BS EN 1191:2012

BSI Standards Publication

Windows and doors — Resistance to repeated opening and closing — Test method

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National foreword

This British Standard is the UK implementation of EN 1191:2012. It supersedes BS EN 1191:2000 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee B/538, Doors, windows, shutters, hardware and curtain walling, to Subcommittee B/538/1, Windows and doors.

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

BSI, as a member of CEN, is obliged to publish EN 1191 as a British Standard. However, attention is drawn to the fact that during the development of this European Standard, the UK committee voted against its approval as a European Standard.

The reason for this vote by the UK committee B/538, Doors, windows, shutters, hardware and curtain walling, is due to concerns regarding the Test order in clause H.4.1. It is not clear whether the door should be returned to the closed position (H.2.7), closed and fastened position (H. 2.8) or closed, fastened and locked position (H.2.9) at the end of each cycle. Therefore, it is of the opinion of the UK committee that the relevant closed condition in the Test order in clause H.4.1 could be clarified.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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Foreword

This document (EN 1191:2012) has been prepared by Technical Committee CEN/TC 33 “Doors, windows, shutters, building hardware and curtain walling”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2013, and conflicting national standards shall be withdrawn at the latest by June 2013.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1191:2000.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association.

The most important changes compared with the previous version EN 1191:2000 are:

— reference velocities for manually operation scaled according to weight;

— different velocities for translatory, rotatory and tilt movement;

— force level for operation of fastening system clearly described;

— more precise description of the testing cycles;

— minor mode of operation and cleaning and maintenance mode of operation defined;

— termination criteria incorporated;

— new normative Annexes A to I integrated (see Scope).

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This European Standard describes one of the test methods that are called up in the product standards for windows and pedestrian doorsets.

The Annexes of this European Standard are to be in line with the relevant hardware standards but they are not direct copies of them.

1 Scope

This European Standard specifies the method to be used to determine the resistance to repeated opening and closing of windows and pedestrian doorsets when subjected to repeated opening and closing.

It applies to all construction materials and operating systems for any window or pedestrian doorset, including gaskets and building hardware, in normal operating conditions.

The parts concerned in the testing are the frame, the opening component (including any additional moving components e.g. an inactive sash/leaf) and all essential and directly involved building hardware, including operating devices, for example, the handle.

The testing does not include any hardware whose operation is not directly involved in the opening and closing of the moving components: added-on fastening systems such as peg-stays or cabin hooks or bolts, nor, unless specified, any independently installed stops (not connected to the complete assembly) such as a wall or ground-mounted stop.

NOTE 1 The Annexes provide more details on the testing procedures that may differ from the main part of this European Standard and are mandatory:

- Annex A applies to Tilt and Turn, Tilt-First, Turn-Only, or Tilt-Only windows and door-height windows;
- Annex B applies to Sliding, Lift and Slide or Lift and Slide and Tilt windows and door-height windows;
- Annex C applies to Tilt and Slide windows and door-height windows;
- Annex D applies to Fold and Slide windows and door-height windows;
- Annex E applies to horizontal and vertical pivot windows and door-height windows;
- Annex F applies to Vertical Sliding windows;
- Annex G applies to side-hung casements and top-hung windows, opening outwards (including reversible windows);
- Annex H applies to side-hung single and double action pedestrian doorsets excluding power operated doors;
- Annex I applies to power-operated (automatic) side-hung single action pedestrian doorsets.

NOTE 2 In this European Standard the term door-height window is used for windows that are used for the passage of pedestrians, i.e. as a pedestrian doorset.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 179, *Building hardware — Emergency exit devices operated by a lever handle or push pad, for use on escape routes — Requirements and test methods*

EN 1125, *Building hardware — Panic exit devices operated by a horizontal bar, for use on escape routes — Requirements and test methods*

EN 1154:1996,[1)] *Building hardware — Controlled door closing devices — Requirements and test methods*

EN 1158:1997,[2)] *Building hardware — Door coordinator devices — Requirements and test methods*

EN 12046-1, *Operating forces — Test method — Part 1: Windows*

EN 12046-2, *Operating forces — Test method — Part 2: Doors*

EN 12217, *Doors — Operating forces — Requirements and classification*

EN 12400, *Windows and pedestrian doors — Mechanical durability — Requirements and classification*

EN 12519:2004, *Windows and pedestrian doors — Terminology*

EN 13115:2001, *Windows — Classification of mechanical properties — Racking, torsion and operating forces*

EN 14600:2005, *Doorsets and openable windows with fire resisting and/or smoke control characteristics — Requirements and classification*

EN 16005, *Powered operated pedestrian doorsets — Safety in use — Requirements and test methods*

prEN 16361, *Power operated pedestrian doors — Product standard, performance characteristics — Pedestrian doorsets, other than swing type, initially designed for installation with power operation without resistance to fire and smoke leakage characteristics*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 12519:2004 and the following apply.

3.1
moving component
window sash or door leaf which is moved, opened or closed

3.2
active moving component
leaf of a multi-leafed window or door, intended to be moved first to provide opening

3.3
inactive moving component
leaf of a multi-leafed window or door, intended to be moved after the active leave

3.4
mode of operation
motion of the moving component as either translatory or rotary

Note 1 to entry: Some hardware systems allow for a combination of several modes of operation, for example, Tilt and Turn windows or folding windows which combine rotary and translatory operations.

3.5
main mode of operation
intended principal type of operation and distance or angular travel as specified by the manufacturer

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1) This document is impacted by the stand-alone amendment EN 1154:1996/A1:2002.

2) This document is impacted by the stand-alone amendment EN 1158:1997/A1:2002.

Note 1 to entry: Windows or pedestrian doorsets might feature multiple main modes of operation, such as tilting and sliding.

3.6
minor mode of operation
secondary type of operation intended for occasional use

Note 1 to entry: Operating the moving component for cleaning or maintenance purposes is not considered a main or minor mode of operation.

3.7
cleaning or maintenance mode of operation
additional type of operation not in everyday use

3.8
cycle
series of operations

Note 1 to entry: Involving opening a moving component, including releasing any fastening systems, moving open to the open position, returning to the closed position and re-engaging any fastening systems. The cycle might consist of several modes of operation that might be tested separately or combined.

Note 2 to entry: For example, a Tilt and Slide window can be tested in a cycle combining the tilting and sliding operations or it can be tested separately by carrying out the tilt cycles first and then the sliding cycles.

3.9
part cycle
series of operations applicable to a single mode of operation and/or limited distance or angular travel

Note 1 to entry: If the test specimen can be operated in more than one main mode of operation, for example, tilting and sliding, the cycle may be tested in part cycles accordingly. In doing so, the part cycles need to be carried out in such a manner that no steps from the cycle are repeated.

Note 2 to entry: All part cycles need to be carried out on the same test specimen.

3.10
number of cycles
quantity of cycles completed applied to the cycle or part cycle accordingly

Note 1 to entry: In accordance with the classification following EN 12400 or EN 14600 as appropriate.

3.11
operating device
building hardware component, for example, the window or door handle, enabling the user to operate the fastening system and/or the moving component

3.12
fastening system
building hardware component or set that keeps the moving component in the closed and fastened position, i.e. latched and/or locked and/or electric systems

3.13
closing edge
outermost edge of the moving component furthest from the axis of rotation

3.14
reference velocity
for translatory operation, actual velocity of the moving components; for rotary operation, velocity of the closing edge

3.15
rest time
time in seconds of a stationary period for the following:

— between one change of direction of operation;

— between the completion of a moving component's operation and the subsequent fastening system's operation;

— between the completion of a fastening system's operation and the subsequent moving component's operation;

— between two cycles

3.16
power operated pedestrian doorset and window
doorset for pedestrian passage only/window with one or more moving components that is moved, at least in one direction, by an external energy supply (e.g. electrically) instead of manual or stored mechanical energy

4 Test equipment

4.1 Test rig

The test rig shall be designed and constructed to be capable of adjustment for test specimens and shall be sufficiently rigid to withstand the induced forces without undue deflection.

Alternatively test specimen linked to prEN 16034 can be tested in supporting construction as described in EN 1634-1 in order to get a maximum range of direct application.

A sub-frame may be used into which the test specimen is mounted.

4.2 Operating equipment

4.2.1 Motion controlled actuators — hydraulic, pneumatic or electric torque and linear cylinders or any appropriate mechanisms, having features consistent with:

a) the reference velocities to be used;

b) the mass of the moving component and the friction forces involved;

c) the applied loads, if relevant, to produce dynamic forces;

d) the duration of the test.

4.3 Measuring equipment

The following equipment shall be used:

— cycle counter;

— velocity and time measurement equipment accurate to ± 5 %;

— force and mass measuring equipment accurate to ± 2 %;

— dynamometer and torque-meter accurate to ± 3 %;

— measuring tape, EC-precision class II;

— dial gauges and callipers accurate to ± 0,1 mm.

4.4 Velocity measurement

The measurement of the reference velocity shall be carried out over a measuring distance with a maximum of 70 mm for turning and sliding and a max of 30 mm for tilting. The end of the measuring distance shall be at a distance of $5\ ^{+5}_{-0}$ mm from the moving component's position where the reference velocity shall be reached. In the case of asymmetrically positioned moving components, the reference velocity shall be measured on the main closing edge.

NOTE Individual velocity measurements have been identified and are shown in the relevant Annexes.

5 Test requirements

5.1 General

All specifications described in this European Standard shall be adhered to, unless stated otherwise in the Annexes.

5.2 Number of cycles

The cycle is repeated either for a specified number of times or until failure occurs or the operating force set for the test is exceeded.

The number of cycles is either set prior to starting the test or the test is carried out until failure occurs.

Each part cycle shall have the same number of part cycles as required for the mode of operation.

NOTE The lowest number of part cycles causing failure is used for classification purposes.

5.3 Reference velocity

5.3.1 Manual operation

The reference velocity of a manually operated moving component depends on its mass and on its operation which can be translatory, rotary, or tilting.

The reference velocities are specified in Table 1 with a tolerance of ± 10 %.

Table 1 — Reference velocities for manually operated moving components

Mass (M) kg	**Operation**		
	Translatory m/s	Rotary m/s	Tilt m/s
$M \leq 65$	0,25	0,50	0,50
$65 < M \leq 100$	0,20	0,35	0,50
$100 < M \leq 150$	0,16	0,30	0,41
$150 < M \leq 200$	0,14	0,25	0,35
$200 < M \leq 300$	0,12	0,20	0,29
$M > 300$	0,10	0,18	0,25
For fire resisting and/or smoke control pedestrian doorsets and openable windows, refer to EN 14600. NOTE A consistent energy of 2,03 J (translatory), 1,56 J (rotary) and 3,125 J (tilt mode) is the basis for calculating the respective mass and velocity.			

5.3.2 Mechanical operation

5.3.2.1 Self-closing devices

If the moving component is mechanically operated, for example, via self-weight, springs or any other mechanism and if the velocity is adjustable, the reference velocity shall be set in accordance with the provisions laid down for opening and closing in the relevant product standard. For controlled door closing devices, opening and closing shall be set as specified in EN 1154. The uncontrolled door closing devices should refer to prEN 15887. If no product standard is available, or the product standard does not include any provisions for opening and closing, the reference velocity during a cycle or a part cycle shall be set as defined in Table 1. If not adjustable, the reference velocity shall be the actual velocity.

5.3.2.2 Power-operation

The velocities for power-operated doorsets/windows shall be set to a present level by the client or stated in a relevant product standard, e.g. prEN 16361 or a supporting standard like EN 16005.

