INTERNATIONAL STANDARD

IEC 60335-2-103

First edition
2002-10

Household and similar electrical appliances – Safety –

Part 2-103: Particular requirements for drives for gates, doors and windows

Appareils électrodomestiques et analogues – Sécurité –

Partie 2-103: Règles particulières aux systèmes d'entraînement motorisé des portails, portes, barrières et éléments analogues

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CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-103: Particular requirements for drives for gates, doors and windows

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.
2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
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.
5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
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.

The text of this first edition is based on the following documents:

FDIS	Report on voting
61/2179/FDIS	61/2260/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, so as to convert that publication into the IEC standard: Safety requirements for electric drives for gates, doors and windows.

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 0 and class 01 are allowed for appliances for indoor use having a rated voltage up to 150 V (Japan).

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 2-103: Particular requirements for drives for gates, doors and windows

1 Scope

This clause of Part 1 is replaced by the following.

This International Standard deals with the safety of electric **drives** for horizontally and vertically moving gates, doors and **windows** for household and similar purposes, their **rated voltage** 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 the **driven part**.

Appliances not intended for normal household use but which nevertheless may be a source of danger to the public, such as appliances intended to be used by laymen in shops, offices, hotels, restaurants, hospitals, in industry and on farms, are within the scope of this standard.

Requirements for **drives** for doors that may be used in emergency are given in Annex AA.

NOTE 101 Examples of **drives** within the scope of this standard are **drives** for

– folding doors;
– revolving doors;
– rolling doors;
– roof **windows**;
– sectional overhead doors;
– swinging and sliding gates or doors.

Examples are shown in Figure 101.

NOTE 102 **Drives** may be supplied with a **driven part**.

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

– the use of appliances by young children or infirm persons without supervision;
– playing with the appliance by young children.

NOTE 103 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 104 This standard does not apply to **drives**

– for vertically moving garage doors for residential use (60335-2-95);
– for rolling shutters, awnings, blinds and similar equipment (60335-2-97);
– intended exclusively to be used by trained persons in commercial and industrial premises;
– for specific purposes, such as fire barriers;
– 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, *Environment testing – Part 2: Tests – Test Kb: Salt mist, cyclic (sodium chloride solution).*

60825-1:1998, *Safety of laser products – Part 1: Equipment classification, requirements and user's guide.*

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 **driven part** are operated with their **rated load.**

Drives supplied with a **driven part** are operated with the **driven part** installed in accordance with the instructions.

3.101
drive
motor and other components that control the movement of the **driven part**

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

3.102
driven part
movable part of a gate, door or window that is operated by the **drive**

3.103
window
part in a building that opens and closes in order to regulate the air and which is not intended for passage

3.104
rated load
force or torque assigned to the **drive** by the manufacturer

3.105
rated operating time
duration of continuous operation assigned to the **drive** by the manufacturer

NOTE During continuous operation, the **drive** may reverse its direction.

3.106
rated number of operating cycles
number of uninterrupted cycles assigned to the **drive** by the manufacturer

3.107
entrapment protection system
part of the **drive** that provides protection against entrapment

NOTE 1 An **entrapment protection system** may consist of one or more devices, such as pressure sensitive edges, passive infrared and active light sensing devices.

NOTE 2 An **entrapment protection system** may be incorporated in the motor assembly or installed separately.

3.108
biased-off switch
switch that automatically returns to the **off position** when its actuating member is released

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 **driven part**, the **driven part** 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.*

*The **driven part** may be simulated by an artificial load.*

5.5 *Addition:*

A wicket door is kept closed during the tests.

5.7 *Addition*:

*If the **drive** is marked with an ambient temperature beyond the range of +5 °C to +40 °C, the tests of Clauses 11, 13, 20.105 to 20.110 and 21 are carried out at the most unfavourable marked temperature.*

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, or parts of **drives**, that are intended for exposure to outdoor conditions shall be at least IPX4.

7 Marking and instructions

This clause of Part 1 is applicable except as follows.

7.1 *Modification:*

Drives shall be marked with the **rated power input**.

