of 110° without backcheck effect in operation (for door closers with adjustable backcheck); or
- b) have an angular velocity of one radian per second (1 rad/s) \pm 10 %, at an opening angle of 60° (for door closers with fixed backcheck and for door closers with an opening angle of less than 110°). ^[A1]

7.3.5.2.2 For door closers incorporating an adjustable backcheck function

With the same setting of the test apparatus as obtained in 7.3.5.2.1 adjust the backcheck action of adjustable backcheck closers to arrest the test door at the 80° open position and continue the cycling test for a total of 100 000 test cycles.

Allow the door closer ^[A1] body surface ^[A1] to cool to within 2 °C of the original ambient temperature recorded in 7.3.4.1 and verify that the test door is arrested before the 90° open position. The adjustable backcheck shall not be readjusted prior to this test.

Upon completion remove the backcheck action and reset the test apparatus in accordance with 7.3.3. Continue cycling for a further 400 000 test cycles.

7.3.5.2.3 For door closers incorporating a fixed backcheck function

With the same setting of the test apparatus as obtained in 7.3.5.2.1 the test door shall be arrested by the backcheck at the ^[A1] 90° ^[A1] open position or less. Continue the cycling test for a total of 100 000 test cycles.

^[A1] Allow the door closer body surface to cool to within 2 °C of the original ambient temperature recorded in 7.3.4.1 and verify that the test door is arrested before the 90° open position. ^[A1]

Continue cycling for a further 400 000 test cycles with the test apparatus set to open the test door to an opening angle of between 70° and 75°

7.3.6 Tests at 500 000 test cycles

7.3.6.1 Closing time

^[A1] Allow the door closer body surface ^[A1] to cool to within 2 °C of the original ambient temperature recorded in 7.3.4.1 and measure the time taken for the test door to close from 90° to the fully closed position. The door closer shall be rejected if this time is more than 2 times, or less than 0,7 times the original value set in 7.3.5.1 or 7.3.5.2.

7.3.6.2 Calculation of closing moments and efficiency

Repeat the tests of closing moments and efficiency specified in 7.3.4.1 and 7.3.4.2. Verify that the values of minimum closing moments and efficiency are not less than the values stated in Table 1.

Door closers with adjustable closing force are considered acceptable if, after adjustment, they can achieve at least the values stated in Table 1.

7.3.6.3 Closing time

Adjust the door closer regulator(s) to give the minimum closing speed and verify that the closing time from 90° open to fully closed is not less than 20 s.

7.3.6.4 Closing overload tests

Carry out a further ten closing overload tests according to 7.3.4.4.

7.3.6.5 For delayed closing door closers only

^[A1] Restabilize the door closer to a temperature of 20 °C, and open the test door to 95°. Verify that the closing time from 90° to the end of the delay zone can be adjusted to at least 20 s in accordance with 5.2.14. ^[A1]

7.3.6.6 For double action door closers only

Remove the door closer from the test door and carry out the test of 7.2.3. The closer shall be rejected if the total measured free play exceeds 6 mm.

7.4 Test procedure — Sample C — Corrosion resistance

The tests shall be carried out in the order as detailed in 7.4.1 to 7.4.4.

7.4.1 General

Apply weights to the test door so that its total mass and centre of gravity are in accordance with Table 2 and 6.2.2, for the particular power size of closer being tested.

Mount the door closer on the test apparatus according to the manufacturer's standard installation instructions.

7.4.2 Calculation of closing moments

Adjust the closing time regulator(s) to a fully open position, open the door to at least 95°, and measure the closing forces of the door closer. The forces are measured by slowly (not faster than 1°/s) allowing the door to close using the force gauge positioned perpendicular to the door face when the door is in an open position from 92° to 88° and from 4° to 0°. In each case the maximum value is to be noted. Take the average of three readings.

Allow the door to close from its maximum opening angle permitted by the closer under test and note the minimum closing force obtained during its travel. Take the average of three readings.

Calculate the closing moments in each case as the product of these average gauge readings and the distance of the force gauge in metres from the vertical axis of the hinges or pivots.

7.4.3 Salt spray test

Remove the door closer from the test apparatus and carry out a salt spray test according to **EN 1670** for the grade of corrosion resistance claimed.

7.4.4 Verification of closing moments

After completion of the salt spray test and within a maximum time of 24 h reinstall the door closer on the test apparatus and repeat the procedure described in 7.4.2. Verify that the door closer meets the requirements of 5.2.17.

8 Marking

Each door closer and separately supplied accessory manufactured to this standard shall be marked with the following:

- a) the manufacturer's name or trademark, or other means of identification;
- b) product model identification;
- c) the classification according to Clause 4;
- d) the number of this European Standard;
- e) the year and week of manufacture.

NOTE This information under e) can be in a coded form.

In the case of concealed door closers, the above information shall be readily visible after removal of the cover plate.

For accessories (where there may be insufficient space to provide the information given in the clause), only item a) is mandatory.