5.4 Rest time

This shall be at least 1 s but shall not exceed 4 s for manually operated moving components. For motor operated moving components, the rest time shall be established with the client prior to the test.

5.5 Operation of the fastening systems

For manually operated fastening systems the operating force applied by the operating equipment shall not exceed 150 % of the last measurement of the operating forces necessary to release and secure the fastening systems (see 7.4). If deemed necessary during the test, subsequent adjustments of the operating equipment may be carried out in order to enable the test to proceed.

This operating force shall be determined in accordance with EN 12046-1 or EN 12046-2.

The operating forces shall be measured with moderate velocity, in a jerk-free and jolt-free manner.

The same specifications shall apply to the operation of the hardware during the repeated opening and closing test, unless specified otherwise in the system specifications.

A load on the hardware's espagnolette by means of overtwisting is not intended. The motion-sequence shall be carried out 'path-controlled' to the target positions in order to satisfy the operational cycle.

Ensure that the moving component is in the closed position before the operation equipment applies a force on the operating device. EN 13115:2001, Table 1 specifies the resistance to operating forces for each class, for example, a hand operating device with a measured operating torque of between 5 Nm and 10 Nm represents Class 1, therefore a force of not greater than 100 N $\times$ 1,5 = (150 $\pm$ 10) N shall be applied as the (gasket) compression force (not applicable for doors).

For power operated fastening systems (either partially or totally) the amplitude of the force shall be that set by the mechanism itself.

6 Preparation for testing

Test specimens shall be stored and tested in a non-destructive environment within the ranges of 15 °C to 30 °C and 25 % to 75 % RH.

Specimens which are intended to be glazed should be supplied with all glazing carried out in accordance with the window/door manufacturer's specification, or an adequately rigid timber, plastic or metal material may be used with additional weights.

Any additional weights are to be mounted equally on the outside and inside of the infilled panel so that the centre of gravity and mass replicate the replaced glazed unit. The mounting of the infilling that replaces the glazing unit shall be representative to the glazing system.

The mass of the moving component shall be measured prior to testing.

In respect of the type, number and position of fixing devices, the installation of the specimen in the testing or sub-frame shall comply with the relevant code of practice, if any, or if none, with the manufacturer's instruction for installation in buildings. These fixings shall not hinder the operation of the opening components, nor of any hardware involved in the test.

Windows or pedestrian doorsets designed to be incorporated in, or form part of a proprietary wall or partition system, should be installed in such a system and the composite construction fitted into the test surround.

Test equipment shall act at the position of normal operation. It shall be balanced so that the dead load applied on the operating point does not increase, in any position, the weight of the moving components by more than 5 %.

Adjustment and lubrication in accordance with the manufacturer's instructions shall be carried out before the test.

Conducting away of any heat (for example, cooling or extending the rest time) shall be carried out as agreed between the testing laboratory and the manufacturer.

7 Test procedure

7.1 Pre-test operation

With the test specimen installed in accordance with Clause 6, and before taking initial measurements, the moving component shall be subjected manually or automatically, if power operated, to five operating cycles.

7.2 Initial measurements

All necessary measurements shall be taken and documented, especially:

— the operating forces in accordance with EN 12046-1 or EN 12046-2;

— the mass of the moving component;

— the dead load applied to the operating point.

7.3 General cycle description

7.3.1 General

The orientation of the test specimen shall be appropriate for its intended use.

In the case of cycles, all main modes of operation are repeated to the specified number of cycles or until failure.

The following sequence applies.

7.3.2 Initial position

The initial position of the moving component is the closed and fastened position.

7.3.3 Stand-by position

The fastening system is released via the operating equipment with moderate velocity as intended in use; this is then followed by the rest time.

7.3.4 Opening cycle

7.3.4.1 Opening system without restrictor

On completion of the rest time, the moving component is set in motion accelerating in a jerk-free and jolt-free manner.

The reference velocity in accordance with Table 1 shall be reached at an opening angle of 60 ° or 60 % of the stroke, and held up to an opening angle of 70° or 70 % of the stroke. Subsequently, the moving component shall be brought slowly to a halt via the operating equipment in a jerk-free and jolt-free manner by the time it has reached its designated final position. Once the predetermined opening is reached, the rest time specified in 5.4 shall be applied.

7.3.4.2 Opening system with restrictor

On completion of the rest time, the moving component is set in motion accelerating in a jerk-free and jolt-free manner.

The reference velocity in accordance with Table 1 shall be reached $5\ ^{+5}_{-0}$ mm before the stopping/restricting position. After this, the moving component shall move freely into the stopping/restricting hardware at the open position.

The rest time specified in 5.4 shall then be applied.

7.3.5 Closing cycle

7.3.5.1 General

On completion of the rest time, the moving component is set in motion via the operating equipment accelerating in a jerk-free and jolt-free manner. The reference velocity in accordance with Table 1 shall be achieved $5\ ^{+5}_{-0}$ mm before reaching the closed-position. After this, the moving component shall move freely into the closed position. If the fastening system does not automatically engage, the fastening system shall subsequently be locked via the operating equipment with moderate velocity as intended in use; this is then followed by the rest time.

7.3.5.2 Possible fastening conditions

a) Case A:

Pedestrian doorsets or windows with latches and/or with automatic fastening devices: after reaching the closed position in the usual operating mode and during the test, the latch or fastening systems engage automatically. In this case no additional fastening system shall be engaged.

b) Case B:

Pedestrian doorsets or windows without latches and/or without automatic fastening devices: after reaching the closed position in the usual operating mode and during the test, the fastening system shall be engaged by means of the operating equipment at the end of each closing cycle.

The component should ‘move freely’ means that dynamic opening and closing forces should be applied.

Ensure that the moving component is in the closed position, before the operation equipment applies a force on the operating device. EN 13115:2001, Table 1 specifies the resistance to operating forces for each class, for example, a hand operating device with a measured operating torque of between 5 Nm and 10 Nm, represents Class 1. Therefore, a force not greater than $100\ \text{N} \times 1{,}5 = (150 \pm 10)\ \text{N}$ should be applied as the (gasket) compression force.

7.3.6 Next cycle

On completion of the rest time, the next cycle or part cycle starts.

NOTE In the case of cycles, all main modes of operation are repeated to the specified number of part cycles or until failure.

7.4 Measurements and maintenance

7.4.1 General

After every period, equal to 2 500 cycles or 25 % of the specified number of cycles, whichever is the greater, the test is halted and the specimen is examined and the operation forces are measured, Lubrication and adjustment of the test specimen hardware in accordance with the manufacturer's maintenance instructions can be carried out during the test, and the test is resumed in the defined conditions for the next period.

7.4.2 Termination criteria

The test is completed if any of the following conditions occurs:

— material failure of any component that is essential to the function of the test specimen;

— the test specimen is not functional in relation to its operating forces, that is, the initial and final operating forces do not fall within the same classification band given in EN 13115 or EN 12217 (see 5.5) (it is permissible for the manufacturer to claim a lower class);

— the specified number of cycles have been carried out;

— the test specimen is not openable or not closable;

— for self-closing pedestrian doorsets and windows: failure of the closing mechanism and/or hold open device;

— for fire resisting and/or smoke control pedestrian doorsets and windows: EN 14600:2005, 5.3.2, applies to clearance/expansion gaps.

7.5 Stroke

Rotary moving components are operated from the closed position to an open position:

— of (90 +0°/–10°) or

— to the stopping position of the restrictor if this occurs at less than 70°.

Moving components are operated from the closed position to at least 60 % of the fully open position, unless specified otherwise in the Annexes for other modes of operation.

7.6 Special cases

7.6.1 Minor mode of operation

If in addition to the main mode of operation (see 3.5), a minor mode of operation is available within the same test specimen, this mode of operation shall be tested with 10 % of the main mode of operation's number of cycles. The operation shall be carried out with moderate velocity as appropriate in intended use. If a relevant classification standard, for example EN 12400 or EN 14600, demands higher requirements/number of cycles, these have to be fulfilled.

7.6.2 Cleaning and maintenance mode of operation

If in addition to the main and minor modes of operation (see 3.5 and 3.6), a cleaning and maintenance mode of operation is available within the same test specimen, this mode of operation shall be tested after the main and minor tests with the minimum of 2 % of the main mode of operation's number of cycles for proper function. The reversible cycle testing shall be done with an additional 2 % of the total number of opening cycles required, up to a maximum of 250 cycles as a cleaning and maintenance mode of operation.

This test can be carried out manually.

7.7 Final measurements

Measurements in accordance with 7.2 shall be repeated.

8 Test results

a) The number of cycles completed for each main and minor mode of operation;

b) the stroke of the moving component;

c) the measurements carried out in accordance with 7.2;

d) the operating forces measured before and after the test.

9 Test report

The test report shall include the following information:

a) the name and address of testing laboratory;

b) the number, title and date of issue of this standard;

c) unique identification of the report and of each page, and total number of pages of the report;

d) name and address of client;

e) date of receipt of test item and date(s) of test;

f) sampling report;

g) details of the test method and any deviation from this standard;

h) all necessary details to identify the window or door;

i) all relevant details concerning the type, specified dimensions, materials, form and construction of the window or door, and its conformity with drawings provided by the manufacturer;

j) full details of the test specimen's hardware, fittings and fixings;

k) the mass of the tested moving component, the mode of operation;

l) the dead load applied by the operating equipment on the moving component;

m) whether or not the fastening system was operated;

n) the frequency of lubrication and the extent of any adjustments carried out during the test;

o) laboratory storage and testing conditions;

p) the results expressed as in Clause 8;

q) details of wear or failure of the specimen and when observed.

For elements with closing devices the reference velocity of the leading edge, the time for the closing process, and closing moment of the door closing device have to be mentioned in the test report.

Annex A
(normative)

Test procedures for Tilt and Turn, Tilt-First, Turn-Only or Tilt-Only windows and door-height windows

A.1 Scope

The test procedures described in this Annex shall be applied to finished manually and motor-operated elements (windows and door-height windows), in which the sashes can be brought into a Tilt-Only or Turn-Only mode as their predetermined main mode of operation.

A.2 General

All requirements specified in the general part of this standard shall be applied to Tilt and Turn, Tilt-First, Turn-Only and Tilt-Only windows and door-height windows, provided no deviating stipulations are listed in this Annex A.

A.3 Testing

A.3.1 Test order

In the case of Tilt and Turn or Tilt-First windows and door-height windows, tilting the sash is the more commonly used operation mode. If the operation modes are to be tested separately, the test shall start with the tilt cycles.

A.3.2 Part cycles

A.3.2.1 Tilt cycles on hardware without positive control

The tilt cycles shall be carried out with the following sequence:

a) Initial position: The initial position of the window sash is the closed position. The fastening system is locked.

b) Standby tilt position: The fastening system is brought into the ‘standby tilt position’ via the operating device (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time.

c) Opening cycle; tilting: On completion of the rest time, the sash is then moved via the operating device with a reference velocity in accordance with Table 1 into the scissor-stay’s (projecting mechanism) final position, within $5\ ^{+5}_{-0}$ mm before reaching the final tilt position. In this case, the sash shall move freely into the final tilt position (for example the operating device can be detached in a suitable manner: $5\ ^{+5}_{-0}$ mm before reaching the final tilt position). The sash’s acceleration up to the specified reference velocity shall be carried out in a jerk-free and jolt-free manner. On reaching the final tilt position, this shall be followed by the rest time.

d) Closing cycle; tilting: On completion of the rest time, the sash is then moved back via the operating device with a reference velocity in accordance with Table 1, within $5\ ^{+5}_{-0}$ mm before reaching the closed position. The sash shall reach the closed position in a free and unrestricted manner (for example the operating device can be detached in a suitable manner: $5\ ^{+5}_{-0}$ mm before reaching the closed position). The sash's acceleration right up to reaching the specified reference velocity shall be carried out in a jerk-free and jolt-free manner. On reaching the closed position, this shall be followed by the rest time.

e) Locking cycle: On completion of the rest time, the fastening system shall be locked via the operating device (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time.

f) On completion of the rest time, the next tilt cycle shall start.