Addition:

Drives shall be marked with their ambient temperature range.

Drives supplied without a **driven part** shall be marked with

– the **rated load**, in newtons or in newton-metres;
– the **rated operating time**, in minutes, unless the **drive** is intended for continuous operation.

Drives supplied with a **driven part** shall be marked with the **rated number of operating cycles,** unless the **drive** is intended for continuous operation.

7.6 *Addition*:

[symbol 0533 of ISO 7000] maximum temperature.

[symbol 0534 of ISO 7000] minimum temperature.

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 these instructions. Save these instructions.

The instructions shall include the substance of the following:

– do not allow children to play with fixed controls. Keep remote controls away from children;
– explanation of mode indicators;
– details on how to use any manual release, and if applicable, state that activation of the manual release may cause uncontrolled movement of the driven part due to mechanical failures or an out-of-balance condition;
– when operating a biased-off switch, make sure that other persons are kept away;
– when closing a window that has been opened by a fire-sensing system, make sure that other persons are kept away;
– details on how to re-adjust controls;
– frequently examine the installation for imbalance and signs of wear or damage to cables, springs and mounting. Do not use if repair or adjustment is necessary;
– disconnect the supply when cleaning or other maintenance is being carried out, if the appliance is automatically controlled.

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 specify the type, size and mass of the driven part, and locations where the drive can be installed. They shall state that the installer is to check that the temperature range marked on the drive is suitable for the location.

The installation instructions shall include the substance of the following:

– the necessary information for safe handling of a drive weighing more than 20 kg. This information shall describe how to use the handling means, such as hooks and ropes;
– before installing the drive, check that the driven part is in good mechanical condition, correctly balanced and opens and closes properly;
– information if the drive is intended to be installed at a height of at least 2,5 m above floor level or other access level;
– that the drive cannot be used with a driven part incorporating a wicket door (unless the drive cannot be operated with the wicket door open);
– ensure that entrapment between the driven part and the surrounding fixed parts due to the opening movement of the driven part is avoided;
– details for the installation of the drive and its associated components, including any non-inherent protection devices or deformable edges;
– that the actuating member of a biased-off switch is to be located within direct sight of the driven part but away from moving parts. Unless it is key operated, it is to be installed at a minimum height of 1,5 m and not accessible to the public;
– that windows, having a gap exceeding 200 mm when open, are to be closed using a biased-off switch if the opening movement is controlled by a fire-sensing system;
– details on how to set controls;
– after installation, ensure that the mechanism is properly adjusted and that the protection system and any manual release function correctly;
– permanently fix the label concerning the manual release adjacent to its actuating member.

7.101 **Drives** having a manual release shall be supplied with a label describing how to use it.

Compliance is checked by inspection.

8 Protection against access to live parts

This clause of Part 1 is applicable.

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.

11 Heating

This clause of Part 1 is applicable except as follows.

11.7 *Replacement:*

***Drives** for continuous operation are operated for consecutive cycles until steady conditions are established.*

*Other **drives** are operated as follows:*

- ***drives** supplied without a **driven part** are operated without rest periods for the **rated operating time** but for not less than five cycles of operation or four minutes, whichever is longer;*
- ***drives** supplied with a **driven part** are operated without rest periods for the **rated number of operating cycles** but for not less than five cycles of operation.*

12 Void

13 Leakage current and electric strength at operating temperatures

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 except as follows.

15.1.2 *Addition:*

*IPX4 tubular **drives** are installed in a tube that is open at both ends and has the largest diameter specified in the instructions. The tube has a length twice that of the motor and is mounted on a support as in normal use. The support is rotated at a speed of 1 rev/min.*

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.

19.1 *Addition:*

Compliance is also checked by the test of 19.101.

19.10 *Addition:*

*For a **drive** having a manual release, the test is made with the **driven part** disconnected.*

19.11.2 *Addition:*

*If the **drive** can be operated when any of the fault conditions are simulated, the tests of 20.104, 20.107 and 20.108 are carried out, the **drive**, however, being supplied at **rated voltage**.*

19.13 *Addition:*

During the test of 19.101, the winding temperature shall not exceed the values specified in 19.9.