A1 Accessories claiming compliance with Annex A, shall be marked with the information a) to e) above. In preferential order the information shall be placed:

- 1) on the product itself; or
- 2) on a label attached to it; or
- 3) on the installation instructions; or
- 4) on its packaging.

NOTE For CE marking and labelling, see Clause **ZA.3** of Annex ZA. **A1**

A1 9 Evaluation of conformity

9.1 Initial type test

Samples, selected in accordance with **7.1.2**, representing the series, shall be subjected to the full test sequence of Clause **7** and, where relevant, to Annex A.

If necessary, (for example, after component changes or redesigns likely to affect the product performance) this initial type test shall be repeated.

9.2 Factory production control

9.2.1 Documentation

9.2.1.1 The manufacturer of door closing devices to this European Standard shall document, operate and maintain an adequate factory production control system to enable the achievement of the required product characteristics and the effective operation of the production control system to be checked.

9.2.1.2 The manufacturer shall draw up and keep up-to-date documents defining the factory production control which he applies. The manufacturer's documentation and procedures shall be appropriate to the product and manufacturing process. The factory production control system shall achieve an appropriate level of confidence in the conformity of the product. This involves:

- a) the preparation of documented procedures and instructions relating to factory production control operations;
- b) the effective implementation of these procedures and instructions;
- c) the recording of these procedures and their results;
- d) the use of these results to correct any deviations, repair the effects of such deviations, treat any resulting instances of non-conformity and, if necessary, revise the factory production control to rectify the cause of non-conformity.

9.2.2 Unit checks during manufacture

The manufacturer shall conduct the following unit checks during manufacture:

- a) check that the components meet the specifications;
- b) check the operation of the mechanism;
- c) check the marking.

9.2.3 Treatment of non-conforming products

The manufacturer shall treat non-conforming products as follows:

- a) isolate and identify non-conforming products;
- b) undertake the necessary corrective actions;
- c) repeat tests as appropriate to prove that product meets the specifications.

9.3 Further testing of samples

At intervals of not more than six months, samples taken from finished product stock, selected in accordance with **7.1.2** and representative of the series, shall be subjected to the full test sequence of **7.3**. **A1**

Annex A (normative)

Additional requirements for door closing devices intended for use on fire/smoke door assemblies

A.1 The door closer, when installed in accordance with the manufacturer's installation instructions, shall be capable of closing the test door from any angle to which it may be opened.

A1) Due to their low closing moments door closers size 1 and 2, without adjustable closing force, are NOT considered suitable for use on fire/smoke door assemblies. Door closers with adjustable closing force shall be capable of adjustment at least to power size 3. For such closers the installation instructions shall include precise instructions to the installer to ensure that the door closer power is adjusted on site to size 3 or more, to overcome resistance of any seals or latches fitted. **A1)**

A.2 The door closer shall not include a hold-open device unless it is an electrically powered device in accordance with prEN 1155.

A.3 Control regulators shall either be concealed, or operable only by means of a tool.

A.4 The design of a door closer shall be such that it is not possible to inhibit its closing action in any way, without the use of a tool.

A.5 Any incorporated delayed action function shall be capable of adjustment to less than 25 s, between the door closing angles of 120° and the end of the delay zone.

A.6 The door closer, representative of its model, shall have been incorporated in a door assembly that has satisfied the appropriate criteria of a fire test. **A1)** The test shall have been on a full sized assembly in accordance with EN 1634-1 or when relevant, in accordance with EN 1634-3. **A1)**