A.3.2.2 Tilt cycles on hardware with positive control

Hardware with positive control can be used on Tilt and Turn, Tilt-First or Tilt-Only windows and door-height windows. On these hardware versions, the sash operation via the hardware enables manoeuvring the sash from the closed position into the tilted position respectively, from the tilted position into the closed position. The tilt cycles shall be carried out with the following sequence:

a) Initial position: The initial position of the window sash is the closed position. The fastening system is locked.

b) Opening cycle; tilting: The fastening system is brought into the 'tilt position' via the operating device (e.g. the window handle) attached to the operating equipment. The operation shall be carried out with moderate velocity as intended in use. This is then followed by the rest time.

c) Closing cycle; tilting: On completion of the rest time, the sash is moved back to its initial position via the operating device (e.g. the window handle) attached to the operating equipment. The operation shall be carried out with moderate velocity as intended in use. On reaching the closed position, this shall then be followed by the rest time.

d) On completion of the rest time, the next tilt cycle shall start.

On hardware systems where the sash movement cycle and the central fastening system's operation are carried out separately, the operation shall be supplemented accordingly.

A.3.2.3 Turn cycles

A.3.2.3.1 General

The turn cycles on Tilt and Turn or Tilt-First windows shall be carried out with half of the number of tilt cycles. On door-height windows, the number of turn cycles and tilt cycles shall be the same.

A.3.2.3.2 Minor mode of operation (turn cycles)

Only for systems with releasable limiting restrictor the following turn cycles shall be carried out as a minor mode of operation prior to testing the main mode of operation:

a) With the restrictor released the sash shall be operated from the closed position into an opened turn position of (90 +0/-10)°.

The turn cycles for this minor mode of operation shall be carried out with the following sequence:

1) Initial position: The initial position of the window sash is the closed position. The fastening system is locked.

2) Standby turn position: The fastening system is brought into the ‘standby turn position’ via the operating device (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time.

3) Opening cycle; turning: On completion of the rest time, the operating equipment moves the moving component into the ‘opened turn position’ in accordance with 7.3. On reaching the opening position, this shall then be followed by the rest time.

4) Closing cycle; turning: On completion of the rest time, the operating equipment moves the sash back into the closed position in accordance with 7.3. On reaching the closed position, this shall then be followed by the rest time.

5) Locking cycle: On completion of the rest time, the fastening system shall be locked via the operating device (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time.

6) On completion of the rest time, the next turn cycle shall start.

A.3.2.3.3 Main mode of operation (turn cycles)

A.3.2.3.3.1 Systems without limiting restrictor

For systems without limiting restrictors the following turn cycles shall be carried out as a main mode of operation:

a) . The sash shall be operated from the closed position into an opened turn position of (90 +0/-10)°.

The turn cycles for this main mode of operation shall be carried out with the following sequence:

1) Initial position: The initial position of the window sash is the closed position. The fastening system is locked.

2) Standby turn position: The fastening system is brought into the ‘standby turn position’ via the operating device (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time.

3) Opening cycle; turning: On completion of the rest time, the operating equipment moves the moving component into the opened turn position in accordance with 7.3. On reaching the opening position this shall then be followed by the rest time.

4) Closing cycle; turning: On completion of the rest time, the operating equipment moves the sash back into the closed position in accordance with 7.3. On reaching the closed position this shall then be followed by the rest time.

5) Locking cycle: On completion of the rest time, the fastening system shall be locked via the operating device (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time.

6) On completion of the rest time, the next turn cycle shall start.

A.3.2.3.3.2 Systems with non-releasable limiting restrictors

The sash shall be operated from the closed position into a stopping position or a restricted position as a main mode of operation as following:

a) The stopping position shall be reached with reference velocity in accordance with Table 1, if this occurs at less than 300 mm opening (measured as a chord across the opening and between the nearest adjacent edges of the sash and frame in the vicinity of the handle) with a maximum of 70°.

The turn cycles for this main mode of operation shall be carried out with the following sequence:

1) Initial position: The initial position of the window sash is the closed position. The fastening system is locked.

2) Standby turn position: The fastening system is brought into the ‘standby turn position’ via the operating device (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time.

3) Opening cycle; turning: On completion of the rest time, the moving component is set in motion accelerating in a jerk-free and jolt-free manner. The reference velocity in accordance with Table 1 shall be reached within $5\ ^{+5}_{-0}$ mm before the stopping position. The sash shall move freely into the stopping position (for example the operating device can be detached in a suitable manner: $5\ ^{+5}_{-0}$ mm before reaching the final stopping position). On reaching the stopping position this shall then be followed by the rest time.

4) Closing cycle; turning: On completion of the rest time, the operating equipment moves the sash back into the closed position in accordance with 7.3. On reaching the closed position this shall then be followed by the rest time.

5) Locking cycle: On completion of the rest time, the fastening system shall be locked via the operating device (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time.

6) On completion of the rest time, the next turn cycle shall start.

b) The restricted position shall be reached without reference velocity, if this occurs at more than 300 mm opening (measured as a chord across the opening and between the nearest adjacent edges of the sash and frame in the vicinity of the handle) or more than 70°.

The turn cycles for this main mode of operation shall be carried out with the following cycle sequence:

1) Initial position: The initial position of the window sash is the closed position. The fastening system is locked.

2) Standby turn position: The fastening device is brought into the ‘standby turn position’ via the operating device (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time.

3) Opening cycle; turning: On completion of the rest time, the moving component is set in motion accelerating in a jerk-free and jolt-free manner. The reference velocity in accordance with Table 1 shall be reached at an opening of 60 % of the restricted position, and held up to an opening of 70 % of the restricted position. Subsequently, the moving component shall be brought slowly to a halt via the operating equipment in a jerk-free and jolt-free manner by the time it has reached the restricted position. On reaching the restricted position this shall then be followed by the rest time.

4) Closing cycle; turning: On completion of the rest time, the operating equipment moves the sash back into the closed position in accordance with 7.3. On reaching the closed position this shall then be followed by the rest time.

5) Locking cycle: On completion of the rest time, the fastening system shall be locked via the operating device (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time.

6) On completion of the rest time, the next turn cycle shall start.

A.3.2.3.3.3 Systems with releasable limiting restrictors

If the cycles for the minor mode of operation have already been carried out in accordance with A.3.2.3.2, the number of cycles for the main mode of operation shall be reduced by the number of the cycles for the minor mode of operation.

For this main mode of operation the sash shall be operated from the closed position into a stopping position or a restricted position as following:

a) The stopping position shall be reached with reference velocity in accordance with Table 1, if this occurs at less than 300 mm opening (measured as a chord across the opening and between the nearest adjacent edges of the sash and frame in the vicinity of the handle) with a maximum of 70°.

The turn cycles for this main mode of operation shall be carried out with the following sequence:

1) Initial position: The initial position of the window sash is the closed position. The fastening system is locked.

2) Standby turn position: The fastening device is brought into the ‘standby turn position’ via the operating system (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time.

3) Opening cycle; turning: On completion of the rest time, the moving component is set in motion accelerating in a jerk-free and jolt-free manner. The reference velocity in accordance with Table 1 shall be reached within $5\ ^{+5}_{-0}$ mm before the stopping position. The sash shall move freely into the stopping position (for example the operating device can be detached in a suitable manner: $5\ ^{+5}_{-0}$ mm before reaching the final stopping position). On reaching the stopping position this shall then be followed by the rest time.

4) Closing cycle; turning: On completion of the rest time, the operating equipment moves the sash back into the closed position in accordance with 7.3. On reaching the closed position this shall then be followed by the rest time.

5) Locking cycle: On completion of the rest time, the fastening system shall be locked via the operating device (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time.

6) On completion of the rest time, the next turn cycle shall start.

b) The restricted position shall be reached without reference velocity, if this occurs at more than 300 mm opening (measured as a chord across the opening and between the nearest adjacent edges of the sash and frame in the vicinity of the handle) or more than max. 70°.

The turn cycles for this main mode of operation shall be carried out with the following cycle sequence:

1) Initial position: The initial position of the window sash is the closed position. The fastening system is locked.

2) Standby turn position: The fastening system is brought into the ‘standby turn position’ via the operating device (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time.

3) Opening cycle; turning: On completion of the rest time, the moving component is set in motion accelerating in a jerk-free and jolt-free manner. The reference velocity in accordance with Table 1 shall be reached at an opening of 60 % of the restricted position, and held up to an opening of 70 % of the restricted position. Subsequently, the moving component shall be brought slowly to a halt via the operating equipment in a jerk-free and jolt-free manner by the time it has reached the restricted position. On reaching the opening position this shall then be followed by the rest time.

4) Closing cycle; turning: On completion of the rest time, the operating equipment moves the sash back into the closed position in accordance with 7.3. On reaching the closed position this shall then be followed by the rest time.

5) Locking cycle: On completion of the rest time, the fastening system shall be locked via the operating device (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time.

6) On completion of the rest time, the next turn cycle shall start.

A.3.3 Total cycles

A.3.3.1 General

The tilt cycles in accordance with A.3.2.1 or A.3.2.2, and the turn cycles in accordance with A.3.2.3 can be combined to result in total cycles (Tilt and Turn cycles). These shall be carried out with the following sequence:

a) Initial position: The initial position of the window sash is the closed position. The fastening system is locked.

b) Tilt cycle: Initially a tilt cycle shall be carried out in accordance with A.3.2.1 or A.3.2.2.

c) Turn cycle: On completion of the rest time after the tilt cycle, a turn cycle in accordance with A.3.2.3 shall then follow.

d) On completion of the rest time after the turn cycle, a total cycle in accordance with A.3.3 shall then start.

If the number of turn cycles do not correspond to the number of tilt cycles: upon reaching the specified number of turn cycles, the test shall be continued with tilt cycles only.

A.3.3.2 Additional failure criteria

No additional failure criteria in this Annex.

Annex B
(normative)

Test procedures for Sliding, Lift and Slide or Lift and Slide and Tilt windows and door-height windows

B.1 Scope

The test procedures described in this Annex shall be applied to finished manually and motor-operated elements (windows and door-height windows), in which the sash can slide horizontally, or be lifted and horizontally slid over to the side as their predetermined main mode of operation. If the sash can also be tilted, this operation mode shall be tested as a further main mode of operation.

Deviating systems (e.g. with movable gaskets) shall be tested accordingly.

B.2 Terms and definitions

For the purposes of this Annex, the following terms and definitions apply.

B.2.1
positive control
sash operation via the hardware that enables the sash to be manoeuvred from the closed position into the tilted position, and from the tilted position into the closed position

Note 1 to entry: The sliding position can also be reached by means of operating the hardware.

B.2.2
fastened closed position
position in which the active sashes espagnolette-side rests up against the frame and the hardware is locked

Note 1 to entry: Windows or door-height windows with a lifting function need to be positioned in the lowered position.

B.2.3
lifting action
action in which the active sash is raised from the lowered position into the lifted position via the hardware

Note 1 to entry: During this action the sash can be moved a limited distance away from the frame in the direction of the opening position.