19.101 ***Drives**, other than those for continuous operation, are supplied at **rated voltage** and operated continuously under **normal operation.***

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 or other access level are considered to be positioned so that adequate protection is provided.

NOTE 102 Stairs and terraces are examples of access levels. Surfaces not normally used for standing on, such as window-sills, and movable equipment such as ladders, are not considered to be access levels.

20.101 **Drives** shall prevent vertically moving **driven parts** from closing unexpectedly.

Compliance is checked by the following test.

*The **drive** is supplied at the most unfavourable voltage between 0,94 and 1,06 times **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 **driven part**, the load is applied to the **driven part** and is equal to the highest force exerted by it.*

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

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

The test is repeated with the supply disconnected.

20.102 A manual release shall be easy to operate. Operation of the release shall not give rise to a hazard such as kickback or unexpected operation of the **drive**.

The **drive** shall not create any hazard when the manual release is activated.

Compliance is checked by the following test.

*The **drive** is installed with a **driven part** and supplied at the most unfavourable voltage between 0,94 and 1,06 times **rated voltage**. The **drive** is adjusted for the highest opening and closing forces, if the adjustment is mentioned in the instructions. The manual release is operated when the **driven part** has stopped at each terminal position in turn. The release shall be operable with a force not exceeding 220 N or a torque not exceeding 1,6 Nm.*

*When the manual release has been activated, the power supply is interrupted. The power supply is then restored and the **drive** activated. It shall not move or create any hazard.*

20.103 A mechanical fault in the **drive** shall not result in a hazardous operation.

Compliance is checked by inspection and if necessary by test.

*The inspection shall evaluate which parts can affect the safety of operation and whether they are likely to break or become loose. These parts may be part of the **drive** or used for connecting the **drive** to the **driven part**.*

NOTE Examples of parts that are evaluated are screws, pins, shafts, wheels, chains and supporting parts.

*If inspection cannot determine whether the **drive** will continue to operate normally or stop its movement when the part has failed, the following test is carried out.*

*The **drive** is installed with a **driven part**, the force exerted by the **drive** being adjusted to its highest value in accordance with the instructions. The **drive** is supplied at the most unfavourable voltage between 0,94 and 1,06 times **rated voltage**.*

*The faults are introduced one at a time and the **drive** is operated as in normal use.*

*Unless the **drive** and the **driven part** continue to operate normally,*

- *the **drive** shall stop operating at least by the end of the cycle of movement;*
- *further operation shall not be possible;*
- *the speed of the **driven part** shall not increase by more than 20 %.*

20.104 **Drives** controlled by a **biased-off switch** shall stop when the actuating member of the switch is released.

Compliance is checked by the following test.

*The **drive** is installed with a **driven part** and supplied at the most unfavourable voltage between 0,94 and 1,06 times **rated voltage**. It is operated to close the **driven part**.*

*When the actuating member of the switch is released, the leading edge of the **driven part** shall stop within a distance of 20 mm for **windows**, and for other **driven parts** within a distance of*

- *50 mm when the opening gap does not exceed 500 mm;*
- *100 mm when the opening gap exceeds 500 mm.*

*The test is repeated during the opening movement of the **driven part**.*

*The requirement for the **driven part** to stop within the specified distance only applies if the closing force exerted by the driven part exceeds 150 N, as measured in 20.108.1.*

20.105 During the movement of the **drive** in either direction, the actuation of a manual control shall stop the movement.

If the control has a single button, further actuation shall reverse the direction of movement.

If the control has two buttons, one button shall stop the movement, this button shall not require key actuation. Actuation of the other button shall restart the movement in the opposite direction.

If the control has three buttons, one button shall stop the movement, this button shall not require key actuation. Another button shall initiate the opening movement and the third button shall initiate the closing movement.

Compliance is checked by manual test.

NOTE 1 The requirement is applicable to other forms of actuating members.

NOTE 2 The test may be carried out without a **driven part**.

