INTERNATIONAL STANDARD

IEC 60335-2-95

Second edition
2002-11

Household and similar electrical appliances – Safety –

Part 2-95: Particular requirements for drives for vertically moving garage doors for residential use

Appareils électrodomestiques et analogues – Sécurité –

Partie 2-95: Règles particulières pour les motorisations de portes de garage à ouverture verticale, pour usage résidentiel

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-95: Particular requirements for drives for vertically moving garage doors for residential use

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
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6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

This part of International Standard IEC 60335 has been prepared by IEC technical committee 61: Safety of household and similar electrical appliances.

This second edition cancels and replaces the first edition published in 1998. It constitutes a technical revision.

The text of this part of IEC 60335 is based on the following documents:

FDIS	Report on voting
61/2229/FDIS	61/2304/RVD

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

This part 2 is to be used in conjunction with the latest edition of IEC 60335-1 and its amendments. It was established on the basis of the fourth edition (2001) of that standard.

NOTE 1 When “Part 1” is mentioned in this standard, it refers to IEC 60335-1.

This part 2 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert that publication into the IEC standard: Safety requirements for electric drives for vertically moving garage doors for residential use.

When a particular subclause of Part 1 is not mentioned in this part 2, that subclause applies as far as is reasonable. When this standard states “addition”, “modification” or “replacement”, the relevant text in Part 1 is to be adapted accordingly.

NOTE 2 The following numbering system is used:

– subclauses, tables and figures that are numbered starting from 101 are additional to those in Part 1;

– unless notes are in a new subclause or involve notes in Part 1, they are numbered starting from 101, including those in a replaced clause or subclause;

– additional annexes are lettered AA, BB, etc.

NOTE 3 The following print types are used:

– requirements: in roman type;

– *test specifications: in italic type;*

– notes: in small roman type.

Words in **bold** in the text are defined in Clause 3. When a definition concerns an adjective, the adjective and the associated noun are also in bold.

The committee has decided that the contents of this publication will remain unchanged until 2004. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

The following differences exist in the countries indicated below.

– 6.1: Class 0I appliances are allowed (Japan).

– 7.1: Additional markings are required (Canada and USA).

– 7.12.1: Additional warnings and instructions are required (Canada and USA).

– 11.7: The test conditions are different (USA).

– 19.9: A running overload test is carried out (USA).

– 20.101: The test is not carried out (USA).

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

It has been assumed in the drafting of this International Standard that the execution of its provisions is entrusted to appropriately qualified and experienced persons.

This standard recognizes the internationally accepted level of protection against hazards such as electrical, mechanical, thermal, fire and radiation of appliances when operated as in normal use taking into account the manufacturer's instructions. It also covers abnormal situations that can be expected in practice.

This standard takes into account the requirements of IEC 60364 as far as possible so that there is compatibility with the wiring rules when the appliance is connected to the supply mains. However, national wiring rules may differ.

If an appliance within the scope of this standard also incorporates functions that are covered by another part 2 of IEC 60335, the relevant part 2 is applied to each function separately, as far as is reasonable. If applicable, the influence of one function on the other is taken into account.

This standard is a product family standard dealing with the safety of appliances and takes precedence over horizontal and generic standards covering the same subject.

An appliance that complies with the text of this standard will not necessarily be considered to comply with the safety principles of the standard if, when examined and tested, it is found to have other features that impair the level of safety covered by these requirements.

An appliance employing materials or having forms of construction differing from those detailed in the requirements of this standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be considered to comply with the standard.

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-95: Particular requirements for drives for vertically moving garage doors for residential use

1 Scope

This clause of Part 1 is replaced by the following.

This International Standard deals with the safety of electric **drives** for garage doors for residential use that open and close in a vertical direction, the **rated voltage** of the **drives** being not more than 250 V for single-phase appliances and 480 V for other appliances. It also covers the hazards associated with the movement of these electrically driven garage doors.

NOTE 101 Examples of garage doors are shown in Figure 101.

NOTE 102 The **drive** may be supplied with a garage door.

NOTE 103 This standard also applies to **entrapment protection devices** for use with **drives**. It does not cover hazards related to the mechanisms of the door itself.

As far as is practicable, this standard deals with the common hazards presented by appliances that are encountered by all persons in and around the home. However, in general, it does not take into account playing with the appliance by young children, but recognizes that children may be in the vicinity of the garage door.