B.2.4
closed position
position in which the active sashes espagnolette-side rests up against the frame, and the hardware is unlocked

Note 1 to entry: Windows or door-height windows with a lifting function are forced into the raised position by the lifting action.

B.2.5
tilted position
position in which the rollers on the bottom of the active sash rest on top of the roller track and the top area of the sash is held in the final tilt position by means of the projecting mechanisms (e.g. scissor stays)

B.2.6
sliding position
position in which the active sash can be moved linearly to the side (‘in-line’), i.e. translatory operation

Note 1 to entry: Windows or door-height windows with a lifting function are lifted.

B.2.7
opening position
position in which the active sash is positioned at the end of the sliding position (resulting in the largest possible clear opening width)

B.3 General

All requirements specified in the general part of this standard shall be applied to Sliding, Lift and Slide or Lift and Slide and Tilt windows and door-height windows, provided no deviating stipulations are listed in this Annex B.

B.4 Testing

B.4.1 Test order

The test order shall be arranged appropriately in accordance with B.4.2. In the case of Lift and Slide and Tilt windows and door-height windows, the ‘tilt’ part cycles shall be tested first in accordance with B.4.2; before the ‘lift’ part cycles in accordance with B.4.2.2.2, ‘slide’ part cycles in accordance with B.4.2.3 or the total cycles (lifting and sliding in accordance with B.4.3.1.3) are carried out. In the case of sliding windows and door-height windows, the fastening system shall be tested first in accordance with B.4.2.2.1, ‘sliding’ part cycles in accordance with B.4.2.3 or the total cycles (sliding in accordance with B.4.3.1.2) are carried out.

B.4.2 Part cycles

B.4.2.1 Tilt cycles on hardware with tilt function

B.4.2.1.1 Tilt function with positive control

The tilt cycles shall be carried out with the following sequence:

a) Initial position: The initial position of the window sash is the fastened closed position. The fastening system is locked.

b) Opening cycle; tilting: The fastening system is brought into the ‘tilt position’ via the operating device (e.g. the window handle) attached to the operating equipment. The operation shall be carried out with moderate velocity as intended in use. This is then followed by the rest time.

c) Closing cycle; tilting: On completion of the rest time, the operating equipment moves the sash back to its initial position. The operation shall be carried out with moderate velocity as intended in use. On reaching the closed position shall then be followed by the rest time.

d) On completion of the rest time, the next tilt cycle shall start.

On hardware systems where the sash movement cycle and the central fastening system’s operation are carried out separately, the operation shall be supplemented accordingly.

B.4.2.1.2 Tilt cycles on hardware without positive control

The tilt cycles shall be carried out with the following sequence:

a) Initial position: The initial position of the window sash is the fastened closed position. The fastening system is locked.

b) Standby tilt position: The fastening system is brought into the 'standby tilt position' via the operating device (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time.

c) Opening cycle; tilting: On completion of the rest time, the sash is then moved via the operating equipment with a reference velocity in accordance with Table 1 into the scissor-stay's (projecting mechanism) final position, within $5\ ^{+5}_{-0}$ mm before reaching the final tilt position. In this case, the sash shall fall freely into the final tilt position (for example the operating device can be detached in a suitable manner: $5\ ^{+5}_{-0}$ mm before reaching the final tilt position). The sash's acceleration right up to reaching the specified reference velocity shall be carried out in a jerk-free and jolt-free manner. On reaching the final tilt position shall then be followed by the rest time.

d) Closing cycle; tilting: On completion of the rest time, the sash is then moved back via the operating equipment with a reference velocity in accordance with Table 1, within $5\ ^{+5}_{-0}$ mm before reaching the closed position. The sash shall reach the closed position in a free and unrestricted manner (for example the operating device can be detached in a suitable manner: $5\ ^{+5}_{-0}$ mm before reaching the closed position). The sash's acceleration up to the specified reference velocity shall be carried out in a jerk-free and jolt-free manner. On reaching the closed position shall then be followed by the rest time.

NOTE Instead of the closed position, a night ventilation position can also be reached.

e) Locking cycle: On completion of the rest time, the fastening system shall be locked via the operating device (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time.

f) On completion of the rest time, the next tilt cycle shall start.

B.4.2.2 Disengaging cycles

B.4.2.2.1 Unlocking and locking cycles (for sliding windows)

These shall be carried out with the following sequence:

a) Initial position: The active sash shall be in the locked closed position;

b) Standby slide position: The fastening system is brought into the 'standby slide position' via the operating device (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time;

c) Locking cycle: On completion of the rest time, the fastening system shall be locked via the operating device (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time;

d) On completion of the rest time, the next tilt cycle shall start.

NOTE During this action the sash can be moved a limited distance away from the frame in the direction of the opening position, if necessary.

B.4.2.2.2 Lifting cycles (for Lift and Slide windows)

Lifting cycles shall be carried out at a moderate velocity rate, as expected in daily use, with the following sequence:

a) Initial position: The active sash shall be in the fastened closed position.

b) Slide standby position: The lifting action is initiated via the hardware in a jerk-free and jolt-free manner, whereby the active sash is manoeuvred into the sliding position. The sash shall remain in this position for the rest time enabling it to settle.

c) Closed standby position: The active sash shall move in the sliding position in the direction of the opening position in such a manner that it stops 3 mm away from the closed position. The sash shall remain in this position for the rest time enabling it to settle.

d) Locking cycle: The active sash shall be manoeuvred back to the initial position via the hardware, in doing so the 'fastened closed position' shall be reached again; the initial movement shall be jerk-free and jolt-free. The hardware shall then remain in the initial position for the rest time, before commencing the next test cycle.

Hardware systems, where the sash itself is not lifted but a gasket mechanism is moved, shall be tested with the gasket mechanism retracted.

B.4.2.3 Sliding cycles

Sliding cycles shall be carried out in accordance with Table 1 (Translatory) and 7.3. The procedure shall be as follows:

a) Initial position: The initial position of the active sash is the closed position.

b) The movement range results from the sash width of the testing-element minus 200 mm (for example: a sash width of 1 200 mm results in a movement range of 1 000 mm) whereby the maximum moving range is 1 000 mm, irrespective of larger sash widths.

c) Opening cycle; sliding: The active sash is moved along a predetermined movement range while in the sliding position, and shall remain there for the rest time at the end of the movement range. Both the acceleration from the initial sliding position, as well as braking at the end of the movement range shall be in a jerk-free and jolt-free manner.

d) Closing cycle; sliding: The active sash shall be brought back into the initial position, and in doing so the closed position is reached again; the initial movement shall be jerk-free and jolt-free. The sash shall free fall into the closed position; (for example: the pneumatic cylinder is decoupled 100 mm before the final closed position or the valves open). The position 100 mm before the closed position shall be reached with the reference velocity as stated in Table 1 (translatory). The sash shall then remain in the initial position for the rest time, allowing it to settle before commencing with the next sliding cycle.

B.4.3 Total cycles (lifting and sliding cycles)

B.4.3.1 General

B.4.3.1.1 Introduction

Disengaging cycles in accordance with B.4.2.2 and sliding cycles in accordance with B.4.2.3 may be combined to result in total cycles. No individual part cycles shall be repeated during the total cycles.

B.4.3.1.2 Description of the total cycles (sliding)

a) Initial position: The initial position of the active sash is the fastened closed position.

b) Slide standby position: Unlocking shall be initiated by the hardware, whereby the active sash is brought into the sliding position in a jerk-free and jolt-free manner. The sash shall remain in this position for the rest time enabling it to settle.

c) The movement range results from the sash width of the testing-element minus 200 mm (for example: a sash width of 1 200 mm results in a movement range of 1 000 mm) whereby the maximum moving range is 1 000 mm, irrespective of larger sash widths.

d) Opening cycle; sliding: The active sash is moved along a predetermined movement range while in the sliding position, and shall remain there for the rest time at the end of the movement range. Both the acceleration from the initial sliding position, as well as braking at the end of the movement range shall be in a jerk-free and jolt-free manner.

e) Closing cycle; sliding: The active sash shall be brought back into the initial position, reaching the closed position again; the initial movement shall be jerk-free and jolt-free. The sash shall freefall into the fastened position; (for example: the pneumatic cylinder is decoupled 100 mm before the final closed position or the valves open). The position 100 mm before the closed position shall be reached with the reference velocity as stated in Table 1 (translatory). The sash shall then remain in the initial position for the rest time, enabling it to settle.

f) Locking cycle: The active sash shall be locked in a jerk-free and jolt-free manner via the hardware, whereby the initial position is reached again. The sash shall then remain in the initial position for the rest time, before commencing the next total cycle.

B.4.3.1.3 Description of the total cycles (lifting and sliding)

Sliding cycles shall be carried out in accordance with Table 1 (translatory) and 7.3. The procedure shall be as follows:

a) Initial position: The initial position of the active sash is the fastened closed position.

b) Slide standby position: A lifting action shall be initiated by the hardware, whereby the active sash is manoeuvred into the sliding position in a jerk-free and jolt-free manner. The sash shall remain in this position for the rest time enabling it to settle.

c) The movement range results from the sash width of the testing-element minus 200 mm (for example: a sash width of 1 200 mm results in a movement range of 1 000 mm), whereby the maximum moving range is 1 000 mm, irrespective of larger sash widths.

d) Opening cycle; sliding: The active sash shall be moved along a predetermined movement range into the sliding position, and shall remain there for the rest time at the end of the movement range. Both the acceleration from the initial sliding position, as well as braking at the end of the movement range shall be in a jerk-free and jolt-free manner.

e) Closing cycle; sliding: The active sash shall be brought back into the initial position, reaching the closed position again; the initial movement shall be jerk-free and jolt-free. The sash shall free fall into the closed position, for example, the pneumatic cylinder is decoupled 100 mm before the final closed position or the valves opened. The position 100 mm before the closed position shall be reached with the reference velocity as stated in Table 1. The sash shall then remain in the closed position for the rest time, enabling it to settle.

f) Closed standby position: The active sash shall move in the sliding position in the direction of the opening position in such a manner that it stops 3 mm away from the closed position. The sash shall remain in this position for the rest time, enabling it to settle.

g) Locking cycle: The active sash shall be brought back to the initial position via the hardware, whereby the fastened closed position shall be reached again; the initial movement shall be jerk-free and jolt-free. The sash shall then remain in the initial position for the rest time, before commencing the next total cycle.

B.4.4 Additional failure criteria

No additional failure criteria in this Annex.

Annex C
(normative)

Test procedures for Tilt and Slide windows and door-height windows

C.1 Scope

The test procedures described in this Annex shall be applied to finished manually and motor-operated elements (windows and door-height windows), in which the sash can be tilted and horizontally slid over to the side as their predetermined main mode of operation.

Deviating systems shall be tested accordingly.

C.2 Terms and definitions

For the purposes of this Annex, the following terms and definitions apply.

C.2.1
positive control
sash operation via the hardware that enables the sash to be manoeuvred from the closed position into the tilted position, and from the tilted position into the closed position

Note 1 to entry: The sliding position can also be reached by means of operating the hardware.

C.2.2
fastened closed position
position in which the active sash lies up against the frame on all sides; the hardware is locked and the window unit is completely closed

C.2.3
closed position
position in which the active sash lies up against the frame on all sides, while the hardware is not yet locked and in which the window unit is not completely closed

C.2.4
tilted position
position in which the bottom of the active sash rests on the frame and the top rail of the sash is held in the final tilt position by means of the projecting mechanisms (e.g. scissor stays)

C.2.5
sliding position
position in which the active sash is disengaged on all sides, enabling it to be moved linearly to the side (‘in-line’)

C.2.6
opening position
position in which the active sash is positioned at the end of the sliding position (resulting in the largest possible clear opening width)

C.3 General

All requirements specified in the general part of this standard shall be applied to Tilt and Slide windows and door-height windows, provided no deviating stipulations are listed in this Annex C.