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

NOTE 1 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. However, automatic **drives** may re-start, provided that they function as in normal use.*

*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. However, automatic **drives** may re-start, provided that they function as in normal use.*

NOTE 2 The test may be carried out without a **driven part**.

NOTE 3 Automatic **drives** are those that operate in at least one direction without deliberate activation.

20.107 Drives incorporating an **entrapment protection system** with sensing devices that prevent the **driven part** from coming into contact with an obstacle shall not cause injury when the **driven part** moves.

Compliance is checked by the following test.

*The **drive** is installed with a **driven part**, the force exerted by the **drive** being adjusted to its highest value in accordance with the instructions. The **drive** is supplied at the most unfavourable voltage between 0,94 and 1,06 times **rated voltage**.*

*An obstacle having dimensions of approximately 200 mm x 300 mm and a height of 700 mm is placed on the ground at any place in the path of the leading edge of the **driven part** and in the most unfavourable orientation.*

NOTE The obstacle is normally made of unplaned wood and painted white but other materials and colours may be used to simulate the most unfavourable conditions.

*The **drive** is operated to close the **driven part**. If the **driven part** moves, it shall stop or reverse its movement without contacting the obstacle.*

The test is repeated with the obstacle being moved at a speed of 3 m/s ± 0,6 m/s.

The tests are repeated with the obstacle placed on its side so that its height is 200 mm.

*The height of the obstacle is then raised in increments up to the height of the **driven part**, but not higher than 2,5 m. At each increment, the test is repeated.*

*The obstacle, in its vertical position, is placed at any location next to the **driven part** in its closed position. The **drive** is operated to open the **driven part**. If the **driven part** moves, it shall stop or reverse its movement without contacting the obstacle.*

*If the **entrapment protection system** incorporates a pressure-sensitive floor pad, a mass of 15 kg ± 0,5 kg having a diameter of approximately 60 mm is used instead of the wooden obstacle.*

20.108 **Drives** shall not cause injury if the **driven part** can contact an obstacle during normal use.

*Compliance is checked by the test of 20.108.1 and, if the **drive** is intended to be used with vertically moving **driven parts** having openings exceeding 50 mm, by the test of 20.108.2 for an opening movement.*

*The **drive** is installed with a **driven part**, the force exerted by the **drive** being adjusted to its highest value if the force can be adjusted during use, **user maintenance** or installation. The **drive** is supplied at the most unfavourable voltage between 0,94 and 1,06 times **rated voltage**.*

20.108.1 *The **drive** is operated to close and open the **driven part** from the fully open and fully closed positions. The forces shall not exceed*

– *150 N during the first 5 s after the force has exceeded 25 N;*
– *25 N thereafter;*

or

– *400 N during the first 0,75 s after the force has exceeded 150 N;*
– *150 N during a further period of 4,25 s;*
– *25 N thereafter.*

NOTE The forces may be limited by operation of an **entrapment protection system** with sensing devices that rely on the **driven part** contacting an obstacle.

The force is measured by means of an instrument that incorporates a rigid plate having a diameter of 80 mm and a spring having a ratio of 500 N/mm ± 50 N/mm. The spring acts on a sensing element that is connected to an amplifier having a rise and fall time not exceeding 5 ms.

*For vertically moving **driven parts**, the values apply to the vertical component of the closing and opening forces.*

*The force is measured on the leading edge of the **driven part** when the dimension of the gap is*

– *50 mm;*
– *300 mm;*

– *500 mm;*

– *2 500 mm or 300 mm below the maximum if this is less (for vertically moving **driven parts**).*

*For vertically moving **driven parts**, the force is measured at the following locations:*

– *in the centre of the leading edge;*

– *200 mm from each end of the leading edge if this edge is longer than 800 mm.*

*For horizontally moving **driven parts**, the force is measured at the following heights:*

