

**BS EN 60335-2-103:2015**

*Incorporating corrigendum May 2015*



**BSI Standards Publication**

# Household and similar electrical appliances — Safety

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

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National foreword

This British Standard is the UK implementation of EN 60335-2-103:2015. It is derived from IEC 60335-2-103:2006+A1:2010. It supersedes BS EN 60335-2-103:2003 which will be withdrawn on 29 September 2017.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to IEC text carry the number of the IEC amendment. For example, text altered by IEC amendment 1 is indicated by A1 A1.

The CENELEC common modifications have been implemented at the appropriate places in the text. The start and finish of each common modification is indicated in the text by tags C C.

The UK participation in its preparation was entrusted by Technical Committee CPL/61, Safety of household and similar electrical appliances, to Subcommittee CPL/61/1, Motorised appliance group.

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

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| 31 May 2015 | CENELEC common modifications implemented |

English Version

**Household and similar electrical appliances - Safety - Part 2-103:  
Particular requirements for drives for gates, doors and windows  
(IEC 60335-2-103:2006 , modified + A1:2010 , modified)**

Appareils électrodomestiques et analogues - Sécurité -  
Partie 2-103: Règles particulières pour les motorisations de  
portails, portes et fenêtres  
(CEI 60335-2-103:2006 , modifiée + A1:2010 , modifiée)

Sicherheit elektrischer Geräte für den Hausgebrauch und  
ähnliche Zwecke - Teil 2-103: Besondere Anforderungen für  
Antriebe für Tore, Türen und Fenster  
(IEC 60335-2-103:2006 , modifiziert + A1:2010 , modifiziert)

This European Standard was approved by CENELEC on 2014-09-29. CENELEC 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.

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Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

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## Foreword

This document (EN 60335-2-103:2015) consists of the text of IEC 60335-2-103:2006 + A1:2010 prepared by IEC/TC 61 "Safety of household and similar electrical appliances", together with the common modifications prepared by CLC/TC 61 "Safety of household and similar electrical appliances".

The following dates are fixed:

- latest date by which this document has to be implemented (dop) 2015-09-29  
at national level by publication of an identical national standard or by endorsement
- latest date by which the national standards conflicting with this document have to be withdrawn (dow) 2017-09-29

This document supersedes EN 60335-2-103:2003 + A11:2009.

The principal changes as compared with EN 60335-2-103:2003 + A11:2009 are as follows. Minor changes are not listed.

- Adds definitions for automatic drive, horizontally moving pedestrian door and reversible drive (3.109, 3.110, 3.111).
- Clarifies the marking requirements for reversible drives and horizontal moving pedestrian doors (7.12 and 7.12.1).
- Clarifies requirements for the use of a biased-off switch (19.11.2, 20.109, 22.107).
- Clarifies the mechanical hazard requirements for drives (20.105, 20.107 to 20.107.2.3).
- Adds requirements for the use of pressure sensitive pads (20.107.1.4, Figure 102).
- Modifies the requirements for batteries supplied with automatic opening doors (22.204.2 in Annex AA).

This Part 2 is to be used in conjunction with EN 60335-1:2012.

NOTE 1 When "Part 1" is mentioned in this standard, it refers to EN 60335-1.

This Part 2 supplements or modifies the corresponding clauses in EN 60335-1, so as to convert that publication into the European Standard: *Safety requirements for 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" it is to be understood as addition or modification or replacement to the published IEC Part 2, unless the introductory sentence mentions Part 1.

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.;
- subclauses, notes and annexes that are additional to those in the IEC standard are prefixed with the letter Z.

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.

Clauses, subclauses, notes, tables, figures and annexes which are additional to those in IEC 60335-2-103:2006 + A1:2010 are prefixed "Z".

CENELEC draws attention to the fact that it is claimed that compliance with this document may involve the use of a patent concerning entrapment protection systems defined in 3.107 and the particular function to override an entrapment protection system under fault conditions as described in 19.11.2 and 22.107.

CENELEC takes no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured CENELEC that he is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with IEC. Information may be obtained from:

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

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

### **Endorsement notice**

The text of the International Standard IEC 60335-2-103:2006 + A1:2010 was approved by CENELEC as a European Standard with agreed common modifications.