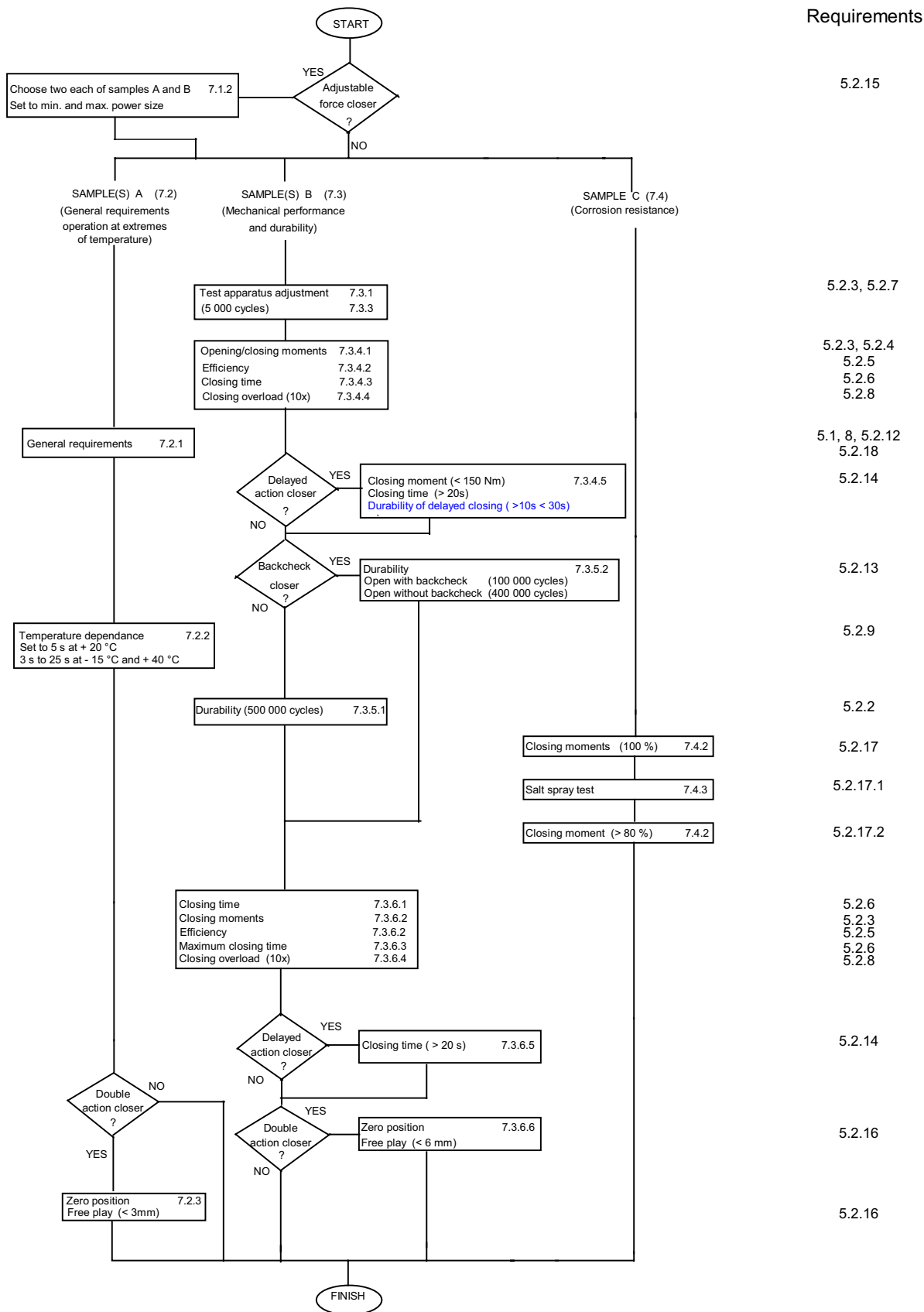
NOTE 1 A wider field of application will be obtained by subjecting the product to a test in accordance with another part of prEN 1634, currently being prepared by CEN/TC 127.

NOTE 2 Products often penetrate the door leaf and interrupt the leaf edge/frame gap. The influence that this may have on the smoke control properties of a door assembly can only be determined by subjecting a full-sized door assembly, fitted with the component, to the test described in prEN 1634-3.

A1) **A.7** Where the door closer is intended for use with other, significantly different arm assemblies (for example slide tracks) which may be supplied separately, that combination shall also be tested according to Clause 7. **A1)**

Annex B (normative)
Flow chart of test procedure

A1



A1

Annex C (informative)