– *50 mm;*

– *300 mm from the top, for **driven parts** between 1,2 m and 5 m in height;*

– *2 500 mm, for **driven parts** more than 2,8 m in height;*

– *in the centre, for **driven parts** not more than 2,8 m in height.*

20.108.2 ***Drives**, intended to be used with a vertically moving **driven part** having openings in which a 50 mm diameter cylinder can be inserted, are subjected to an opening test, the **driven part** being loaded with a mass of 15 kg ± 0,5 kg. The mass, having dimensions of approximately 200 mm x 200 mm x 200 mm, is fixed to the **driven part** in the most unfavourable place, with one edge adjacent to the bottom edge of the **driven part**.*

*The **drive** is operated to open the **driven part**. If the bottom edge of the **driven part** moves more than 500 mm, the force exerted on the mass shall not exceed 150 N.*

20.109 Entrapment protection systems shall provide an adequate level of protection in the event of a failure within the system.

*Compliance is checked by the following test, unless the **entrapment protection system** is a **biased-off switch**.*

*The **drive** is installed with a **driven part** and supplied at **rated voltage**. The **drive** is operated to close the **driven part**. During the movement, a short circuit or open circuit is simulated in the system or installation wiring.*

*Unless the system continues to operate normally, the **driven part** shall stop moving or the movement of the **driven part** shall only be controlled by a supplementary **biased-off switch** by the time it has completed its movement.*

*The test is repeated during the opening movement of the **driven part**.*

If the system continues to operate normally, the test is repeated with an additional fault simulated.

NOTE It may be necessary to simulate several faults before the test is completed.

20.110 Drives for **windows** shall operate so that the movement of the **window** is not likely to cause an injury.

Compliance is checked as follows:

– ***drives** controlled by a **biased-off switch**, by the test of 20.104;*

– ***drives** incorporating an **entrapment protection system**, by the tests of 20.107 to 20.109.*

*Other **drives** are subjected to the following test.*

*The **drive** is installed with a **window** and supplied at the most unfavourable voltage between 0,94 and 1,06 times **rated voltage**. The **drive** is adjusted for the highest opening and closing forces, if the adjustment is mentioned in the instructions.*

*The **drive** is operated to open the **window**. The speed of the leading edge is measured while it travels between 15 mm and 50 mm from the closed position. The speed shall not exceed 50 mm/s.*

*When fully open, the gap shall not exceed 200 mm, unless the opening movement is controlled by a fire-sensing system. The **drive** is then operated to close the **window**, and the measurement repeated. The speed shall not exceed 15 mm/s.*

21 Mechanical strength

This clause of Part 1 is applicable.

22 Construction

This clause of Part 1 is applicable except as follows.

22.101 **Drives** weighing more than 20 kg shall incorporate suitable means for handling, such as hooks.

Compliance is checked by inspection.

22.102 All controls supplied with the **drive** shall be marked to indicate the functions in the same way.

Compliance is checked by inspection.

22.103 Any indication showing the selected mode of operation shall not be misleading.

Compliance is checked by inspection.

22.104 It shall only be possible to make adjustments that could affect compliance with this standard by means of a **tool** or by use of a code.

Compliance is checked by inspection.

22.105 A **drive** for a door or gate incorporating a wicket door shall be constructed so that the **drive** cannot be operated when the wicket door is open.

Compliance is checked by inspection.

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

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.

25.5 *Modification:*

Type Z attachment is allowed for **drives** having a **rated power input** not exceeding 100 W and for separate power supplies for indoor use.

25.7 *Addition:*

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

25.23 *Addition:*

Type Z attachment is allowed for separate controls.

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 *Addition:*

30.2.2 is applicable for ***drives*** *operated by a* ***biased-off switch.***

30.2.3 is applicable for other ***drives****.*

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 surfaces 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 **drive** 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 except as follows.

32.101 Appliances incorporating a laser shall be constructed so that they provide adequate protection from laser radiation.

Compliance is checked by the following test.