## Annex ZAA (normative)

### Stability and mechanical hazards for drives for windows

#### 20 Stability and mechanical hazards

Clause 20 of Part 1 is applicable except as follows.

**20.1** Not applicable

**20.2** *Addition:*

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 to provide adequate protection against personal injury in normal use.

NOTE Z101 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.

*Add the following new subclauses.*

**20.ZAA.1** **Drives** shall prevent vertically moving **windows** 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. Automatic operation of **automatic drives** is disabled. It is loaded with 1,2 times the **rated load** applied for 30 min. If the **drive** is supplied with a **window**, the load is applied to the **window** 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.*

*If there is **creepage** in the **drive**, the **window** shall not move faster than 1mm/s.*

NOTE ZAA.1 The highest force is determined with the **window** in the most unfavourable position, the **drive** not being energized.

NOTE ZAA.2 It is to be noted that compliance with this clause does not necessarily cover risks due to operation of the **window**, anti-drop or equivalent safety devices might be necessary.

*The test is repeated with the power supply disconnected.*

**20.ZAA.2** **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.ZAA.5;
- **drives** incorporating an **entrapment protection system**, by the relevant tests of 20.ZAA.8 and 20.ZAA.9.

*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 shall not exceed 50 mm/s.*

*When fully open, the gap shall not exceed 200 mm, unless the opening movement is controlled by a smoke control system. The **drive** is then operated to close the **window**. The speed of the leading edge shall not exceed 15 mm/s.*

**20.ZAA.3** A manual release or **reversible drive** 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.

Operation of a **reversible drive** used as a means for a manual release shall not give rise to a hazard.

*Compliance is checked by the following test.*

*Automatic operation of **automatic drives** is disabled.*

*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 such adjustment is mentioned in the instructions. The manual release is operated when the **window** has stopped at each terminal position, in turn. The release or **reversible drive** shall be operable with a force not exceeding 220 N or a torque not exceeding 1,6 Nm. The force is applied as stated in the instructions.*

*The test is repeated with the power supply interrupted.*

*When the manual release has been activated, the power supply is then restored and the **drive** activated. The **drive** shall not move, or if the **drive** moves, all requirements of this standard shall be met.*

**20.ZAA.4** 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 **window**.*

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 **window**, 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 **window** continue to operate normally, all of the following conditions shall be fulfilled:*

- *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 **window** shall not increase by more than 20 %.*

**20.ZAA.5** Drives controlled by a **biased-off switch** shall stop when the actuating member of the actuator is released.

*Compliance is checked by 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**. It is operated to close the **window**.*

*When the actuating member of the switch is released, the leading edge of the **window** shall stop within a distance of 20 mm.*

*The test is repeated during the opening movement of the **window**.*

*The requirement for the **window** to stop within the specified distance only applies if the closing force exerted by the **window** exceeds 150 N, as measured in 20.ZAA.8.2.*

**20.ZAA.6** During the movement of the **drive** in either direction, the actuation of a manual control shall stop the movement if there is no separate button for the stop function.

If the **drive** has a single button for controlling the movement, further actuation shall reverse the direction of movement.

If the **drive** has three buttons for controlling the movement, one button shall be a stop button.

These requirements do not apply to controls affecting automatic modes of operation.

Any button that has a stop function shall not require a key to stop the **drive**.

*Compliance is checked by a manual test.*

NOTE The test may be carried out without a **window**.

**20.ZAA.7 Drives** shall not restart automatically after the movement has stopped unintentionally.

NOTE ZAA.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 ZAA.2 The test may be carried out without a **window**.

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

**20.ZAA.8** For **drives** incorporating an **entrapment protection system** with sensing devices that prevent the **window** from coming into contact with a person, compliance is checked by the relevant tests specified in 20.ZAA.8.1.

NOTE ZAA.1 Obstacles used in the following tests are normally made of unplanned wood and painted white, but other materials and colours may be used to simulate the most unfavourable conditions.

