BS EN 1906:2012

BSI Standards Publication

Building hardware — Lever handles and knob furniture — Requirements and test methods

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National foreword

This British Standard is the UK implementation of EN 1906:2012. It supersedes BS EN 1906:2010 which is withdrawn.

BSI, as a member of CEN, is obliged to publish EN 1906:2012 as a British Standard. However, it should be noted that the UK committee voted against the adoption of this standard during the Unique Acceptance Procedure, primarily because this revision of EN 1906:2010 introduces 6 new classifications for fire testing in Clause 4.1.5, which were not agreed by Working Group WG4.

The UK participation in its preparation was entrusted to Technical Committee B/538/4, Building hardware.

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

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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Compliance with a British Standard cannot confer immunity from legal obligations.

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Schlösser und Baubeschläge - Türdrücker und Türknäufe - Anforderungen und Prüfverfahren

This European Standard was approved by CEN on 16 March 2012.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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Foreword

This document (EN 1906:2012) 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of an identical text or by endorsement, at the latest by November 2012, and conflicting national standards shall be withdrawn at the latest by November 2012.

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 1906:2010.

Contribution to the preparation of this standard has been made by the European manufacturers' organisation "ARGE".

This document is part of a series of European Standards dedicated to building hardware products.

Compliance of a set of lock or latch furniture with this European Standard means that it conforms to requirements for normal use, for safety in use and for safety in case of fire.

Normative and informative annexes to this document are indicated in the contents.

Compliance with this European Standard ensures a margin of strength in excess of that needed for normal operation. Additional requirements are necessary for special safety furniture used in situations where there is a high risk of failure. Since special safety furniture is not essential in every situation, this European Standard provides additional safety requirements (see 5.13) which are only necessary when the manufacturer claims it essential that the safety furniture conform to these requirements.

This document states five grades of security. Grade 0 is in accordance with requirements specified in the main part of this document. Grades 1 to 4 are specified in accordance with requirements for security lock furniture for use on burglary-resistant doors (see Annex A). These additional security requirements are necessary only when the manufacturer claims that products need have a high level of security, which is not essential in every situation.

The suitability of lock or latch furniture for use on fire/smoke door assemblies is determined by fire performance tests in addition to the performance tests specified by this standard. Since suitability for use on fire/smoke door assemblies is not essential in every situation, the manufacturer has the option of stating whether the furniture is claimed to conform to these additional requirements or not. If such a claim is made, the additional requirements given in Annex C are necessary.

Annex C refers to all kinds of lock or latch furniture for use on fire/smoke door assemblies, and their use on single-leaf or double-leaf doors.

A product conforming to this standard can also be part of an exit device in accordance with EN 179.

In order to claim conformance to EN 1906 all relevant requirements of Table 1, Main test parameters, should be met and declared.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, 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.

1 Scope

This European Standard specifies test methods and requirements for spindle and fastening elements, operating torques, permissible free play and safety, free angular movement and misalignment, durability, static strength and corrosion resistance for sprung and unsprung lever handles, knobs for doors, push pads and similar devices in combination with backplates or roses operating latches.

This European Standard is applicable only to lever handles and knobs that operate a latch or a lock and other devices.

It specifies four categories of use according to frequency and other conditions of use.

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 314-2:1993, *Plywood — Bonding quality — Part 2: Requirements*

EN 636:2003, *Plywood — Specifications*

EN 1154:1996+A1:2002, *Building hardware — Controlled door closing devices — Requirements and test methods*

EN 1634-1, *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*

EN 1634-2, *Fire resistance and smoke control tests for door, shutter and openable window assemblies and elements of building hardware — Part 2: Fire resistance characterisation test for elements of building hardware*

EN 1634-3, *Fire resistance and smoke control tests for door and shutter assemblies, openable windows and elements of building hardware — Part 3: Smoke control test for door and shutter assemblies*

EN 1670:2007, *Building hardware — Corrosion resistance — Requirements and test methods*

EN 12209, *Building hardware — Locks and latches — Mechanically operated locks, latches and locking plates — Requirements and test methods*

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

ISO 10899, *High-speed steel two-flute twist drills — Technical specifications*

3 Terms and definitions

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

3.1
backplate
element generally, but not essentially, rectangular in plan whose purpose is, firstly, functional, providing a bearing for the rotation of a door lever handle or knob and the means of attachment to the door; and, secondly, decorative, working as a trim plate to cover holes provided in the door for the passage of spindles, keys or lock cylinders

Note 1 to entry: See Figure 1a.

3.2
baseplate
component of an assembly of two parts that fit together to form a backplate or rose, which provides the bearing and means of fixing the assembly to the door

Note 1 to entry: See Figure 1b.

3.3
door furniture
combination of lever handles or knobs on backplates or roses for the purpose of operating latches or locks

3.4
door knob
fixed or rotatable operating element, usually designed to be circular in plan, but which may be non-circular, with a maximum offset of 75 mm from its axis of rotation; and which engages a spindle passing through the door and operating then a latch mechanism when rotated, so that the latch bolt is withdrawn to unlatch the door; or alternatively, is fixed against rotation and is used to pull the door to the closed position and thereby re-latch the door

Note 1 to entry: See Figure 2.

3.5
door lever handle
rotatable operating element designed as a lever with a length from its axis of rotation to its free end that exceeds 75 mm, and which engages a spindle passing through a door

3.6
emergency release
facility provided on the external plate that enables the door to be opened in case of emergency

Note 1 to entry: See Figure 3.

3.7
set of door furniture
two lever handles or knobs with two lockplates or latchplates (or, alternatively, roses and escutcheons), complete with a spindle and fastening elements to operate the latch

3.8
entrance set
set with a lever handle on the one side of the door and a fixed knob or bar or no handle on the other

3.9
fire protection inlay
metal sheet inlay under the escutcheon and in the lever handle, which prevents fire going through after melting of the cover or escutcheon

Note 1 to entry: Materials with a melting point higher than 1 000 °C are used.

3.10
fireproof core
fireproof material (typically steel) inside a lever handle which enables the handle function to remain operable after a fire

3.11
escutcheon
surround with a shaped hole to accommodate a key or a lock cylinder, with or without a pivoted cover plate, intended primarily to protect the door leaf from abrasion caused by keys

Note 1 to entry: See Figure 2.

3.12
external plate
backplate or rose that is fitted on the external face of a door

Note 1 to entry: See Figure 3.

3.13
fixed spindle system
system in which the spindle is fastened to both lever handles or both knobs of a lockset or latchset (often without any additional fixing of the handles or knobs to the backplates or roses), which enables the rotation of the follower of the lock or latch to withdraw the latch bolt; and which enables adaptation for different thicknesses of doors, connects the lever handle or knob to the spindle, and transmits imposed axial pulling forces to the opposite face of the door

3.14
floating spindle system
system in which the spindle is not attached to either of the lever handles or knobs of a lockset or latchset, but has additional fixing of the lever handles or knobs to the backplates or roses; and which enables the rotation of the follower of the lock or latch to withdraw the latchbolt; and which enables adaptation for different thicknesses of doors

Note 1 to entry: This system does not transmit imposed axial pulling forces to the opposite face of the door.

3.15
radial split spindle system
system in which the spindle is split across the radial X-section which is normal to its axis of normal operation, including door furniture spindle suitable for emergency exit-entrance door locks

3.16
half set
single lever or knob attached to a plate or rose which enables operation of the lock or latch from one side of the door only

3.17
indicator
device that is visible from the exterior of the door to indicate whether the door is locked or unlocked

3.18
internal plate
backplate or rose that is fitted on the internal face of a door

Note 1 to entry: See Figure 3.

3.19
latchplate
backplate adapted for use with a latch and having no keyhole or cylinder aperture

3.20
lockplate
backplate having an aperture for use with a cylinder or lever key

3.21
cylinder protection plate
plate whose function is to protect the cylinder plug and its components against violent attack

3.22
rose
element generally circular, but which may have equi-axial or approximately equi-axial shapes such as square or octagonal, that otherwise has the same features as a backplate

Note 1 to entry: See Figure 2.

3.23
security furniture
device which provides added resistance to the lock and/or cylinder against physical attack

3.24
set of mortice latch furniture
two door lever handles or knobs with two latchplates or roses, complete with a spindle and fastening elements

3.25
set of mortice lock furniture
two door lever handles or knobs with two lockplates (or, alternatively, roses and escutcheons), complete with a spindle and fastening elements

Note 1 to entry: See Figure 2.

3.26
special safety furniture
furniture where the strength of the fixing of the lever, lever handle or knob to the backplate and/or spindle, and the strength of the fixing of the backplate to the door, combine to provide a robust attachment to withstand a heavy force in any direction of removing the lever, lever handle or knob from the door

3.27
spindle
bar, usually square in cross-section, that engages with a follower

3.28
spring-assisted furniture
lever handle or knob furniture, usually exceptionally heavy in design, that incorporates a spring which assists the return of the handle to its intended "at-rest" position but which may not necessarily have sufficient torque to return it fully

Note 1 to entry: For exceptionally heavy lever handles, it is difficult to design springs that have sufficient torque to return the handles to their "at-rest" position and also have an adequate working life. For reasons relating to designs of springs, the operating angle of such lever handles is usually restricted to 40°, and they are used with latches whose bolts retract fully at this angle of operation. When in use, the combined action of the lever handle spring and the latch spring is sufficient to return the lever handle to its intended "at-rest" position.

3.29
Sprung furniture
door furniture that incorporates a spring which fully returns the lever handle or knob to its intended "at-rest" position after operating the latch

Note 1 to entry: Sprung furniture frequently includes an internal stop to prevent rotation beyond the intended "at-rest" position, but this feature is not essential if the furniture is used with a latch mechanism incorporating its own stop.

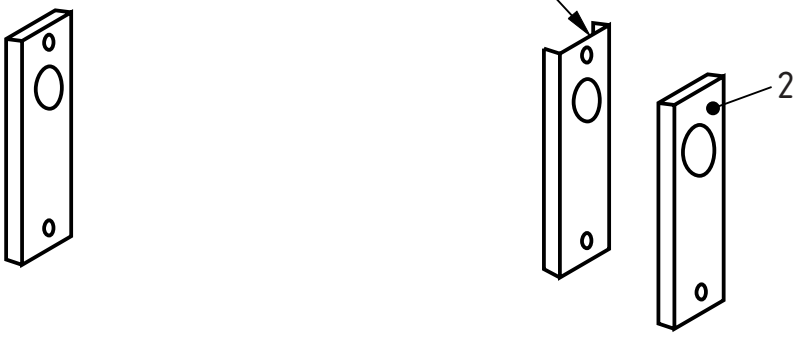
3.30
thumb turn
small T-handle, knob or other handle fitted on the internal plate of a set of bathroom lock furniture that operates a lock deadbolt to provide privacy rather than high security

Note 1 to entry: See Figure 3.

3.31
trim plate
component of an assembly of two parts that fit together to form a backplate or rose which is fastened to the baseplate as a decorative cover

Note 1 to entry: See Figure 1b).

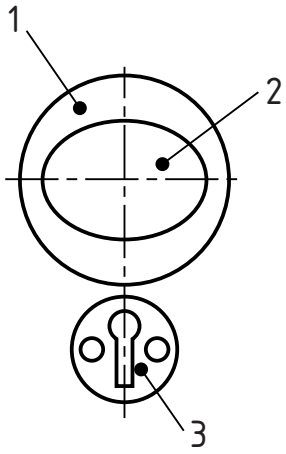
3.32
assessment
documented expert opinion based on technical data from an original test, taking into account relevant factors such as materials and design



a) One part backplate **b) Two part backplate**

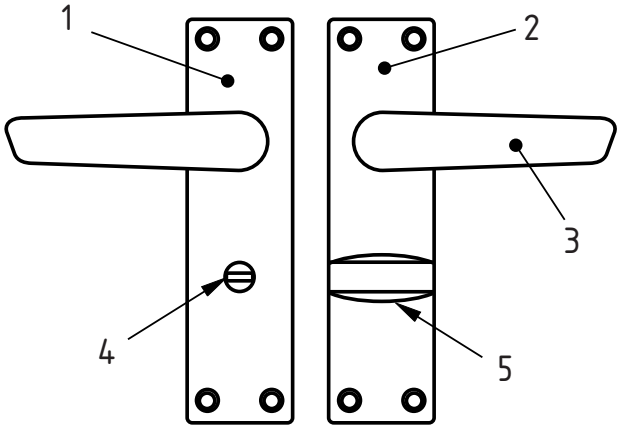
Key
1 Baseplate
2 Trim plate

Figure 1 — Illustrations of backplates



Key
1 Rose
2 Door knob
3 Escutcheon

Figure 2 — Set of lock furniture



Key
1 External plate
2 Internal plate
3 Lever handle
4 Emergency release
5 Thumb turn

Figure 3 — Bathroom lockset

4 Classification

4.1 Coding system

4.1.1 General

For the purpose of document, lever handles and knobs for doors on backplates or roses shall be classified in accordance with the eight digit coding system specified in 4.1.2 to 4.1.9.

4.1.2 Category of use (first digit)

Four grades of use are identified:

— grade 1: medium frequency of use by people with a high incentive to exercise care and with a small chance of misuse, e.g. internal residential doors;

— grade 2: medium frequency of use by people with some incentive to exercise care but where there is some chance of misuse, e.g. internal office doors;

— grade 3: high frequency of use by public or others with little incentive to exercise care and with a high chance of misuse, e.g. public office doors;

— grade 4: high frequency of use on doors which are subject to frequent violent usage, e.g. football stadiums, offshore installations (oil rigs), barracks, public toilets, etc.

4.1.3 Durability (second digit)

Two grades of durability are identified:

— grade 6: medium frequency of use: 100 000 cycles;

— grade 7: high frequency of use: 200 000 cycles.

4.1.4 Door mass (third digit)

No classification.