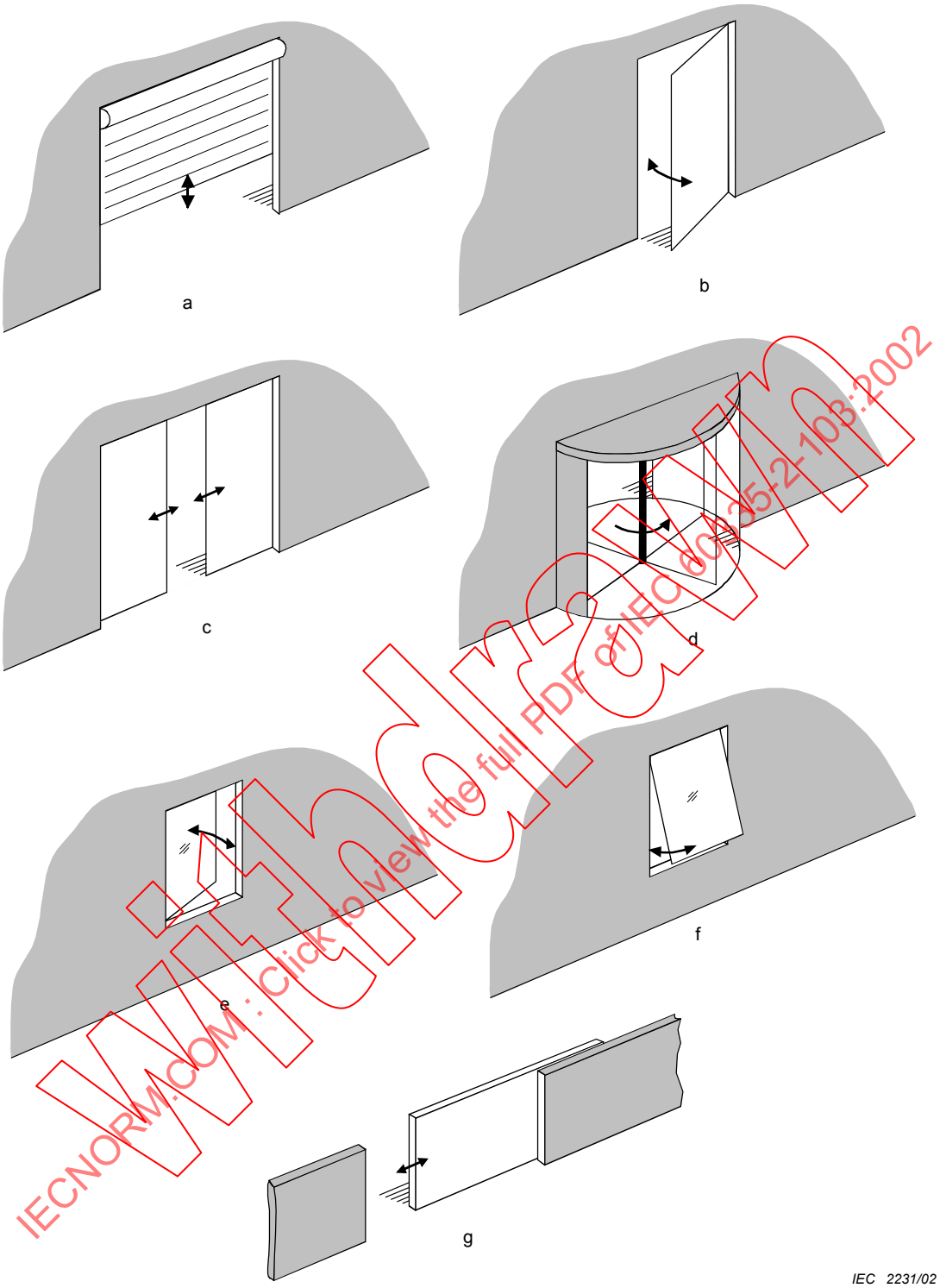
***Detachable parts** are removed. Any **accessible controls** are adjusted to give the highest laser radiation even if a **tool** is required to make the adjustment. If the control is inaccessible, it is also adjusted to give the highest laser radiation unless its actuating member is adequately locked in position.*

NOTE Solder or sealing compound is considered to provide adequate locking.