NOTE 104 Attention is drawn to the fact that in many countries additional requirements are specified by the national authorities responsible for the protection of labour and similar authorities.

NOTE 105 This standard does not apply to **drives**

– for rolling shutters, awnings, blinds and similar equipment (IEC 60335-2-97);

– for garage doors for use by more than one household (IEC 60335-2-103);

– for commercial and industrial purposes;

– intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere (dust, vapour or gas).

2 Normative references

This clause of Part 1 is applicable except as follows.

Addition:

60068-2-52:1996, *Environmental testing – Part 2: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution)*

3 Definitions

This clause of Part 1 is applicable except as follows.

3.1.9 *Replacement:*

normal operation
operation of the **drive** under the following conditions

Drives supplied without a door are operated with their **rated load.**

Drives supplied with a door are operated with the door installed in accordance with the instructions.

3.101
drive
motor and other components that control the movement of the door

NOTE Examples of components are gears, controls, brakes and **inherent entrapment protection systems**.

3.102
inherent entrapment protection system
system incorporated in the **drive** to provide protection against entrapment

3.103
non-inherent entrapment protection device
device that is not part of the **drive**, but is installed with the door to provide protection against entrapment when activated

NOTE Examples are pressure sensitive edges and active opto-electronic **protective devices**.

3.104
biased-off switch
switch that automatically returns to the **off position** when its actuating member is released

3.105
rated load
force or torque assigned to the **drive** by the manufacturer

4 General requirement

This clause of Part 1 is applicable.

5 General conditions for the tests

This clause of Part 1 is applicable except as follows.

5.2 *Addition:*

*When a test has to be carried out with a door, the door specified for installation with the **drive** that gives the most unfavourable conditions for the test is used. The **drive** is adjusted in accordance with the instructions.*

6 Classification

This clause of Part 1 is applicable except as follows.

6.1 *Modification:*

Drives shall be **class I, class II** or **class III**.

6.2 *Addition:*

Drives for outdoor use shall be at least IPX4.

6.101 Enclosures of **non-inherent entrapment protection devices** shall also provide the appropriate degree of protection against ingress of solid foreign objects. They shall be at least IP4X.

Compliance is checked by inspection and the relevant tests.

7 Marking and instructions

This clause of Part 1 is applicable except as follows.

7.1 *Addition:*

The **rated load** shall be marked, unless the **drive** is supplied with a door.

7.12 *Addition:*

The instructions shall state the substance of the following:

WARNING: Important safety instructions. It is important for the safety of persons to follow all instructions. Save these instructions.

The instructions shall include the substance of the following:

– do not allow children to play with door controls. Keep remote controls away from children;
– watch the moving door and keep people away until the door is completely opened or closed;
– take care when operating the manual release since an open door may fall rapidly due to weak or broken springs, or being out of balance;
– frequently examine the installation, in particular check cables, springs and mountings for signs of wear, damage or imbalance. Do not use if repair or adjustment is needed since a fault in the installation or an incorrectly balanced door may cause injury;
– each month check that the drive reverses when the door contacts a 40 mm high object placed on the floor. Adjust if necessary and recheck since an incorrect adjustment may present a hazard;
– details on how to use the manual release;
– information concerning the adjustment of the door and drive.

7.12.1 *Addition:*

The installation instructions shall state the substance of the following:

WARNING: Important safety instructions. Follow all instructions since incorrect installation can lead to severe injury.

The installation instructions shall include details for the installation of the **drive** and its associated components, including any **non-inherent protection device**. They shall indicate the types of doors and mechanism for which the **drive** is intended to be used.

The installation instructions shall include the substance of the following:

– before installing the drive, remove all unnecessary ropes or chains and disable any equipment, such as locks, not needed for powered operation;
– before installing the drive, check that the door is in good mechanical condition, correctly balanced and opens and closes properly;
– install the actuating member for the manual release at a height less than 1,8 m;
– install any fixed control at a height of at least 1,5 m and within sight of the door but away from moving parts;

NOTE 101 It is not required to specify a minimum height for key-operated switches.

– permanently fix the labels warning against entrapment in a prominent place or near any fixed controls;

– permanently fix the label concerning the manual release adjacent to its actuating member;
– after installation, ensure that the mechanism is properly adjusted and that the drive reverses when the door contacts a 40 mm high object placed on the floor.