C.4 Testing

C.4.1 Test order

The test order shall be arranged appropriately in accordance with C.4.2.

C.4.2 Part cycles

C.4.2.1 Tilt cycles

C.4.2.1.1 Tilt cycles on hardware with positive control

The tilt cycles shall be carried out with the following sequence:

a) Initial position: The initial position of the window sash is the fastened closed position. The fastening system is locked.

b) Opening cycle; tilting: The fastening system is brought into the ‘tilt position’ via the operating device (e.g. the window handle) attached to the operating equipment. The operation shall be carried out with moderate velocity as intended in use. This is then followed by the rest time.

c) Closing cycle; tilting: On completion of the rest time, the operating equipment moves the sash back to its initial position. The operation shall be carried out with moderate velocity as intended in use. On reaching the closed position shall then be followed by the rest time.

d) On completion of the rest time, the next tilt cycle shall start.

On hardware systems where the sash movement cycle and the central fastening system’s operation are carried out separately, the operation shall be supplemented accordingly.

C.4.2.1.2 Tilt cycles on hardware without positive control

The tilt cycles shall be carried out with the following sequence:

a) Initial position: The initial position of the window sash is the fastened closed position. The fastening system is locked.

b) Standby tilt position: The fastening system is brought into the ‘standby tilt position’ via the operating device (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time.

c) Opening cycle; tilting: On completion of the rest time, the sash is then moved via the operating equipment with a reference velocity in accordance with Table 1 into the scissor-stay’s (projecting mechanism) final position, within $5\ ^{+5}_{-0}$ mm before reaching the final tilt position. In this case, the sash shall fall freely into the final tilt position (for example the operating device can be detached in a suitable manner: $5\ ^{+5}_{-0}$ mm before reaching the final tilt position). The sash’s acceleration right up to reaching the specified reference velocity shall be carried out in a jerk-free and jolt-free manner. On reaching the final tilt position shall then be followed by the rest time.

d) Closing cycle; tilting: On completion of the rest time, the sash is then moved back via the operating device with a reference velocity in accordance with Table 1, within $5\ ^{+5}_{-0}$ mm before reaching the closed position. The sash shall reach the closed position in a free and unrestricted manner (for example the operating device can be detached in a suitable manner: $5\ ^{+5}_{-0}$ mm before reaching the closed position). The sash's acceleration right up to reaching the specified reference velocity shall be carried out in a jerk-free and jolt-free manner. On reaching the closed position shall then be followed by the rest time.

e) Locking cycle: On completion of the rest time, the fastening system shall be locked via the operating device (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time.

f) On completion of the rest time, the next tilt cycle shall start.

C.4.2.2 Sliding cycles

C.4.2.2.1 Sliding cycles on hardware with positive control

Sliding cycles shall be carried out in accordance with Table 1 (translatory) and 7.3. The procedure shall be as follows:

a) Initial position: The initial position of the active sash is the tilted position.

b) Slide standby position: The hardware is moved jerk-free and jolt-free into an operating position, in which the sliding position is reached. If the sliding position via the hardware is not engaged automatically, the active sash shall now be moved to the initial sliding position. The sash shall remain in this initial sliding position for the rest time, enabling it to settle.

c) The movement range results from the specimen's sash rebate width minus 200 mm (for example: a sash rebate width of 1 200 mm results in a movement range of 1 000 mm), whereby the maximum moving range is 1 000 mm, irrespective of larger sash widths.

d) Opening cycle; sliding: The active sash is moved along a predetermined movement range while in the sliding position, and shall remain at the end of the movement range for the rest time, Both the acceleration from the initial sliding position, as well as braking at the end of the movement range shall be in a jerk-free and jolt-free manner.

e) Closing cycle; sliding: The active sash shall be brought back to the initial position, and in doing so the tilted position is reached again; the initial movement shall be jerk-free and jolt-free. The sash shall free fall into the tilted position; (for example: the pneumatic cylinder is decoupled 100 mm before the final tilt position or the valves open). The sash shall then remain in the initial position for the rest time, allowing it to settle before commencing with the next test cycle.

   The velocity with which the hardware is operated may be increased if required, as long as the sash travels securely to the initial position.

If the hardware is equipped with retaining devices (i.e. bullet catches, halting strikers, magnets etc.) that catch and retain the active sash on the bottom in the tilting position, these retaining devices shall engage at the end of every cycle. If these above mentioned retaining devices have to be released via the hardware in order to bring the sash back again into the sliding position, this hardware release operation shall be carried out during every sliding cycle.

C.4.2.2.2 Sliding cycles on hardware without positive control

Sliding cycles shall be carried out in accordance with Table 1 (translatory) and 7.3. The sequence shall be as follows:

a) Initial position: The initial position of the active sash is the tilted position.

b) Slide standby position: The hardware is moved jerk-free and jolt-free into an operating position, in which the sliding position can be enabled. After that the active sash shall be moved towards the initial sliding position. The sash shall remain in this sliding position for the rest time, enabling it to settle.

c) The movement range results from the specimen's sash rebate width minus 200 mm (for example: a sash rebate width of 1 200 mm results in a movement range of 1 000 mm), whereby the maximum moving range is 1 000 mm, irrespective of larger sash widths.

d) Opening cycle; sliding: The active sash is moved along a predetermined movement range while in the sliding position, and shall remain at the end of the movement range for the rest time. Both the acceleration from the initial sliding position, as well as braking at the end of the movement range shall be in a jerk-free and jolt-free manner.

e) Closing cycle; sliding: The active sash shall be brought back to the initial position, and in doing so the tilted position is reached again; the initial movement shall be jerk-free and jolt-free. The sash shall free fall into the tilted position; (for example: the pneumatic cylinder is decoupled 100 mm before the final tilt position or the valves open). The sash shall then remain in the initial position for the rest time, allowing it to settle before commencing with the next test cycle.

   The velocity with which the hardware is operated may be increased if required, as long as the sash travels securely to the initial position.

If the hardware is equipped with retaining devices (i.e. bullet catches, halting strikers, magnets etc.) that catch and retain the active sash on the bottom in the tilting position, these retaining devices shall engage at the end of every cycle. If these above mentioned retaining devices have to be released via the hardware in order to bring the sash back again into the sliding position, this hardware release operation shall be carried out during every sliding cycle.

C.4.3 Total cycles (tilting and sliding cycles)

C.4.3.1 General

Tilt cycles in accordance with C.4.2.1 and sliding cycles in accordance with C.4.2.2 may be combined to result in total cycles. No individual steps shall be repeated during the total cycles.

C.4.3.2 Total cycles on hardware with positive control

Sliding cycles shall be carried out in accordance with Table 1 (translatory) and 7.3. The sequence shall be as follows:

a) Initial position: The initial position of the active sash is the fastened closed position.

b) Opening cycle; tilting: The fastening system is brought into the 'tilt position' via the operating device (e.g. the window handle) attached to the operating equipment. The operation shall be carried out with moderate velocity as intended in use. This is then followed by the rest time.

c) Slide standby position: The hardware is moved jerk-free and jolt-free into an operating position, in which the sliding position is reached or enabled. If the sliding position via the hardware is not engaged automatically, the active sash shall now be moved to the initial sliding position. The sash shall remain in this position for the rest time, enabling it to settle.

d) The movement range results from the specimen's sash rebate width minus 200 mm (for example: a sash rebate width of 1 200 mm results in a movement range of 1 000 mm), whereby the maximum moving range is 1 000 mm, irrespective of larger sash widths.

e) Opening cycle; sliding: The active sash is moved along a predetermined movement range while in the sliding position, and shall remain there for the rest time, at the end of the movement range. Both the

acceleration from the sliding position, as well as braking at the end of the movement range shall be in a jerk-free and jolt-free manner.

f) Closing cycle; sliding: The active sash is moved back to the initial position. The initial movement shall be in a jerk-free and jolt-free manner. The active sash shall reach the tilt position once again. The sash shall free fall into the tilted position; (for example: the pneumatic cylinder is decoupled 100 mm before the final tilt position or the valves open). The sash shall then remain in this tilted position for the rest time, enabling it to settle.

The velocity with which the hardware is operated may be increased if required, as long as the sash travels securely to the tilted position.

g) Closing cycle; tilting: On completion of the rest time, the operating equipment moves the sash back into the initial position. The operation shall be carried out with moderate velocity as intended in use. On reaching the closed position shall then be followed by the rest time.

h) On completion of the rest time, the next total cycle shall start.

On hardware systems where the sash movement cycle and the central fastening system's operation are carried out separately, the operation shall be supplemented accordingly.

If the hardware is equipped with retaining devices (i.e. bullet catches, halting strikers, magnets etc.) that catch and retain the active sash on the bottom in the tilting position, these retaining devices shall engage at the end of every cycle. If these above mentioned retaining devices have to be released via the hardware in order to bring the sash back again into the sliding position, this hardware release operation shall be carried out during every sliding cycle.

C.4.3.3 Total cycles on hardware without positive control

Sliding cycles shall be carried out in accordance with Table 1 (translatory) and 7.3. The sequence shall be as follows:

a) Initial position: The initial position of the active sash is the fastened closed position.

b) Standby tilt position: The hardware shall be manoeuvred into an operating position, in which the tilting position is reached or enabled.

c) Opening cycle; tilting: On completion of the rest time, the sash is then moved via the operating equipment with a reference velocity in accordance with Table 1 into the scissor-stay's (projecting mechanism) final position, within $5\ ^{+5}_{-0}$ mm before reaching the final tilt position. In this case, the sash shall fall freely into the final tilt position (for example the operating device can be detached in a suitable manner: $5\ ^{+5}_{-0}$ mm before reaching the final tilt position). The sash's acceleration right up to reaching the specified reference velocity shall be carried out in a jerk-free and jolt-free manner. On reaching the final tilt position shall then be followed by the rest time.

d) Slide standby position: The hardware is moved jerk-free and jolt-free into an operating position, in which the sliding position is reached or enabled. After that the active sash shall be moved into the initial sliding position. The sash shall remain in this sliding position for the rest time, enabling it to settle.

e) The movement range results from the specimen's sash rebate width minus 200 mm (for example: a sash rebate width of 1 200 mm results in a movement range of 1 000 mm), whereby the maximum moving range is 1 000 mm, irrespective of larger sash widths.

f) Opening cycle; sliding: Move the active sash along the predetermined movement range while in the sliding position, remaining at the end of the movement range the rest time. Both the acceleration from the initial sliding position, as well as braking at the end of the movement range shall be in a jerk-free and jolt-free manner.

g) Closing cycle; sliding: Move the active sash back to the tilted position once again; the initial movement shall be jerk-free and jolt-free. The sash shall free fall into the tilted position; (for example: the pneumatic cylinder is decoupled 100 mm before the final tilt position or the valves open). The hardware shall then remain in the tilted position for rest time, enabling it to settle.