Door closer and door types

C.1 Typical door closer types

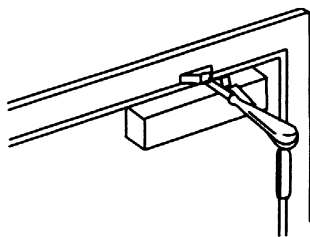


Figure C.1.1 — Overhead door closer surface mounted

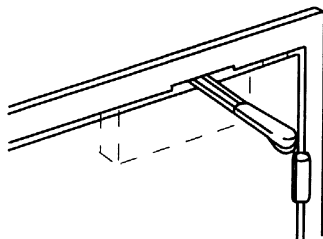


Figure C.1.2 — Overhead concealed door closer door mounted

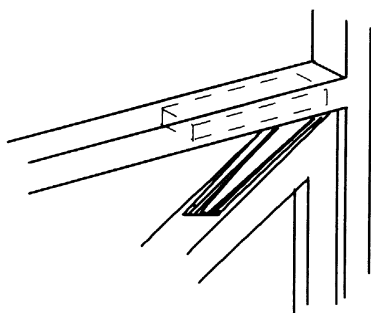


Figure C.1.3a Double action

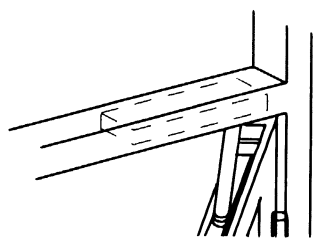