4.1.5 Fire resistance (fourth digit)

Five grades of fire resistance are identified and shall receive the extension ”1” for an optional door cycle test:

— grade 0: no performance determined;

— grade A: for use on smoke-control doors;

— grade A1: for use on smoke-control doors, tested with 200 000 cycles on a test door;

— grade B: for use on smoke-control and fire-resistant doors;

— grade B1: for use on smoke-control and fire-resistant doors, tested with 200 000 cycles on a test door;

— grade C: for use on smoke-control and fire-resistant doors with requirements for fire protection inlays in backplate, rose and escutcheon;

— grade C1: for use on smoke-control and fire-resistant doors with requirements for fire protection inlays in backplate, rose and escutcheon, tested with 200 000 cycles on a test door;

— grade D: for use on smoke-control and fire-resistant doors with requirements for special core in the handle/knob;

— grade D1: for use on smoke-control and fire-resistant doors with requirements for special core in the handle/knob, tested with 200 000 cycles on a test door.

NOTE See Annex C.

4.1.6 Safety (fifth digit)

Two grades of safety are identified:

— grade 0: normal use;

— grade 1: safety applications.

NOTE Standard furniture should conform to 5.1 to 5.12. Safety furniture should conform to 5.1 to 5.13.

4.1.7 Corrosion resistance (sixth digit)

Six grades of corrosion resistance are identified in accordance with EN 1670:2007 as follows:

— grade 0: no performance determined;

— grade 1: mild resistance;

— grade 2: moderate resistance;

— grade 3: high resistance;

— grade 4: very high resistance;

— grade 5: extremely high resistance.

4.1.8 Security (seventh digit)

Five grades of security are identified:

— grade 0: no performance determined;

— grade 1: mild burglary resistance;

— grade 2: moderate burglary resistance;

— grade 3: high burglary resistance;

— grade 4: extra high burglary resistance.

Grades 1, 2, 3 and 4 are determined in accordance with the requirements and optional tests of Annex A.

4.1.9 Type of operation (eighth digit)

Three types of operation are identified:

— type A: spring-assisted furniture;

— type B: spring-loaded furniture;

— type U: unsprung furniture.

4.2 Example of classification

1	6	—	0	0	1	0	U

This classification example denotes furniture for use by people with a high incentive to use care in a domestic situation, with durability grade 6 for medium frequency of use. There is no classification for door mass, it is not approved for fire/smoke doors, nor for safety applications and has a mild resistance to corrosion for internal use. It is not suitable for use on burglary-resistant doors and is of the unsprung type.

5 Requirements

5.1 General

Sets of lock or latch furniture are in general similar executed groups. From this group the expected weakest assembly is subjected to the sequence of tests specified in 6.1, and listed in Table 1 using the test apparatus in accordance with 6.2 and the methods specified in Clause 7 and shall conform to 5.2 to 5.14.

Results of a sequence of tests may be found to be applicable or conform to sets which are tested in another sequence of tests. If sets that are of equivalent construction on both sides of the door have been endurance tested, these sets cannot be passed on a one-sided movable knob set or lever handle set.

For entrance sets, the equivalent set of lock or latch furniture shall be endurance tested to verify that the lever handles or knobs conform to the durability requirements. The entrance set assembly shall be tested in accordance with all other appropriate tests. Furniture that is made available with a lever one side and a knob on the other side shall be endurance tested accordingly.

Sets of furniture shall be classified in grades 1 to 4 (see 4.1.2) in regard to performance requirements specified in 5.2 to 5.13.

NOTE 1 If door furniture is to perform satisfactorily in service, it is essential that it is correctly selected for the application for which it is to be used and fitted strictly in accordance with the manufacturer's recommendations.

Materials in products shall not release any dangerous substances in excess of the maximum levels specified in the European material standards.

NOTE 2 National regulations may also apply.

Table 1 — Main test parameters

Test	Subclause	Figure	Description	Category of use acceptance criteria			
				grade 1	grade 2	grade 3	grade 4
1	5.2 and 7.3.1	—	Check of fastening elements and spindle	yes/ no	yes/ no	yes/ no	Yes/ no
2	5.4 and 7.3.2	B.3	Axial strength				
			— Axial strength $^{+5}_{0}$ % at (50 ± 1) mm	300 N	500 N	800 N	1 000 N
			— pre-load ± 1N at (50 ± 1) mm	15 N	15 N	15 N	15 N
			— permanent deformation at (75 ± 2) mm	≤ 2 mm	≤ 2 mm	≤ 2 mm	≤ 2 mm
3	5.5 and 7.3.3	B.8	Free play "at-rest" and then at (60 ± 5)° or maximum of design				
			— force ± 1N at (50 ± 1) mm	15 N	15 N	15 N	15 N
			— total movement at (75 ± 2) mm	≤ 10 mm	≤ 10 mm	≤ 6 mm	≤ 6 mm
			Safety requirements	yes	yes	yes	Yes
4	5.6 and 7.3.4	B.9	Free angular movement				
			— force ± 1N at (50 ± 1) mm	15 N	15 N	15 N	15 N
			— misalignment measured at (75 ± 2) mm	≤ 10 mm	≤ 10 mm	≤ 5 mm	≤ 5 mm
5	5.7 and 7.3.5	—	Operate-moment and return-moment				
			Unsprung lever handles				
			— operate moment	-	-	-	-
			— return-moment	≤ 0,6 Nm	≤ 0,6 Nm	≤ 1,5 Nm	≤ 1,5 Nm
			Unsprung knobs				
			— operate moment	-	-	-	-
			— return-moment	≤ 0,6 Nm	≤ 0,6 Nm	≤ 0,6 Nm	≤ 0,6 Nm
			Spring assisted lever handles				
			— operate moment	≤ 1,5 Nm	≤ 1,5 Nm	≤ 2,4 Nm	≤ 2,4 Nm
			— return-moment	≤ 0,6 Nm	≤ 0,6 Nm	≤ 1,5 N.M.	≤ 1,5 Nm
			— angle of rotation	≥ 40°	≥ 40°	≥ 40°	≥ 40°
			Spring-loaded lever handles				
			— operate moment	≤ 1,5 Nm	≤ 1,5 Nm	≤ 2,4 Nm	≤ 2,4 Nm
			— return-moment	-	-	-	-
			Limited deviations "at rest" for sets with spring load	± 4°	± 2°	± 1°	± 1°
6	5.8 and 7.3.6	B.6	Endurance test				
			— number of cycles $^{+1}_{0}$ %	100 000	100 000	200 000	200 000
			— force L $^{+5}_{0}$ %	60 N	60 N	100 N	100 N
			— force P $^{+5}_{0}$ %	60 N	60 N	100 N	100 N
			— force R $^{+5}_{0}$ %	12 N	12 N	20 N	20 N
			— limit deviations "at-rest" after test (except for spring assisted levers)	± 4°	± 2°	± 1°	± 1°
7	5.9 and 7.3.7	B.3	Axial strength (repetition of test 2)	Same values as for test 2			
8	5.10 and 7.3.8	B.8	Free play (repetition of test 3)	Same values as for test 3 except for special safety requirements			
9	5.11 and 7.3.9	B.9	Free angular movement (repetition of test 4)	Same values as for test 4			

Table 1 (*concluded*)

Test	Subclause	Figure	Description	Category of use acceptance criteria			
				grade 1	grade 2	grade 3	grade 4
10	5.12 and 7.3.10	—	Torque of return mechanism (repetition of test 5)	Same values as for test 5			
11	5.13 and 7.3.11	B.3	Axial strength $^{+5}_{0}$ % at (50 ± 1) mm optional test applicable to special safety furniture only.	1 500 N	1 500 N	2 500 N	2 500 N
12	5.3 and 7.3.12	B.1	Rotational torque strength — rotational torque ± 5 % — pre-torque ± 0,1 Nm — permanent deformation at (50 ± 2) mm	 20 Nm 1 Nm ≤ 5 mm	 30 Nm 1 Nm ≤ 5 mm	 40 Nm 1 Nm ≤ 5 mm	 60 Nm 1 Nm ≤ 5 mm
13	5.14 and 7.4	—	Corrosion resistance	To conform to the requirements of EN 1670			

NOTE Test 11 can be performed after Test 12.

5.2 Check of spindle and fastening elements

The spindle and fastening elements should be supplied or specified by the manufacturer with every set of lock or latch furniture. The manufacturer should state clearly the door thickness or range of door thicknesses for which the furniture is suitable, and in the case of spring-assisted and spring-loaded furniture, the angle of rotation possible by the design (see 6.2.1.1 and 7.3.1).

5.3 Rotational torque strength

When tested in accordance with 7.3.12, lock or latch furniture shall show no failure of any component and the lever handles or knobs shall still be operational after the test. Lever handles or knobs shall not deform permanently more than 5 mm as measured at (50 ± 2) mm from the axis of rotation by the dial gauge.

5.4 Axial strength of lock furniture or latch furniture and fixing

When tested in accordance with 7.3.2, there shall be no failure of any component, and lever handles or knobs shall still be operational after the test.

After testing, the permanent deformation for lever handles or knobs measured at the reference point (75 ± 2) mm from the axis of rotation shall not increase by more than 2 mm.

5.5 Free play and safety

5.5.1 Requirement for free play

The maximum total movement measured in accordance with 7.3.3 shall not exceed 10 mm for category of use grades 1 and 2, and 6 mm for category of use grades 3 and 4, for lock or latch furniture.

This requirement only applies to lever handles and knobs that will not be driven during the endurance test.

5.5.2 Safety requirements

When the lock or latch furniture is fitted to the test block there shall be no sharp edges that can cause injury.

NOTE This requirement should typically be satisfied by edges that are broken by a chamfer of 0,5 mm maximum × 45° or by a radius of 0,5 mm minimum.

In the area of rotation of the lever handle or knob, the head of any visible fastening element shall be level with or below the surface of the backplate or rose after fitting. However, raised head screws may stand proud of the furniture plate by the domed height of the screw head.

Any fastening element that secures the lever handle or knob to the spindle shall not project above the surface by more than 1 mm after fitting.

The design of lock or latch furniture shall ensure that, after fitting, it is not possible for the fingers of a user to be trapped between lever handle or knob and backplate or rose over the full range of rotation of the lever handle or knob.

5.6 Free angular movement or misalignment

When the furniture is tested in accordance with 7.3.4, the free angular movement or misalignment shall not exceed 10 mm for category of use grades 1 and 2, and 5 mm for category of use grades 3 and 4. This requirement applies to all furniture with either a fixed or a floating spindle.

5.7 Torque of return mechanism

5.7.1 General

When the furniture is tested in accordance with 7.3.5, the lock or latch furniture shall conform to 5.7.2 to 5.7.4.

As sprung and unsprung lever handles and knobs differ in mechanical features of design, different requirements should be applied to each.

5.7.2 Unsprung and spring-assisted lever handles

When the furniture is tested in accordance with 7.3.5.1, the torque required to return the unsprung or spring-assisted lever handle back to its intended "at-rest" position shall be not greater than 0,6 Nm for category of use grades 1 and 2, and not greater than 1,5 Nm for category of use grades 3 and 4.

For spring-assisted lever handles only, the torque required to rotate the lever handle to a minimum angle of 40° from its intended "at-rest" position shall not exceed 1,5 Nm for category of use grades 1 and 2, and 2,4 Nm for category of use grades 3 and 4.

5.7.3 Unsprung knobs

When the furniture is tested in accordance with 7.3.5.2, the torque value in either direction shall be not greater than 0,6 Nm.

5.7.4 Spring-loaded lever handles or knobs

When the furniture is tested in accordance with 7.3.5.3, the torque required to rotate the lever handles or knobs through a maximum of 60° $^{+5^\circ}_{0}$ or through the angle of rotation possible by the design shall not be more than 1,5 Nm for category of use grades 1 and 2, and 2,4 Nm for category of use grades 3 and 4.

After removal of the torque, the lever handle or knob shall return to its recorded "at-rest" position within ± 4° for category of use grade 1, within ± 2° for category of use grade 2, and within ± 1° for category of use grades 3 and 4.

5.8 Durability of mechanism

When the furniture is tested in accordance with 7.3.6, there shall be no failure of any component and the lever handle or knob shall still be operational after the test.

After the test, the "at-rest" position of spring-loaded door furniture when against its stops shall conform to the "at-rest" position recorded before commencing, within ± 4° for category of use grade 1, within ± 2° for category of use grade 2, and within ± 1° for category of use grades 3 and 4. This requirement does not apply to spring-assisted lever furniture.

5.9 Repeat test of axial strength of lock or latch furniture and methods of fixing

After completion of 7.3.6, the lock or latch furniture shall be repeat-tested in accordance with 7.3.7 and shall conform to 5.4.

5.10 Repeat test of free play measurement

After completion of 7.3.7, the free play measured on the lever handle or knob not driven during the endurance test shall be repeat-tested in accordance with 7.3.8 and shall conform to 5.5.1.

5.11 Repeat test of measurement of free angular movement or misalignment

After completion of 7.3.8, the lock or latch furniture shall be repeat-tested in accordance with 7.3.9 and shall conform to 5.6.

5.12 Repeat test of torque of return mechanism

After completion of 7.3.9, the lock or latch furniture shall be repeat-tested in accordance with 7.3.10 and shall conform to 5.7.

5.13 Axial strength for safety furniture (optional)

After completion of 7.3.10, furniture classified as safety furniture shall be subjected to the requirements of 7.3.11. There shall be no failure of any component and the furniture shall remain fixed to the test block. The lever handle or knob need not be operational after completion of the test.

NOTE It is recommended that only furniture conforming to this requirement should be used in situations where there is a high risk of falling, such as for doors at the top of cellar steps or other types of staircases.

5.14 Corrosion resistance

Corrosion resistance shall conform to EN 1670.

The grade of corrosion resistance achieved shall be included in the classification coding specified in 7.4.

All surfaces of the lever handle and knob furniture which are visible when fitted in service shall conform to the acceptance criteria defined in EN 1670.

NOTE 1 Products for internal use should conform to at least grade 1. Products for external use, e.g. entrance doors, should conform to the minimum for grade 3. Other grades can be chosen for special purposes. For example, grades 4 or 5 should be used for products exposed to marine atmospheres or to very polluted industrial environments.

NOTE 2 Products which are intended to develop a natural surface patina (e.g. bronze or brass products) or are intended to be cleaned frequently, are not required to conform to any corrosion requirements.