*For **drives** incorporating an **entrapment protection system** that allows the **window** to contact a person, compliance is checked by the relevant tests specified in 20.ZAA.8.2.*

NOTE ZAA.2 In one direction of travel of the **window**, 20.ZAA.8.1 can be met and 20.ZAA.8.2 can be met in the opposite direction of travel.

**20.ZAA.8.1** The **drive** is installed with a **window**, 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**.

*For horizontally moving **windows** the test of 20.ZAA.8.1.1 is carried out.*

*For vertically moving **windows** the test of 20.ZAA.8.1.2 is carried out*

**20.ZAA.8.1.1** An obstacle having dimensions of approximately 25 mm × 100 mm × 300 mm, with three sides (one in each dimension) being reflective (e.g. mirror, fine grained stainless steel, white gloss paint) and the other three of dull black, painted rough wood, is placed at any place in the path of the leading edges and planes of the **window** and in the most unfavourable dimension.

NOTE The leading edge is the edge of the **window** opposite to the hinge.

*The **drive** is operated to close the **window** from the fully open position and from a 300 mm gap. If the **window** moves, it shall stop or reverse its movement without contacting the obstacle.*

**20.ZAA.8.1.2** An obstacle having dimensions of approximately 25 mm × 100 mm × 300 mm is placed at any place in the path of the leading edge along its 300 mm length across the **window** opening.

*The **drive** is operated to close the **window** from heights of 100 mm, 1 000 mm and the fully open position of the **window**. The **window** shall not move or shall only move in the opening direction.*

**20.ZAA.8.2** The **drive** is installed with a **window**. The force exerted by the **drive** is adjusted to the highest value if the force can be adjusted by the user during use or **user maintenance**. Otherwise, the force should be adjusted according to the installation instructions. The **drive** is supplied at the most unfavourable voltage between 0,94 and 1,06 times **rated voltage**.

*The **drive** is operated to close the **window** from the fully open position. The forces between the leading edge and counter opposing edges 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.

However, after 0,75 s, peaks lower than 400 N will be accepted, if

- they are decreasing from one to the other and
- the period of oscillation is  $\leq 1$  s and
- the average force calculated over the remaining period of 4,25 s is  $\leq 150$  N.

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  $\pm$  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 **windows**, the force is measured on the leading edge of the **windows** when the dimension of the gap is 50 mm, 300 mm and 500 mm.

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

- in the centre of the leading edge and;
- 200 mm from each end of the leading edge if this edge is longer than 800 mm.

For horizontally moving **windows**, the force is measured on the leading edge of the **window**, at the following heights, when the dimension of the gap is 50 mm and 500 mm:

- 50 mm;
- 300 mm from the top, for **windows** between 1,2 m and 2,5 m in height;
- 2 500 mm, for **windows** more than 2,8 m in height;
- in the centre, for **windows** not more than 2,8 m in height.

**20.ZAA.9 Entrapment protection systems** shall provide an adequate level of protection in the event of a failure within the system installation wiring.

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

Unless the system continues to operate normally, the **window** shall stop moving within one cycle of operation or the movement of the **window** shall only be controlled by a **biased-off switch** by the time it has completed its movement.

## Annex ZBB (normative)

### Stability and mechanical hazards for drives for power operated pedestrian doors

#### 20 Stability and mechanical hazards

Clause 20 of Part 1 is applicable except as follows.

**20.1** Not applicable

**20.2** *Addition:*

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 to provide adequate protection against personal injury in normal use.

NOTE ZBB.1 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.

For horizontally moving **pedestrian doors**, moving parts including interconnecting parts of their drives shall not be guarded if the gap between fixed and moving parts is below 8 mm, or above 25 mm, or it is at least 2 m above the ground or other access level. This also applies to the gap between parts that may move at different speeds.

*Add the following new subclauses:*

NOTE The numbering of the following subclauses is 20.ZBB.X in order to maintain the same structure for the three annexes (i.e ZAA, ZBB and ZCC).

**20.ZBB.1** Void

**20.ZBB.2** Void

**20.ZBB.3** A manual release or **reversible drive** 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.

Operation of a **reversible drive** used as a means for a manual release shall not give rise to a hazard.