Figure C.1.3b Single action

Figure C.1.3 — Overhead concealed door closer transom mounted

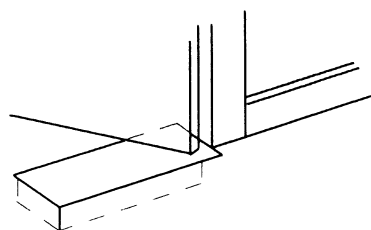


Figure C.1.4a Double action

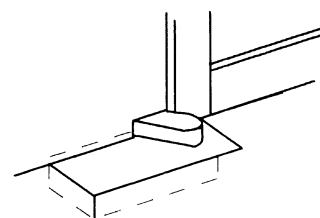
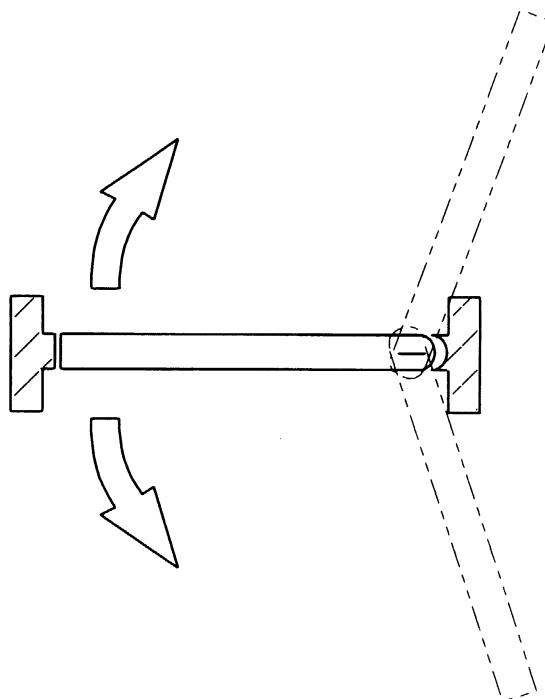
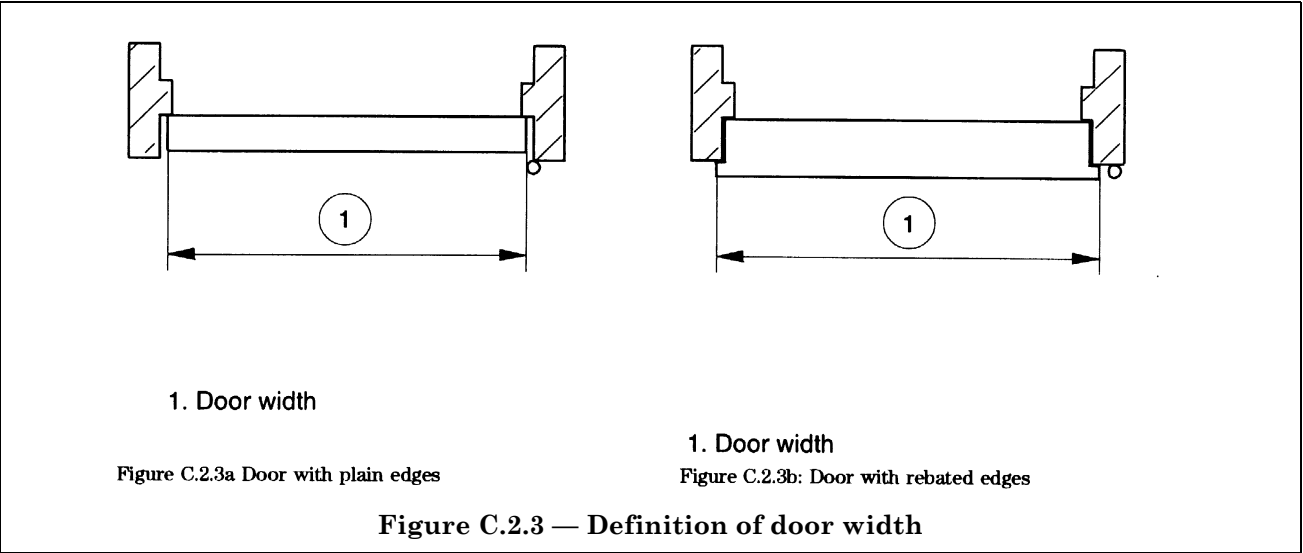
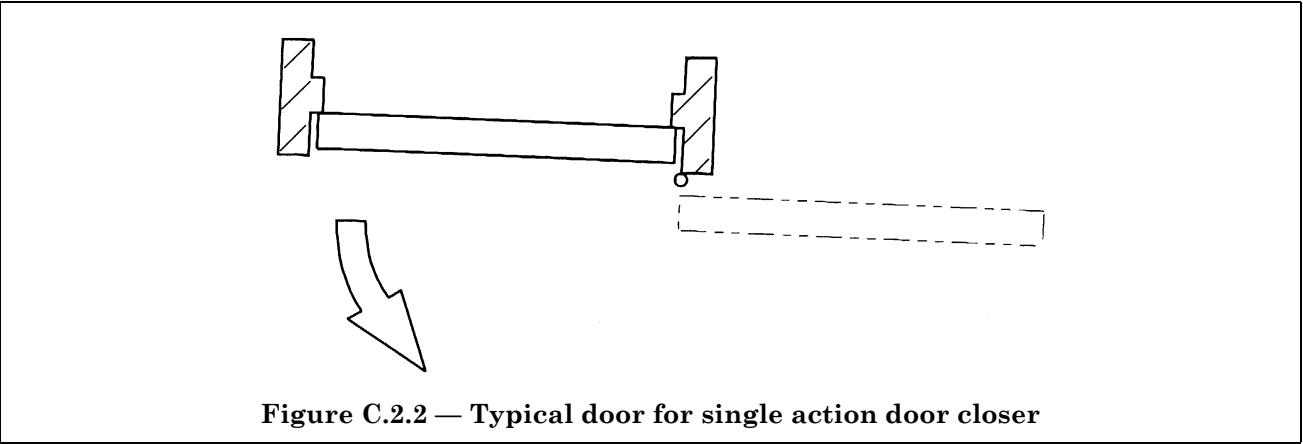
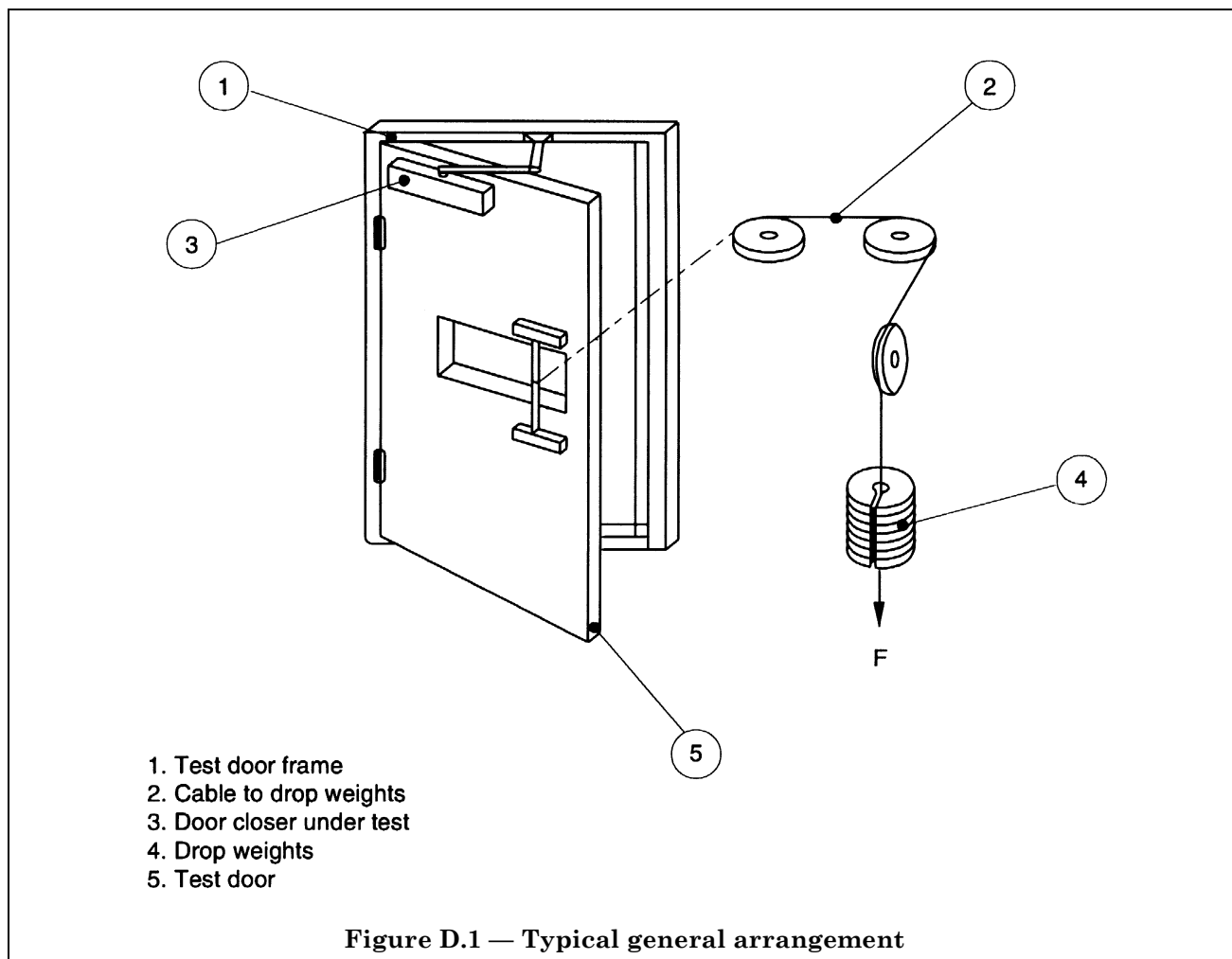