6 Tests − Sequence and test

6.1 Test sequence

Examine samples before starting the tests to ensure completeness and compliance with the manufacturer's packaging statements and to identify possible damage.

After checking the spindle and fastening elements (see 5.2), a half set of lock or latch furniture shall be fitted to a test block as specified in 6.2.1.1 and shall conform to 7.3.12.

A set of lock or latch furniture, including the half set already submitted to 7.3.2, shall be fitted to a test block as specified in 6.2.1.2. The half set already tested shall be tested in accordance with 7.3.3 to 7.3.12, as appropriate to the type of furniture, and in the sequence specified in Table 1.

Samples that have not been subjected to any of the preceding tests shall be tested for corrosion resistance in accordance with 5.14 and 7.4, and shall conform to the requirements of EN 1670.

6.2 Test apparatus

6.2.1 Fixing to a test block (see Figures B.1 and B.2)

6.2.1.1 After checking that the spindle and fastening elements conform to 5.2, a half-set of lock or latch furniture shall be mounted on a test block of laminated wood (bonding type 1F 20, quality II/II, 19 laminates, see EN 636:2003) or similar quality, as shown in Figure B.1 and Figure B.2.

The dimensions of the test block shall be (300 ± 5) mm × (150 ± 5) mm × (20 ± 1) mm finished thickness.

NOTE 1 Fixings supplied or recommended by the manufacturer should be used.

NOTE 2 If fixings are unsuitable for the 20 mm block thickness, any other suitable means can be used.

The spindle shall be engaged with the lever handle or knob to the minimum recommended by the manufacturer or otherwise to the minimum possible according to the design. It shall pass through a clearance hole in the test block to engage in a fixed reaction plate for a distance of 8 mm $^{+1}_{0}$ mm.

Knobs shall be fitted with a counterbalanced steel bar with a length of (180 ± 10) mm and a diameter of (10 ± 0,5) mm whose centre line intersects the axis of rotation of the knob within a tolerance of 0,5 mm. The vertical plane that contains the bar shall be parallel with the face of the test block within a tolerance of ± 2°.

6.2.1.2 After testing to 7.3.12 and checking for compliance with the requirements of 5.3, a set of lock or latch furniture that includes the half-set already tested shall be mounted on another test block of laminated wood (bonding type 1F 20, quality II/II, 19 laminates (see EN 636:2003) or similar quality) as shown in Figure B.2, in accordance with the manufacturer's instructions.

NOTE Only fastening elements supplied or specified by the manufacturer should be used and the arrangement should be such that the half-set already subjected to 7.3.2 should also be subjected to the subsequent tests.

The dimensions of the test block shall be (300 ± 5) mm × (150 ± 5) mm × (40 $^{+2}_{0}$ mm) finished thickness, although the thickness may be varied to conform to 5.2. The block shall have been morticed and cross-drilled in accordance with Figure B.2 to accommodate the pulley specified in 6.2.3.1. An appropriate pulley shall be fitted to the spindle.

6.2.1.3 A set of lock or latch furniture intended for use on a non-timber door shall be rigidly fastened to an auxiliary fixture that matches as closely as possible the intended material and profile shape of the door on which it is to be used. The auxiliary fixture shall have a length of (300 ± 5) mm and only the fastening elements supplied or specified by the manufacturer shall be used. The auxiliary fixture shall then be rigidly secured to the test apparatus.

The set of lock or latch furniture shall be fitted with the appropriate spindling but without a lock or latch. A suitable pulley shall be fitted to the spindle as specified in 6.2.3.

Once 7.3.3 has commenced, the fastening elements shall not be re-tightened until the completion of 7.3.11 or 7.3.12, as is appropriate, if there is no other information in the service manual from the producer.

6.2.2 Apparatus for strength tests

For the axial strength tests 7.3.2 and 7.3.11, tensile test apparatus is preferred.However, a simple test apparatus like that shown in Figure B.3 can be used as an alternative.

Figure B.1a) illustrates convenient methods of applying the torques required for 7.3.2, 7.3.4, 7.3.5 and 7.3.6.

6.2.3 Apparatus for endurance test

6.2.3.1 Artificial latch mechanism

An artificial latch mechanism shall be used to eliminate the variability inherent in commercially produced latches, the latch action being simulated by cord and weight.

The test apparatus shall incorporate a pulley made from aluminium as shown in Figure B.4. The pulley includes a central hub with a hole no more than 0,1 mm larger than the maximum spindle size. The operating angle shall be (55 ± 5)° from the horizontal centre line.

Additional accurate slots may be incorporated into the pulley to accommodate the fixing bolts of bolt-through door furniture (see Figure B.5).

6.2.3.2 Test apparatus

The test apparatus shall be capable of supporting the test block and attached lock or latch furniture in a secure manner and capable of subjecting it to the required forces. A suitable test apparatus is illustrated in Figure B.6.

The means of rotating the driven lever handle or knob through (55 ± 5)° shall be such that the lever handle or knob can be released suddenly and left to return to the "at-rest" position under the action of a return force. A motor driven cam, with a shape allowing the sudden release of the lever handle or knob, shall be used for this purpose.

For spring-assisted lever handles with a designed operating angle of 40°, the cam shall be such as to release the lever handle at (35 ± 5)°, or, in the case of spring-loaded furniture, at the angle of rotation ± 5° possible by the design.

For unsprung lever handles and for spring-assisted lever handles, the return force shall be12 N for category of use grades 1 and 2, and 20 N for category of use grades 3 and 4. The return force shall act parallel, within ± 3°, to the plane of the test block in an upward direction at an angle of (30 ± 3)° from the vertical.

The return force shall be applied to the lever handle not driven by the cam at a point (50 ± 1) mm from the axis of rotation.

For spring-loaded lever handles, the return force shall be similar in all respects, except that it shall apply a force of (10 ± 0,5) N at a (30 ± 3)° rotation, with a variation not exceeding 2 N at 0° and $55\,^{+5^\circ}_{0}$ at the limit of the rotation allowed by the design.

A counterbalanced bar or other suitable device may be attached to the knob or levers to apply the rotary movement and to trigger the return movement.

A rigid steel stop of 10 mm diameter may be attached to the frame of the test apparatus and positioned (80 ± 1) mm from the axis of rotation of the furniture to arrest levers at the "at-rest" position ± 1°. The test may be done with or without a rigid steel stop, and the way of testing has to be documented.

The "at-rest" position occurs whenever the spindle hole in the lever or knob is square to the horizontal/vertical. This position may be set by reference to the "cord" hole in the pulley (see Figure B.4).

6.2.3.3 Application of test loads

A force "P" shall be applied to one of the lever handles or knobs by a cord carrying a suitable load that passes over a pulley whose axis is (500 ± 10) mm from the face of the test block. The position of the pulley shall be such that when the lever handle or knob is in its "at-rest" position, the cord is perpendicular ± 2° to the plane of the test block (see Figure B.6).

For lever handles, the force shall be applied without shock and in a controlled manner, and at a point (50 ± 1) mm from the axis of rotation of the spindle.

For knobs, the force shall be applied without shock and in a controlled manner, coaxially with the axis of rotation ± 1 mm.

A downward force "L" shall be applied to the pulley, as indicated in Figure B.6.

A suitable bottom pulley is shown in Figure B.7.

Means of repeating the required test cycle for the specified numbers of operations shall be provided in accordance with 7.3.6.

7 Test methods

7.1 General

Out of a batch of three complete lever handle/knob sets, two test specimen are selected and subjected to the following tests:

— eleven performance tests to verify compliance with the requirements listed in 5.2 to 5.12;

— a corrosion resistance test to verify compliance with the requirement given in 5.14.

Test samples shall not be subjected to both sets of tests.

Performance tests, in addition to the above, are required to verify that:

— safety lever handles and knob furniture conform to the requirement given in 5.13;

— burglary-resistant lever handles and knob furniture conform to the requirements given in Annex A;

— fire-resistant lever handles and knob furniture conform to the requirements given in Annex C.

Flow charts of the procedures for each of these tests are shown in Annex D.

It is important to check requirements before performance tests are commenced.

7.2 Acceptance conditions

7.2.1 If each test set conforms to the appropriate requirements of Clause 5, the whole stock from which the samples were taken shall be deemed to conform to this European Standard.

7.2.2 If any one set fails to conform to all the appropriate requirements of Clause 5, the third test sample can be used to repeat-testing in accordance with Clauses 6 and 7.

7.2.3 If more than one set of lock or latch furniture fails to conform to the appropriate requirements of Clause 5, the stock shall be deemed not to conform to this European Standard and shall not be tested further.

7.3 Performance tests

7.3.1 Check of spindle and fastening elements (Test 1)

Before fitting the set of lock or latch furniture to a test block it shall be verified that the spindle and fastening elements supplied conform to requirements of 5.2 and 6.1.

7.3.2 Axial strength of lock or latch furniture and fastening elements (Test 2)

The axial strength of fastening elements shall conform to 5.4.

The sample set of lock or latch furniture shall be mounted on the test block as required by 6.2.1.2 and shown in Figure B.3.

The sample shall be subjected to a pre-load of (15 ± 1) N, followed by a test force applied without shock in a direction away from the test block surface and perpendicular to it ± 2°. The forces shall be applied at a distance of (50 ± 1) mm from the axis of rotation.

Apply the pre-load, measure, and then record the distance from the face of the test block to the underside of the lever handle or knob bar, at a reference point (75 ± 2) mm from the axis of rotation.

Apply the test force in accordance with Table 1. Maintain the test force for 60 s $^{+10\ s}_{0}$ and then slowly reduce it back to the pre-load value of (15 ± 1) N. Re-measure and record the distance from the face of the test block to the reference point on the lever handle or knob bar.

7.3.3 Free play and safety (Test 3)

Free play and safety shall conform to 5.5.1 and 5.5.2.

With the lever handle or knob in its "at-rest" position, apply a force of (15 ± 1) N to the lever handle or knob bar at a point (50 ± 1) mm from the axis of rotation, alternately towards and away from the test block, in a direction perpendicular to the face of the test block ± 5°, as shown in Figure B.8.

Measure and record the maximum total movement between the extreme positions of a reference point (75 ± 2) mm from the axis of rotation, while the forces are applied.

Repeat and record the measurements with the lever handle or knob rotated to a position (60 ± 5)° from the "at-rest" position as shown in Figure B.8, or at the maximum angle of rotation allowed by the design.

7.3.4 Free angular movement or misalignment (Test 4)

Free angular movement or misalignment shall conform to 5.6.

With one lever handle or knob held against rotation, the other lever handle or knob shall be rotated by applying a force of (15 ± 1) N at a point (50 ± 1) mm from the axis of rotation in a parallel plane ± 2° to the face of the test block, as indicated in Figure B.9.

The displacement of the lever handle or knob bar at a point (75 ± 2) mm from the axis of rotation shall be measured and recorded for comparison with the position of the corresponding point on the fixed lever handle or bar.

7.3.5 Torque of return mechanism (Test 5)

7.3.5.1 Unsprung lever handles and spring-assisted lever handles

Unsprung and spring-assisted lever handles shall conform to 5.7.2.

Verify that the lever handle rotates through the required minimum operating angle of 60° for unsprung lever handles or 40° for spring-assisted lever handles.

A torque shall be applied to return the lever handle to its "at-rest" position at 5° and 10° intervals up to 60° or 40°, as appropriate. Measure and record the value of the torque.

For spring-assisted lever handles only, a torque shall be applied to rotate the lever handle to a minimum of 40° from its "at-rest" position. Measure and record the value of the torque.

7.3.5.2 Unsprung knobs

Unsprung knobs shall conform to 5.7.3.

With the knobs in their "at-rest" position, a torque shall be applied in either direction sufficient to rotate the knobs through a minimum angle of 60°. Measure and record the value of this torque.

Remove the torque and apply a torque in the reverse direction sufficient to rotate the knobs back through the original "at-rest" position and then through a further minimum angle of 60°. Measure and record the value of this torque.

7.3.5.3 Spring-loaded lever handles or knobs

Spring-loaded lever handles or knobs shall conform to 5.7.4.

Verify that the lever handle or knob is in the "at-rest" position against its stops. Measure and record this position.

A torque shall be applied to the spindle, knob or lever handle sufficient to rotate it in the normal operating direction. The torque shall be increased until the lever handle or knob has rotated through a minimum angle of 60° or through its designed angle of rotation from the original "at-rest" position. Measure and record the value of this torque.

Remove the torque gradually over a period of 1 s to 3 s. Measure and record the "at-rest" position of the lever handle or knob.

Repeat the test at 10° intervals for angles of rotation between 5° and 60° or of the designed angle of rotation, to verify that the lever handle or knob returns to its original "at-rest" position within ± 1° from any intermediate angle. Record the "at-rest" position for each test interval.

7.3.6 Durability of mechanism (Test 6)

Durability of the mechanism shall conform to 5.8.

Fit the test block to the test apparatus described in 6.2.3.2 and 6.2.3.3 (see Figure B.6) and apply a downwards force "L", an outwards force "P" and a return force “R”, in accordance with Table 1.

An outwards force "P" shall be applied to the lever handle or knob when it is in the normal "at-rest" position, and maintained during rotation.

— For unsprung furniture, release the lever handle or knob between 50° and the fully rotated position, allowing it to return under the action of the return force "R" only.

— For spring-assisted furniture, release between 30° and the fully rotated position of 40°, allowing it to return under the action of the spring in combination with the return force "R".

— For spring-loaded furniture, release between 50° and 60°, or 10° before the maximum angle of rotation allowed by the design.

Apply a force sufficient to rotate the driven lever handle or knob through an angle of $35°\,^{+5°}_{0}$ for spring-assisted furniture, $55°\,^{+5°}_{0}$ for unsprung furniture and $55\,^{+5°}_{0}$ or the maximum angle $^{0}_{-5°}$ allowed by the design for spring-loaded furniture.

The frequency of execution shall be between 20 and 30 operations per minute.

For spring loaded furniture with its own internal stops, the position of the lever handle or knob when in its "at-rest" position against its stops shall be measured and recorded.

7.3.7 Repeat test of axial strength and methods of fastening (Test 7)

Repeat test 2 (see 7.3.2 and Figure B.3).