7.101 Drives shall be supplied with a label suitable for permanent fixing that states the substance of the following:

Keep children away when the door is moving.

This warning shall also be given by a pictogram having a height of at least 60 mm.

NOTE An example of a suitable pictogram is shown in Figure 102.

Compliance is checked by inspection and by measurement.

7.102 Drives shall be supplied with a label suitable for permanent fixing that states the substance of the following:

WARNING: Risk of entrapment. Regularly check and, if necessary, adjust to ensure that the door reverses when it contacts a 40 mm high object placed on the floor.

Compliance is checked by inspection.

7.103 Drives shall be supplied with a label suitable for permanent fixing that describes how to use the manual release.

Compliance is checked by inspection.

8 Protection against access to live parts

This clause of Part 1 is applicable except as follows.

8.2 *Modification:*

Basic insulation and parts separated from **live parts** by **basic insulation** may be touched during adjustment, if a **tool** is needed to gain access to the adjustment means.

9 Starting of motor-operated appliances

This clause of Part 1 is not applicable.

10 Power input and current

This clause of Part 1 is applicable except as follows.

10.1 *Modification:*

Instead of determining the mean value, the maximum value of power input is determined, the effect of inrush currents being ignored.

10.2 *Modification*:

Instead of determining the mean value, the maximum value of the current is determined, inrush currents being ignored.

11 Heating

This clause of Part 1 is applicable except as follows.

11.7 *Replacement:*

Drives *supplied without a door are operated for 2 min.*

Drives *supplied with a door are operated for three cycles of opening and closing the door, without rest periods.*

12 Void

13 Leakage current and electric strength at operating temperature

This clause of Part 1 is applicable.

14 Transient overvoltages

This clause of Part 1 is applicable.

15 Moisture resistance

This clause of Part 1 is applicable.

16 Leakage current and electric strength

This clause of Part 1 is applicable.

17 Overload protection of transformers and associated circuits

This clause of Part 1 is applicable.

18 Endurance

This clause of Part 1 is not applicable.

19 Abnormal operation

This clause of Part 1 is applicable except as follows.

19.9 Not applicable.

19.10 Not applicable.

19.13 *Addition:*

After each test, the appliance shall comply with 20.102 to 20.107.

20 Stability and mechanical hazards

This clause of Part 1 is applicable except as follows.

20.2 *Addition*:

NOTE 101 Moving parts of **drives** intended to be installed at a height of at least 2,5 m above the ground are considered to be positioned so that adequate protection is provided.

20.101 **Drives** shall prevent doors from closing accidentally.

Compliance is checked by the following test.

*The **drive** is supplied at **rated voltage** but is not operated. It is loaded with 1,2 times the **rated load** applied for 30 min. If the **drive** is supplied with a door, the load is applied to the door and is equal to the highest force exerted by it.*

There shall be no movement except for removal of any play in the system.

NOTE The highest force is determined with the door in the most unfavourable position, the **drive** not being energized.

*The test is repeated with the **drive** supplied at 0,85 times **rated voltage** and with the supply disconnected.*

20.102 The operation of an **inherent entrapment protection system** shall prevent injury resulting from a closing door.

Compliance is checked by the following test.

*The **drive** is installed with a door in accordance with the installation instructions, the force exerted by the **drive** being adjusted to the highest value. **Non-inherent entrapment protection devices** are rendered inoperative. The **drive** is supplied at **rated voltage** and operated to close the door. An obstacle is placed at any height exceeding 40 mm above the floor, but not within the first 300 mm of downward travel from the fully open position.*

The door shall reverse its movement within 2 s after it has come into contact with the obstacle and shall open at least 300 mm.

*The test is repeated with the **drive** supplied at 0,85 times **rated voltage**.*

20.103 The **inherent entrapment protection system** shall ensure that the time to operate the door is not excessive.

Compliance is checked by the following test, which is carried out without a door.

*The **drive** is supplied at **rated voltage**, any limit switches being rendered inoperative. The closing movement is initiated. The **drive** shall reverse within 30 s. The opening movement is then initiated and the **drive** shall stop within 30 s.*

*The test is repeated with the **drive** supplied at 0,85 times **rated voltage**.*

20.104 The activation of a **non-inherent entrapment protection device** shall prevent injury resulting from a closing door.