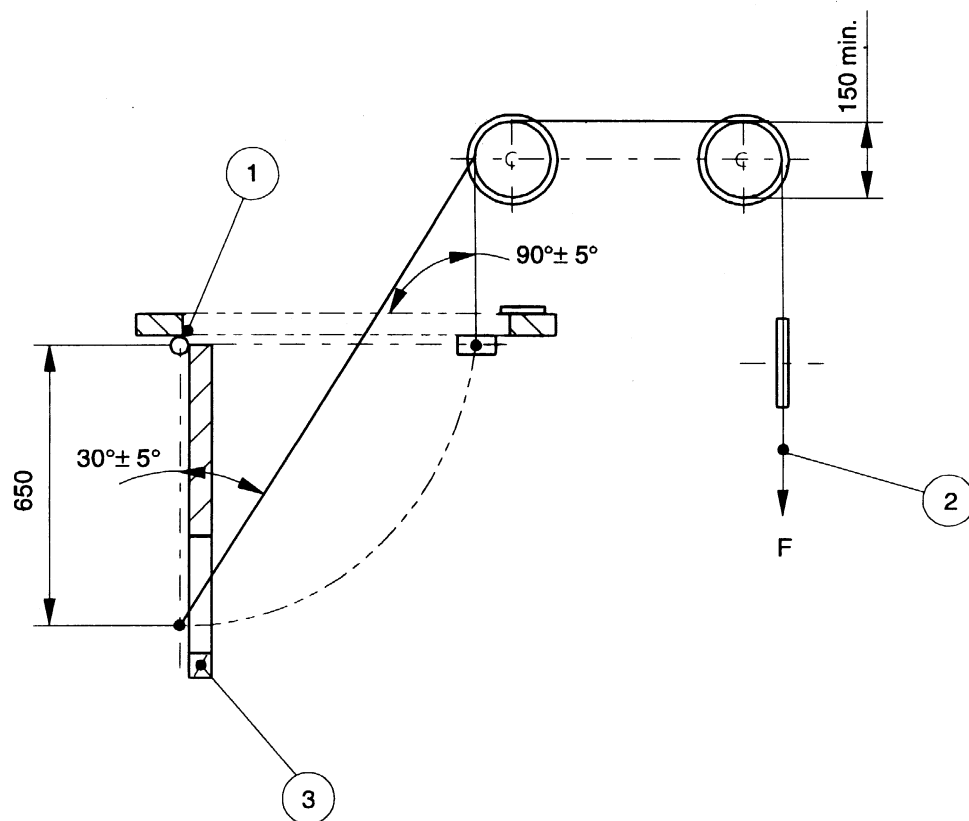
Figure C.1.4b Single action

Figure C.1.4 — Floor concealed door closer floor spring**Figure C.2.1 — Typical door for double action door closer**



Annex D (informative)
Overload performance test apparatus





- 1. Door pivot
 - 2. Cable to drop weights
 - 3. Test door in 90° open position
- Dimensions in millimetres

Figure D.2 — Arrangement for closing overload test

Annex E (informative)

Bibliography

This European Standard derives from performance requirements contained in:

NF P 26-316 1979, *Quincaillerie — Ferme porte à frein — Spécifications — Essais*.

NF P 26-317 1981, *Quincaillerie — Pivots à frein hydraulique au sol — Spécifications — Essais*.

BS 6459-1 1987, *Door closers — Specification for mechanical performance of crank and rack and pinion overhead closers*.

DIN 18263-1 1987, *Türschließer mit hydraulischer Dämpfung — Oben-Türschließer mit Kurbeltrieb und Spiralfeder*.

DIN 18263-2 1987, *Türschließer mit hydraulischer Dämpfung — Oben-Türschließer mit Lineartrieb*.


DIN 18263-3 1987, *Türschließer mit hydraulischer Dämpfung — Boden-Türschließer*.

SIS SS 2947 1986, *Byggnadsbeslag — Dörrstängare — Fordringar*.

SIS SS 2987 1986, *Byggnadsbeslag — Dörrstängare — Provning*.

Miscellaneous:

ARGE 1973, Specification for overhead closing devices.

EN ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories* (ISO/IEC 17025:1999). 

Annex ZA (informative)**Clauses of this European Standard addressing the provisions of the EU Construction Products Directive (89/106/EEC)****ZA.1 General**

This European Standard has been prepared under mandate M/101 “Doors, windows, shutters, gates and related building hardware” given to CEN by the European Commission and the European Free Trade Association.

The clauses of this European Standard, shown in this annex meet the requirements of the mandate given under the EU Construction Products Directive (89/106/EEC). Compliance with these clauses confers a presumption of fitness of door closing devices covered by this European Standard for their intended use.

WARNING Other requirements and other EU Directives, not affecting the fitness for intended use, can be applicable to door closing devices falling within the scope of this European Standard.