The axial strength of the fasteners shall conform to 5.4.

7.3.8 Repeat check of free play (Test 8)

Repeat test 3 (see 7.3.3 and Figure B.8) to measure free play.

Free play shall conform to 5.5.1. Verification of compliance with the safety requirements of 5.5.2 shall not be repeated.

7.3.9 Repeat measurement of free angular movement (Test 9)

Repeat test 4 (see 7.3.4 and Figure B.9).

Free angular movement shall conform to 5.6.

7.3.10 Repeat test of torque of return mechanism (Test 10)

Repeat test 5 (see 7.3.5).

The torque of the return mechanism shall conform to 5.7.

7.3.11 Axial strength and method of fastening of special safety furniture (Test 11 − optional)

This test shall only apply to furniture classified as safety furniture (see Clause 1) and may be performed after Test 12.

The axial strength of safety furniture shall conform to 5.13.

The sample shall be subjected to a test force in accordance with Table 1, applied without shock in a direction away from the test block surface and perpendicular to it ± 2°. The force shall be applied at a distance of (50 ± 1) mm from the axis of rotation and maintained for 60 s $^{+10}_{0}$ s. The test force shall then be removed without shock.

7.3.12 Rotational strength (Test 12)

Rotational torque strength shall conform to 5.3.

The sample half set of lock or latch furniture shall be mounted on the test block specified in 6.2.1.1 and shown in Figure B.1.

A dial gauge shall be mounted in contact with the lever handle or knob bar at a point (50 ± 2) mm from the axis of rotation of the spindle. A pre-torque of (1 ± 0,1) Nm shall be applied without shock in a plane parallel to the block surface ± 2°, and the reading of the dial gauge shall be recorded.

A torque in accordance with Table 1 shall be applied without shock, in a plane parallel to the block surface ± 2°. The torque shall be maintained for 60 s $^{+10}_{0}$ s and then removed without shock.

After removal of the torque except for the pre-torque, the reading of the dial gauge shall be recorded.

7.4 Corrosion resistance (Test 13)

Corrosion resistance shall conform to 5.14.

Corrosion resistance shall be tested on samples that have not been subjected to any previous tests.

The test shall conform to EN 1670 and shall be tested in accordance with the grade of corrosion resistance claimed.

8 Marking

The product and/or its literature, packaging, etc., where indicated, shall be marked with the following:

— manufacturer's name or trademark, or other means of positive identification;

— product model identification;

— number of this European Standard and the classification in accordance with Clause 4;

— door thickness range;

— year and week of manufacture.

NOTE This information may be in coded form.

Annex A
(normative)

Requirements for security lock furniture for use on burglary resistant doors

A.1 Introduction

This annex specifies additional requirements for the strength and fastening methods for security lock furniture for use on burglary-resistant doors. When such furniture incorporates through-door cylinders, it also specifies free play tolerances that are relevant to the protection of such cylinders against forced entry. Requirements for the strength of a plug protection plate, when fitted, are also included. It specifies the test methods to be used and classifies security lock furniture in grades 1 to 4 (see Clause 4 and A.4).

This annex excludes methods of protection of lock cylinders that are features of the construction of the cylinder itself, and which improve its resistance to drilling and/or manipulation of its detainers. It also excludes special protection for mortice locks (such as specially hardened plates) since the positions of the features in the mortice lock that require such protection may be outside the area covered by the furniture backplate.

If security lock furniture incorporates a cylinder in the external plate, this cylinder should be supported by an aperture in the backplate whose dimensions match those of the cylinder with a little free play around the whole periphery of the cylinder.

When the backplate is an assembly of baseplate and trim plate, this requirement shall apply to the baseplate only.

NOTE The resistance of door lock furniture to forced entry is only one aspect of the overall resistance of a burglary-resistant door assembly, which also includes the door leaf and frame, the lock, the hinges and their fastenings as well as the method of fixing the complete door and frame into the building structure. This annex classifies important aspects of the performance of security lock furniture for use on such doors so that the door furniture may be properly selected in relation to the other aspects that jointly determine the overall performance of the complete door assembly.

A.2 Requirements

A.2.1 Design requirements

A.2.1.1 Security lock furniture shall have at least two fastening elements that pass through the door to connect the internal and external plates to each other. Plates and fastenings shall be so designed that, after fitting to the door, the fastenings cannot be detached from the external plate without accessing the internal plate.

If connecting bolts are required to pass through a lock case, it shall be ensured that the positions of such bolts are compatible with the corresponding apertures in the lock case.

A.2.1.2 When a trim plate can be removed with less force than that specified for the security grade claimed for the furniture, the baseplate shall conform to the requirements of this annex.

A.2.1.3 If the security lock furniture incorporates components such as levers, knobs or door pulls attached to the door, or serving to anchor the lockplate to the door, that cannot readily be removed from the exterior of

the door when secured in the locked position, these elements shall be in position during the strength tests A.2.2.1 and A.2.2.2.

A.2.2 Performance requirements

A.2.2.1 Plate strength

For cylinder and lever lockplates, the deflection under load, measured at the centre of key rotation when tested in accordance with A.3.3, shall not exceed 5 mm without a cylinder.

A.2.2.2 Strength of fastening elements

When tested in accordance with A.3.4 the deformation shall not exceed 2 mm.

A.2.2.3 Resistance to attack by drilling

When security lock furniture is tested in accordance with A.3.5, the drill shall not penetrate within the drilling time specified. Where the area of the drilling protection will not cover the complete area of the external plate, the area to be protected should be in accordance with the areas of the lock and the furniture fixing points most likely vulnerable. The minimum area of the drilling protection shall be 1 500 mm² in class 2 and class 3; in class 4 the complete external plate has to be protected.

These requirements do not apply to security grade 1.

NOTE Experience has shown that for case-hardened materials, a minimum hardness of 60 HRC and a depth of hardening of 0,3 mm is necessary to ensure such protection.

A.2.2.4 Resistance to attack by chisel

When tested in accordance with A.3.6, the inner and outer plates shall remain connected to each other by at least two fastening elements, and it shall not be possible to remove the outer plate without accessing the inner plate.

A.2.2.5 Additional requirement for the strength of plug protection plate (if fitted)

If the security lock furniture incorporates a plug protection plate, it shall not fracture and shall not be deformed during the test in accordance with A.3.7 in such a way that it is possible for it to be removed from the backplate.

This requirement does not apply to security grade 1.

A.3 Test methods

A.3.1 Test parameters

Table A.1 summarizes the main test parameters for security lock furniture.

Table A.1 — Parameters for security lock furniture for use on burglary resistant doors

Test	Subclause	Figure	Description	Category of security acceptance criteria			
				grade 1	grade 2	grade 3	grade 4
A.1	A.2.1	—	Design requirements	yes	yes	Yes	yes
A.2	A.2.2.1 / A.3.3	B.10	Plate strength — Force ± 50 N: — Maximum deflection:	 7 kN 5 mm	 10 kN 5 mm	 15 kN 5 mm	 20 kN 5 mm
A.3	A.2.2.2 / A.3.4	B.11	Strength of fastening elements — Force $^{+5}_{0}$ %: — Pre-load ± 50 N: — Maximum deformation:	 10 kN 500 N 2 mm	 15 kN 500 N 2 mm	 20 kN 500 N 2 mm	 30 kN 500 N 2 mm
A.4	A.2.2.3 / A.3.5	—	Resistance to drilling — Test duration: — Axial force $^{+5}_{0}$ %:	 no no	 ≥ 30 s 200 N	 ≥ 3 min 200 N	 ≥ 5 min 300 N
A.5	A.2.2.4 / A.3.6	B.12 B.13 B.14 B.15	Resistance to chisel — Long plate impact positions: — Short plate impact positions: — Escutcheon (see A.3.6.2) — Number of impacts of the pendulum:	 no no * no	 1,2 1,2 * 3	 1, 3, 4 1, 2, 4 * 6	 1, 2, 3, 4, 5 1, 2, 3, 4 * 12
A.6	A.2.2.5 / A.3.7	B.16	Strength of plug protection plate (if fitted) — Force $^{+5}_{0}$ %:	 no	 10 kN	 15 kN	 20 kN
* As appropriate to design and to A.3.6.2.							

A.3.2 Pre-checks (Test A.1)

The samples shall be checked for compliance with the requirements of A.2.1 before commencing the performance tests.

A.3.3 Plate strength (Test A.2)

Plate strength shall conform to A.2.2.1.

A (tensile) testing machine shall be used for the plate strength test. The force in accordance with Table A.1 shall be applied smoothly and continuously with a limit deviation of ± 50 N within 30 s by a (14 ± 1) mm steel rod. The rod passes through the inside plate and acts upon a (20 ± 1) mm wide by 100 $^{+5}_{0}$ mm long and 10 mm thick hardened steel plate, as illustrated in Figure B.10.

Measure and record the deflection on the line of the applied force.

For plates intended to be used with cylinder or lever locks, the force shall be applied in the centreline of the key rotation. For plates where the key rotation centre cannot be defined, the force shall be applied at the midpoint between the fixing screws with the largest distance.

The testing authority shall be provided with internal plates having a 16 mm $^{+1}_{0}$ mm diameter hole as appropriate for the plate to be tested.

A.3.4 Strength of fastening elements (Test A.3)

Fastening elements shall conform to A.2.2.2.

A (tensile) testing machine shall be used for the fixings strength test, incorporating laminated wood ((bonding type IF 20, quality II/II, 19 laminates, see EN 636:2003) or of similar quality) between the platen plates and the security plates as shown in Figure B.11. The two steel platen plates are attached, one to each of the fixed and moving jaws of the (tensile) testing machine.

A pre-load of (500 ± 50) N shall be applied and the gap between the platens shall be measured and recorded. The maximum force in accordance with Table A.1 shall then be applied smoothly and continuously with a limit deviation of $^{+5}_{0}$ % within 30 s and this force shall be maintained for 60 s $^{+1}_{0}$ s after which it shall be reduced to (500 ± 50) N and the gap between the platens re-measured. Measure and record the deformation on the line of the applied force.

The specified test forces shall be applied in succession, the first as near as is practicable to one end of the plate and then to the other. Where both fastenings are identical, only one end need be tested (see Figure B.11).

A.3.5 Resistance to attack by drilling (Test A.4)

Security lock furniture shall resist attack by drilling in accordance with A.2.2.3.

For the drilling test, the drilling machine shall have a power of between 500 W and 700 W at a no load speed of 500 r/min to 800 r/min. A 6 mm diameter high speed steel drill, in accordance with ISO 10899, shall be used under an applied axial force of (200 ± 10) N $^{+10}_{0}$ N for security grades 2 and 3, and an axial force of (300 ± 15) N $^{+15}_{0}$ N for security grade 4.

The point chosen for the drilling test shall be at the discretion of the testing authority. Drilling time shall be 30 s $^{+5}_{0}$ s for security grade 2, 3 min $^{+5}_{0}$ s for security grade 3 and 5 min $^{+5}_{0}$ s for security grade 4.

As an alternative to the drilling test described above, the security plate shall be checked for compliance with the hardness and depth of hardness given in A.2.2.3. Providing that it conforms to or exceeds these requirements, the drilling test may be omitted.

This test does not apply to security grade 1.

A.3.6 Resistance to attack by chisel (Test A.5)

A.3.6.1 Test apparatus (see Figures B.12, B.13, B.14 and B.15)

A.3.6.1.1 Pendulum

The pendulum is mounted on a rigidly supported ball bearing pivot, where there is a length of (1 000 ± 5) mm between the axis of the pivot and the centre of gravity of the pendulum. The mass of the pendulum shall be such that a static downwards load of (6 ± 0,1) kg results when the pendulum is supported with its shaft horizontal ± 1°.

It shall be possible to clamp the arm of the pendulum in a vertical position $^{+1°}_{0}$, from which it can be released manually to fall under its own mass and then impinge on the head of a chisel. The chisel is positioned as near

as is practicable under the centre of gravity of the pendulum, with its head at such a height that initial contact is made when the shaft of the pendulum is horizontal ± 2°.

Alternatively, a chisel can be energized by a guided, free-falling weight of 6 kg from a height of 1 000 mm.

A.3.6.1.2 Support for the test block

The support for the test block shall be steel, securely clamped to the base of the test apparatus and adapted to support the test block by carrying the samples under test with vertical guides to locate the chisel. The height of the chisel guides shall be arranged so that they do not prevent the chisel from penetrating the full depth of the backplate under test. The support block shall be positioned so that the chisel is (1 000 ± 5) mm from the axis of rotation of the pendulum and capable of lateral movement so that it may be aligned to strike the backplate as shown in Figures B.13 and B.14.

A.3.6.1.3 Test block and chisels

The test block shall be of laminated wood (bonding class 1 in accordance with EN 314-2:1993, 19 laminates, see EN 636) or of similar quality with dimensions (100 ± 5) mm × (300 ± 5) mm × (40 $^{+2}_{0}$ mm). It shall have channels cut out as indicated in Figure B.13 and Figure B.14, and positioned so that the chisel may strike either the edges of the backplate or the lugs for the fastening bolts. In the location of the lugs, furniture spindle and/or cylinder, these channels shall reach the centre line of the backplate; elsewhere they shall traverse the full depth of the test block.

The chisels used shall be of self-hardening steel with a hardness of 52 to 58 HRC, a bit angle of (60 ± 1)°, and finished dimensions of (12 ± 1) mm width by (8 ± 0,1) mm thickness (see Figure B.15).

A.3.6.2 Test procedure

Backplates shall resist attack by chisels in accordance with A.2.2.4.