*Compliance is checked by the following test.*

*Automatic operation of **automatic drives** is disabled.*

*The **drive** is installed with a **pedestrian door** 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 such adjustment is mentioned in the instructions. The manual release is operated when the **pedestrian door** has stopped at each terminal position, in turn. The release or **reversible drive** shall be operable with a force not exceeding 220 N or a torque not exceeding 1,6 Nm. The force is applied as stated in the instructions.*

*The test is repeated with the power supply disconnected.*

*When the manual release has been activated, the power supply is then restored and the **drive** activated. The **drive** shall not move, or if the **drive** moves, all requirements of this standard shall be met.*

**20.ZBB.4** 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 **pedestrian door**.*

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 **pedestrian door**, 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 **pedestrian door** continue to operate normally, all of the following conditions shall be fulfilled:

- 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 **pedestrian door** shall not increase by more than 20 %.

## 20.ZBB.5 Void

**20.ZBB.6** During the movement of the **drive** in either direction, the actuation of a manual control shall stop the movement if there is no separate button for the stop function.

If the **drive** has a single button for controlling the movement, further actuation shall reverse the direction of movement.

If the **drive** has three buttons for controlling the movement, one button shall be a stop button.

These requirements do not apply to controls affecting automatic **modes of operation**.

Any button that has a stop function shall not require a key to stop the **drive**.

*Compliance is checked by a manual test.*

NOTE The test may be carried out without a **pedestrian door**.

**20.ZBB.7 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. 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 ZBB.1 The test may be carried out without a **pedestrian door**.

NOTE ZBB.2 Automatic **drives** are those that operate in at least one direction without deliberate activation.

**20.ZBB.8 Drives** shall incorporate an **entrapment protection system** that reduces the risk of injury when the **pedestrian door** moves or shall be adjustable to control the energy of the movement of the pedestrian door.

NOTE In one direction of travel of the **pedestrian door**, 20.ZBB.8.1 can be met and 20.ZBB.8.2 can be met in the opposite direction of travel.

For **drives** incorporating an **entrapment protection system** with sensing devices that prevent the **pedestrian door** from coming into contact with a person, compliance is checked by the relevant tests specified in 20.ZBB.8.1.

**20.ZBB.8.1** For **drives** incorporating an **entrapment protection system** with sensing devices that prevent the **pedestrian door** from coming into contact with a person, compliance is checked by the following relevant tests.

The **drive** is installed with a **pedestrian door**, 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**.

If the sensing devices are other than pressure sensitive pads, the test specified in 20.ZBB.8.1.1 is applied.

If the sensing devices are pressure sensitive pads, the test specified in 20.ZBB.8.1.2 is applied.

For pedestrian doors, an **entrapment protection system** with sensing devices that continuously adapt to environmental changes shall detect a stationary obstacle for at least 30 s.

**20.ZBB.8.1.1** The reference bodies for the tests shall be in accordance with EN 16005:2012, Annex C.

For horizontally moving **pedestrian doors**, the **drive** is operated to open or close the door. For **drives** for horizontally moving **pedestrian doors** other than revolving doors tests are carried out using the reference body positioned in the moving plane of the pedestrian door as shown in Figures C.2 to C.6 of EN 16005:2012, Annex C.

The reference body CA is detected in all positions of the travel area of the doorset leaves.

For **drives** for revolving doors tests are carried out in accordance with 5.9.2 to 5.9.4 of EN 16005:2012 using the reference body positioned as shown in Figures C.7 to C.9 of EN 16005:2012, Annex C.

**20.ZBB.8.1.2** If the **entrapment protection system** incorporates a pressure-sensitive floor pad, a mass of 15 kg  $\pm$  0,5 kg having a diameter of approximately 60 mm is used instead of the wooden obstacle.

The following inactive floor pad areas are excluded from this requirement:

- the last 38 mm on each side of the **pedestrian door** opening width;
- 60 mm along the junction of floor pads joined together side-by-side with the longest dimension perpendicular to the **pedestrian door** opening;
- 90 mm along the junction of floor pads joined together side-by-side with the longest dimension parallel to the **pedestrian door** opening;
- 150 mm across the junction of floor pads meeting at the threshold.

NOTE The inactive floor areas of pressure sensitive pads are shown in Figure 102.