NOTE In addition to any specific clauses relating to dangerous substances contained in this Standard, there may be other requirements applicable to the products falling within its scope (e.g. transposed European legislation and national laws, regulations and administrative provisions). In order to meet the provisions of the EU Construction Products Directive, these requirements need also to be complied with, when and where they apply. *Note: an informative database of European and national provisions on dangerous substances is available at the Construction web site on EUROPA (CREATE, accessed through <http://europa.eu.int>).*

Table ZA.1 — Scope and clauses of this standard applying to the essential characteristics

Product:	Controlled door closing devices, as covered by the scope of this standard.		
Intended use:	On fire and smoke compartmentation doors (to fulfil the self-closing requirements of such doors)		
Requirement/ characteristic	Requirement clauses in this European Standard	Mandated levels and/or classes	Notes (expression of performance)
Self-closing.	5.2.1 5.2.3 to 5.2.16 inclusive 5.2.18	None	Pass/Fail criteria for: Category of use: Angles of operation Power size: Closing moment Opening moment Efficiency Overload performance Suitability for fire/smoke door use: Fire/smoke door suitability Safety: Closing time Temperature dependence Fluid leakage Damage Latch control (when relevant) Backcheck (when relevant) Delayed closing (when relevant) Adjustable closing force (when relevant) Zero position (when relevant)
Durability of self-closing	5.2.2 and 5.2.17.1 and 5.2.17.2	None	Pass/Fail criteria for: Durability: Number of test cycles Corrosion resistance: Corrosion grade
Dangerous substances	See Note 1 above	None	See Clause ZA.3

NOTE Values fixed for pass/fail criteria in the relevant subclauses of Clauses 4 and 5 are not to be considered threshold levels if self-closing is not regulated for controlled door closing devices to be used in fire/smoke compartmentation doors. **Annex A1**

A1) ZA.2 Procedure for the attestation of conformity of controlled door closing devices

Controlled door closing devices for the intended use listed shall follow the system of attestation of conformity shown in Table ZA.2, in accordance with the Decision of the Commission (1999/93/EC) and Annex III of Mandate 101.

Table ZA.2 — System of attestation of conformity

Product	Intended use	Levels or classes	System of attestation of conformity
Building hardware related to doors and gates	On fire/smoke compartmentation doors	—	1
System 1: See CPD, Annex III point 2 (i), without audit-testing of samples			

The attestation of conformity shall be based on the evaluation of conformity procedure resulting from the application of those clauses of this European Standard indicated in Table ZA.3.

Table ZA.3 — Assignment of evaluation of conformity tasks

Tasks		Content of the task	Clauses to apply
a) Tasks for the manufacturer	Factory production control (F.P.C)	Parameters related to the characteristics of Table ZA.1	9.2
	Further testing of samples taken at factory	The characteristics of Table ZA.1	9.3
	Initial type testing	Dangerous substances	9.1
b) Tasks for the certification body	Initial type testing	All characteristics of Table ZA.1 except dangerous substances	9.1
	Initial inspection of factory and of F.P.C	Parameters related to the characteristics of Table ZA.1	9.2
	Continuous surveillance, assessment and approval of F.P.C.	Parameters related to the characteristics of Table ZA.1	9.2

For products intended to be placed in markets of those Member States where there are no legal requirements for the characteristic of “self-closing”, the producer is not required to determine and may declare “no performance determined” for this characteristic in the information accompanying the CE marking required in **ZA.3**. The “No performance determined” (NPD) option may not be used where the characteristic is subject to a threshold level.

When compliance with the conditions of this annex is achieved, the certification body shall draw up a certificate of conformity (EC Certificate of conformity) with the information indicated below. This EC Certificate of conformity entitles the manufacturer to affix the CE marking, as described in **ZA.3**.

The EC Certificate of conformity shall include the following information:

- name, address and identification number of the certification body;
- name and address of the manufacturer, or his authorized representative established in the EEA, and place of production;
- description of the product (type, identification, use,...);
- provisions to which the product conforms (e.g. Annex ZA of EN 1154:1996 + A1:2002);
- particular conditions applicable to the use of the product;
- the certificate’s number;
- conditions and period of validity of the certificate, where applicable;
- name of, and position held by, the person empowered to sign the certificate.

In addition, for each product covered by an EC Certificate of conformity, the manufacturer shall draw up a declaration of conformity (EC Declaration of conformity) including the following information:

- name and address of the manufacturer, or his authorized representative established in the EEA;
- number of the attached EC Certificate of conformity;
- name of, and position held by, the person empowered to sign the declaration on behalf of the manufacturer or of his authorized representative.

Both documents must be presented in the official language (or languages) of the Member State of the EU in which the product is to be used. **A1)**

ZA.3 CE marking and labelling

The CE conformity marking symbol consists exclusively of the letters “CE” in accordance with Directive 93/68/EC.