Two chisels shall be used for testing security grade 2, and three chisels for testing security grade 3. For security grade 4, four chisels shall be used for a short backplate and five chisels for a long backplate.

a) Security grade 2:

   1) long backplate (greater than 200 mm overall length): insert two chisels successively in positions 1 and 2 of Figure B.13, driving each of them inwards with three impacts of the pendulum;

   2) short backplate (less than 200 mm overall length): insert two chisels successively in positions 1 and 2 of Figure B.14, driving each of them inwards with three impacts of the pendulum.

b) Security grade 3:

   1) long backplate (greater than 200 mm overall length): insert three chisels successively in positions 1, 3 and 4 of Figure B.13, driving each of them inwards with six impacts of the pendulum;

   2) short backplate (less than 200 mm overall length): insert three chisels successively in positions 1, 2 and 4 of Figure B.14, driving each of them inwards with six impacts of the pendulum.

c) Security grade 4:

   1) long backplate (greater than 200 mm overall length): insert five chisels successively in positions 1, 2, 3, 4 and 5 of Figure B.13, driving each of them inwards with twelve impacts of the pendulum;

   2) short backplate (less than 200 mm overall length): insert four chisels successively in positions 1, 2, 3 and 4 of Figure B.14, driving each of them inwards with twelve impacts of the pendulum.

The design of security doorplates may prevent the application of chisels in the precise positions defined above. In such cases, the test house shall decide where to apply the chisels, following as closely as practicable the procedure of A.3.6.2**,** and with the chisels applied at the bolts and at the weakest point of the plate.

This test shall not apply to security grade 1.

A.3.7 Strength of plug protection plate (if fitted) (Test A.6)

Plug protection plates shall conform to A.2.2.5.

If a plug protection plate is fitted, it shall be subjected to a force applied by means of a tool as illustrated in Figure B.16.

The force shall be applied perpendicular to the plug protection plate by a (compression) test machine equipped with suitable guides to position the tool centrally in the keyhole on the plug protection plate. The force shall be increased smoothly to the appropriate value as specified in Table A.1 with a limit deviation of $^{+5}_{0}$ % and shall be maintained for 60 s $^{+10}_{0}$ s, after which it shall be removed without shock.

This test does not apply to security grade 1.

A.4 Classification

In accordance with the classification specified in Clause 4, security lock furniture shall be categorized in security grades 1 to 4 with regard to the forces applied in accordance with A.3 and requirements of A.2.

A.5 Marking

Security lock furniture shall conform to Clause 8, and the external labelling or packaging shall include a statement of the minimum and maximum door thickness for which the furniture is suitable.

NOTE When the furniture is to be used with a lock cylinder, the external labelling or packaging should state the types that are suitable. The range of suitable dimensions should also be stated.

A.6 Fixing instructions

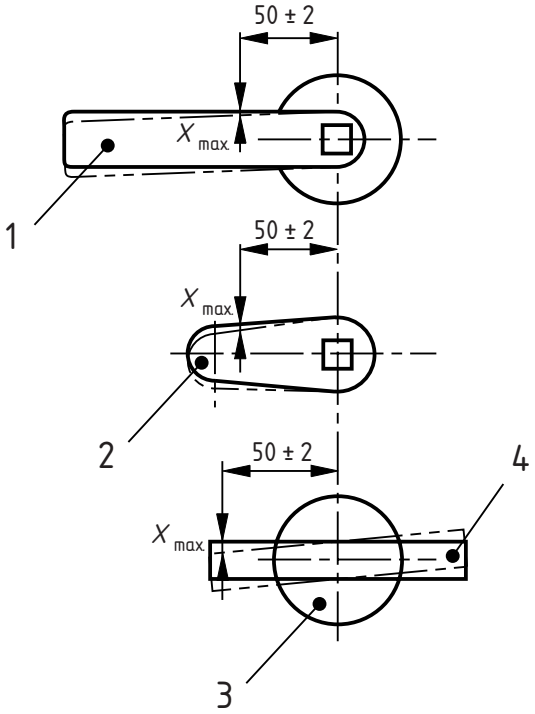
Fixing instructions that include pictorial or diagrammatic illustrations of the method of fixing and of a drilling template shall be available.

If the backplate is used for protecting the cylinder, the fixing instructions shall recommend that a cylinder shall be selected so that the lock cylinder does not protrude more than 3 mm above the outer surface of the backplate (or baseplate of an assembly). This requirement reduces the risk of tools being used to grip a projecting cylinder from fracturing or rotatating it.

Annex B
(informative)

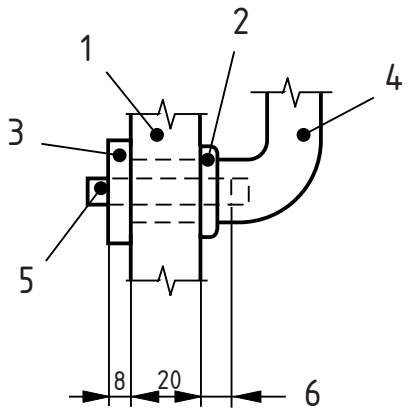
Test apparatus illustrations

Dimensions in millimetres



Key
1 Lever handle
2 Eccentric handle
3 Round knob
4 Insert through round knob

a) Test 12

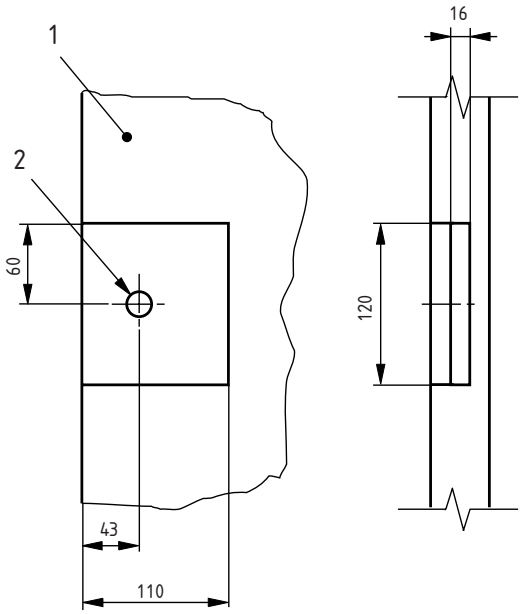


Key
1 Test block
2 Backplate
3 Fixed reaction plate
4 Lever handle
5 Spindle
6 Minimum engagement permitted by design or specified by the manufacturer

b) Test apparatus

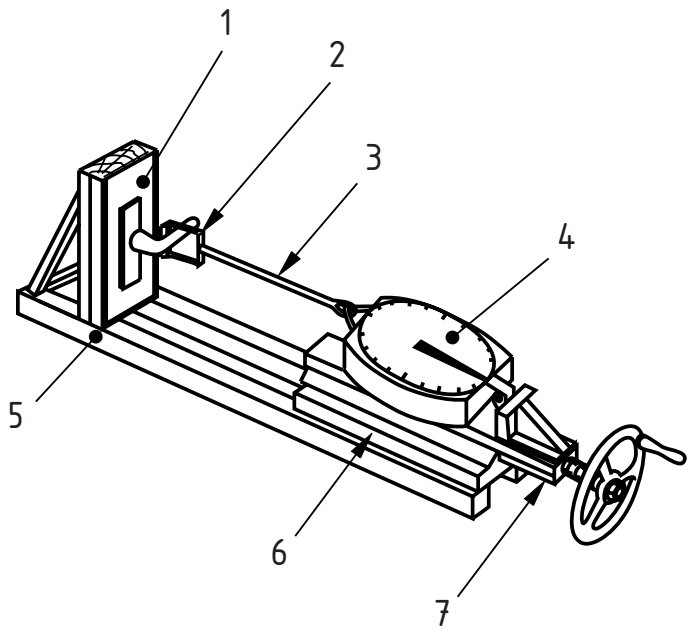
Figure B.1 — Rotational torque strength test

Dimensions in millimetres



Key
1 Test block
2 15 mm diameter hole

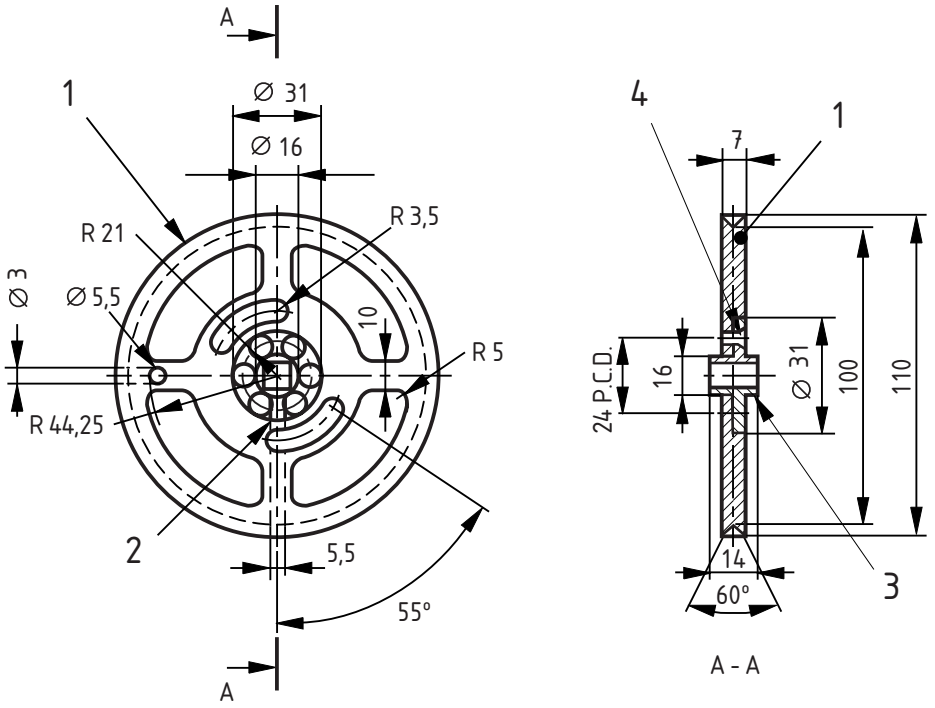
Figure B.2 — Mortice details for test block



Key
1 Fixed mounting block
2 Handle attachment means
3 Cable
4 Dial gauge
5 Machine bed
6 Fixed saddle
7 Screw thread moveable slide

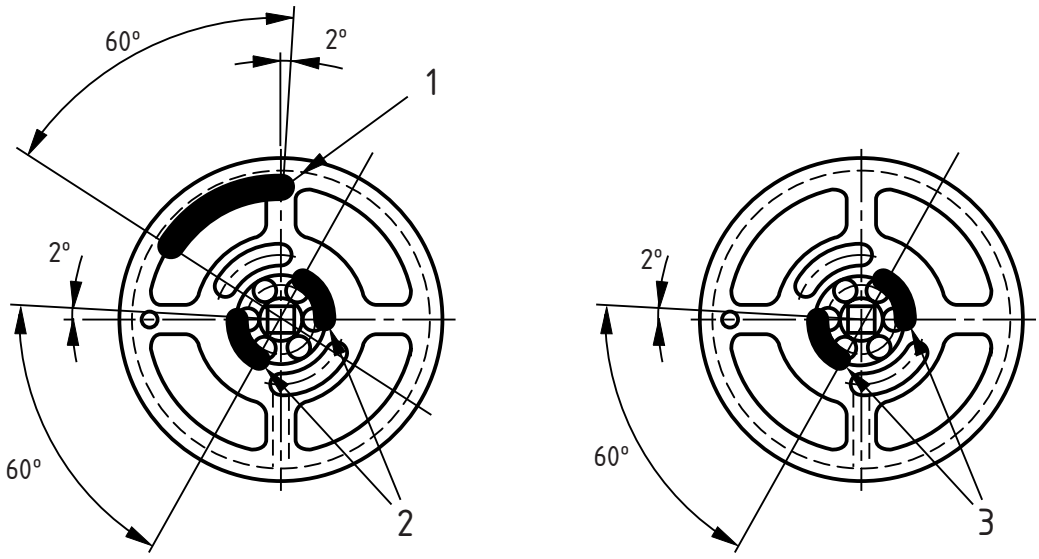
Figure B.3 — Test apparatus for axial strength tests

Dimensions in millimetres



Part	Description	Size	Quantity	Material
1	Pulley	Ø 110 x 7	1	Aluminium
2	Grub screw	M5 x 4	1	Steel
3	Adaptor piece with square hole	Ø 31 x 14	1	Steel
4	Countersunk posi screw	M4 x 6	6	Steel