*The **drive** is supplied at **rated voltage** and operated under **normal operation**. The laser radiation is measured in accordance with 9.2 of IEC 60825-1 and the accessible emission level shall not exceed the limits for Class I, as specified in Table 1 of that standard. The time basis for the classification is 100 s.*

The test is repeated but under the conditions specified in Clause 19 and the laser radiation measured again. The accessible emission level shall not exceed five times the limits specified for Class I for wavelengths of 400 nm to 700 nm. For other wavelengths, it shall not exceed the limits for Class 3R as specified in Table 3 of IEC 60825-1.

If compliance with IEC 60825-1 relies on the operation of an interlock, this interlock shall be of the fail-safe type or be tested for 30 000 cycles of operation under the conditions of 24.1.4.



Key

A Rolling door
B Horizontally swinging door
C Horizontally sliding door
D Revolving door
E Vertically hinged window
F Horizontally hinged window
G Horizontally sliding gate

Figure 101 – Examples of driven parts

Annexes

The annexes of Part 1 are applicable except as follows.

Annex AA
(normative)

Drives for doors used in emergency

The following modifications to this standard are applicable for **drives** for doors used in emergency routes and emergency exits.

NOTE 1 In many countries additional requirements are specified by the national authorities responsible for building regulations and fire protection.

NOTE 2 Additional subclauses in this annex are numbered starting with 201.

7 Marking and instructions

7.7 Terminals for connection to a fire alarm system shall be identified.

7.12 The instructions shall include the substance of the following:

– ensure that controls that can be set for a locked position are only activated when there are no other persons in the room.

7.12.1 The instructions shall include the substance of the following:

– drives are to be connected so that doors open in the escape direction unless the system allows break out in this direction;
– drives that operate automatically opening doors shall be electrically connected to a fire alarm system.

An explanation of the marking of the terminals and how to connect the drive to the fire alarm system shall be given.

19 Abnormal operation

19.11.2 *For **drives** for automatic-opening doors, compliance with 22.205 is checked when the fault conditions are applied.*

22 Construction

22.201 **Drives** shall be constructed so that they cannot be put into a locked mode that prevents the door from being opened from the inside.

Compliance is checked by inspection.

22.202 **Drives** shall be constructed so that they operate break-out doors or automatic-opening doors.

Compliance is checked by inspection.

22.203 **Drives** for break-out doors shall be constructed so that they release the door in the event of an emergency.

Compliance is checked by the following test.

*The **drive** is installed with a door and supplied at **rated voltage**. A force of 220 N is applied at a height of 1 m ± 10 mm to the leading edge of the door in the break-out direction. The door shall become released from the **drive**.*

22.204 **Drives** for automatic-opening doors shall be constructed so that the door opens automatically if the power supply fails.

Compliance is checked by the test of 22.204.1, and if a battery is required, also with 22.204.2 and 22.204.3.

22.204.1 *The **drive** is installed with a door and supplied at **rated voltage**, any battery being fully charged. The supply is disconnected and the door shall start to open immediately at a speed of at least 200 mm/s. It shall then remain open.*

22.204.2 *The **drive** is installed with a door and supplied at **rated voltage**, the battery being fully charged. The battery is discharged at a rate of approximately 10 % of its rated capacity per hour. The door shall start to open within 30 min, the opening speed being at least 200 mm/s. It shall then remain open.*

22.204.3 *The **drive** is installed with a door and supplied at **rated voltage**. The battery is disconnected. The door shall start to open within 30 min, the opening speed being at least 200 mm/s. It shall then remain open.*

22.205 **Drives** for automatically opening doors shall be constructed so that the door opens automatically in response to a signal from a fire alarm system.

Compliance is checked by the following test.

*The **drive** is installed with a door and supplied at **rated voltage**. An appropriate signal from a fire alarm is introduced. The door shall open immediately with a speed of at least 500 mm/s, and shall remain open.*

22.206 **Drives** for automatic-opening doors shall have terminals for connection to a fire alarm system. The terminals shall be suitable for connection to a 24 V d.c./1 A circuit and have no potential to earth.

Compliance is checked by inspection and measurement.