NOTE The manufacturer, or his authorized representative established in the EEA, is responsible for the affixing of the CE marking symbol

The CE marking symbol shall be accompanied by the following information:

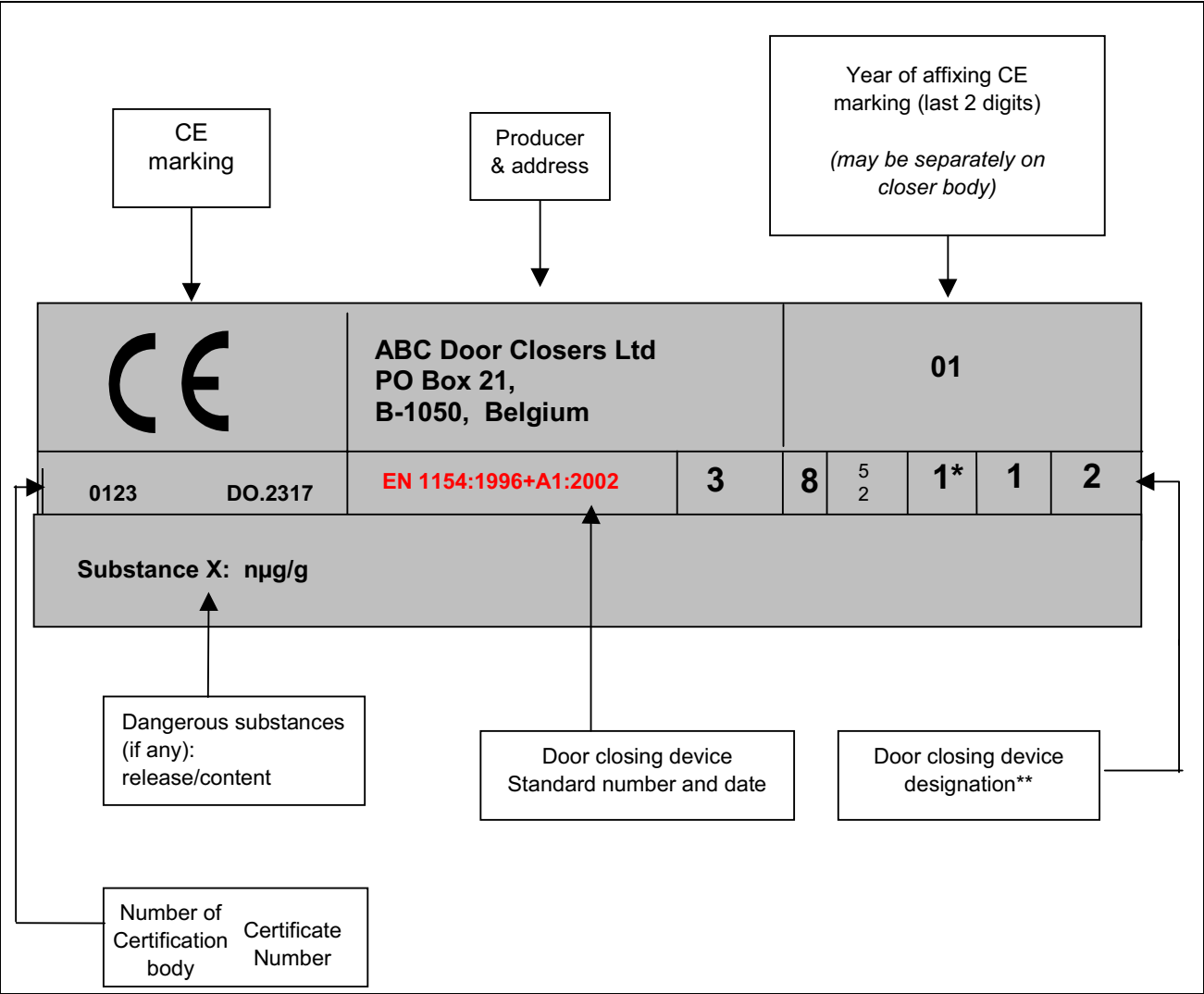
- a) identification number of the certification body;
- b) the name or identifying mark of the producer;
- c) registered address of the producer;
- d) the last two digits of the year in which the marking was applied;
- e) the number of the EC certificate of conformity;
- f) reference to this European standard (EN 1154:1996 + A1:2002);
- g) the designation and performance of the door closing device according to 4.2 to 4.7, where referenced in Table ZA.1.

The CE marking symbol and items a) to g) above shall accompany the product and shall be included with the installation instructions. Additionally, the CE marking symbol and some or all of this information may be affixed to the door closing device and/or the product packaging.

In addition to any specific information relating to dangerous substances shown above, the product should also be accompanied, when and where required and in the appropriate form, by documentation listing any other legislation on dangerous substances for which compliance is claimed, together with any information required by that legislation.

NOTE European legislation without national derogations need not be mentioned. 

A1 Example of CE Marking for a door closing device:



NOTE 1 The manufacturer should state the precise field of application for fire/smoke door use according to A.6 of Annex A.

NOTE 2 All or some of the digits may be substituted by NPD in the designation of products intended to be placed in markets where there are no legal requirements for self-closing or for any of the related characteristics. **A1**

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

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