Figure B.4 — Aluminium pulley for use with endurance test apparatus



Key

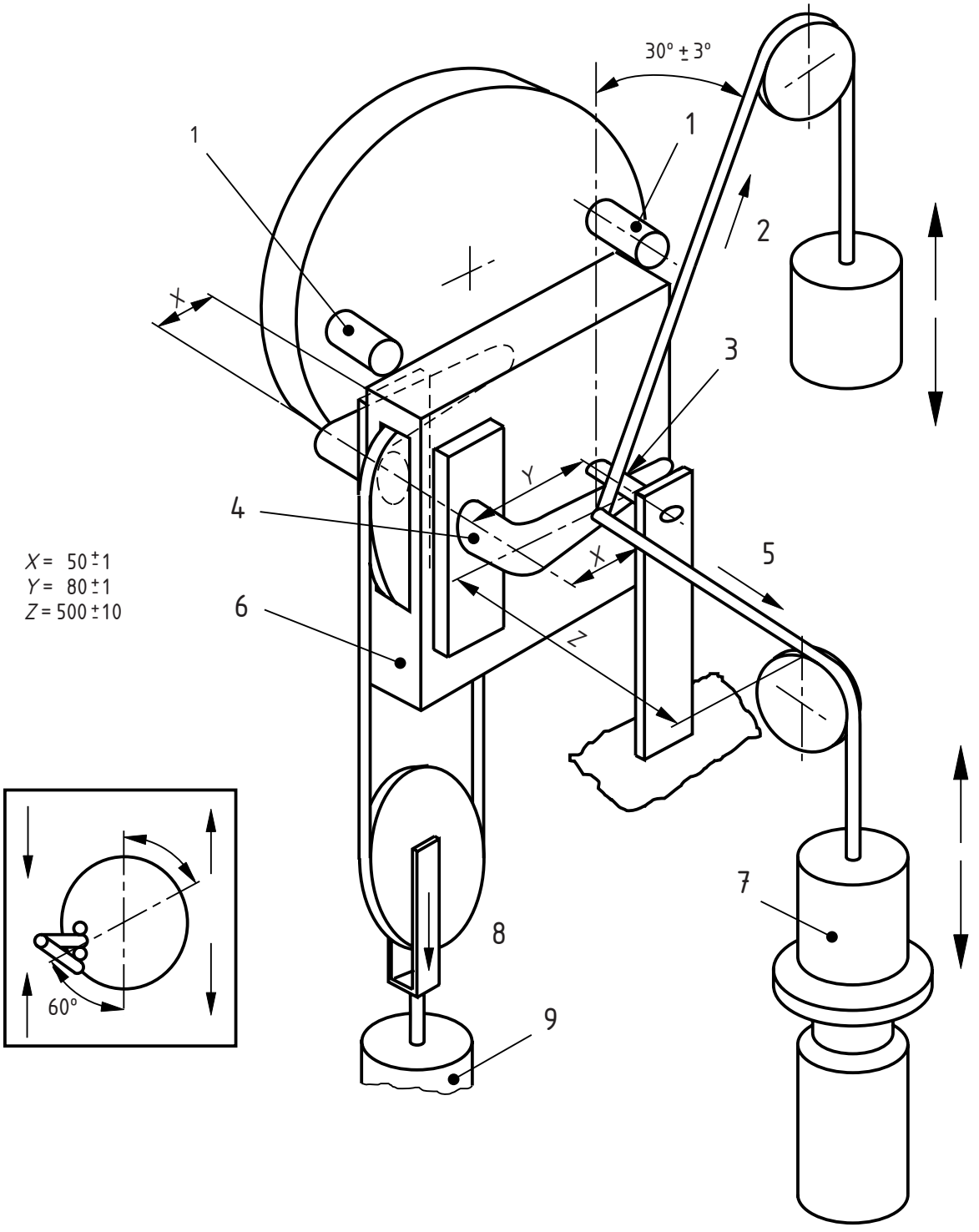
1 Details for Netherlands

2 Details for Finland, Sweden, Norway and Denmark

3 Details for United Kingdom

Figure B.5 — Bolt through slot details

Dimensions in millimetres

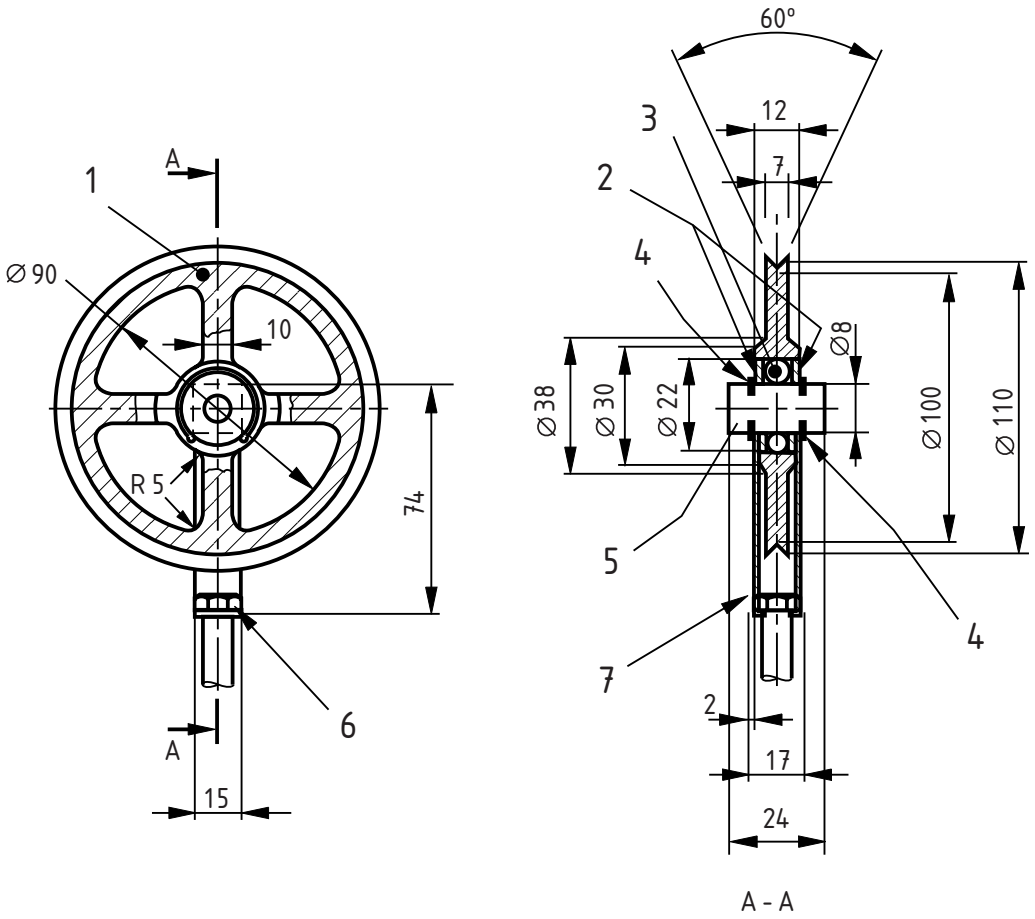


Key

1 Driving peg
2 Handle return force ‘R’
3 10 mm diameter steel stop
4 Lever handle
5 Outward force "P"
6 Test block
7 Means to apply
8 Downward force "L"
9 Means to apply appropriate test force "L"

Figure B.6 — Test apparatus for endurance tests

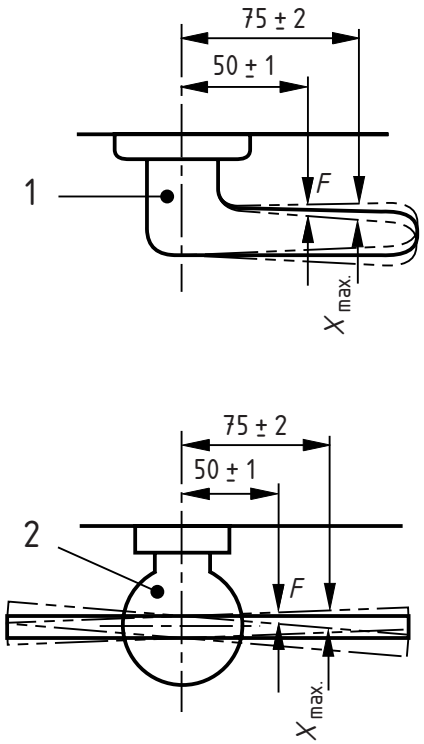
Dimensions in millimetres



Part	Description and note	Size	Quantity	Material
1	Pulley	ø110 × 12	1	aluminium
2	Spacing ring	ø8 × ø22	1	steel
3	Ball bearing	8 × 22 × 7	1	
4	Circlip	ø22 × 1	2	steel
5	Spindle	ø8 × 24	1	steel
6	Hexagon head setpin	M6 × 20	1	steel
7	Carrier	17 × 14 × 74 ×2	1	sheet steel

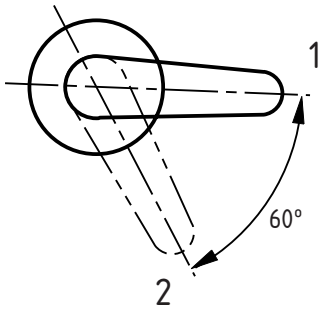
Figure B.7 — Weight pulley for use with endurance test apparatus

Dimensions in millimetres



Key
1 Lever handle
2 Knob

a)

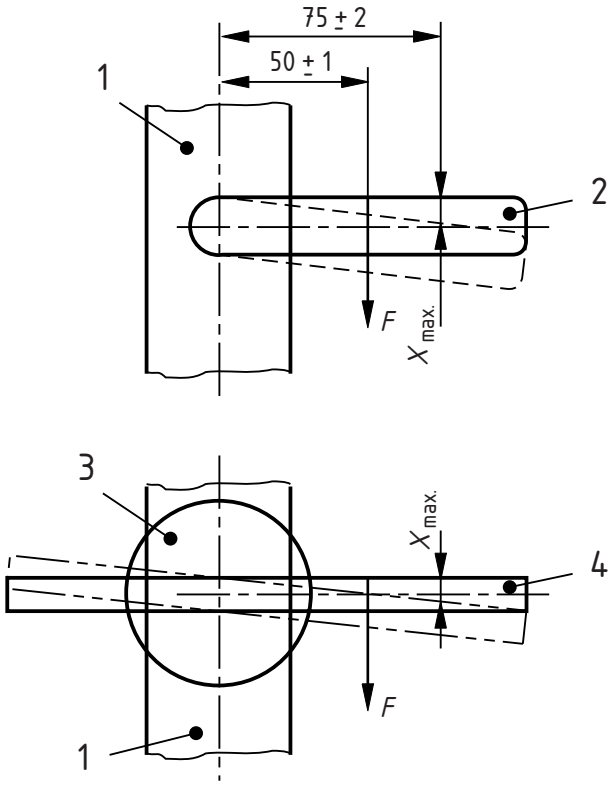


Key
1 At rest positions
2 Position after rotation

b)

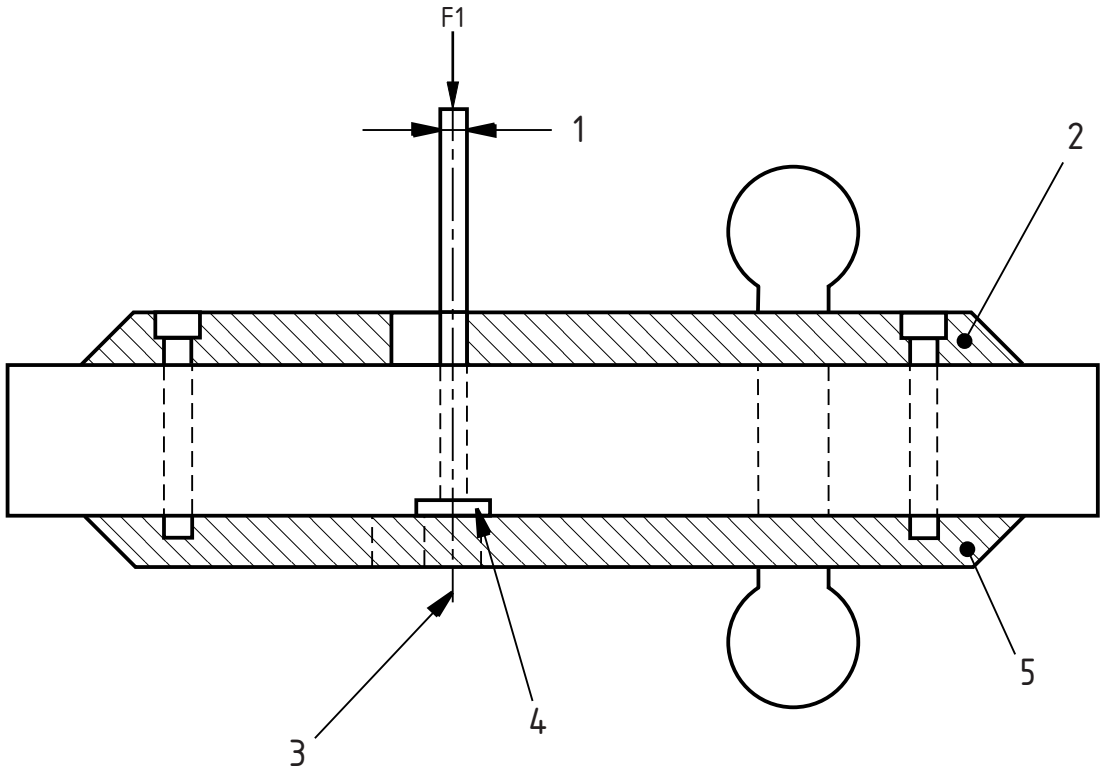
Figure B.8 — Measurement of free play

Dimensions in millimetres



Key
1 Test block
2 Fixed lever handle
3 Knob
4 Fixed bar

Figure B.9 — Check of free angular movement

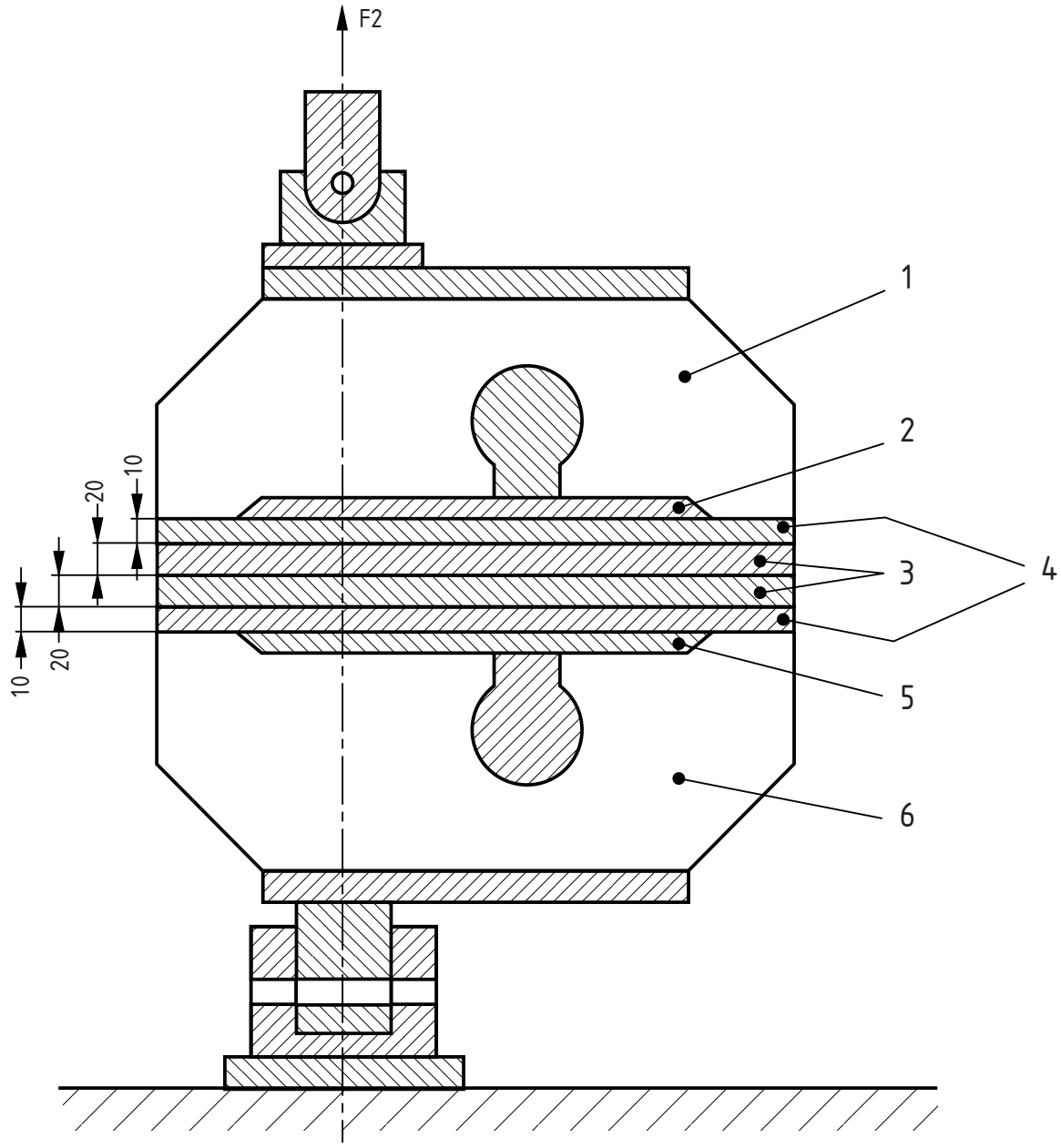


Key

1 (14 ± 1) mm diameter rod
2 Inner plate
3 Centre line of key rotation
4 (20 ± 1) mm wide × 100 mm $^{+5}_{0}$ mm long × (10 ± 1) mm thick plate
5 Outer plate