**20.ZBB.8.2 Entrapment protection systems** that allow the **pedestrian door** to contact a person shall only be used to reduce the risk of injury for:

- the opening movement of a sliding door with the leave(s) moving along a plain part and the distance between the front surface of the leave and the fixed side screen or wall is more than 100 mm and less than or equal to 150 mm;
- the opening and closing movement of a balanced door;
- the opening movement of a folding door;
- the closing movement of a folding door only in combination with an **entrapment protection system** with sensing devices that prevent the **pedestrian door** from coming into contact with a person installed at the outer side of the door;
- the movement of revolving doors in combination with the peripheral speed which shall not exceed 1 000 mm/s for a door with a diameter up to 3 000 mm and shall not exceed 750 mm/s for a door with a diameter over 3 000 mm.

For **drives** incorporating an **entrapment protection system** that allows the **pedestrian door** to contact a person, compliance is checked by the following relevant tests.

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

The **drive** is operated to close and open the **pedestrian door** from the fully open and fully closed positions. The forces between the leading edge and counter opposing edges shall not exceed the values stated in 4.6.7 of EN 16005:2012 when measured at points according to Annex B of EN 16005:2012.

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  $\pm$  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.

**20.ZBB.8.3 Drives** adjustable to control the energy of the movement of a pedestrian door, shall be in compliance with 4.6.4 of EN 16005:2012 or Annex G of EN 16005:2012.

**Drives** adjustable to control the energy of the movement of a pedestrian door shall only be used to reduce the risk of injury for:

- the opening and closing movement of a sliding door when the movement is in accordance with 4.6.4 of EN 16005:2012;
- the opening and closing movement of a swing door when the movement is in accordance with 4.6.4 of EN 16005:2012;
- the movement of a revolving door when the movement is in accordance with 4.6.4 of EN 16005:2012;
- the opening movement of a swing door when the movement is in accordance with Annex G of EN 16005:2012 and sufficient safety distances are provided (see Figure ZBB.1);
- the closing movement of a swing door when the movement is in accordance with Annex G of EN 16005:2012.

**20.ZBB.9 Entrapment protection systems** shall provide an adequate level of protection in the event of a failure within the system installation wiring.

Compliance is checked by the following test.

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

Unless the system continues to operate normally, the **pedestrian door** shall stop moving within one cycle of operation or the movement of the **pedestrian door** shall only be controlled by a **biased-off switch** by the time it has completed its movement.

The test is repeated during the opening movement of the **pedestrian door**.

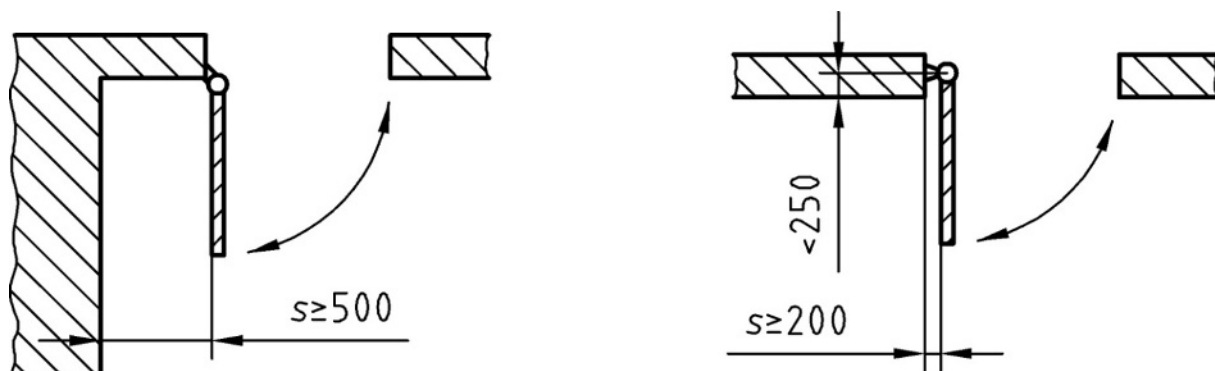


Figure ZBB.1 – Safety distances for opening movement of swing door