   The velocity with which the sash is operated may be increased if required, as long as the sash travels securely to the tilted position.

h) Closing cycle; tilting: On completion of the rest time, the sash is then moved back via the operating equipment with a reference velocity in accordance with Table 1, within $5\ ^{+5}_{-0}$ mm before reaching the closed position. The sash shall reach the closed position in a free and unrestricted manner (for example the operating device can be detached in a suitable manner: $5\ ^{+5}_{-0}$ mm before reaching the closed position). The sash's acceleration right up to reaching the specified reference velocity shall be carried out in a jerk-free and jolt-free manner. On reaching the closed position shall then be followed by the rest time.

i) Locking cycle: On completion of the rest time, the fastening system shall be locked via the operating device (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time.

j) On completion of the rest time, the next total cycle shall start.

k) If the hardware is equipped with retaining devices (i.e. bullet catches, halting strikers, magnets, etc.) that catch and retain the active sash on the bottom in the tilting position, these retaining devices shall engage at the end of every cycle. If these above mentioned retaining devices have to be released via the hardware in order to bring the sash back again into the sliding position, this hardware release operation shall be carried out during every sliding cycle.

C.4.4 Additional failure criteria

No additional failure criteria in this Annex.

Annex D
(normative)

Test procedures for Fold and Slide windows and door-height windows

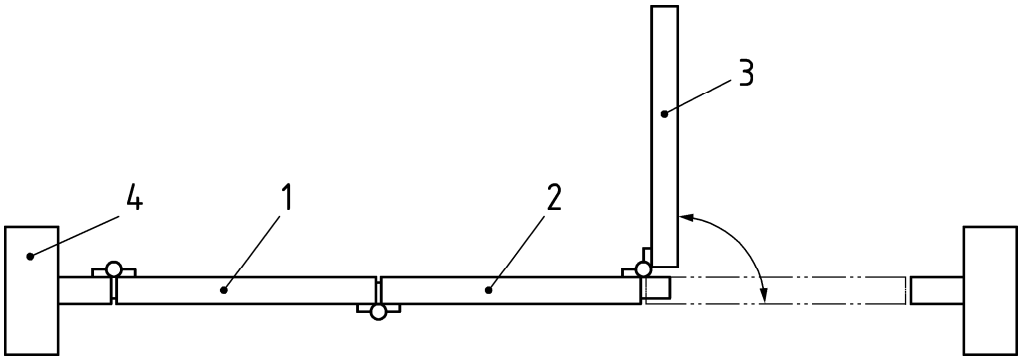
D.1 Scope

The test procedures described in this Annex shall be applied to finished manually and motor-operated elements (windows and door-height windows), in which the sash can be horizontally slid and folded over to the side as their predetermined main mode of operation.

If the sash can also be turned, this operation mode shall be tested as a further main mode of operation.

D.2 General

Fold and Slide windows and door-height windows may consist of a multitude of interconnected sashes. All components of possible opening types should be covered in a representative sample. As a general rule this results in a 3-sash element (see Figure D.1). Multiple tests of components are not necessary. All requirements specified in the general part of this standard shall be applied to Fold and Slide windows and door-height windows, provided no deviating stipulations are listed in this Annex D.



Key

1 Fold and Slide sash
2 Fold and Slide sash
3 Turn-Only sash
4 Supporting sub frame

Figure D.1 — Turn cycles on Fold and Slide windows and door-height windows

D.3 Testing

D.3.1 Test order

The operation modes shall be tested separately. The test order shall be arranged appropriately in accordance with D.3.2. Deviating samples shall be tested correspondingly.

D.3.2 Part cycles

D.3.2.1 Turn cycles

The test shall be carried out in accordance with the descriptions in A.3.2.3 (Test procedures for Tilt and Turn, Tilt-First, Turn-Only or Tilt-Only windows and door-height windows). For this purpose, the fastening system between the Fold and Slide sashes (see Figure D.1, position 1 (Fold and Slide sash) and position 2 (Fold and Slide sash) are locked.

D.3.2.2 Folding-sliding cycles

The folding-sliding cycles shall be carried out with the following sequence, whereby the length of motion results from the specified angular positions and the respective sash widths:

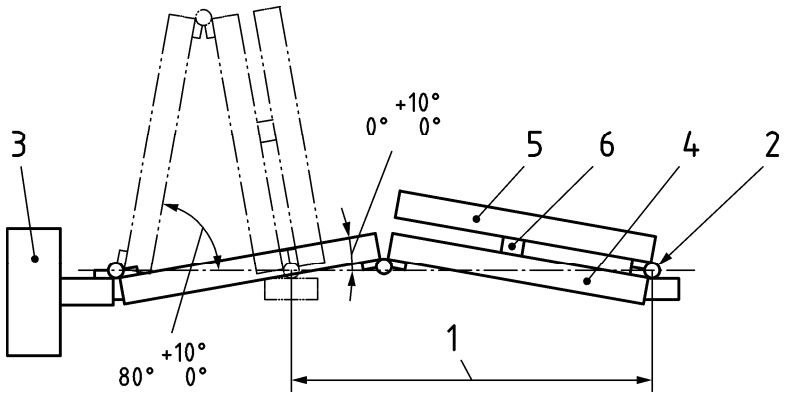
a) Initial position: The sashes initial position can be found in Figure D.2 (‘almost closed position’ — depicted in continuous lines $(0 + 10)°$). The fastening system between the Fold and Slide sashes (see Figure D.1, position 1 and position 2) shall be brought into the Fold and Slide stand-by position. The fastening system shall remain in this position while carrying out all Fold and Slide cycles. The tolerance details on both of the angular positions shall be utilised in such a manner as to avoid dead-centre positions on the following movements that could lead to obstruction of the movement cycles.

b) Opening cycle; sliding: The operating equipment shall engage at an appropriate location on the element and slide the sash into the ‘almost completely folded position’, as depicted in Figure D.2 (‘folded position’ — depicted with a broken line). In doing so, the Turn-Only sash (if applicable) shall always be coupled to the Fold and Slide sash. In this case the sashes shall initially be accelerated in a jerk-free and jolt-free manner by the operating equipment up as far as reaching half the distance of the Fold and Slide movement. Subsequently the sashes shall be brought slowly to a halt via the operating equipment in a jerk-free and jolt-free manner before reaching the ‘folded position’. On reaching the folded position $(80+10)°$ is then followed by the rest time.

c) Closing cycle; sliding: On completion of the rest time, the sashes shall be moved back to the initial position via the operational equipment (‘almost closed position’). In doing so, the Turn-Only sash (if applicable) shall always be coupled to the Fold and Slide sash. In this case the sashes shall initially be accelerated in a jerk-free and jolt-free manner by the operating equipment up as far as reaching half the distance of the Fold and Slide movement. Subsequently the sashes shall be brought slowly to a halt via the operating equipment in a jerk-free and jolt-free manner before reaching the ‘almost closed position’. On reaching the ‘almost closed position’ is then followed by the rest time.

d) On completion of the rest time, the next Fold and Slide cycle starts.

The Fold and Slide cycles shall be carried out with the specified velocities in accordance with Table 1 (translatory). In doing so, consult the mass of all moving sashes together for the velocity calculation.



Key

1 Length of motion
2 Turn-Only hinges
3 Supporting sub frame
4 Sample's 2nd Fold and Slide sash
5 Sample's Turn-Only sash
6 Coupling between Turn-Only sash and sliding sash

Figure D.2 — Fold and Slide cycles on Fold and Slide windows and door-height windows

D.3.2.3 Locking cycles

The locking cycles shall be carried out with the following sequence, whereby the fastening system on the Turn-Only sash (if applicable) is unlocked:

a) Initial position: In the initial position, sashes 1 and 2 (see Figure D.1) shall be in the fastened closed position.

b) Fold and Slide standby position: The fastening system between sashes 1 and 2 (see Figure D.1) is brought into the 'Fold and Slide stand-by position' via the operating device (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time. The element has the possibility of carrying out design-related motions during this rest time.

c) Locking cycle: If after opening the fastening system, there is a distance between the sashes and the frame that makes it impossible for the fastening system to guide the sashes to the frame by means of the locking movement itself, then the sash shall be moved up to the frame via the operating equipment with a force in accordance with 5.5. On completion of the rest time, the fastening system between the Fold and Slide sashes is locked again via the operating device (e.g. the window handle) attached to the operating equipment. This is then followed by the rest time.

d) On completion of the rest time, the next locking cycle starts.

Should the sample be equipped with several comparable fastening systems, it is only necessary to carry out the locking cycles on a fastening system once in accordance with this subclause.

If a comparable fastening system is used that has already been successfully tested on Tilt and Turn, Tilt-First, Turn-Only windows and/or door-height windows in accordance with Annex A with the same number of cycles in the same window system, one may forgo carrying out these locking cycles.

D.3.3 Additional failure criteria

No additional failure criteria in this Annex.

Annex E
(normative)

Test procedures for horizontal or vertical pivot windows and door-height windows

E.1 Scope

The test procedures described in this Annex shall be applied to the finished hand- and power-operated windows and door-height windows in which the moving components can be brought into a pivot mode as its main mode of operation. Where a window has a releasable limiting restrictor, an additional ventilation position (larger than the restricted position) shall be tested as a minor mode of operation. If the moving component can be reversed, this operation mode shall be tested as a cleaning and maintenance mode of operation.

Operation modes as in EN 12519:2004, A.3.1.5 and A.3.1.6.

E.2 Terms and definitions

For the purposes of this Annex, the following terms and definitions apply.

E.2.1
fastened closed position
position in which the moving component is resting against the frame or compresses the gaskets on all sides, and the hardware is effectively engaged

E.2.2
closed position
position in which the moving component is resting against the frame or the gaskets on all sides, and the hardware is unlocked

E.2.3
open position
position in which the moving component is in a defined opening or the maximum opening of the operated window

E.2.4
reversed position
position in which the moving component has been rotated past the open position until the internal and external faces of the moving component are inverted

E.2.5
limiting restrictor
device intended to limit the movement of a moving component to a predetermined position

E.2.6
locked situation for windows with automatic engaging devices
position after reaching the closed position in the usual operating mode and during the test, the latch or locking/closing devices engage automatically, in which case no additional locking or closing device will be engaged

E.2.7
locked situation for windows without automatic engaging devices
position after reaching the closed position in the usual operating mode and during the test, the locking/closing device will be engaged by means of the operating equipment at the end of each closing cycle

E.3 General

E.3.1 Introduction

All the requirements specified in the general part of this standard are to be applied to horizontal and vertical pivot windows and door-height windows, provided no deviating stipulations are listed in this Annex E.

Roof windows are to be installed in the test apparatus at an angle of 45°.

E.3.2 Main mode of operation

The open position shall be limited to the following:

— for systems without limiting restrictor; (45 +0/- 3)° movement from the closed position with a maximum of 600 mm opening from the fully closed position (measured as a chord across the opening and between the nearest adjacent edges of the sash and frame) or

— for systems with limiting restrictor; to the stopping position of any limiting restrictor device if this occurs at less than 45° or 600 mm.

E.3.3 Minor mode of operation

The open position shall be limited to the following:

— for systems without limiting restrictor; (45 +0/-3)° movement from the closed position or

— for systems with releasable limiting restrictor; with the restrictor unengaged (45° +0/-3)° movement from the closed position.

E.3.4 Cleaning and maintenance mode of operation

The reversed position can be considered to be a cleaning and maintenance mode of operation.

The reversed position is:

— the predetermined position of the reverse restrictor or

— 100 mm before the end of the fully reversed position.

E.4 Testing

E.4.1 Test order

The test order shall be arranged appropriately in accordance with E.4.2.

E.4.2 Cycles

E.4.2.1 General

The rest time in accordance with 5.4 shall be applied. If the hinges have a problem of overheating the rest time can be extended up to 8 s between two cycles.