Figure B.10 — Cylinder lockplate strength test

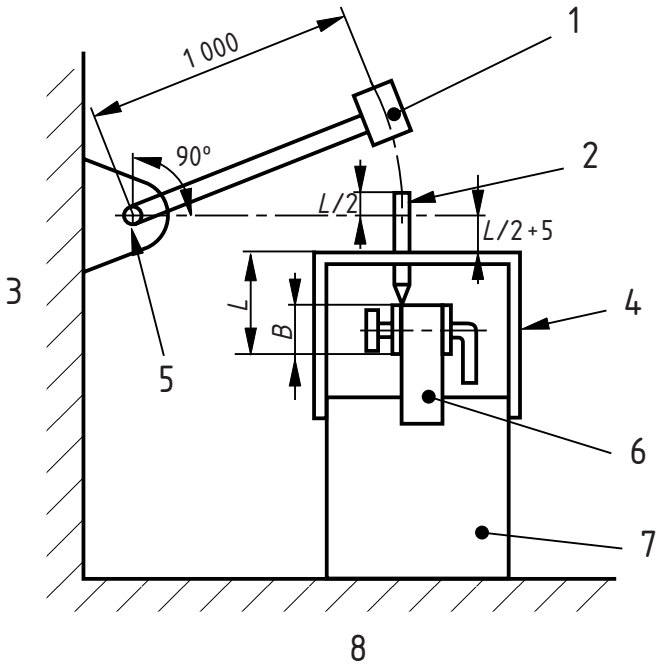
Dimensions in millimetres



Key
1 Moving jaw
2 Outer plate
3 Steel plate*)
4 Laminated wood *)
(bonding type IF 20 II/II 19 laminates
see EN 636:2003) or of similar quality
5 Inner plate
6 Fixed jaw
*) Shall correspond to door leaves.

Figure B.11 — Fixings strength test

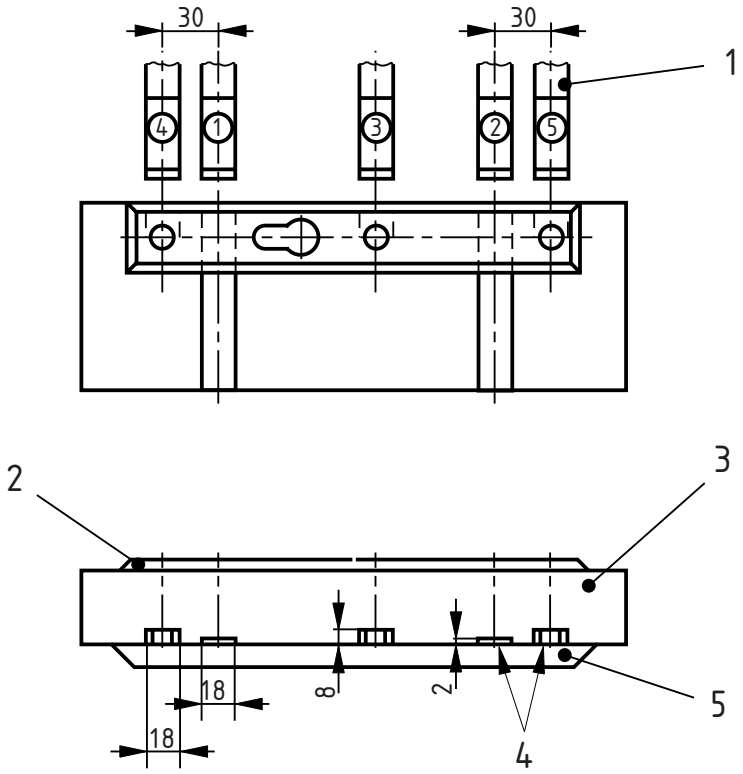
Dimensions in millimetres



Key
1 6 kg pendulum mass
2 Chisel
3 Wall
4 Chisel guide
5 Ball bearings
6 Laminated wood test block
7 Support for test block
8 Rigid floor / ground

Figure B.12 — Apparatus for chisel attack test

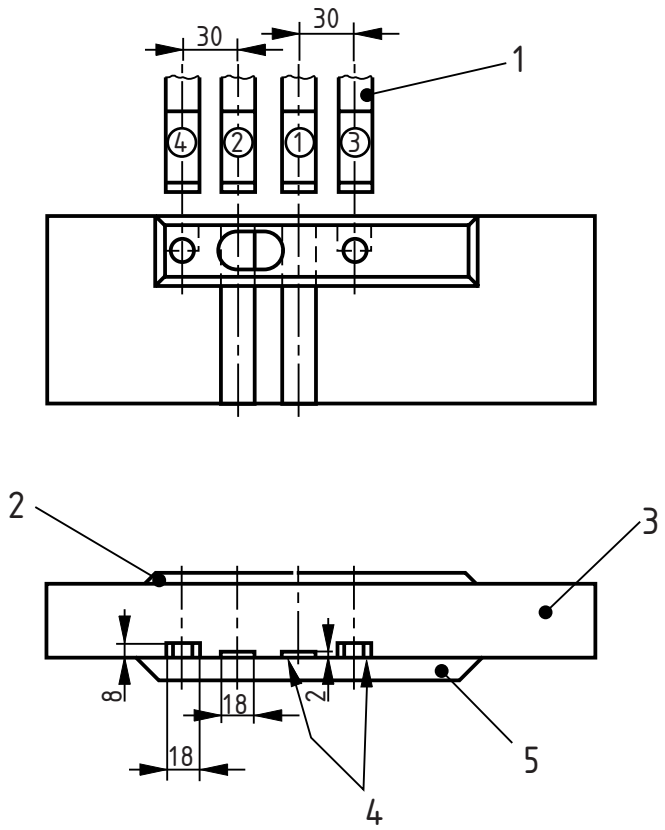
Dimensions in millimetres



Key
1 Chisels
2 Internal plate
3 Test block
4 Slots for chisels
5 External plate

Figure B.13 — Long backplate test block for chisel attack

Dimensions in millimetres



Key
1 Chisels
2 Internal plate
3 Test block
4 Slots for chisels
5 External plate

Figure B.14 — Short backplate test block for chisel attack

Dimensions in millimetres

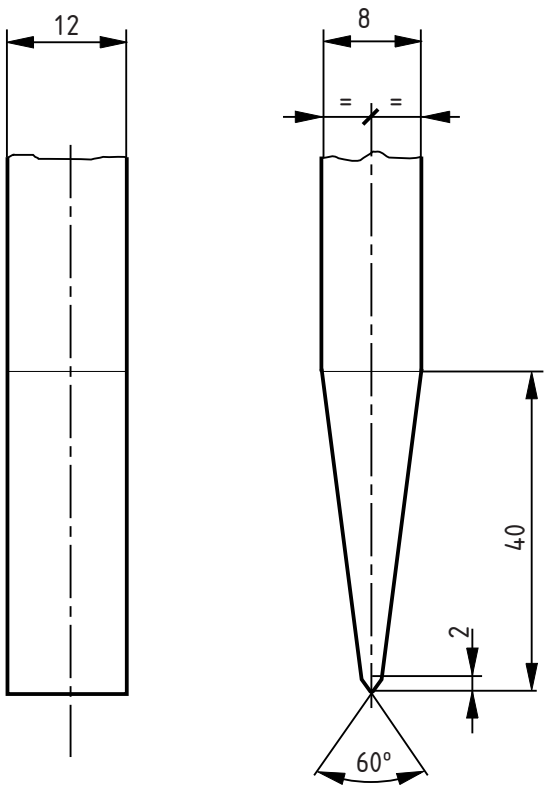
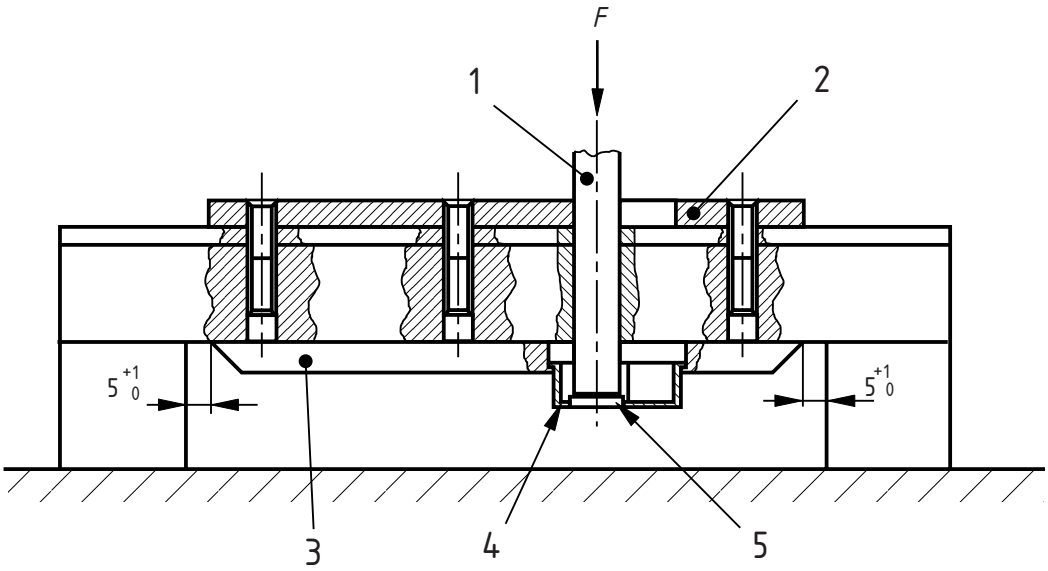


Figure B.15 — Chisel

Dimensions in millimetres



Key
1 Tool
2 Inner plate
3 Outer plate
4 Cylinder protection cover
5 Plug protection plate

Figure B.16 — Tensile strength test of plug protection plate

Annex C
(normative)

Requirements for lever handles and knob furniture for use on smoke-control and fire-resistant doors

C.1 General

The requirements of this annex apply only to lever handles and knob furniture for use on smoke-control and fire-resistant doors. The supply chain providing door furniture to these types of doors varies from country to country. In some regions, smoke-control and fire-resistant doors are supplied as doorsets, complete with hardware. In other regions, doors and hardware are supplied separately and are assembled on site. National building regulations also vary in their requirements. Those responsible for the doorsets' compliance with local regulations should choose the most appropriate grades for their situation.

Lever handles and knob furniture for smoke-control and fire-resistant doors must conform with this standard's classification for category of use that is applicable for their intended use (see 4.1.2).

NOTE See also EN 14600.

C.2 Classification for smoke-control and fire-resistant Grades A, B, C and D

Lever handles and knob furniture in these grades shall have acceptable documentary evidence to show that they are suitable for use on the smoke-control and fire-resistant doors for which they are intended. These shall be either:

— current test reports to EN 1634-1, EN 1634-2 or EN 1634-3; or

— assessment by an accredited testing institute based on applicable test reports (for example tests based on design and material).

The documentation should indicate the methods of fixing which may be used, together with details of any additional materials necessary to achieve the required performance under test.

Lever handles and knob furniture for smoke-control and fire-resistant doors shall be a group of which the components shall be matched by the manufacturer. The components of the door lever handle set must be identifiable as belonging together (e.g. by a list of parts, fixing instructions, etc.).

Table C.1 — Classification of suitability for use on smoke control and fire resistant doors

Grade		Suitability	Material/ melting point	Special features with melting-point ≥ 1 000 °C	Evidence	
standard	with door cycle test C.4.3				EN 1634-X	Assessment
0	—	No performance determined for use on smoke-control and fire-resistant doors	—	—	—	—
A	A1	Intended for smoke-control doors	< 300 °C	—	EN 1634-3	Yes
			≥ 300 °C	—	—	Yes
B	B1	Intended for fire-resistant doors	< 1 000 °C	—	EN 1634-1 EN 1634-2	Yes
			≥ 1 000 °C	—	—	Yes
C	C1	Intended for fire-resistant doors	< 1 000 °C	Fire protection inlay in backplate /escutcheon, key hole cover	EN 1634-1 EN 1634-2	Yes
D	D1	Intended for fire-resistant doors	< 1 000 °C	Fire protection inlay in backplate /escutcheon, key hole cover and steel core in handle/knob	—	Yes

Door furniture made of materials with a melting point < 300 °C can be classified as grade A with test report in accordance with EN 1634-3; or if an accredited test institute has given an assessment based on an applicable smoke-control test report.

Door furniture made of materials with a melting point ≥ 300 °C can be classified as grade A without test report in accordance with EN 1634-3, if an accredited test institute has given an assessment.