Compliance is checked by the following test.

*The **drive** is installed in accordance with the installation instructions and supplied at **rated voltage**. The closing movement is initiated and the **non-inherent entrapment protection device** is activated. The **drive** shall reverse its movement. Activation of the **non-inherent entrapment protection device** shall prevent initiation of the closing movement.*

*The test is repeated with the **drive** supplied at 0,85 times **rated voltage**.*

NOTE 1 The test may be carried out without a door.

NOTE 2 **Non-inherent entrapment protection devices** connected to the supply mains separately from the **drive** are supplied as specified for the **drive**.

20.105 Non-inherent entrapment protection devices incorporating an active opto-electronic **protective device** shall detect stationary and moving obstacles, and cause a closing door to stop and reverse its movement.

Compliance is checked by the following tests.

*The **non-inherent entrapment protection device** is installed in accordance with the installation instructions. The **drive** is supplied at **rated voltage** and the closing movement of the door is initiated. White-painted stationary and moving obstacles are placed under the door in turn.*

The stationary obstacle measures approximately 100 mm in height, 300 mm in length and 80 mm in width. It is placed under the door with its major axis at right angles to the plane of the door opening, first centrally and then 100 mm from each end of the door opening.

*The moving obstacle measures approximately 50 mm in diameter and 850 mm in length. One end of the cylinder is suspended 900 mm above the floor and placed centrally above the beam of the **non-inherent entrapment protection device**. The cylinder is swung through the beam from an angle of 45°.*

*During each test, the **non-inherent entrapment protection device** shall operate so that the door reverses its movement.*

20.106 Non-inherent entrapment protection devices incorporating a pressure sensitive edge shall detect stationary obstacles and cause the closing door to stop and reverse its movement before an excessive force is exerted by the door.

Compliance is checked by the following test.

*The **non-inherent entrapment protection device** is installed in accordance with the installation instructions. The **drive** is supplied at **rated voltage** and the closing movement of the door is initiated. A stationary obstacle measuring 40 mm in height, 25 mm in width and at least 200 mm in length is placed under the door at right angles to the plane of the door opening. It is first placed centrally and then 100 mm from each end of the door opening.*

*The **non-inherent entrapment protection device** shall operate so that the door reverses its movement. The force exerted on the obstacle after actuation of the edge sensor shall not exceed 150 N.*

NOTE Impact forces are not measured.

The test is repeated with an obstacle measuring 250 mm x 250 mm and at least 200 mm in length, the force, however, not being measured.

20.107 A short circuit or open circuit in the wiring connected to a **non-inherent entrapment protection device** or other external control shall not affect the operation of the **inherent entrapment protection system** during the closing movement of the **drive**.

Compliance is checked by repeating the relevant tests of 20.102 and 20.103, and applying one fault condition at a time.

NOTE 1 The requirement is met if the door is not operable when the fault is applied.

NOTE 2 Electronic circuits are checked by the tests of 19.11 and 19.12.

NOTE 3 The test may be carried out without a door.

20.108 During the closing movement of the **drive**, the actuation of a manual control shall stop and reverse the movement. During the opening movement, it shall only stop the movement. However, for three-button controls

– the actuation of the "up" button shall stop and reverse the closing movement;

– the actuation of the "down" button shall have no effect on the opening movement;

– the actuation of the "stop" button shall only stop the movement in either direction.

Compliance is checked by manual test.

NOTE The test may be carried out without a door.

20.109 The appliance shall incorporate a manual release so that the door can be operated manually. Operation of the manual release shall not give rise to a hazard, such as kickback or unexpected operation of the **drive**.

Compliance is checked by operating the manual release with the door blocked by an obstacle placed at different heights during closing. The release shall be operable with a force not exceeding 220 N or a torque not exceeding 1,6 Nm.

*The test is carried out with the entrapment protection devices rendered inoperative and then without the **drive** being energized.*

20.110 Drives shall not restart automatically after the movement has stopped unintentionally.

NOTE Unintentional stopping may be caused by interruption of the power supply or by operation of a **thermal cut-out**.

Compliance is checked by the following tests.

*The **drive** is supplied at **rated voltage** and operated under **normal operation**. The supply is then interrupted. After the supply is restored, the **drive** shall not restart automatically.*

*The **drive** is operated again and operation of the **thermal cut-out** is simulated. After the fault condition has been removed, the **drive** shall not restart automatically.*

21 Mechanical strength

This clause of Part 1 is applicable.