E.4.2.2 Minor mode of operation

If a minor mode of operation in accordance with E.3.3 is applicable, the cycles for the minor mode of operation in accordance with 7.6.1 shall be carried out with the following cycle sequence:

a) fastened closed position;

b) closed position;

c) open the moving component in accordance with 7.3 into a position in accordance with E.3.3;

d) closed position in accordance with 7.3;

e) fastened closed position.

E.4.2.3 Main mode of operation

If the cycles for the minor mode of operation have already been carried out, the number of cycles for the main mode of operation shall be reduced by the number of the cycles for the minor mode of operation. The cycles for the main mode of operation shall be carried out with the following cycle sequence:

a) fastened closed position;

b) closed position;

c) open the moving component in accordance with 7.3 into a position in accordance with E.3.2;

d) closed position in accordance with 7.3;

e) fastened closed position.

E.4.2.4 Cleaning and maintenance mode of operation test

If a cleaning and maintenance mode of operation in accordance with E.3.4 is applicable, the cycles for the cleaning and maintenance mode of operation shall be carried out with the following cycle sequence. The number of cycles shall be 2 % of the total number of cycles required up to a maximum of 250 cycles. This test shall be carried out with moderate velocity. The reference velocities in accordance with Table 1 do not apply to this test.

Where suitable test equipment is not available for this test, the test can be carried out manually:

a) open position;

b) reversed position;

c) open position.

Annex F
(normative)

Test procedures for Vertical Sliding windows

F.1 Scope

The test procedures described in this Annex are applied to the complete hand- and power-operated windows, in which the sash(es) can be opened in a sliding mode as their main mode of operation.

If the sash(es) can be tilted, this operation mode shall be tested as a cleaning and maintenance mode of operation .

Operation modes as in EN 12519:2004, A.3.1.7.

F.2 Terms and definitions

For the purposes of this Annex, the following terms and definitions apply.

F.2.1
fastened closed position
position in which the opening edge of the sash is in contact with the weather seal, the sash is at the full extent of its closing movement and the fastening system effectively engaged

F.2.2
closed position
position in which the opening edge of the sash is in contact with the weather seal, the sash is at the full extent of its closing movement and the fastening system not engaged

F.2.3
open position
position in which the opening edge of the sash is not in contact with the weather seal and the sash is at the full extent of its opening movement (the largest possible opening height)

F.2.4
closed tilt position
position in which the opening edge of the sash is at the mid-point between the closed position and open position with the sash vertical

F.2.5
open tilt position
position in which the opening edge of the sash is at the mid-point between the closed position and open position and the sash is held in the final tilt position by the projecting mechanism

F.2.6
tilt latch
releasable device or devices, that hold the sash in a vertical position when engaged

F.2.7
limiting restrictor
device intended to limit the vertical movement of a sash to a predetermined position

F.3 General

F.3.1 Introduction

All requirements specified in the general part of this standard are to be applied to Vertical Sliding Windows, provided no varying stipulations are listed in this Annex F.

F.3.2 Open position cycle test velocity

The cycle shall be at a velocity of not less than 0,12 m/s (7,3 m/min) or greater than 0,15 m/s (9,2 m/min). A rest time of not more than 30 s is permissible between cycles.

F.4 Testing

F.4.1 Test order

For windows without a tilt position only the main mode of operation, the open position cycle test shall be performed.

Where a window has more than one opening sash, the main mode of operation to the open position cycle test shall be fully completed on each sash in turn.

For sliding sash windows the open position is more commonly used ,therefore the tilt position, testing shall be done as an additional 2 % of the total number of cycles required up to a maximum of 250 cycles as a cleaning and maintenance mode of operation.

F.4.2 Cycles

F.4.2.1 Open position cycle test

The open position cycles are to be carried out with the following specified cycle sequence:

a) fastened closed position;

b) closed position;

c) open position;

d) closed position;

e) fastened position.

NOTE The velocity requirements of Table 1 are not applicable.

F.4.2.2 Tilt position cycle test

Tilt cycles shall be carried out at a moderate velocity, as intended in use. Where suitable test apparatus is not available it is permitted for this test to be carried out manually. The tilting of the sash shall be unimpeded.

The procedure shall be as follows:

a) closed Tilt position,

b) release Tilt latch,

c) open Tilt position,

d) closed Tilt position,

e) engage Tilt latch.

NOTE The velocity requirements of Table 1 are not applicable.

During testing it is permissible for the opening edge of the sash to move away from the initial set closed tilt position.

Annex G
(normative)

Test procedures for side-hung and top-hung windows, opening outwards (including reversible windows)

G.1 Scope

The test procedures described in this Annex are applied to the complete hand- and power-operated windows, in which the casement can be opened in a rotary or outward projecting mode as their main mode of operation.

NOTE Operation modes as in EN 12519:2004, A.3.1.3 and A.3.1.16.

G.2 Terms and definitions

For the purposes of this Annex, the following terms and definitions apply.

G.2.1
fastened closed position
position in which the moving component is resting against the frame or compresses the gaskets on all sides, and the hardware is effectively engaged

G.2.2
closed position
position in which the moving component is resting against the frame or the gaskets on all sides, and the hardware is unlocked

G.2.3
open position
position in which the moving component is in a defined aperture or the maximum opening of the operated window

G.2.4
reversed position
position in which the moving component has been rotated past the open or opening positions until the internal and external faces of the moving component are inverted to a restricted reversed position

G.2.5
limiting restrictor
device intended to limit the movement of a moving component to a predetermined position or positions

G.2.6
locked situation for windows with automatic engaging devices
for windows with automatic engaging devices the situation after reaching the closed position in the usual operating mode and during the test, the latch or locking/closing devices engage automatically, in which case no additional locking or closing device will be engaged

G.2.7
locked situation for windows without automatic engaging devices
for windows without automatic engaging devices the situation after reaching the closed position in the usual operating mode and during the test, the locking/closing device will be engaged by means of the operating equipment at the end of each closing cycle

G.3 General

G.3.1 General requirements

All the requirements specified in the general part of this standard are to be applied to side-hung and top-hung windows and door-height windows, provided no deviating stipulations are listed in this Annex G.

Roof windows are to be installed in the test apparatus at an angle of 45°.

G.3.2 Limiting restrictors

Where a window has either a releasable or multiple limiting restrictor/restrictors, an additional ventilation position (larger than the restricted position) shall be tested as a minor mode of operation. If the moving component can be reversed, this operation mode shall be tested as a cleaning and maintenance mode of operation.

G.3.3 Main mode of operation

The open position shall be limited to the following:

— for systems without limiting restrictor; (45 +0/- 3)° movement from the closed position with a maximum of 600 mm opening from the fully closed position (measured as a chord across the opening and between the nearest adjacent edges of the sash and frame) or

— for systems with limiting restrictor; to the stopping position of any limiting restrictor device if this occurs at less than 45° or 600 mm; where additional stop positions are added these are not considered as the main mode of operation

G.3.4 Minor mode of operation

The open position shall be limited to the following:

— for systems without limiting restrictor; (45 +0/-3)° movement from the closed position or

— for systems with releasable limiting restrictor; with the restrictor unengaged (45° +0/-3)° movement from the closed position.

G.3.5 Cleaning and maintenance mode of operation

The reversed position can be considered to be a cleaning and maintenance mode of operation.

The reversed position is:

— the predetermined position of the reverse restrictor or

— 100 mm before the end of the fully reversed position.

G.4 Testing

G.4.1 Test order

The test order shall be arranged appropriately in accordance with G.4.2.

G.4.2 Cycles

G.4.2.1 General

The rest time in accordance with 5.4 shall be applied. If the hinges have a problem of overheating the rest time can be extended up to 8 s between two cycles.

G.4.2.2 Minor mode of operation

If a minor mode of operation in accordance with G.3.4 is applicable, the cycles for the minor mode of operation in accordance with 7.6.1 shall be carried out with the following cycle sequence:

a) fastened closed position;

b) closed position;

c) open the moving component in accordance with 7.3 into a position in accordance with G.3.4;

d) closed position in accordance with 7.3;

e) fastened closed position.

G.4.2.3 Main mode of operation

If the cycles for the minor mode of operation have already been carried out, the number of cycles for the main mode of operation shall be reduced by the number of the cycles for the minor mode of operation. The cycles for the main mode of operation shall be carried out with the following cycle sequence:

a) fastened closed position;

b) closed position;

c) open the moving component in accordance with 7.3 into a position in accordance with G.3.3;

d) closed position in accordance with 7.3;

e) fastened closed position.

G.4.2.4 Cleaning and maintenance mode of operation test

If a cleaning and maintenance mode of operation in accordance with G.3.5 is applicable, the cycles for the cleaning and maintenance mode of operation shall be carried out with the following cycle sequence. The number of cycles shall be 2 % of the total number of cycles required up to a maximum of 250 cycles.

This test shall be carried out with moderate velocity. The reference velocities in accordance with Table 1 do not apply to this test.

Where suitable test equipment is not available for this test, the test can be carried out manually:

a) open position;

b) reversed position;

c) open position.

Annex H
(normative)

Test procedures for side-hung pedestrian doorsets excluding power operated doors

H.1 Scope

The test procedures described in this Annex apply to manually operated side-hung single and double action pedestrian doorsets being either single leaf or double leaf pedestrian doorsets. Included in this Annex are also pedestrian doorsets in escape routes or fire resisting and/or smoke control pedestrian doorsets or combinations of such pedestrian doorsets, e.g. a fire resisting door being intended for use in an escape route.

H.2 Terms and definitions

For the purposes of this Annex, the terms and definitions given in EN 12519:2004 and EN 14600:2005, and the following apply.

H.2.1
doorset
complete unit consisting of a door frame and a door leaf or leaves, supplied with all essential parts

H.2.2
striking plate
plate attached to the frame or the secondary leaf to keep the latch or lock bolts

H.2.3
door leaf
hinged, pivoted or sliding part of a pedestrian doorset

H.2.4
active leaf
leaf of a multi-leafed door, intended to be moved first to provide opening

H.2.5
inactive leaf
leaf of a multi-leafed door, intended to be moved after the active leaf

H.2.6
side-hung pedestrian doorset
hinged or pivoted pedestrian doorsets

H.2.7
closed position
position in which the moving part of the pedestrian doorset is resting against the frame or weather seal on all given sides, and the fastening system is not engaged

H.2.8
closed and fastened position
position in which the moving part of the pedestrian doorset is resting against the frame or compressed weather seal on all given sides and the fastening system is engaged, e.g. latched

H.2.9
closed, fastened and locked position
position in which the moving part of the pedestrian doorset is resting against the frame or weather seal on all given sides and the fastening system is fully engaged (optionally latched and locked and/or clenched, e.g. by key or handle)

H.2.10
door coordinating device
mechanism which ensures the correct sequence of closing of double leaf single action pedestrian doorsets with rebated meeting stiles so that the inactive leaf always closes before the active leaf

H.2.11
carry bar
component that ensures, in the case of the inactive leaf being operated first, that the active leaf is moved beyond the waiting position and that is installed on double-leaf pedestrian doorsets with rebated meeting stiles in connection with door-coordinating devices

Note 1 to entry: See EN 1158.

H.3 General

H.3.1 Introduction

All requirements specified in the main part of this standard are to be applied to side hung single and double action pedestrian doorsets, unless specified otherwise in this Annex.

This Annex describes procedures for testing the mechanical resistance to repeated opening and closing of manually operated side hung single and double action pedestrian doorsets in order to verify that such pedestrian doorsets are suitable to be used for the specified number of cycles.

For different testing procedures, clearly defined closing conditions of the pedestrian doorsets are required.