Door furniture made of materials with a melting point < 1 000 °C can be classified as grade B with test report in accordance with EN 1634-1, EN 1634-2; or if an accredited test institute has given an assessment based on an applicable fire test report.

Door furniture made of materials with a melting point ≥ 1 000 °C can be classified as grade B without test report in accordance with EN 1634-1, EN 1634-2, if an accredited test institute has given an assessment.

Door furniture made of materials with melting point < 1 000 °C with fire protection inlay in escutcheon, key hole cover, without fire proof core in the handle, can be classified as grade C without test report in accordance with EN 1634-1, EN 1634-2, if an accredited test institute has given an assessment based for example on the design and materials.

Door furniture made of materials with melting point < 1 000 °C, with fire protection inlay (core) in handle, escutcheon, backplate, rose and key hole cover, can be classified as grade D without test report in

accordance with EN 1634-1, EN 1634-2, if the requirements from C.3 are complied with and an accredited test institute has given an assessment.

C.3 Additional requirements for fire resistance classification Grade D with fire-proof core

Lever handles which are made of materials with a melting point lower than 1 000 °C shall contain a fire-proof core which remains connected to the spindle after the fire, and which is incorporated in the handle with a minimum length of 80 mm. The steel core shall have a cross-section of a minimum width of 4,5 mm and a height of 9 mm or a corresponding section modulus W_{tmin}.

The bearing of the lever shall be resistant to axial force and turnable. Even after a possible fire, a tensile-resistant connection between the lever handle and the baseplate of the backplate or the rose shall remain. Open keyholes in the backplate or the escutcheons shall be covered on both sides with self-acting keyhole covers to avoid the passage of fire. Key hole covers shall be made of materials with a melting point ≥ 1 000 °C. Covers for cylinder locks are not required if the cylinder is made from materials with a melting point > 840 °C.

A turnable or fixed knob may be installed on one side of the door instead of a lever handle. For turnable knobs, the same requirements as for lever handles shall apply.

NOTE National regulations shall be followed.

Through the door fixings shall be made of materials with a melting point ≥ 1 000 °C.

Radial split spindles may only be used if the lever handles' design is equipped with a fixed and rotatable lever handle bearing, through which the axial forces and torques can be applied.

C.4 Tests

C.4.1 Fire resistance

Fire resistance shall be determined by testing in accordance with EN 1634-1 or EN 1634-2, unless an assessment can be given without testing by an accredited test institute on the basis of similarity to another product.

C.4.2 Smoke control

Smoke control performance shall be determined by testing to EN 1634-3, unless an assessment can be given without testing by an accredited test institute on the basis of similarity to another product.

C.4.3 Door cycle test - Durability and functional endurance for grades A1, B1, C1, D1

C.4.3.1 General

Lever handles and knob furniture for smoke-control and fire-resistant doors shall prove their suitability in a durability test on a test door in accordance with C.4.3.2.

The door lever handle set shall be fixed to the test door for the durability test. The door shall be tested 200 000 times by the test apparatus (for passive leaf handle sets 100 000 times) by unlatching the door lever handle, opening it via the hardware to an approximately 30° door opening angle and then closing it again after every opening by means of the door closer.

To open, a constant torque of max. 5,0 Nm shall be applied to the door lever handle while operating at intervals of 100 mm from the rotation point of the door lever handle.

C.4.3.2 Test door

The test door is essentially a frame structure with a door leaf weight of 200 kg and maximum door leaf dimensions of 1 100 mm width and 2 100 mm height. The test door's lock area shall be designed in such a way that this can be simulated for the intended door type (timber, steel sheet or framed door) and the door lever handle sets to be tested can be installed in accordance with the manufacturers' specifications. The test door shall be preferably equipped with a door closer in accordance with EN 1154:1996+A1:2002 size 4 or a cord and weight mechanism, and a lock matched to suit both the test door and the door lever handle set in accordance with EN 12209. Upon closing, the door leaf shall hit up against the frame at a speed of 0,3 m/s ± 10%. The test door shall be operated with 10-12 cycles per minute.

C.4.3.3 Functional endurance

On lever handles and knob furniture for smoke-control and fire-resistant doors, no damage in the form of fractures or cracks may be evident after the durability test and the door lever handle operation shall be warranted.

The connecting pieces used to install the door lever handle set shall not have become loose.

NOTE The manufacturers' maintenance instructions shall be followed.

C.5 Test report

The test report shall be in accordance with EN ISO/IEC 17025.

NOTE If a Hardware Performance Sheet regarding prEN 16035 is issued, the test application and test method should be documented within this document.

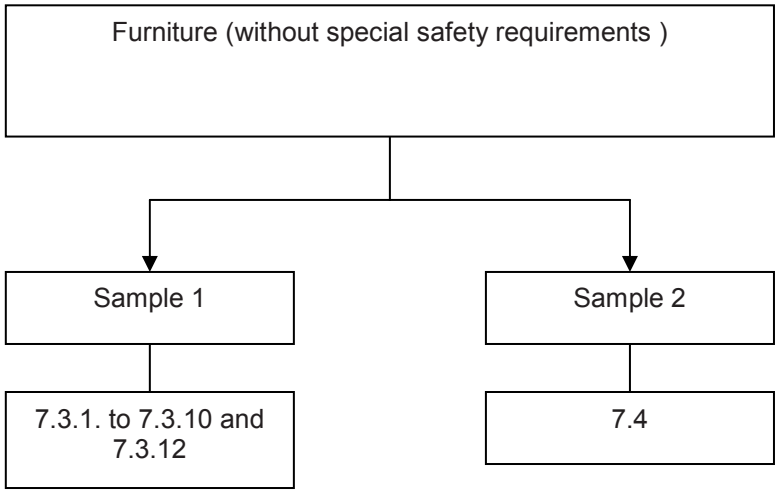
C.6 Voluntary Monitoring

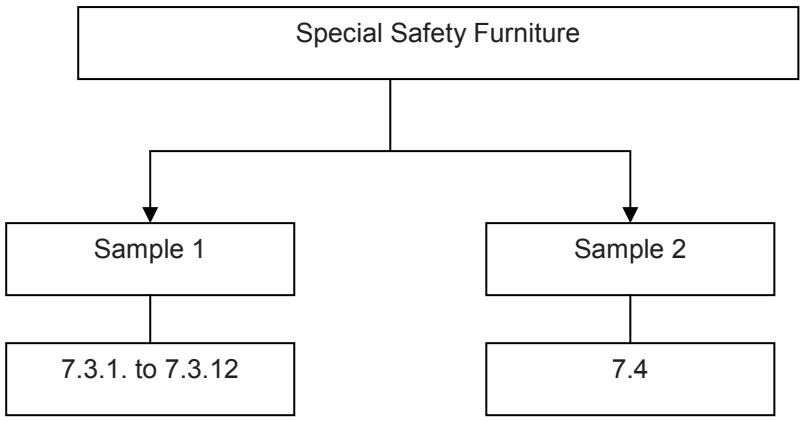
Lever handles and knob furniture for smoke-control and fire-resistant doors should be subject to a voluntary monitoring and certification programme from an accredited test laboratory.

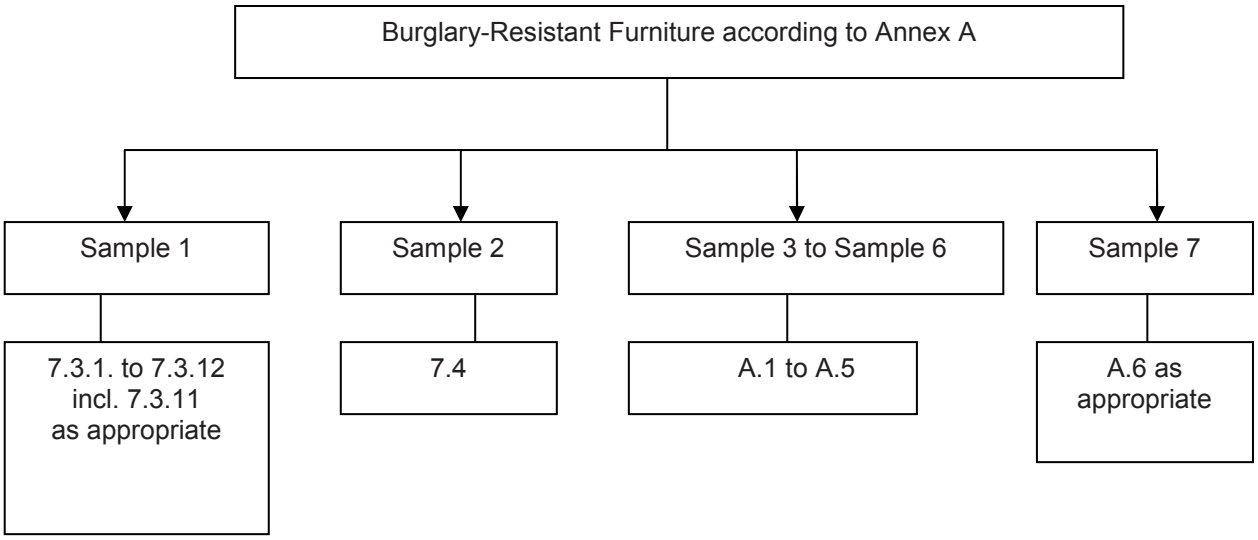
NOTE National regulations shall be followed.

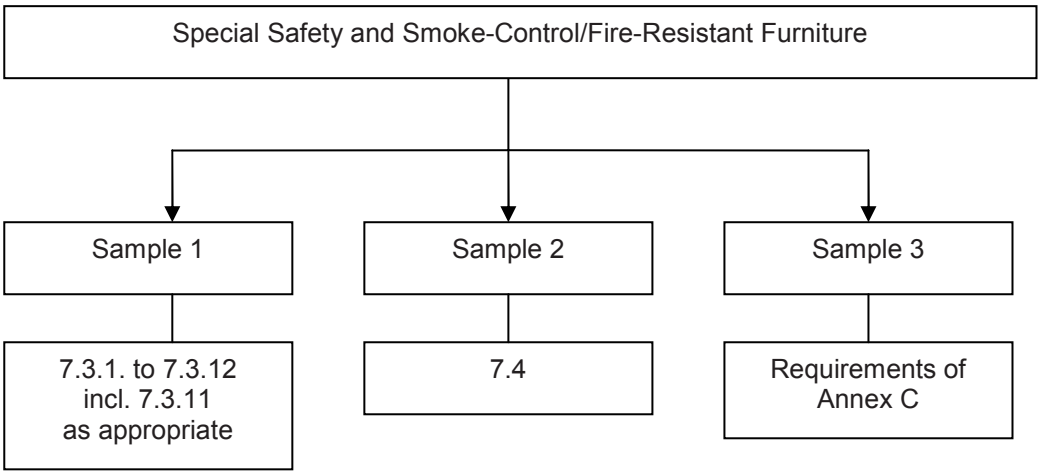
Annex D
(informative)

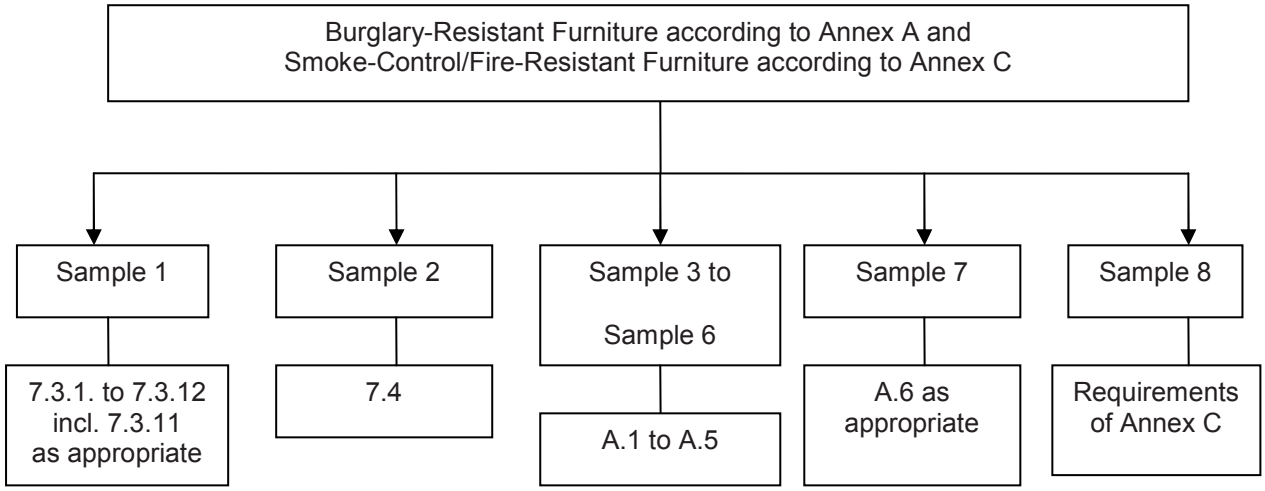
Flow charts of test procedures






Burglary-Resistant Furniture according to Annex A
Sample 1
Sample 2
Sample 3 to Sample 6
Sample 7
7.3.1. to 7.3.12 incl. 7.3.11 as appropriate
7.4
A.1 to A.5
A.6 as appropriate


Special Safety and Smoke-Control/Fire-Resistant Furniture
Sample 1
Sample 2
Sample 3
7.3.1. to 7.3.12 incl. 7.3.11 as appropriate
7.4
Requirements of Annex C


Burglary-Resistant Furniture according to Annex A and
Smoke-Control/Fire-Resistant Furniture according to Annex C
Sample 1
Sample 2
Sample 3 to
Sample 6
Sample 7
Sample 8
7.3.1. to 7.3.12
incl. 7.3.11
as appropriate
7.4
A.1 to A.5
A.6 as
appropriate
Requirements
of Annex C

Bibliography

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

[2] EN 14600, *Doorsets and openable windows with fire resisting and/or smoke control characteristics — Requirements and classification*

[3] prEN 16035, *Hardware performance sheet (HPS) — Identification and summary of test evidence to facilitate the interchangeability of building hardware for application to fire resisting and smoke control doorsets and openable windows*

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