22 Construction

This clause of Part 1 is applicable except as follows.

22.101 It shall not be possible to adjust the **drive** without the use of a **tool**.

Compliance is checked by inspection.

22.102 **Drives** shall be supplied with all associated components necessary for compliance with this standard.

Compliance is checked by inspection.

22.103 **Drives** that generate a force exceeding 150 N shall incorporate an **inherent entrapment protection system** and be provided with an **non-inherent entrapment protection device**. Other **drives** shall incorporate an **inherent entrapment protection system** or be provided with a **non-inherent entrapment protection device**.

Compliance is checked by inspection and by measurement.

Non-inherent entrapment devices *are rendered inoperative. The force is determined with the* ***drive*** *supplied at* ***rated voltage*** *and operated under* ***normal operation****, or during the tests of Clause 19. It is measured at the edge of the door in a vertical direction, the door being in the most unfavourable position.*

22.104 **Drives** shall not be provided with a control that renders the entrapment protection means inoperative. However, one of the entrapment protection means may be rendered inoperative by a **biased-off switch** that is intended to be fixed inside the garage.

Compliance is checked by inspection.

22.105 The actuating member of the manual release shall be coloured red.

Compliance is checked by inspection.

22.106 If the **drive** is supplied with a three-button control, all other manual controls shall be of the same type.

Compliance is checked by inspection.

NOTE 1 This requirement only applies to controls for the movement of the door.

NOTE 2 The control may be for remote operation or for wall mounting.

22.107 It shall only be possible to open and close the door by use of a manual control.

Compliance is checked by inspection.

23 Internal wiring

This clause of Part 1 is applicable.

24 Components

This clause of Part 1 is applicable except as follows.

24.1.3 *Addition*:

If a switch is used to disconnect the ***drive*** *when the manual release is operated, the switch is tested for 300 cycles of operation.*

25 Supply connection and external flexible cords

This clause of Part 1 is applicable except as follows.

25.7 *Addition*:

The **supply cord** of **drives** for outdoor use shall be polychloroprene sheathed and not be lighter than ordinary polychloroprene sheathed cord (code designation 60245 IEC 57).

26 Terminals for external conductors

This clause of Part 1 is applicable.

27 Provision for earthing

This clause of Part 1 is applicable.

28 Screws and connections

This clause of Part 1 is applicable.

29 Clearances, creepage distances and solid insulation

This clause of Part 1 is applicable.

30 Resistance to heat and fire

This clause of Part 1 is applicable except as follows.

30.2.2 Not applicable.

31 Resistance to rusting

This clause of Part 1 is applicable except as follows.

Addition:

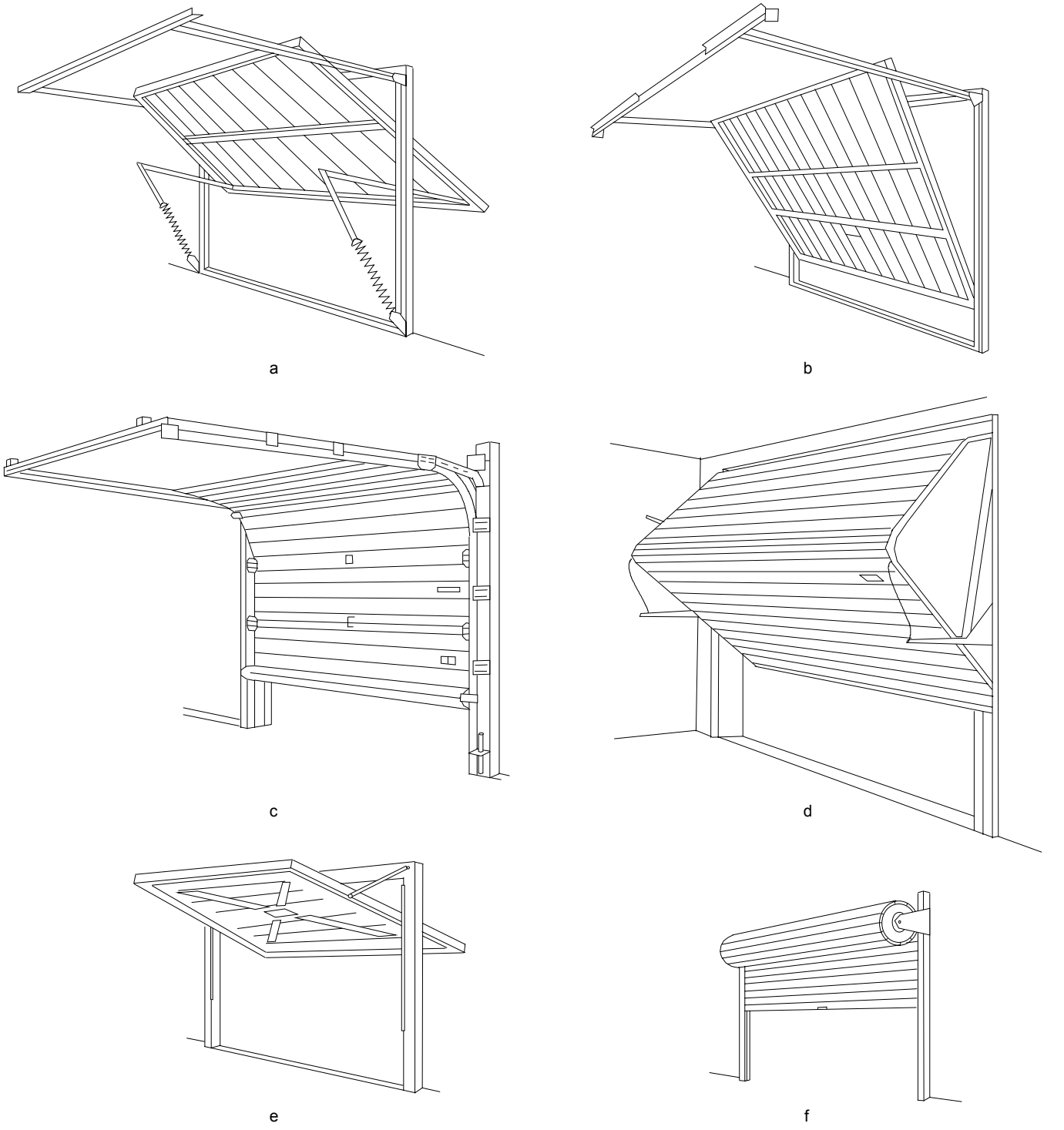
For parts intended to be installed outdoors, compliance is checked by the salt mist test of IEC 60068-2-52, severity 2 being applicable.

Before the test, coatings are scratched by means of a hardened steel pin, the end of which has the form of a cone with an angle of 40°. Its tip is rounded with a radius of 0,25 mm ± 0,02 mm. The pin is loaded so that the force exerted along its axis is 10 N ± 0,5 N. The scratches are made by drawing the pin along the surface of the coating at a speed of approximately 20 mm/s. Five scratches are made at least 5 mm apart and at least 5 mm from the edges.

After the test, the appliance shall not have deteriorated to such an extent that compliance with this standard, in particular with Clauses 8 and 27, is impaired. The coating shall not be broken and shall not have loosened from the metal surface.

32 Radiation, toxicity and similar hazards

This clause of Part 1 is applicable.



Types

a One-piece door with horizontal track

b One-piece door with vertical and horizontal track

c Sectional door with horizontal and vertical track

d Sectional door with horizontal folding

e Vertical tracked canopy door

f Rolling door

Figure 101 – Examples of types of garage doors

Figure 102 – Example of pictogram warning against child entrapment

Annexes

The annexes of Part 1 are applicable.

Bibliography

The bibliography of Part 1 is applicable except as follows.

Addition:

IEC 60335-2-97, *Household and similar electrical appliances – Safety – Part 2-97: Particular requirements for drives for rolling shutters, awnings, blinds and similar equipment*

IEC 60335-2-103, *Household and similar electrical appliances – Safety – Part 2-103: Particular requirements for drives for gates, doors and windows*

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(1) unacceptable,
(2) below average,
(3) average,
(4) above average,
(5) exceptional,
(6) not applicable

timeliness.....
quality of writing.....
technical contents.....
logic of arrangement of contents .....
tables, charts, graphs, figures.....
other .....

Q8 I read/use the: *(tick one)*

French text only ❑
English text only ❑
both English and French texts ❑

Q9 Please share any comment on any aspect of the IEC that you would like us to know:

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