H.3.2 Quantity of cycles for double leaf pedestrian doorsets

Table H.1 — Quantity of cycles on the leaves of a double leaf door with rebated meeting stiles

Door function	Active leaf	Inactive leaf
Pedestrian doorsets with or without self-closing device on the active leaf, excluding on escape routes	100 % with inactive leaf in closed and fastened position	10 % with active leaf held-open
Pedestrian doorsets on escape routes with or without self-closing device on the active leaf	100 % with inactive leaf in closed and fastened position	10 % Both leaves opened via the inactive leaf
Pedestrian doorsets with self-closing and door coordinator device	5 % both leaves opened via the inactive leaf 5 % first opening of the active leaf followed by opening of the inactive leaf	
	90 % opening of the active leaf with the inactive leaf in the closed and fastened position	

H.3.3 Range of direct application of pedestrian doorsets with self-closing devices

Test results of controlled door closing devices with folding arm can be transferred to products with slide rail, if the door closer power size is equal or less and the closer body is in the same position.

H.3.4 Special conditions for testing fire resistant and/or smoke control side hung pedestrian doorsets

For fire resistant and/or smoke control side hung pedestrian doorsets the requirements and failure criteria are given in EN 14600.

Adjustment for fire resistant and/or smoke control side hung pedestrian doorsets is not allowed.

H.3.5 Single action side-hung pedestrian doorsets with self-closing device

When applying uncontrolled door closing devices the closing moment should be adjusted according to prEN 15887:2008, Table 1. The closing velocity results from this adjustment.

When applying controlled door closing devices the closing moment has to be adjusted according to EN 1154:1996, Table 1.

It shall be ensured that the door leaves close in an even, controlled manner.

The overall closing time from an angle of 90° to 0° shall be (5 ± 2) s, although 5 s is the preferred value. In case of door width >1 600 mm the closing time shall be adjusted as specified by the door manufacturer.

Delayed closing mechanisms and hold-open devices shall be switched off during the resistance to repeated opening and closing test.

The door closer can be equipped with a back check function. If such option is specified for the door closer, the back check function shall be tested and evaluated in accordance with the relevant clauses of EN 1154 but with the exception that the back check function shall be tested up to a 20 % share of test cycles as intended for the door set.

If the hold-open device cannot be switched off, the door may only be opened up to 5° before the start of the hold-open position in the resistance to repeated opening and closing test.

The latch control may be switched on to overcome latches and door gaskets.

H.3.6 Double leaf, single action pedestrian doorsets not intended for use in escape routes

The active leaf is operated to the open position as described in 7.5, followed by the inactive leaf. The closing operation starts with the inactive leaf moving first.

If the specimen is equipped with a mechanism to regulate the closing sequence, it shall operate normally throughout the test.

H.3.7 Single or double leaf, single action pedestrian doorsets for use in escape routes

The operating force shall comply with EN 1125 or EN 179. The operating forces of doorsets in escape routes should comply with FprEN 13637.

For double leaf where emergency or panic exit devices are fitted on both, the active and inactive leaves, the operating device on the inactive leaf shall be actuated first and the leaf opened to (90 +0/–10)°. For the test it is necessary that the active leaf is opened by the action of the inactive leaf in such a manner that both leaves are able to close properly. When using door coordinating devices (see EN 1158), the inactive leaf shall move

the active leaf to the minimum waiting position. This may require the use of carry bars. The closing operation starts with the inactive leaf moving first if the door is equipped with a door coordinator device.

H.3.8 Double or single leaf pedestrian doorsets with double-action operation

The leaf or leaves of double action pedestrian doorsets shall be tested in both directions, either in cycles or part cycles for each direction or by a cycle in opposite directions.

H.4 Testing

H.4.1 Test order

H.4.1.1 Single leaf side-hung pedestrian doorsets

The following sequences shall be carried out with the specified number of cycles:

a) Initial position: The initial position of the pedestrian doorsets moving component is the relevant closed condition as defined in H.2.

b) Standby position: The fastening system is brought into the unlatched position via the operating device (e.g. the door handle) attached to the operating equipment. The operation is carried out with moderate velocity as intended in use. In the standby position, the leaf is still in its closed position but free to be opened.

c) Opening cycle for doorsets without self-closing devices: On completion of a rest time of not more than 1 s, the door leaf is then moved via the operating equipment with a reference velocity in accordance with Table 1 (Rotatory) in 5.3.1 seconded into motion and is brought to a halt as described in 7.3.

d) Opening cycle for doorsets with self-closing devices: On completion of a rest time of not more than 1 s, the door leaf is then accelerated via the operating equipment to an opening angle of maximum 50° at such a rate that the door leaf will achieve an opening angle of 90° without further acceleration by the operating equipment.

e) Closing cycle: On completion of the rest time, the moving component is then moved back via the operating equipment with a reference velocity in accordance with Table 1 (rotatory), within $5\ ^{+5}_{-0}$ mm before reaching the closed-position. On reaching the relevant closed condition is then followed by the rest time.

f) On completion of the rest time, the next cycle starts.

H.4.1.2 Double leaf side-hung pedestrian doorsets without self closing devices

The active leaf has to be tested as defined under H.4.1.1 with the specified cycle quantity according to Table H.1:

The following sequences shall be carried out in accordance with Table H.1 on the inactive leaf:

a) Initial position: The initial position of the active leaf is the opened position at a min. of 90°. In this position the active leaf is fixed. The inactive leaf is in the relevant closed condition as defined in H.2.

b) Standby position: The fastening system, if any, of the inactive leaf is brought into the closed position via the operating device attached to the operating equipment. The operation is carried out with moderate velocity as intended in use. In the standby position, the leaf is still in its closed position but free to be opened.

c) Opening cycle: On completion of a rest time of not more than 1 s, the door leaf is then moved via the operating equipment with a reference velocity in accordance with Table 1 (Rotatory) and is brought to a halt as described in 7.3.

d) Closing cycle with automatic fastening system: On completion of the rest time, the moving component is then moved back via the operating equipment with a reference velocity in accordance with Table 1 (Rotatory), within $5\ ^{+5}_{-0}$ mm before reaching the closed-position. On reaching the closed-position the fastening system has to be automatically engaged, allowed by the rest time.

e) Closing cycle with manual fastening system: On completion of the rest time, the moving component is then moved back via the operating equipment with a reference velocity in accordance with Table 1 (Rotatory) and has to be reached at an opening angle of at least 30° and held up to 20° and then is brought to a halt at the closed position in a jerk-free and jolt-free manner. On reaching the closed-position the fastening system has to be engaged by the operating equipment, allowed by the rest time.

f) On completion of the rest time, the next cycle starts.

H.4.1.3 Double leaf side-hung pedestrian doorsets with self-closing devices

The active leaf has to be tested as defined in H.4.1.1 with the specified cycle quantity according to Table H.1:

The following sequences shall be carried out in accordance with Table H.1 on the inactive leaf:

a) Initial position: The initial position of the active leaf is the opened position at (90 ± 5)°. In this position the active leaf is fixed. The inactive leaf is in the relevant closed condition as defined in H.2.

b) Standby position: The fastening system, if any, of the inactive leaf is brought into the closed position via the operating device attached to the operating equipment. The operation is carried out with moderate velocity as intended in use. In the standby position, the leaf is still in its closed position but free to be opened.

c) Opening cycle: On completion of a rest time of not more than 1 s, the door leaf is then moved via the operating equipment with a reference velocity in accordance with Table 1 (Rotatory) and is brought to a halt.

d) Closing cycle with automatic fastening system: After the greatest opening angle has been reached the closing cycle is initiated by the door closer immediately, without a rest time. The moving component is moved back via the self-closing device with a reference velocity in accordance with Table 1 (Rotatory). The self-closing device has to be adjusted as described in H.3.5. On reaching the closed-position the fastening system has to be automatically engaged, followed by the rest time.

e) Closing cycle manual fastening system: After the greatest opening angle has been reached the closing cycle is initiated by the door closer immediately, without a rest time. The moving component is then moved back via the self-closing device with a reference velocity in accordance with Table 1 (Rotatory). The self-closing device has to be adjusted as described in H.3.5. On reaching the closed-position the fastening system has to be engaged by the operating equipment, followed by the rest time.

f) On completion of the rest time, the next cycle starts.

H.4.2 Range of direct application of pedestrian doorsets with fire resistance and/or smoke control characteristics

The direct range of application as described in EN 1634-1:2008, 13.1 and 13.2, can be applied to the products. EN 14600:2005, 4.10, applies with regard to permissible modifications in the design of tested doorsets and openable windows.

H.4.3 Direct applications also applicable to product variations with different sizes or masses

The durability of self-closing and/or repeated opening and closing shall be performed with the largest and heaviest variation of the particular product type. Therefore the product's performance is also applicable to smaller and lighter variations of the product.

H.4.4 Additional failure criteria

If during the maintenance and measurement checks the relevant closing conditions are not achieved the test fails.

Annex I
(normative)

Test procedures for power-operated (automatic) side-hung single action pedestrian doorsets

I.1 Scope

The test methods described in this annex apply to power-operated single action single- or double-leaf pedestrian doorsets.

I.2 Terms and definitions

I.2.1
closed position
position in which the moving part of the pedestrian doorset is resting against the frame or on all sides of the weatherseal and the fastening system, if any, is automatically engaged or locked

I.2.2
automatic operator for side-hung pedestrian doors
unit comprising motor, control system and all other electrical, electronic and mechanical components required to power a side-hung door

I.3 General

The requirements laid down in the main part of this standard apply in their entirety to power-operated side-hung single action pedestrian doorsets, unless otherwise specified in this annex.

This annex describes methods of testing the mechanical durability of power-operated side-hung single action pedestrian doorsets to check whether such pedestrian doorsets are suitable for use over the specified number of cycles.

When using automatic operators for side-hung pedestrian doorsets with an adjustable closing moment, the latter shall be set in accordance with EN 1154.

I.4 Testing — Test order

I.4.1 Side-hung single-leaf pedestrian doorsets

The following sequences shall be carried out with the specified number of cycles:

a) Initial position: The initial position of the moving component of the pedestrian doorset is the closed condition.

b) Standby position: The fastening system of the door leaf is brought into the unlatched position/unlocked position by a control signal from the door operator. In the standby position, the leaf is still in its closed position but is free to be opened.

c) Opening cycle: The door leaf is opened to an angle of 90° by the automatic door operator within (5 + 2) s.

d) Closing cycle: On completion of the 5 s rest time, the door leaf is moved into the closed position by means of the automatic door operator within (5 + 2) s. In case of door width >1 600 mm the opening and closing time shall be adjusted as specified by the door manufacturer.

The next cycle begins after a rest time not exceeding 2 s.

I.4.2 Side-hung double-leaf pedestrian doorsets with door coordinating device

The resistance to repeated opening and closing of power-operated side-hung double-leaf pedestrian doorsets with door coordinator devices shall be tested in accordance with EN 1158:1997, 7.2.7.

Bibliography

[1] EN 1634-1:2008, *Fire resistance and smoke control tests for door, shutter and openable window assemblies and elements of building hardware — Part 1: Fire resistance tests for doors, shutters and openable windows*

[2] FprEN 13637, *Building hardware — Electrically controlled exit systems for use on escape routes — Requirements and test methods*

[3] prEN 15887:2008, *Building hardware — Uncontrolled Door Closing Devices for single action doors — Requirements and test methods*

[4] prEN 16034, *Pedestrian doorsets, industrial, commercial, garage doors and windows — Product standard, performance characteristics — Fire resistance and/or smoke control characteristics*

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